

TwinSAFE tutorial 12 | EN

SafeMotion Wizard

AX8000 projects with partially different functionality

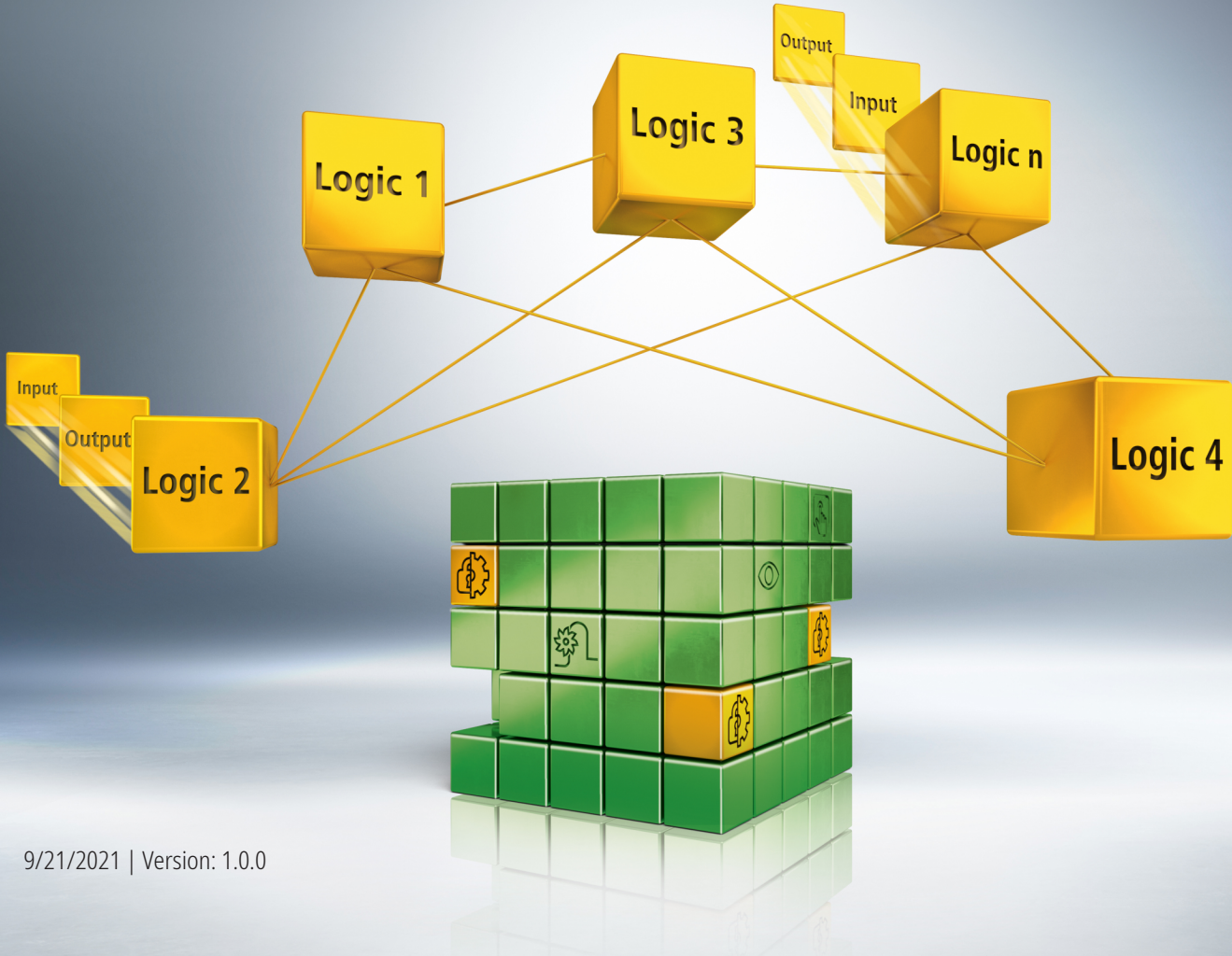


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1 Introduction

TwinSAFE includes several innovations that bring more functionality and performance to your safety controller. A major innovation is that the functionality of the safety controller is integrated in each TwinSAFE component. This means that you can, for example, use a TwinSAFE input component both as an input component and the safety control integrated on it to use application-specific pre-processing.

This is tutorial 12 of a tutorial series.

The aim of this tutorial series is to familiarize you with the TwinSAFE innovations using individual examples.

This tutorial is about extending a SafeMotion Wizard project with an additional functionality for one axis.

1.1 Issue statuses

Issue	Comment
1.0.0	<ul style="list-style-type: none">• First released version
0.0.1	<ul style="list-style-type: none">• First draft

1.2 Requirements

Meet the following requirements for this tutorial:

- TwinCAT 3 version $\geq 3.1.4024.11$
- TwinCAT Safety Editor TE9000 $\geq 1.2.1.1$
- TwinSAFE firmware ≥ 03
- AX8000 firmware ≥ 0104 ; with default module ID active

1.3 Starting point

At the starting point of the tutorial

- a TwinCAT 3 project with standard PLC exists,
- an EL6910 project exists.

1.4 Demo system

1.4.1 Hardware

The demo system of this tutorial consists of the following hardware:

- CX for EtherCAT communication and the standard PLC controller
- EL6910 as master TwinSAFE Logic
- EL1918 with safe inputs for reading light barrier signals
- Light barrier
- AX8000-x2xx

1.4.2 Desired Safety functionality

This tutorial describes the realization of the following safety functionality:

- Realization of an identical project for all axes with additional function on one axis using the SafeMotion Wizard.

2 Demonstration

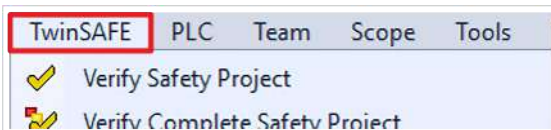
2.1 Create Safe Motion project

Starting point of the tutorial is an existing TwinCAT3 project with an existing I/O configuration and the corresponding Safe Motion entries.

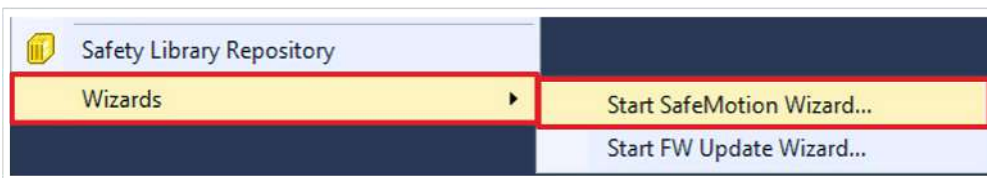
Proceed as follows to create a Safe Motion project with the SafeMotion Wizard:



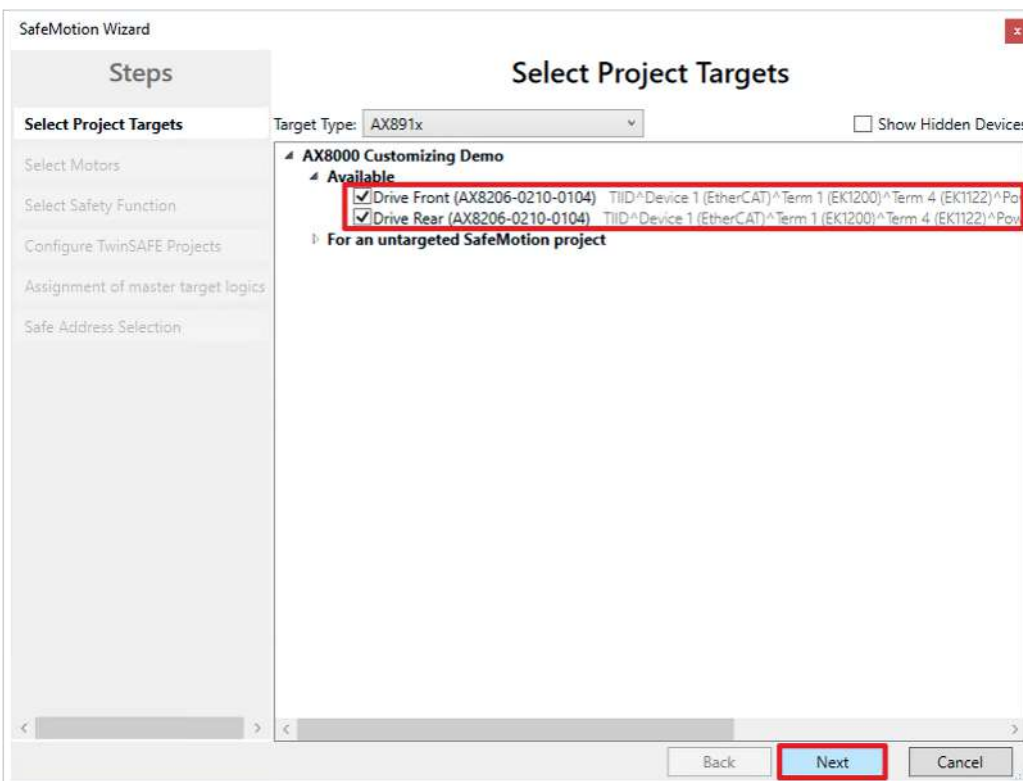
1. Select project



2. Select "TwinSAFE" tab

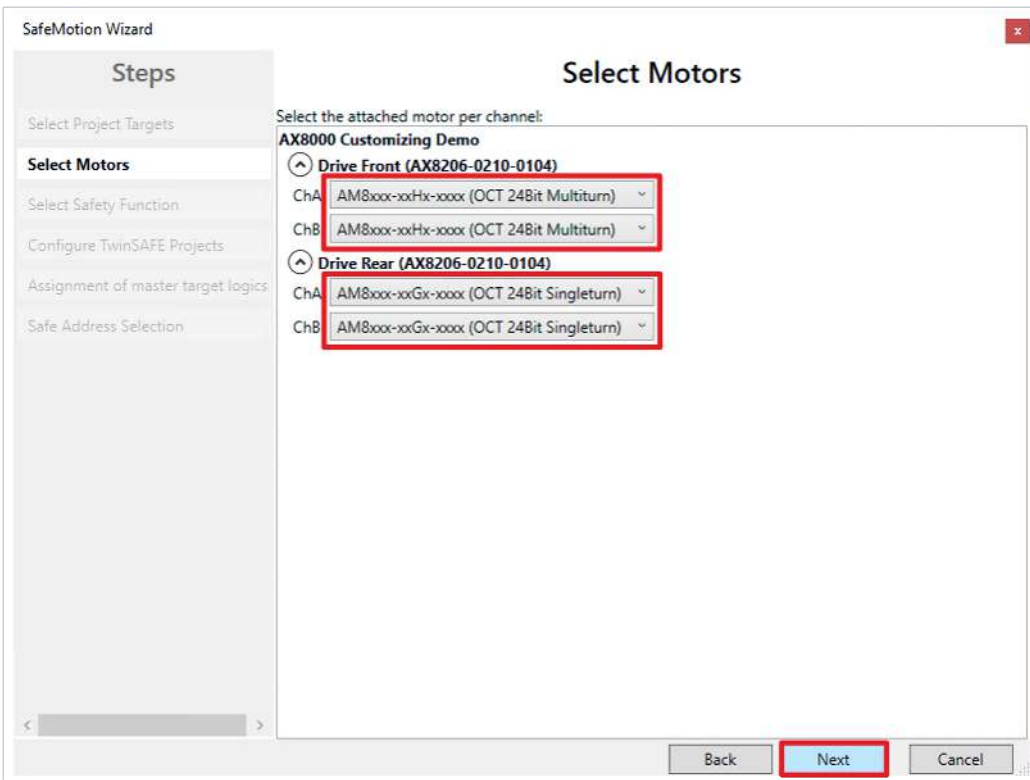


3. Select "Start SafeMotion Wizard..." via the wizard field



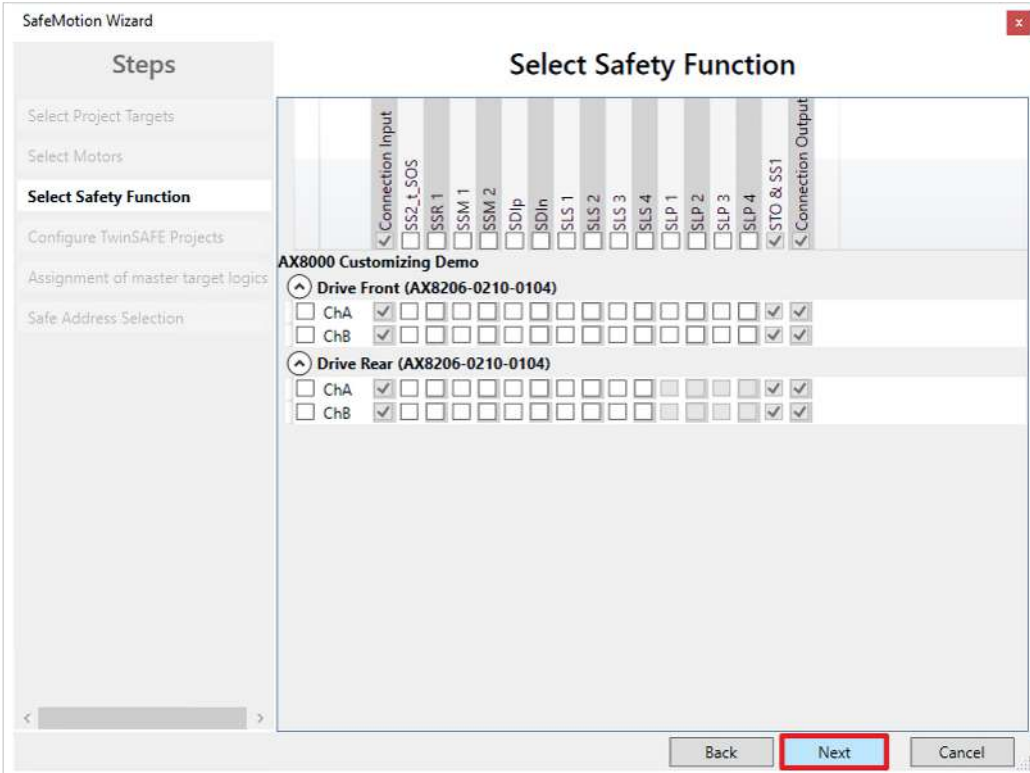
The "Select Project Targets" window opens and shows you an overview of all existing and virtual axes.

4. Select Safe-Motion components
5. Confirm selection with "Next"



In the “Select Motors” window, you configure the feedback for the individual axes.

