EtherCAT®

TwinCAT 3 – Function blocks for 6th generation drive controllers
Manual

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STÖBER

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1 Foreword

STOBER function blocks are small, functional software units that support you during commissioning of your drive controllers and in case of service. You can reuse them in TwinCAT 3 in different projects.

The available function blocks can be found in packed form at http://www.stoeber.de/en/downloads/.
Enter `TwinCAT 3 blocks` into the search field.

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2 User information

To make efficient use of the function blocks provided by STOBER, you should be familiar with the EtherCAT network technology and the associated Beckhoff automation systems, particularly programming with TwinCAT 3 as well as creating and editing the hardware configuration.

2.1 Timeliness

Check whether this document is the latest version of the documentation. We make the latest document versions for our products available for download on our website:
http://www.stoeber.de/en/downloads/.

2.2 Original language

The original language of this documentation is German; all other language versions are derived from the original language.

2.3 Described product

This documentation is binding for:

6th generation STOBER drive controllers.

2.4 Applicable documentation

This documentation supplements the EtherCAT for SD6 or EtherCAT for SC6 and SI6 manuals as well as the related manual for the CiA 402 application. You may use the documentation at hand only in combination with the listed manuals (see Further information [▶ 51]).

2.5 Legal disclaimer

The library provided in the STOBER download center and the function blocks it contains for TwinCAT 3 are a free service.

STOBER assumes no liability for their content, function and applicability in a real-world machine or application.

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2.6 Markup of text elements

Certain elements of the continuous text are distinguished as follows.

Important information	Words or expressions with a special meaning
Interpolated position mode	Optional: File or product name or other name
Detailed information	Internal cross-reference
http://www.samplelink.com	External cross-reference

Software and other displays

The following formatting is used to identify the various information content of elements referenced by the software interface or a drive controller display, as well as any user entries.

Main menu Settings	Window names, dialog box names, page names or buttons, combined proper nouns, functions referenced by the interface
Select `Referencing method A`	Predefined entry
Save your `<own IP address>`	User-defined entry
EVENT 52: COMMUNICATION	Displays (status, messages, warnings, faults)

Keyboard shortcuts and command sequences or paths are represented as follows.

[Ctrl], [Ctrl] + [S]	Key, key combination
Table > Insert table	Navigation to menus/submenus (path specification)

2.7 Trademarks

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EtherCAT®, Safety over EtherCAT®	EtherCAT® and Safety over EtherCAT® are registered trademarks and patented technologies, licensed by Beckhoff Automation GmbH, Germany.
TwinCAT®	TwinCAT® is a registered and licensed trademark of Beckhoff Automation GmbH, Germany.
Windows®, Windows® 7, Windows® 10, Windows® 11	Windows®, the Windows® logo, Windows® XP, Windows® 7, Windows® 10, and Windows® 11 are registered trademarks of Microsoft Corporation in the United States and/or other countries.

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Products that are registered as trademarks are not specially indicated in this documentation. Existing property rights (patents, trademarks, protection of utility models) are to be observed.

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3 Safety notes

⚠ WARNING!

Risk of fatal injury if safety notes and residual risks are not observed!

Failure to observe the safety notes and residual risks in the drive controller documentation may result in accidents causing serious injury or death.

- Observe the safety notes in the drive controller documentation.
- Consider the residual risks in the risk assessment for the machine or system.

⚠ WARNING!

Malfunction of the machine due to incorrect or modified parameterization!

In the event of incorrect or modified parameterization, malfunctions can occur on machines or systems which can lead to serious injuries or death.

- Observe the security notes in the drive controller documentation.
- Protect the parameterization, e.g. from unauthorized access.
- Take appropriate measures for possible malfunctions (e.g. emergency off or emergency stop).

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4 Installing a library and adding to a project

If you would like to use STOBER function blocks, you must install them in TwinCAT 3 as a library and add them to your project.

Installing a library

1. Navigate to your PLC project > References in the solution explorer.
2. Click on Add library in the main window.
   ⇨ The Add library window opens.
3. Click on Advanced....
   ⇨ Another Add library window opens.
4. Click on Library Repository….
5. The Library Repository window opens.
6. Click on Install..., navigate to the library to be installed and click on Open.

⇨ The selected library is installed in the library repository.

Adding a library to a project

1. Navigate to your PLC project > References in the solution explorer.
2. Click on Add library in the main window.
   ⇨ The Add library window opens.
3. Under Application > STÖBER Antriebstechnik GmbH + Co. KG, select the library that you would like to add and confirm with OK.

⇨ The library is added to your PLC project under References in the solution explorer.

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5 Linking an NC axis and PLC project

If it is necessary to transfer an NC axis to the function block, you must create a link between the NC axis and PLC project. Please refer to the description of the respective function block to find out whether a link is required.

Creating the variable

Define a variable of type AXIS_REF in your PLC project.

Linking the variable and NC axis

✓ You have activated Config mode.

1. In the solution explorer, navigate to Motion > NC-Task 1 SAF > Axes > Axis1.
2. In the main window, switch to the Settings tab.
3. Select Link To PLC ....
   ⇨ The Select Axis PLC Reference ('Axis 1') window opens.
4. Select the variable of type AXIS_REF previously created in the PLC project from the list and confirm with OK.

⇨ The variable and NC axis are linked.

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6 Function blocks

The following table provides an overview of the available function blocks.

Function block	Description	Software version	Library version
STOBER_BoxName [▶ 11]	Write the name of the EtherCAT SubDevice to parameter A251 of the drive controller	V 3.1.4022.22 and later	V 3.1.0.0 and later
STOBER_Backup_Restore_Initiator [▶ 12]	Determine possible services for the STOBER_Backup_Restore function block	V 3.1.4024.40 and later	V 3.1.2.0 and later
STOBER_Backup_Restore [▶ 14]	Load project configurations from TwinCAT 3 into the drive controllers	V 3.1.4022.22 and later	V 3.1.1.0 and later
STOBER_MC_HOME [▶ 20]	Control drive controller-guided referencing of the CiA 402 and CiA 402 HiRes Motion applications (with transfer of an NC axis)	V 3.1.4022.22 and later	V 3.1.0.0 and later
STOBER_MC_HOME_REF [▶ 23]	Control drive controller-guided referencing of the CiA 402 and CiA 402 HiRes Motion applications (with transfer of reference position, referencing method and an NC axis)	V 3.1.4024.40 and later	V 3.1.2.0 and later
STOBER_Action [▶ 26]	Execute actions on the drive controller	V 3.1.4024.40 and later	V 3.1.2.0 and later
STOBER_Power_Action [▶ 28]	Execute actions on the drive controller after enabling the drive controller (with transfer of an NC axis)	V 3.1.4024.40 and later	V 3.1.2.0 and later
STOBER_Phase_Test [▶ 31]	Execute phase test action on the drive controller (with transfer of an NC axis)	V 3.1.4024.40 and later	V 3.1.2.0 and later
STOBER_PRM_LoadMatrix [▶ 34]	Read out the load matrix from the drive controller (R118) and write it to an array (with transfer of an NC axis)	V 3.1.4024.40 and later	V 3.1.2.0 and later
STOBER_PRM_LoadMatrix_AMS [▶ 36]	Read out the load matrix from the drive controller (R118) and write it to an array	V 3.1.4024.40 and later	V 3.1.2.0 and later
STOBER_PRM_LoadMatrix_File [▶ 38]	Read out the load matrix from the drive controller (R118) and save it as a file in a directory (with transfer of an NC axis)	V 3.1.4024.40 and later	V 3.1.2.0 and later
STOBER_PRM_LoadMatrix_File_AMS [▶ 41]	Read out the load matrix from the drive controller (R118) and save it as a file in a directory	V 3.1.4024.40 and later	V 3.1.2.3 and later
STOBER_SDO_Info [▶ 44]	Determine whether the SDO Info service is active in the drive controller	V 3.1.4024.40 and later	V 3.1.2.0 and later

Tab. 1: Function blocks for TwinCAT 3

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6.1 STOBER_BoxName

By executing the STOBER_BoxName function block in your TwinCAT project, the name of the EtherCAT SubDevice assigned in TwinCAT 3 is automatically written to parameter A251 of the drive controller. This process is carried out for all STOBER drive controllers in the project by executing the function block once. This makes the assignment to the drive controllers configured in TwinCAT 3 easier for you when configuring the drive controllers in DriveControlSuite. The name is transmitted to the EtherCAT SubDevice via SDO data exchange.

Prerequisites

- TwinCAT 3 version 3.1.4022.22 and later
- STOBER_G6_Util library version 3.1.0.0 and later

Information

When using the function block, be aware that the hardware actually used must match the topology configured in TwinCAT 3 during commissioning. If the hardware and network topology in TwinCAT 3 do not match, this causes the function block to malfunction.

Parameters

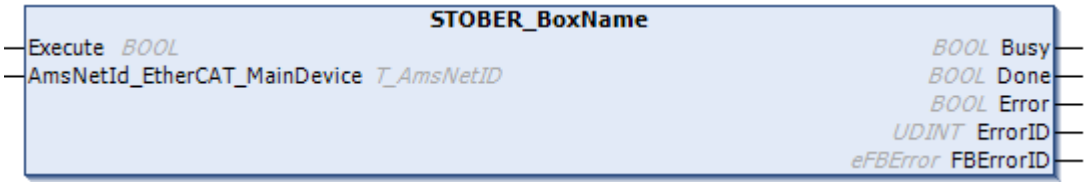

Fig. 1: STOBER_BoxName function block: Input and output parameters

Parameters	Data type	Declaration	Description
Execute	BOOL	IN	Activating the function block with rising edge
AmsNetId_EtherCAT_MainDevice	T_AmsNetID	IN	AMS NetID of the EtherCAT MainDevice
Busy	BOOL	OUT	State of the function block (Busy = True: writing not yet finished)
Done	BOOL	OUT	State of the function block (Done = True: writing successfully completed)
Error	BOOL	OUT	State of the function block (ERROR = True: writing faulty)
ErrorID	UDINT	OUT	Beckhoff-specific ADS error code of the function blocks used internally
FBErrorID	eFBError	OUT	Block-specific error code (see eFBError (ENUM) [▶ 48])

Tab. 2: STOBER_BoxName function block: Parameter

For information on the data types, refer to the TwinCAT 3 documentation at https://infosys.beckhoff.com/content/1033/tc3_plc_intro/2529388939.html.

