SIEMENS

SINAMICS

VIBX Vibration Extinction

Function Manual

Edition 07/2016

SIEMENS

SINAMICS

VIBX Vibration Extinction

Function Manual

Valid for	
Technology Extension	**Firmware version**
VIBX	**1.3**
for the drive	
SINAMICS S120	**from 4.4**
SINAMICS Integrated	**from 4.4**

07/2016
A5E32163869

Legal information

Warning notice system

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

⚠ DANGER

indicates that death or serious injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or serious injury **could** result if proper precautions are not taken.

⚠ CAUTION

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

NOTICE

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

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

Qualified personnel

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

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products are only permitted to be used for the applications listed in the catalog and in the associated technical documentation. If third-party products and components are used, then they must be recommended or approved by Siemens. These products can only function correctly and safely if they are transported, stored, set up, mounted, installed, commissioned, operated and maintained correctly. The permissible ambient conditions must be adhered to. Notes in the associated documentation must be observed.

Trademarks

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

Disclaimer of liability

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

Siemens AG
Industry Sector
P.O. Box 48 48
90026 NUREMBERG
GERMANY

Article number: A5E32163869
07/2016 Subject to change without prior notice

Preface

Information about the SINAMICS documentation

The SINAMICS documentation is organized in two parts:

- General documentation/catalogs
- Manufacturer / service documentation

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

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

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

Target group

This documentation addresses commissioning engineers and service personnel who use SINAMICS.

Objective

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

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

Search tools

The following guides are provided to help you locate information in this manual:

1. Table of contents for the complete manual (Page 7)
2. List of abbreviations (Page 69)
3. Index (Page 79)

Technical support

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

http://www.siemens.com/automation/service&support

SINAMICS

Information about SINAMICS can be found on the Internet at the following address:
http://www.siemens.com/sinamics

Table of contents

Fundamental safety instructions

1

Content

1.1 General safety instructions

⚠ WARNING

Risk of death if the safety instructions and remaining risks are not carefully observed

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

- Observe the safety instructions given in the hardware documentation.
- When assessing the risk, take into account residual risks.

⚠ WARNING

Danger to life or malfunctions of the machine as a result of incorrect or changed parameter assignment

Machines can malfunction as a result of incorrect or changed parameter assignment, which in turn can lead to injuries or death.

- Protect the parameterization (parameter assignments) against unauthorized access.
- Respond to possible malfunctions by applying suitable measures (e.g. EMERGENCY-STOP or EMERGENCY-OFF).

1.2 Industrial security

Note

Industrial security

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, devices, and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

To ensure that Siemens products and solutions are operated securely, suitable preventive measures (e.g. cell protection concept) and each component must be integrated into a state-of-the-art holistic industrial security concept. Any third-party products that may be in use must also be taken into account. You will find more information about industrial security at:

http://www.siemens.com/industrialsecurity

To receive information about product updates on a regular basis, register for our product newsletter. You will find more information at:

http://support.automation.siemens.com

⚠ WARNING

Danger due to unsafe operating states caused by software manipulation

Software manipulation (e.g. by viruses, Trojan horses, malware, worms) can cause unsafe operating states to develop in your installation which can result in death, severe injuries and/or material damage.

- Update your software regularly.

  You can find information and newsletters on this subject at:

  http://support.automation.siemens.com
- Integrate the automation and drive components into a holistic, state-of-the-art industrial security concept for the plant or machine.

  For more information, visit:

  http://www.siemens.com/industrialsecurity
- Make sure that you include all installed products into the holistic industrial security concept.

⚠ WARNING

Danger to life due to software manipulation when using exchangeable storage media

Storing files onto exchangeable storage media amounts to an increased risk of infection, e.g. with viruses and malware. As a result of incorrect parameterization, machines can malfunction, which in turn can lead to injuries or death.

- Protect files stored on exchangeable storage media from malicious software by taking suitable protection measures, e.g. virus scanners.

Application range, properties

2

The Technology Extension "Vibration extinction" (VIBX, VIBration EXtinction, vibration quenching) is an extension for the SERVO and VECTOR drive objects.

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

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 vibration as possible caused in the natural frequency range of the moving mechanical components.

Applications – stacker cranes

For a stacker crane, mast vibration 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 stacker crane 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.

Filter types

The following filter types can be set:

- **Rugged**
- **Sensitive**

The filter characteristics can be set using frequency and damping (attenuation).

Via a connector input, in operation, the filter frequency can be linearly changed between two limit values. 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.

Additional information on VIBX

The Technology Extension VIBX is described in detail in Chapter"Function description and commissioning" (Page 29).

Installation and activation

3

Content

3.1 Installing a Technology Extension using STARTER

Note

The subsequent description in this chapter refers to the fictitious Technology Extension "ABC_OA".

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

This description to install and commission an Technology Extension is also applicable for engineering software with integrated STARTER (e.g. SIMOTION SCOUT).

3.1.1 General

Terms

- Technology Extension (TEC)

  Software component, which is installed as an additional technology package and which expands the functionality of the SINAMICS drive system.

  A Technology Extension is also known as OA-application (OA, Open Architecture).

- OA support package (OASP)

  By installing an OA support package (OASP), the STARTER commissioning tool is expanded by the corresponding Technology Extension.

  An OA support package is only required if the associated Technology Extension is used. Generally, it can be sourced through your local Siemens office.

Devices

This description is applicable for devices that require a memory card (e.g. S120, automation systems with SINAMICS Integrated).

Requirements

1. The STARTER commissioning tool as of Version V4.2 must be installed.
2. The file for the OA support package "oasp_abc_oa_v1_2_oaif04402300.zip" must be located in a known directory.

   The file name for the OA support package comprises the following elements:

   – oasp = OA support package

   – abc_oa = name of the Technology Extension

   – v1_2 = version of the Technology Extension

   – oaif04402300 = OA-interface version (OA-interface version)

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

Note

The following description assumes that control and the drive have been commissioned.

3.1.2 Installing theOA support package in STARTER

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

Requirements

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

Procedure

Proceed as follows:

1. Select the menu **Tools >Installation libraries and technology packages …**.

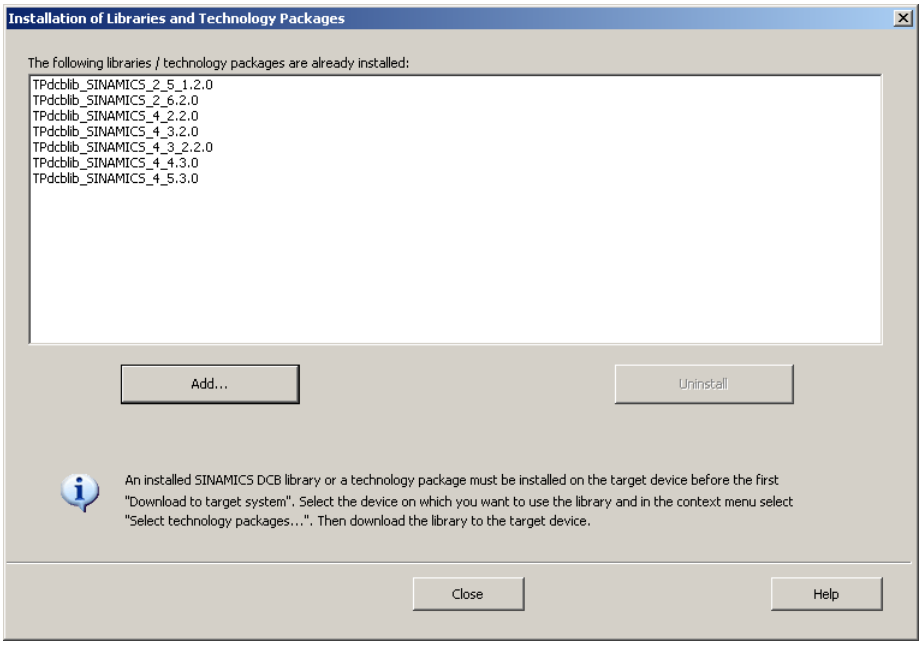


Fig. 3-1 Select OA support package (technology package) and install

2. Press the **Add …** button.
3. Open file "oasp_abc_oa_v1_2_oaif04402300.zip".

   The technology package belonging to the Technology Extension ABC is added.
4. Press the **Close** button.

