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VIBX

Vibration Extinction

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Technology Extension VIBX

Function Manual

Valid for
Technology Extension VIBX
with firmware version 1.3 HF1
for SINAMICS S120 and SINAMICS Integrated from
firmware version 4.4

Legal information

Warning notice system

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

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

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

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

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

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

Qualified Personnel

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

Proper use of Siemens products

Note the following:

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

Trademarks

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

Disclaimer of Liability

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

Table of contents

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 (mailto:docu.motioncontrol@siemens.com).

FAQs

You can find Frequently Asked Questions under Product Support (https://support.industry.siemens.com/cs/de/en/ps/faq).

Training

At the following address (http://www.sitrain-learning.siemens.com), you can find information about SITRAIN (Siemens training on products, systems and solutions for automation and drives).

Technical Support

Country-specific telephone numbers for technical support are provided in the Internet at the following address (http://support.industry.siemens.com/sc/ww/en/sc/2090) in the "Contact" area.

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

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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.
- Protect the drive against unauthorized changes by activating the "Know-how protection" converter function.

Applications and features

<div style="text-align: right; font-size: 2em;">3</div>

3.1 Applications

Technology Extension VIBX (VIBbration eXtinction, vibration absorber) is for SINAMICS and extension for SERVO and VECTOR drive objects.

Application modes

In the application, a setpoint filter is implemented that supports the following two application modes:

- Application mode **EPOS and LR**
  The setpoint filter acts between the "Basic positioner, EPOS" and "Position control, LR". The position setpoint and velocity setpoint are filtered between the output of EPOS and the input to the LR.

- Application mode **DSC**
  The setpoint filter acts between the PROFIdrive receive telegram for DSC and the DSC controller. Process data XERR and NSOLL_B are filtered before they are used in the DSC controller.

The objective of the axis setpoint filter to change the setpoint of an axis so that there is as little oscillation as possible excited in the natural frequency range of the moving mechanical components.

Storage and retrieval machine application

For a storage and retrieval machine, mast oscillation is excited when accelerating and braking. VIBX significantly reduces this mast vibration, which means that it is adequately stationary in a verifiable short time. As a consequence, a storage and retrieval machine can handle more goods in the same time period.

Advantages:

- Increases the handling capacity.
- Increases the warehouse capacity/warehouse height.
- Possibility of reducing construction costs.
- Energy usage is reduced as a result of the lower weight.
- Less stress on the material.
- Lower wear.

3.2 Features

System integration

With servo or vector control, Technology Extension VIBX can be used in conjunction with the following systems:

- SINAMICS S120 (CU320-2)
- SINAMICS Integrated (SIMATIC Drive Controller, SIMOTION D4x5-2, SINUMERIK 840D sl)

Technology Extension VIBX is supported by SINAMICS firmware version from 4.4 and higher.

Commissioning tool

Technology Extension supports the following commissioning tools:

- SINAMICS Startdrive from version V16
- SINUMERIK Operate from version 4.5
- STARTER from version 4.4

License key

You require a license key for Technology Extension VIBX

Additional information is available in Section "Commissioning overview (Page 49)".

Features of Technology Extension VIBX

The filter characteristics can be set using frequency and damping (attenuation). In operation, the filter frequency can be linearly changed between two limit values via a connector input. This means that the filter frequency can be tracked to follow the changing natural frequency of a mechanical system (e.g. as a result of different load states) (online frequency change).

A binector input is used to enable the activation and calculation of the complete setpoint filter.

Installing and activating

<div style="text-align: right; font-size: 3em;">4</div>

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 SINAMICS Startdrive

4.2.1 Preconditions for installing using Startdrive

This description on how to install and commission a Technology Extension is applicable when using the Startdrive commissioning tool (Basic or Advanced).

Devices

This general description applies to:

- SINAMICS S120, S150 from firmware version V5.2
- SINAMICS Integrated from firmware version V5.2

Preconditions

1. The Startdrive commissioning tool with version V16 must be installed.
2. The installation package for Technology Extension ABC_OA (abc_oa_V1_2.tec) must be in a known directory.

4.2.2 Installing and activating Technology Extension

4.2.2.1 Installing Technology Extension

In the following, the Technology Extension ABC_OA (version V1.2) is installed in the Startdrive.

After the installation, Technology Extension ABC_OA is available for all projects and drive objects.

Preconditions

1. The Startdrive commissioning tool is open.
2. A project has been created, or an existing project is open.

Procedure

Proceed as follows to open the screen form for the Technology Extension:
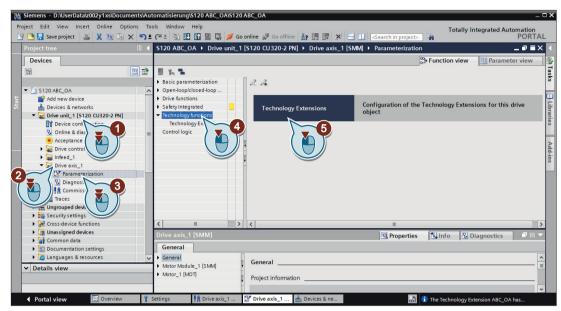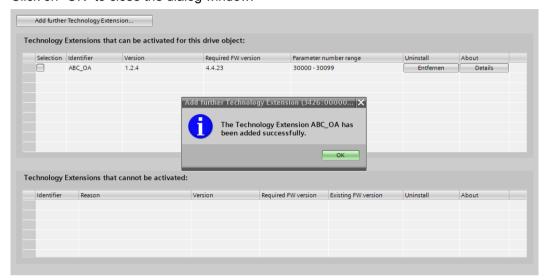
Figure 4-1   Overview

1. In the "Project tree" window, double-click on "Drive unit" ① > " Drive axis" ② >
   "Parameterization" ③.
   The function view for parameterization opens in the "Working area" window.

2. In the "Working area" window, double-click on "Technology functions" ④ and click on
   "Technology Extensions" ⑤.
   The screen form for "Technology Extensions" opens.

Proceed as follows to add Technology Extension "ABC_OA":

1. In the "Technology Extensions" screen form, click on "Add further Technology Extension...". An "Open file" dialog window opens.

2. Navigate to the folder in which the installation package for Technology Extension "ABC_OA" is located, select file "ABC_OA_V1_2.tec" and click on "Open".
Technology Extension "ABC_OA" is added to your Startdrive installation, and a dialog window informs you whether the operation was successful.
Click on "OK" to close the dialog window.

If the Technology Extension can be activated at this drive object, then the Technology Extension is displayed in the upper overview.

If the Technology Extension is run in the lower overview "Technology Extensions that cannot be activated", then check the specified cause. Additional information is provided in the Startdrive online help.

4.2.2.2 Activating Technology Extension

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

Preconditions

1. The Startdrive commissioning tool is open.

2. A project has been created, or an existing project is open.

3. Technology Extension "ABC_OA" has been installed.

4. Technology Extension "ABC_OA" is run in overview "Technology Extensions that can be activated for this drive object".

Procedure

1. To activate Technology Extension "ABC_OA" for this drive object, in the "Selection" column, click on the checkbox of the appropriate TEC.
The TEC is activated and the associated parameters are displayed in the parameter view.
Active Technology Extensions are marked by a check symbol in the checkbox.

Figure 4-2   Technology Extension is activated

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

Figure 4-3   Parameters of the Technology Extension in the parameter view

3. To activate the Technology Extension for the drive object, download the project.
   Click on "Go online" and then on "Load to device".
   The "Load preview" dialog opens:
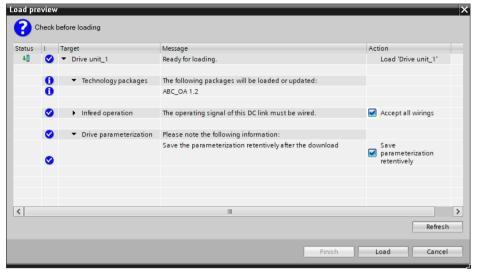
Figure 4-4   Loading ABC_OA to the device

4. Activate checkbox "Save parameterization retentively" and then click on "Load".
   After the load operation has been completed, Technology Extension "ABC_OA" is activated in the drive object and can be used.

4.2.2.3   Commissioning Technology Extension VIBX

To commission Technology Extension VIBX, set the corresponding additional parameters in Startdrive.

Parameters from p31580 and higher are available for the Technology Extension VIBX, see "Parameter (Page 69)".

Commissioning Technology Extension VIBX is described in detail in Chapter "Commissioning (Page 49)".

4.2.3 Upgrading Technology Extension

Technology Extension "ABC_OA" is upgraded from version V1.2.4 to version V1.2.5 in the following. When doing this, the new version of the Technology Extension is installed in Startdrive as an additional technology package.

Preconditions

The following preconditions must be satisfied:

- The Startdrive commissioning tool is open.

- A project has been created, or an existing project is open.

- Installation package "ABC_OA_V1_2_4.tec" has been installed and activated.

- The installation package with the new version "ABC_OA_V1_2_5.tec " is available in a known directory.

Procedure

To use a higher version of an already installed Technology Extension, you must also install and activate the higher version.

1. Carry out the installation as described in Chapter "Installing Technology Extension (Page 17)".

2. Click in the "Version" column on the version number to display all of the installed versions.

Figure 4-5   Upgrading the Technology Extension in Startdrive

3. Click on version "1.2.5" to use the higher version of Technology Extension "ABC_OA".

NOTICE
Parameters are reset to the factory setting
When upgrading, all parameters are restored to the factory setting.

Further 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 additional drive objects, see "Activating Technology Extension (Page 19)".

2. The parameters set in a drive object in the previous version of the Technology Extension are lost. All parameters of the Technology Extension are reset to the factory setting.

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 installation package of the previous version of the Technology Extension can be deleted from Startdrive if it can no longer be used for other projects or drive units.
   For the procedure for deleting/uninstalling, see "Uninstalling Technology Extension (Page 23)".

