SIEMENS

Function Manual

SINAMICS

DYNEGMA

Dynamic Energy Management

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SINAMICS

Technology Extension DYNEGMA

Function Manual

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List of abbreviations A

Valid for
Technology Extension DYNEGMA,
Firmware version 1.1 SP3
SINAMICS from 4.7
SINAMICS Integrated from 4.7
SINUMERIK from 4.7

09/2020
A5E45815184B

Legal information

Warning notice system

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

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

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

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

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

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

Qualified Personnel

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

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

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Disclaimer of Liability

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

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Introduction 1

1.1 The SINAMICS converter family

With the SINAMICS converter family, you can solve any individual drive task in the low-voltage, medium-voltage and DC voltage range. From converters to motors and controllers, all Siemens drive components are perfectly matched to each other and can be easily integrated into your existing automation system. With SINAMICS you are prepared for digitization. You benefit from highly efficient engineering with a variety of tools for the entire product development and production process. And you also save space in the control cabinet – thanks to the integrated safety technology.

You can find additional information about SINAMICS at the following address (http://www.siemens.com/sinamics).

1.2 General information about SINAMICS documentation

SINAMICS documentation

The SINAMICS documentation is organized in the following categories:

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

Standard scope

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

- Other functions not described in this documentation might be able to be executed in the drive system. However, no claim can be made regarding the availability of these functions when the equipment is first supplied or in the event of service.
- The documentation can also contain descriptions of functions that are not available in a particular product version of the drive system. Please refer to the ordering documentation only for the functionality of the supplied drive system.
- Extensions or changes made by the machine manufacturer must be documented by the machine manufacturer.

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

Target group

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

Benefits

This manual provides all of the information, procedures and operator actions required for the particular usage phase.

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 the following address (https://support.industry.siemens.com/My/ww/en/documentation).

Additional information

You can find information on the topics below at the following address (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)

Questions relating to the technical documentation

Please send any questions about the technical documentation (e.g. suggestions for improvement, corrections) to the following email address (https://support.industry.siemens.com/cs/de/en/ps/faq).

FAQs

You can find Frequently Asked Questions about SINAMICS under Product Support (mailto:docu.motioncontrol@siemens.com).

Siemens Support while on the move



With the "Siemens Industry Online Support" app, you can access more than 300,000 documents for Siemens Industry products – any time and from anywhere. The app supports you in the following areas, for example:

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

Furthermore, you have access to the Technical Forum and other articles that our experts have drawn up:

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

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

Data matrix code on the rating plate

The data matrix code on the rating plate contains the specific device data. This code can be read-in with any smartphone and technical information for the appropriate device can be displayed via the "Industry Online Support" mobile app.

Websites of third-party companies

This document includes hyperlinks to websites of third-party companies. Siemens is not responsible for and shall not be liable for these websites or their content, as Siemens has not checked the information contained in the websites and is not responsible for the content or information they provide. The use of such websites is at the user's own risk.

Training

You can find information on SITRAIN at the following address (http://www.sitrain-learning.siemens.com). SITRAIN offers training courses for products, systems and solutions in drive and automation technology from Siemens.

Technical Support

To ask a technical question or create a support request, click on "Support Request" at the following address and select "Create Request".

See also

Technical Support (http://support.industry.siemens.com/sc/ww/en/sc/2090)

1.3 General Data Protection Regulation

Compliance with the General Data Protection Regulation

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

For this product, this means:
The product does not process neither store any person-related data, only technical function data (e.g. time stamps). If the user links these data with other data (e.g. shift plans) or if he stores person-related data on the same data medium (e.g. hard disk), thus personalizing these data, he has to ensure compliance with the applicable data protection stipulations.

Fundamental safety instructions 2

2.1 General safety instructions

⚠ WARNING

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

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

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

⚠ WARNING

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

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

- Protect the parameterization against unauthorized access.
- Handle possible malfunctions by taking suitable measures, e.g. emergency stop or emergency off.

2.2 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.

2.3 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 may be implemented, please visit
https://www.siemens.com/industrialsecurity (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 under
https://www.siemens.com/industrialsecurity (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, 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.

Applications and features

3

3.1 Applications

Technology Extension DYNEGMA (Dynamic Energy Management) is a peak load management and overload protection function for machine tool infeeds.

The task of DYNEGMA is to protect the infeed unit during power peaks; these can occur when several drives simultaneously accelerate or brake. DYNEGMA only intervenes when actually required in order to guarantee not only safe and reliable operation, but also maximum dynamic performance.

To protect the infeed unit against overload, and in turn resulting tool, material machine damage, when required DYNEGMA also limits the torque of individual drives. This extends the acceleration times of these drives. As soon as there is no longer a risk of the infeed unit being overloaded, DYNEGMA again withdraws the torque limits.

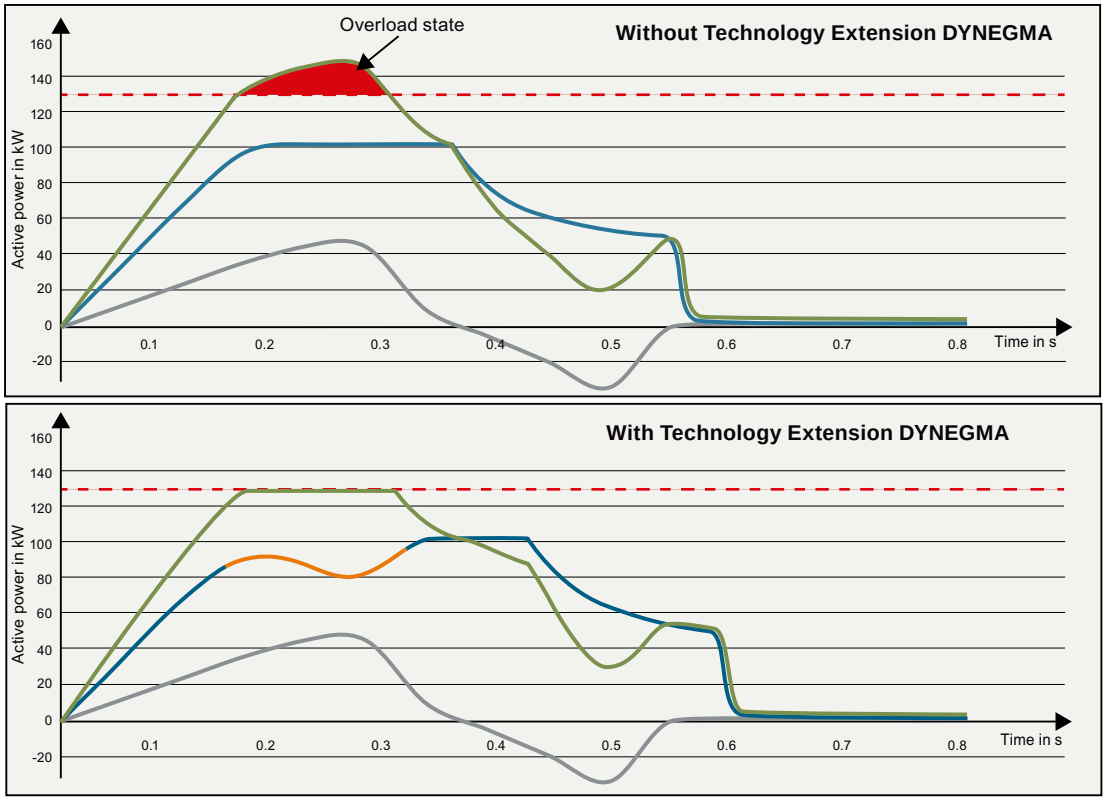


Figure 3-1 Function overview of TEC DYNEGMA

Overload states can occur in the following situations:

- Axes and spindles connected to a common DC link accelerate simultaneously. The sum of the powers when accelerating is higher than the maximum power of the infeed. This can occur when changing tools, for example.
- Several axes move in rapid traverse and the spindle rotates; in this case, an EMERGENCY STOP is initiated. When all drive objects simultaneously brake, this can result in an infeed overload in the generator mode.
- It is not permissible that any overload conditions occur during the actual machining process of a machine tool. It is crucial that this is taken into account when selecting and dimensioning the infeed unit.

Without the DYNEGMA dynamic energy management, frequently infeed overload states are avoided by permanently limiting the maximum spindle power through the appropriate parameterization. This results in longer spindle acceleration and braking operations (i.e. machining time is lost) – independent of the dynamic performance of the infeed. This disadvantage does not exist for the DYNEGMA dynamic energy management function; in fact, spindle acceleration and braking operations can be optimally adapted to the actual performance of the infeed unit. It is no longer necessary to permanently limit the spindle drive power DYNEGMA as the limits automatically become active when there is a risk of an overload condition.

Advantages of Technology Extension DYNEGMA

Technology Extension DYNEGMA prevents infeed overload conditions in operation, and offers the following advantages:

- DYNEGMA prevents overload situations, without restricting the dynamic performance in normal operation.
  - In the critical range, DYNEGMA limits the power of the spindles, and facilitates safe and reliable operation within the infeed power limits.
  - In normal operation, DYNEGMA does not limit the power. As a consequence, there are no restrictions regarding the dynamic performance while machining.
- DYNEGMA is available for all Active Line Modules (ALM) and Smart Line Modules (SLM) in combination with any SERVO drive objects.
- Configuring DYNEGMA is simple and intuitive.
- DYNEGMA prevents overload conditions, even when an EMERGENCY STOP is forced.
- When the power fails, the emergency response can be performed via the V_{dc} controller, as in this case, DYNEGMA is automatically shut down.
- Using the appropriate control word interconnection, the power limiting can be temporarily inhibited on the drive objects, e.g. if a spindle is in the axis/positioning mode.
- No additional/modified hardware is required.

3.2 Features

System integration

One infeed and up to 4 spindle drives can be incorporated in the DYNEGMA dynamic energy management. Both the infeed as well as the associated drives must be connected to the same Control Unit via DRIVE-CLiQ.

Technology Extension DYNEGMA is used for servo controls in conjunction with the following systems:

- SINAMICS S120 (CU320-2)
- SINAMICS Integrated (SINUMERIK NCU, SINUMERIK NX)

The following firmware versions support Technology Extension DYNEGMA:

- Without using PROFIdrive telegram 146, 147 or 149
  - From SINAMICS 4.7 (corresponds to SINUMERIK V4.7)
- Using PROFIdrive telegram 146, 147 or 149
  - From SINAMICS 5.2 (corresponds to SINUMERIK V4.91 and SINUMERIK 6.11)

To use PROFIdrive telegrams, see Inhibiting spindle power reduction (Page 54).

Supported components

Technology Extension DYNEGMA (dynamic energy management) is an extension for the following SINAMICS S120 components:

The following types of infeed units (Line Modules) with DRIVE-CLiQ interface:

- The following types of Active Line Module (ALM) infeed units (Line Modules) with DRIVE-CLiQ interface:
- Smart Line Module (SLM)

Note

The infeed unit used must as a minimum satisfy the following criteria:

- It is not permissible that any overload situations occur while machining.
- The simultaneity (coincidence) factor to evaluate the maximum DC link voltage, assumed during the engineering/design phase, may only be exceeded in exceptional cases, for example, for tool changes.

Up to four SERVO drive objects:

- Main application: Drive objects, which are used as spindle Typically, for these drive objects p0500 is set = 102.

  Note

  Using DYNEGMA on spindles

  In the following cases, DYNEGMA must be deactivated on spindles (p32602 = 1):

  - When operating spindles in position-controlled/position-monitored operation
  - If it is not permissible that the spindle power is limited.

- Permissible application: Drive objects, which are operated as spindle/axis combination that can be switched over.

  Note

  Using DYNEGMA on spindle/axis combinations that can be switched over

  For certain machining tasks, e.g. on lathes with face machining, a spindle can be switched over into the axis mode and operated as rotary axis. Generally, in spindle operation and for rotary axes in closed-loop speed control DYNEGMA can be used without any restrictions.

  DYNEGMA must be deactivated in the following cases (p32602 = 1):

  - When operating rotary axes in position-controlled/position-monitored operation.
  - If it is not permissible that the rotary axis power is limited.

Generally, in alarm and parameter lists - as well as the following chapters - the formulation "spindle" is used, e.g. that the power of a "spindle" is limited. The term "spindle" refers to any arbitrary drive object, where the power should be limited.

License Key

A license key is required for Technology Extension DYNEGMA, see "Commissioning overview (Page 51)".