3.1.3 Downloading the technology package

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

Requirements

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

Procedure

Proceed as follows:

1. Select the drive device in the project navigator.
2. In the shortcut menu (right mouse key), call the**Select technology packages ….**.

   The "Select technology packages" window opens.
3. For the technology package "ABC_OA", set the action "Load to target device"

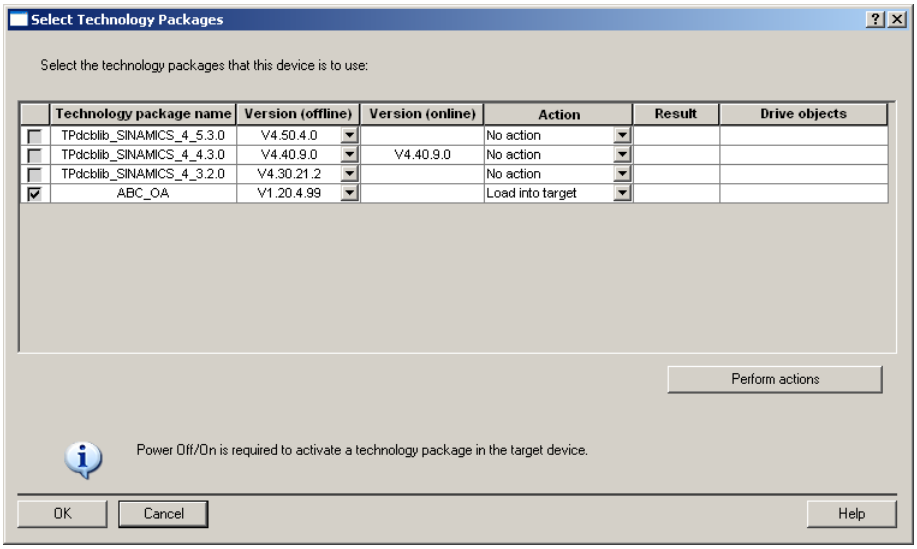


Fig. 3-2 Select Technology packages

4. Click the **Execute actions** button.

   After successfully performing the action, the "OK" result field is displayed.
5. Then perform a power on (switch off/on) for the target device.

Additional information on the "Select technology package" dialog

- For a technology package, the "Version (online)" column will only be filled after you have executed "Load into target device."
- The version data between the columns "Version (offline)" and "Version (online)" can differ. When you download the technology package, the version in the target device is always overwritten.

3.1.4 Activating the Technology Extension in the drive object

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

Requirements

1. A project matching the device is open.
2. The corresponding drive axes are created in the project.
3. The STARTER commissioning tool is in the offline mode.

Procedure

Proceed as follows:

1. In the project navigator, select the drive object for which the functionality is required (e.g. SERVO_03).
2. Select the shortcut menu **Properties** (right mouse key)
3. Select the **Technology packages** tab.
4. Activate the checkbox for "ABC_OA" (set the check mark).

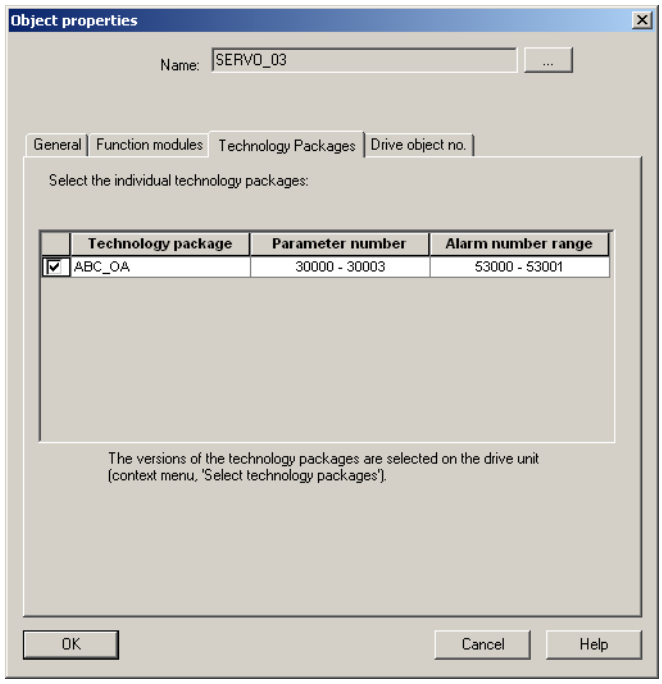
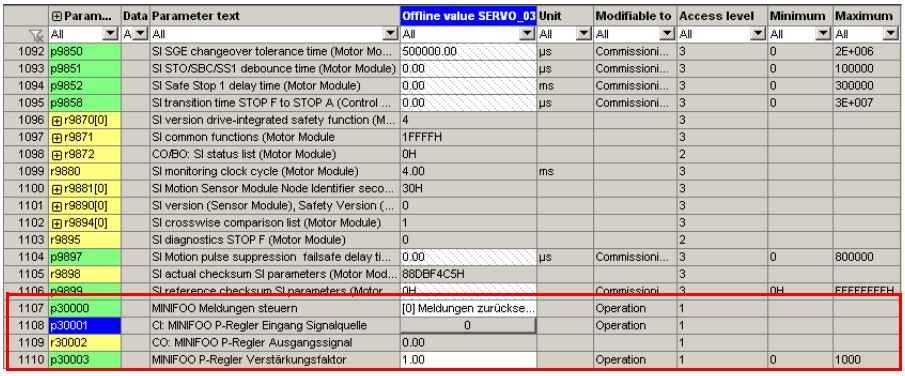


Fig. 3-3 Object properties

5. Press the **OK** button.

6. Checking 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.



	Param...	Data	Parameter text	Offline value SERVO_03	Unit	Modifiable to	Access level	Minimum	Maximum
	All	A	All	All	All	All	All	All	All
1092	p9850		SI SGE changeover tolerance time (Motor Mo...	500000.00	µs	Commissioni...	3	0	2E+006
1093	p9851		SI STO/SBC/SS1 debounce time (Motor Module)	0.00	µs	Commissioni...	3	0	100000
1094	p9852		SI Safe Stop 1 delay time (Motor Module)	0.00	ms	Commissioni...	3	0	300000
1095	p9858		SI transition time STOP F to STOP A (Control ...	0.00	µs	Commissioni...	3	0	3E+007
1096	r9870[0]		SI version drive-integrated safety function (M...	4			3		
1097	r9871		SI common functions (Motor Module	1FFFFH			3		
1098	r9872		CO/BO: SI status list (Motor Module)	0H			2		
1099	r9880		SI monitoring clock cycle (Motor Module)	4.00	ms		3		
1100	r9881[0]		SI Motion Sensor Module Node Identifier seco...	30H			3		
1101	r9890[0]		SI version (Sensor Module), Safety Version (...	0			3		
1102	r9894[0]		SI crosswise comparison list (Motor Module)	1			3		
1103	r9895		SI diagnostics STOP F (Motor Module)	0			2		
1104	p9897		SI Motion pulse suppression failsafe delay ti...	0.00	µs	Commissioni...	3	0	800000
1105	r9898		SI actual checksum SI parameters (Motor Mod...	88DBF4C5H			3		
1106	p9899		SI reference checksum SI parameters (Motor	0H		Commissioni	3	0H	FFFFFFFFH
1107	p30000		MINIFOO Meldungen steuern	[0] Meldungen zurückse...		Operation	1		
1108	p30001		CI: MINIFOO P-Regler Eingang Signalquelle	0		Operation	1		
1109	r30002		CO: MINIFOO P-Regler Ausgangssignal	0.00			1		
1110	p30003		MINIFOO P-Regler Verstärkungsfaktor	1.00		Operation	1	0	1000

Fig. 3-4 Expert list

7. Download the project

   To activate the Technology Extension, for the drive object, a project download is required (establish the ONLINE mode, download the project).