4.2.4 Uninstalling Technology Extension

Procedure

To uninstall a Technology Extension using Startdrive, proceed as follows:

1. In the "Project tree" window, double-click on "Drive unit" --> " Drive axis" --> "Parameterization".
   The function view for parameterization opens in the "Working area" window.

2. In the "Working area" window, double-click on Technology functions and click on "Technology Extensions".
   The screen form for "Technology Extensions" opens.

3. To deactivate Technology Extension "ABC_OA" for this project, in the "Selection" column, click on the checkbox of the corresponding TEC.

4. To uninstall Technology Extension "ABC_OA" in Startdrive, in column "Uninstall", click on "Remove".

4.3 SINUMERIK Operate

4.3.1 Preconditions for installing using SINUMERIK Operate

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

Devices

This general description applies to SINUMERIK control systems with SINAMICS Integrated (e.g. SINUMERIK 840D sl).

Preconditions

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 reference:
   - 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 Technology Extension

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:

Drive parameters		AX1:X1/SERVO_3.3:3	
r4950	OA DO-specific number	1	
r4951	OA DO-specific identifier total length	9	
r4952	OA DO-specific GUID total length	18	
r4955[0]	OA DO-specific identifier	'A'	
r4955[1]	OA DO-specific identifier	'B'	
r4955[2]	OA DO-specific identifier	'C'	
r4955[3]	OA DO-specific identifier	'_'	
r4955[4]	OA DO-specific identifier	'O'	
r4955[5]	OA DO-specific identifier	'A'	
r4955[6]	OA DO-specific identifier	0	
r4955[7]	OA DO-specific identifier	0	
r4955[8]	OA DO-specific identifier	0	
p4956[0]	OA DO-specific activation	[1] OA applicati...	
r4957[0]	OA DO-specific version	91200400	
r4958[0]	OA DO-specific interface version	4402300	
r4959[0]	OA DO-specific GUID	C7H	
r4959[1]	OA DO-specific GUID	59H	
r4959[2]	OA DO-specific GUID	D3H	

Figure 4-6   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).
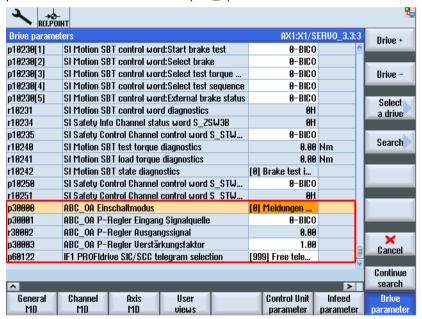
Figure 4-7   Parameter list

4.3.2.3   Commissioning Technology Extension VIBX

To commission Technology Extension VIBX, set the corresponding additional parameters using SINUMERIK Operate.

Parameters from p31580 and higher are available for the Technology Extension VIBX, see "Parameter (Page 69)".

Commissioning Technology Extension VIBX is described in detail in Chapter "Commissioning (Page 49)".

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 "Installing and activating Technology Extension (Page 24)".
- 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 24)"
- "Activating Technology Extension on the drive object (Page 25)"

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 25)".

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.

4.4 STARTER or SIMOTION SCOUT

4.4.1 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 description is applicable for SINAMICS S120 (CU320-2) and SIMOTION D4x5-2 with SINAMICS Integrated.

Preconditions

1. The current STARTER version is recommended for the installation. If scripting in STARTER is to be used, then as a minimum, STARTER version V5.1 SP1 HF2 should be used.

2. The installation package for Technology Extension ABC_OA (oasp_abc_oa_v1_1_oaif04402300.zip) must be in a known directory.

4.4.2 Installing and activating Technology Extension

4.4.2.1 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.
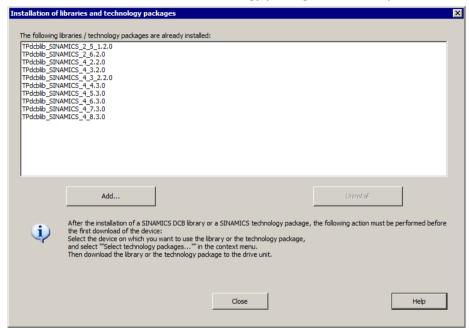
Figure 4-8   Selecting and installing the technology package

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.

4.4.2.2 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"
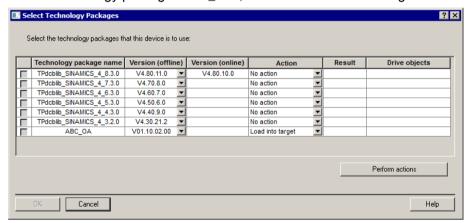
Figure 4-9   Select the technology packages

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.

4.4.2.3 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.
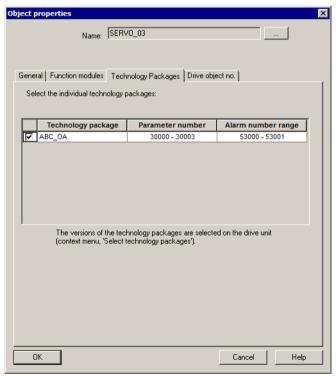
Figure 4-10   Object properties

4. Click on "OK".

Note

If multiple versions of a Technology Extension are installed in STARTER, select the required version, see "Downloading the technology package (Page 34)".

---

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 4-11   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".

4.4.2.4   Commissioning Technology Extension VIBX

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

Parameters from p31580 and higher are available for the Technology Extension VIBX, see "Parameter (Page 69)".

Commissioning Technology Extension VIBX is described in detail in Chapter "Commissioning (Page 49)".

4.4.3   Upgrading Technology Extension

4.4.3.1   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 32)".

After this installation, both versions of ABC_OA are visible in the window "Installation of libraries and technology packages".
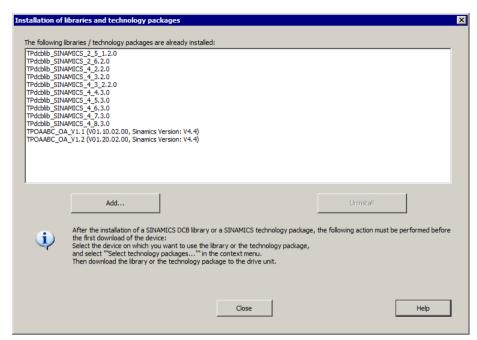
Figure 4-12   Installing the OA Support Package (technology package)

4.4.3.2 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)".
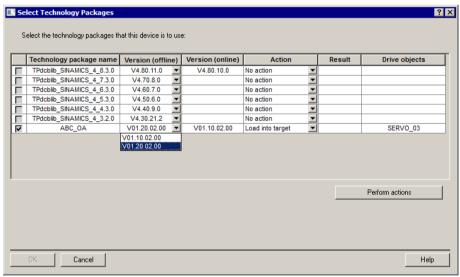
Figure 4-13   Selecting the technology package version

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".

4.4.3.3 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 35)".

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 40)".

4.4.4 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 35)".

2. Delete the technology package belonging to the Technology Extension in the drive unit, see "Downloading the technology package (Page 34)".

   – 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.
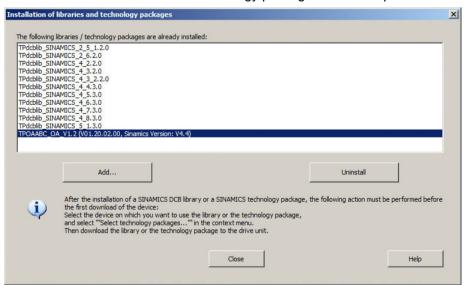
Figure 4-14   Uninstalling technology packages

2. Select the technology package belonging to the Technology Extension ABC_OA.

3. Click the "Uninstall" button.
   The technology package is deleted.

4. Click the "Close" button.

4.4.5 Scripting with STARTER or SIMOTION SCOUT

4.4.5.1 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.

4.4.5.2 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 Technology Extension (Page 36)". 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 "GetActivated-TECs" 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.

Function description

<div style="text-align: right; font-size: 3em;">5</div>

5.1   Principle of operation of VIBX

The objective of the axis setpoint filter to change the setpoint of an axis so that there is as little oscillation as possible excited in the natural frequency range of the moving mechanical components.

When the VIBX filter is activated, although motion is slightly delayed, when correctly parameterized, oscillation will not be excited in the mechanical system. The additional travel time is significantly less than the wait time until the vibration levels in the mechanical system are within the tolerance range.

The "EPOS and LR" or "DSC" application mode can be set for the setpoint filter VIBX (p31580).

5.2 Sampling times and number of controllable drives

Sampling time

The sampling time for Technology Extension VIBX is indicated in r31587, and depends on the application mode that has been selected (p31580).

- "EPOS and LR" application mode:
  The sampling time depends on the SINAMICS firmware version used.

  – The following applies to firmware version < V4.6:
    Sampling time = position controller sampling time (p0115[4])

  – For firmware version ≥ V4.6 the following applies:
    Sampling time = EPOS sampling time (p0115[5])

- "DSC" application mode:
  The sampling time in r2064[1] is effective for isochronous operation.

Number of controllable drives

The VIBX setpoint filter requires additional CPU time. This can reduce the maximum number of drive axes that can be controlled.

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".

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

Examples of additional computation time utilization

The following table lists the values for the additional CPU time utilization with different sampling times (r31587) for 1 to 4 drive objects with activated Technology Extension VIBX.

Table 5-1   VIBX computation time utilization (examples)

Exam-ple	VIBX sampling time	Additional CPU time utilization (r9976[1])		
	r31587	1 drive object with VIBX	2 drive objects with VIBX	4 drive objects with VIBX
1	1000 µs	Approx. 2 %	Approx. 4 %	Approx. 8 %
2	2000 µs	Approx. 1 %	Approx. 2 %	Approx. 4 %
3	4000 µs	Approx. 0.5 %	Approx. 1 %	Approx. 2 %

Example for servo control

Setpoint filter VIBX can, when maintaining the following conditions, be operated for all SERVO type drive objects:

- 4 drives with a sampling time of 125 µs for the current controller and the speed controller (p0115[0, 1] = 125 µs).

- 1 infeed with a sampling time for the speed controller of 250 µs (p0115[0] = 250 µs).