Installation and activation

4

4.1 Overview of installation and activation

The subsequent installation descriptions in this chapter refer to the fictitious Technology Extension "ABC_OA". The procedure described can be analogously applied to any real Technology Extension.

Precondition

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

Commissioning tools

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

- Startdrive commissioning tool
- SINUMERIK Operate (SINUMERIK control system with SINAMICS Integrated)
- STARTER commissioning tool
- SIMOTION SCOUT engineering software with integrated STARTER

Refer to the readme file for suitable commissioning tools to install the Technology Extension described in this manual.

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:

- ABC_OA_V1_1.tec for installation with Startdrive
- rmed_abc_oa_v1_1_oaif04402300.tgz for installation with SINUMERIK Operate
- oasp_abc_oa_v1_1_oaif04402300.zip for installation with STARTER (SIMOTION SCOUT)

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

4.2 STARTER or SIMOTION SCOUT

4.2.1 Preconditions for installing using STARTER or SIMOTION SCOUT

This description for installing and commissioning a Technology Extension is applicable to the STARTER commissioning tool and to 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

Requirements

1. The current STARTER version is recommended for the installation. If scripting is to be used, STARTER version V5.1 SP1 HF2 or higher 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.

4.2.2 Installing and activating an OA application

4.2.2.1 Installing the OA Support Package in STARTER

In the following description, 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.

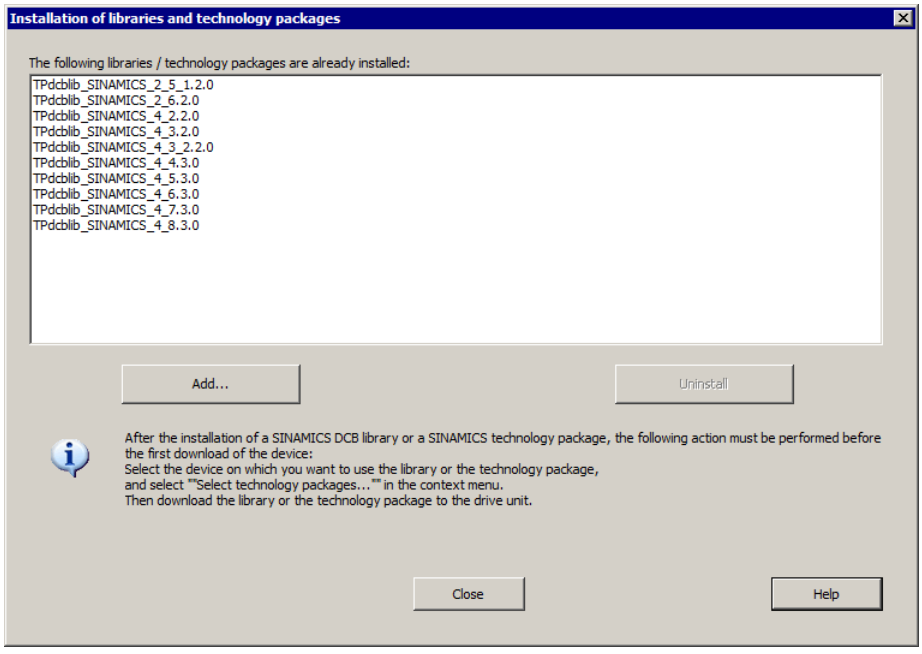


Figure 4-1 Selecting and installing the technology package

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

4.2.2.2 Downloading the technology package

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

Requirements

The following requirements must be met before downloading:

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"

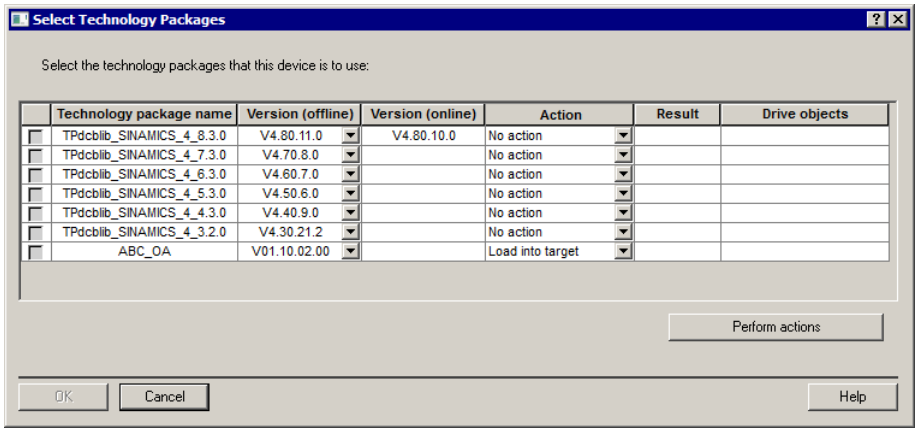


Figure 4-2 Select the technology packages

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 package" 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.

4.2.2.3 Activating the Technology Extension in the drive object

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

Preconditions

1. A project matching the device is open.
2. The corresponding drive axes have been created in the project.
3. The STARTER commissioning tool is in the 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 check box "ABC_OA" on the "Technology packages" tab.

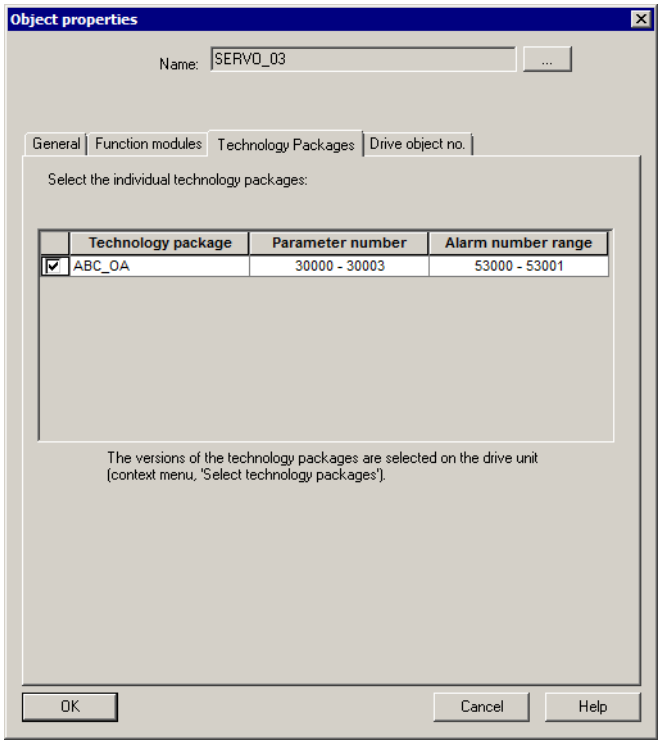


Figure 4-3 Object properties

4. Click on "OK".

Note

If multiple versions of a Technology Extension are installed in STARTER, select the required version, see "Download the technology package for the new version (Page 26)".

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

Figure 4-4 Expert list

6. To activate the Technology Extension for the drive object, download the project.
   Set the mode to ONLINE and select "Download Project to Target System".

4.2.2.4 Commissioning Technology Extension DYNEGMA

To commission Technology Extension DYNEGMA, set the additional parameters in the expert list of the STARTER commissioning tool accordingly.

Parameters from p32600 onwards are available for Technology Extension DYNEGMA, see "Parameter (Page 59)".

The commissioning is described in detail in Chapter "Commissioning (Page 51)".

4.2.3 Upgrading an OA application

4.2.3.1 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 21)".

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

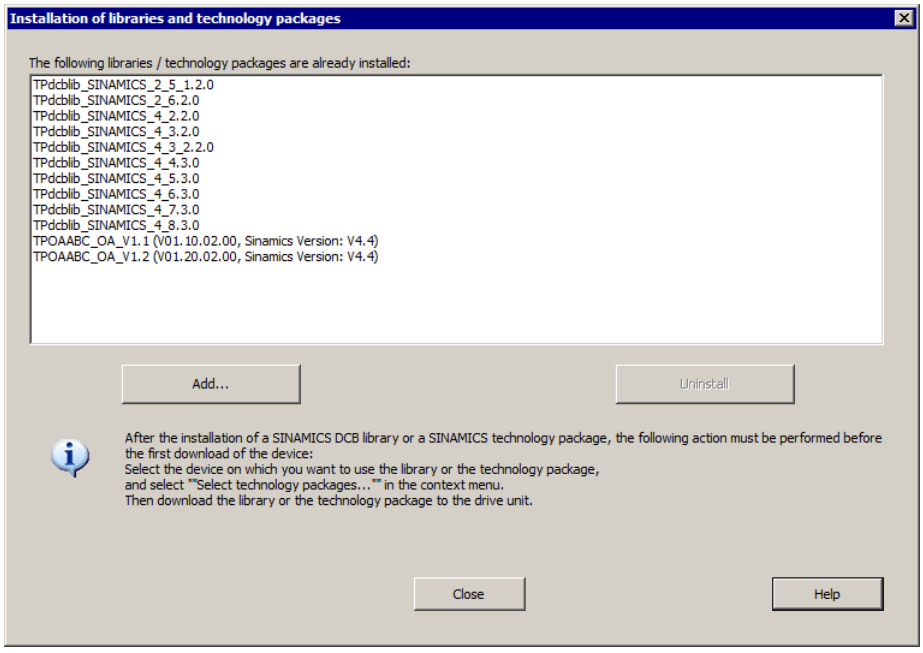


Figure 4-5 Installing the OA Support Package (technology package)

4.2.3.2 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.

Requirements

The following requirements must be met before downloading:

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)".

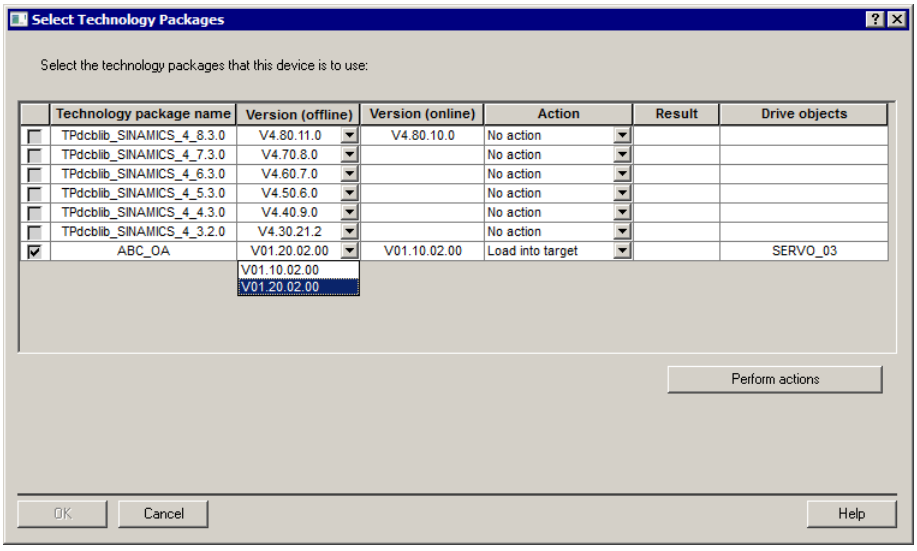


Figure 4-6 Selecting the technology package version

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, perform the project download.
   Set the mode to ONLINE and select "Download Project to Target System".

4.2.3.3 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.
   Procedure for activating/deactivating the Technology Extension in further drive objects, see "Activating the Technology Extension in the drive object (Page 24)".
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 "Uninstalling Technology Extension (Page 28)".

4.2.4 Uninstalling 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 24)".
2. Delete the technology package belonging to the Technology Extension in the drive unit, see "Downloading the technology package (Page 23)".
   - 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.

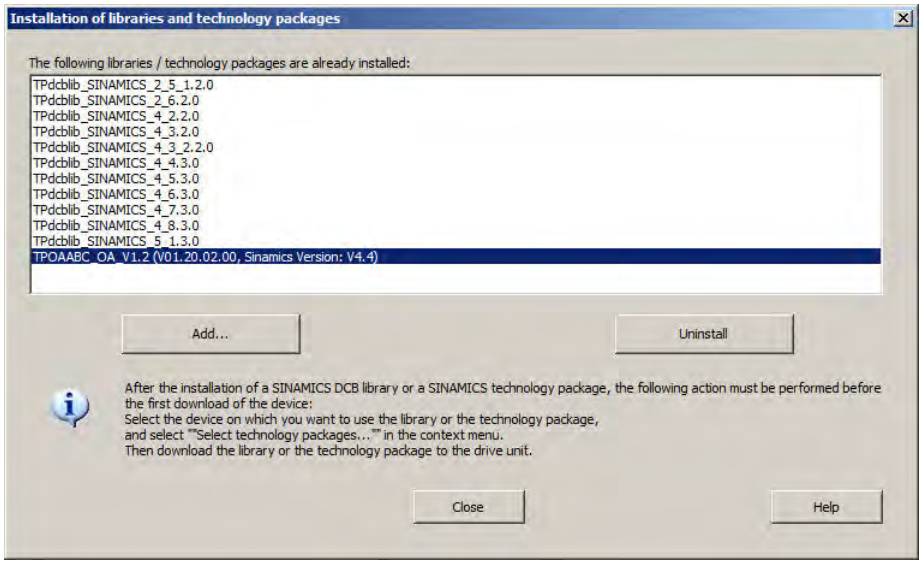


Figure 4-7 Uninstalling technology packages

2. Select the technology package belonging to the Technology Extension ABC_OA.
3. Click the "Uninstall" button.
   The technology package is deleted.
4. Click the "Close" button.