6. Select “AM8xxx-xxHx-xxx (OCT 24Bit Multiturn)” for both channels of the Drive Front
7. Select “AM8xxx-xxGx-xxx (OCT 24Bit Singleturn)” for both channels of the Drive Rear
8. Confirm selection with “Next”

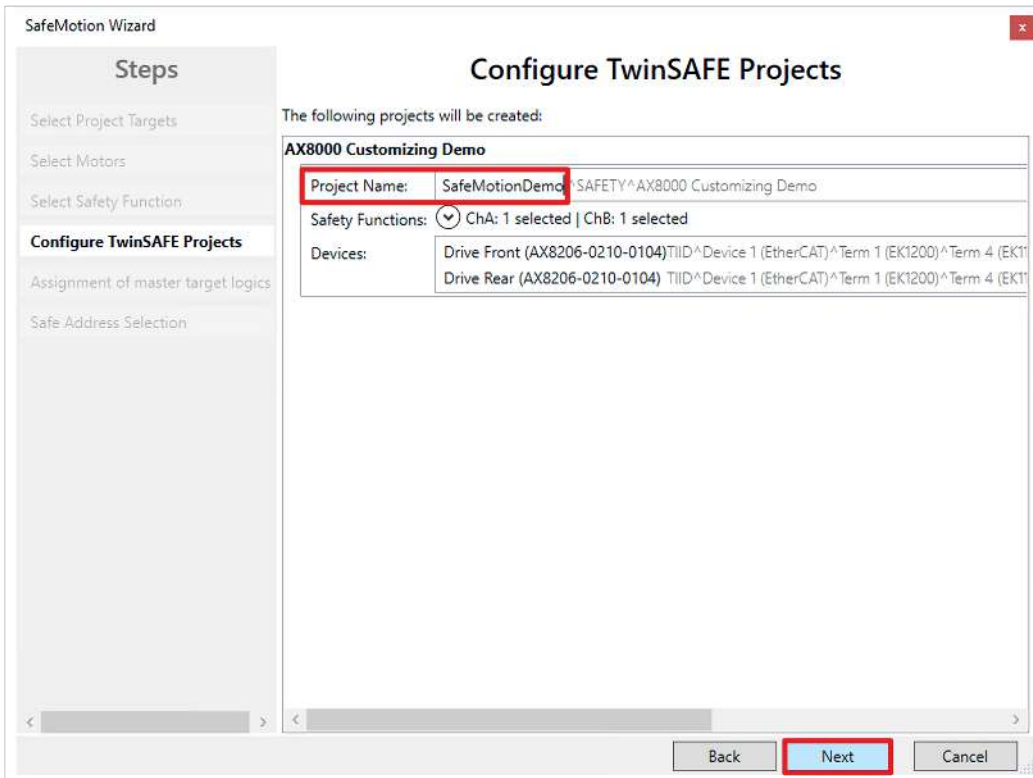


In the “Select Safety Function” window, select the desired safety functions.

9. Do not select any additional safety functions, as the default settings are sufficient here

The STO safety function is active as a default setting for all channels.

10. Confirm selection with “Next”



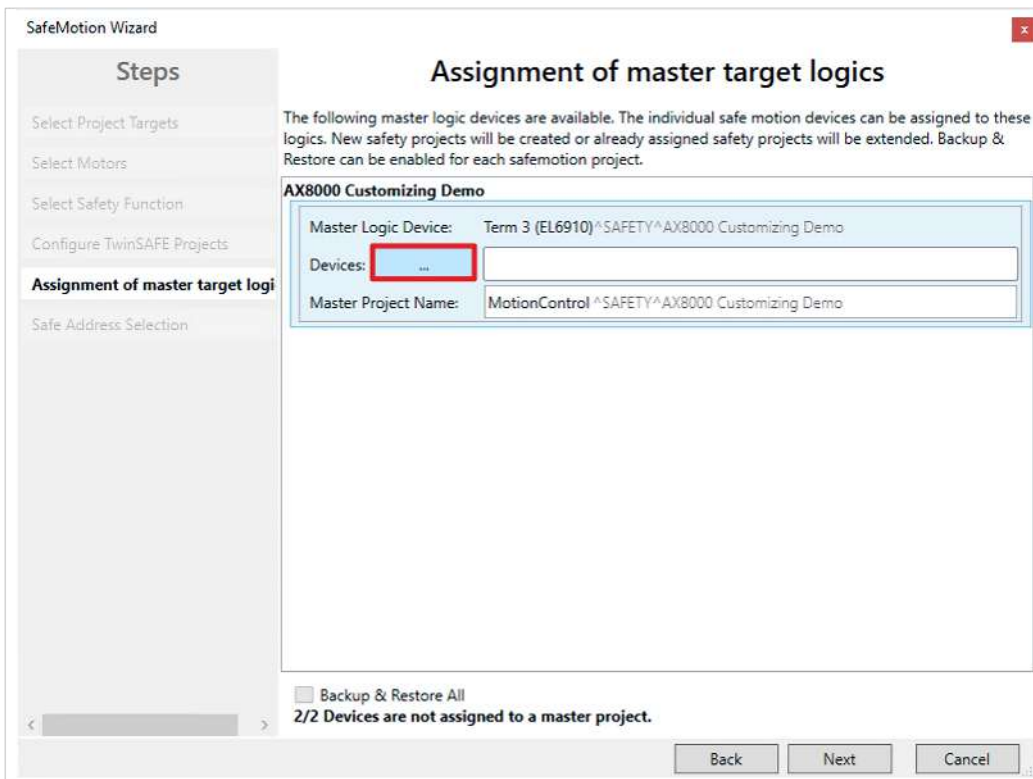
The “Configure TwinSAFE Projects” window opens. Here you have the option of renaming your safety project, which is generated for your safe motion component.

You also get an overview of the safety settings that have been made.

11. Rename project as desired

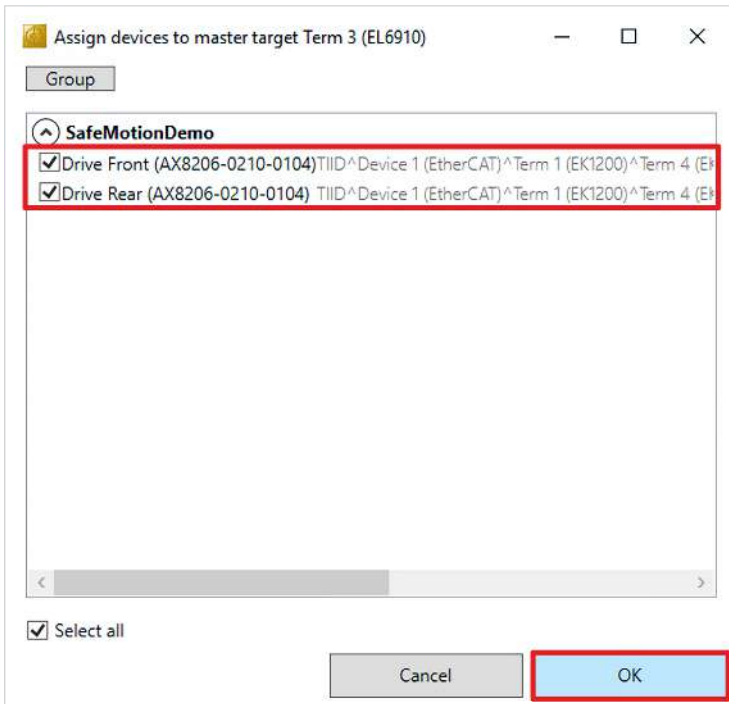
12. Check settings

13. Confirm selection with “Next”



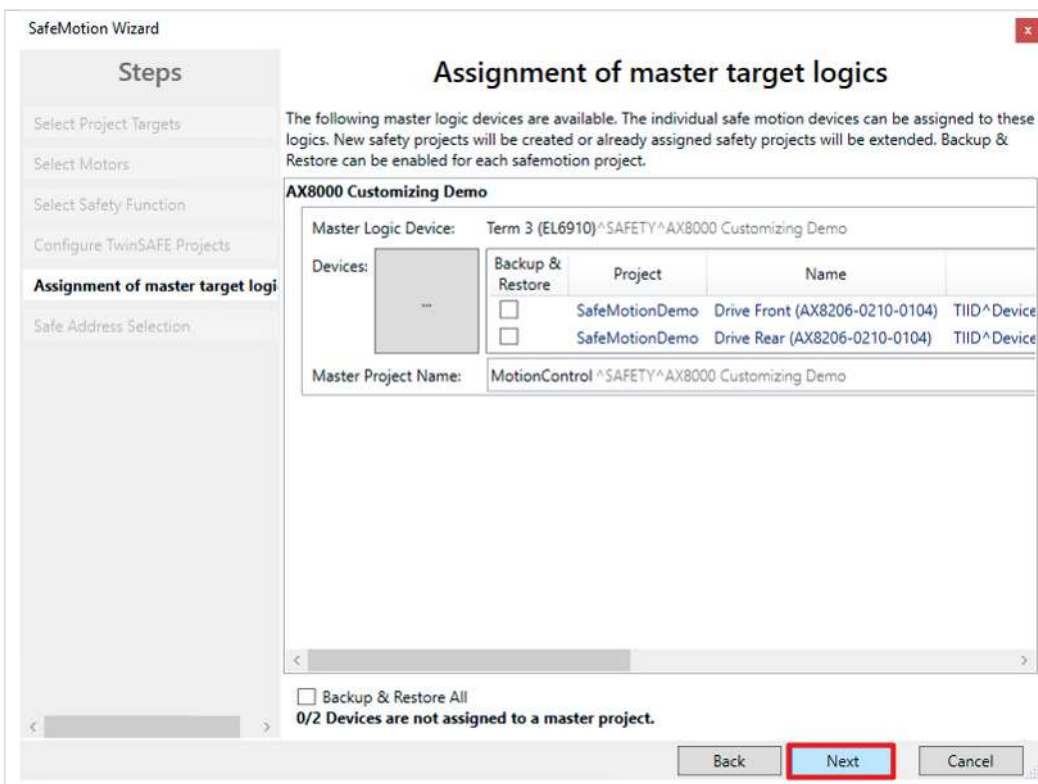
In the next window “Assignment of master target logics” the connection to the EL6910 project is closed so that your Safe Motion component can communicate with the EL6910 project. The EL6910 project is automatically found and displayed.

14. Click the button “ ... “

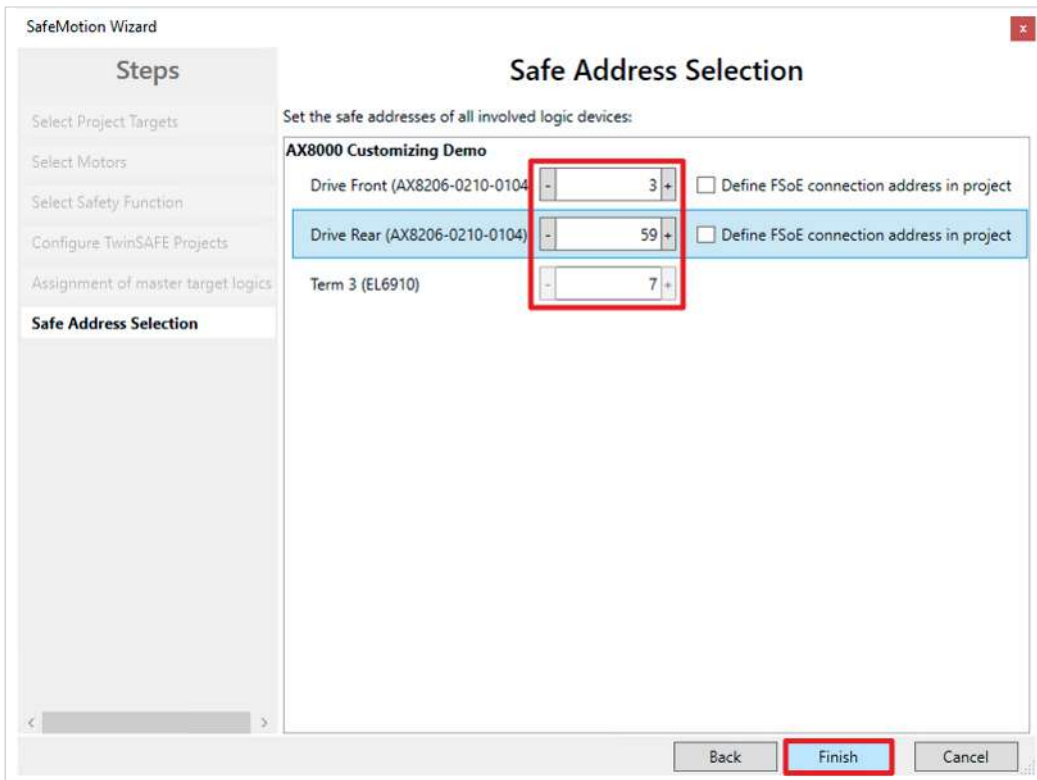


15. Select safe motion components that you want to connect to the EL6910 project

16. Confirm selection with “OK”



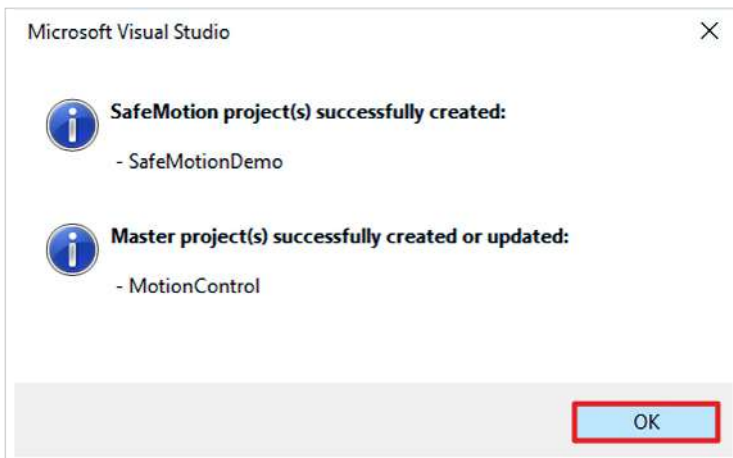
17. Confirm window with “Next”



The “Safe Address Selection” window opens. Here the safe addresses are read out automatically. For virtual axes or axes that cannot be reached, you have the option of configuring the addresses yourself.