- "Position control, LR" function module activated on all SERVO type drive objects (r0108.3 = 1) with a sampling time of 1000 µs (p0115[4] = 1000 µs).

- "Basic positioner, EPOS" function module activated on all SERVO type drive objects (r0108.4 = 1) with a sampling time of 4000 µs (p0115[5] = 4000 µs).

Example for vector control

Setpoint filter VIBX can, when maintaining the following conditions, be operated for all VECTOR type drive objects:

- 4 drives with a sampling time of 500 µs for the current controller and 2 ms for the speed controller (p0115[0] = 500 µs, p0115[1] = 2000 µs).

- 1 infeed with a sampling time for the speed controller of 250 µs (p0115[0] = 250 µs).

- "Position control, LR" function module activated on all VECTOR type drive objects (r0108.3 = 1) with a sampling time of 2000 µs (p0115[4] = 2000 µs).

- "Basic positioner, EPOS" function module activated on all VECTOR type drive objects (r0108.4 = 1) with a sampling time of 4000 µs (p0115[5] = 4000 µs).

5.3 SINAMICS Safety Integrated

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

Note

Information on SINAMICS Safety Integrated can be found in the following reference:

● SINAMICS S120 Safety Integrated Function Manual.

Commissioning 6

6.1 Commissioning overview

The following description of the functionality also describes the normal procedure when commissioning VIBX.

The installed Technology Extension VIBX is also transferred with the "Load to file system". This can be used for series commissioning.

Preconditions

The following preconditions apply when commissioning Technology Extension VIBX using STARTER:

- The Technology Extension is installed as a technology package in STARTER, see "Installing the OA Support Package in STARTER (Page 32)".

- The technology package is loaded into the Control Unit, see "Downloading the technology package (Page 34)".

- Technology Extension is assigned to the following drive objects:

    – SERVO or VECTOR when the "EPOS and LR" application mode is required

    – SERVO when the "DSC" application mode is required

    See "Activating the Technology Extension in the drive object (Page 35)".

Licensing

A license key is required for the TechnologyExtension VIBX.

You can generate the appropriate license key using the WEB License Manager. To do this, you require the Certificate of License (CoL) or the electronic Certificate of License (eCoL):

- Article number for the CoL: **6SL3077-0AA00-5AB0**

- Article number for the eCoL: **6SL3077-0AA00-5AH0**

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 Technology Extension for a limited time by activating the "Trial License" function.

Please see the corresponding product documentation for more information about the Trial License.

Configuration

The configuration of the Technology Extension VIBX can be seen in the following function diagrams:

- 7314 – VIBX application mode "EPOS and LR" (p31580=1, p31610≡0) (Page 80)

- 7315 – VIBX application mode "DSC" (p31580=2, p31610≡0) (Page 81)

- 7316 – VIBX online frequency change (p31610≠0), deadtime symmetrization (Page 82)

The necessary settings for the configuration are provided in the following sections:

1. Setting the application mode (Page 51)

2. Setting the natural frequency and damping (Page 53)

3. Setting the filter type (p31581) (Page 54)

4. Parameterizing BICO interconnections as a function of the application mode:

   – Parameterizing BICO interconnections for "EPOS and LR" (Page 58)

   – Parameterizing BICO interconnections for "DSC" (Page 59)

5. Optional: If required, parameterize online frequency change and dead time symmetrization (Page 66)

6.2 Setting the application mode

The "EPOS and LR" or "DSC" application mode can be set for the setpoint filter VIBX (p31580).

EPOS and LR (p31580 = 1)

The VIBX setpoint filter can be activated for all types of SERVO and VECTOR drive objects.

On a drive object type with VIBX, as precondition, the function modules "Basic positioner, EPOS" (r0108.4 = 1) and "Position control, LR" (r0108.3 = 1) must be activated.

A setpoint filter is implemented in the application, which is effective between the EPOS and LR function modules. The position setpoint and velocity setpoint are filtered between the output of the EPOS and the input to the LR. To do this, BICO interconnections must be changed, see "Parameterizing BICO interconnections for "EPOS and LR" (Page 58)".

DSC (p31580 = 2)

In conjunction with DSC and a PROFIdrive telegram for DSC, the VIBX setpoint filter can only be activated for SERVO drive objects.

Note

The PROFIdrive telegram for DSC is provided in the following reference:

● SINAMICS S120/S150 List Manual, Chapter "PROFIdrive function diagrams "

The filter acts between the position deviation XERR, sent via PROFIdrive, and the DSC position controller. In addition, the precontrol velocity NSOLL_B is filtered. To do this, BICO interconnections must be changed, see "Parameterizing BICO interconnections for "DSC" (Page 59)".

The filter is calculated in the fixed runtime group "Receive AFTER IF1 PROFIdrive PZD" For reasons relating to performance, this runtime group should not be used anywhere else (e.g. in DCC applications).

NOTICE

Setpoint steps (jumps) when switching over between closed-loop position/speed control result in undesirable acceleration.

In the PROFIdrive profile, closed-loop control concept "Dynamic Servo Control (DSC)", a speed setpoint step can occur when switching over between closed-loop position/speed control.

When using VIBX with DSC, this speed setpoint step can result in undesirable, critical acceleration. As a consequence, this speed setpoint step is not permitted.

If the speed setpoint step cannot be avoided, then switching over between closed-position control and closed-loop speed control is not permitted.

NOTICE

A fast stop is influenced by VIBX with DSC

When using DSC and a higher-level control system (e.g. SINUMERIK, SIMOTION), the VIBX setpoint filter influences a fast stop, issued by the control system along the preparameterized braking ramp.

- The following applies for a fast stop in closed-loop position control:
  The VIBX setpoint filter is still active, and delays the effect of the braking ramp.

- For a fast stop with switchover to closed-loop speed control, the following applies:
  The undesirable acceleration, explained in the previous note, occurs.

Internal drive fault responses (e.g. OFFS1, OFF2) are not influenced.

Recommendation:

For open-loop control systems, which communicate using the PROFIdrive profile, a fast stop must be parameterized as follows:

1. The drive should be stopped with closed-loop speed control active.
   In so doing, the effect of the VIBX filter is deactivated using KPC=0.0 (precondition: Connector input p31596 is appropriately interconnected, see Table 6-2 BICO interconnections in application mode "DSC" (p31580=2) (Page 59).

2. Avoid the setpoint step that occurs when switching over to closed-loop speed control - and the resulting undesirable acceleration.
   You can achieve this as follows, for example:

   - SINUMERIK (from 4.7):
     Set axis machine data 36610 "MA_AX_EMERGENCY_STOP_TIME=0s".

   - SIMOTION (from 4.5):
     Stop motion with closed-loop speed control active (movingMode := SPEED_CONTROLLED).
     ```
     RetVal := _stop (… , movingMode := SPEED_CONTROLLED, …);
     ```

Supplementary conditions

In the "DSC" application mode, the VIBX filter acts within the control loop between the position controller of the higher-level control system and the position/speed controller of the drive.

As a result, the following boundary conditions apply:

- It is recommended that PROFIdrive telegrams with torque precontrol (M_VST) are not used, as this process data is not filtered by VIBX.
  Instead, it is recommended that the internal SINAMICS torque precontrol (p1402.4 = 1) is used.

- Measuring functions (position controller control frequency response) are influenced as the VIBX filter characteristics are also measured.

- When calculating the following error in the higher-level control system, the characteristics of the VIBX filter are added to the actual following error.

6.3 Setting the natural frequency and damping

When commissioning the system, the setpoint filter is set with the natural frequency f_d (p31585) and damping D (p31586) of the natural mechanical oscillation.

- Constant natural frequency
  The natural frequency is set in p31585[0]. This value cannot be changed during motion.

- Variable natural frequency
  The upper and lower natural frequencies are set in p31585[0,1]. An online frequency change is possible between the two frequencies, see "If required, parameterize online frequency change and dead time symmetrization (Page 66)".

You determine the value for the frequency f_d of the natural mechanical oscillation using the trace function of the STARTER commissioning software. This is described in detail in Section "Methods to determine the frequency (p31585) (Page 60)". In exceptional cases, an additional measuring device may be required (e.g. an oscillation sensor).

As the damping is low for almost all practical applications (for instance, a storage and retrieval machine), the following applies:

Natural frequency of damped system f_d ~resonant frequency f_r

For this reason, the frequency to be parameterized can either be determined in the time domain (f_d) or in the frequency domain (f_r).

Note

The damping refers to the natural mechanical oscillation to be damped.

Typical damping values lie in the range 0.1…3 % (D = 0.001…0.03). If damping cannot be determined, then a value of D = 0.001 is recommended.

Frequency f_d must be determined by making the appropriate measurements.

A following error (difference between the filter input and filter output) is obtained as a result of the filter. This is added to the following error that already exists in the position control. This secondary condition that should especially be taken into account for interpolating axes.

When frequency (p31585[0,1]) and damping (p31586) are either incorrectly or inaccurately set, the setpoint filter does not cause any oscillation to be excited. The oscillation is either not damped or inadequately damped.

6.4　Setting the filter type (p31581)

Set the filter type in p31581.

Rugged (p31581 = 0)

When compared to the sensitive filter type, the rugged VIBX filter has a lower sensitivity with respect to frequency shift; however, it results in a higher delay in motion sequences. The complete motion sequence is extended by one period T_d, where $T_d = 1/f_d$.

Sensitive (p31581 = 1)

When compared to the rugged filter type, the sensitive VIBX filter has a higher sensitivity with respect to frequency shift; however, it results in a smaller delay in motion sequences. The complete motion sequence is extended by half a period $T_d/2$, where $T_d = 1/f_d$.

6.5 Activating/deactivating the VIBX filter

State description

The actual state of the setpoint filter at an axis is displayed in r31600.

After the setpoint filter has been initialized, it changes into the "Filter ready" state (r31600.2=1). This is automatically the case after powering up, as the filter parameters are pre-assigned valid values. In this state, the actual setpoints are passed through without any filtering.