3.1.5 Commissioning the Technology Extension

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

Parameters p30000 … p30003 are available for ABC_OA.

Commissioning VIBX

For the Technology Extension VIBX, parameters from p31580 are available, see "List of parameters" (Page 53).

Commissioning is described in detail in Chapter "Function description and commissioning" (Page 29).

BICO interconnections must be set when commissioning VIBX. These can either be manually or automatically set, see Section "Parameterizing BICO interconnections" (Page 37).

3.2 Uninstalling a Technology Extension using STARTER

Uninstalling a Technology Extension via STARTER is performed in the inverse sequence to that of installation.

1. Deactivating the Technology Extension in the drive object, see "Activating the Technology Extension in the drive object" (Page 20).
2. Delete the technology package, belonging to the Technology Extension, in the drive unit, see "Downloading the technology package" (Page 19).
   – Deactivate the technology package in the OFFLINE mode.
   – For the technology package in the ONLINE mode, select the "Delete" action and press the **Execute actions** button.
3. Uninstalling the Technology Extension in STARTER, see "Installing theOA support package in STARTER" (Page 18).

3.3 Installing a Technology Extension via SINUMERIK HMI

Note

The subsequent description in this chapter refers to the fictitious Technology Extension "ABC_OA".

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

3.3.1 General

Terms

- Technology Extension (TEC)

  Software component, which is installed as an additional technology package and which expands the functionality of the SINAMICS drive system.

  A Technology Extension is also known as OA-application (OA, Open Architecture).

- Portable service system for NCU

  Emergency boot system (EBS) on a USB memory. If service is required, you can initiate that the NCU powers up from the service system in order to execute various service tasks (e.g. data backup or update).

  Note

  The portable service system for NCU, as well as the procedure to generate it on a USB memory, is described in detail in the following reference:

  References: /IM7/ SINUMERIK operating system NCU commissioning manual Chapter "Diagnostics and service"

Devices

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

Requirements

1. The HMI appropriate for the associated SINUMERIK version must have been installed (e.g. HMI-Operate, used here, or HMI-Advanced).
2. A USB memory, which is installed on the portable service system for the NCU, is available.
3. The file for the Technology Extension ABC_OA "abc_oa_v1_2_oaif04402300.tgz" is copied to the FAT- partition of the USB memory using the portable service system.

   The file name for the Technology Extension ABC_OA comprises the following elements:

   – abc_oa = name of the Technology Extension
   – v1_2 = version of the Technology Extension
   – oaif04402300 = OA-interface version (OA-interface version)

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

Note

The following description assumes that control and the drive have been commissioned.

3.3.2 Install Technology Extension on the drive device

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

Procedure

1. Connect the USB memory with portable service system to USB interface X125 or X135 of the SINUMERIK NCU.
2. Restart the SINUMERIK NCU:
   – Switch off the device and then switch on again.

   or

   – press the "Reset" button.

   SINUMERIK NCU starts with the service system.
3. In the service system, execute the following actions one after the other:
   – In the main menu, select menu item "Update NCU Software and Data".
   – Then select menu item "Update system software from USB memory stick".
   – Select file "abc_oa_v1_2_oaif04402300.tgz" and acknowledge with "OK".

   File "abc_oa.cfs" is extracted from file "abc_oa_v1_2_oaif04402300.tgz", and is saved in the directory "/card/oem/sinamics/oa".
4. Restart SINUMERIK NCU as described under Step 2.

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

3.3.3 Activate Technology Extension for the axis (drive object)

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

Configuration example

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

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

Procedure

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

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

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

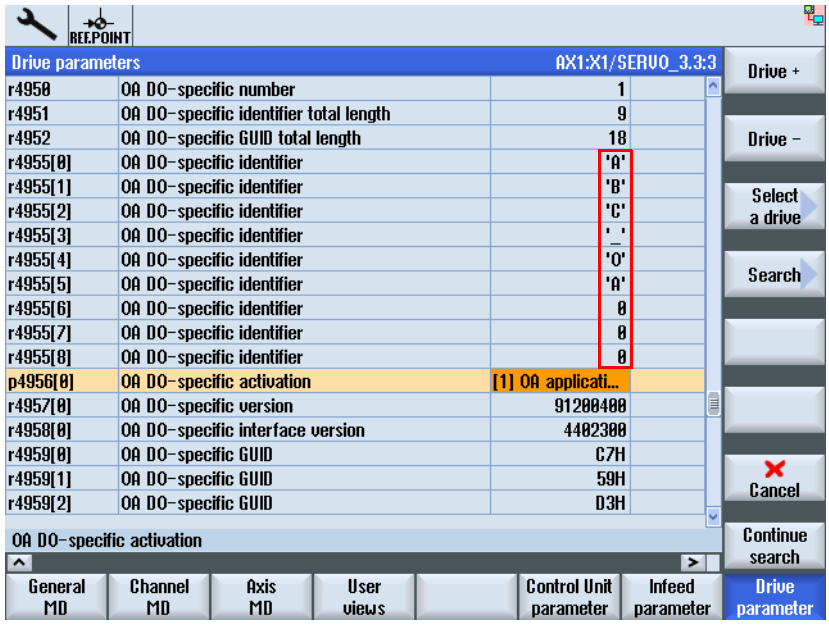


Fig. 3-5 Activated Technology Extension in the drive machine data

Note

The number of Technology Extensions is displayed in r4950.

r4955[0…8] contains the identifier for Technology Extension 1
r4955[9…17] contains the identifier for Technology Extension 2, etc.

For r4950 = 1, the following applies:

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

For r4950 > 1, the following applies:

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

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

Note

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

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

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

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

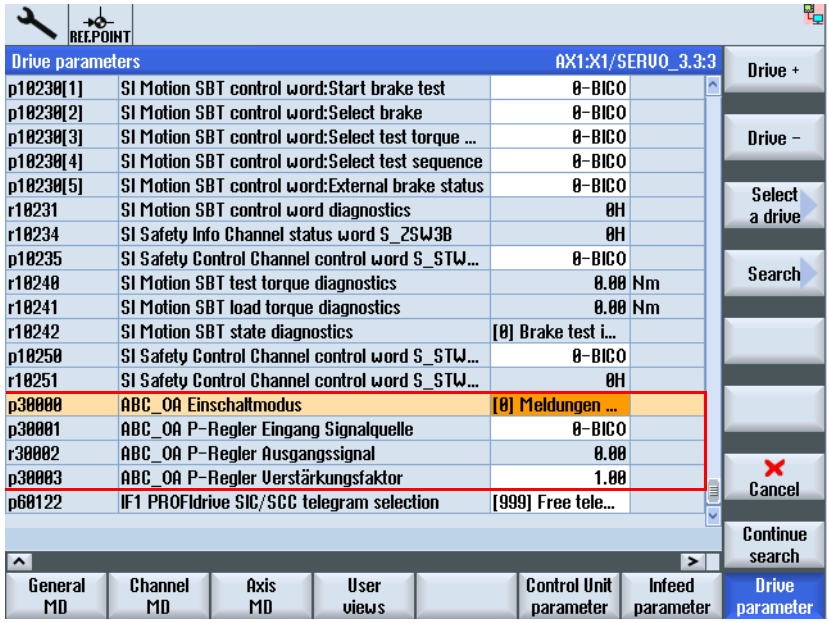


Fig. 3-6 Expert list

3.3.4 Commissioning the Technology Extension

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

Parameters p30000 … p30003 are available for ABC_OA.

Commissioning VIBX

For the Technology Extension VIBX, parameters from p31580 are available, see "List of parameters" (Page 53).

Commissioning is described in detail in Chapter "Function description and commissioning" (Page 29).

BICO interconnections must be set when commissioning VIBX. These can either be manually or automatically set, see Section "Parameterizing BICO interconnections" (Page 37).