18. Close window with “Finish”

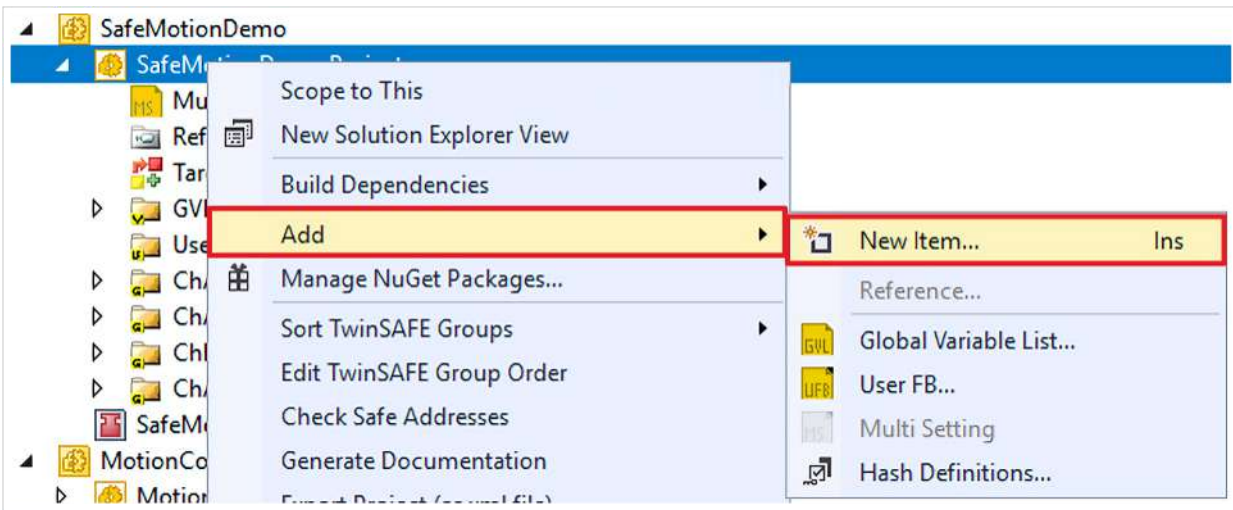
The SafeMotion Wizard configures the project.



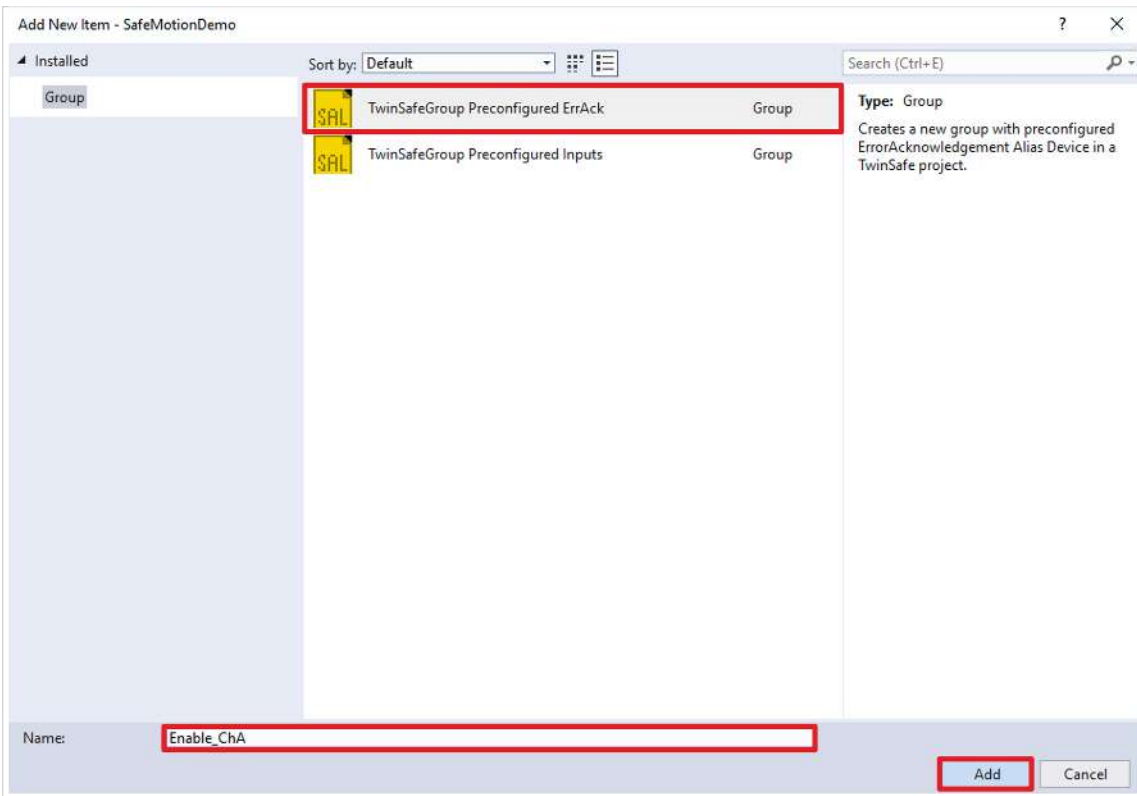
19. Close window with “OK”

2.2 Configure functionality

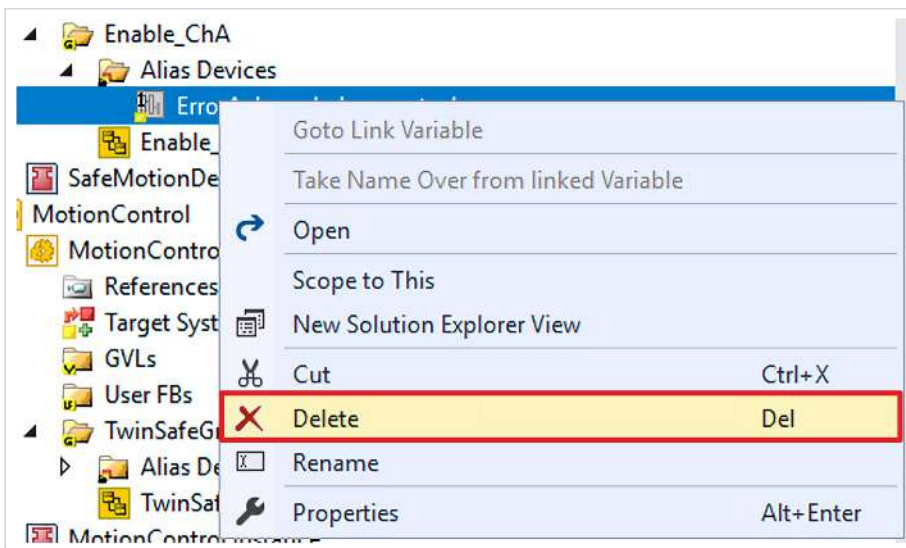
2.2.1 Create TwinSAFE group



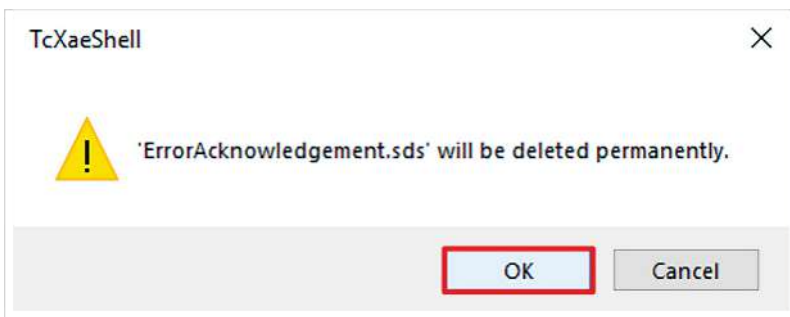
1. Right click on the newly created Safe Motion project
2. Select "New Item" via the "Add" field



3. Select "TwinSAFEGroup Preconfigured ErrAck"
4. Rename TwinSAFE group
5. Confirm selection with "Add"

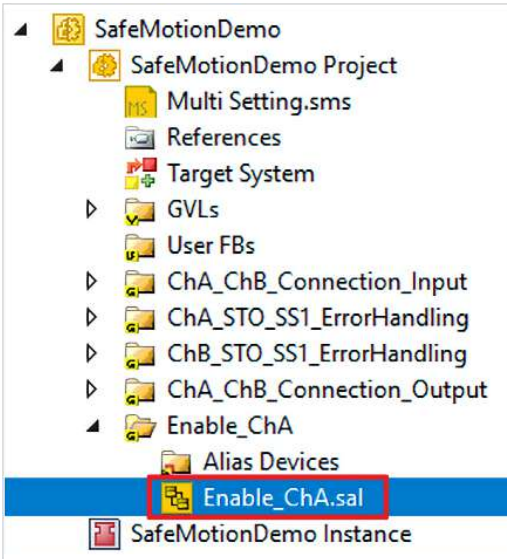


- 6. Right click on file "ErrorAcknowledgement.sds"
- 7. Click on "Delete"



- 8. Close window with "OK" to confirm deletion

2.2.2 Configure TwinSAFE group

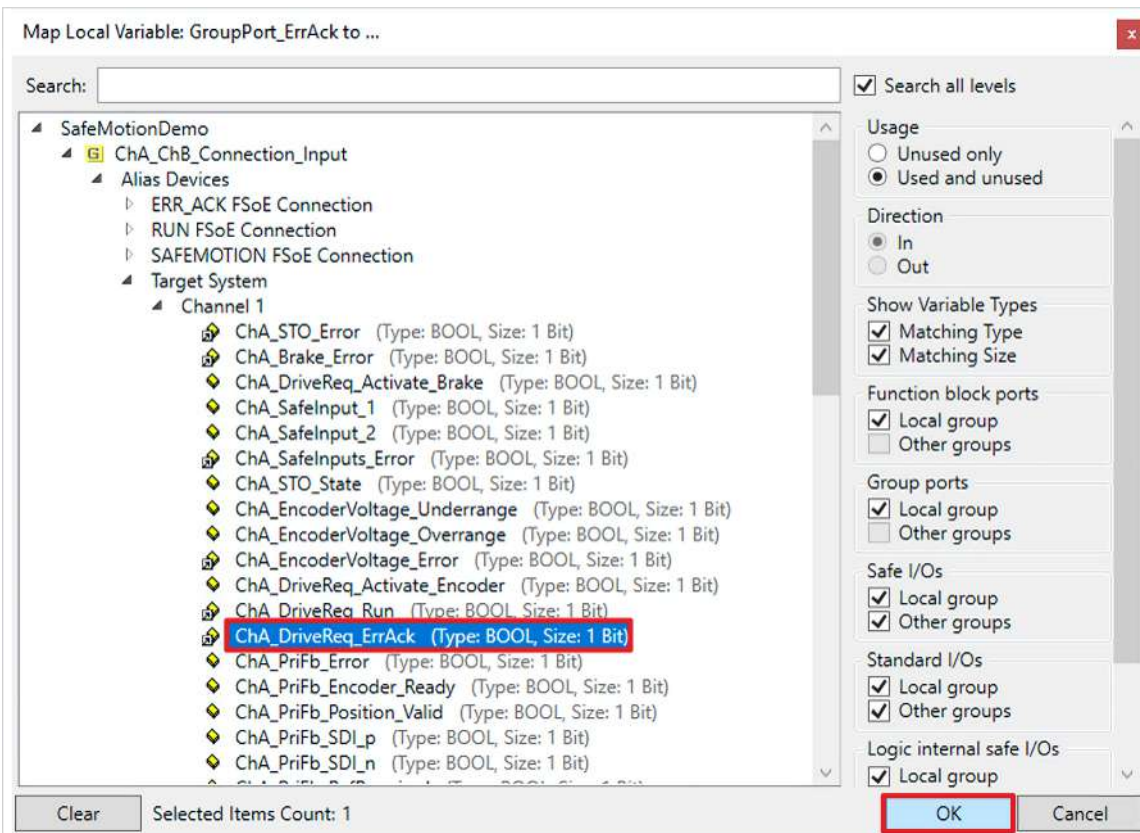


1. Open sal file of the new TwinSAFE group



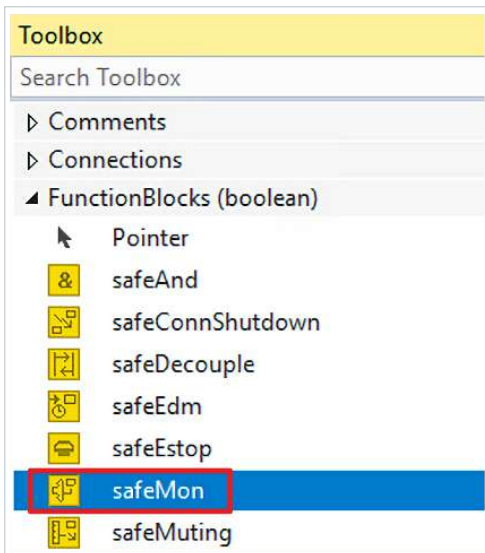
2. Open tab “Variable Mapping”

3. Click on “ ... “ at parameter “GroupPort_ErrAck”



4. Select “ChA_DriveReq_ErrAck”

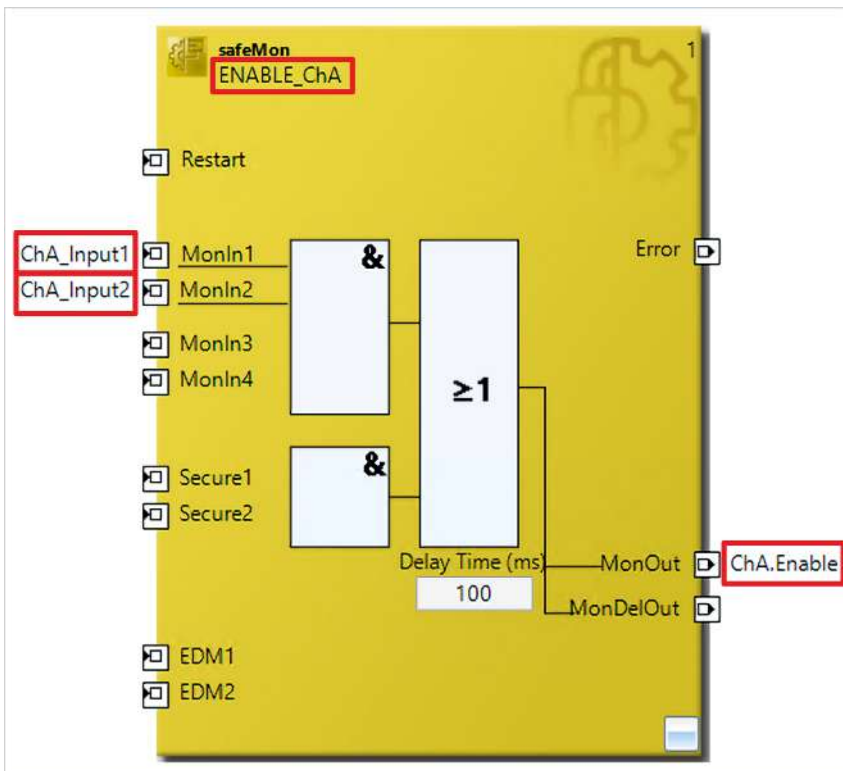
5. Confirm selection with “OK”



