

Advanced Safety Module for Sigma-7 SERVOPACK SGD7S-DDDA0D8DDF91, 400 V Application Manual

Model: SGD7S-OSB01A SGD7S-OSB02A

To properly use the product, read this manual thoroughly and retain for easy reference, inspection, and maintenance. Ensure the end user receives this manual.



Manual No. SIEP YEUOS7S 02A

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1 Unpacking and Mounting the Advanced Safety Module

1.1 Contents of the Box

Depending on the type you have ordered, you will receive the SGD7S-OSB01A or the SGD7S-OSB02A. The SGD7S-OSB01A is represented by a single board, while the SGD7S-OSB02A consists of a double board (sandwich).

Never try to disassemble. Otherwise the warranty will be lost.

The box also includes:

- the Instruction Manual
- the Declaration of Conformity (DoC)
- the nameplate sticker, the model designation sticker and the LED identification sticker
- the mounting screws

1.2 Required Accessory for Board Mounting

To attach the module to the SERVOPACK you will need the mounting rail for option cards for Sigma-7 400 V SERVOPACKs (order no. JZSP-P7R2-8-E).

For the SGD7S-OSB02A you additionally need the I/O connector (order no. JUSP-7CN21).

1.3 Attaching the Advanced Safety Module to the SERVOPACK

- **1.** Read the Instruction Manual to find out how to attach the module to the SERVO-PACK.
- **2.** Also pay attention to the safety instructions in this manual.
- 3. Make sure that the power supply (main power supply 400 V AC and control power supply 24 V DC) is switched off and the charge LED of the SERVOPACK is not lit.
- **4.** Then start by opening the cover for the Option Modules on the right-hand side of the SERVOPACK.
- **5.** Attach the mounting rail.
- 6. Carefully plug the Advanced Safety Module into the SERVOPACK.
- **7.** Fix the module with the mounting screws.
- **8.** Take the plastic module cover out of the box.
- **9.** Depending on your needs, you should break out the openings in the cover for the CN21 connector (SGD7S-OSB02A) and/or for other interface connectors for additional option modules as the second encoder module.
- **10.** Attach the nameplate sticker, the model designation sticker and the LED identification sticker on the designated fields on the cover. For a detailed illustration of the specified positions, see chapter 3.3 of the Instruction Manual.
- 11. Close the cover.

1.4 Attaching the I/O Connector (SGD7S-OSB02A only)

1. Read the Instruction Manual and make sure that the power is switched off.

2. Plug the field connector JUSP-7CN21 into the CN21 plug of the Advanced Safety Module.

FSoE Connection

3. Close the both levers of the connector to tighten the connection. This prevents the connection from being loosened by vibrations or shocks.



Do not mix up the I/O connection of the SERVOPACK with the I/O connection of the Advanced Safety Module. This could damage the safety module or the SERVOPACK.

4. Follow the instructions in the Product Manual for I/O wiring. Analogue signals must be shielded. An external 24V SELV/PELV power supply must be connected to drive the digital outputs.

1.5 FSoE Connection

Plug the Ethernet cable (CAT5 or higher such as Yaskawa Part Numbers found below) of the previous FSoE communication device into connector CN6A (input) and the next FSoE device into connector CN6B (output) of the SERVOPACK. However, the FSoE master can also be located anywhere within the network.

Cables with RJ45 Connectors on Both Ends

Cable Length	Item Number
0.2 m	CM3RRM0-00P2-E
0.5 m	CM3RRM0-00P5-E
1 m	JZSP-CM3RRM0-01-E
3 m	JZSP-CM3RRM0-03-E
5 m	JZSP-CM3RRM0-05-E
10 m	JZSP-CM3RRM0-10-E
20 m	JZSP-CM3RR00-20-E
30 m	JZSP-CM3RR00-30-E
40 m	JZSP-CM3RR01-40-E
50 m	JZSP-CM3RR01-50-E
20 m 30 m 40 m 50 m	JZSP-CM3RR00-20-E JZSP-CM3RR00-30-E JZSP-CM3RR01-40-E JZSP-CM3RR01-50-E

Switching On the Control Voltage > Preparations

2 Switching On the SERVOPACK

2.1 Switching On the Control Voltage

2.1.1 Preparations

The correct assembly and wiring of the SERVOPACK and the Advanced Safety Module is described in the Instruction Manual and the Product Manual.

