BECKHOFF New Automation Technology

TwinSAFE Tutorial 14 | EN SafeMotion Wizard

Retargeting of a SafeMotion Wizard project



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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 14 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 the transfer of an EL6910 project to an EL1918 as a new target.

1.1 Edition status

Edition	Comment
1.0.0	First released edition
0.0.1	First draft

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 \geq 03 \rightarrow irrelevant
- AX8000 firmware \geq 0104; with default module ID active \rightarrow irrelevant

1.3 Starting point

At the starting point of the tutorial

- a TwinCAT 3 project with standard PLC exists,
- an EL6910 project exists,
- a SafeMotion Wizard 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 functionality

This tutorial describes the realization of the following functionality:

• Transferring the safety project of the EL6910 to the EL1918 as a new target system.

2 Demonstration

2.1 Select new target system



1. Open Target System

Target System:	EL6910 ~
Physical Device:	AMI891x AMP891x AX891x
Software Version:	EJ1914 EJ1918
Serial Number:	EJ1957 EJ2914
Project CRC:	EJ2918 EJ6910
Map Serial Number:	EK1960
Version Number:	EL1918
Safe Address:	EL2912 EL 6900
Hardware Address:	EL6910 EL6930 EP1918 EP1957 EP2919

2. Select EL1918 in the drop-down menu of "Target System" to select EL1918 as new target system

Target System:	EL1918 ~	
Physical Device:	not available 📑	
	Device is an external device	
Software Version:	not available	

3. Click on the link field at "Physical Device"

Choose lo	cal device	ОК
Search:		Cancel
Device:	i - Devices i - Device 1 (EtherCAT) i - Tem 1 (EK1200) i Term 2 (EL1918)	

- 4. Select EL1918 in the "Choose physical terminal for mapping" window
- 5. Confirm selection with "OK"

Project B		uild	Debug	TwinCA	
		L ^C	* 6 *	白り・	
led) 🔻	=	Sav	e All (Ctrl+	Shift+S)	

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



A control window appears asking whether you want to delete the process image of the previous target system.

7. Close the window with "Yes





8. Close the window "Target System Process Image Update" with "OK"

Safe Address:	7
	Take FSoE Connection Address
Hardware Address:	1 🖉 😰
	12345678910 L3
Teminal View:	

- 9. Click the left arrow symbol to load the hardware address of the EL1918
- 10. Click the right arrow symbol to accept the displayed hardware address for the EL1918



11. Open file "SafeIn (EL1918).sds"

Linking	Linking Connec		ction Safety Parame	
FSoE Address:		1	$\langle \rangle$	Exte
Linking M	lode:	Automatic × Automatic		
Physical I	Device:			
Dip Switch:				

In the linking tab you have the possibility to select different linking modes. The linking modes have the following functions:

Linking Mode	Function
Automatic	 When selecting a component from the I/O configuration, the links are created automatically
Manual	The mapping is created
	Links must be created manually
Local	Link to a local component
	Access to the internal process image

12. Select "Local" as the linking mode

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

2.2 Link Safe Motion component

In the following you link the two AX8000 with the EL1918. This linking is only necessary because the AX8000 communicate via Custom Connections. If an I/O terminal is linked to the EL1918, the link is created automatically.



1. Open file "Connection to Drive Front (AX8206-0210-0104).sds"

Linking	Connecti	on Process Image
Safe Add	ress:	3 External Safe Address:
Linking N	Aode:	Manual Y
Alias Dev	rice:	SafeMotionDemo^ChA_ChB_Connection_Input^Alias Devices^SA
Dip Swite	:h:	
Input: F	ull Name:	TIID^Device 1 (EtherCAT)^Term 1 (EK1200)^Term 2 (EL1918)^Co
L	inked to:	
Output: F	ull Name:	TIID^Device 1 (EtherCAT)^Term 1 (EK1200)^Term 2 (EL1918)^Co
L	inked to:	
Name:		Message_15

2. Click on the link symbol at Input

	200 300 3000
earch: X Devices Devices Device 1 (EtherCAT) Message_15 RxPD0 > QB 1562.0, FSOE_11 (11.0) Message_16 RxPD0 > QB 1573.0, FSOE_11 (11.0) Drive Front (AX8206-0210-0104) Message_1 > QB 1589.0, Message_1_66C11425 (11.0)	Show Variables Only Unused Exclude disabled Exclude other Device Exclude same Image Show Tooltips Sort by Address Show Variable Group Collapse last Level
⊡	Show Variable Types Matching Type Matching Size All Types Array Mode Offsets Continuous Ignore Gaps Show Dialog
< >	Variable Name / Comme / Hand over / Take over Cancel OK
Select message 1 of the drive front Confirm selection with "OK" Go through steps 4 to 6 for output	
 MotionControl MotionControl Project References Target System GVLs User FBs Subser FBs Finis Devices 	
Connection to Drive Front (AX8206-0210-0 Connection to Drive Rear (AX8206-0210-01 ErrorAcknowledgement.sds	104).sds 04).sds