4.2.5 Scripting with STARTER or SIMOTION SCOUT

4.2.5.1 Information about scripting

Preconditions

Using the scripting functionality assumes that you are 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 must be used 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), for example axes, can be configured.

Standard scripts can be adapted to specific situations during the runtime using interactive queries, which means that the scripts are executed dependent on query results. This simplifies and speeds up commissioning. Other 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.

- Run systematic tests on new and modified scripts to verify and validate them.
- Before running a script, carefully ensure it has the correct content! Verify and validate the results when running a 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 in 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 styleguide, 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 STEP7 command interface and other scripting interfaces (e.g. for databases or XML). This form of scripting is implemented using VisualBasic or Visual C#, for example.

4.2.5.2 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 subsequently described.

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

Upgrading a Technology Extension using scripting methods

To update a Technology extension using scripting, the same steps must be performed as for a manual update, see "Upgrading an OA application (Page 25)". Additional steps and queries serve especially to guarantee a safe and reliable function.

Table 4-1 Scripting methods and corresponding commissioning steps

Scripting methods	Commissioning step
GetActivatedTECs	Query, on which drive objects are Technology Extensions activated and which version is used.
GetTECParameterRanges	Query, 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 new TEC version to be installed.
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 to the installation folder, then an update can be fully automatically performed in STARTER.

Explanations and programming examples

An overview and help for 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 to 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.

4.3 SINUMERIK Operate

4.3.1 Preconditions 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.

4.3.2 Installing and activating an OA application

4.3.2.1 Installing Technology Extension on the drive unit

In the description below, the Technology Extension is installed on the drive unit.

Procedure

Install the Technology Extension as follows:

1. Connect the USB memory with portable service system to USB interface X125 or X135 of the SINUMERIK NCU.
2. Restart SINUMERIK NCU:
   - Switch the device off and then 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 the file "abc_oa_v1_2_oaif04402300.tgz" and confirm with "OK".

   File "abc_oa.cfs" is extracted from file "abc_oa_v1_2_oaif04402300.tgz", and saved to directory "/oem/sinamics/oa".
4. Restart SINUMERIK NCU (see Step 2).

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

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

Alternatively installation can also be performed using 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 preconditions.

Install the Technology Extension as follows:

1. Copy 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 to confirm, click the "Execute" button:
   - sc stop all
   - sc restore -update -force abc_oa_v1_2_oaif04402300.tgz
     The "abc_oa.cfs" file is extracted from the "abc_oa_v1_2_oaif4402300.tgz" file and stored in the following directory:
     /card/oem/sinamics/oa
   - sc reboot
     When the system runs up, Technology Extension ABC_OA is installed in directory "/oem/sinamics/oa". The appropriate data is made available in the "abc_oa" subdirectory.

Note

Any error messages that appear can normally be ignored.

File "abc_oa_v1_2_oaif4402300.tgz" is a temporary file (is located in a volatile memory) and is deleted when the "sc reboot" command is executed or for power on.

4.3.2.2 Activating Technology Extension on 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:

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

Procedure

Activate Technology Extension on the required axes as follows:

1. Deactivate the pulse enable for SINAMICS (e.g.via the EP terminal)
2. Set "Configure Technology Extension" on the Control Unit:
   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:

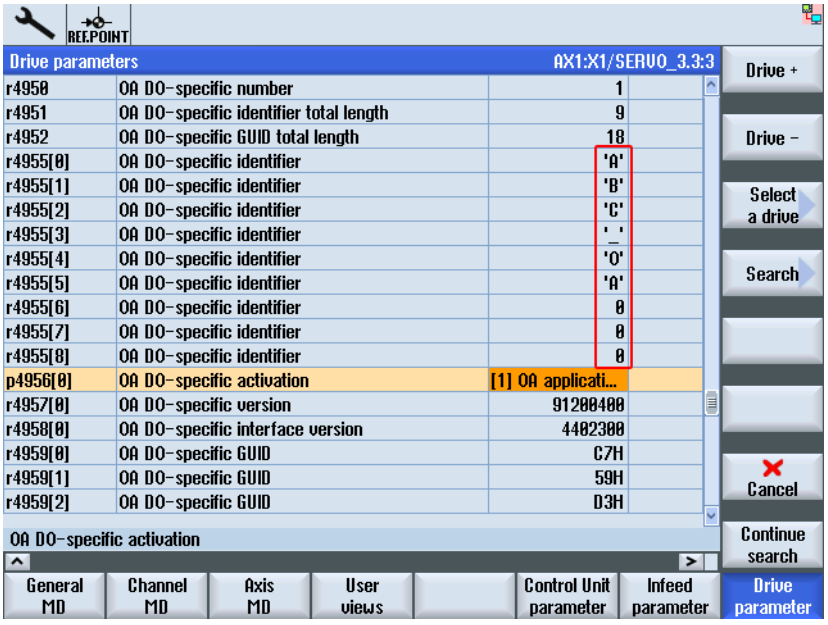


Figure 4-8 Activated Technology Extension in the drive machine data

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.

r4950 = 1 means:

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

r4950 > 1 means:

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

4. Repeat step 3 for all further axes on which this Technology Extension is to be activated (e.g. DO_4, AX2).

5. End the configuration for the Technology Extension on the Control Unit:
   p0009 = 50 → 0

   Note

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

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

6. Perform the parameter backup.
7. If necessary, carry out an NCK reset or POWER ON.
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).

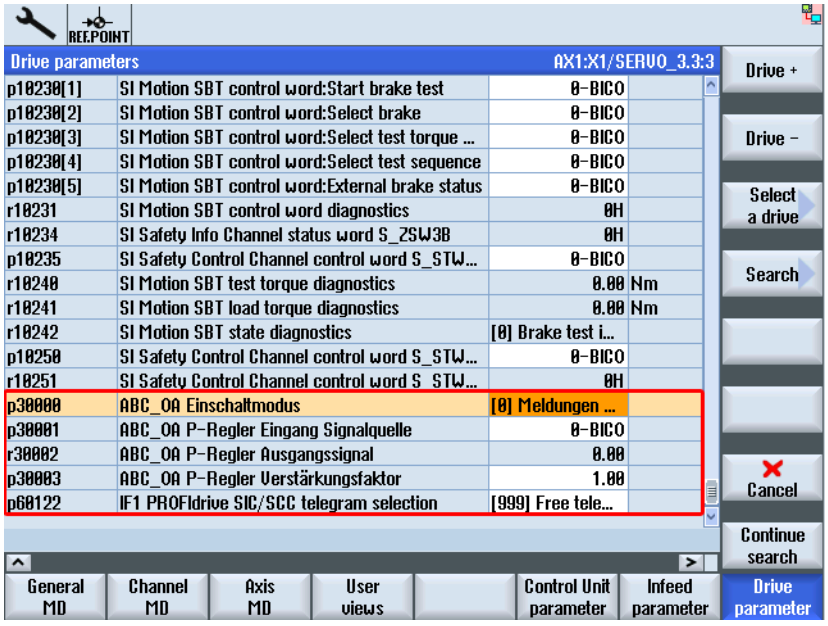


Figure 4-9 Parameter list

4.3.2.3 Commissioning Technology Extension DYNEGMA

Appropriately set the additional parameters to commission Technology Extension DYNEGMA.

Parameters from p32600 onwards are available for Technology Extension DYNEGMA, see "Parameter (Page 59)".

The commissioning is described in detail in Chapter "Commissioning (Page 51)".

4.3.3 Upgrading Technology Extension

Technology Extension "ABC_OA" is upgraded from version V1.1 to version V1.2 in the following. When doing this, the old version of Technology Extension is overwritten.

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 previously used version of the Technology Extension is overwritten.

Devices

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

- SINUMERIK 840D sl
- SINUMERIK ONE

Preconditions

- The installation package for Technology Extension ABC_OA "abc_oa_v1_1_oaif04402300.tgz" has been installed and assigned to the required drive objects, see "SINUMERIK Operate (Page 32)".
- The installation package 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 drive.

Procedure

Install the Technology Extension as described in the following chapters:

- "Installing Technology Extension on the drive unit (Page 32)"
- "Activating Technology Extension on the drive object (Page 34)"

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

Further 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 "/oem/sinamics/oa/abc_oa/" - as well as file "/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 back to 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.

4.3.4 Uninstalling Technology Extension

Precondition

Deactivate the Technology Extension in the drive object using SINUMERIK Operate, see "Activating Technology Extension on the drive object (Page 34)".

Procedure

Uninstall the Technology Extension using the SFTP client for Windows (e.g. WinSCP) as follows:

1. Stop the system:
   - Reestablish the connection using Secure Shell (SSH).
   - Execute command "`sc stop all`".
2. Delete the subdirectory and files on the memory card:
   - Select the system data.
   - Select directory "/oem/sinamics/oa" under the system CF card.
   - Select and delete subdirectory "abc_oa".
   - Select and delete file "abc_oa.cfs".

   Note

   Pay attention to the sequence when deleting:

   First delete the subdirectory and then the file.
3. Restart SINUMERIK NCU:
   - Switch the device off and then on again (POWER ON) or
   - Press the "Reset" button.
4. If necessary, carry out a RAM-to-ROM.

Function description

5

5.1 Comparison with existing solutions

There are already some options to avoid overload states; however, these options have some disadvantages:

- Hardware solution:
  - Procedure: Either an infeed unit with a higher power rating is used, or the number of drive objects connected to a common DC link is reduced.
  - Disadvantage: With an appropriately selected infeed unit, overload situations occur only very briefly. As a consequence, using an infeed unit with a higher power rating would mean that it would be overdimensioned in standard operation. Further, installing a larger infeed unit is not always possible due to restricted space.

Note

The infeed unit used must as a minimum satisfy the following criteria:

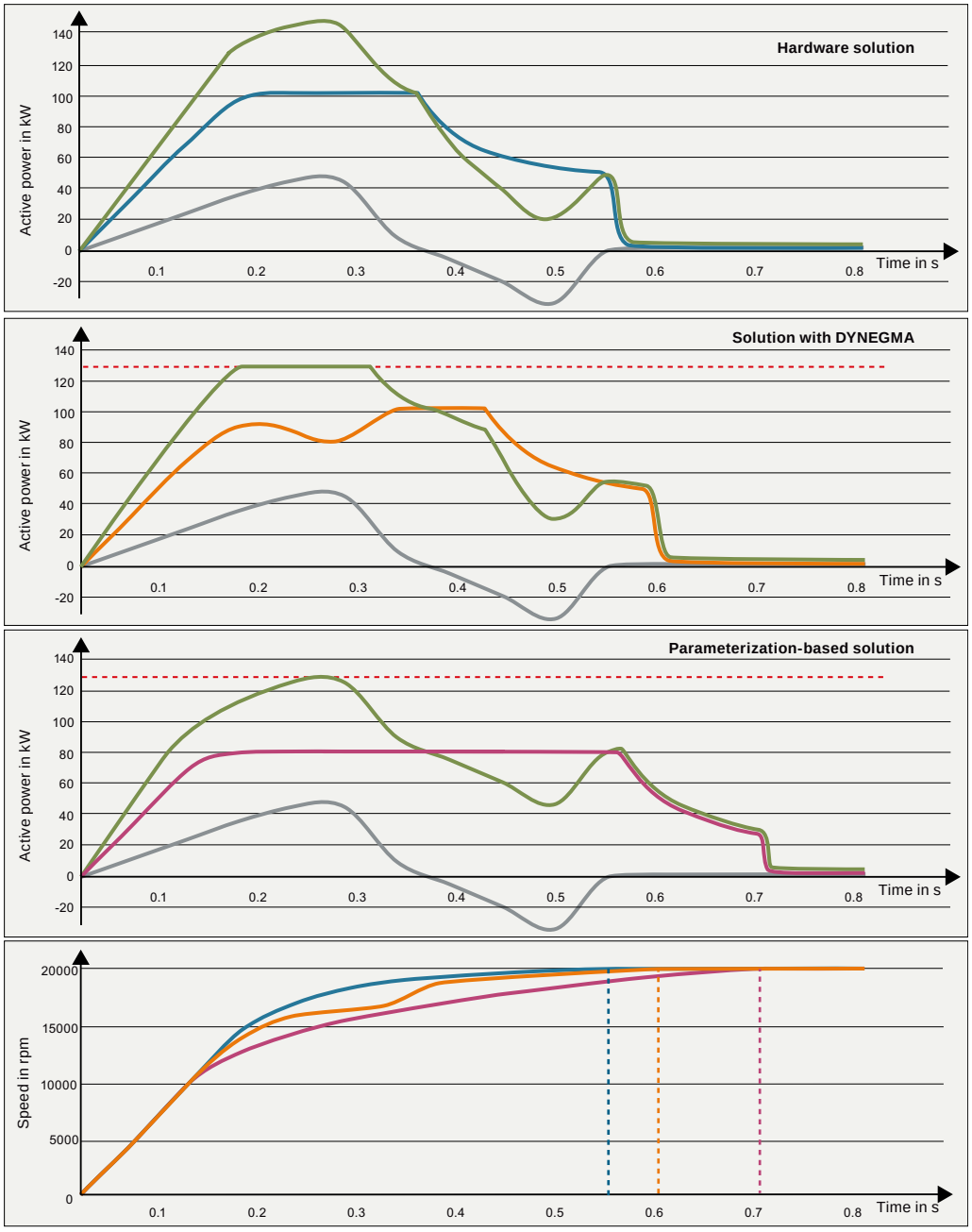
- It is not permissible that any overload situations occur while machining.
- The simultaneity (coincidence) factor to evaluate the maximum DC link voltage, assumed during the engineering/design phase, may only be exceeded in exceptional cases, for example, for tool changes.

- Parameterization-based solution:
  - Procedure: The maximum power of a spindle is permanently reduced using the appropriate parameter settings.
  - Disadvantage: The parameterized power limiting of the spindle is applicable for all operating states. This also applies even if critical situations would occur. The reduced dynamic performance is noticeable for all acceleration and deceleration operations, resulting in lost time.

Comparison between DYNEGMA and the parameterization and hardware solutions

The following characteristics indicate how DYNEGMA responds when compared to parameterization and hardware solutions.

- For the hardware solution, an infeed unit with a power limit > 150 kW is assumed.
- For the parameterization solution, an infeed unit with a power limit of 130 kW is assumed. In order that the infeed unit is not overloaded, the spindle is permanently limited to 80 kW, so that it is always able to provide 50 kW for the feed axis.
- DYNEGMA automatically calculates the power limit of the infeed unit. For the following diagram, for reasons of simplicity, a power limit of 130 kW is also assumed.



- Active power of the infeed
- Hardware solution (infeed: P_max > 150 kW): Spindle does not have to be limited
- Technology Extension DYNEGMA: Spindle is dynamically limited
- Parameterization-based solution: Spindle is permanently limited to 80 kW
- Feed axis
- Power limit of the infeed
- Maximum speed reached

Figure 5-1 Comparison of the speed characteristic

Contrary to the hardware solution, although Technology Extension DYNEGMA must intervene, this intervention is typically only brief (0.15 s - 0.3 s). After the necessary limit applied by DYNEGMA, the torque is enabled again and the spindle accelerates up to the maximum speed.

On the other hand, for the parameterizing solution, only reduced power is available for a long period of time (from 0.15 s - 0.5 s). The impact of this limit is manifested in the significantly longer acceleration time.

5.2 Principle of operation of Technology Extension DYNEGMA

For brief peak loads of the drives, DYNEGMA prevents the infeed unit from being overloaded. To achieve this, the drive torques, typically the spindles, are specifically limited sufficiently in advance. As soon as there is no longer a risk of an overload, DYNEGMA again releases the torque limits, and the spindles can again be operated at their full rated power.

DYNEGMA proceeds as follows to prevent the infeed from being overloaded:

1. DYNEGMA calculates in real time the actual power limit of the infeed.
   The parameters relevant for this calculation are listed in Chapter "Power limit of the infeed (Page 43)".
2. DYNEGMA calculates in real time the potentially necessary limits for the drives.
   Typically, only the speed setpoints of the spindles are limited, and the power required by the feed axes covered. Depending on the actual power limits and mode that has been set, DYNEGMA calculates the potentially necessary limits for the assigned drives.
3. DYNEGMA monitors the calculated power limits, and when required limits the spindle torques.
   DYNEGMA compares the actual active power of the infeed with the calculated infeed power limit. If there is a risk of a potential overload, the calculated, potentially necessary limiting for the drives becomes active and the actual limit is applied. The torque setpoints are re-enabled as soon as there is no longer a risk of an overload.

5.3 Power limit of the infeed

Technology Extension DYNEGMA calculates in realtime the actual power limit from the relevant parameters, such as line voltage, thermal state and I^2t derating. In addition, users can set a fixed power limit in parameter p32603.

DYNEGMA applies the power limit with the lower value, and indicates the maximum available power in parameter r32626.

The following parameters are incorporated in the automatic calculation of the power limit:

r0036	Power unit overload I2t
r0037[0]	Power unit temperatures, inverter maximum value
r0037[1]	Power unit temperatures, depletion layer maximum value
r0072[2]	Input voltage line voltage source
r0207	Rated power unit current
r0209	Power unit maximum current
r3405.3	Infeed status word, current limit reached

5.4 Power distribution as a function of the DYNEGMA mode

Technology Extension DYNEGMA determines the power reserve of the infeed from the difference between the maximum possible power and actual power. The power reserve plus the actual spindle power is the total power that can be distributed to the spindles. A basic and an intelligent mode are available for the power distribution.

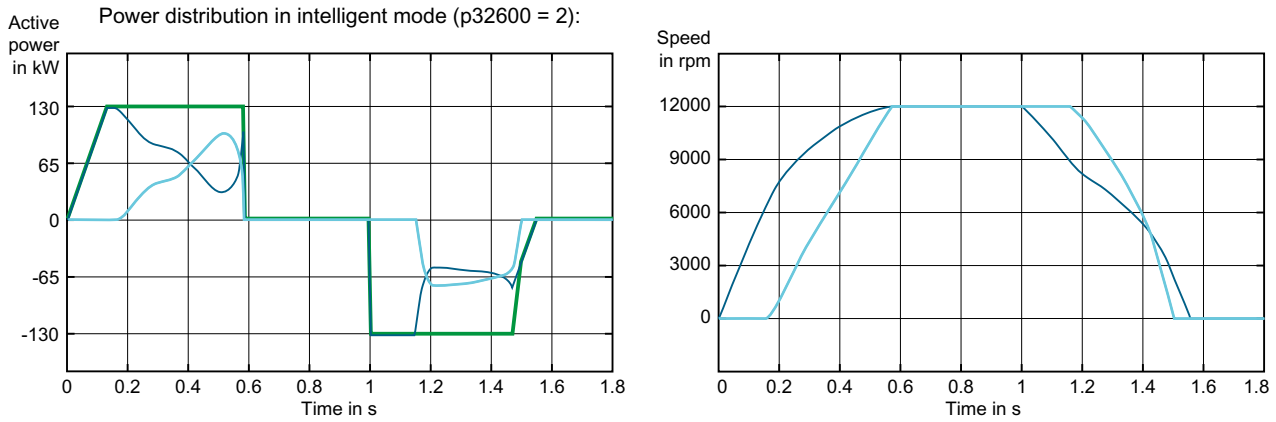
The mode that is selected especially depends on the spindle configuration and the necessary machining processes. Relevant factors include whether the spindles are identical (same power, same motor data), and whether the machining processes run synchronously or asynchronously.

Recommendation for selecting the mode

The following recommendations can be derived from this:

- Basic mode (p32600 = 1):
  The power available is equally distributed between the spindles, and the torque limit is the same for all spindles. This mode is recommended for the following machine tools:
  - Single-spindle machines
  - Double-spindle machines with identical spindles and synchronous machining
  - Multiple-spindle machines with identical spindles and synchronous machining
- Intelligent mode (p32600 = 2):
  The distribution is a dynamic process and is obtained from the power demand of the spindles. DYNEGMA distributes the power available to the spindles, corresponding to the spindle torque setpoints (r1509). Spindles that are not moved are not assigned any power, and the power reserve is distributed among the other spindles proportional to their power demand. This mode is recommended for the following machine tools:
  - Multi-spindle machines with different spindles
  - Multiple-spindle machines with identical spindles and asynchronous machining
  - Turning-milling centers

The diagram below illustrates the power distribution for the intelligent mode. The infeed provides 130 kW that is distributed between the two spindles. In this case, torque limiting is not active.



The diagram shows that initially spindle 2 (which is not moving) is not assigned any power, and spindle 1 can utilize the total power (0 - 0.2 s). Contrary to the basic mode, where each spindle is limited to 65 kW, in the intelligent mode, spindle 1 can utilize the maximum possible power. As soon as spindle 2 rotates, the power is distributed between the two spindles according to their associated power demands. After 0.4 s, the power demand of spindle 2 is greater than that of spindle 1, and as a consequence, this spindle is assigned more power.

5.5 Demarcation between DYNEGMA and the VDC controller

Both DYNEGMA and the V_{dc} controller include an overload protection function, which only responds when actually required. Both protect the drive objects connected to the DC link; however, they differ regarding some essential issues. A comparison indicates for which applications they are suitable.

Principle of operation of the V_{dc} controller

The V_{dc} controller monitors the DC voltage in the DC link for overvoltage and undervoltage. When an overvoltage or undervoltage is identified, the V_{dc}controller responds corresponding to the setting in p1240. The V_{dc} controller does not make a distinction as to whether the DC link voltage decreases as a result of power failure, or whether the connected drive objects are drawing too much power.

Contrary to DYNEGMA, the V_{dc} controller responds to critical states, on the other hand, DYNEGMA is intended to prevent critical states. To safely and reliably master fault cases, in addition to DYNEGMA, the V_{dc} controller should also be activated. Notes regarding simultaneous use are provided in Chapter "Response of DYNEGMA in fault situations (Page 48)".

Typical applications for DYNEGMA and the V_{dc} controller are compared in the following.

Comparison between DYNEGMA and the V_{dc} controller

Table 5-1 Comparison between DYNEGMA and the V_{dc} controller

Property	Technology Extension DYNEGMA	V_{dc} controller
Principle	Technology Extension DYNEGMA monitors the maximum infeed power limit. When the power limit is reached, DYNEGMA appropriately influences the torque limits of the drive objects and therefore their power.	The V_{dc} control monitors the DC link for overvoltage and undervoltage. When an overvoltage or undervoltage is identified, the V_{dc}controller responds corresponding to the setting in p1240. To do this, the torque limits and torque setpoints of the drive objects are appropriately influenced by the active V_{dc} controller.
Typical application case	Power peaks when accelerating and braking, e.g. when changing tools	Power failure
Characterization of the application case	Operating case (the Technology Extension prevents critical states)	Fault case (the V_{dc} controller responds to critical states)
Frequency of the application	Dependent on the NC/machine combination, application domain, number of axes, infeed power rating, ...	Only in exceptional cases
Problem/cause	The total power demand of all drive objects exceeds the maximum power rating of the infeed. This state is caused by the operating case of the machine (the cause is in the machine itself).	The DC link collapses as a result of an external cause (power failure).

Property	Technology Extension DYNEGMA	V_{dc} controller
Response	Before the infeed reaches its maximum power limit, DYNEGMA activates the power limiting, and the torque limits are appropriately set on the drive objects. The power available is distributed according to the DYNEGMA mode being used: • Uniformly across all drive objects. • Variably distributed between the drive objects corresponding to the actual demand. The DC link voltage remains essentially stable as a result of the reduced torque and in turn the lower power drawn.	The lower voltage limit of the DC link, set in p1248, is reached. The V_{dc} control is activated, and when the "Extended stop and retract" function is being used, responds as follows: • The drive objects draw energy from the DC link in order to perform the parameterized stop and retract response. • To support the DC link voltage, a previously defined and appropriately parameterized drive object is switched into the generator mode. The braking energy recovered is used to maintain the DC link voltage. • The V_{dc} control manages the energy drawn from the DC link to maintain the DC link voltage above the minimum DC link voltage.
Possible fault responses and consequences	The machine continues to run normally during and after the DYNEGMA intervention. Faults and stop responses are not triggered while DYNEGMA is intervening.	The machine is stopped after a fault occurs. When stopping, fault messages and faults can occur. Typically, machine operation is interrupted after a fault has occurred.