Activating the VIBX filter

The VIBX filter can be activated when the axis is enabled or not enabled:

- When the axis is enabled, coupling in is bumpless.
- Activating when the axis is moving temporarily reduces the velocity.

Switch from state "Filter ready" to state "Filter active" by requesting that VIBX is activated (BI: p31590 = 1signal).

The filter coupling-in process is displayed with r36100.3 = 1. Successful activation is acknowledged with r31600.4 = 1 and r31600.2 = r36100.3 = 0.

In the "Filter active" state, the setpoints are filtered according to what has been parameterized.

Note

Coupling-in is skipped for constant setpoints in the filter or for an axis that has not been enabled. A direct transition is made from "Filter ready" to "Filter active" state.

Deactivating the VIBX filter

The VIBX filter can be deactivated when the axis is enabled or not enabled.

- When the axis is enabled, coupling-out is bumpless.
- Deactivating when the axis is moving temporarily increases the velocity. Take this response into consideration when parameterizing the drive (velocity limiting).

Switch from state "Filter active" to state "Filter ready" by requesting that VIBX is deactivated (BI: p31590 = 0 signal).

The filter coupling-out process is displayed with r36100.5 = 1. Successful deactivation is acknowledged with r31600.2 = 1 and r31600.4 = r36100.5 = 0.

Note

Coupling-out is skipped for constant setpoints in the filter or if the axis is not enabled. A direct transition is made from "Filter active" to "Filter ready" state.

Behavior for OFF responses

The setpoint filter is inactive for axis faults, which result in the position controller being deactivated. The filter changes into the "Filter ready" state (r31600.2 = 1). When the position controller is activated, the filter is coupled-in, see "Activating the VIBX filter".

As an OFF1, OFF2 or OFF3 response has an effect on the speed controller setpoint channel and the position controller is deactivated, VIBX has no reaction on the OFF responses.

6.6 Extending the PROFIdrive telegrams for EPOS/DSC

For PROFIdrive telegrams for positioning (e.g. 110, 111) or for DSC (e.g. 5, 105), no control and status information is included for the VIBX filter.

Procedure

If VIBX is to be activated and monitored from a higher-level control system via PROFIdrive, then you must extend the telegrams to include the appropriate information (e.g. p31590, r31600) using the free telegram configuration (p0922 = 999).

- In the "EPOS and LR" application mode, change the BICO interconnection for signal "Setpoint fixed" in a telegram (e.g. PZD POS_ZSW2.2 in telegram 111) as follows: BI: p2084[2] = r31600.8

- In application mode "DSC", you can freely interconnect status word r31600 as required.

References

The structure of the positioning telegrams and the telegram configuration are provided in the following reference:

- SINAMICS S120 Function Manual Drive Functions, Chapter "Communication"

- SINAMICS S120/S150 List Manual, Chapter "PROFIdrive function diagrams"

6.7 Parameterizing BICO interconnections

6.7.1 Parameterizing BICO interconnections for "EPOS and LR"

In order that VIBX is active in the "EPOS and LR" application mode (p31580 = 1), 3 standard BICO interconnections between the EPOS and LR function modules must be disconnected and replaced by the following 6 BICO interconnections.

The BICO interconnections listed can be set as follows:

- Manually, according to the following table.

- Automatically based on a user-defined value list (only when using the STARTER commissioning tool).

- Automatically using a script (this will not be described in any more detail here).

Manually setting BICO interconnections

Table 6-1   BICO interconnections for EPOS and LR

Signal sink (connector input)		Signal source (connector output)	
BICO interconnections between VIBX and EPOS			
CI: p31591	VIBX filter input, position setpoint EPOS_LR/DSC	CO: r2665	EPOS position setpoint
CI: p31592	VIBX filter input, velocity setpoint EPOS_LR	CO: r2666	EPOS velocity setpoint
CI: p31595	VIBX input word EPOS	CO: r2683	EPOS status word 1
BICO interconnections between LR and VIBX			
CI: p2530	LR position setpoint	CO: r31601	VIBX filter output, position setpoint EPOS_LR/DSC
CI: p2531	LR velocity setpoint	CO: r31602	VIBX filter output, velocity setpoint EPOS_LR
BI: p2551	LR setpoint fixed message	BO: r31600.8	VIBX status work, setpoint fixed

User-defined value list (only when using STARTER)

With the Technology Extension VIBX, a user-defined value list to automatically set the above listed BICO interconnections is provided.

This value list is provided in the following zip file: VIBX_BICO_EPOS_list_of_values.zip

The following preconditions must be fulfilled in order to be able to execute the user-defined value list.

- The Technology Extension VIBX is activated on the corresponding drive object, see "Activating the Technology Extension in the drive object (Page 35)".

- The basic positioner (EPOS) is activated at the drive object.

- The device is in the "Drive basis configuration" mode (p0009 = 3).

Proceed as follows:

1. Unzip the zip file at a suitable location in the file system.
   You obtain the "VIBX_BICO_EPOS_list_of_values.xml" file as well as a directory with additional files.

2. Open the expert list of the appropriate drive object.

3. Click on "Open user-defined value list" 📥.

4. Select file "VIBX_BICO_EPOS_list_of_values.xml".

5. Click on "Open" and "Accept values"
   The BICO interconnections specified in the value list have now been set.

6. Check set BICO interconnections using table "BICO interconnections for EPOS and LR".

6.7.2 Parameterizing BICO interconnections for "DSC"

In order that VIBX is active in application mode "DSC" (p31580=2), the default interconnections of the PROFIdrive telegram for DSC must be disconnected.

Disconnection is realized after switching over the telegram settings in parameter p0922 = 999 "Free telegram configuration with BICO".

In conjunction with DSC, isochronous operation (Control Unit r2064[0]=1) and communication interface IF1 are mandatory.

The BICO interconnections can be set as follows:

● Manually, according to the following table.

● Automatically using a script (this will not be described in any more detail here).

Manually setting BICO interconnections

Table 6-2   BICO interconnections in application mode "DSC" (p31580=2)

Signal sink (connector input)		Signal source (connector output)	
CI: p31591	VIBX filter input, position setpoint EPOS_LR/DSC	CO: r2060[6] [1]	IF1 PROFIdrive PZD receive double word PZD 7+8
CI: p31593	VIBX filter input, velocity setpoint DSC	CO: r2060[1]	IF1 PROFIdrive PZD receive double word PZD 2+3
CI: p31596	VIBX filter input position controller gain DSC	CO: r2060[8] [1]	IF1 PROFIdrive PZD receive double word PZD 9+10
CI: p1190	DSC position deviation XERR	CO: r31601	VIBX filter output, position setpoint EPOS_LR/DSC
CI: p1430	Speed precontrol	CO: r31603	VIBX filter output, velocity setpoint DSC

[1]   The PZDs to be interconnected depend on the XERR or KPC position in the selected telegram.

6.8 Methods to determine the frequency (p31585)

The following methods show how you can determine the damped natural frequency of the mechanical system.

For natural frequencies, which strongly depend on the system state, then the natural frequencies are determined in both extreme states. Using the online frequency change, you can interpolate between the extreme states, see "If required, parameterize online frequency change and dead time symmetrization (Page 66)".

6.8.1 Empirically determining the frequency

This method is suitable if the natural frequency to be damped is approximately known.

Procedure

Proceed as follows to empirically determine the frequency:

1. Set the estimated frequency band (p31585[0, 1]).

2. Activate the VIBX filter (BI: p31590).

3. Set the effective frequency r31613 using the interpolation source p31610.

4. Check the effect of the filter while traveling with different load levels.
   For a storage and retrieval machine, check the effect with different load levels and position of the load suspension device.

5. Repeat steps 3 to 4 with a different frequency, until the frequency with the optimum filter effect has been found.

Use the lowest value if you determine several values for the frequency.

6.8.2 Determining the frequency using the measuring function in the frequency domain

With this method, the natural frequency to be damped is determined using the internal SINAMICS measuring function "Speed controller loop (excitation after the current setpoint filter)".

The speed controller loop indicates the mechanical transfer response of the drive train. Based on the measurement, the transfer function v_{motor} / F_{motor} is determined, and shown in a Bode diagram.

The measuring function excites the motor with a frequency spectrum (white noise). This is the reason that during the measuring time, an increased noise level can occur. In spite of the noise, when the measuring function is correctly parameterized, this measuring technique does not subject the mechanical system to any stress.

Note

Information on the measuring functions can be found in the following reference:

* SINAMICS S120 Commissioning Manual, Chapter "Diagnostics using STARTER"

Preconditions

Note

This measuring technique is only used to determine the natural frequency. It cannot be used to check the effect of the filter.

Coupled axes

This measuring technique only acts on one drive. You must take special measures in order to be able to use this measuring technique for coupled axes. For instance, it must be ensured that the pulses for the other drives are canceled and if a brake is being used, then it is open. It is possible that this measuring technique cannot be used to determine the frequency.

Speed controller settings

You may have to adapt the proportional gain Kp (p1460) and the integral time Tn (p1462). Typically, Kp should be reduced and Tn increased.

Using the measuring function

Apply the measuring function as follows:

1. Select the "Speed controller loop (excitation after the current setpoint filter)" measuring function.

2. Parameterize the measuring function:

   – Amplitude
   From experience, practical values lie in the range 1…5 %. The value is scaled to p2003.

   – Offset
   The offset is intended to slowly move the axis.
   The value should be selected so that the axis visibly moves in order to overcome the stiction. From experience, values in the range 0.5 … 1 % of the maximum axis velocity are sufficient.

   – Ramp-up time
   This value should be generously dimensioned corresponding to the offset that has been set (e.g. 200 … 500 ms).

   – Measuring period
   Set the highest possible number of measuring periods (e.g.number = 4). Ensure that the available travel distance of the axis is sufficient for the offset velocity that has been set. Observe displayed measuring time.