6.1.1 Example code

The following example is for implementation in Structured Text (ST).

```
PROGRAM MAIN
VAR
	fbBoxname:STOBER_BoxName;
	bExecuteBox: BOOL;
	bError: BOOL;
	bBusy: BOOL;
	bDone: BOOL;
	uiErrorID: UDINT;
	uiFbErrorID: eFBError;
END_VAR

fbBoxname(
	AmsNetId_EtherCAT_MainDevice:='172.18.132.104.2.1',
	Execute:=bExecuteBox,
	Error=>bError,
	Busy=>bBusy,
	Done=>bDone,
	ErrorID=>uiErrorID,
	FBErrorID=>uiFbErrorID);
```

6.2 STOBER_Backup_Restore_Initiator

The STOBER_Backup_Restore_Initiator function block can be used to determine possible services for the STOBER_Backup_Restore function block. The function block checks whether a backup can be performed or whether a restore is required. You can use the iAction output of the function block to determine the service for the service type input of the STOBER_Backup_Restore function block.

Prerequisites

- TwinCAT 3 version 3.1.4024.40 and later
- STOBER_G6_Util library version 3.1.2.0 and later
- Target platform: PC or CX with Windows Embedded Standard (WES) 7, Windows 7 or Windows 10 operating system
- Engineering PC with TwinCAT 3 engineering environment (XAE) and external EtherCAT controller with TwinCAT 3 runtime environment (XAR)

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Parameters

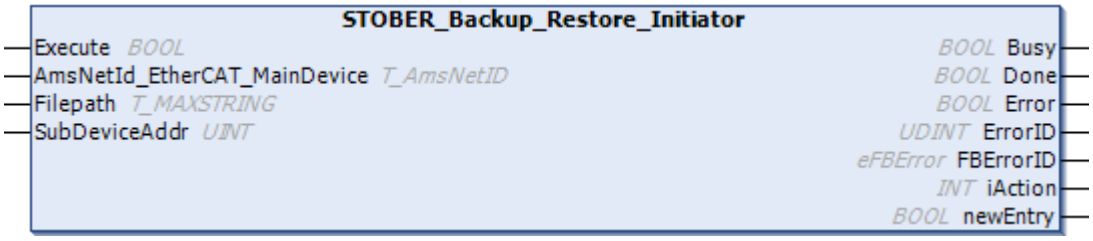

Fig. 2: STOBER_Backup_Restore_Initiator function block: Input and output parameters

Parameters	Data type	Declaration	Description
Execute	BOOL	IN	Activating the function block with rising edge
AmsNetId_EtherCAT_MainDevice	T_AmsNetID	IN	AMS NetID of the EtherCAT MainDevice
File path	T_MAXSTRING	IN	File path to the directory of the project file (*.ds6) on the EtherCAT controller
SubDeviceAddr	UINT	IN	Address of the EtherCAT SubDevice
Busy	BOOL	OUT	State of the function block (Busy = True: service not yet finished)
Done	BOOL	OUT	State of the function block (Done = True: service successfully completed)
Error	BOOL	OUT	State of the function block (Error = True: service faulty)
ErrorID	UDINT	OUT	Beckhoff-specific ADS error code of the function blocks used internally
FBErrorID	eFBError	OUT	Block-specific error code (see eFBError (ENUM) [▶ 48])
iAction	INT	OUT	Action that can be requested by the STOBER_Backup_Restore function block: ▪ iAction = 0 (backup, backup with reverse documentation or restore) ▪ iAction = 2 (Restore)
newEntry	BOOL	OUT	Information on the DeviceInfo.txt: ▪ newEntry = True: drive controller was added to DeviceInfo.txt or DeviceInfo.txt was newly created ▪ newEntry = False: DeviceInfo.txt already contains the drive controller

Tab. 3: STOBER_Backup_Restore_Initiator function block: Parameters

For information on the data types, refer to the TwinCAT 3 documentation at https://infosys.beckhoff.com/content/1033/tc3_plc_intro/2529388939.html.

6.2.1 Example code

The following example is for implementation in Structured Text (ST).

```
PROGRAM MAIN
VAR
	fbBackup_Init:STOBER_Backup_Restore_Initiator;
	bExecute: BOOL;
	bError: BOOL;
	bBusy: BOOL;
	bDone: BOOL;
	ErrorIDADS: UDINT;
	FbErrorID: STOBER_G6_Util.eFBERROR;
	iAction: INT;
END_VAR

fbBackup_Init(
	AmsNetId_EtherCAT_MainDevice:='192.168.12.50.3.1',
	Execute:=bExecute,
	Filepath:='C:\Transfer\ExampleProject\DS6-Projects',
	SubDeviceAddr:=1004,
	Error=>bError,
	Busy=>bBusy,
	Done=>bDone,
	ErrorID=>ErrorIDADS,
	FBErrorID=>FbErrorID,
	iAction=>iAction);
```

6.3 STOBER_Backup_Restore

The STOBER_Backup_Restore function block enables selected DriveControlSuite configurations to be sent from the EtherCAT controller to the drive controller via TwinCAT 3 or to be read out from the drive controller. For the correct assignment of the drive controllers configured in DriveControlSuite to the configured EtherCAT SubDevices in TwinCAT 3, you also need the STOBER_BoxName function block.

To determine which services are possible, first execute the STOBER_Backup_Restore_Initiator function block.

The STOBER_Backup_Restore function block accesses the script mode of the DriveControlSuite. A back up or restore of the configuration in the drive controller is executed as soon as DriveControlSuite is started and an online connection is established.

Information

The function block executes the Save values action (A00).

Prerequisites

- TwinCAT 3 version 3.1.4024.40 and later
- STOBER_G6_Util library version 3.1.2.0 and later
- Target platform: PC or CX with Windows Embedded Standard (WES) 7, Windows 7 or Windows 10 operating system
- Engineering PC with TwinCAT 3 engineering environment (XAE) and external EtherCAT controller with TwinCAT 3 runtime environment (XAR)
- DriveControlSuite from version 6.5-K and later, installed on the EtherCAT controller

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Parameters

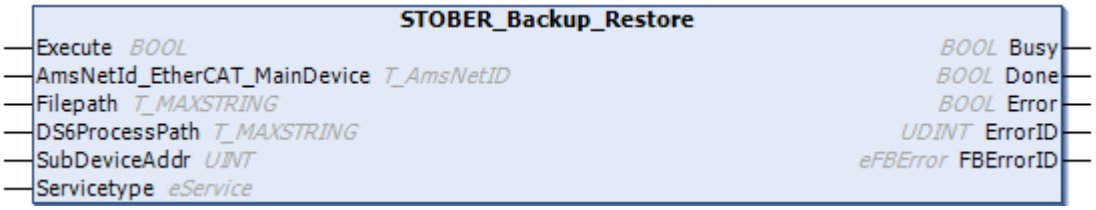

Fig. 3: STOBER_Backup_Restore function block: Input and output parameters

Parameters	Data type	Declaration	Description
Execute	BOOL	IN	Activating the function block with rising edge
AmsNetId_EtherCAT_MainDevice	T_AmsNetID	IN	AMS NetID of the EtherCAT MainDevice
File path	T_MAXSTRING	IN	File path to the directory of the project file (*.ds6) on the EtherCAT controller
DS6ProcessPath	T_MAXSTRING	IN	File path to DriveControlSuite (*.exe) on the EtherCAT controller, e.g.: C:\Program Files (x86)\STOBER\DriveControlSuite (6.X-X)\bin
SubDeviceAddr	UINT	IN	Address of the EtherCAT SubDevice
Service type	eService	IN	Requested Service: ▪ Backup ▪ Backup_RevDocu (backup with reverse documentation) ▪ Restore
Busy	BOOL	OUT	State of the function block (Busy = True: service not yet finished)
Done	BOOL	OUT	State of the function block (Done = True: service successfully completed)
Error	BOOL	OUT	State of the function block (Error = True: service faulty)
ErrorID	UDINT	OUT	Beckhoff-specific ADS error code of the function blocks used internally
FBErrorID	eFBError	OUT	Block-specific error code (see eFBError (ENUM) [▶ 48])

Tab. 4: STOBER_Backup_Restore function block: Parameters

For information on the data types, refer to the TwinCAT 3 documentation at https://infosys.beckhoff.com/content/1033/tc3_plc_intro/2529388939.html.

Services

Service type	Description
Backup	The project is read out from the drive controller and stored in the directory on the EtherCAT controller.
Backup_RevDocu	The project is read out from the drive controller with reverse documentation and stored in the directory on the EtherCAT controller.
Restore	The project in the directory on the EtherCAT controller is transmitted to the drive controller and saved there.

Tab. 5: STOBER_Backup_Restore function block: Service type

Information

If a backup service is run and a project already exists in the directory on the EtherCAT controller, it is moved to the SaveOriginals subdirectory and provided with the date and time. The subdirectory is created automatically when a backup service is run for the first time.

6.3.1 Using a function block

Configure all drive controllers, enter the PLC device names, and save your DS6 project on the EtherCAT controller. Then execute the STOBER_BoxName and STOBER_Backup_Restore function blocks.

Information

For each drive controller in your EtherCAT network, you need one instance of the STOBER_Backup_Restore function block.