5.6 Response of DYNEGMA in fault situations

DYNEGMA is especially used in operating cases; nevertheless, DYNEGMA can also be used for some fault cases. For fault case "Fast stop of all drive objects after an Emergency Stop has been initiated", DYNEGMA responds in a similar fashion as the V_{dc} controller. DYNEGMA and also the V_{dc} controller limit the torque applied when braking to prevent overload of the infeed unit as a result of the energy that is fed back. As a consequence, DYNEGMA can be used to stop drive objects in a controlled fashion.

On the other hand, DYNEGMA cannot be used to support the DC link when the power fails – or to set a retraction response. For cases such as these, the V_{dc} controller must be parameterized within the scope of "Extended stop and retract (ESR)". When a power failure is detected (r0072[2] < 15 V), Technology Extension DYNEGMA is automatically deactivated so that it cannot limit (in this case, undesirable) the torque setpoint. This means that the Vdc controller can perform the parameterized stop/retract response, described in the previous table.

DYNEGMA is also automatically deactivated when a spindle develops an external fault.

5.7 Summary

Technology Extension DYNEGMA guarantees safe and reliable operation in the range of the infeed power limit. Further, it permits dynamic operation in the range below the power limit. Although DYNEGMA is designed for operating cases, it can also be used for the "Emergency Stop" fault case. On the other hand, for fault cases, such as "Power failure" or "External fault at the spindle", DYNEGMA is automatically deactivated in order not to influence the responses that have been set.

With DYNEGMA, the overall machine tool response is significantly more dynamic than for machines with a parameterization-based solution, for the following reasons:

- Continuous operation and the acceleration of individual drive objects do not exceed the infeed power limit, and are therefore not limited by DYNEGMA.
- The distribution of the available power using DYNEGMA modes can be adapted to the particular machine.
- A simultaneous maximum load of all connected drive objects only occurs briefly. Technology Extension DYNEGMA only intervenes in this particular case.

Commissioning 6

6.1 Commissioning overview

Preconditions

The following preconditions apply when commissioning the DYNEGMA OA application:

- The DYNEGMA OA application has been installed and is activated on the drive objects, see "Installation and activation (Page 19)".
  - The DYNEGMA OA application may be simultaneously operated on a maximum of four SERVO type drive objects.
  - The DYNEGMA OA application must be activated on the infeed.
  - The infeed and SERVO drive objects must be computed on the same Control Unit so that the necessary BICO interconnections can be automatically established.
- The fixed torque limit is set on the SERVO drive objects (p1551 = 1 signal).
- Function "Torque limiting active in motoring/regenerative mode" is deactivated (p1400.4 = 0 signal).

Note

Telegrams with DYNEGMA functionality

From SINAMICS V5.2 or SINUMERIK V4.91 and V6.11, PROFIdrive telegram 146, 147 or 149 can be set in the drives, in which p32602 (Inhibit power reduction) and r32605.2 (Torque limited) is interconnected via STW7/ZSW7.

Licensing

A license key is required for the DYNEGMA OA application.

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:
6SL3077-0AA03-0AB0

Note

Information and the procedure required for licensing can be found in the following reference:

- SINAMICS S120 Drive Functions Function Manual, Chapter "Licensing".

You can use the OA application for a limited time by activating the "Trial License" function.

Additional information on Trial License is provided in the appropriate product documentation.

Sampling times and number of controllable drives

The sampling time of the DYNEGMA OA application is 1 ms.

The calculations required for the DYNEGMA OA application are performed on the infeed. When active (p32600 > 0), the DYNEGMA function requires approximately 2.4% additional CPU time. This value is independent of the selected mode and the number of drive objects on which DYNEGMA is used.

Example	DYNEGMA mode (p32600)	Additional CPU time utilization (r9976[1])		
		1 spindle with DYNEGMA	2 spindles with DYNEGMA	4 spindles with DYNEGMA
1	= 1: Basic mode	Approx. 2.4%	Approx. 2.4%	Approx. 2.4%
2	= 2: Intelligent mode	Approx. 2.4%	Approx. 2.4%	Approx. 2.4%

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

The following restriction applies to the DYNEGMA OA application:

Of the six possible SERVO drive objects on a Control Unit, a maximum of four may be operated with DYNEGMA. Typically, these four drive objects are parameterized as spindles.

Note

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

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

Configuration

The configuration of the DYNEGMA OA application can be seen in the following function diagram:

- 7415 - Structure (Page 70)

6.2 Commissioning DYNEGMA

Commissioning - Basics

To commission Technology Extension DYNEGMA, an appropriate mode must be set in parameter p32600 of the infeed:

- The parameters relevant for DYNEGMA are automatically interconnected with the correct signal sources/destinations.
- In the factory setting, spindles with installed and activated TEC DYNEGMA are already released for the DYNEGMA function.

Although DYNEGMA is in principle ready for operation after the appropriate mode has been selected, for safe and reliable operation, carry out the following commissioning steps.

Commissioning Technology Extension DYNEGMA

The necessary commissioning steps are subsequently listed. A detailed description of the individual steps is given in the following chapters.

Proceed as follows to safely and reliably use Technology Extension DYNEGMA:

1. Check that all of the preconditions for commissioning are satisfied, see "Commissioning overview (Page 51)".
2. To activate DYNEGMA, on the infeed, set parameter p32600 (DYNEGMA mode) to a value ≠ 0.
3. If the torque should not be limited on a drive object with active Technology Extension DYNEGMA, then inhibit the power limiting on this drive object with p32602 = 1 signal (DYNEGMA enable signal source inhibit power reduction).
4. Check that the connector inputs (p32606 to p32616) and connector outputs (r32620 and r32621) have been correctly interconnected.
   The correct interconnection parameters of the connector inputs and connector outputs are specified in the "Parameter list" under "Recommendation".
5. Reduce any possibly occurring harmonics in the DC link.
6. Optional: Manually set the following parameters:
   - p32603 DYNEGMA power limit
     When required, manually set the infeed power limit.
   - p32604 DYNEGMA power threshold activation
     When required, set a threshold value. DYNEGMA does not apply any limits below this threshold.

6.2.1 Activating DYNEGMA

The basic and intelligent modes are available to activate Technology Extension DYNEGMA:

- Basic mode (p32600 = 1):
  The power available is equally distributed between the spindles, and the torque limit is the same for all spindles.
- Intelligent mode (p32600 = 2):
  The distribution is a dynamic process and is obtained from the power demand of the spindles. DYNEGMA correspondingly distributes the power available to the spindles.

A more detailed description to select the mode and power distribution is provided in Chapter "Power distribution as a function of the DYNEGMA mode (Page 44)".

6.2.2 Inhibiting spindle power reduction

In the factory setting, function DYNEGMA is enabled on all spindles with activated Technology Extension DYNEGMA. For the particular spindle, the function can be inhibited when commissioning as well as in operation. When the function is inhibited, DYNEGMA no longer limits the torque.

Enabling/inhibiting DYNEGMA

DYNEGMA can be enabled/inhibited in the following ways:

- Via binector input p32602 (DYNEGMA Enable signal source inhibit power reduction).
- Via STW7.0 (DYNEGMA: Inhibit power reduction) or DB31 - DB61.DBB188f.
  STW7.0 is automatically interconnected to p32602 if the following preconditions are satisfied:
  - The firmware version is at least SINAMICS V5.2 or SINUMERIK V4.9 / V6.11.
  - PROFIdrive telegram 146, 147 or 149 is set on the spindles.

NOTICE
Infeed overload by inhibiting power reduction To prevent damage to the system, you must carefully ensure that inhibiting the power reduction does not result in an infeed overload condition. • Enable power reduction on the other spindles, or ensure that power reduction is enabled on the other spindles. • Apply other suitable measures to prevent an overload condition.

Example: Inhibiting power limiting when cutting threads

Some processes require that power not be reduced for a certain period of time. For example, this is the case if the spindle is switched into the C-axis mode to cut threads.

In the ideal case, the SINUMERIK control system is programmed so that:

- When selecting thread cutting:
  - The power limiting initiated by DYNEGMA for the spindle/C axis is automatically deactivated using telegram 146/147/149.
  - The power reduction is enabled on another spindle, or other measures are applied to protect the infeed against overload.
- After the thread has been cut:
  - The spindle/C axis is again operated as spindle, and power limiting by DYNEGMA is re-enabled.

6.2.3 Checking the interconnection of connector inputs and connector outputs

The CI and CO parameters of DYNEGMA are automatically interconnected. As a precautionary measure, you should check the interconnections as an incorrect interconnection would otherwise lead to problems. The correct interconnection parameters of the connector inputs and connector outputs are specified in the "Parameter list" under "Recommendation".

6.2.4 Reducing vibrations in the DC link

When function DYNEGMA is activated, under certain circumstances, the active power and DC link voltage can manifest oscillation:

- For Smart Line Modules (SLM), oscillations in the infeed active power (r0082) can occur caused by line voltage harmonics.
- For Active Line Modules (ALM), DC link voltage oscillations (r0070) can occur if the dynamic response of the DYNEGMA is faster than that of the DC link voltage controller.

Reducing oscillations - overview

Proceed as follows to reduce oscillations:

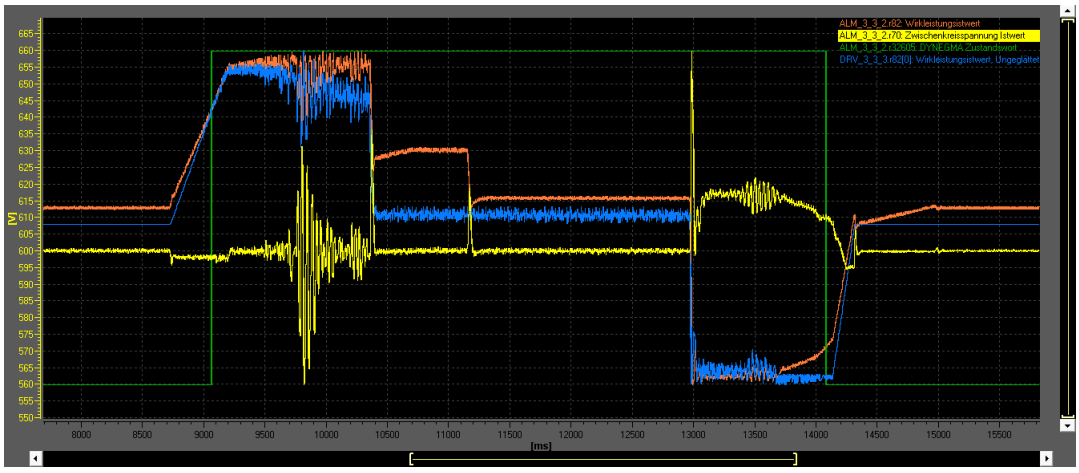
Active Line Module in the Active Mode (p3400.0 = 0)	**Active Line Module in the Smart Mode (p3400.0 = 1) and Smart Line Module**
Carry out a line supply and DC link identification routine.	
Increase the P gain of the Vdc controller (p3560).	
If the ripple of the torque limits is still too high, increase p32608[0] (DYNEGMA output filter time constant).	If the ripple of the torque limits is still too high, increase p32608[1] (DYNEGMA output filter time constant).

Carry out a line supply and DC link identification routine (applicable for all infeeds)

Set p3410 = 5 to carry out the line supply and DC link identification routine.

An optimal setting of the current and voltage control is achieved with the line supply and DC link identification routine. Detailed information about the line supply and DC link identification

routine is provided in the Function Manual Drive Functions. As a result of the optimization, the majority of the harmonics should be removed, and a significant improvement should also be able to be identified in the trace:



- r0082: Active power actual value (infeed)
- r32605: DYNEGMA status word (infeed)
- r0070: Actual DC link voltage (infeed)
- r0082[0]: Active power actual value unsmoothed (spindle)

Figure 6-1 DYNEGMA - factory setting: Slight oscillations occur in the DC link

Adapt the P gain of the Vdc controller (only Active Line Modules in the Active Mode (p3400.0 = 0))

To reduce the harmonics, increase the proportional gain of the Vdc controller (p3560).