   – Bandwidth
   Select this value so that the expected natural frequency can be displayed with a good resolution (e.g. bandwidth < 400 Hz).
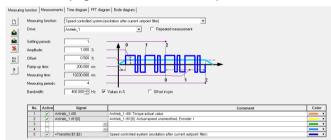
Figure 6-1   Parameterize the "Speed controller loop (excitation after the current setpoint filter)" measuring function

3. Perform the measuring function.

    – Assuming control priority

    – Switch on the drive

    – Start the measuring function

4. Evaluate the result.
   After the measuring function has been completed, the result is automatically displayed in the following Bode diagram.
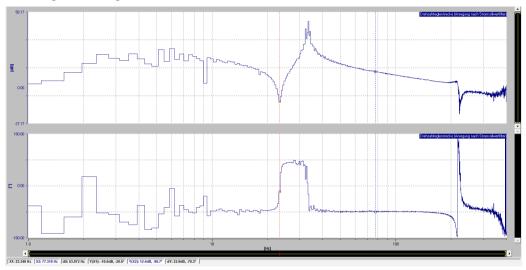
Figure 6-2   Evaluate the result of the measuring function

The Bode diagram shows the absolute value (top) and the phase (bottom) of the complex transfer function in a logarithmic scale.

The natural frequency f_d to be damped can be identified by the notch in the absolute value diagram (zero position). A positive phase rotation also occurs at this position. This is marked using a colored measuring cursor in the diagram. The result is shown at the bottom left (e.g. 23.346 Hz).

6.8.3 Determining the frequency in the time domain using traversing motion

With this method, the natural frequency to be damped is determined using a fast positioning operation, where the actual values with respect to time are recorded in a trace.

The setpoint excites the mechanical system of the axis to oscillate and acts on the motor. In spite of the fact that the speed controller has been correctly set, motor vibration can be identified if a direct measuring system is not being used.

The frequency is determined from the inverse of the time period of the oscillation at the motor.

Example for application mode "EPOS and LR"

The following parameters are recommended as measuring variables. These parameters are shown in color in the following diagrams.

- r2665: EPOS position setpoint (red)
- r2521[1]: LR position actual value, encoder 1 (green)
- r2521[2]: LR position actual value, encoder 2 (if one is being used), (blue)

The following diagram shows a positioning operation to determine the frequency.
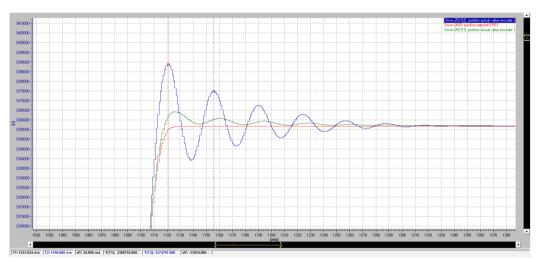
Figure 6-3   Displaying the positioning operation and determining the frequency

In the diagram above, the time period is marked using a colored measuring cursor. The result is shown below with dT = 34.966 ms (≈ 35.0 ms).

The frequency of the natural vibration to be damped is calculated as follows:

f_d = 1 / time period = 1 / 0.0350 s = 28.6 Hz

The following diagram shows the effect of VIBX in the previous example. The natural frequency is set to f_d = 28.6 Hz. The diagram shows travel with VIBX activated and deactivated.
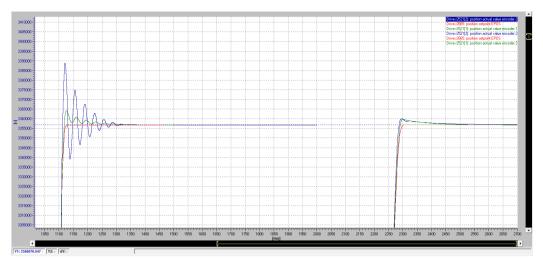
Figure 6-4   Travel with VIBX deactivated (left) and activated (right)

Alternatively, you can use the velocity or the torque as measurement variables.

- Recommended parameter for velocity:

    - r2666: EPOS velocity setpoint

    - r0061[0]: Unsmoothed speed actual value, encoder 1

    - r0061[1]: Speed actual value, unsmoothed, encoder 2 (if one is being used)

- Recommended parameter for current:

    - r0080 or r0080[0]: Actual torque value

Example of the "DSC" application mode

The procedure is similar to that for application mode "EPOS and LR". The following parameters are recommended as measurement variables for position:

- r0479[0]: Diagnostics, encoder position actual value Gn_XIST1, encoder 1

- r0479[1]: Diagnostics, encoder position actual value Gn_XIST1, encoder 2 (if one is being used)

6.9 If required, parameterize online frequency change and dead time symmetrization

Using the online frequency change, you can adapt frequency f_d of the damped natural oscillation during the runtime, with filtering active and an enabled axis that is moving.

The function offers the advantage that during motion the filter frequency can be adapted to the properties of the mechanical system as a function of the position

Preconditions

The online frequency change requires the following preconditions:

- The deadtime symmetrization must be activated (p31612 = 1 signal), or the frequency change is only accepted when the setpoint is fixed and no longer changes (r31600.8 = 1). The dead time symmetrization prevents undesirable axis velocity changes, which occur as a result of a varying delay time (dead time) of the filter due to a changing effective filter frequency f_d.
  You can find the dependency of the filter delay time on the filter type and the effective filter frequency, in "Setting the filter type (p31581) (Page 54)".
  When the deadtime symmetrization is activated, a constant, frequency-dependent filter delay time is generated, which is obtained from the lower of the two frequencies p51580[0] and p51580[1].

- Filter type "Sensitive" (p31581 = 1) is recommended.
  Using the "Sensitive" filter type, for the online frequency change, the natural frequency can be precisely adapted to the different physical attributes of the system.

  #### Note

  When using the "Sensitive" filter type a lower deceleration of the motion sequence is obtained, see "Setting the filter type (p31581) (Page 54)".

Application example

Storage and retrieval machines for high bay warehouses generally comprise a mast. The mast is equipped with a load handling device, which can be deployed at the top of the mast. This load handling device is used to place goods into a rack or remove them from a rack. The natural oscillation frequency of a storage and retrieval machine essentially depends on the position of the load handling device and its associated load (i.e. either moving with or without a load).

Procedure

1. Enter the lower and upper frequency f_d of the damped natural oscillation of the mechanical system in p31585[0, 1].

2. Interconnect connector input p31610 with the signal source for the frequency to be interpolated.
   0 % at the signal source corresponds to the lower frequency p31585[0] and 100% to the upper frequency p31585[1]. The system linearly interpolates between the two values.

3. Activate the deadtime symmetrization (p31612 = 1 signal).
   A signal change is only accepted when the setpoint is fixed (r31600.8 = 1).

Note

As a result of the settling process of the filter, the frequency cannot change at any speed, as otherwise the filter would not be effective. The rate with which the frequency can change is limited. This is internally calculated, and can be adapted by the user as a percentage (p31611).

The currently effective frequency is output at connector output r31613.

Symmetrization between several axes

When using VIBX, for interpolating or coupled axes, additional symmetrization is required in order to ensure that all of the axes involved have an identical deadtime.

For symmetrization, it must be ensured that the same filter type is set for all of the axes involved (rugged or sensitive).

1. Set frequency f_d of the particular axis (p31585[0, 1]) for all interpolating or coupled axes.

2. Determine the minimum frequency f_d of all interpolating axes.

3. Enter the minimum frequency that has been determined for all interpolating or coupled axes in p31614.

4. Activate the deadtime symmetrization (p31612 = 1 signal).

Parameter

7

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 VIBX.

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

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

Product: drvoa_vibx SIPS, Version: 1301000, Language: eng
Objects: SERVO, VECTOR

---

p31580	VIBX application mode / Appl_mode		
All objects	Can be changed: C1(3)	Calculated: -	Access level: 3
	Data type: Integer16	Dynamic index: -	Function diagram: 7314, 7315
	P-Group: Functions	Unit group: -	Unit selection: -
	Not for motor type: -	Scaling: -	Expert list: 1
	Min:	Max:	Factory setting:
	0	2	0
Description:	Sets the application mode for VIBX.		

The VIBX technology extension implements a setpoint filter to reduce the natural vibrations of a mechanical system. The position setpoint and the velocity setpoint are filtered.

The "EPOS and LR" mode is the standard application. It is employed when the drive-internal positioning is used ("basic positioner, EPOS" and "position controller LR" function modules).

The "DSC" mode is recommended when using an external position controller in a higher-level control in conjunction with the DSC position controller.

The "Inactive" mode deactivates the filter function. Status bit "Setpoint fixed" is set (r32600.8 = 1), all filter outputs set to zero (r31601 = r31602 = r31603 = 0) and alarm A52433 output.

Value:	0:	Inactive
	1:	EPOS and LR
	2:	DSC
Dependency:	See also: A53433	

Note

DSC: Dynamic Servo Control

VIBX: VIBration eXtinction (vibration absorber)

If value = 1:

The VIBX filter acts between the function modules "basic positioner, EPOS" and "position controller (LR)".

The following parameters are not effective:

p31593, r31603

If value = 2:

The VIBX filter acts in front of the DSC position controller.

The following parameters are not effective:

p31592, p31595, r31602

---

p31581   VIBX filter type / Filter type

All objects	**Can be changed:** T	**Calculated:** -	**Access level:** 3
	Data type: Integer16	**Dynamic index:** -	**Function diagram:** 7314, 7315
	P-Group: Functions	**Unit group:** -	**Unit selection:** -
	Not for motor type: -	**Scaling:** -	**Expert list:** 1
	Min:	**Max:**	**Factory setting:**
	0	1	0

Description: Sets the filter type for VIBX.

Depending on the selected filter type, the VIBX filter results in motion sequences that take somewhat longer.

Value:
- 0: Rugged
- 1: Sensitive

Note

If value = 0:

The rugged VIBX filter has a lower sensitivity to frequency offsets compared with the sensitive filter type, but results in a higher delay of the motion sequence.

The total motion sequence is extended by the time period Td (Td = 1/fd).

If value = 1:

The sensitive VIBX filter has a higher sensitivity to frequency offsets compared with the rugged filter type, but results in a lower delay of the motion sequence.

The total motion sequence is extended by half the time period Td/2 (Td = 1/fd).