3.4 Uninstalling a Technology Extension via SINUMERIK HMI

Procedure

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

1. Deactivating the Technology Extension in the drive object, see "Activate Technology Extension for the axis (drive object)" (Page 25).
2. Stop the system:
   - Connect via Secure Shell (SSH).
   - Run the following command: `sc stop all`.
3. Delete the subdirectory and files on the memory card:
   - Select the system data.
   - Select directory "/oem/sinamics/oa" under the system CF card.
   - Select subdirectory "abc_oa" and delete.
   - Select file "abc_oa.cfs" and delete.

   Note

   Pay attention to the sequence when deleting:

   First the subdirectory and then the file.
4. Carry out a POWER ON (switch off/switch on).

Function description and commissioning

4

Content

4.1 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 vibration as possible caused in the natural frequency range of the moving mechanical components.

When the VIBX filter is activated, although motion is slightly delayed, when correctly parameterized, vibration 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).

4.1.1 Commissioning

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

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

Requirements

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

- When installed using STARTER:
  - The Technology Extension is installed as technology package in STARTER, see "Installing theOA support package in STARTER" (Page 18).
  - It is loaded into the Control Unit, see "Downloading the technology package" (Page 19).
  - It 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 20).
- When installed via SINUMERIK HMI:
  - The Technology Extension is installed on the drive device, see "Install Technology Extension on the drive device" (Page 24)
  - It is activated for the axis (drive object), see "Activate Technology Extension for the axis (drive object)" (Page 25).

Licensing is required, see "Licensing" (Page 49).

Configuration

The VIBX configuration is shown in the following function diagrams:

- "7314 – VIBX application mode "EPOS and LR" (p31580 = 1, p31610 ≡ 0)" (Page 62).
- "7315 – VIBX application mode "DSC" (p31580 = 2, p31610 ≡ 0)" (Page 63)
- "7316 – VIBX online frequency change (p31610 ≠ 0), deadtime symmetrization" (Page 64)

The settings required for the configuration are as follows:

1. Defining the application mode:
   See "Application mode" (Page 32).
2. Defining the natural frequency and damping:
   See "Natural frequency f_d and damping D" (Page 34).
3. Defining the filter type:
   See "Filter types (p31581)" (Page 34).
4. Defining BICO interconnections as a function of the application mode:
   – For the "EPOS and LR" application mode:
   See "BICO interconnections for the "EPOS and LR" application mode" (Page 37).
   – For the "DSC" application mode:
   See "BICO interconnections for the "DSC" application mode" (Page 38).
5. If required, parameterize online frequency change and dead time symmetrization:
   See "Online frequency change and dead time symmetrization" (Page 44).

4.1.2 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 EPOS and the input to the LR. To do this, BICO interconnections must be changed, see "BICO interconnections for the "EPOS and LR" application mode" (Page 37).

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 telegrams for DSC can be found in the following references:

References: /LH1/ SINAMICS S120/S150 List Manual
Chapter "Function diagrams PROFIdrive"

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 "BICO interconnections for the "DSC" application mode" (Page 38).

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, Section "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), then 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 mentioned above occurs.

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

Recommendation:

For control systems that communicate according to the PROFIdrive profile, the fast stop must therefore 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 "BICO interconnections in application mode "DSC" (p31580 = 2)" (Page 38)).

2. The setpoint step that occurs when switching over to closed-loop speed control - and the resulting undesirable acceleration - must be avoided.

For example, this is achieved as follows:

- SINUMERIK (from 4.7):

  Set axis machine data 36610 "MA_AX_EMERGENCY_STOP_TIME = 0 s".

- SIMOTION (from 4.5):

  Stop motion with closed-loop speed control active (movingMode := SPEED_CONTROLLED).

  ```
  RetVal := _stop (… , movingMode := SPEED_CONTROLLED, …);
  ```

Note

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:

- Torque precontrol:

  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.

4.1.3 Natural frequency f_d and damping D

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

- 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 "Online frequency change and dead time symmetrization" (Page 44).

The value for the frequency f_d of the natural mechanical vibration can be determined using the trace function of the STARTER commissioning software. This is described in detail in section "Determining the frequency f_d (p31585)" (Page 39). In exceptional cases, an additional measuring device may be required (e.g. a vibration sensor).

As the damping is low for almost all practical applications (for instance, a stacker crane), the following applies:

Natural frequency of damped system f_d ~ resonant frequency f_r

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

Note

The damping refers to the natural mechanical vibration to be dampened (attenuated).

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.

The 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.

4.1.4 Filter types (p31581)

The following filter types can be set:

- **Rugged**

  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**

  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 $T_d = 1/f_d$.

4.1.5 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. However, activation while the axis is traversing can result in a temporary velocity reduction.

A transition is made from the "Filter ready" state to the "Filter active" state in the following way:

- Request activation of VIBX (BI: p31590 = 1-signal).

  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. However, when deactivated while the axis is traversing, results in a temporary increase in the velocity. This must be taken into account when parameterizing the drive (velocity limiting).

A transition is made from the "Filter active" state to the "Filter ready" state in the following way:

- Request deactivation of VIBX (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.

4.1.6 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" (Page 35).

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 reactions.

4.1.7 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.

When VIBX is activated and monitored from a higher-level control system via PROFIdrive, then the telegrams must be expanded by the corresponding information (e.g. p31590, r31600) using free telegram configuration (p0922 = 999).

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

In application mode "DSC", status word r31600 can be freely interconnected as required.

Note

The structure of the positioning telegrams mentioned above as well as the telegram configuration can be found in the following references:

References: /FH1/	SINAMICS S120 Function Manual Drive Functions Section "Communication"
References: /LH1/	SINAMICS S120/S150 List Manual Chapter "Function diagrams PROFIdrive"

4.2 Parameterizing BICO interconnections

4.2.1 BICO interconnections for the "EPOS and LR" application mode

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.

Table 4-1 BICO interconnections in the "EPOS and LR" application mode (p31580 = 1)

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

The BICO interconnections listed above can be set as follows:

- Manually according to the table above.
- Automatically using a user-defined value list (see below).
- Automatically using a script (this will not be described in any more detail here).

User-defined value list

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

This value list is contained 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 must already be activated on the corresponding drive object, see "Activating the Technology Extension in the drive object" (Page 20).
- The basic positioner (EPOS) must be activated at the drive object.
- The device must be 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 will 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 corresponding drive object.
3. Click on the **Open the user-defined value list** button .
4. Select the "VIBX_BICO_EPOS_list_of_values.xml" file.
5. Press the **Open** and **Accept values** button.

   The BICO interconnections specified in the value list have now been set.
6. Check the BICO interconnections that have been set based on the table above.

4.2.2 BICO interconnections for the "DSC" application mode

In order that VIBX is active in application mode "DSC" (p31580 = 2), it is necessary to disconnect the standard interconnections of the PROFIdrive telegram for DSC.

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.

Table 4-2 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[7][a]	IF1 PROFIdrive PZD receive double word PZD 8+9
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[9][a]	IF1 PROFIdrive PZD receive double word PZD 10+11
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

a. The signal source is dependent on the PROFIdrive telegram with XERR or KPC being used.

The BICO interconnections listed above can be set as follows:

- Manually according to the table above.
- Automatically using a script (this will not be described in any more detail here).

4.3 Determining the frequency f_d (p31585)

Methods on how the dampened natural frequency of the mechanical system can be determined are described in the following.

For natural frequencies, which strongly depend on the system state, then the natural frequencies are determined in both extreme states. Using online frequency change, it is possible to interpolate between the extreme states, see"Online frequency change and dead time symmetrization" (Page 44).

4.3.1 Empirically determine the frequency

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

You should proceed as follows:

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 states.

   For a stacker crane, the effect with different load levels and position of the load suspension device should be checked.
5. Repeat steps 3 to 4 with another frequency, until the frequency with the optimum filter effect has been found.

Note

For several frequency values that have been determined, a value towards the lowest value should be used.

