SafeMotion Wizard
SLP with automatic referencing
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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 10 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 adding automatic referencing to an existing SafeMotion Wizard project with SLP functionality.

1.1 Issue statuses

<table>
<thead>
<tr>
<th>Version</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0.0</td>
<td>• First released version</td>
</tr>
<tr>
<td>0.0.1</td>
<td>• First draft</td>
</tr>
</tbody>
</table>

1.2 Requirements

Meet the following requirements for this tutorial:

• TwinCAT 3 version ≥ 3.1.4024.11
• TwinCAT Safety Editor TE9000 ≥ 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,
• an AX8000 project with SLP functionality 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:
- Configuration of SLP (Safe Limited Position) with automatic referencing.

1.5 Approach

1.5.1 Recording the ini signals

- Use of safe inputs of the EL1918 on the EL6910 for recording the ini signals
- Accumulation of the ini signals to the reference signal
- Transmission of the reference signal to the AX8000
1.5.2 Transmission to the AX8000

- Expansion of the process image on the output side of the EL6910 by inserting an additional bit
- Corresponding change on the AX8000

1.5.3 Setting the reference point

- Extension of the process image on the input side of the AX8000 by inserting an additional bit
- Link to the ChB_PriFb_SetRef signal of the internal process image
2 Demonstration

2.1 Link reference signal

1. Open file “ChB_SLP_1.sal”

You will see the already configured SLP functionality.

2. Right click in the network

3. Click on “Network” via the “Add After” field to add another network
4. Open toolbox

5. Add a safeMon module to the new network

6. Rename FB

The next step is to link the block. The procedure is identical for all inputs and outputs and is illustrated here using the screenshots for one input as an example.
7. Right click on an input
8. Click on “Change Link”
9. Select variable
10. Confirm selection with “OK”

This results in the following links for the inputs and outputs of the safeMon module:

<table>
<thead>
<tr>
<th>Input/Output</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>MonIn1</td>
<td>SLP_1_REF_CMD</td>
</tr>
<tr>
<td>MonIn2</td>
<td>ACK_REFERENCE_STD</td>
</tr>
<tr>
<td>MonOut</td>
<td>SIGNAL_TO_SDF</td>
</tr>
</tbody>
</table>

11. Click on “Save all” in the menu bar to save the settings
2.2  Configure reference behavior

1. Open the “Target Systems.sds” file
2. Open the “Internal Safety Parameters” tab

Under C3C2:0 you will find the reference settings for ChB.

In the following you must make the parameter settings.

3. Double click on “C3C2:01 Operation Mode”

4. Select “Automatic Referencing, Set Reference Position enabled” in the “Enum” drop-down menu
5. Confirm selection with “OK”
For the other parameters, the procedure is identical and is shown here using the screenshots for one parameter as an example.

6. Double click on the desired parameter

7. Enter the corresponding value in the “Dec” field
8. Confirm window with “OK”

Enter the following values for the parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C3C2:11</td>
<td>Reference safePosition Singleturn</td>
</tr>
<tr>
<td>C3C2:12</td>
<td>Reference safePosition Multiturn</td>
</tr>
<tr>
<td>C3C2:13</td>
<td>Speed at Reference Position</td>
</tr>
<tr>
<td>C3C2:15</td>
<td>Maximum Multiturn Referenced SafePosition</td>
</tr>
<tr>
<td>C3C2:17</td>
<td>Minimum Multiturn Referenced SafePosition</td>
</tr>
</tbody>
</table>

9. Click on “Save all” in the menu bar to save the settings
2.3 Download safety projects

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

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 “Finish”

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

Your safety projects are now downloaded and active.
2.4 Check referencing

Activate the axis as follows:

1. Open “Axis 2”

2. Open tab “Online”

3. Click on “Set”

4. Close window with “All”
5. Click “F8” to reset the error

6. Open the tab “Functions”
7. Enter the position at “TargetPosition” as shown
8. Click on “Start”

Now check the referencing:
9. Open file “ChB_SLP_1.sal”

10. Click on “Show Online Data” in the menu bar to activate the Online View

11. Right click on the network

12. Click “Show Online Value”
You see that the command from the EL6910 arrives correctly. Furthermore, you see at the safeSLP block that the command ChB.PriFb_REFPOSITION_VALID is still on FALSE.

13. In the process image right click on “SLP_ACK_STD”
14. Click on “Online Force”
15. In the window “Set Value Dialog” click at bool “1”

You see in the newly added safeMon module that the acknowledgment is available and the signal is transferred to the process image.

16. Right click on “SLP_ACK_STD”

17. Click on “Online Force”

18. Click in the window “Set Value Dialog” at bool “0”

19. Right click on “SLP_ACK_STD”

20. Click on “Release Force”
In the safeSLP block you see that the command ChB.PriFb_REFPOSITION_VALID is now TRUE and you have successfully referenced.

Next, let the engine proceed as follows:

21. Open “Axis 2”

22. Open tab “Functions”

23. Select “Reversing Sequence” in the drop-down menu of Start Mode

24. Enter position and time according to the figure

25. Click on “Start”

26. Open file “ChB_SLP_1.sal”
Based on the values, you can now see how the motor traverses.
2.5 Additional information

If it is necessary to move the axis in switched-off state
→ automatic referencing

If the position information is invalid after startup
→ manual referencing → new download
→ automatic referencing → reference run

If it is necessary to move the axis while the safety project is running
→ no problem
More Information:
www.beckhoff.com/twinsafe/