---

p31585[0...1]   VIBX frequency fd / Frequency fd

All objects	**Can be changed:** T	**Calculated:** -	**Access level:** 3
	Data type: FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7314, 7315, 7316
	P-Group: Functions	**Unit group:** -	**Unit selection:** -
	Not for motor type: -	**Scaling:** -	**Expert list:** 1
	Min:	**Max:**	**Factory setting:**
	0.500 [Hz]	10000.000 [Hz]	1.000 [Hz]

Description: Sets the frequency bandwidth of the damped natural vibration of the mechanical system.

These frequencies can be determined by making the appropriate measurements.

Value CI: p31610 = 0.0 (factory setting):

The lower frequency applies (p31585[0]).

0.0 <value CI: p31610 < 1.0:

Linear interpolation is carried out between the lower and upper frequency.

Value CI: p31610 = 1.0:

The upper frequency applies (p31585[1]).

Index:
- [0] = Lower frequency
- [1] = Upper frequency

| **Dependency:** | See also: p31610, p31611, r31613 | | |
| | See also: F53432 | | |

Note

The maximum frequency that can be set depends on the filter sampling time.

f_max = 1 / (2 * r31587)

---

p31586	**VIBX damping / Damping**		
All objects	**Can be changed:** T	**Calculated:** -	**Access level:** 3
	Data type: FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7314, 7315
	P-Group: Functions	**Unit group:** -	**Unit selection:** -
	Not for motor type: -	**Scaling:** -	**Expert list:** 1
	Min:	**Max:**	**Factory setting:**
	0.00000	0.99000	0.00100
Description:	Sets the value for the damping of the natural mechanical vibration to be filtered.		

Note

The value for damping lies typically between 0.1... 3 % (D = 0.001 ... 0.03).

---

r31587	**VIBX sampling time effective / t_sample effective**		
All objects	**Can be changed:** -	**Calculated:** -	**Access level:** 3
	Data type: FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7314, 7315
	P-Group: Functions	**Unit group:** -	**Unit selection:** -
	Not for motor type: -	**Scaling:** -	**Expert list:** 1
	Min:	**Max:**	**Factory setting:**
	- [μs]	- [μs]	- [μs]
Description:	Displays the effective sampling time of the VIBX filter.		
	The value is automatically determined, and depends on the selected application mode (p31580) and the corresponding setpoint channel.		

---

p31590	**BI: VIBX activation / Activation**		
All objects	**Can be changed:** T	**Calculated:** -	**Access level:** 3
	Data type: Unsigned32 / Binary	**Dynamic index:** -	**Function diagram:** 7314, 7315
	P-Group: Functions	**Unit group:** -	**Unit selection:** -
	Not for motor type: -	**Scaling:** -	**Expert list:** 1
	Min:	**Max:**	**Factory setting:**
	-	-	0
Description:	Sets the signal source to activate the VIBX filter.		
	BI: p31590 = 1 signal:		
	The setpoint filter is activated.		
	For the transition from 0 to 1, the setpoint filter is coupled in (r31600.3 = 1). Coupling-in has been completed when the "Filter active" status bit is set (r31600.4 = 1).		
	BI: p31590 = 0 signal:		
	The setpoint filter is deactivated.		
	For the transition from 1 to 0, the setpoint filter is coupled out (r31600.5 = 1). Coupling-out has been completed when the "Filter ready" status bit is set (r31600.2 = 1).		
Dependency:	See also: r31600		

p31591   CI: VIBX filter input position setpoint EPOS_LR/DSC / Inp s_setp

All objects	Can be changed: T	Calculated: -	Access level: 3
	Data type: Unsigned32 / Integer32	Dynamic index: -	Function diagram: 7314, 7315
	P-Group: Functions	Unit group: -	Unit selection: -
	Not for motor type: -	Scaling: -	Expert list: 1
	Min:	Max:	Factory setting:
	-	-	0

Description: Sets the signal source for the position setpoint for the application mode "EPOS and LR" (p31580 = 1) and "DSC" (p31580 = 2).

Recommendation: The following BICO interconnection should be set as standard:
- application mode "EPOS and LR"
CI: p31591 = r2665
- application mode "DSC"
CI: p31591 = r2060[x], x = 6, 7, 8 (depending on the selected PROFIdrive telegram with XERR)

Dependency: See also: r31601

Note
In application mode "DSC" (p31580 = 2) the signal is interpreted as position deviation (XERR).

p31592   CI: VIBX filter input velocity setpoint EPOS_LR / Inp v_set EPOS

All objects	Can be changed: T	Calculated: -	Access level: 3
	Data type: Unsigned32 / Integer32	Dynamic index: -	Function diagram: 7314
	P-Group: Functions	Unit group: -	Unit selection: -
	Not for motor type: -	Scaling: -	Expert list: 1
	Min:	Max:	Factory setting:
	-	-	0

Description: Sets the signal source for the velocity setpoint for the application mode "EPOS and LR" (p31580 = 1).

Recommendation: The following BICO interconnection should be set as standard:
CI: p31592 = r2666

Dependency: See also: r31602

p31593   CI: VIBX filter input velocity setpoint DSC / In v_set DSC

All objects	Can be changed: T	Calculated: -	Access level: 3
	Data type: Unsigned32 / FloatingPoint32	Dynamic index: -	Function diagram: 7315
	P-Group: Functions	Unit group: -	Unit selection: -
	Not for motor type: -	Scaling: p2000	Expert list: 1
	Min:	Max:	Factory setting:
	-	-	0

Description: Sets the signal source for the velocity setpoint for application mode "DSC" (p31580 = 2).

Recommendation: The following BICO interconnection should be set as standard:
CI: p31593 = r2060[1] (index corresponds to NSOLL_B in the PROFIdrive telegram)

Dependency: See also: r31603

p31595   CI: VIBX input word EPOS / Input_word EPOS

All objects	Can be changed: T	Calculated: -	Access level: 3
	Data type: Unsigned32 / Integer16	Dynamic index: -	Function diagram: 7314
	P-Group: Functions	Unit group: -	Unit selection: -
	Not for motor type: -	Scaling: -	Expert list: 1
	Min:	Max:	Factory setting:
	-	-	0

Description:	Sets the signal source for input word EPOS for application mode "EPOS and LR" (p31580 = 1).
	The signal "Setpoint fixed" (bit 2) is required from this input word (EPOS status word 1).
Recommendation:	The following BICO interconnection should be set as standard:
	CI: p31595 = r2683
Dependency:	See also: r31600

---

p31596	CI: VIBX filter input position controller gain DSC / Inp KPC DSC		
All objects	Can be changed: T	Calculated: -	Access level: 3
	Data type: Unsigned32 / FloatingPoint32	Dynamic index: -	Function diagram: 7315
	P-Group: Functions	Unit group: -	Unit selection: -
	Not for motor type: -	Scaling: -	Expert list: 1
	Min:	Max:	Factory setting:
	-	-	0

Description:	Sets the signal source for the position controller gain "KPC" in application mode "DSC" (p31580 = 2).
Recommendation:	The following BICO interconnection should be set as standard:
	CI: p31596 = r2060[9] (index corresponds to KPC in PROFIdrive telegram)

---

r31600.0...13	CO/BO: VIBX status word / ZSW		
All objects	Can be changed: -	Calculated: -	Access level: 3
	Data type: Unsigned16	Dynamic index: -	Function diagram: 7314, 7315, 7316
	P-Group: Functions	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 for VIBX.
Recommendation:	For bit 08:
	For application mode "EPOS and LR", the following BICO interconnection should be set:
	BI: p2551 = r31600.8
	This bit is not interconnected for application mode "DSC".

Bit field:	Bit	Signal name	1 signal	0 signal	FP
	00	"Filter not initialized" state	Yes	No	-
	02	"Filter ready" state	Yes	No	-
	03	"Filter being activated" state	Yes	No	-
	04	"Filter active" state	Yes	No	-
	05	"Filter being deactivated" state	Yes	No	-
	08	Setpoint fixed	Yes	No	-
	09	Frequency being changed	Yes	No	-
	10	Frequency change limiting active	Yes	No	-
	11	Dead time symmetrization activated	Yes	No	-
	12	Immediate coupling-in possible	Yes	No	-
	13	Tracking active	Yes	No	-
Dependency:	See also: p31590, p31595				

Note

For bit 00:

An application mode has not been set (p31580).

For bit 02:

The setpoint filter is ready and can be coupled in.

For bit 03:

The filter is being coupled into the setpoint channel.

For bit 04:

The setpoint filter is activated.

For bit 05:

The filter is being coupled out of the setpoint channel.

For bit 08:

This bit is continually set in the "Inactive" mode (p32580 = 0).

For bit 09:

This bit is set while the effective frequency is being changed (CI: p31610).

For bit 10:

This bit is set if the change of the effective frequency is limited using p31611.

For bit 11:

Dead time symmetrization is activated via binector input p31612 = 1 signal.

---

r31601   **CO: VIBX filter output position setpoint EPOS_LR/DSC / Outp s_setp**

All objects		
Can be changed: -	**Calculated:** -	**Access level:** 3
Data type: Integer32	**Dynamic index:** -	**Function diagram:** 7314, 7315
P-Group: Functions	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
-	-	-

Description: Display and connector output for the position setpoint (filter output) for the application mode "EPOS and LR" (p31580 = 1) and "DSC" (p31580 = 2).

Recommendation: The following BICO interconnection should be set as standard:

- application mode "EPOS and LR"

CI: p2530 = r31601

- application mode "DSC"

CI: p1190 = r31601

Dependency: See also: p31591

---

r31602   **CO: VIBX filter output velocity setpoint EPOS_LR / Outp v_set EPOS**

All objects		
Can be changed: -	**Calculated:** -	**Access level:** 3
Data type: Integer32	**Dynamic index:** -	**Function diagram:** 7314
P-Group: Functions	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
-	-	-

Description: Display and connector output for velocity setpoint (filter output) for application mode "EPOS and LR" (p31580 = 1).