4.3.2 Determine 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 is provided in the following reference:

References: /IH1/ SINAMICS S120 Commissioning Manual
Chapter "Diagnostics using STARTER"

Using the measuring function

The measuring function can be applied and executed according to the following points:

1. Select the "Speed controller loop (excitation after the current setpoint filter)" measuring function
2. Parameterizing 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.
   - Rampup 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). However, it must be ensured that the available travel distance of the axis is sufficient for the offset velocity that has been set. The displayed measuring time should be observed.
   - Bandwidth

     This value should be selected, so that the expected natural frequency can be displayed with a good resolution (e.g. bandwidth < 400 Hz).

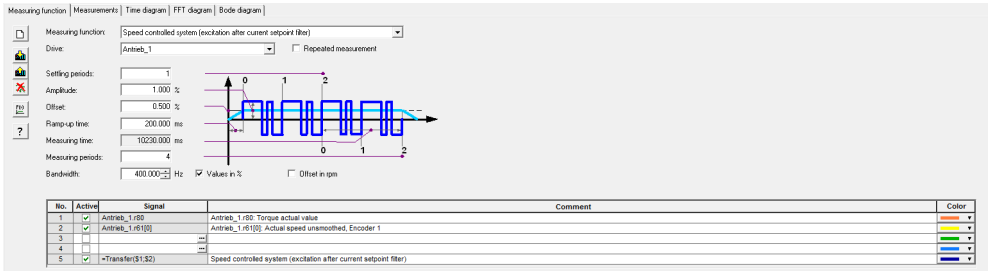


Fig. 4-1 Parameterize the "Speed controller loop (excitation after the current setpoint filter)" measuring function

3. Execute the measuring function
   - Fetch master control
   - 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.

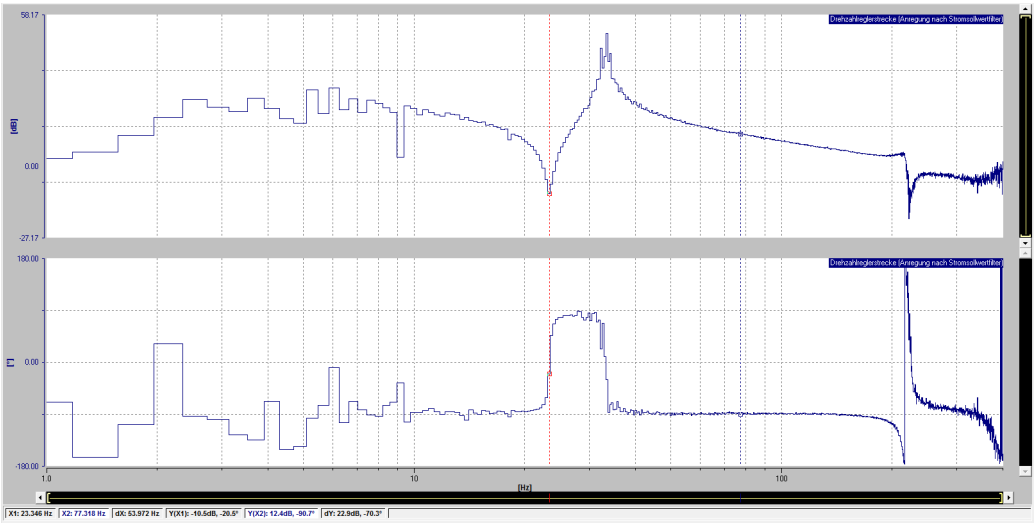


Fig. 4-2 Evaluate the result of the measuring function

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 dampened can be identified by the notch in the absolute value diagram (zero position). A positive phase rotation also occurs at this position.

In the diagram above, this is marked using a colored measuring cursor. The result is shown at the bottom left (e.g. 23.346 Hz).

Note

Coupled axes

This measuring technique only acts on one drive. In order to be able to use this measuring technique for coupled axes, special measures have to be taken. 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

For this measuring technique it may be necessary to adapt the proportional gain Kp (p1460) and the integral time Tn (p1462). Typically, Kp should be reduced and Tn increased.

Objective

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

4.3.3 Determining the frequency in the time domain using traversing motion

With this method, the natural frequency to be dampened 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 vibration at the motor.

Example for application mode "EPOS and LR"

The following parameters are recommended as measuring variables:

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

The following diagram shows a positioning operation to determine the frequency. The following are shown:

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

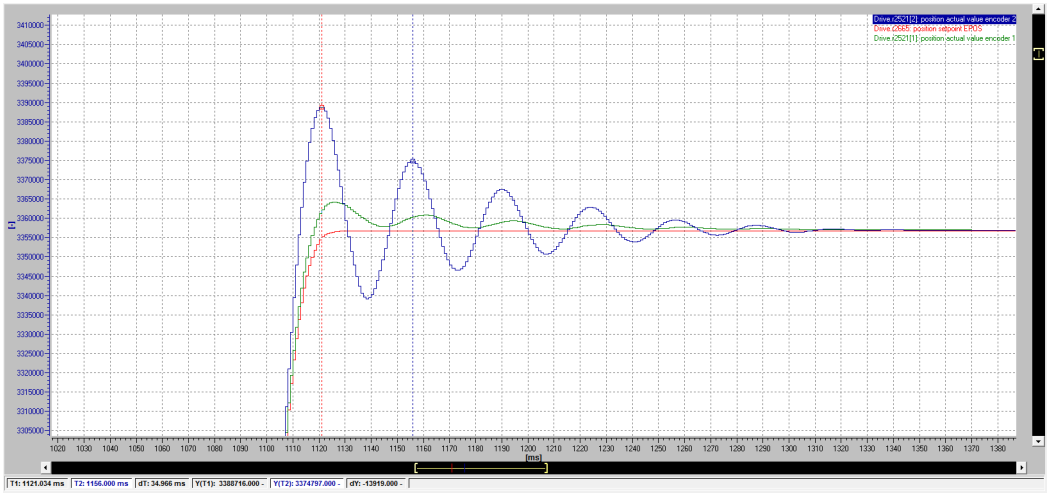


Fig. 4-3 Displaying the positioning operation and determining the frequency

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

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

$$f_d = 1 / \text{time period} = 1 / 0.0350 \text{ s} = 28.6 \text{ Hz}$$

The following diagram shows the effect of VIBX in the example above. The natural frequency is set to f_d = 28.6 Hz as determined in the example. Travel is recorded with the VIBX activated and deactivated. The following are shown:

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

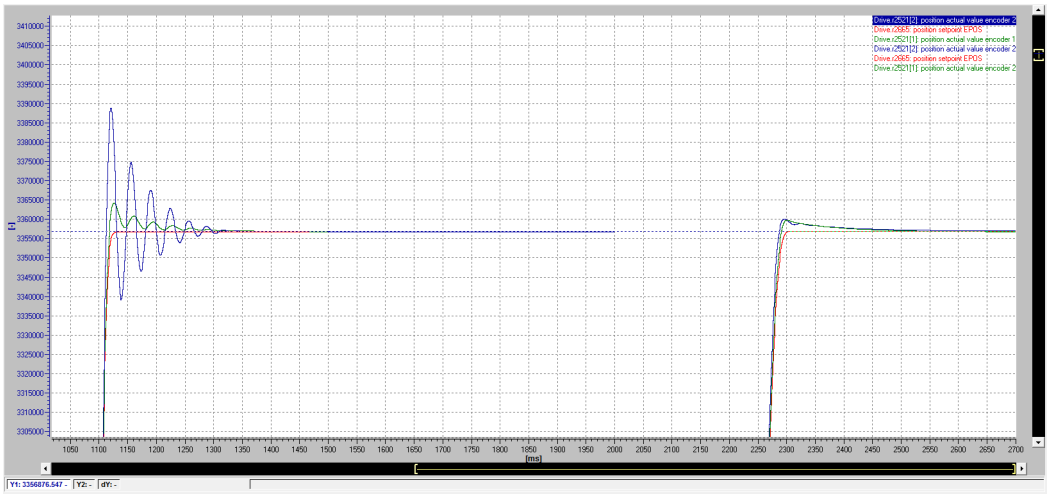


Fig. 4-4 Traversing with VIBX deactivated (left) and activated (right)

Alternatively, the velocity or the current can be used as measurement variables

- Velocity

  Recommended parameters:

  – r2666: EPOS velocity setpoint
  – r0061[0]: Speed actual value unsmoothed, encoder 1
  – r0061[1]: Speed actual value, unsmoothed, encoder 2 (if one is being used)

- Current

  Recommended parameters:

  – 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", see "Example for application mode "EPOS and LR"" (Page 42). The following parameters are recommended as measuring variables:

- 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)

4.4 Online frequency change and dead time symmetrization

Using the online frequency change, frequency f_d of the dampened natural oscillation can be adapted 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

Deadtime symmetrization must be activated to do this. 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. For the dependency of the filter delay time on the filter type and the effective filter frequency, see "Filter types (p31581)" (Page 34).