- 6. Open toolbox
- 7. Add a safeMon module to the network



- 8. Rename network as desired

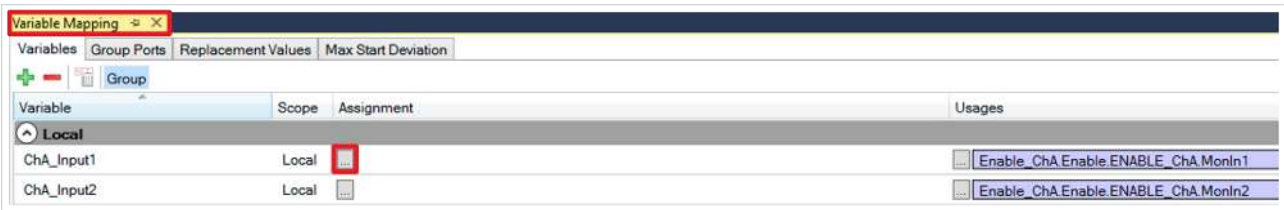


- 9. Rename safeMon block as desired
- 10. Add the following variables to the inputs and output:

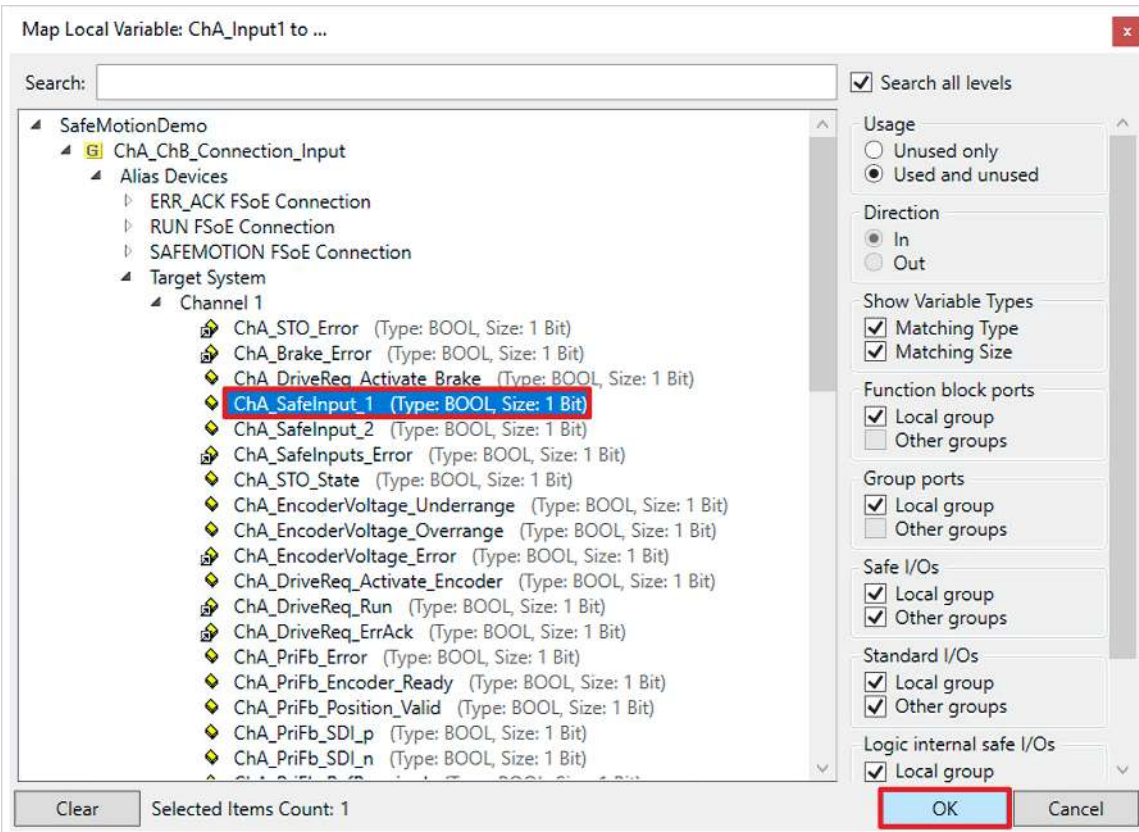
Input/Output	Variable
MonIn1	ChA_Input1
MonIn2	ChA_Input2
MonOut	ChA.Enable

2.2.3 Link inputs

In the following, you must link the individual signals and variables in the "Variable Mapping" tab. The procedure is identical for all variables and is shown here as an example for one variable using the screenshots.



1. Click the button "... " at the desired variable

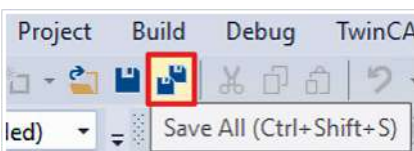


2. Select the signal for your Safe Motion component

3. Confirm selection with "OK"

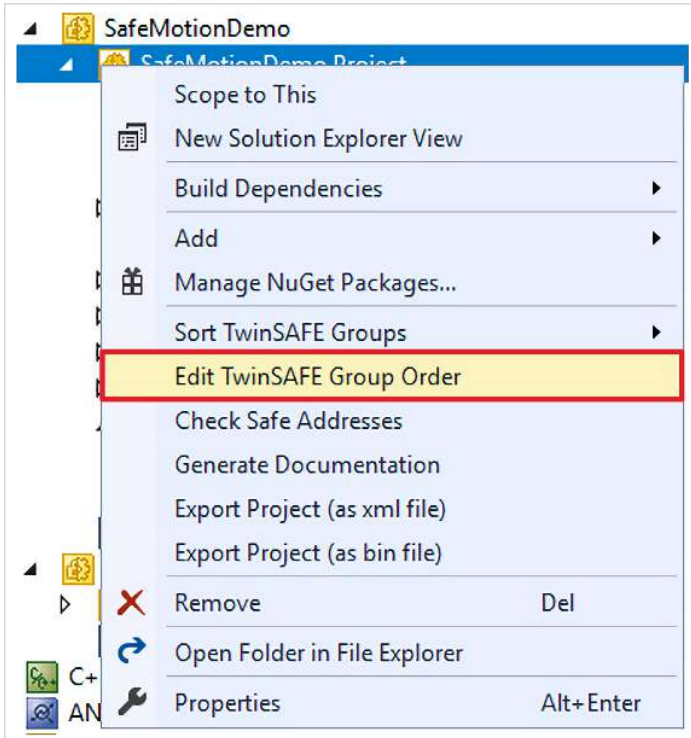
The following links result for the variables:

Variable	Signal
ChA_Input1	ChA_SafeInput_1
ChA_Input2	ChA_SafeInput_2

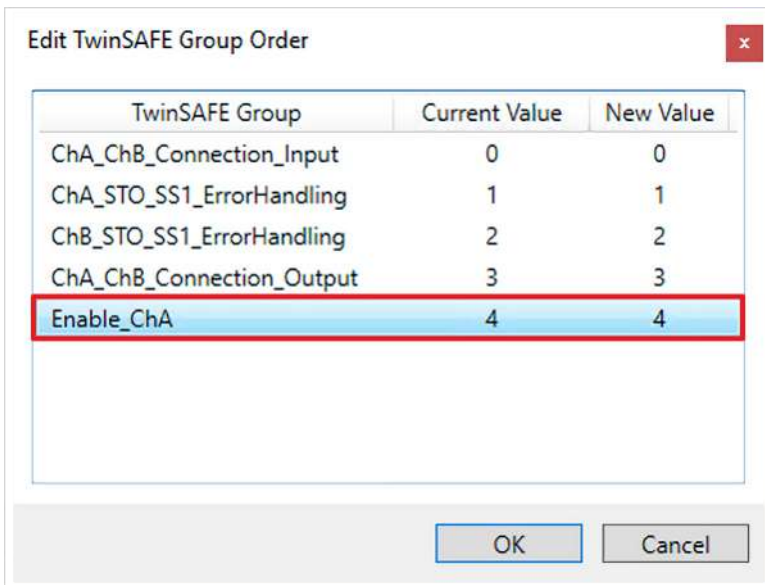


4. Click on "Save all" in the menu bar to save the settings

2.2.4 Changing the order of the TwinSAFE groups



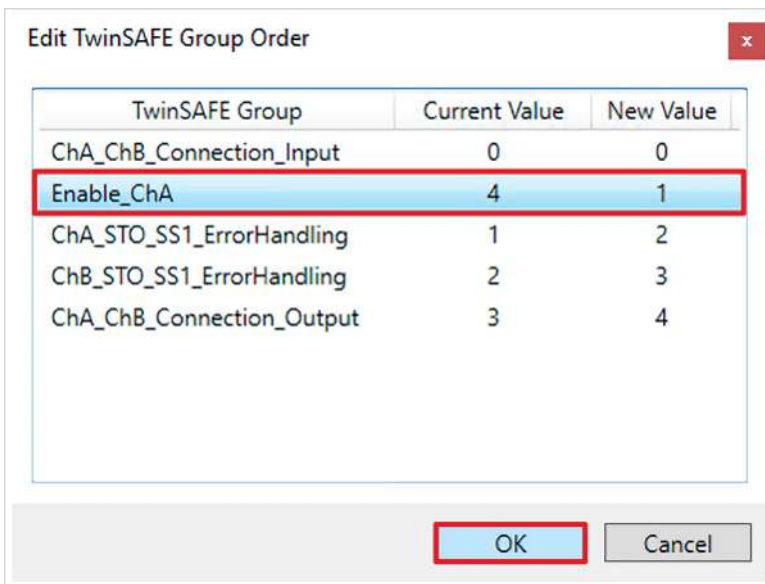
1. Right click on Safe Motion project
2. Click on "Edit TwinSAFE Group Order"



In the "Edit TwinSAFE Group Order" window you can see a comparison of the current order values of the TwinSAFE groups with the new order values.

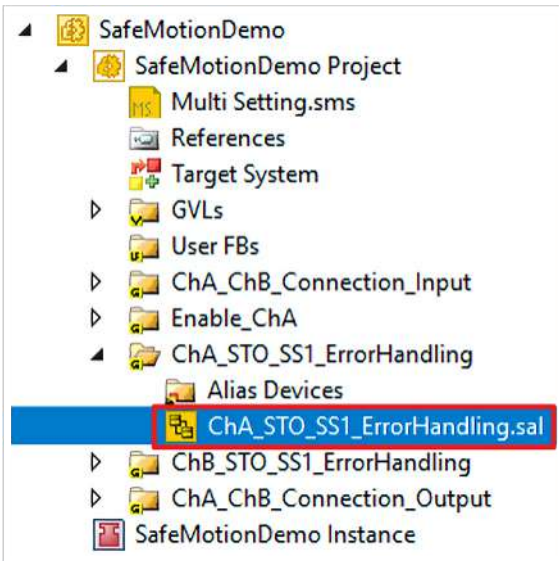
Change the order of the TwinSAFE groups as follows:

3. Click the TwinSAFE group "Enable_ChA"

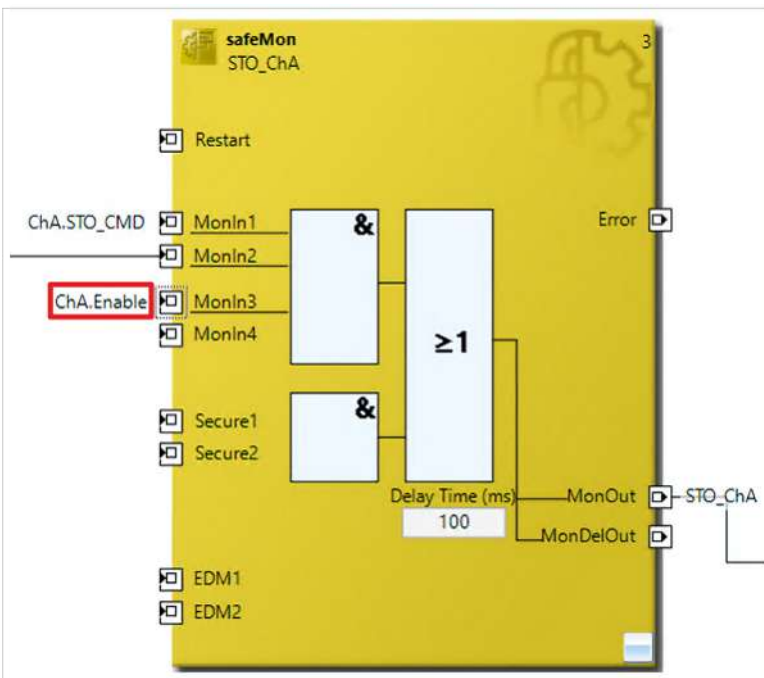


4. Drag with pressed mouse button to the position above “ChA_STO_SS1_ErrorHandling” to correspond to the Safe Motion project
5. Confirm selection with “OK”

2.2.5 Link output



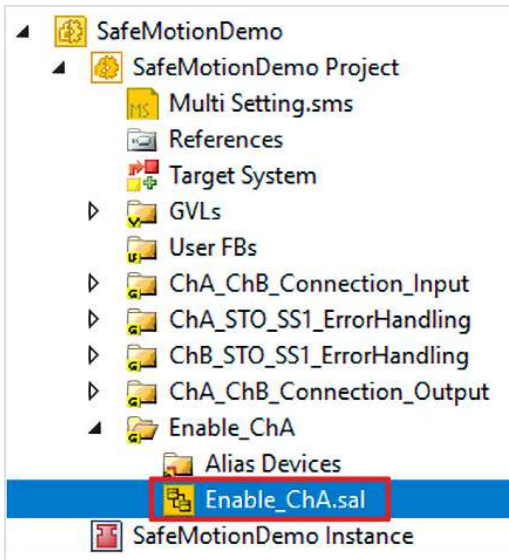
1. Open file “ChA_STO_SS1_ErrorHandling.sal”



2. Add variable “ChA.Enable” at FB3 at input MonIn3

2.3 Configure discrepancy

Proceed as follows to permanently deactivate the TwinSAFE group:

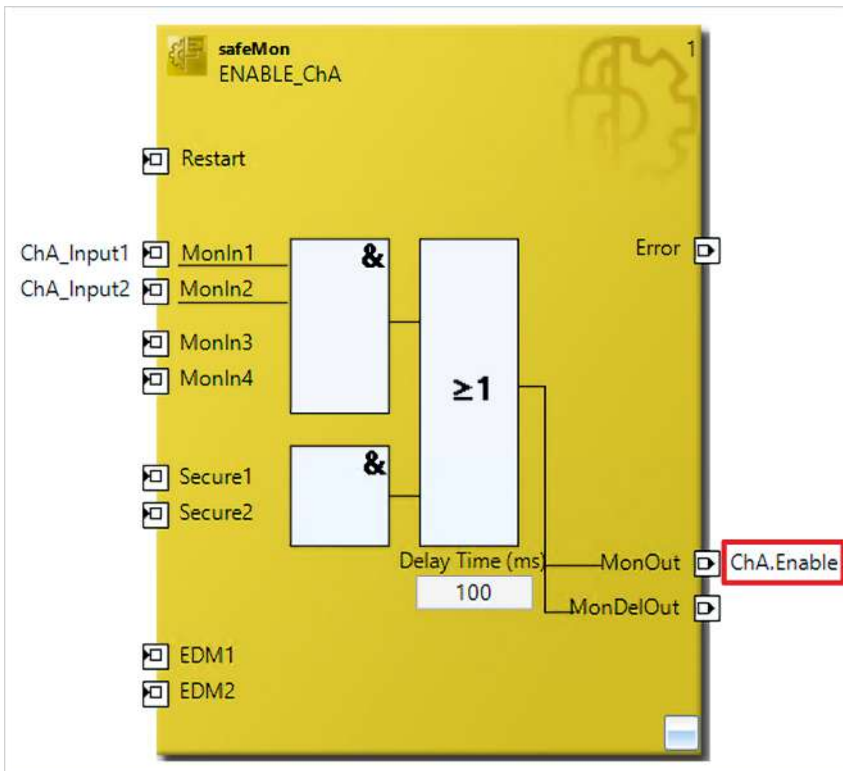


1. Open file "Enable_ChA.sal"
2. Open "Properties"

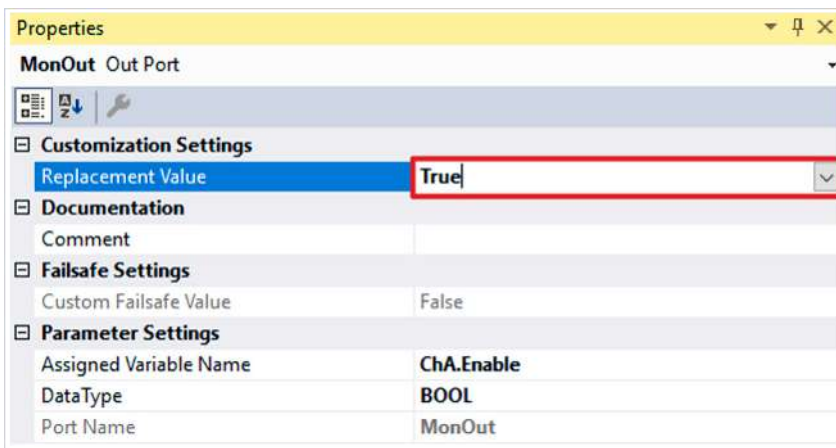


3. Select "True" in the drop-down menu of "Permanent Deactivation Allowed", so that the TwinSAFE group can be permanently deactivated

Next, configure an appropriate substitute value for the enable signal.



4. Click on enable output

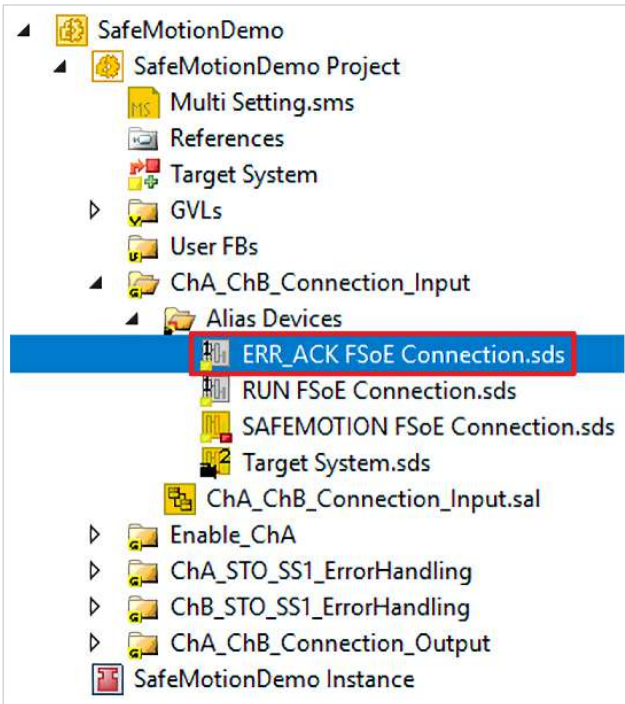


5. Select “True” in the drop-down menu of “Replacement Value”

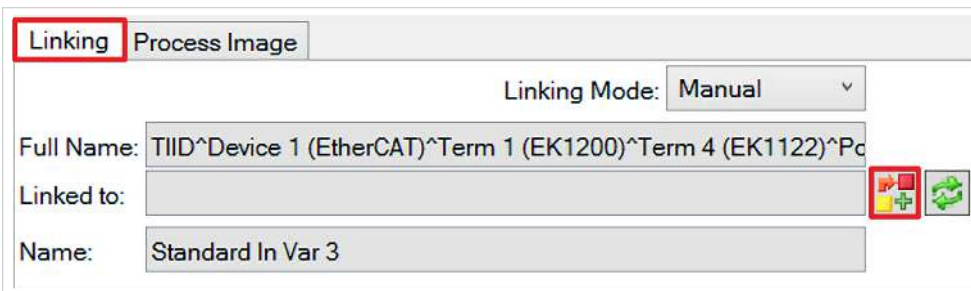
6. Click “Save all” in the menu bar to save the settings

When the group is deactivated, this enable signal is “True” so that the rest of the safety functionality continues to work.