- 7. Follow steps 4 to 7 for the Drive Rear

2.3 Link ErrAck and Run signal

MotionControl
MotionControl Project
References
Target System
GVLs
User FBs
TwinSafeGroup1
Alias Devices
Connection to Drive Front (AX8206-0210-0104).sds
Connection to Drive Rear (AX8206-0210-0104).sds
🚻 ErrorAcknowledgement.sds
🛍 Run.sds
📲 Safeln (EL1918).sds
🔁 TwinSafeGroup1.sal
MotionControl Instance

1. Open file "ErrorAcknowledement.sds"

Linking F	Process Image	
	Linking Mode: Manu	al Y
Full Name:	TIID^Device 1 (EtherCAT)^Term 1 (EK1200)^Term 2 (E	L1918)^Sta
Linked to:		R 2
Name:	Standard In Var 1	45

2. Click the link icon

laneby	V	Show Variables
earch: MOTION PLC PLC PLC PLC PLC PLC PLC PLC	×	Show Variables Only Unused Exclude disabled Exclude other Devices Exclude same Image Show Tooltips Sort by Address Show Variable Groups Collapse last Level Show Variable Types Matching Type Matching Size All Types
MAIN.AX1_ST0_ChA > QB 385010.0, BOOL [1.0] MAIN.AX1_ST0_ChB > QB 385011.0, BOOL [1.0] MAIN.AX2_ST0_ChA > QB 385012.0, BOOL [1.0] MAIN.AX2_ST0_ChB > QB 385013.0, BOOL [1.0] MAIN.AX2_ST0_ChB > QB 385013.0, BOOL [1.0] Devices Devices Devices SyncUnits Composition Composi		Offsets Continuous Ignore Gaps Show Dialog Variable Name / Comment / Hand over / Take over

3. Select "MAIN.TS_ErrAck" as signal

4. Confirm selection with "OK"

4	MotionControl
	MotionControl Project
	Carl References
	🚰 Target System
	🦕 GVLs
	🔁 User FBs
	TwinSafeGroup1
	Alias Devices
	Connection to Drive Front (AX8206-0210-0104).sds
	Connection to Drive Rear (AX8206-0210-0104).sds
	ErrorAcknowledgement.sds
	Hun.sds
	88 Safeln (EL1918).sds
	Bag TwinSafeGroup1.sal
	MotionControl Instance

- 5. Open file "Run.sds"
- 6. Go through steps 2 to 4. Select "MAIN.TS_Run" as signal.
- 7. Click on "Save all" in the menu bar to save the settings



8. Click on "Verify complete safety project" in the menu bar to verify the project

2.4 Download safety project



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

Multi-Download						×
Steps			Select Valid	Project(s)		
Select Valid Project(s)	Download	Project Name	Physical Device	CRCs	Target System	Backup/Re
General Download Settings		MotionControl	Term 2 (EL1918)	0x0000 0x6CE4 0x056D 0x056D	EL1918	🕑 0 De
		SafeMotionDemo	Drive Front (AX8206-0210-0104)	0xA019 0xA019 0xA019 0xA019 0xA019	AX891x	🕑 0 De
		SafeMotionDemo	(MS_2) Drive Rear (AX8206-0210-0104)	0xA019 0xA019 0xA019 0xA019 0xA019	AX891x	🕑 0 De
	¢					3
				_		•
					vext	Cancel

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

- 2. Select the safety project that you want to download
- 3. Confirm selection with "Next"

Steps	General Download Settings
Select Valid Project(s)	Complete Download
General Download Settings	Download complete project data with default group customization settings (customization is possible after the download) and use these login credentials for each project: Username: Password: Please verify the Serial Number of each project:
	Verified Project Name Physical Device Serial Number Target System Backup/Restore masters Backup/Restore slaves

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

Default username: Administrator

Default password: TwinSAFE

- 5. Select the safety project that you want to download
- 6. Confirm selection with "Next"

<i>c</i> .					· · · · ·				
Steps			•	inal Ver	ificatio	n			
Select Valid Project(s)	Project Name	Physical Device		Download	Result		Target Sy	Backup/Restore master	Backu
General Download Settings	1993 1997		Configured Datasets	Online	Offline	Verification			
Final Verification	MotionControl	Term 2 (EL1918)	Safe Logic Data	0xCD3F	0xCD3F	0	EL1918	O Dependencies	~
Activation			Mapping Data	0x28EC	0x28EC	0		0	0
			Parameter Data	0x638C	0x638C	0			
Multi-Download Kesult	-								

- 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"

Multi-Download	*
Steps	Activation
Select Valid Project(s)	Login Credentials
General Download Settings	Username: Administrator
Final Verification	Password:
Activation	
Multi-Download Result	Activate Project Name Physical Device larget System Backup/Restore masters Backup/Restore slaves Image: Start Start MotionControl Term 2 (EL1918) EL1918 Image: Start Start Image: Start Image: Start Start Image: Start Image: Start Start
	Nrxt Cancel

The "Activation" window opens, in which you activate the safety project.