In the test, good results were obtained in the following setting:

- p3560 = 200 %

Adapt the time constant of the output filter (p32608[0...1]) (applicable for all infeed units)

Note

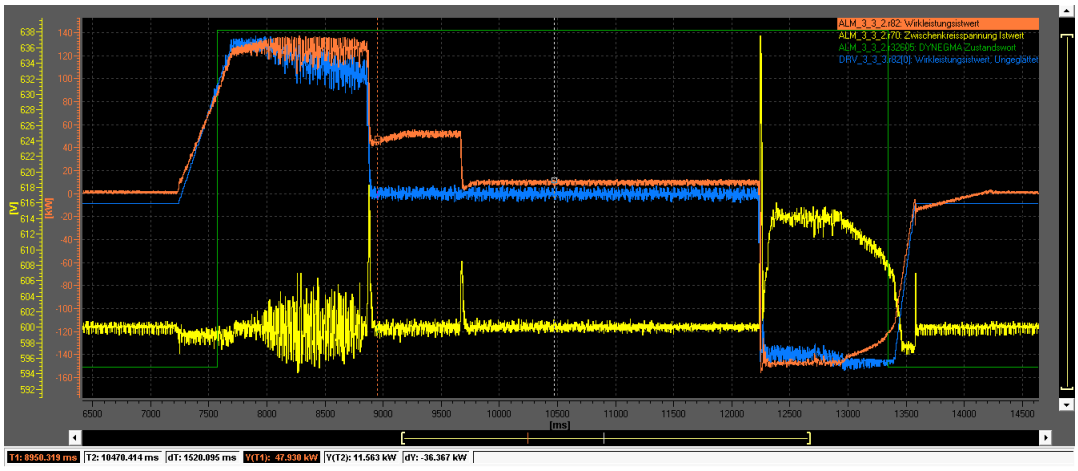
Unstable response at the torque limit

Excessively low values in p32608[0...1] can result in an unstable response at the torque limit. Only reduce the values in small steps.

In tests, good results were obtained with the following settings:

- ALM in the Active Mode (p3400.0 = 0):
  - p3560 = 200 %
  - p32608[0] = 12 ms
- ALM in the Smart Mode (p3400.0 = 1) and Smart Line Module:
  - p32608[1] = 120 ms

If the previous measures were not sufficient, in order to remove the harmonics, increase the output filter time constant (p32608[0...1]).



- r0082: Active power actual value (infeed)
- r32605: DYNEGMA status word (infeed)
- r0070: Actual DC link voltage (infeed)
- r0082[0]: Active power actual value unsmoothed (spindle)

Figure 6-2 ALM - status after increasing p3560 and/or p32608: Harmonics minimized

As a consequence, torque limits r32620 and r32621 specified by DYNEGMA are smoothed before they are interconnected to torque limits p1520 and p1521. Smoothing is only active for torque limits that increase as absolute value.

In the following trace sections, the right-hand side shows a significantly smoother characteristic of the torque limit r32621 shown in green (DYNEGMA torque limit lower):

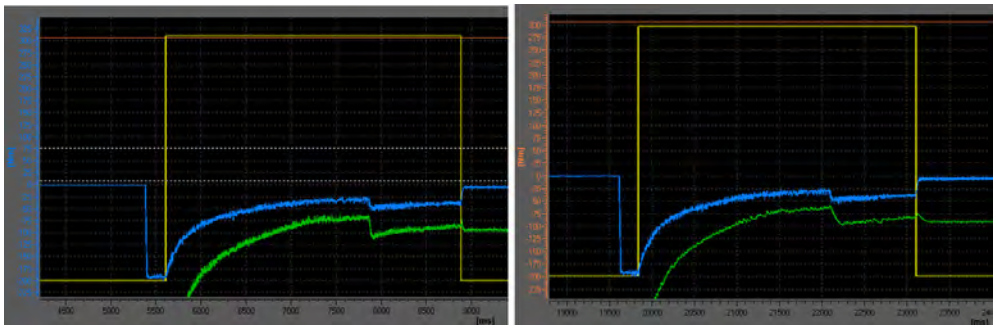


Figure 6-3 Smoothing with p32608 = 12 ms (left) and p32608 = 120 ms (right)

6.2.5 Setting the infeed power limit

Technology Extension DYNEGMA automatically calculates the infeed power limit as a function of the actual dynamic state. Variable values, such as temperature values for example, are incorporated in the calculation, which means that the power limit calculated by DYNEGMA varies. In addition, a fixed power limit can be manually entered in parameter p32603 of the infeed unit. DYNEGMA applies the power limit with the lower value.

A detailed description of how the power limit is calculated is provided in Chapter "Power limit of the infeed (Page 43)".

Recommendation

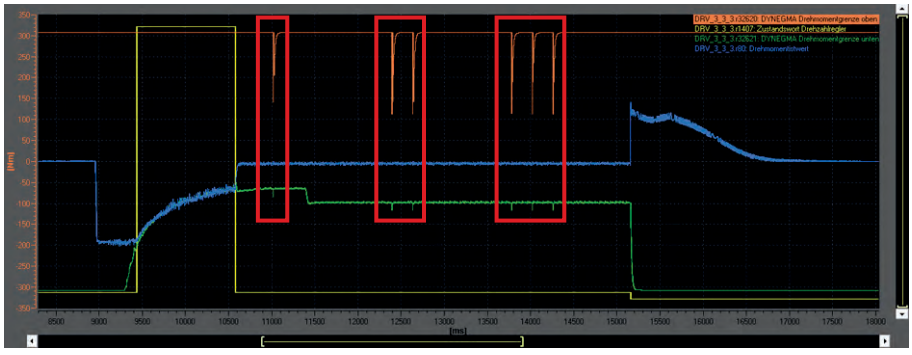
To achieve maximum dynamic response, it is recommended that the power limit is automatically calculated and parameter p32603 is kept at the factory setting.

On the other hand, to test the functionality of DYNEGMA, the setting of p32603 should be briefly reduced. In the case that DYNEGMA does not intervene (for example, as a result of incorrect parameterization), the system would still operate in a safe range below the infeed unit limit. This means that any risk for the system can be avoided.

6.2.6 Setting the power threshold

A threshold value can be specified in parameter p32604 for each spindle. DYNEGMA does not apply any limit below this threshold value. The threshold value is especially relevant for the trace recording.

Sporadic dips at the upper DYNEGMA torque limit while the spindle is operating without any load are shown in the following diagram. The same effect occurs at the lower torque limit; however, to a significantly lower extent.



- r32620: DYNEGMA torque limit upper
- r32621: DYNEGMA torque limit lower
- r1407: Speed controller status word (this line indicates whether the speed controller is at the torque limit, which in turn means that DYNEGMA is currently intervening - identical with bit r32605.3.)
- r0080: Torque actual value

Figure 6-4 Sporadic dips at the torque limit

The dips are the result of a change in sign of the power drawn. Setting the power threshold p32604 to 10 % for example, would prevent these dips in the trace. This setting does not change the machine response, as the torque limit is not reduced far enough that it actually becomes effective. This means that the torque setpoint is not limited.

Parameter 7

Overview

Note

An overview of the parameters, especially the explanation of the parameter list, can be found in the product-specific List Manuals, for example:

- SINAMICS S120/S150 List Manual, Chapter "Overview of parameters".

List of parameters

Note

This chapter only includes the parameters for Technology Extension DYNEGMA.

You can find the product-dependent parameters available for SINAMICS in the online help for the particular control system or commissioning tool or, for example, in the following reference:

- SINAMICS S120/S150 List Manual, Chapter "List of parameters".

Product: drvoa_dynegma, Version: 1102500, Language: eng
Objects: A_INF, S_INF, SERVO

p32600 DYNEGMA mode / Mode

A_INF, S_INF

Can be changed: T, U	**Calculated:** -	**Access level:** 3
Data type: Integer16	**Dynamic index:** -	**Function diagram:** 7415
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
0	2	1

Description: Setting of the mode for the DYNEGMA Technology Extension.
For p32600 = 1:
In this mode, the available power is distributed equally across the spindles.
For p32600 = 2:
In this mode, the available power is distributed variably as required.

Value:
0: Inactive
1: Simple
2: Intelligent

Dependency: The DYNEGMA Technology Extension is intended for SERVO drive objects with the "Spindle" technology application (p0500 = 102).
If a different value is set in p0500, messages (e.g. "Speed controller at its limit") or contour monitoring in the higher-level controller may occur. The DYNEGMA function may need to be inhibited for this axis (p32602 = 1).

Note

DYNEGMA: Dynamic Energy Management

The DYNEGMA Technology Extension can be used to limit the torques and therefore the power for up to 4 spindles, ensuring the infeed does not reach its power limit.

The Technology Extension is activated on the A_INF or S_INF drive objects as well as on the SERVO drive objects.

DYNEGMA is called with a sampling time of 1 ms.

All drive objects must be computed on the same Control Unit in order to be able to set the necessary BICO interconnections.

p32602 BI: Inhibit DYNEGMA enable signal source power reduction / Enable s_s inhib

SERVO

Can be changed: T, U	**Calculated:** -	**Access level:** 3
Data type: Unsigned32 / Binary	**Dynamic index:** -	**Function diagram:** 7415
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
-	-	0

Description: Sets the signal source to inhibit the DYNEGMA function for this spindle.

p32602 = 0 signal:

The DYNEGMA function is enabled for this spindle.

The calculated values are available at the connector outputs r32620 and r32621.

p32602 = 1 signal:

The DYNEGMA function is inhibited for this spindle.

The signals of the connector inputs p32606 and p32607 are available at the connector outputs r32620 and r32621.

p32603 DYNEGMA power limit / P_limit

A_INF, S_INF

Can be changed: T, U	**Calculated:** -	**Access level:** 4
Data type: FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7415
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
0.00 [kW]	10000.00 [kW]	10000.00 [kW]

Description: Sets the power limit of the infeed.

This setting can be used to reduce the power limit of the infeed.

p32604 DYNEGMA power threshold activation / P_thr act

SERVO

Can be changed: T, U	**Calculated:** -	**Access level:** 4
Data type: FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7415
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
0.00 [kW]	10000.00 [kW]	0.00 [kW]

Description: Sets the power threshold of the spindle.

Above this threshold, DYNEGMA limits the torque of the spindle where required.

r32605.0...3 CO/BO: DYNEGMA status word / ZSW

SERVO

Can be changed: - **Calculated:** - **Access level:** 3
Data type: Unsigned16 **Dynamic index:** - **Function diagram:** 7415
P-Group: - **Unit group:** - **Unit selection:** -
Not for motor type: - **Scaling:** - **Expert list:** 1
Min: **Max:** **Factory setting:**
- - -

Description: Display and BICO output for the status word of the DYNEGMA function.

Bit field:

Bit	Signal name	1 signal	0 signal	FP
00	DYNEGMA activated	Yes	No	-
01	DYNEGMA inhibited	Yes	No	-
02	Torque limit reduced	Yes	No	-
03	Torque limit reached	Yes	No	-

Dependency: See also: p32600, p32602

Note
For bit 00:
The set bit shows that a valid mode has been set (p32600 > 0).
For bit 01:
The set bit shows that DYNEGMA is inhibited for this spindle (p32602 = 1 signal).
For bit 02:
The set bit shows that DYNEGMA is reducing the torque limit for this spindle.
For bit 03:
The set bit shows that this spindle has reached the reduced torque limit. This reduces the power for this spindle.

r32605.0...15 CO/BO: DYNEGMA status word / ZSW

A_INF, S_INF

Can be changed: - **Calculated:** - **Access level:** 3
Data type: Unsigned16 **Dynamic index:** - **Function diagram:** 7415
P-Group: - **Unit group:** - **Unit selection:** -
Not for motor type: - **Scaling:** - **Expert list:** 1
Min: **Max:** **Factory setting:**
- - -

Description: Display and BICO output for the status word of the DYNEGMA function.