Recommendation: The following BICO interconnection should be set as standard:

CI: p2531 = r31602

Dependency: See also: p31592

---

r31603	**CO: VIBX filter output velocity setpoint DSC / Outp v_setp DSC**		
All objects	Can be changed: -	Calculated: -	Access level: 3
	Data type: FloatingPoint32	Dynamic index: -	Function diagram: 7315
	P-Group: Functions	Unit group: -	Unit selection: -
	Not for motor type: -	Scaling: p2000	Expert list: 1
	Min:	Max:	Factory setting:
	- [rpm]	- [rpm]	- [rpm]
Description:	Display and connector output for velocity setpoint (filter output) for application mode "DSC" (p31580 = 2).		
Recommendation:	The following BICO interconnection should be set as standard:		
	CI: p1430 = r31603		
Dependency:	See also: p31593		

---

r31603	**CO: VIBX filter output velocity setpoint DSC / Outp v_setp DSC**		
SERVO (Lin)	Can be changed: -	Calculated: -	Access level: 3
	Data type: FloatingPoint32	Dynamic index: -	Function diagram: 7315
	P-Group: Functions	Unit group: -	Unit selection: -
	Not for motor type: -	Scaling: p2000	Expert list: 1
	Min:	Max:	Factory setting:
	- [m/min]	- [m/min]	- [m/min]
Description:	Display and connector output for velocity setpoint (filter output) for application mode "DSC" (p31580 = 2).		
Recommendation:	The following BICO interconnection should be set as standard:		
	CI: p1430 = r31603		
Dependency:	See also: p31593		

---

r31605	**CO: VIBX filter difference position setpoint / Filt diff s_setp**		
All objects	Can be changed: -	Calculated: -	Access level: 4
	Data type: Integer32	Dynamic index: -	Function diagram: -
	P-Group: Functions	Unit group: -	Unit selection: -
	Not for motor type: -	Scaling: -	Expert list: 1
	Min:	Max:	Factory setting:
	-	-	-
Description:	Display and connector output for the position setpoint difference between the filter input and filter output.		
Dependency:	See also: p31591, r31601		

---

p31610	**CI: VIBX frequency fd interpolation signal source / fd interpol s_src**		
All objects	Can be changed: T	Calculated: -	Access level: 3
	Data type: Unsigned32 / FloatingPoint32	Dynamic index: -	Function diagram: 7314, 7315, 7316
	P-Group: Functions	Unit group: -	Unit selection: -
	Not for motor type: -	Scaling: PERCENT	Expert list: 1
	Min:	Max:	Factory setting:
	-	-	0
Description:	Sets the signal source for the interpolation of the active frequency fd.		
	A frequency change is indicated in r31600.9.		
Dependency:	If the frequency is to be changed while the axis is traversing, then dead time symmetrization must be activated (BI: p31612 = 1).		
	See also: p31585, r31600, p31611, r31613		

Note

For value <= 0.0, frequency p31585[0] is active.

For value >= 1.0, frequency p31585[1] is active.

For 0.0 < value < 1.0, a linear interpolation is made between frequencies p31585[0] and p31585[1].

---

p31611	VIBX frequency fd maximum rate of change / fd chng_rate max		
All objects	Can be changed: T	Calculated: -	Access level: 4
	Data type: FloatingPoint32	Dynamic index: -	Function diagram: -
	P-Group: Functions	Unit group: -	Unit selection: -
	Not for motor type: -	Scaling: -	Expert list: 1
	Min:	Max:	Factory setting:
	20.0 [%]	500.0 [%]	100.0 [%]
Description:	Sets the maximum rate of change for the active frequency fd.		
	Limiting becomes effective if the signal source of p31610 changes its value to quickly.		
	Limiting is indicated in status bit r31600.10.		
Dependency:	See also: r31600, p31610, r31613		

Note

The lower this value, the slower the frequency can be changed.

---

p31612	BI: VIBX dead time symmetrization activation / Dead time sym act		
All objects	Can be changed: T	Calculated: -	Access level: 3
	Data type: Unsigned32 / Binary	Dynamic index: -	Function diagram: 7314, 7315, 7316
	P-Group: Functions	Unit group: -	Unit selection: -
	Not for motor type: -	Scaling: -	Expert list: 1
	Min:	Max:	Factory setting:
	-	-	0
Description:	Sets the signal source to activate the dead time symmetrization when frequency fd changes.		
	BI: p31612 = 0 signal:		
	Dead time symmetrization is deactivated. When the frequency changes, the filter dead time also changes.		
	BI: p31612 = 1 signal:		
	Dead time symmetrization is activated. Symmetrization is carried out for a constant dead time.		
Dependency:	Dead time symmetrization must be activated in the following cases (BI: p31612 = 1):		
	- for a frequency change of a traversing axis.		
	- for interpolating axes. In this case, p31614 must also be set.		
	See also: p31585, p31614		

Note

A signal change only becomes effective when the axis comes to a standstill.

---

r31613	CO: VIBX frequency fd active / fd active		
All objects	Can be changed: -	Calculated: -	Access level: 3
	Data type: FloatingPoint32	Dynamic index: -	Function diagram: -
	P-Group: Functions	Unit group: -	Unit selection: -
	Not for motor type: -	Scaling: -	Expert list: 1
	Min:	Max:	Factory setting:
	- [Hz]	- [Hz]	- [Hz]
Description:	Display and connector output for the active frequency fd.		
Dependency:	See also: p31585, p31610, p31611		

p31614	VIBX dead time symmetrization interpolating axes min. frequency / t_dead sym f_min		
All objects	Can be changed: T	Calculated: -	Access level: 3
	Data type: FloatingPoint32	Dynamic index: -	Function diagram: -
	P-Group: Functions	Unit group: -	Unit selection: -
	Not for motor type: -	Scaling: -	Expert list: 1
	Min:	Max:	Factory setting:
	0.500 [Hz]	10000.000 [Hz]	10000.000 [Hz]
Description:	Sets the minimum frequency for the dead time symmetrization for interpolating axes.		
	The minimum frequency should be kept to the factory setting for non-interpolating axes.		
	The following conditions must be satisfied for interpolating axes:		
	1. The frequency set here must be less than or equal to the lowest frequency in p31585 for all interpolating axes.		
	2. The filter type in p31581 must be set the same for all interpolating axes.		
	3. Dead time symmetrization must be activated (BI: p31612 = 1 signal).		
Dependency:	See also: r31615		

r31615	CO: VIBX delay time additional sum / t_delay addit sum		
All objects	Can be changed: -	Calculated: -	Access level: 4
	Data type: FloatingPoint32	Dynamic index: -	Function diagram: -
	P-Group: Functions	Unit group: -	Unit selection: -
	Not for motor type: -	Scaling: -	Expert list: 1
	Min:	Max:	Factory setting:
	- [ms]	- [ms]	- [ms]
Description:	Display and connector output for the delay time.		
	The value comprises the delay time of the dead time symmetrization and the selected symmetrization frequency (p31614).		
Dependency:	See also: p31612, p31614		