DS6-Create project and save project configuration on the drive controllers

1. Create a new project directory on your EtherCAT controller.
2. Start the DriveControlSuite on the EtherCAT controller.
3. Create a project and configure all drive controllers in your EtherCAT network.
4. Transmit the project to the drive controllers and save it to their non-volatile memory.

Information

Alternatively you can create a separate DS6 project for each drive controller in your EtherCAT network.

Entering a PLC device name and saving the DS6 project to the EtherCAT controller

1. Switch to TwinCAT XAE and navigate to an EtherCAT SubDevice in the solution explorer.
2. Double-click on the EtherCAT SubDevice to open it.
3. Main window > General tab > Name field:
   Copy the name of the EtherCAT SubDevice to the clipboard.
4. Switch to DriveControlSuite on your EtherCAT controller.
5. Select the corresponding drive controller in the project tree and click the desired projected axis in the Project menu > Parameter list area.
6. Group A > Parameter A251 PLC-Devicename:
   Paste the copied name from the clipboard.
7. Repeat the steps for all other drive controllers in your project.
8. Save the project to the directory previously created on the EtherCAT controller.
9. Close the DriveControlSuite on the EtherCAT controller.

Information

Do not save the project until you have connected to the drive controllers online. Make sure that the production number of the corresponding drive controller has been entered in parameter E52[2] when establishing the connection.

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Executing a function block

Information

When the STOBER_Backup_Restore function block is used for the first time, the Restore service is executed to transfer the project to the drive controllers.

To determine which services are possible, first execute the STOBER_Backup_Restore_Initiator function block.

If the wrong service is requested, the FBErrorID output of the STOBER_Backup_Restore function block issues the 109: WRONG_SERVICE_TYPE_INPUT error.

✓ The file path to the directory of the project file (*.ds6) on the EtherCAT controller is specified at the Filepath input of the STOBER_Backup_Restore function block.

✓ The file path to DriveControlSuite (*.exe) on the EtherCAT controller is specified at the DS6ProcessPath input of the STOBER_Backup_Restore function block.

1. Switch to TwinCAT XAE.
2. Make sure that all drive controllers in your EtherCAT network are in the Operational state.
3. Run the STOBER_BoxName function block.
   ⇨ If the function block has written the names of all EtherCAT SubDevices to the drive controllers, the Done output is set to True.
4. Then call up the instances of the STOBER_Backup_Restore function block for each drive controller one after the other.

⇨ After the service has been successfully completed, the Done output is set to True.

⇨ The data is stored in non-volatile memory in the drive controller.

6.3.2 Example code

The following sample project is for implementation in Structured Text (ST). It shows the serial execution of the STOBER_Backup_Restore function block for an EtherCAT network with two drive controllers.

```
PROGRAM MAIN
VAR
	fbBoxname:STOBER_BoxName;
	fbBackup_Init1,fbBackup_Init2:STOBER_Backup_Restore_Initiator;
	fbBackup1,fbBackup2:STOBER_Backup_Restore;
	bExecuteBox: BOOL;
	bExecute_BR_init: ARRAY [0..1] OF BOOL;
	done_init: ARRAY [0..1] OF BOOL;
	busy_init: ARRAY [0..1] OF BOOL;
	Error_init: ARRAY [0..1] OF BOOL;
	BR_Init_ErrorIDADS: ARRAY [0..1] OF UDINT;
	BR_Init_FbErrorID: ARRAY [0..1] OF STOBER_G6_Util.eFBERROR;
	bExecute_BR: ARRAY [0..1] OF BOOL;
	done: ARRAY [0..1] OF BOOL;
	busy: ARRAY [0..1] OF BOOL;
	Error: ARRAY [0..1] OF BOOL;
	errorIDADS: ARRAY [0..1] OF UDINT;
	FBErrorID: ARRAY [0..1] OF STOBER_G6_Util.eFBERROR;
	iAction: ARRAY [0..1] OF INT;
	bError: BOOL;
	bBusy: BOOL;
	bDone: BOOL;
	uiErrorID: UDINT;
	uiFbErrorID: STOBER_G6_Util.eFBError;
	service: ARRAY [0..1] OF STOBER_G6_Util.eService;
END_VAR

fbBoxname(
	AmsNetId_EtherCAT_MainDevice:='192.168.12.50.3.1',
	Execute:=bExecuteBox,
	Error=>bError,
	Busy=>bBusy,
	Done=>bDone,
	ErrorID=>uiErrorID,
	FBErrorID=>uiFbErrorID);
fbBackup_Init1(
	Execute:=bExecute_BR_init[0],
	AmsNetId_EtherCAT_MainDevice:='192.168.12.50.3.1',
	Filepath:='C:\Transfer\ExampleProject\DS6-Projects',
	SubDeviceAddr:=1004,
	Done=>done_init[0],
	Busy=>busy_init[0],
	Error=>Error_init[0],
	ErrorID=>BR_Init_ErrorIDADS[0],
	FBErrorID=>BR_Init_FbErrorID [0],
	iAction=>iAction[0]);
```

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```
IF iAction[0] = 0 THEN
	service[0]:=STOBER_G6_Util.eService.Backup;
ELSE
	service[0]:=STOBER_G6_Util.eService.RESTORE;
END_IF
fbBackup1(
	Execute:=bExecute_BR[0] AND done_init[0],
	AmsNetId_EtherCAT_MainDevice:='192.168.12.50.3.1',
	Filepath:='C:\Transfer\ExampleProject\DS6-Projects',
	DS6ProcessPath:='C:\DS6\DriveControlSuite_Nightly\bin',
	SubDeviceAddr:=1004,
	Servicetype:=service[0],
	Done=>done[0],
	Busy=>busy[0],
	Error=>Error[0],
	ErrorID=>errorIDADS[0],
	FBErrorID=>FbErrorID[0]);
fbBackup_Init2(
	Execute:=bExecute_BR_init[1] AND done[0],
	AmsNetId_EtherCAT_MainDevice:='192.168.12.50.3.1',
	Filepath:='C:\Transfer\ExampleProject\DS6-Projects',
	SubDeviceAddr:=1005,
	Done=>done_init[1],
	Busy=>busy_init[1],
	Error=>Error_init[1],
	ErrorID=>BR_Init_ErrorIDADS[1],
	FBErrorID=>BR_Init_FbErrorID [1],
	iAction=>iAction[1]);
IF iAction[1] = 0 THEN
	service[1]:=STOBER_G6_Util.eService.Backup;
ELSE
	service[1]:=STOBER_G6_Util.eService.RESTORE;
END_IF
fbBackup2(
	Execute:=bExecute_BR[1] AND done_init[1],
	AmsNetId_EtherCAT_MainDevice:='192.168.12.50.3.1',
	Filepath:='C:\Transfer\ExampleProject\DS6-Projects',
	DS6ProcessPath:='C:\DS6\DriveControlSuite_Nightly\bin',
	SubDeviceAddr:=1005,
	Servicetype:=service[1],
	Done=>done[1],
	Busy=>busy[1],
	Error=>Error[1],
	ErrorID=>errorIDADS[1],
	FBErrorID=>FbErrorID[1]);
```

6.4 STOBER_MC_HOME

The function block controls the drive controller-guided referencing of the CiA 402 and CiA 402 HiRes Motion applications. The current operating mode is read out when the function block is executed. The referencing method for referencing, which is defined in parameter A586 for the drive controller, is then activated. After successful referencing, the previously read operating mode is reactivated.

Prerequisites

- TwinCAT 3 version 3.1.4024.40 and later
- STOBER_G6_Util library version 3.1.2.0 and later
- Tc2_MC2 library from Beckhoff

Information

As the transfer of an NC axis to the function block is required, you must create a link between the NC axis and PLC project (see Linking an NC axis and PLC project [▶ 9]).

Parameters

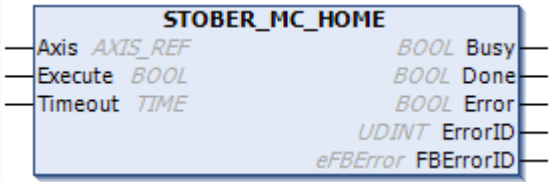

Fig. 4: STOBER_MC_HOME function block: Input and output parameters

Parameters	Data type	Declaration	Description
Axis	AXIS_REF	IN/OUT	Axis data structure
Execute	BOOL	IN	Activating the function block with rising edge
Timeout	TIME	IN	Specified time period after which an error message is triggered if referencing is not successful
Busy	BOOL	OUT	State of the function block (Busy = True: referencing still not finished)
Done	BOOL	OUT	State of the function block (Done = True: referencing completed)
Error	BOOL	OUT	State of the function block (Error = True: referencing faulty)
ErrorID	UDINT	OUT	Beckhoff-specific ADS error code of the function blocks used internally
FBErrorID	eFBError	OUT	Block-specific error code (see eFBError (ENUM) [▶ 48])

Tab. 6: STOBER_MC_HOME function block: Parameters

For information on the data types, refer to the TwinCAT 3 documentation at https://infosys.beckhoff.com/content/1033/tc3_plc_intro/2529388939.html.

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6.4.1 Process of referencing

Prerequisites

- NC axis and PLC project are linked (see Linking an NC axis and PLC project [▶ 9])
- Operating mode in the drive controller corresponds to csp, csv, cst or Homing mode (A541 = 8: Cyclic synchronous position mode, 9: Cyclic synchronous velocity mode, 10: Cyclic synchronous torque mode or 6: Homing Mode
- Axis is enabled

Procedure

During execution of the STOBER_MC_HOME function block, the following steps are performed:

1. Reading the axis data (ADS access data, e.g. AMS NetID, SubDevice address, axis type, etc.)
2. Reading out the current operating mode of the control unit for the axis
3. Deleting the reference bit of the NC axis
4. Setting the operating mode to Homing mode (A541 = 6: Homing Mode)
5. Reading in the referencing method (A586) via CoE
6. Starting referencing
7. Waiting until referencing has ended
8. Setting the reference for the NX axis
9. Setting the current actual position as the set position for the NC axis
10. Setting the operating mode (A541) to the operating mode read out at the start of the action

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6.4.2 Example code

The following example is for implementation in Structured Text (ST).