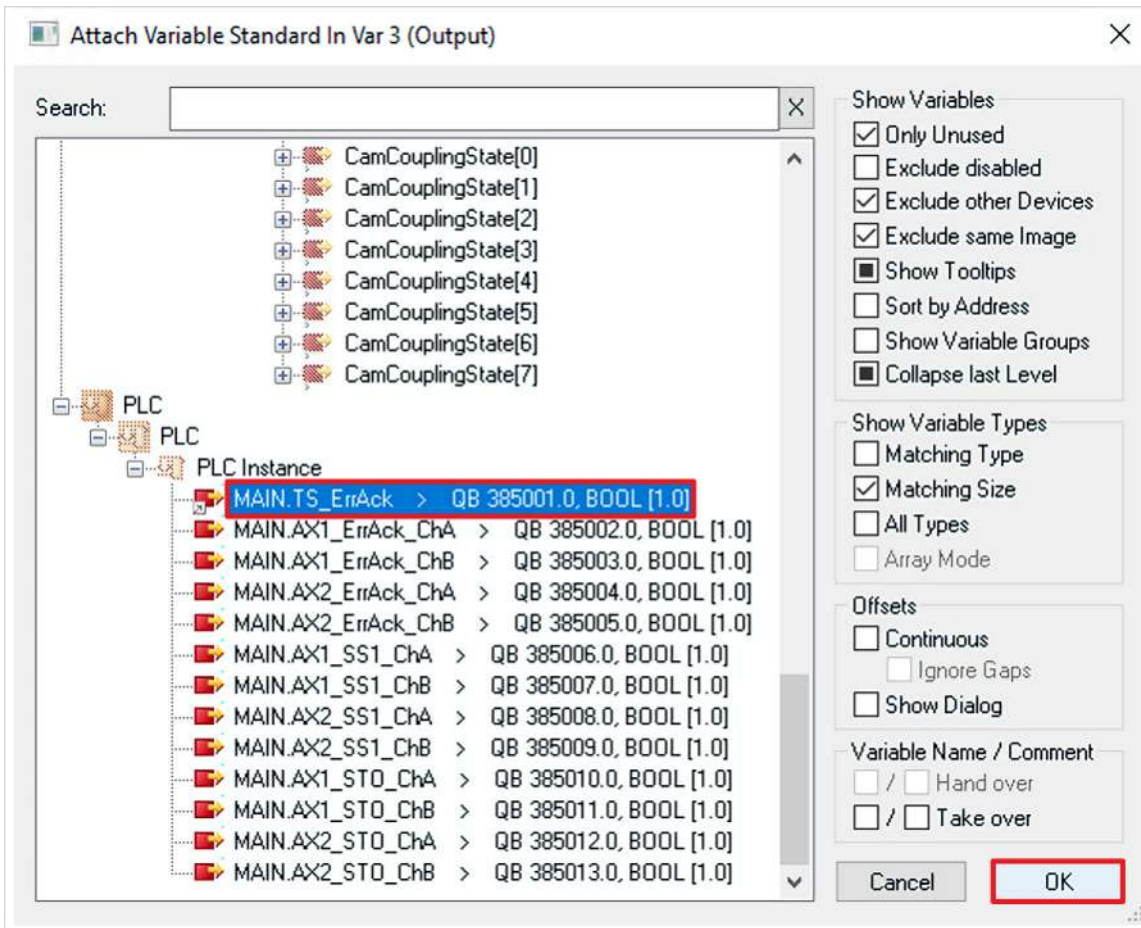
2.4 Link ErrorAck signal



1. Open file "ERR_ACK FSoE Connection.sds"

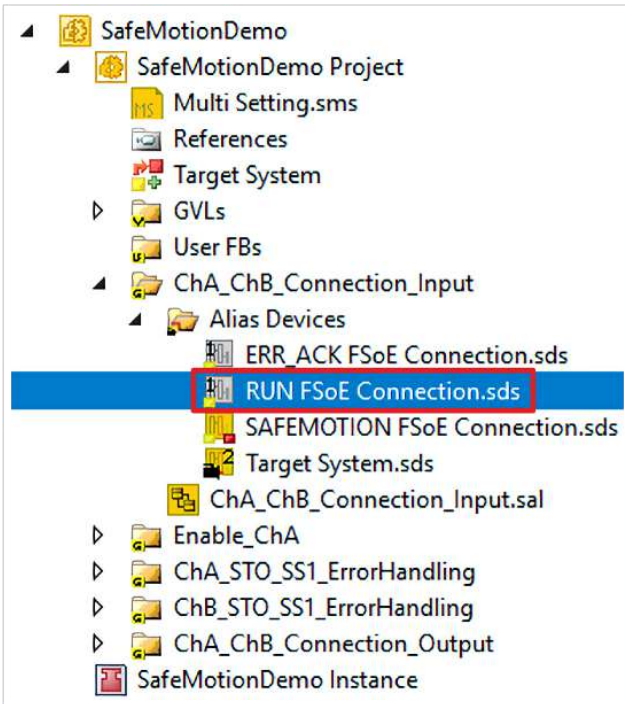


2. Click the link icon in the linking tab

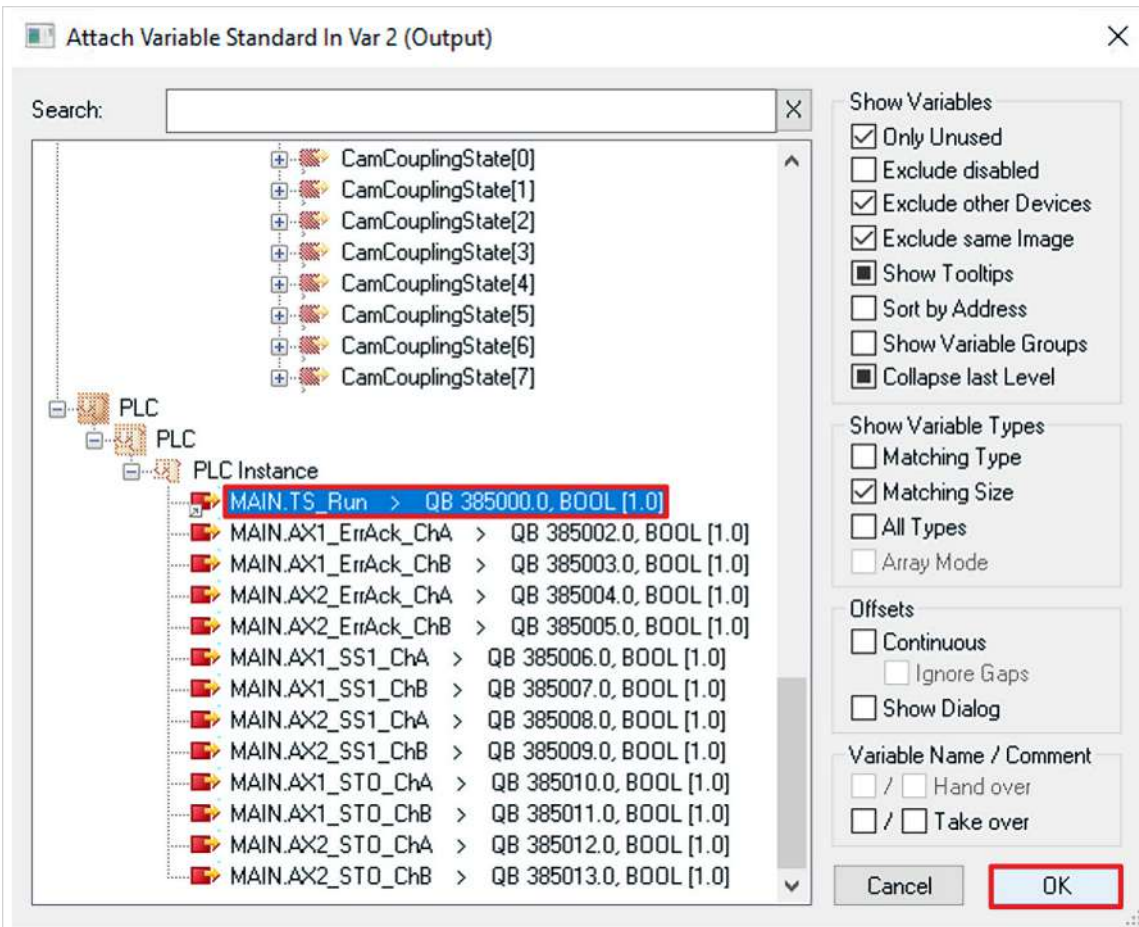


3. Select "MAIN.TS_ErrAck"
4. Confirm selection with "OK"

2.5 Link Run signal

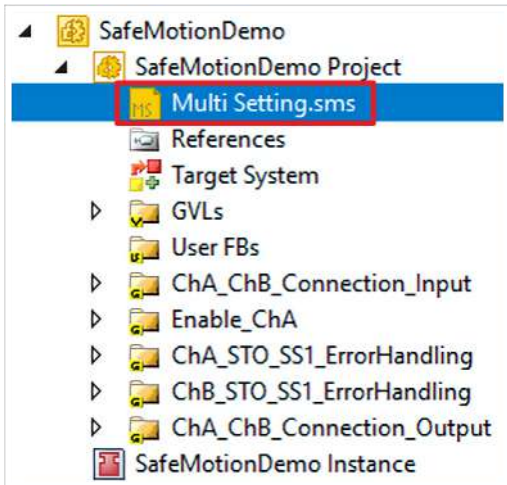


1. Open file "RUN FSoE Connection.sds"
2. Click link icon

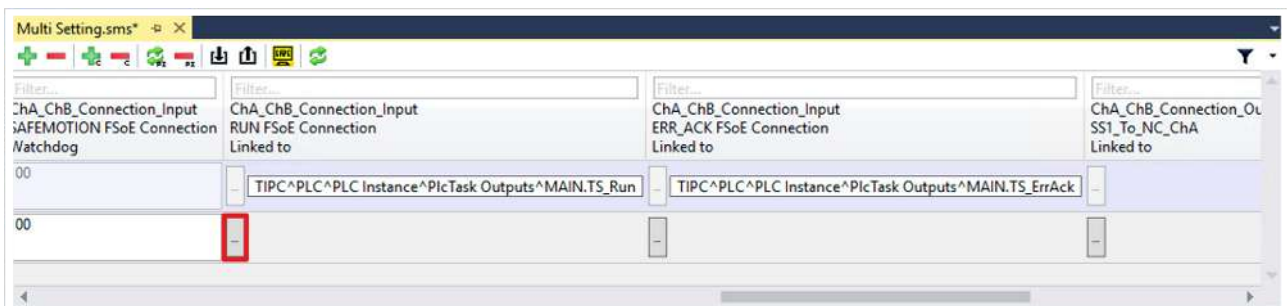


3. Select "MAIN.TS_Run"
4. Confirm selection with "OK"

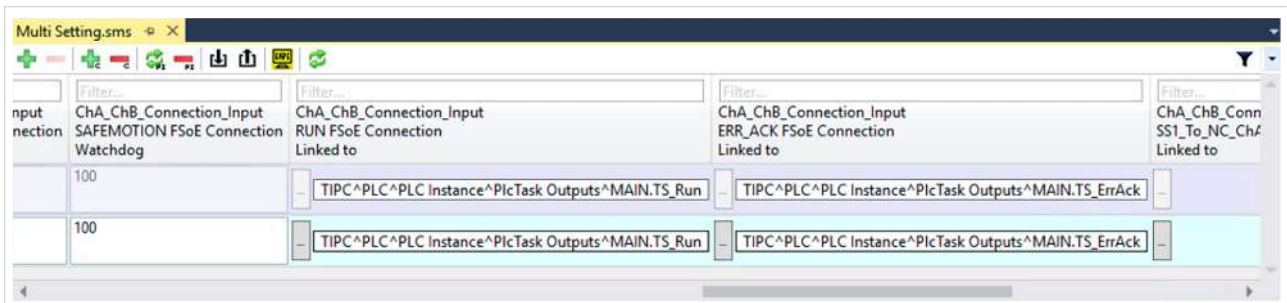
2.6 Link Multisettings



1. Open file "Multi Settings.sms"
2. Scroll to Run-FSoE-Connection



3. Click on " ... "



4. Select signals for Run and ErrorAck
5. Confirm selection with "OK"
6. Click "Save all" in menu bar to save the settings

2.7 Link projects

This chapter describes the linking of the SafeMotion project with the EL6910 Safety project via the EL6910 parameters.

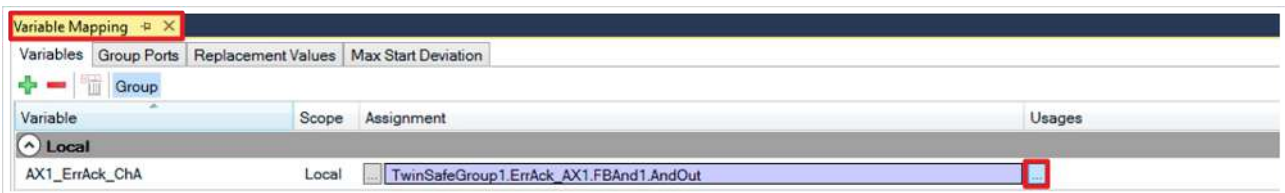
The SafeMotion Wizard has already created the connections via the Alias Devices.

Proceed as follows:

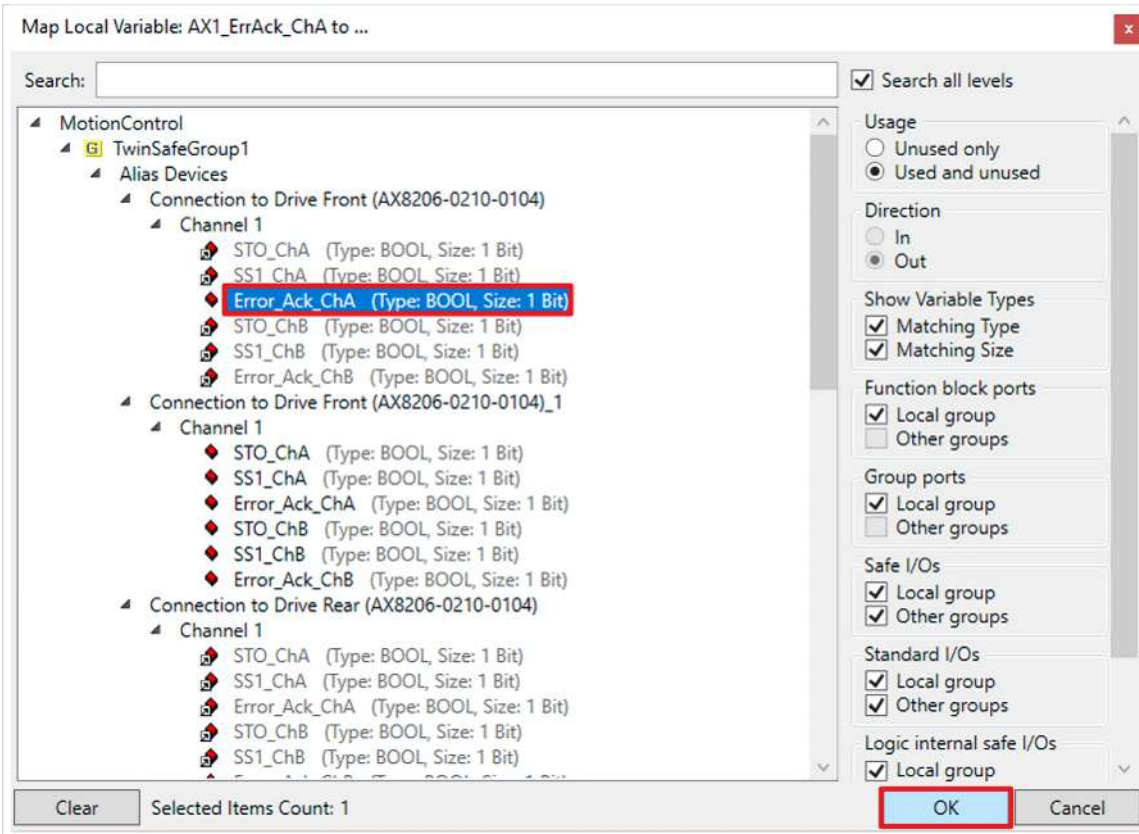


1. Open the "TwinSafeGroup1.sal" file in your EL6910 project
2. Open the "Variable Mapping" tab

In the following, you must link the individual signals and variables in the "Variable Mapping" tab. The procedure is identical for all variables and is shown here as an example using the screenshots for one variable.



3. Click the button "... " at the desired variable



4. Select the signal for your safe motion component
5. Confirm selection with “OK”

The following links result for the variables:



Link

The cells with “ / “ are already filled in and do not have to be linked. The information in the brackets is used for the assignment to “Connection to Drive Front” and “Connection to Drive Rear”.

Variable	Assignment	Usages
AX1_ErrAck_ChA	/	Error_Ack_ChA (Drive Front)
AX1_ErrAck_ChB	/	Error_Ack_ChB (Drive Front)
AX2_ErrAck_ChA	/	Error_Ack_ChA (Drive Rear)
AX2_ErrAck_ChB	/	Error_Ack_ChB (Drive Rear)
ErrAck_Req_AX1_ChA	Error_AckReq_ChA (Drive Front)	/
ErrAck_Req_AX1_ChB	Error_AckReq_ChB (Drive Front)	/
ErrAck_Req_AX2_ChA	Error_AckReq_ChA (Drive Rear)	/
ErrAck_Req_AX2_ChB	Error_AckReq_ChB (Drive Rear)	/
SSO_STO_Global	/	STO_ChA SS1_ChA STO_ChB SS1_ChB (Drive Front)
		STO_ChA SS1_ChA STO_ChB SS1_ChB (Drive Rear)

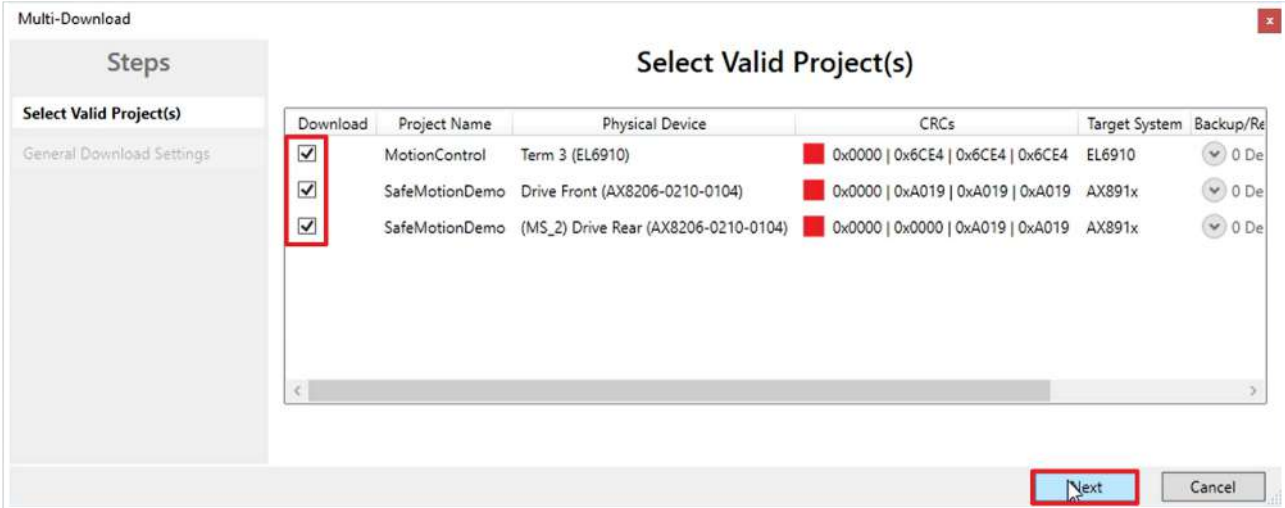
6. Click on “Save all” in the menu bar to save the settings

The link is now complete. In the next chapter you will download the safety projects.

2.8 Download Safety projects

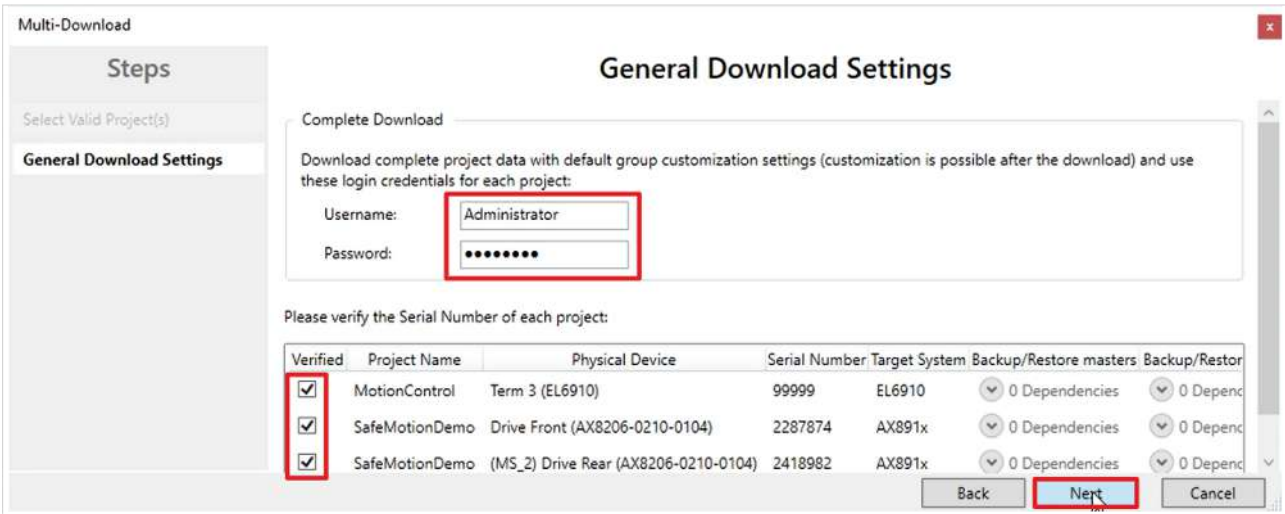


1. Click on “Multi-Download Safety Project(s)”



The “Select Valid Project(s)” window opens. Here you can see which safety projects you can download.