Bit field:

Bit	Signal name	1 signal	0 signal	FP
00	DYNEGMA activated	Yes	No	-
04	Spindle 1 DYNEGMA inhibited	Yes	No	-
05	Spindle 2 DYNEGMA inhibited	Yes	No	-
06	Spindle 3 DYNEGMA inhibited	Yes	No	-
07	Spindle 4 DYNEGMA inhibited	Yes	No	-
08	Spindle 1 torque limit reduced	Yes	No	-
09	Spindle 2 torque limit reduced	Yes	No	-
10	Spindle 3 torque limit reduced	Yes	No	-
11	Spindle 4 torque limit reduced	Yes	No	-
12	Spindle 1 torque limit reached	Yes	No	-
13	Spindle 2 torque limit reached	Yes	No	-
14	Spindle 3 torque limit reached	Yes	No	-
15	Spindle 4 torque limit reached	Yes	No	-

Dependency: See also: p32600, p32602

Note
For bit 00:
The set bit shows that a valid mode has been set (p32600 > 0).
For bits 04 ... 07:
A set bit shows that DYNEGMA is inhibited for the corresponding spindle (p32602 = 1 signal).
For bits 08 ... 11:
A set bit shows that DYNEGMA is reducing the torque limit for the corresponding spindle.
For bits 12 ... 15:
A set bit shows that this spindle has reached the reduced torque limit. This reduces the power for this spindle.

p32606 CI: DYNEGMA torque maximum signal source / M max s_s

SERVO

Can be changed: T, U	**Calculated:** -	**Access level:** 4
Data type: Unsigned32 / FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7415
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
-	-	1520[0]

Description: Sets the signal source for the maximum torque of the spindle.

Recommendation: Recommended BICO interconnection (set automatically):
CI: p32605 = p1520

p32607 CI: DYNEGMA torque minimum signal source / M min s_s

SERVO

Can be changed: T, U	**Calculated:** -	**Access level:** 4
Data type: Unsigned32 / FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7415
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
-	-	1521[0]

Description: Sets the signal source for the minimum torque of the spindle.

Recommendation: Recommended BICO interconnection (set automatically):
CI: p32607 = p1521

p32608[0...1] DYNEGMA output filter, smoothing time constant / Outp_filt t

A_INF

Can be changed: T, U	**Calculated:** -	**Access level:** 4
Data type: FloatingPoint32	**Dynamic index:** -	**Function diagram:** -
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
0 [ms]	1000 [ms]	[0] 12 [ms] [1] 120 [ms]

Description: Sets the smoothing time constant for the output filter (PT1) for displaying the torque limits (r32620, r32621).
The smoothing is only effective for increasing torque limit absolute values.
The filter is ineffective for decreasing torque limit absolute values.

Index: [0] = Closed-loop controlled operation
[1] = Smart Mode

NOTICE
Values that are too low can lead to instability in power limitation.

Note
The smoothing time constant must be adjusted if oscillations caused by the harmonics of the line voltage occur for the active power of the infeed.
The two indices are switched automatically when the infeed changes to Smart Mode (see r3405.0).

p32608[0...1] DYNEGMA output filter, smoothing time constant / Outp_filt t

S_INF

Can be changed: T, U	**Calculated:** -	**Access level:** 4
Data type: FloatingPoint32	**Dynamic index:** -	**Function diagram:** -
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
0 [ms]	1000 [ms]	[0] 120 [ms] [1] 120 [ms]

Description: Sets the smoothing time constant for the output filter (PT1) for displaying the torque limits (r32620, r32621).
The smoothing is only effective for increasing torque limit absolute values.
The filter is ineffective for decreasing torque limit absolute values.

Index: [0] = Closed-loop controlled operation
[1] = Smart Mode

NOTICE
Values that are too low can lead to instability in power limitation.

Note
The smoothing time constant must be adjusted if oscillations caused by the harmonics of the line voltage occur for the active power of the infeed.
The two indices are switched automatically when the infeed changes to Smart Mode (see r3405.0).

p32610 CI: DYNEGMA line voltage signal source / U_line s_s

A_INF, S_INF

Can be changed: T, U	**Calculated:** -	**Access level:** 4
Data type: Unsigned32 / FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7415
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
-	-	0

Description: Sets the signal source for the line voltage of the infeed.

Recommendation: Recommended BICO interconnection (set automatically):
CI: p32610 = r0072[2]

p32611 CI: DYNEGMA I2t overload signal source / I2t overload s_s

A_INF, S_INF

Can be changed: T, U	**Calculated:** -	**Access level:** 4
Data type: Unsigned32 / FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7415
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
-	-	0

Description: Sets the signal source for the I2t overload of the infeed.

Recommendation: Recommended BICO interconnection (set automatically):
CI: p32611 = r0036

p32612[0...1] CI: DYNEGMA power unit temperature signal source / PU temp s_s

A_INF, S_INF

Can be changed: T, U	**Calculated:** -	**Access level:** 4
Data type: Unsigned32 / FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7415
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
-	-	0

Description: Sets the signal sources for the temperatures in the power unit (infeed).

Recommendation: Recommended BICO interconnection (set automatically):
CI: p32612[0] = r0037[0]
CI: p32612[1] = r0037[1]

Index: [0] = Inverter
[1] = Depletion layer

p32613 CI: DYNEGMA active power signal source / P_act s_s

A_INF, S_INF

Can be changed: T, U	**Calculated:** -	**Access level:** 4
Data type: Unsigned32 / FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7415
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
-	-	0

Description: Sets the signal source for the active power of the infeed.

Recommendation: Recommended BICO interconnection (set automatically):
CI: p32613 = r0082 (infeed)

p32614 CI: DYNEGMA active power signal source / P_act s_s

SERVO

Can be changed: T, U	**Calculated:** -	**Access level:** 4
Data type: Unsigned32 / FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7415
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
-	-	82[0]

Description: Sets the signal source for the active power of the spindle.

Recommendation: Recommended BICO interconnection (set automatically):
CI: p32614 = r0082[0]

p32615 CI: DYNEGMA actual speed smoothed signal source / n_act smth s_s

SERVO

Can be changed: T, U	**Calculated:** -	**Access level:** 4
Data type: Unsigned32 / FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7415
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
-	-	63[0]

Description: Sets the signal source for the smoothed actual speed value of the spindle.

Recommendation: Recommended BICO interconnection (set automatically):
CI: p32615 = r0063

p32616 CI: DYNEGMA torque setpoint signal source / M_set s_s

SERVO

Can be changed: T, U | **Calculated:** - | **Access level:** 4
Data type: Unsigned32 / FloatingPoint32 | **Dynamic index:** - | **Function diagram:** -
P-Group: - | **Unit group:** - | **Unit selection:** -
Not for motor type: - | **Scaling:** - | **Expert list:** 1
Min: | **Max:** | **Factory setting:**
- | - | 1509[0]

Description: Sets the signal source for the torque setpoint of the spindle.

Recommendation: Recommended BICO interconnection (set automatically):
CI: p32616 = r1509

p32617 CI: DYNEGMA status word voltage controller signal source / ZSW U_ctrl s_s

A_INF, S_INF

Can be changed: T, U | **Calculated:** - | **Access level:** 4
Data type: Unsigned32 / Integer16 | **Dynamic index:** - | **Function diagram:** -
P-Group: - | **Unit group:** - | **Unit selection:** -
Not for motor type: - | **Scaling:** - | **Expert list:** 1
Min: | **Max:** | **Factory setting:**
- | - | 3405[0]

Description: Sets the signal source for the status word of the DC link voltage controller.

Recommendation: Recommended BICO interconnection (set automatically):
CI: p32617 = r3405

p32618 CI: DYNEGMA status word speed controller signal source / ZSW n_ctrl s_s

SERVO

Can be changed: T, U | **Calculated:** - | **Access level:** 4
Data type: Unsigned32 / Integer32 | **Dynamic index:** - | **Function diagram:** -
P-Group: - | **Unit group:** - | **Unit selection:** -
Not for motor type: - | **Scaling:** - | **Expert list:** 1
Min: | **Max:** | **Factory setting:**
- | - | 1407[0]

Description: Sets the signal source for the status word of the speed controller.

Recommendation: Recommended BICO interconnection (set automatically):
CI: p32618 = r1407

r32620 CO: DYNEGMA upper torque limit / M_limit upper

SERVO

Can be changed: - | **Calculated:** - | **Access level:** 4
Data type: FloatingPoint32 | **Dynamic index:** - | **Function diagram:** 7415
P-Group: - | **Unit group:** - | **Unit selection:** -
Not for motor type: - | **Scaling:** - | **Expert list:** 1
Min: | **Max:** | **Factory setting:**
- [Nm] | - [Nm] | - [Nm]

Description: Display and connector output for the calculated upper torque limit of the spindle.

Recommendation: Recommended BICO interconnection (set automatically):
CI: p1522 = r32620

r32621 CO: DYNEGMA lower torque limit / M_limit lower

SERVO

Can be changed: - **Calculated:** - **Access level:** 4
Data type: FloatingPoint32 **Dynamic index:** - **Function diagram:** 7415
P-Group: - **Unit group:** - **Unit selection:** -
Not for motor type: - **Scaling:** - **Expert list:** 1
Min: **Max:** **Factory setting:**
- [Nm] - [Nm] - [Nm]

Description: Display and connector output for the calculated lower torque limit of the spindle.

Recommendation: Recommended BICO interconnection (set automatically):
CI: p1523 = r32621

r32622 DYNEGMA torque distribution / M_distribution

SERVO

Can be changed: - **Calculated:** - **Access level:** 4
Data type: FloatingPoint32 **Dynamic index:** - **Function diagram:** 7415
P-Group: - **Unit group:** - **Unit selection:** -
Not for motor type: - **Scaling:** - **Expert list:** 1
Min: **Max:** **Factory setting:**
- - -

Description: Display of the allocated torque percentage.

r32622[0...3] DYNEGMA torque distribution / M_distribution

A_INF, S_INF

Can be changed: - **Calculated:** - **Access level:** 4
Data type: FloatingPoint32 **Dynamic index:** - **Function diagram:** 7415
P-Group: - **Unit group:** - **Unit selection:** -
Not for motor type: - **Scaling:** - **Expert list:** 1
Min: **Max:** **Factory setting:**
- - -

Description: Displays the torque distribution between the spindles.

Index: [0] = Spindle 1
[1] = Spindle 2
[2] = Spindle 3
[3] = Spindle 4

r32626 DYNEGMA power maximum / P max

A_INF, S_INF

Can be changed: - **Calculated:** - **Access level:** 3
Data type: FloatingPoint32 **Dynamic index:** - **Function diagram:** 7415
P-Group: - **Unit group:** - **Unit selection:** -
Not for motor type: - **Scaling:** - **Expert list:** 1
Min: **Max:** **Factory setting:**
- [kW] - [kW] - [kW]

Description: Displays the maximum power of the infeed.

Dependency: See also: p32603, p32610, p32611

Note
The infeed power currently possible is calculated and limited to p32603.

r32627 CO: DYNEGMA utilization / Utilization

A_INF, S_INF	**Can be changed:** -	**Calculated:** -	**Access level:** 3
	Data type: FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7415
	P-Group: -	**Unit group:** -	**Unit selection:** -
	Not for motor type: -	**Scaling:** -	**Expert list:** 1
	Min:	**Max:**	**Factory setting:**
	- [%]	- [%]	- [%]

Description: Display and connector output for the utilization of the infeed.
The utilization corresponds to the quotient of active power to maximum power.

Dependency: See also: p32603, p32610, p32611

Function diagrams

8

Note

This chapter only contains the function diagrams for the Technology Extension DYNEGMA.

You can find the product-dependent function diagrams available for SINAMICS in the following reference:

- SINAMICS S120/S150 List Manual, Chapter "Function diagrams".