```
PROGRAM MAIN
VAR
	lSTOBER_MC_HOME: STOBER_MC_HOME;
	lEnable: MC_Power;
	lAxis: AXIS_REF;
	lExecute: BOOL;
	lBusy: BOOL;
	lDone: BOOL;
	lError: BOOL;
	lErrorID: UDINT;
	lFBErrorID: STOBER_G6_Util.eFBError;
	Enable: BOOL;
END_VAR

lEnable(Axis:=lAxis,
	Enable:=Enable,
	Enable_Positive:=Enable,
	Enable_Negative:=Enable);
lSTOBER_MC_HOME(Axis:=lAxis,
	Execute:=lExecute,
	Timeout:=T#180S,
	Busy=>lBusy,
	Done=>lDone,
	Error=>lError,
	ErrorID=>lErrorID,
	FBErrorID=>lFBErrorID);
```

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6.5 STOBER_MC_HOME_REF

The function block controls the drive controller-guided referencing of the CiA 402 and CiA 402 HiRes Motion applications. The current operating mode is read out when the function block is executed. The referencing method for referencing is then written to parameter A586 and activated. After successful referencing, the previously read operating mode is reactivated.

The reference position (A569) that is to be present after referencing and the referencing method (A586) which the drive controller is to use for referencing must be transferred to the function block.

Prerequisites

- TwinCAT 3 version 3.1.4024.40 and later
- STOBER_G6_Util library version 3.1.2.0 and later
- Tc2_MC2 library from Beckhoff

Information

As the transfer of an NC axis to the function block is required, you must create a link between the NC axis and PLC project (see Linking an NC axis and PLC project [▶ 9]).

Parameters

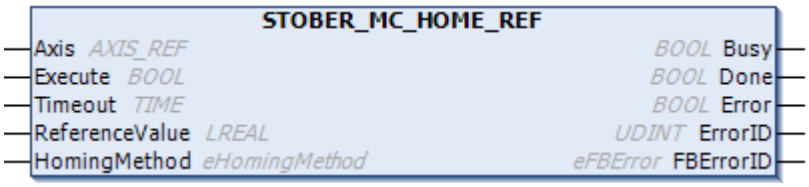

Fig. 5: STOBER_MC_HOME_REF function block: Input and output parameters

Parameters	Data type	Declaration	Description
Axis	AXIS_REF	IN/OUT	Axis data structure
Execute	BOOL	IN	Activating the function block with rising edge
Timeout	TIME	IN	Specified time period after which an error message is triggered if referencing is not successful
ReferenceValue	LREAL	IN	Reference position after referencing (A569)
HomingMethod	eHomingMethod	IN	Referencing method for referencing (A586)
Busy	BOOL	OUT	State of the function block (Busy = True: referencing still not finished)
Done	BOOL	OUT	State of the function block (Done = True: referencing completed)
Error	BOOL	OUT	State of the function block (Error = True: referencing faulty)
ErrorID	UDINT	OUT	Beckhoff-specific ADS error code of the function blocks used internally
FBErrorID	eFBError	OUT	Block-specific error code (see eFBError (ENUM) [▶ 48])

Tab. 7: STOBER_MC_HOME_REF function block: Parameters

For information on the data types, refer to the TwinCAT 3 documentation at https://infosys.beckhoff.com/content/1033/tc3_plc_intro/2529388939.html.

6.5.1 Process of referencing

Prerequisites

- NC axis and PLC project are linked (see Linking an NC axis and PLC project [▶ 9])
- Operating mode in the drive controller corresponds to csp, csv, cst or Homing mode (A541 = 8: Cyclic synchronous position mode, 9: Cyclic synchronous velocity mode, 10: Cyclic synchronous torque mode or 6: Homing Mode
- Axis is enabled

Procedure

During execution of the STOBER_MC_HOME_REF function block, the following steps are performed:

1. Writing the referencing method to parameter A586 (corresponds to communication object Homing method according to CiA 402; object 6098 hex, object 6898 hex)
2. Writing the reference position to parameter A569 (corresponds to communication object Home offset according to CiA 402; object 607C hex, object 687C hex)
3. Reading the axis data (ADS access data, e.g. AMS NetID, SubDevice address, axis type, etc.)
4. Reading out the current operating mode of the control unit for the axis
5. Deleting the reference bit of the NC axis
6. Setting the operating mode to Homing mode (A541 = 6: Homing Mode)
7. Reading in the referencing method (A586) via CoE
8. Starting referencing
9. Waiting until referencing has ended
10. Setting the reference for the NX axis
11. Setting the current actual position as the set position for the NC axis
12. Setting the operating mode (A541) to the operating mode read out at the start of the action

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6.5.2 Example code

The following example is for implementation in Structured Text (ST).

```
PROGRAM MAIN
VAR
	lSTOBER_MC_HOME: STOBER_MC_HOME_REF;
	lEnable: MC_Power;
	lAxis: AXIS_REF;
	lExecute: BOOL;
	lBusy: BOOL;
	lDone: BOOL;
	lError: BOOL;
	lErrorID: UDINT;
	lFBErrorID: STOBER_G6_Util.eFBError;
	Enable: BOOL;
	ReferenceValue: LREAL;
	HomingMethod: eHomingMethod;
END_VAR

lEnable(Axis:=lAxis,
	Enable:=Enable,
	Enable_Positive:=Enable,
	Enable_Negative:=Enable);
lSTOBER_MC_HOME(Axis:=lAxis,
	Execute:=lExecute,
	Timeout:=T#180S,
	ReferenceValue:=ReferenceValue,
	HomingMethod:=HomingMethod,
	Busy=>lBusy,
	Done=>lDone,
	Error=>lError,
	ErrorID=>lErrorID,
	FBErrorID=>lFBErrorID);
```

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6.6 STOBER_Action

Actions can be executed on the drive controller via the STOBER_Action function block. All prerequisites as well as more detailed information on the individual actions can be found in the corresponding parameter descriptions in DriveControlSuite. You can calculate the index for the function block using the coordinates of the parameter (group and line). After successful execution, the function block outputs the result of the action.

Prerequisites

- TwinCAT 3 version 3.1.4024.40 and later
- STOBER_G6_Util library version 3.1.2.0 and later

Parameters

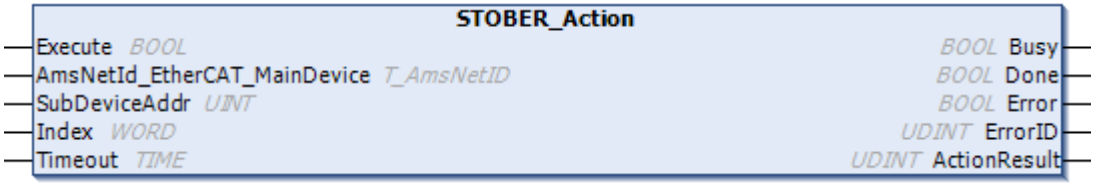

Fig. 6: STOBER_Action function block: Input and output parameters

Parameters	Data type	Declaration	Description
Execute	BOOL	IN	Activating the function block with rising edge
AmsNetId_EtherCAT_MainDevice	T_AmsNetID	IN	AMS NetID of the EtherCAT MainDevice
SubDeviceAddr	UINT	IN	Address of the EtherCAT SubDevice
Index	WORD	IN	Index of the action to be executed (see Calculating the index [▶ 46])
Timeout	TIME	IN	Specified time period after which an error message is triggered if the action does not return a result
Busy	BOOL	OUT	State of the function block (Busy = True: action not yet finished)
Done	BOOL	OUT	State of the function block (Done = True: action successfully completed)
Error	BOOL	OUT	State of the function block (Error = True: action faulty)
ErrorID	UDINT	OUT	Beckhoff-specific ADS error code of the function blocks used internally
ActionResult	UDINT	OUT	Result of the action

Tab. 8: STOBER_Action function block: Parameters

For information on the data types, refer to the TwinCAT 3 documentation at https://infosys.beckhoff.com/content/1033/tc3_plc_intro/2529388939.html.

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6.6.1 Examples of actions without an enable requirement

The following table lists examples of actions that can be executed via the STOBER_Action function block and that do not require a drive controller enable signal.

Parameters	Action	Axis A index	Axis B index
A00	Save values	2000 hex	A000 hex
A09	Restart	2009 hex	A009 hex
B06	Read nameplate	2006 hex	A206 hex
B30	Read axe model from nameplate	221E hex	A21E hex
I38	Clear reference	3026 hex	B026 hex

Tab. 9: STOBER_Action function block: Examples of actions without an enable requirement

Check DriveControlSuite to see which actions are available to you depending on the access level, hardware, software, and application. All prerequisites as well as more detailed information on the individual actions can be found in the corresponding parameter descriptions.

6.6.2 Example code

The following sample project is for implementation in Structured Text (ST).