2. Select the safety projects that you want to download
3. Confirm selection with “Next”

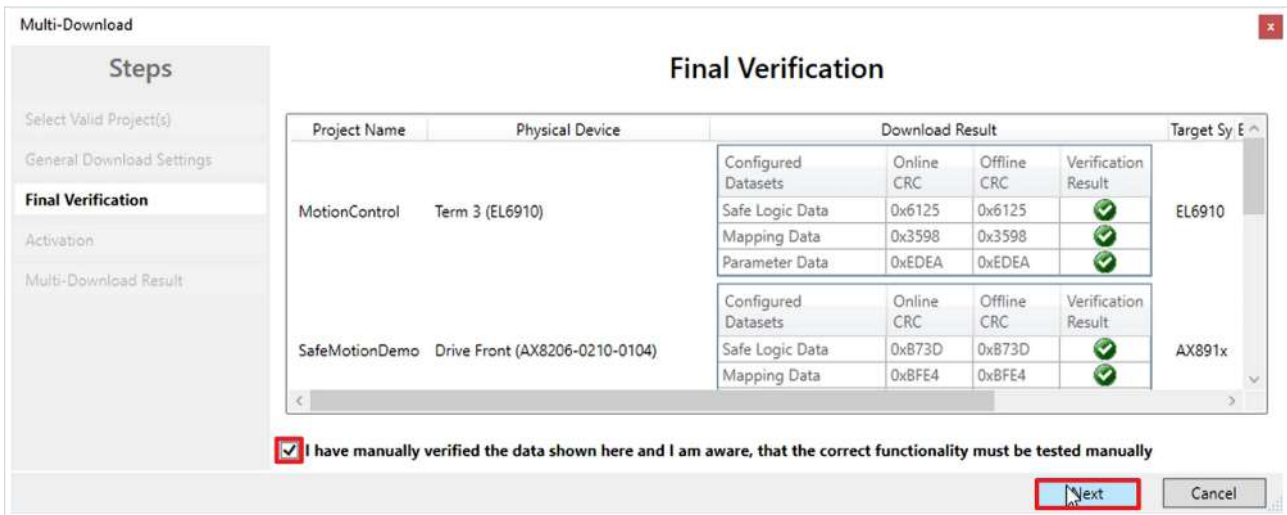


4. Enter the username and password in the “General Download Settings” window

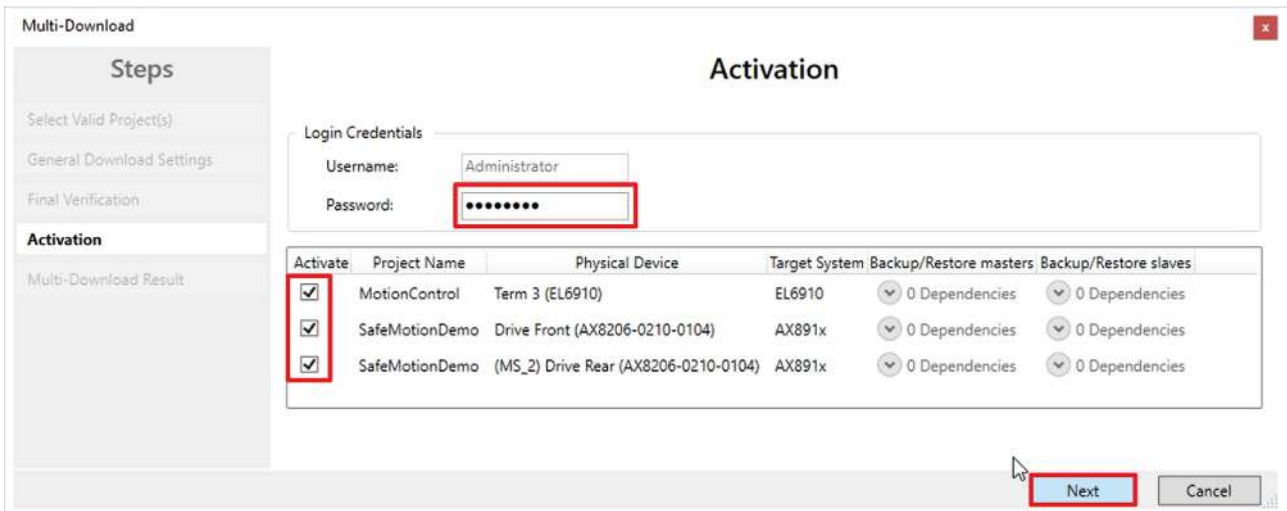
Default username: Administrator

Default password: TwinSAFE

5. Select the safety projects that you want to download
6. Confirm selection with “Next”

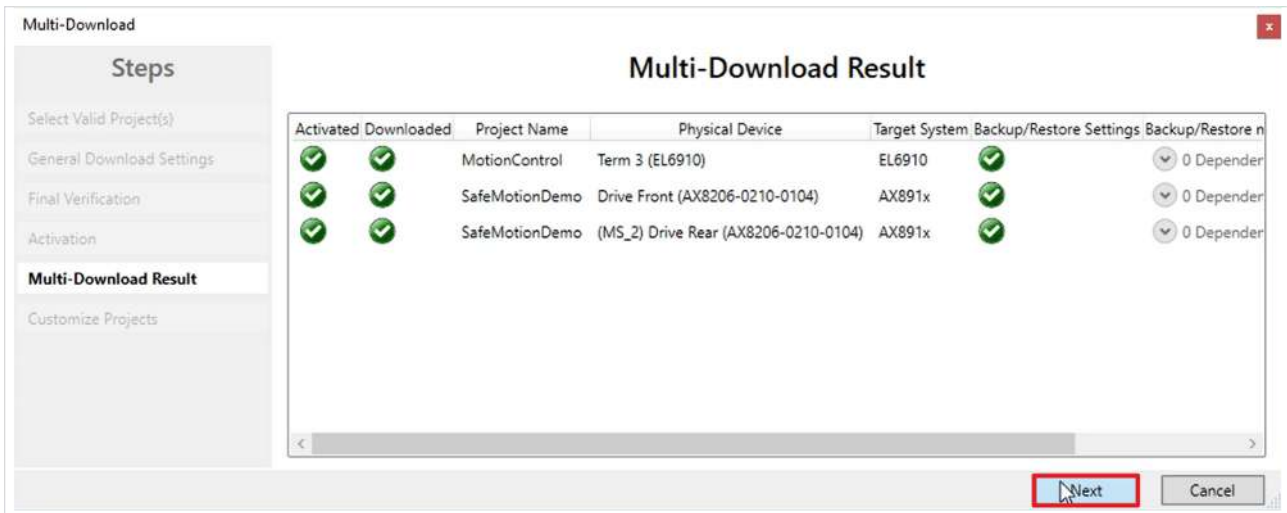


7. Check the CRCs in the “Final Verification” window
8. If the CRCs match, click on the box to confirm the verification
9. Confirm window with “Next”

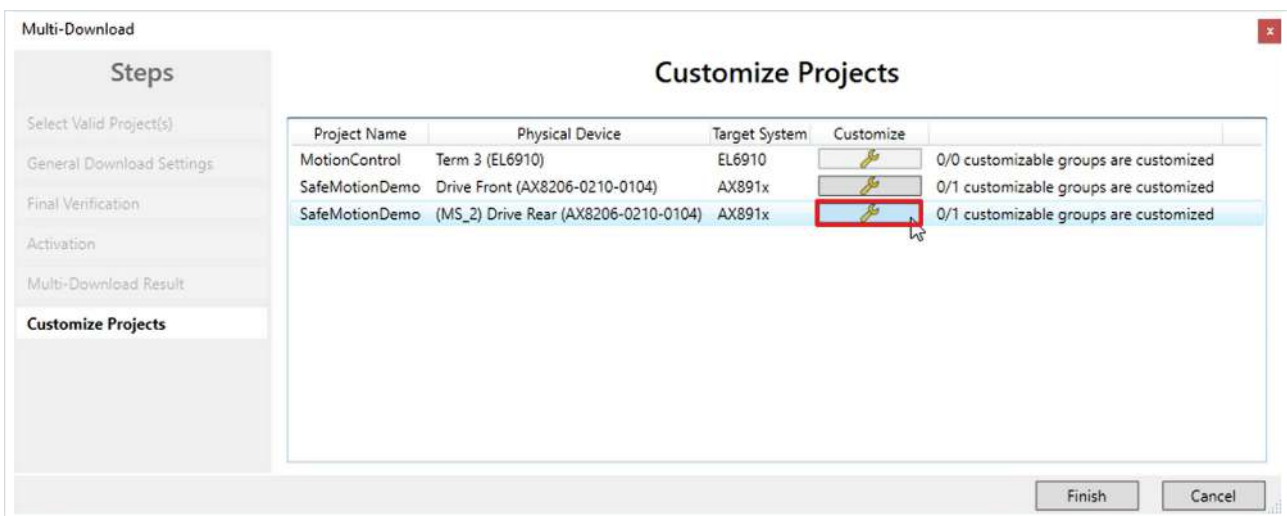


The “Activation” window opens, in which you activate the safety projects.

10. Enter the default password
11. Check if the safety projects are selected
12. Confirm selection with “Next”



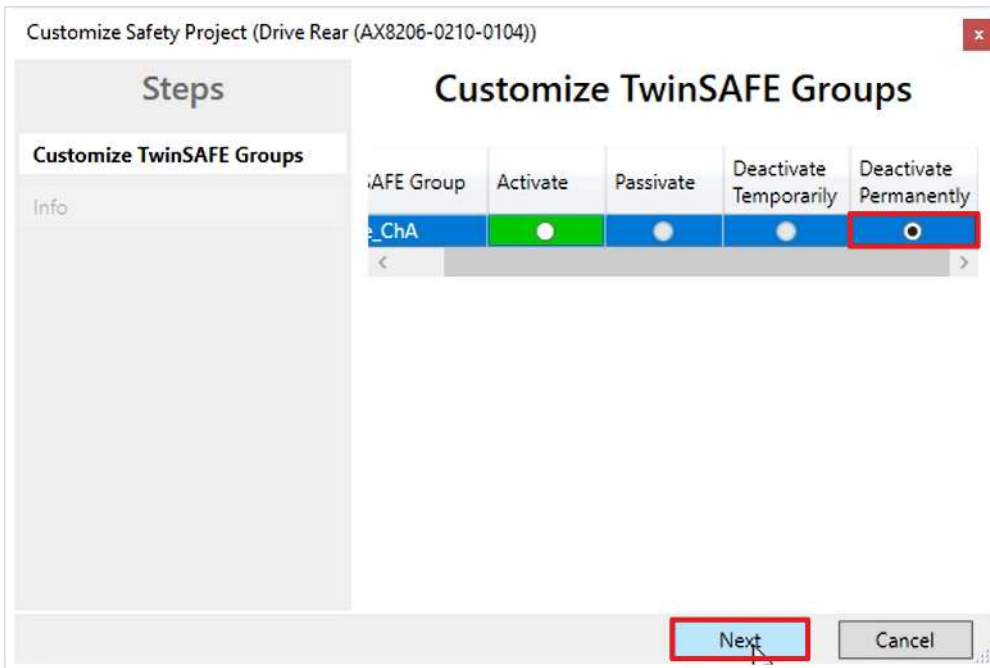
13. Close the window "Multi-Download Result" with "Next"



If customizing is configured in one of your projects, the additional "Customize Projects" window appears. Here you get an overview of the projects for which customizing is possible.

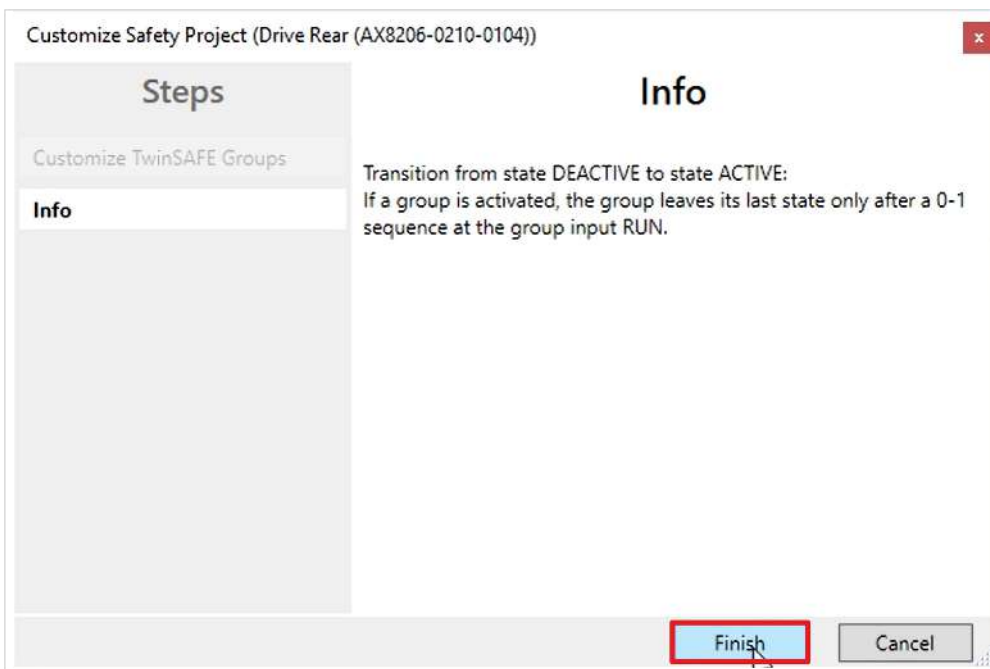
In this use case, the additional functionality should be active on the Drive Front and not on the Drive Rear. Therefore, deactivate the additional functionality in Customizing for the Drive Rear as follows:

14. Click on the wrench icon of the Drive Rear to open customizing



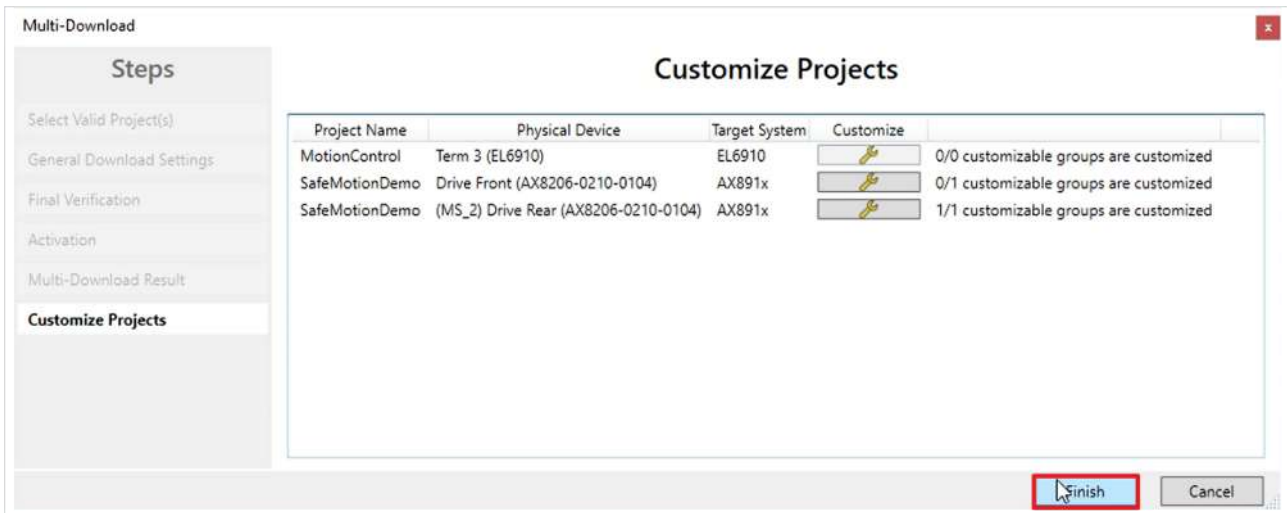
15. Select “Deactivate Permanently”

16. Confirm selection with “Next”



The “Info” window informs you about the settings made

17. Close window with “Finish”



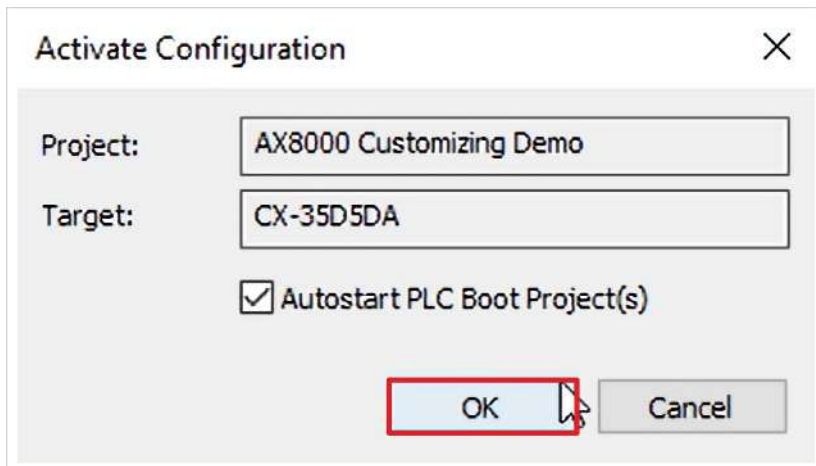
- 18. Close “Customize Projects” window with “Finish”
 - 19. Click “Save all” in the menu bar to save the settings
- Your safety projects are now downloaded and active.