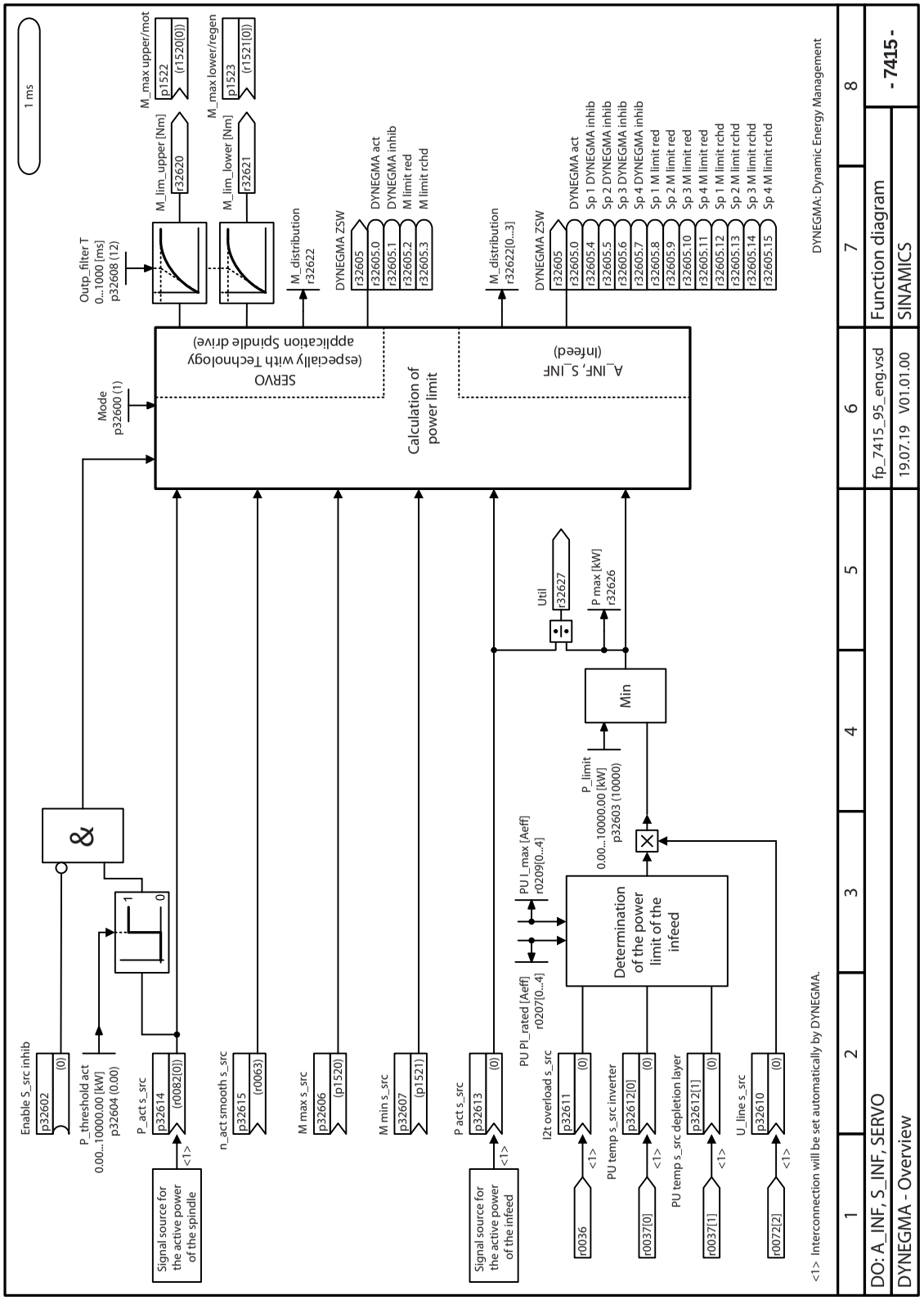


Figure 8-1 7415 - Structure

Faults and alarms

9

Overview

Note

You can find an overview of the faults and alarms, especially the explanation of the faults and alarms list, in the product-specific List Manuals, for example:

- SINAMICS S120/S150 List Manual, Chapter "Overview of parameters".

List of faults and alarms

Note

This chapter only includes the messages for the Technology Extension DYNEGMA.

You can find information on messages that are output (faults, alarms) in the online help for the particular control or commissioning tool or, for example, in the following reference:

- SINAMICS S120/S150 List Manual, Chapter "List of faults and alarms".

Product: drvoa_dynegma, Version: 1102500, Language: eng
Objects: A_INF, S_INF, SERVO

F53605	**DYNEGMA: TEC not activated on infeed**
Drive object:	SERVO
Message class:	Error in the parameterization/configuration/commissioning sequence (18)
Message value:	-
Reaction:	NONE
Acknowledge:	POWER ON
Cause:	The DYNEGMA TEC has been activated on at least one SERVO drive object, but not on an associated infeed. Note: DYNEGMA: Dynamic Energy Management TEC: Technology Extension
Remedy:	Activate the DYNEGMA Technology Extension on the associated infeed.

F53606	**DYNEGMA: Technology Extension activated for too many drive objects**
Drive object:	A_INF, S_INF
Message class:	Error in the parameterization/configuration/commissioning sequence (18)
Message value:	-
Reaction:	NONE
Acknowledge:	POWER ON
Cause:	An attempt was made to activate the DYNEGMA Technology Extension on more than 4 SERVO drive objects. Note: DYNEGMA must be operated on an A_INF drive object as well as on one with a maximum of 4 SERVO drive objects.
Remedy:	Reduce the number of activated DYNEGMA Technology Extensions to a maximum of 4 SERVO drive objects.

F53607	DYNEGMA: Incorrect configuration of the torque limit
Drive object:	SERVO
Message class:	Error in the parameterization/configuration/commissioning sequence (18)
Message value:	-
Reaction:	NONE
Acknowledge:	IMMEDIATELY
Cause:	The DYNEGMA Technology Extension has been activated on a SERVO drive object for which the torque limit has been incorrectly configured (p1551 = 0 signal). Note: DYNEGMA: Dynamic Energy Management
Remedy:	Set parameter p1551 = 1 signal.

F53608	DYNEGMA: Incorrect configuration of the speed control
Drive object:	SERVO
Message class:	Error in the parameterization/configuration/commissioning sequence (18)
Message value:	-
Reaction:	NONE
Acknowledge:	IMMEDIATELY
Cause:	The DYNEGMA Technology Extension has been activated on a SERVO drive object for which the speed control has been incorrectly configured (p1400.4 = 1 "Torque limiting active in motoring/regenerative mode" = Yes). Note: DYNEGMA: Dynamic Energy Management
Remedy:	Turn off the "Torque limiting active in motoring/regenerative mode" function (p1400.4 = 0).

List of abbreviations

A

Note

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

A

Abbreviation	Derivation of abbreviation	Meaning
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
AWG	American Wire Gauge	American Wire Gauge (Standard for cross-sections of cables)

B

Abbreviation	Derivation of abbreviation	Meaning
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

Abbreviation	Derivation of abbreviation	Meaning
BO	Binector Output	Binector output
BOP	Basic Operator Panel	Basic operator panel

C

Abbreviation	Derivation of abbreviation	Meaning
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 disc
CDS	Command Data Set	Command data set
CF Card	CompactFlash Card	CompactFlash card
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/binector output
COB-ID	CAN Object-Identification	CAN Object Identification
CoL	Certificate of License	Certificate of License
COM	Common contact of a change-over relay	Center contact of a change-over contact
COMM	Commissioning	Commissioning
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

Abbreviation	Derivation of abbreviation	Meaning
DAC	Digital Analog Converter	Digital analog converter
DC	Direct Current	Direct 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

Abbreviation	Derivation of abbreviation	Meaning
DDS	Drive Data Set	Drive Data Set
DHCP	Dynamic Host Configuration Protocol	Dynamic Host Configuration Protocol (Communication protocol)
DI	Digital Input	Digital input
DI/DO	Digital Input/Digital Output	Digital input/output, bidirectional
DIN	Deutsches Institut für Normung	Deutsches Institut für Normung (German Institute for Standardization)
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 Ported 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	Doppelsubmodul	Double submodule
DTC	Digital Time Clock	Timer

E

Abbreviation	Derivation of abbreviation	Meaning
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
EIP	EtherNet/IP	EtherNet Industrial Protocol (real-time Ethernet)
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	Electrostatic Sensitive Devices	Electrostatic sensitive devices

Abbreviation	Derivation of abbreviation	Meaning
ESM	Essential Service Mode	Essential service mode
ESR	Extended Stop and Retract	Extended stop and retract

F

Abbreviation	Derivation of abbreviation	Meaning
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	Failsafe Digital Input	Fail-safe digital input
F-DO	Failsafe Digital Output	Fail-safe digital output
FEPROM	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
F-PLC	Fail-safe PLC	Fail-safe PLC
FW	Firmware	Firmware

G

Abbreviation	Derivation of abbreviation	Meaning
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)
GSD	Gerätestammdaten	Device master data: Describe the features of a PROFIBUS slave
GSV	Gate Supply Voltage	Gate supply voltage
GUID	Globally Unique Identifier	Globally Unique Identifier

H

Abbreviation	Derivation of abbreviation	Meaning
HF	High frequency	High frequency
HFD	Hochfrequenzdrossel	Radio frequency reactor
HLA	Hydraulic Linear Actuator	Hydraulic linear actuator
HLG	Hochlaufgeber	Ramp-function generator

Abbreviation	Derivation of abbreviation	Meaning
HM	Hydraulic Module	Hydraulic Module
HMI	Human Machine Interface	Human Machine Interface
HTL	High-Threshold Logic	Logic with high interference threshold
HTTP	Hypertext Transfer Protocol	Hypertext Transfer Protocol (communication protocol)
HTTP	Hypertext Transfer Protocol Secure	Hypertext Transfer Protocol Secure (communication protocol)
HW	Hardware	Hardware

I

Abbreviation	Derivation of abbreviation	Meaning
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	Commissioning
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
ISO	Internationale Organisation für Normung	International Standards Organization
IT	Isolé Terre	Non-grounded three-phase line supply
IVP	Internal Voltage Protection	Internal voltage protection

J

Abbreviation	Derivation of abbreviation	Meaning
JOG	Jogging	Jogging

K

Abbreviation	Derivation of abbreviation	Meaning
KDV	Kreuzweiser Datenvergleich	Data cross-check
KHP	Know-how protection	Know-how protection

Abbreviation	Derivation of abbreviation	Meaning
KIP	Kinetische Pufferung	Kinetic buffering
Kp	-	Proportional gain
KTY84-130	-	Temperature sensor

L

Abbreviation	Derivation of abbreviation	Meaning
L		
L	-	Symbol for inductance
LED	Light Emitting Diode	Light emitting diode
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

Abbreviation	Derivation of abbreviation	Meaning
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
MRCD	Modular Residual Current protection Device	Modular Residual Current protection Device
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
MSR	Motorstromrichter	Motor-side converter
MT	Messtaster	Probe

N

Abbreviation	Derivation of abbreviation	Meaning
N. C.	Not Connected	Not connected
N...	No Report	No report or internal message
NAMUR	Interessengemeinschaft Automatisierungstechnik der Prozessindustrie	User association of automation technology in the process industry
NC	Normally Closed (contact)	NC contact
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 contact
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

O

Abbreviation	Derivation of abbreviation	Meaning
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 commissioning tool by the corresponding OA application
OC	Operating Condition	Operation condition
OCC	One Cable Connection	One-cable technology
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

Abbreviation	Derivation of abbreviation	Meaning
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
PDS	Power Drive System	Drive system

Abbreviation	Derivation of abbreviation	Meaning
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 Logical Controller	Programmable logic controller
PLL	Phase-Locked Loop	Phase-locked loop
PM	Power Module	Power Module
PMI	Power Module Interface	Power Module Interface
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

Q

Abbreviation	Derivation of abbreviation	Meaning
No entries		

R

Abbreviation	Derivation of abbreviation	Meaning
r...	-	Display parameters (read-only)
RAM	Random Access Memory	Memory for reading and writing
RCCB	Residual Current Circuit Breaker	Residual current operated circuit breaker
RCD	Residual Current Device	Residual current device
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

Abbreviation	Derivation of abbreviation	Meaning
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 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

Abbreviation	Derivation of abbreviation	Meaning
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
SCSE	Single Channel Safety Encoder	Single-channel safety encoder
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
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

Abbreviation	Derivation of abbreviation	Meaning
SLA	Safely-Limited Acceleration	Safely limited acceleration
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 (time-monitored, ramp-monitored)
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

Abbreviation	Derivation of abbreviation	Meaning
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
TN	Terre Neutre	Grounded three-phase line supply
Tn	-	Integral time

Abbreviation	Derivation of abbreviation	Meaning
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 logic
Tv	-	Rate time

U

Abbreviation	Derivation of abbreviation	Meaning
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

Abbreviation	Derivation of abbreviation	Meaning
VC	Vector Control	Vector control
Vdc	-	DC link voltage
VdcN	-	Partial DC link voltage negative
VdcP	-	Partial DC link voltage positive
VDE	Verband der Elektrotechnik, Elektronik und Informationstechnik	Association of Electrical Engineering, Electronics and Information Technology
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

Abbreviation	Derivation of abbreviation	Meaning
WEA	Wiedereinschaltautomatik	Automatic restart
WZM	Werkzeugmaschine	Machine tool

X

Abbreviation	Derivation of abbreviation	Meaning
XML	Extensible Markup Language	Extensible markup language (standard language for Web publishing and document management)

Y

Abbreviation	Derivation of abbreviation	Meaning
No entries		

Z

Abbreviation	Derivation of abbreviation	Meaning
ZK	Zwischenkreis	DC link
ZM	Zero Mark	Zero mark
ZSW	Zustandswort	Status word

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Further information

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www.siemens.com

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www.siemens.com/online-support

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