```
PROGRAM MAIN
VAR
	fbAction:STOBER_Action;
	SubDevice_Address:UINT;
	bExecute: BOOL;
	bError: BOOL;
	bBusy: BOOL;
	bDone: BOOL;
	uiADSErrorID: UDINT;
	uiActionResult: UDINT;
	Net_ID: T_AmsNetID;
END_VAR
VAR CONSTANT
	SaveValuesIndex:WORD:=16#2000;
END_VAR

fbAction(
	AmsNetId_EtherCAT_MainDevice:=Net_ID,
	Execute:=bExecute,
	SubDevice_Addr:=SubDevice_Address,
	Index:=SaveValuesIndex,
	Timeout:=t#60s,
	Error=>bError,
	Busy=>bBusy,
	Done=>bDone,
	ErrorID=>uiADSErrorID,
	ActionResult=>uiActionResult);
```

6.7 STOBER_Power_Action

The STOBER_Power_Action function block can be used to execute actions on the drive controller that require a drive controller enable signal. All prerequisites as well as more detailed information on the individual actions can be found in the corresponding parameter descriptions in DriveControlSuite. You can calculate the index for the function block using the coordinates of the parameter (group and line). After successful execution, the function block outputs the result of the action.

Prerequisites

- TwinCAT 3 version 3.1.4024.40 and later
- STOBER_G6_Util library version 3.1.2.0 and later
- Tc2_MC2 library from Beckhoff

Information

All MC_POWER blocks in your PLC project must not overwrite the enable signal of this function block and must be called up before it.

Information

As the transfer of an NC axis to the function block is required, you must create a link between the NC axis and PLC project (see Linking an NC axis and PLC project [▶ 9]).

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Parameters

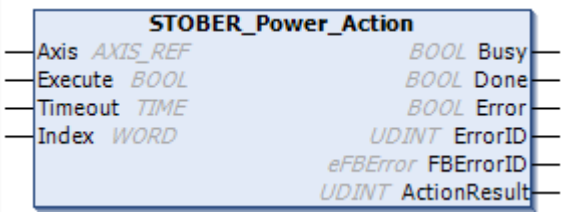

Fig. 7: STOBER_Power_Action function block: Input and output parameters

Parameters	Data type	Declaration	Description
Axis	AXIS_REF	IN/OUT	Axis data structure
Execute	BOOL	IN	Activating the function block with rising edge
Timeout	TIME	IN	Specified time period after which an error message is triggered if the action does not return a result
Index	WORD	IN	Index of the action to be executed (see Calculating the index [▶ 46])
Busy	BOOL	OUT	State of the function block (Busy = True: action not yet finished)
Done	BOOL	OUT	State of the function block (Done = True: action successfully completed)
Error	BOOL	OUT	State of the function block (Error = True: action faulty)
ErrorID	UDINT	OUT	Beckhoff-specific ADS error code of the function blocks used internally
FBErrorID	eFBError	OUT	Block-specific error code (see eFBError (ENUM) [▶ 48])
ActionResult	UDINT	OUT	Result of the action

Tab. 10: STOBER_Power_Action function block: Parameters

For information on the data types, refer to the TwinCAT 3 documentation at https://infosys.beckhoff.com/content/1033/tc3_plc_intro/2529388939.html.

6.7.1 Examples of actions with an enable requirement

The following table lists examples of actions that can be executed via the STOBER_Power_Action function block and that require a drive controller enable signal.

Parameters	Action	Axis A index	Axis B index
B41	Calibrate motor	2229 hex	A229 hex
B43	Test winding	222B hex	A22B hex
B49	Optimize current controller (standstill)	2231 hex	A231 hex

Tab. 11: STOBER_Power_Action function block: Examples of actions with an enable requirement

Check DriveControlSuite to see which actions are available to you depending on the access level, hardware, software, and application. All prerequisites as well as more detailed information on the individual actions can be found in the corresponding parameter descriptions.

6.7.2 Example code

The following sample project is for implementation in Structured Text (ST).

```
PROGRAM MAIN
VAR
	lSTOBER_Power_Action: STOBER_Power_Action;
	lAxis: AXIS_REF;
	lExecute: BOOL;
	lBusy: BOOL;
	lDone: BOOL;
	lError: BOOL;
	lErrorID: UDINT;
	lFBErrorID: STOBER_G6_Util.eFBError;
	lTimeout: TIME;
END_VAR
VAR CONSTANT
	Phasetest_Index:WORD:=16#2228;
END_VAR

lSTOBER_Power_Action(Axis:=lAxis,
	Execute:=lExecute,
	Timeout:=lTimeout,
	Index:=Phasetest_Index,
	Busy=>lBusy,
	Done=>lDone,
	Error=>lError,
	ErrorID=>lErrorID,
	FBErrorID=>lFBErrorID);
```

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6.8 STOBER_Phase_Test

The STOBER_Phase_Test function block starts the phase test action on the drive controller, which measures the commutation offset, for example. After a successful phase test, the values are stored in non-volatile memory on the drive controller.

⚠ DANGER!

Risk of fatal injury due to gravity-loaded vertical axis!

During this action, the brakes are released. The motor cannot generate any or can only generate limited torque/force during this time. This can cause a gravity-loaded vertical axis to drop.

- Only perform this action with axes without gravity load.

Information

The function block executes the Save values action (A00).

Prerequisites

- TwinCAT 3 version 3.1.4024.40 and later
- STOBER_G6_Util library version 3.1.2.0 and later
- Tc2_MC2 library from Beckhoff

Information

All MC_POWER blocks in your PLC project must not overwrite the enable signal of this function block and must be called up before it.

Information

As the transfer of an NC axis to the function block is required, you must create a link between the NC axis and PLC project (see Linking an NC axis and PLC project [▶ 9]).

Parameters

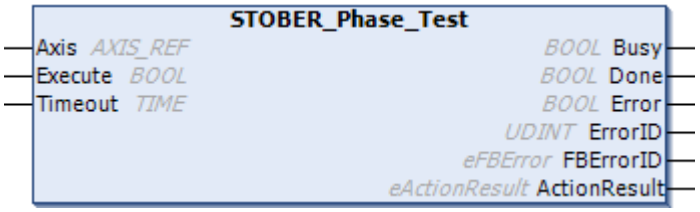

Fig. 8: STOBER_Phase_Test function block: Input and output parameters

Parameters	Data type	Declaration	Description
Axis	AXIS_REF	IN/OUT	Axis data structure
Execute	BOOL	IN	Activating the function block with rising edge
Timeout	TIME	IN	Specified time period after which an error message is triggered if the action does not return a result
Busy	BOOL	OUT	Status of the function block (Busy = True: action not yet completed or values not yet saved)
Done	BOOL	OUT	Status of the function block (Done = True: action successfully completed and values saved)
Error	BOOL	OUT	State of the function block (Error = True: action faulty)
ErrorID	UDINT	OUT	Beckhoff-specific ADS error code of the function blocks used internally
FBErrorID	eFBError	OUT	Block-specific error code (see eFBError (ENUM) [▶ 48])
ActionResult	eActionResult	OUT	Result of the action

Tab. 12: STOBER_Phase_Test function block: Parameters

For information on the data types, refer to the TwinCAT 3 documentation at https://infosys.beckhoff.com/content/1033/tc3_plc_intro/2529388939.html.

6.8.1 Procedure of the phase test

Prerequisites

NC axis and PLC project are linked (see Linking an NC axis and PLC project [▶ 9])

Procedure

During execution of the STOBER_Phase_Test function block, the following steps are performed:

1. Reading the axis data (ADS access data, e.g. AMS NetID, SubDevice address, axis type, etc.)
2. Executing the STOBER_Power_Action function block with the phase test action:
   - 2.1. Checking the enable signal and, if necessary, enabling the axis
   - 2.2. Executing the phase test action
   - 2.3. Removing the axis enable signal
3. Executing the Save values action (A00)

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6.8.2 Example code

The following sample project is for implementation in Structured Text (ST).

```
PROGRAM MAIN
VAR
	lSTOBER_LoadMatrix : STOBER_PRM_LoadMatrix;
	lAxis: AXIS_REF;
	lExecute: BOOL;
	lBusy: BOOL;
	lDone: BOOL;
	lError: BOOL;
	lErrorID: UDINT;
	lFBErrorID: STOBER_G6_Util.eFBError;
	PRMjson: ARRAY [0..16255] OF BYTE;
	StringLength: UINT;
END_VAR

lSTOBER_LoadMatrix(Axis:=lAxis,PRMjson:=PRMjson,
	Execute:=lExecute,
	Busy=>lBusy,
	Done=>lDone,
	Error=>lError,
	ErrorID=>lErrorID,
	FBErrorID=>lFBErrorID,
	StringLength=>StringLength);
```

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6.9 STOBER_PRM_LoadMatrix

The function block reads out the load matrix from the drive controller (R118) and writes it to the transferred array.

Prerequisites

- TwinCAT 3 version 3.1.4024.40 and later
- STOBER_G6_Util library version 3.1.2.0 and later
- Tc2_MC2 library from Beckhoff

Information

To be able to read out the load matrix, the Predictive Maintenance function must be active in the drive controller.

Information

As the transfer of an NC axis to the function block is required, you must create a link between the NC axis and PLC project (see Linking an NC axis and PLC project [▶ 9]).

Parameters

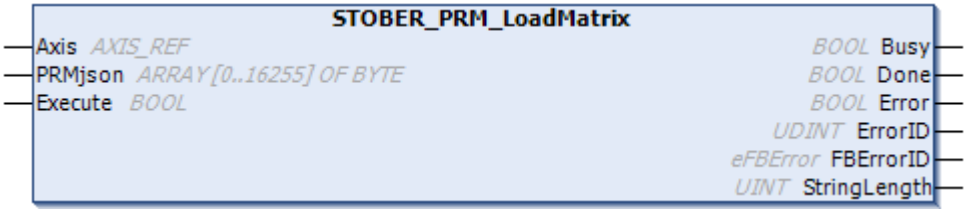

Fig. 9: STOBER_PRM_LoadMatrix function block: Input and output parameters

Parameters	Data type	Declaration	Description
Axis	AXIS_REF	IN/OUT	Axis data structure
PRMjson	ARRAY [0..16255] OF BYTE	IN/OUT	Data buffer into which the load matrix is to be written
Execute	BOOL	IN	Activating the function block with rising edge
Busy	BOOL	OUT	State of the function block (Busy = True: reading and writing not yet finished)
Done	BOOL	OUT	State of the function block (Done = True: reading and writing successfully completed)
Error	BOOL	OUT	State of the function block (ERROR = True: reading/writing faulty)
ErrorID	UDINT	OUT	Beckhoff-specific ADS error code of the function blocks used internally
FBErrorID	eFBError	OUT	Block-specific error code (see eFBError (ENUM) [▶ 48])
StringLength	UINT	OUT	Number of bytes written in the PRMjson array

Tab. 13: STOBER_PRM_LoadMatrix function block: Parameters

For information on the data types, refer to the TwinCAT 3 documentation at https://infosys.beckhoff.com/content/1033/tc3_plc_intro/2529388939.html.

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6.9.1 Reading and writing procedure

During execution of the STOBER_PRM_LoadMatrix function block, the following steps are performed:

1. Reading the axis data (ADS access data, e.g. AMS NetID, SubDevice address, axis type, etc.)
2. Reading out the Predictive Maintenance status (R100)
3. Reading out the load matrix and writing it to the transferred PRMjson array
4. Calculating the StringLength of the load matrix

6.9.2 Example code

The following sample project is for implementation in Structured Text (ST).