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].

Note

Filter type "sensitive" (p31581 = 1) is recommended when using the online frequency change. This filter type can be used, because using the online frequency change, the natural frequency can be precisely adapted to the different physical attributes of the system.

When using this filter type, a lower deceleration of the motion sequence is obtained, see "Filter types (p31581)" (Page 34).

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 dampened 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 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.

For an online frequency change for a moving axis, 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).

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.

It must be ensured that the same filter type is set for all of the axes involved (rugged or sensitive). Otherwise, symmetrization is not possible.

Procedure:

1. For interpolating or coupled axes, set frequency f_d of the particular axis (p31585[0, 1]).
2. Determine the minimum frequency f_d of all interpolating axes.
3. Enter this minimum frequency that has been determined for all interpolating or coupled axes in p31614.
4. Activate deadtime symmetrization (p31612 = 1 signal).

4.5 Function diagram

Note

This manual only contains function diagrams for Technology Extension VIBX, see Chapter "Function diagrams" (Page 61).

The product-dependent function diagrams available for SINAMICS (e.g. function diagrams 3635, 4015) are included in the following reference:

References: /LH1/ SINAMICS S120/S150 List Manual
Chapter "Function diagrams"

4.6 Sampling times and the number of controllable drives

The sampling time for Technology Extension "Vibration Extinction" (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.

  – For firmware version < V4.6 the following applies:

    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.

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 is provided in the following reference:

References: /FH1/ SINAMICS S120 Function Manual Drive Functions
Chapter "System sampling times and number of drives that can be controlled"

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

Examples of additional computation (CPU) time utilization

The following table lists the values for the additional computation time utilization:

- For different sampling times (r31587).
- For 1 drive object with activated Technology Extension VIBX.
- For 2 drive objects with activated Technology Extension VIBX.
- For 4 drive objects with activated Technology Extension VIBX.

Table 4-3 VIBX computation time utilization (examples)

Example	VIBX sampling time	Additional computation time utilization (r9976[1])		
	r31587	1 drive object mit VIBX	2 drive objects mit VIBX	4 drive objects mit 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

Generally, the following applies:

- 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).

- 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).

4.7 Licensing

A license key is required for the Technology Extension "Vibration Extinction" (VIBX).

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

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

6SL3077-0AA00-5AB0

Note

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

References: /FH1/ SINAMICS S120 Function Manual Drive Functions
Chapter "Licensing"

4.8 SINAMICS Safety Integrated

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

Note

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

References: /FHS/ SINAMICS S120 Safety Integrated Function Manual

Parameters

5

Content

5.1 Overview of parameters

Note

An overview of the parameters, especially the explanation of the parameter list can be taken from the following reference:

References: /LH1/ SINAMICS S120/S150 List Manual
Chapter "Overview of the parameters"

5.2 List of parameters

Note

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

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

References: /LH1/ SINAMICS S120/S150 List Manual
Chapter "List of parameters"

Product: SINAMICS VIBX, 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	**Dyn. index:** -	**Func. 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: Refer to: 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	**Dyn. index:** -	**Func. 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	**Dyn. index:** -	**Func. 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: Refer to: p31610, p31611, r31613

Refer to: 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	**Dyn. index:** -	**Func. 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	**Dyn. index:** -	**Func. 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	**Dyn. index:** -	**Func. 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: Refer to: 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	**Dyn. index:** -	**Func. 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: Refer to: 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	**Dyn. index:** -	**Func. 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: Refer to: 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	**Dyn. index:** -	**Func. 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: Refer to: r31603

p31595 CI: VIBX input word EPOS / Input_word EPOS

All objects	**Can be changed:** T	**Calculated:** -	**Access level:** 3
	Data type: Unsigned32 / Integer16	**Dyn. index:** -	**Func. 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: Refer to: 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	**Dyn. index:** -	**Func. 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	**Dyn. index:** -	**Func. 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: Refer to: 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	**Dyn. index:** -	**Func. 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: Refer to: 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	**Dyn. index:** -	**Func. 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: Refer to: 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	**Dyn. index:** -	**Func. 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: Refer to: 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	**Dyn. index:** -	**Func. 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: Refer to: p31593

r31605 CO: VIBX filter difference position setpoint / Filt diff s_setp

All objects

Can be changed: -	**Calculated:** -	**Access level:** 4
Data type: Integer32	**Dyn. index:** -	**Func. 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: Refer to: 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	**Dyn. index:** -	**Func. 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).
Refer to: 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	**Dyn. index:** -	**Func. 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: Refer to: 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	**Dyn. index:** -	**Func. 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.
Refer to: 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	**Dyn. index:** -	**Func. 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: Refer to: 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	**Dyn. index:** -	**Func. 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: Refer to: r31615

r31615 CO: VIBX delay time additional sum / t_delay addit sum

All objects	**Can be changed:** -	**Calculated:** -	**Access level:** 4
	Data type: FloatingPoint32	**Dyn. index:** -	**Func. 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: Refer to: p31612, p31614