Function diagrams 8

Note
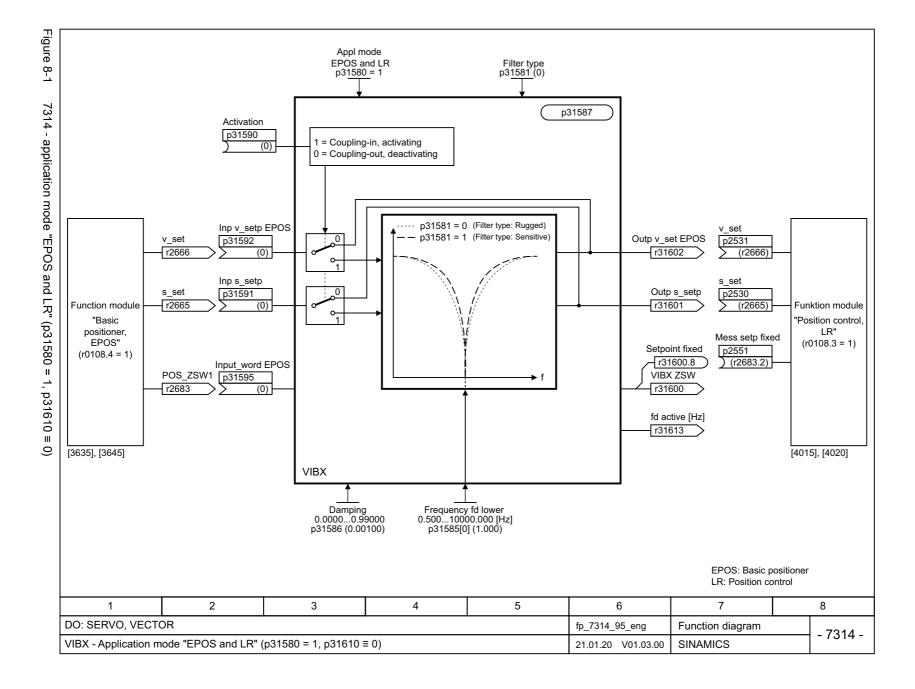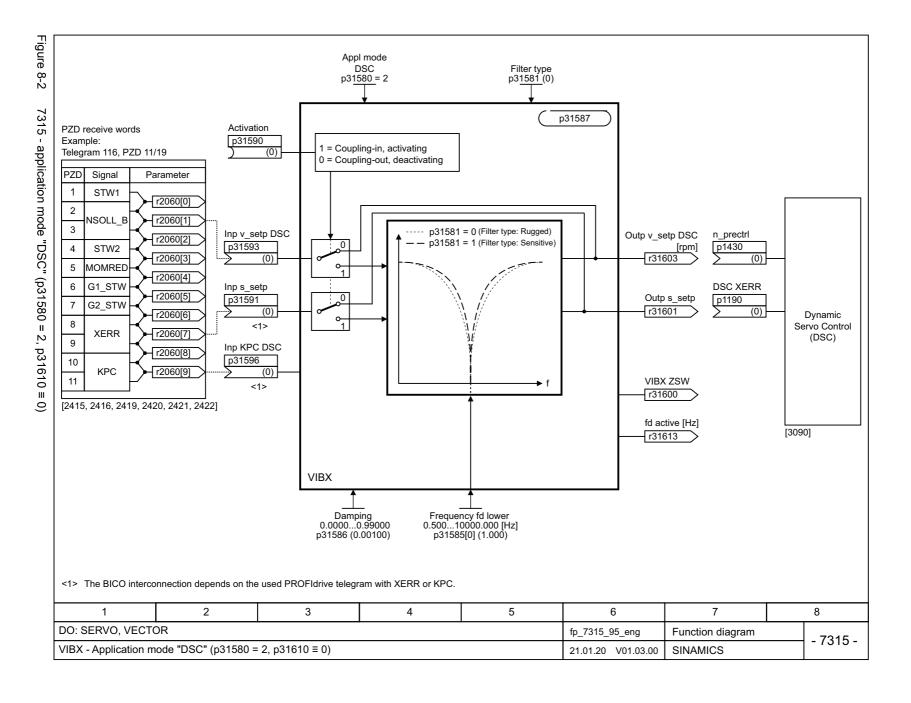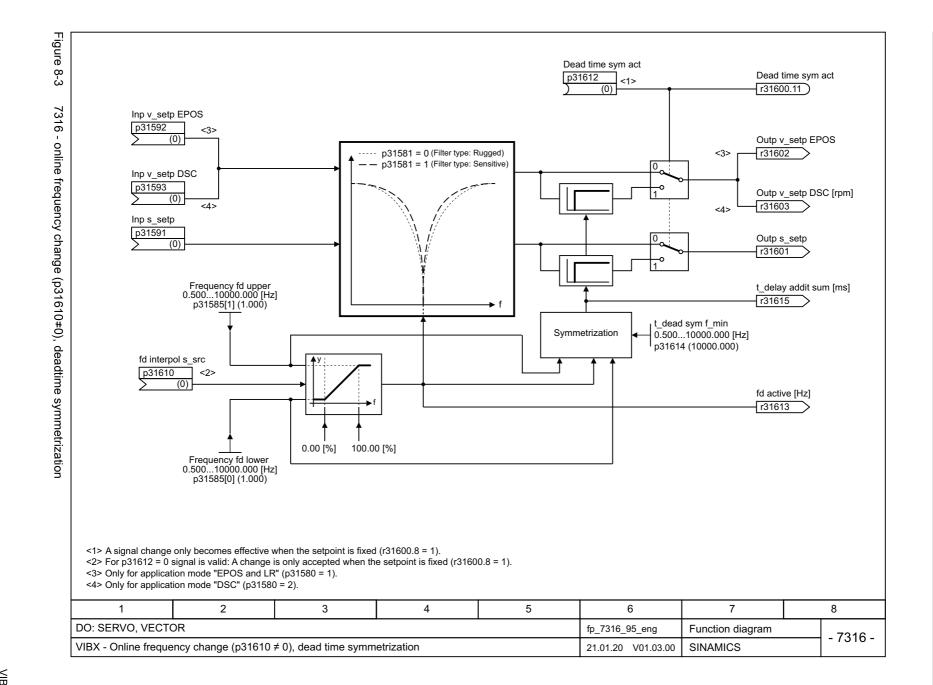
This chapter only includes the function diagrams for Technology Extension VIBX.

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   7314 - application mode "EPOS and LR" (p31580 = 1, p31610 ≡ 0)

1	2	3	4	5	6	7	8

| DO: SERVO, VECTOR | | | | | fp_7314_95_eng | Function diagram | - 7314 - |
| VIBX - Application mode "EPOS and LR" (p31580 = 1, p31610 ≡ 0) | | | | | 21.01.20   V01.03.00 | SINAMICS | |

Figure 8-2   7315 - application mode "DSC" (p31580 = 2, p31610 ≡ 0)

Figure 8-3   7316 - online frequency change (p31610≠0), deadtime symmetrization

Dead time sym act
p31612   <1>
(0)

Dead time sym act
r31600.11

Inp v_setp EPOS
p31592   <3>
(0)

Inp v_setp DSC
p31593
(0)   <4>

Inp s_setp
p31591
(0)

p31581 = 0 (Filter type: Rugged)
p31581 = 1 (Filter type: Sensitive)

f

Outp v_setp EPOS
<3>   r31602

Outp v_setp DSC [rpm]
<4>   r31603

Outp s_setp
r31601

t_delay addit sum [ms]
r31615

Symmetrization

t_dead sym f_min
0.500...10000.000 [Hz]
p31614 (10000.000)

Frequency fd upper
0.500...10000.000 [Hz]
p31585[1] (1.000)

fd interpol s_src
p31610   <2>
(0)

y

f

fd active [Hz]
r31613

0.00 [%]   100.00 [%]

Frequency fd lower
0.500...10000.000 [Hz]
p31585[0] (1.000)

<1> A signal change only becomes effective when the setpoint is fixed (r31600.8 = 1).
<2> For p31612 = 0 signal is valid: A change is only accepted when the setpoint is fixed (r31600.8 = 1).
<3> Only for application mode "EPOS and LR" (p31580 = 1).
<4> Only for application mode "DSC" (p31580 = 2).

1	2	3	4	5	6	7	8
DO: SERVO, VECTOR					fp_7316_95_eng	Function diagram	- 7316 -
VIBX - Online frequency change (p31610 ≠ 0), dead time symmetrization					21.01.20 V01.03.00	SINAMICS	

Faults and alarms

<div style="text-align: right; font-size: 2em;">9</div>

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 faults and alarms".

List of faults and alarms

> **Note**
>
> This chapter only includes the messages for Technology Extension VIBX.
>
> You can find information on additional messages that are output (faults, alarms) 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 faults and alarms".

Product: drvoa_vibx SIPS, Version: 1301000, Language: eng
Objects: SERVO, VECTOR

F53430   VIBX EPOS not activated

Message value:	-
Drive object:	All objects
Reaction:	NONE
Acknowledge:	IMMEDIATELY
Cause:	In the application mode "EPOS and LR" (p31580 = 1), it was identified that the function module "Basic positioner, EPOS" (r0108.4) is not activated. The function module "Basic positioner, EPOS" must be activated in this application mode.
Remedy:	Activate the function module "Basic positioner, EPOS" (r0108.4). Note: VIBX: VIBration eXtinction (vibration absorber)

F53432   VIBX frequency fd > Shannon frequency

Message value:	-
Drive object:	All objects
Reaction:	NONE
Acknowledge:	IMMEDIATELY
Cause:	The VIBX filter frequency is greater than the Shannon frequency. The Shannon frequency is calculated according to the following formula: Shannon frequency = 0.5 / r31587

Remedy: Reduce the VIBX filter frequency (p31585).

Note:

VIBX: VIBration eXtinction (vibration absorber)

A53433 (F)   VIBX configuration not complete/configuration missing

Message value:	-
Drive object:	All objects
Reaction:	NONE
Acknowledge:	NONE
Cause:	The VIBX technology extension is activated. However, an application mode has still not been set (p31580 = 0).
	The following signals are constantly evaluated:
	r32600.8 = 1, r31601 = r31602 = r31603 = 0
	See also: p31580 (VIBX application mode)
Remedy:	Set the required application mode (p31580 > 0).
	Note:
	VIBX: VIBration eXtinction (vibration absorber)
Reaction upon F:	OFF2
Acknowl. upon F:	IMMEDIATELY

A53434 (F)   VIBX not sufficient system memory

Message value:	-
Drive object:	All objects
Reaction:	NONE
Acknowledge:	NONE
Cause:	The VIBX technology extension cannot be activated due to lack of memory.
	The following signals are constantly evaluated:
	r32600.8 = 1, r31601 = r31602 = r31603 = 0
	See also: p31580 (VIBX application mode)
Remedy:	- de-activate unused technology extensions.
	- de-activate unused DCC charts.
	Note:
	VIBX: VIBration eXtinction (vibration absorber)
Reaction upon F:	OFF2
Acknowl. upon F:	IMMEDIATELY

Appendix A

A.1 List of abbreviations

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

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

Abbreviation	Derivation of abbreviation	Meaning
BLM	Basic Line Module	Basic Line Module
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

Abbreviation	Derivation of abbreviation	Meaning
DDC	Dynamic Drive Control	Dynamic Drive Control
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

Abbreviation	Derivation of abbreviation	Meaning
ESD	Electrostatic Sensitive Devices	Electrostatic sensitive devices
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

Abbreviation	Derivation of abbreviation	Meaning
HLG	Hochlaufgeber	Ramp-function generator
HM	Hydraulic Module	Hydraulic Module
HMI	Human Machine Interface	Human Machine Interface
HTL	High-Threshold Logic	Logic with high interference threshold
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
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

Abbreviation	Derivation of abbreviation	Meaning
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

Abbreviation	Derivation of abbreviation	Meaning
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
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

Abbreviation	Derivation of abbreviation	Meaning
RESM	Reluctance synchronous motor	Synchronous reluctance motor
RFG	Ramp-Function Generator	Ramp-function generator
RJ45	Registered Jack 45	Term for an 8-pin socket system for data transmission with shielded or non-shielded multi-wire copper cables
RKA	Rückkühlanlage	Cooling unit
RLM	Renewable Line Module	Renewable Line Module
RO	Read Only	Read only
ROM	Read-Only Memory	Read-only memory
RPDO	Receive Process Data Object	Receive Process Data Object
RS232	Recommended Standard 232	Interface standard for 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

Abbreviation	Derivation of abbreviation	Meaning
SIL	Safety Integrity Level	Safety Integrity Level
SITOP	-	Siemens power supply system
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

Abbreviation	Derivation of abbreviation	Meaning
TN	Terre Neutre	Grounded three-phase line supply
Tn	-	Integral time
TPDO	Transmit Process Data Object	Transmit Process Data Object
TSN	Time-Sensitive Networking	Time-Sensitive Networking
TT	Terre Terre	Grounded three-phase line supply
TTL	Transistor-Transistor-Logic	Transistor-transistor 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

Index

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