```
PROGRAM MAIN
VAR
	lSTOBER_LoadMatrix : STOBER_PRM_LoadMatrix;
	lAxis: AXIS_REF;
	lExecute: BOOL;
	lBusy: BOOL;
	lDone: BOOL;
	lError: BOOL;
	lErrorID: UDINT;
	lFBErrorID: STOBER_G6_Util.eFBError;
	PRMjson: ARRAY [0..16255] OF BYTE;
	StringLength: UINT;
END_VAR

lSTOBER_LoadMatrix(Axis:=lAxis,PRMjson:=PRMjson,
	Execute:=lExecute,
	Busy=>lBusy,
	Done=>lDone,
	Error=>lError,
	ErrorID=>lErrorID,
	FBErrorID=>lFBErrorID,
	StringLength=>StringLength);
```

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6.10 STOBER_PRM_LoadMatrix_AMS

The function block reads out the load matrix from the drive controller (R118) and writes it to the transferred array.

Prerequisites

- TwinCAT 3 version 3.1.4024.40 and later
- STOBER_G6_Util library version 3.1.2.0 and later
- Tc2_MC2 library from Beckhoff

Information

To be able to read out the load matrix, the Predictive Maintenance function must be active in the drive controller.

Parameters

Fig. 10: STOBER_PRM_LoadMatrix_AMS function block: Input and output parameters

Parameters	Data type	Declaration	Description
PRMjson	ARRAY [0..16255] OF BYTE	IN/OUT	Data buffer into which the load matrix is to be written
AmsNetId_EtherCAT_MainDevice	T_AmsNetID	IN	AMS NetID of the EtherCAT MainDevice
SubDeviceAddr	UINT	IN	Address of the EtherCAT SubDevice
AxisNumber	USINT	IN	Axis from which the load matrix is to be read: ▪ 0 = axis A ▪ 1 = axis B
Execute	BOOL	IN	Activating the function block with rising edge
Busy	BOOL	OUT	State of the function block (Busy = True: reading and writing not yet finished)
Done	BOOL	OUT	State of the function block (Done = True: reading and writing successfully completed)
Error	BOOL	OUT	State of the function block (ERROR = True: reading/writing faulty)
ErrorID	UDINT	OUT	Beckhoff-specific ADS error code of the function blocks used internally
FBErrorID	eFBError	OUT	Block-specific error code (see eFBError (ENUM) [▶ 48])
StringLength	UINT	OUT	Number of bytes written in the PRMjson array

Tab. 14: STOBER_PRM_LoadMatrix_AMS function block: Parameters

For information on the data types, refer to the TwinCAT 3 documentation at https://infosys.beckhoff.com/content/1033/tc3_plc_intro/2529388939.html.

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6.10.1 Reading and writing procedure

During execution of the STOBER_PRM_LoadMatrix_AMS function block, the following steps are performed:

1. Reading out the Predictive Maintenance status (R100)
2. Reading out the load matrix and writing it to the transferred PRMjson array
3. Calculating the StringLength of the load matrix

6.10.2 Example code

The following sample project is for implementation in Structured Text (ST).

```
PROGRAM MAIN
VAR
	lSTOBER_LoadMatrix : STOBER_PRM_LoadMatrix_AMS;
	lExecute: BOOL;
	lAMS_NetID: T_AmsNetID;
	lSubDeviceAddr: UINT;
	lBusy: BOOL;
	lDone: BOOL;
	lError: BOOL;
	lErrorID: UDINT;
	lFBErrorID: STOBER_G6_Util.eFBError;
	PRMjson: ARRAY [0..16255] OF BYTE;
	StringLength: UINT;
END_VAR

lSTOBER_LoadMatrix(PRMjson:=PRMjson,
	AmsNetId_EtherCAT_MainDevice:=lAMS_NetID,
	SubDeviceAddr:=lSubDeviceAddr,
	Execute:=lExecute,
	Busy=>lBusy,
	Done=>lDone,
	Error=>lError,
	ErrorID=>lErrorID,
	FBErrorID=>lFBErrorID,
	StringLength=>StringLength);
```

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6.11 STOBER_PRM_LoadMatrix_File

The function block reads the load matrix from the drive controller (R118) and saves it as a file in the directory under the transferred file path.

Prerequisites

- TwinCAT 3 version 3.1.4024.40 and later
- STOBER_G6_Util library version 3.1.2.0 and later
- Tc2_MC2 library from Beckhoff

Information

To be able to read out the load matrix, the Predictive Maintenance function must be active in the drive controller.

Information

As the transfer of an NC axis to the function block is required, you must create a link between the NC axis and PLC project (see Linking an NC axis and PLC project [▶ 9]).

Parameters

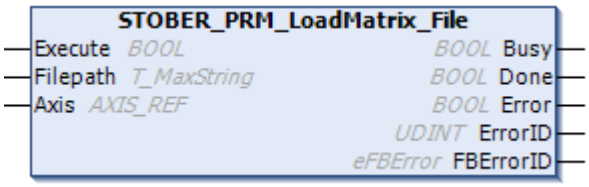

Fig. 11: STOBER_PRM_LoadMatrix_File function block: Input and output parameters

Parameters	Data type	Declaration	Description
Execute	BOOL	IN	Activating the function block with rising edge
File path	T_MaxString	IN	File path to the directory in which the file is to be written
Axis	AXIS_REF	IN/OUT	Axis data structure
Busy	BOOL	OUT	State of the function block (Busy = True: reading and writing not yet finished)
Done	BOOL	OUT	State of the function block (Done = True: reading and writing successfully completed)
Error	BOOL	OUT	State of the function block (ERROR = True: reading/writing faulty)
ErrorID	UDINT	OUT	Beckhoff-specific ADS error code of the function blocks used internally
FBErrorID	eFBError	OUT	Block-specific error code (see eFBError (ENUM) [▶ 48])

Tab. 15: STOBER_PRM_LoadMatrix_File function block: Parameters

For information on the data types, refer to the TwinCAT 3 documentation at https://infosys.beckhoff.com/content/1033/tc3_plc_intro/2529388939.html.

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Structure of the file name

Example 1: **Axis 2_0_3B96214A.json**

Value in example	Meaning
Axis 2	TwinCAT axis identification
0	Axis of the drive controller (0 = axis A, 1 = axis B)
3B96214A	File name from parameter R106

Tab. 16: Example 1: Structure of the file name

Example 2: **Axis 2_0_PRM.json**

Value in example	Meaning
Axis 2	TwinCAT axis identification
0	Axis of the drive controller (0 = axis A, 1 = axis B)
PRM	Automatically assigned value if parameter R106 is not available

Tab. 17: Example 2: Structure of the file name

6.11.1 Reading and writing procedure

During execution of the STOBER_PRM_LoadMatrix_File function block, the following steps are performed:

1. Reading the axis data (ADS access data, e.g. AMS NetID, SubDevice address, axis type, etc.)
2. Reading out the Predictive Maintenance status (R100)
3. Reading out the load matrix
4. Calculating the StringLength of the load matrix
5. Determining the file name of the load matrix read from the drive controller (R106)
6. Storing the load matrix with StringLength as a file in the directory under the transferred file path

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6.11.2 Example code

The following sample project is for implementation in Structured Text (ST).

```
PROGRAM MAIN
VAR
	lSTOBER_LoadMatrix : STOBER_PRM_LoadMatrix_File;
	lAxis: AXIS_REF;
	lExecute: BOOL;
	lBusy: BOOL;
	lDone: BOOL;
	lError: BOOL;
	lErrorID: UDINT;
	lFBErrorID: STOBER_G6_Util.eFBError;
	Filepath: T_MaxString;
END_VAR