Function diagrams

6

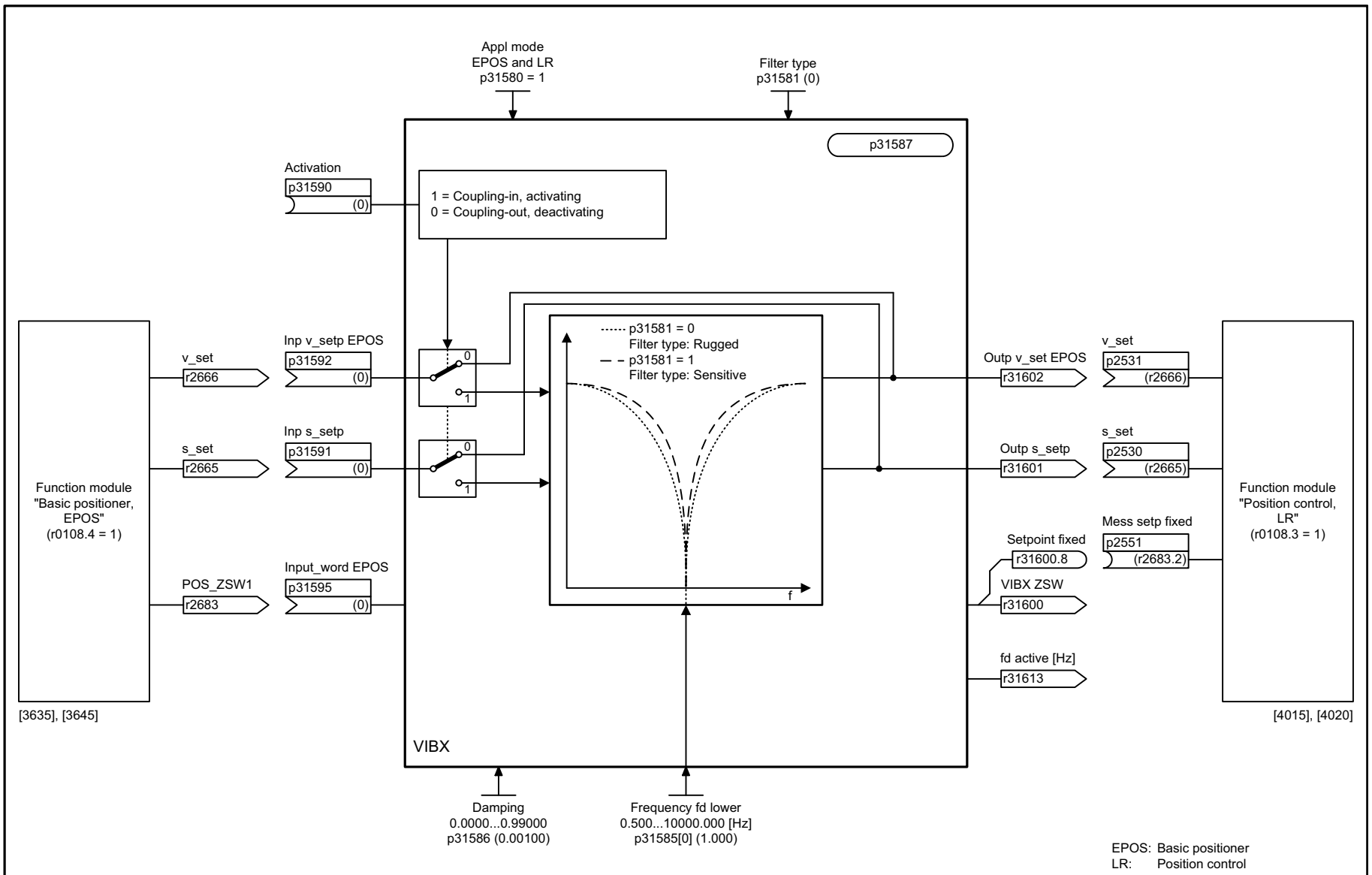
Content

Note

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

The product-dependent function diagrams available for SINAMICS (e.g. function diagrams 3635, 4015) are included in the following reference:

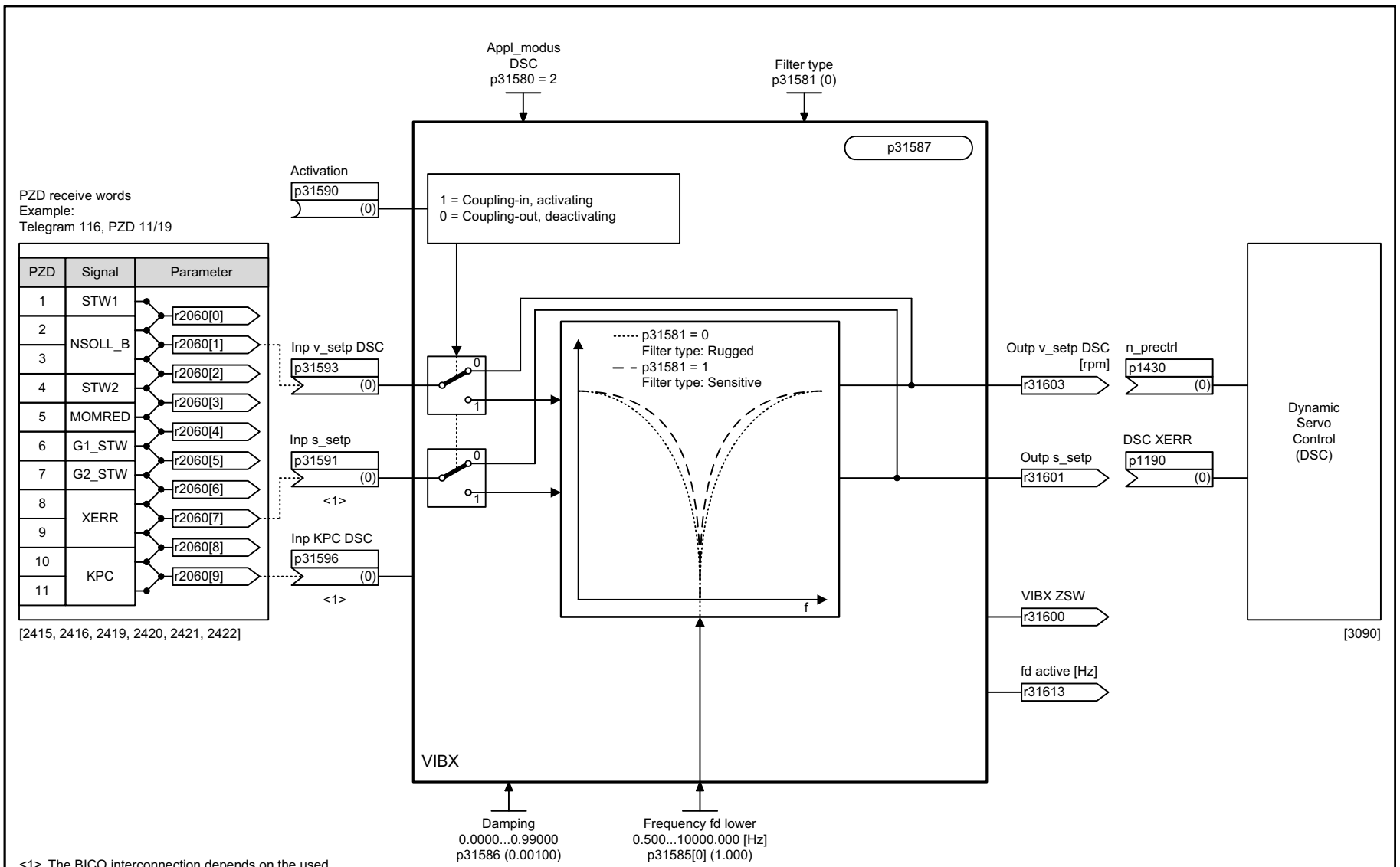
References: /LH1/ SINAMICS S120/S150 List Manual
Chapter "Function diagrams"



1	2	3	4	5	6	7	8
DO: SERVO, VECTOR					fp_7314_95_eng.vsd	Function diagram	- 7314 -
VIBX Vibration Extinction - Application mode "EPOS and LR" (p31580 = 1, p31610 ≡ 0)					24.05.16 V01.03.00	SINAMICS	

Fig. 6-1 7314 – VIBX application mode "EPOS and LR" (p31580 = 1, p31610 ≡ 0)

Fig. 6-2 7315 – VIBX application mode "DSC" (p31580 = 2, p31610 ≡ 0)



<1> The BICO interconnection depends on the used PROFIdrive telegram with XERR or KPC.

1	2	3	4	5	6	7	8
DO: SERVO					fp_7315_95_eng.vsd	Function diagram	- 7315 -
VIBX Vibration Extinction - Application mode "DSC" (p31580 = 2, p31610 ≡ 0)					24.05.16 V01.03.00	SINAMICS	