2.9 Activate configuration

Since the process images of the Safe Motion components and the EL6910 have been changed, it is necessary to reactivate the configuration. To do this, proceed as follows:



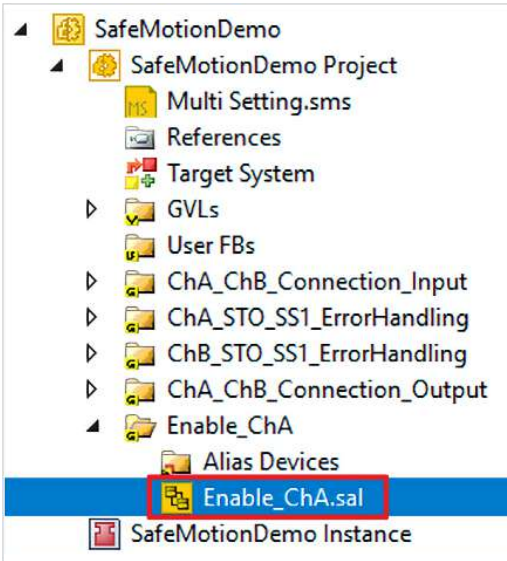
Click on “Activate Configuration” in the menu bar



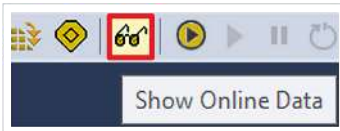
1. Confirm the “Activate Configuration” window with “OK”

2.10 Check signals

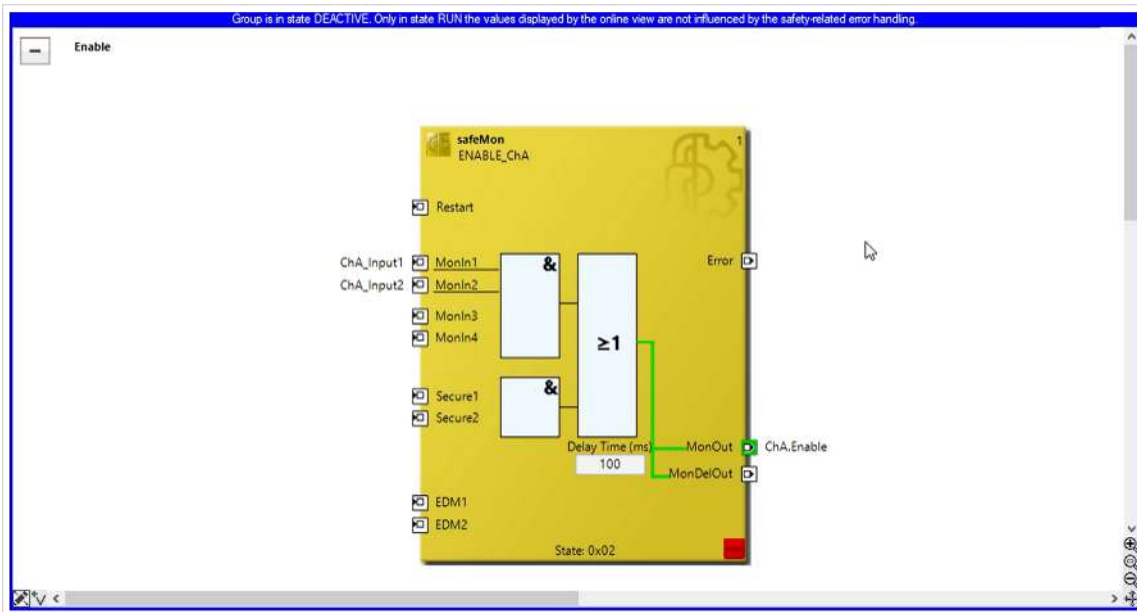
In the following, check the configuration as follows:



1. Open file "Enable_ChA.sal"

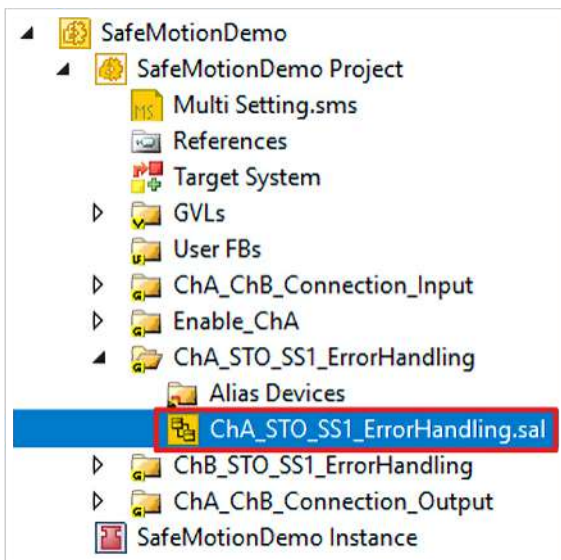


2. Click in the menu bar "Show Online Data" to enable the online view

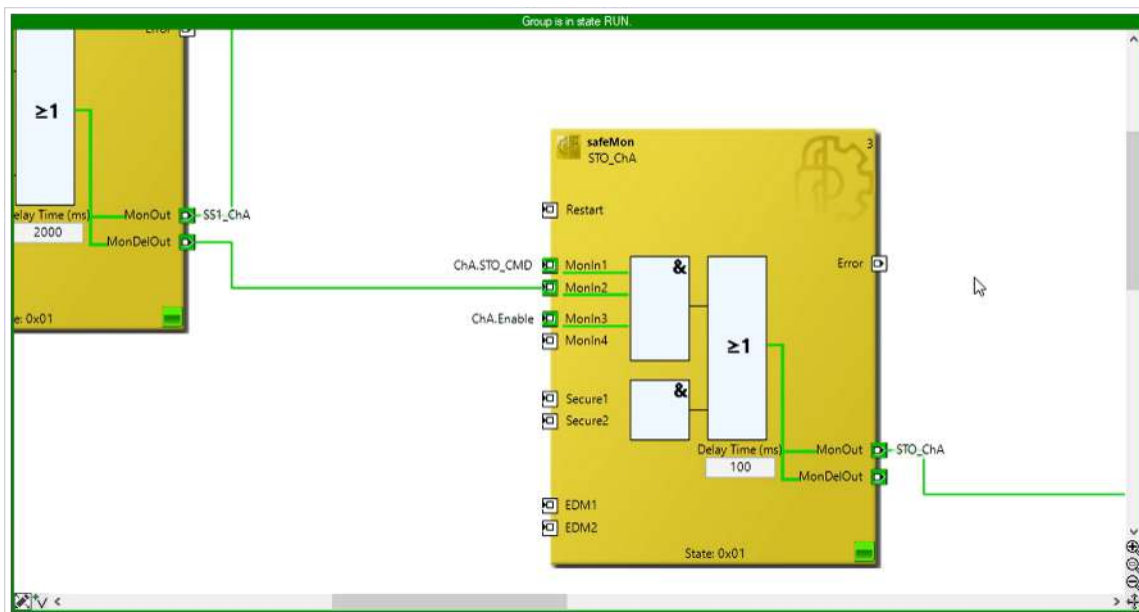


You can see for the Drive Rear that the TwinSAFE group is disabled.

Since a substitute value is configured for the Enable output, the output is still True.



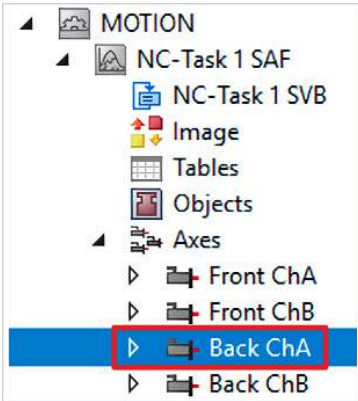
3. Open file “ChA_STO_SS1_ErrorHandling.sal”



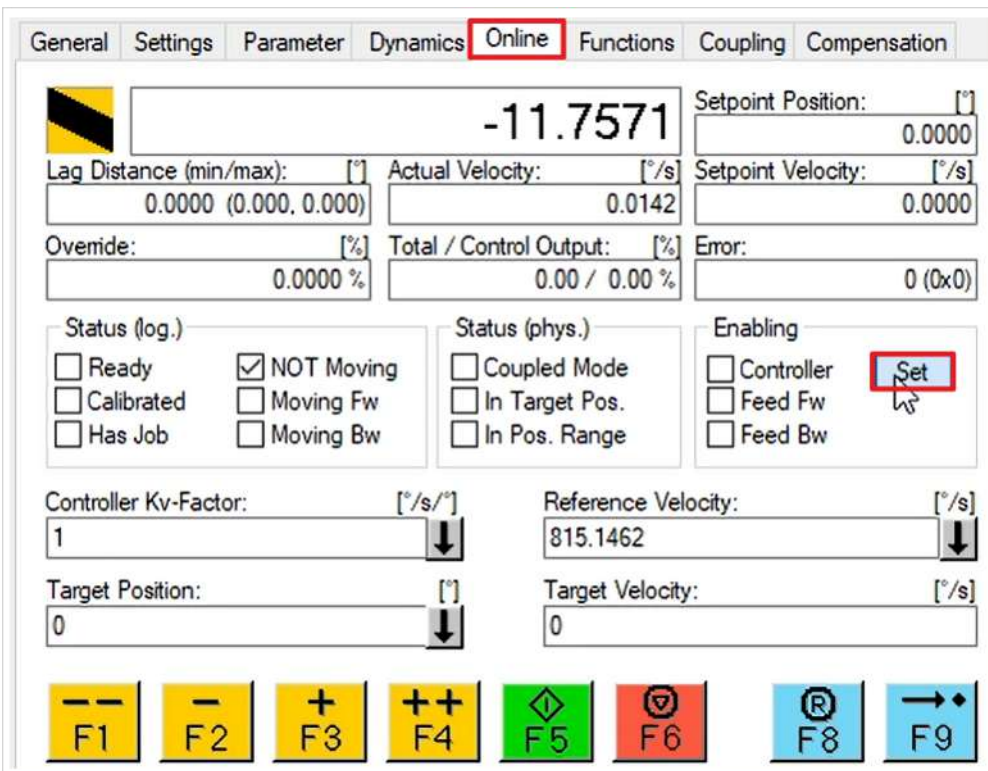
In the ErrorHandling you see now also that the Enable-Input is True.

2.11 Let motor traverse

Activate the axis as follows:

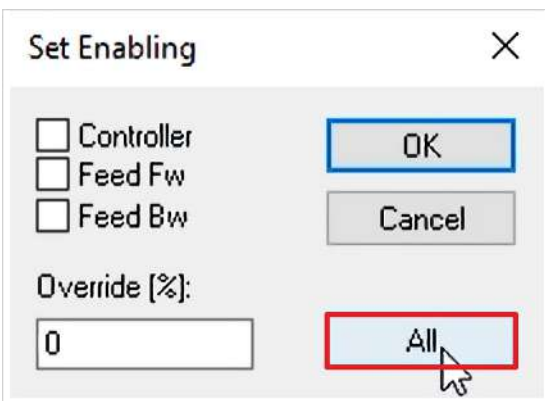


1. Open "Back ChA"




2. Open tab "Online"

3. Click on "Set"



4. Close window with "All"

General Settings Parameter Dynamics **Online** Functions Coupling Compensation

 **-7.0313** Setpoint Position: [°] -6.4000

Lag Distance (min/max): [°] 0.3347 (-0.070, 0.335) Actual Velocity: [°/s] 36.6502 Setpoint Velocity: [°/s] 37.0521

Override: [%] 100.0000 % Total / Control Output: [%] 4.59 / 0.04 % Error: 0 (0x0)

Status (log.) Status (phys.) Enabling

Ready NOT Moving Coupled Mode Controller

Calibrated Moving Fw In Target Pos. Feed Fw

Has Job Moving Bw In Pos. Range Feed Bw


Controller Kv-Factor: [°/s/°] 1 Reference Velocity: [°/s] 815.1462

Target Position: [°] 0 Target Velocity: [°/s] 0

F1 **F2** **F3** **F4** **F5** **F6** **F8** **F9**

5. Click on "F3"

General Settings Parameter Dynamics **Online** Functions Coupling Compensation

 **18.6912** Setpoint Position: [°] 18.0847

Lag Distance (min/max): [°] -0.3100 (-0.502, 0.361) Actual Velocity: [°/s] -37.7509 Setpoint Velocity: [°/s] -37.0521

Override: [%] 100.0000 % Total / Control Output: [%] -4.58 / -0.04 % Error: 0 (0x0)

Status (log.) Status (phys.) Enabling

Ready NOT Moving Coupled Mode Controller

Calibrated Moving Fw In Target Pos. Feed Fw

Has Job Moving Bw In Pos. Range Feed Bw

Controller Kv-Factor: [°/s/°] 1 Reference Velocity: [°/s] 815.1462

Target Position: [°] 0 Target Velocity: [°/s] 0

F1 **F2** **F3** **F4** **F5** **F6** **F8** **F9**

6. Click on "F2"

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