lSTOBER_LoadMatrix(Axis:=lAxis,
	Execute:=lExecute,
	Filepath:=Filepath,
	Busy=>lBusy,
	Done=>lDone,
	Error=>lError,
	ErrorID=>lErrorID,
	FBErrorID=>lFBErrorID);
```

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6.12 STOBER_PRM_LoadMatrix_File_AMS

The function block reads the load matrix from the drive controller (R118) and saves it as a file in the directory under the transferred file path.

Prerequisites

- TwinCAT 3 version 3.1.4024.40 and later
- STOBER_G6_Util library version 3.1.2.3 and later

Information

To be able to read out the load matrix, the Predictive Maintenance function must be active in the drive controller.

Parameters

Fig. 12: STOBER_PRM_LoadMatrix_File_AMS function block: Input and output parameters

Parameters	Data type	Declaration	Description
Execute	BOOL	IN	Activating the function block with rising edge
File path	T_MaxString	IN	File path to the directory in which the file is to be written
AmsNetId_EtherCAT_MainDevice	T_AmsNetID	IN	AMS NetID of the EtherCAT MainDevice
SubDeviceAddr	UINT	IN	Address of the EtherCAT SubDevice
AxisNumber	USINT	IN	Axis from which the load matrix is to be read: ▪ 0 = axis A ▪ 1 = axis B
Busy	BOOL	OUT	State of the function block (Busy = True: reading and writing not yet finished)
Done	BOOL	OUT	State of the function block (Done = True: reading and writing successfully completed)
Error	BOOL	OUT	State of the function block (ERROR = True: reading/writing faulty)
ErrorID	UDINT	OUT	Beckhoff-specific ADS error code of the function blocks used internally
FBErrorID	eFBError	OUT	Block-specific error code (see eFBError (ENUM) [▶ 48])

Tab. 18: STOBER_PRM_LoadMatrix_File_AMS function block: Parameters

For information on the data types, refer to the TwinCAT 3 documentation at https://infosys.beckhoff.com/content/1033/tc3_plc_intro/2529388939.html.

Structure of the file name

Example 1: **Axis 2_0_3B96214A.json**

Value in example	Meaning
Axis 2	TwinCAT axis identification
0	Axis of the drive controller (0 = axis A, 1 = axis B)
3B96214A	File name from parameter R106

Tab. 19: Example 1: Structure of the file name

Example 2: **Axis 2_0_PRM.json**

Value in example	Meaning
Axis 2	TwinCAT axis identification
0	Axis of the drive controller (0 = axis A, 1 = axis B)
PRM	Automatically assigned value if parameter R106 is not available

Tab. 20: Example 2: Structure of the file name

6.12.1 Reading and writing procedure

During execution of the STOBER_PRM_LoadMatrix_File_AMS function block, the following steps are performed:

1. Reading out the Predictive Maintenance status (R100)
2. Reading out the load matrix
3. Calculating the StringLength of the load matrix
4. Determining the file name of the load matrix read from the drive controller (R106)
5. Storing the load matrix with StringLength as a file in the directory under the transferred file path

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6.12.2 Example code

The following sample project is for implementation in Structured Text (ST).

```
PROGRAM MAIN
VAR
	lSTOBER_LoadMatrix : STOBER_PRM_LoadMatrix_File_AMS;
	lAMS_NetID: T_AmsNetID;
	lSubDeviceAddr: UINT;
	lAxisNumber: USINT;
	lExecute: BOOL;
	lBusy: BOOL;
	lDone: BOOL;
	lError: BOOL;
	lErrorID: UDINT;
	lFBErrorID: STOBER_G6_Util.eFBError;
	Filepath: T_MaxString;
END_VAR

lSTOBER_LoadMatrix(AmsNetId_EtherCAT_MainDevice:=lAMS_NetID,
	SubDeviceAddr:=lSubDeviceAddr,
	Execute:=lExecute,
	AxisNumber:=lAxisNumber,
	Filepath:=Filepath,
	Busy=>lBusy,
	Done=>lDone,
	Error=>lError,
	ErrorID=>lErrorID,
	FBErrorID=>lFBErrorID);
```

6.13 STOBER_SDO_Info

The function block determines whether the SDO Info service is active in the drive controller. This makes it easier for you to address the elements of array and record parameters. If SDO Info is inactive, the subindex 0 of an SDO object corresponds to element 0 of the parameter. If SDO Info is active, subindex 0 of an SDO object corresponds to the number of elements of the parameter and subindex 1 corresponds to element 0 of the parameter.

Prerequisites

- TwinCAT 3 version 3.1.4024.40 and later
- STOBER_G6_Util library version 3.1.2.0 and later

Parameters

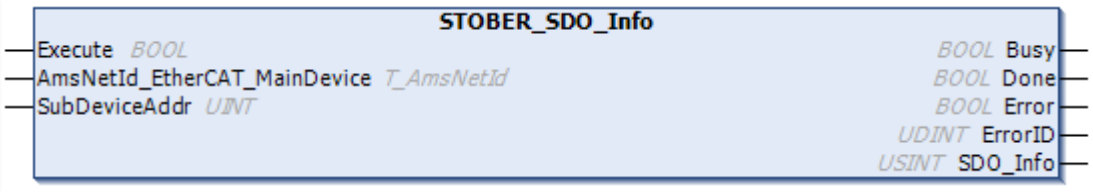

Fig. 13: STOBER_SDO_Info function block: Input and output parameters

Parameters	Data type	Declaration	Description
Execute	BOOL	IN	Activating the function block with rising edge
AmsNetId_EtherCAT_MainDevice	T_AmsNetID	IN	AMS NetID of the EtherCAT MainDevice
SubDeviceAddr	UINT	IN	Address of the EtherCAT SubDevice
Busy	BOOL	OUT	State of the function block (Busy = True: check not yet finished)
Done	BOOL	OUT	State of the function block (Done = True: check completed)
Error	BOOL	OUT	State of the function block (Error = True: check faulty)
ErrorID	UDINT	OUT	Beckhoff-specific ADS error code of the function blocks used internally
SDO_Info	USINT	OUT	SDO Info service status in the drive controller: ▪ 0 = inactive ▪ 1 = active

Tab. 21: STOBER_SDO_Info function block: Parameters

For information on the data types, refer to the TwinCAT 3 documentation at https://infosys.beckhoff.com/content/1033/tc3_plc_intro/2529388939.html.

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6.13.1 Example code

The following sample project is for implementation in Structured Text (ST).

```
PROGRAM MAIN
VAR
	lSTOBER_SDO : STOBER_SDO_Info;
	AMS_NetID:T_AmsNetID;
	SubDeviceAddress: UINT;
	lExecute: BOOL;
	lBusy: BOOL;
	lDone: BOOL;
	lError: BOOL;
	lErrorID: UDINT;
	SDO_INFO: USINT;
END_VAR