- 10. Enter the default password
- 11. Check if the safety project is selected
- 12. Confirm selection with "Next"

Multi-Download							*
Steps			Mult	i- <mark>D</mark> own	load Resul	t	
Select Valid Project(s)	Activated Downloaded	Project Name	Physical Device	Target System	n Backup/Restore S	ettings Backup/Restore masters	Backup/Restore sli
General Download Settings	00	MotionControl	Term 2 (EL1918)	EL1918	0	O Dependencies	🕑 0 Dependenc
Final Verification							
Activation							
Multi-Download Result							
	¢						>
						Firtish	Cancel

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

2.5 Check signals



Show Online Data

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



You will see that all signals arrive successfully.

3. Click on "Show Online Data" in the menu bar to deactivate the online view



- 4. Open ErrorHandling
- 5. Click in the menu bar "Show Online Data" to activate the Online View



You can see that the STO signal has arrived successfully and the AX8000 is enabled.

6. Click on "Show Online Data" in the menu bar to activate the Online View

2.6 Let drive traverse



1. Open "Front ChA"

General	Settings	Parameter	Dynamics	Online	Func	tions	Coupling	Compe	nsation
			22	2420	54	86	Setpoint P	osition:	"] 0.0000
Lag Dis	tance (min	/max): [1 Actual	Velocity:		[°/s]	Setpoint V	/elocity:	[°/s]
	0.0000	(0.000, 0.000)		0.	0103			0.0000
Ovemid	e:	[9] Total /	Control O	utput:	[%]	Error:		0.40.00
		0.0000 2	6	0.	00/0.	00 %			0 (0x0)
Statu	s (log.)			Status (ph	ys.)		Enabling	,	
	ady ibrated		ving [w F		d Mode			oller Fw	fet Vs
Ha	s Job	Moving I	Bw [In Pos.	Range		Feed	Bw	
Controll	er Kv-Facto	or:	[°/s/°]	F	eferenc	ce Vel	ocity:		[°/s
1			1	-	2974.9	202			1
Target	Position:		["]	Ţ	arget V	elocity	<i>y</i> :		[°/s
0			t)				
	_	-				ര	1	പ	→ •
F1	F2	F3	F4	F	5	F6		F8	F9

- 2. Open tab "Online"
- 3. Click on "Set"



4. Close window with "All"

eneral	Settings	Parameter	Dynamics	Online	Functions	Coupling	Compensation
			22	953.	3436	Setpoint P	osition: [°]
Lag Dista	ance (min 0.7045 (/max): [1 -0.187, 2.281] Actual V	elocity:	[°/s] 589.1498	Setpoint V	/elocity: [°/s] 589.7691
Ovemide:		ڑ] 100.0000 %	6] Total / C	Control Ou 4.5	tput: [%] 5 / 0.01 %	Error:	0 (0×0)
Status Read Calib Has	(log.) dy orated Job	NOT Mo	ving C Sw C Sw C	atus (phy] Coupled] In Targe] In Pos. I	rs.) I Mode et Pos. Range	Enabling Contro Feed) oller Set Fw Bw
Controller 1	r Kv-Fact	or:	[°/s/°] ↓	Re 1	eference Ve 2974.9202	locity:	[°/s
Target Po 0	osition:		[]]	Ta 0	arget Velocit	y:	[°/s

5. Click "F3" to move the drive manually into the plus range

General	Settings	Parameter	Dynamics	Online	Functions	Coupling	Compe	nsation
			23	252	.0571	Setpoint F	osition: 23	[° 245.8769
Lag Dis	tance (min	/max): [Actual V	elocity:	[°/s]	Setpoint V	elocity:	[°/s
Overrid	-1.4619 (-3.200, 2.281	1 Total / C	Control O	-098.6089	Emor		389.769
Oveniu	с.	100.0000		-4.	56 / -0.01 %			0 (0x0
Statu	s (log.)		S	tatus (phy	ys.)	Enabling)	
☑ Re □ Cal ☑ Ha	ady ibrated s Job	NOT Mo Moving Moving	ving [Fw [] Bw []] Coupled] In Targe] In Pos.	d Mode et Pos. Range	Contr Feed Feed	oller Fw Bw	Set
Controll	er Kv-Facto	or:	[°/s/°]	R	eference Ve	locity:		[*/
1			ļ	1	2974.9202			
Target 0	Position:		["] []	T C	arget Velocit;)	y:		[*/s
F1	F1	+ F3	++ F4	€ F	F6		® F8	→ F9

6. Click on "F2" to move the drive manually into the minus range

You see that you can move as expected.

There is now no connection to the EL6910. You can remove the EL6910 from your I/O configuration. This is only possible in a combination with the EL1918 and an AX8000.

More Information: www.beckhoff.com/twinsafe/

Beckhoff Automation GmbH & Co. KG Hülshorstweg 20 33415 Verl Germany Phone: +49 5246 9630 info@beckhoff.com www.beckhoff.com