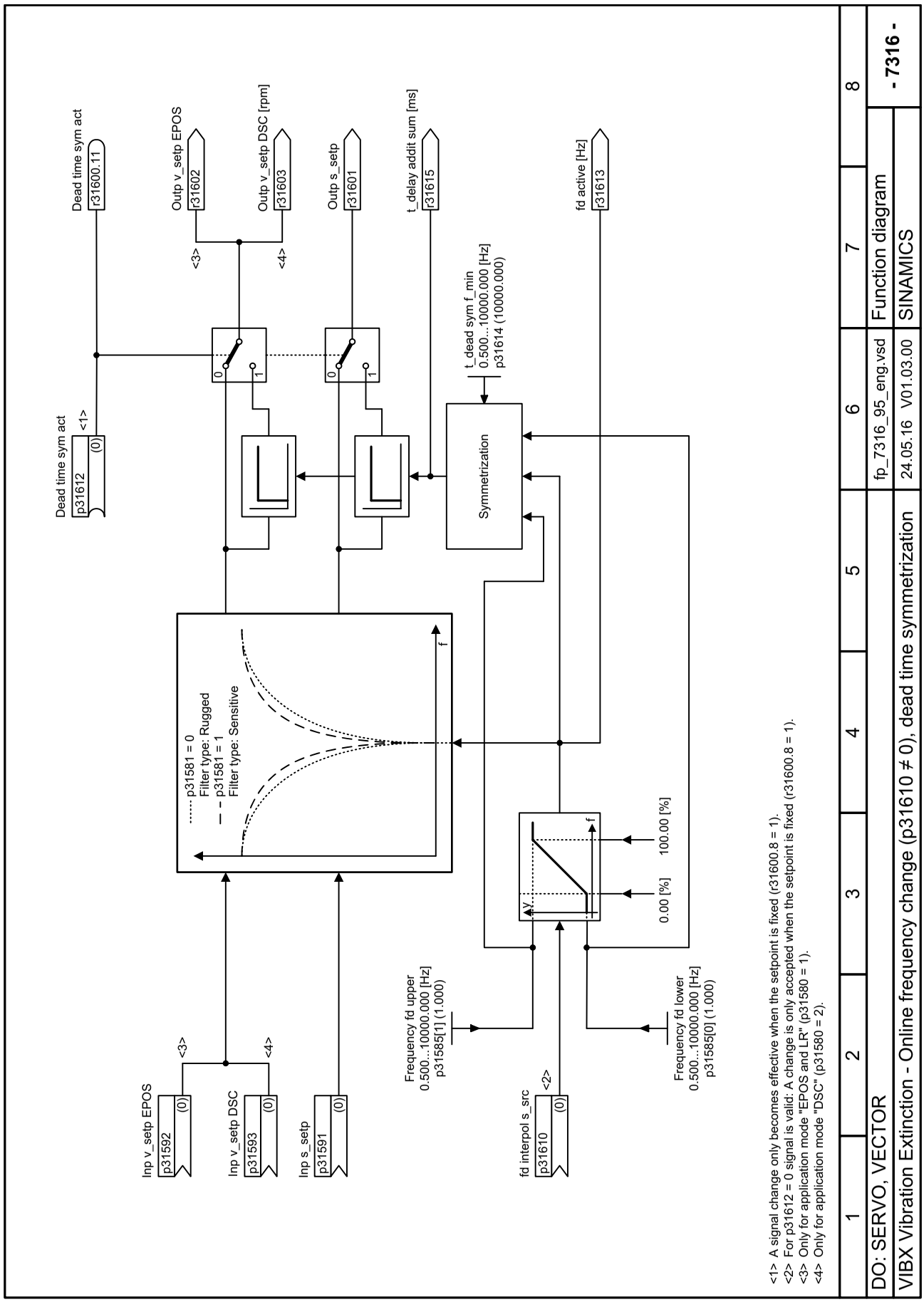


Fig. 6-3 7316 – VIBX online frequency change (p31610 ≠ 0), deadtime symmetrization

Faults and alarms

7

Content

7.1 Overview of faults and alarms

Note

An overview of the faults and alarms, especially the explanation of the faults and alarms list can be taken from the following reference:

References: /LH1/ SINAMICS S120/S150 List Manual
Chapter "Overview of faults and alarms"

7.2 List of faults and alarms

Note

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

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

References: /LH1/ SINAMICS S120/S150 List Manual
Chapter "List of faults and alarms"

Product: SINAMICS VIBX, Version: 1301000, Language: eng
Objects: SERVO, VECTOR

F53430 VIBX EPOS not activated

Message value: -
Drive object: All objects
Component: None **Propagation:** GLOBAL
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
Component: None **Propagation:** GLOBAL
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
Component: None **Propagation:** GLOBAL
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
Component: None **Propagation:** GLOBAL
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

List of abbreviations

A

Note

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

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

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

Abbreviation	Source of abbreviation	Significance
DSC	Dynamic Servo Control	Dynamic Servo Control
DTC	Digital Time Clock	Timer
E		
EASC	External Armature Short-Circuit	External armature short-circuit
EDS	Encoder Data Set	Encoder data set
EEPROM	Electrically Erasable Programmable Read-Only Memory	Electrically Erasable Programmable Read-Only-Memory
EGB	Elektrostatisch gefährdete Baugruppen	Electrostatic sensitive devices
ELCB	Earth Leakage Circuit-Breaker	Residual current operated circuit breaker
ELP	Earth Leakage Protection	Ground-fault monitoring
EMC	Electromagnetic Compatibility	Electromagnetic compatibility
EMF	Electromotive Force	Electromotive force
EMK	Elektromotorische Kraft	Electromotive force
EMV	Elektromagnetische Verträglichkeit	Electromagnetic compatibility
EN	Europäische Norm	European Standard
EnDat	Encoder-Data-Interface	Encoder interface
EP	Enable Pulses	Pulse enable
EPOS	Einfachpositionierer	Basic positioner
ES	Engineering System	Engineering system
ESB	Ersatzschaltbild	Equivalent circuit diagram
ESD	Electrostatically Sensitive Devices	Electrostatic sensitive devices
ESM	Essential Service Mode	Essential service mode
ESR	Extended Stop and Retract	Extended stop and retract
F		
F…	Fault	Fault
FAQ	Frequently Asked Questions	Frequently Asked Questions
FBLOCKS	Free Blocks	Free function blocks
FCC	Function control chart	Function control chart
FCC	Flux Current Control	Flux current control
FD	Function Diagram	Function diagram
F-DI	Fail-safe Digital Input	Failsafe digital input
F-DO	Fail-safe Digital Output	Fail-safe digital output
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
FW	Firmware	Firmware
G		
GB	Gigabyte	Gigabyte
GC	Global Control	Global control telegram (broadcast telegram)

Abbreviation	Source of abbreviation	Significance
GND	Ground	Reference potential for all signal and operating voltages, usually defined as 0 V (also referred to as M)
GSD	Gerätestammdatei	Generic Station Description: Describes the features of a PROFIBUS slave
GSV	Gate Supply Voltage	Gate supply voltage
GUID	Globally Unique Identifier	Globally Unique Identifier
H		
HF	High Frequency	High frequency
HFD	Hochfrequenzdrossel	Radio frequency reactor
HLA	Hydraulic Linear Actuator	Hydraulic linear actuator
HLG	Hochlaufgeber	Ramp-function Generator
HM	Hydraulic Module	Hydraulic Module
HMI	Human Machine Interface	Human Machine Interface
HTL	High-Threshold Logic	Logic with high interference threshold
HW	Hardware	Hardware
I		
i. V.	In Vorbereitung	Under development: This property is currently not available
I/O	Input/Output	Input/output
I2C	Inter-Integrated Circuit	Internal serial data bus
IASC	Internal Armature Short-Circuit	Internal armature short-circuit
IBN	Inbetriebnahme	Startup
ID	Identifier	Identification
IE	Industrial Ethernet	Industrial Ethernet
IEC	International Electrotechnical Commission	International Electrotechnical Commission
IF	Interface	Interface
IGBT	Insulated Gate Bipolar Transistor	Insulated gate bipolar transistor
IGCT	Integrated Gate-Controlled Thyristor	Semiconductor power switch with integrated control electrode
IL	Impulslöschung	Pulse suppression
IP	Internet Protocol	Internet protocol
IPO	Interpolator	Interpolator
IT	Isolé Terre	Non-grounded three-phase line supply
IVP	Internal Voltage Protection	Internal voltage protection
J		
JOG	Jogging	Jogging
K		
KDV	Kreuzweiser Datenvergleich	Data cross-check
KHP	Know-How Protection	Know-how protection
KIP	Kinetische Pufferung	Kinetic buffering
Kp	-	Proportional gain
KTY84	-	Temperature sensor

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

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

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

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

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

Index

Siemens AG
Industry Sector
Drive Technologies
Motion Control Systems
P.O. Box 3180
91050 ERLANGEN
GERMANY

www.siemens.com/motioncontrol