lSTOBER_SDO(AmsNetId_EtherCAT_MainDevice:=AMS_NetID,
	SubDeviceAddr:=SubDeviceAddress,
	Execute:=lExecute,
	Busy=>lBusy,
	Done=>lDone,
	Error=>lError,
	ErrorID=>lErrorID,
	SDO_Info=>SDO_INFO);
```

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7 Calculating the index

You can use the coordinates of the parameter (group and line) to calculate the index for the STOBER_Action or STOBER_Power_Action function blocks.

Information

The **index** must be specified in the format required by the controller.

Information

The calculation described below is only valid for converting the manufacturer-specific parameters.

The axes differ by an offset of 8000 hex. The line of the parameter must be less than 512. The index is calculated from the group and line of the parameter according to the following formulas:

- Axis A index = 8192 + (number of the group × 512) + number of the line
- Axis B index = 40960 + (number of the group × 512) + number of the line

Calculation example for axis A

Calculation for parameter I38:

Number of the group = 8

Number of the line = 38

Index = 8192 + (8 × 512) + 38 = 12326 = 3026 hex

Number of the group

The following table shows the number of the group, which is required to calculate the index.

Group	Number
A: Drive controller	0
B: Motor	1
C: Machine	2
D: Set value	3
E: Show	4
F: Terminals	5
G: Technology	6
H: Encoders	7
I: Motion	8
J: Motion blocks	9
K: Control panel	10
M: Profile	12
P: Customer-specific parameters	15
Q: Customer-specific parameters, instance-dependent	16
R: Production data	17
S: Safety	18
T: Scope	19
U: Protection functions	20
Z: Fault counter	25

Tab. 22: STOBER_Action function block: Parameter groups and numbers for index calculation

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8 Diagnostics

For diagnosis in the event of an error (Error = True), the function blocks output error codes via the ErrorID and FBErrorID outputs.

If the error is within the TwinCAT-specific function blocks, the ADS error code is output at the ErrorID output. These error codes can be referenced using the documentation of Beckhoff Automation GmbH & Co. KG.

If the error is block-specific, this is output at the FBErrorID output.

Log files for advanced diagnostics

When the STOBER_Backup_Restore_Initiator or STOBER_Backup_Restore function blocks are executed, various log files are created in your project directory which are used for extended diagnostics in the event of an error.

File	Description
File in the log directory	The directory is created automatically as soon as one of the two function modules is executed for the first time. Each time the STOBER_Backup_Restore function block is executed, a log file with information on the script mode is saved in this directory.
File Tc_Log.log	Device-specific log file with information on which EtherCAT SubDevice one of the two function blocks was executed for. If the STOBER_Backup_Restore function block was executed, the service type is also logged. The file also contains information on whether the execution was successful.
File DeviceInfo.txt	File created automatically with all SubDevice addresses and production numbers of the drive controllers in the EtherCAT network. **ATTENTION! This file must not be modified or deleted.**
Files in the SaveOriginals directory	The directory is created automatically when a backup service is run for the first time. With each backup service, the current DS6 project file is moved to the SaveOriginals directory. The file is provided with the current date and time.

Tab. 23: STOBER_Backup_Restore_Initiator or STOBER_Backup_Restore function block: Log files in the project directory

8.1 eFBError (ENUM)

Error (FBErrorID)	No.	Cause	Check and actions
NO_ERROR	0	No block-specific error occurred	—
HOMING_METHOD_INACTIVE	1	Parameter A586 = 0: Inactive	In parameter A586, select the referencing method that is to be run when the block is executed.
AXIS_NOT_ENABLED	2	The axis is not enabled	Enable the axis of the drive controller (cause of switch-on lockout: E47).
WRONG_MODE	3	Incorrect operating mode for drive controller-guided referencing	Switch to one of the following operating modes (A541): ▪ 8: Cyclic synchronous position mode ▪ 9: Cyclic synchronous velocity mode ▪ 10: Cyclic synchronous torque mode ▪ 6: Homing Mode
NO_DEVICE_LINK	4	Changing the operating mode to 6: Homing Mode did not work	—
AXIS_ERROR	5	Drive controller or axis has a fault	Eliminate the cause of the fault and acknowledge the fault.
COMMAND_ABORTED	6	Referencing was canceled	The drive controller has malfunctioned during referencing or the enable has been removed. Eliminate the cause of the fault and acknowledge the fault. The drive controller must be enabled until referencing is complete.
HOMING_TIMEOUT	7	Referencing could not be completed in the specified time	Extend the specified time period. Check that the correct referencing method is selected and that the conditions for referencing can be met.
WRONG_AMS_NETID	100	Incorrect AMS NetID	Link the AMS NetID and the associated variable of type T_AmsNetId.
WRONG_FILE_PATH	101	The specified file path to the directory of the project file could not be found	Check and correct the file path to the project file directory on the EtherCAT controller.
WRONG_DS6_PROCESS_PATH	103	The specified file path to the directory of DriveControlSuite could not be found	Check and correct the file path to the directory of the DriveControlSuite on the EtherCAT controller.
WRONG_ETHERCAT_REVISION	105	EtherCAT revision number < 6000	Revision number of the drive controller < 6000 (Revision Number communication object according to CiA 301; object 1018 hex, subindex 3 hex). Create a DS6 project with a current EtherCAT template.
INVALID_BOXNAME	107	Parameter A251 has an invalid value	Run the STOBER_BoxName function block.
WRONG_SERVICE_TYPE_INPUT	109	The requested service does not match the service type requested by the STOBER_Backup_Restore function block	For the service type, select the correct service according to the iAction output of the STOBER_Backup_Restore_Initiator function block. When using the function block for the first time, the Restore service type must be selected (service type = 2).

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Error (FBErrorID)	No.	Cause	Check and actions
TIMEOUT_EXCEED	111	Script mode could not be executed in the specified time	Make sure that DriveControlSuite is not open on the EtherCAT controller while you are running the function block. Make sure not to run multiple instances of the function block at the same time. Instead, run the instances one after the other.
NO_STOBER_SUBDEVICE_IN_CONFIGURATION	113	No STOBER SubDevice could be found in the TwinCAT configuration	Make sure that there is a STOBER drive controller in the TwinCAT configuration.
ERROR_SAVING_VALUES	115	The Save values action on the drive controller has returned an error	Use parameter E61[0] to check whether an SD card or Paramodul is inserted and recognized. Use E68 to check whether the storage medium is write-protected.
UNEXPECTED_VALUE	117	A transferred parameter has an unexpected value	—
DEVICE_INFO_TXT_TOO_LONG	119	DeviceInfo.txt contains more than 200 drive controllers	Reduce the number of STOBER drive controllers to a maximum of 200.
MAX_SUBDEVICES_NUMBER_REACHED	200	Maximum number of connected EtherCAT SubDevices exceeded	Reduce the number of EtherCAT SubDevices connected to the function block to max. 2000.
PROJECT_NOT_FOUND	201	The drive controller was not found in the project	The drive controller for which the STOBER_Backup_Restore function block is to be executed could not be found in any file (*.ds6) in the project folder. Make sure that you have entered the PLC device name from your EtherCAT project into the DS6 project. Check the log files in your project directory for more information.
MORE_THAN_ONE_PROJECT_FOUND	203	The drive controller was found in several projects	The drive controller for which the STOBER_Backup_Restore function block is to be executed was found in several projects. Check the log files in your project directory for more information.
OPEN_PROJECT_ERROR	205	Project could not be opened	Make sure that the specified DS6 project is not already open. Check the log files in your project folder for more information.
CONNECTION_ERROR	207	Connection error	Connection between control PC and drive controller could not be established. Check the Ethernet cable connection between the control PC and drive controller (service interface X9).
ONLINE_ERROR	209	Faulty project configuration	Make sure that firmware version, drive controller, and option module are configured correctly in your DS6 project.
ALL_SUBDEVICES_NOT_IN_OPERATIONAL_MODE	300	Not all STOBER SubDevices in the Operational state	Make sure that all EtherCAT SubDevices are in the Operational state. The error remains active until all SubDevices are ready to operate.
INVALID_OFFSET	301	Invalid offset when reading out R118	—
WRONG_AXIS	302	Incorrect drive controller axis connected	—

Error (FBErrorID)	No.	Cause	Check and actions
PREDICTIVE_MAINTENANCE_INACTIVE	303	Predictive Maintenance is inactive	Activate Predictive Maintenance for the drive controller, perform the Save values action (A00), and restart the drive controller.
JSON_LENGTH_ZERO	304	Load matrix could not be read out correctly	Check whether Predictive Maintenance is activated.
JSON_INCOMPLETE	305	Load matrix could not be read out completely	Check whether there is competing access to parameter R118, e.g. via DS6.
MASTER_NOT_IN_OPERATIONAL_MODE	400	MainDevice not in Operational state	Make sure that the EtherCAT MainDevice is in the Operational state.
ABORTED	401	Enable-off by user or device fault	—
TIMEOUT	402	Enable-on not activated within 30 s after starting the action	Check the general conditions.
ILLEGAL	403	Activation of the action in the state ≠ 2: Ready for switch-on (E48), operation of the motor in control mode without vector control and motor encoder (B20, B26) or use of the brakes with inactive brake control (F00)	Check the general conditions.
AXIS_LOAD	404	Axis moved with Enable-on and activated and released brakes	—
PHASE_ORDER	405	Phase order does not match the counting direction of the motor encoder	Check the general conditions.
MOTOR_POLES	406	Electrically specified distance does not match the mechanically covered distance	Check and correct the following settings if necessary: ▪ Number of poles of the synchronous servo motor or asynchronous motor and setting in B10 ▪ Pole pitch of the linear motor and setting in B16 ▪ Motor encoder scaling (numerator/ denominator value pair) ▪ No mechanical blockage of the output ▪ Sufficient torque/force for test run
TEST_RUN	408	Test run using the determined commutation offset not successful	—
REMOVE_ENABLE	498	Enable signal already active when starting the action	Remove the axis enable signal.
AXIS_ENABLED	410	Enabled axis when executing the function block	Remove the axis enable signal.
GENERAL_ERROR	413	—	—

Tab. 24: Module-specific errors: eFBError (ENUM)

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9 Appendix

9.1 Further information

The documentation listed below provides you with further relevant information on the 6th STOBER drive controller generation. The current status of the documentation can be found in our download center at:
http://www.stoeber.de/en/downloads/.
Enter the ID of the documentation in the search field.

SC6, SI6 drive controllers

Title	Documentation	Contents	ID
SC6 drive controller	Manual	System design, technical data, project configuration, storage, installation, connection, commissioning, operation, service, diagnostics	442790
Multi-axis drive system with SI6 and PS6	Manual	System design, technical data, project configuration, storage, installation, connection, commissioning, operation, service, diagnostics	442728
EtherCAT communication – SC6, SI6	Manual	Electrical installation, data transfer, commissioning, diagnostics, detailed information	443025
CiA 402 application – SC6, SI6	Manual	Project planning, configuration, parameterization, function test, detailed information	443080

SD6 drive controller

Title	Documentation	Contents	ID
SD6 drive controller	Manual	System design, technical data, project configuration, storage, installation, connection, commissioning, operation, service, diagnostics	442426
EtherCAT communication – SD6	Manual	Installation, electrical installation, data transfer, commissioning, diagnostics, detailed information	442516
CiA 402 application – SD6	Manual	Project planning, configuration, parameterization, function test, detailed information	443077

A free basic version of the TwinCAT 3 automation software is available at
https://www.beckhoff.com/en-us/products/automation/twincat/te1xxx-twincat-3-engineering/te1000.html.

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9.2 Abbreviations

Abbreviation	Meaning
ADS	Automation Device Specification
AMS	Automation Message Specification
CiA	CAN in Automation
CoE	CANopen over EtherCAT
EtherCAT	Ethernet for Control Automation Technology
IP	Internet Protocol
MDevice	MainDevice
NC	Numerical Control
PDO	Process Data Objects
PLC	Programmable Logic Controller
SDO	Service Data Objects
PLC	Programmable Logic Controller
ST	Structured Text
SubDevice	SubordinateDevice
TwinCAT	The Windows Control and Automation Technology

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10 Contact

10.1 Consultation, service and address

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systemsupport@stoeber.de

If you need a replacement device:
Phone +49 7231 582-1128
replace@stoeber.de

Call our 24-hour service hotline:
Phone +49 7231 582-3000

Our address:
STÖBER Antriebstechnik GmbH + Co. KG
Kieselbronner Strasse 12
75177 Pforzheim, Germany

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Thank you for your interest.
Your STOBER editorial team

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STOBER AUSTRIA
www.stoeber.at
+43 7613 7600-0
sales@stoeber.at

STOBER CHINA
www.stoeber.cn
+86 512 5320 8850
sales@stoeber.cn

STOBER FRANCE
www.stober.fr
+33 478 98 91 80
sales@stober.fr

STOBER Germany
www.stoeber.de
+49 4 7231 582-0
sales@stoeber.de

STOBER HUNGARY
www.stoeber.de
+36 53 5011140
info@emtc.hu

STOBER ITALY
www.stober.it
+39 02 93909570
sales@stober.it

STOBER JAPAN
www.stober.co.jp
+81-3-5875-7583
sales@stober.co.jp

STOBER SWITZERLAND
www.stoeber.ch
+41 56 496 96 50
sales@stoeber.ch

STOBER TAIWAN
www.stober.tw
+886 4 2358 6089
sales@stober.tw

STOBER TURKEY
www.stober.com
+90 216 510 2290
sales-turkey@stober.com

STOBER UK
www.stober.co.uk
+44 1543 458 858
sales@stober.co.uk

STOBER USA
www.stober.com
+1 606 759 5090
sales@stober.com

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STÖBER Antriebstechnik GmbH + Co. KG
Kieselbronner Str. 12
75177 Pforzheim
Germany
Tel. +49 7231 582-0
mail@stoeber.de
www.stober.com

24 h Service Hotline
+49 7231 582-3000