Observe the safety regulations for the protection of people and equipment.

You need the *Advanced Safety Module Parameter Editor* tool on your PC (laptop) to configure the Advanced Safety Module.

- **1.** Please download the tool software from the Yaskawa homepage yaskawa.eu.com.
- 2. Follow the instructions in the Quick Installation Guide to install and activate the tool. (You can also find the Quick Installation Guide as a download on the homepage in the Safety Option Module section).
- 3. If you have installed the Advanced Safety Module Parameter Editor on your PC (laptop), connect the USB online cable JZSP-CVS06-02-E to your USB interface and plug it into the CN7 connector of the SERVOPACK.
- **4.** Start the tool on your PC.



For more detailed information on the Advanced Safety Module Parameter Editor, see & Chap. 3 'Creating a Project using the Advanced Safety Module Parameter Editor' page 22.

5. Please note the serial number of the Advanced Safety Module. It will be needed in the next step of the initial start-up.

Switching On the Control Voltage > Initial Start-Up

2.1.2 Initial Start-Up

1. Switch on the control voltage of the SERVOPACK.



After the voltage has been switched on, the pairing of the safety module and the SERVOPACK is carried out automatically.

⇒ ■ The SERVOPACK stores that the safety module is connected.
 ■ The safety module stores the serial number of the connected SERVOPACK.



- Fig. 1: Pairing of Safety Module and SERVOPACK
- **2.** Observe the devices.

The red LED on the Advanced Safety Module lights up. The error display on the SERVOPACK shows "A.EC1" (Safety-related Servo Parameter Unmatch Alarm) or "A.EC0" (Safety Module Confirmation Alarm).

Alarm cause "A.EC1": There is no valid safe container in the safety module.

Alarm cause "A.EC0": Serial number of the SERVOPACK and serial number of the SERVOPACK stored in the safety module do not match.

If the error "A.EC0" (Safety Module Confirmation Alarm) appears on the SERVO-PACK error display, continue with step 2 in chapter & *Chap. 2.1.3.2 'Safety Module already in operation and new SERVOPACK' page 17.*

3. Continue with the parameterisation via the *Advanced Safety Module Parameter Editor*.

The parameterisation is described in detail with an example in chapter & Chap. 3 'Creating a Project using the Advanced Safety Module Parameter Editor' page 22.

4. During parameterisation, you must enter the serial number of the Advanced Safety Module when configuring the General Device Parameters. Without this entry, it is not possible to generate a safe parameter container upon completion of the project file.

The *Advanced Safety Module Serial Number* consists of a total of 15 digits (2 characters and 13 numbers), e.g. D0207A000110004. Locate the serial number of the Advanced Safety Module to be deployed and enter it exactly in the applicable data entry field.

Rotary table application	
Will the Advanced Safety Module be connected to an FSoE Master?	Limit Violation Deactivation Delay Time (LVDDT) (ms)
○ No U	
FSoE Address	Encoder Filter (samples)
Advanced Safety Module Serial Number	

- Fig. 2: The General Device Parameters dialog
- **5.** Enter your safety parameters as described in chapter \bigotimes Chap. 3 'Creating a Project using the Advanced Safety Module Parameter Editor' page 22.

Switching On the Control Voltage > Initial Start-Up

6. When all the necessary intermediate steps described in chapter & Chap. 3 'Creating a Project using the Advanced Safety Module Parameter Editor' page 22 have been carried out, click on CMIF Container Transfer in the Device menu.

Connection		
Jsed Interface Port:	Port#10 USB	Configure
		Connect
afe Container File		
File name: ASM7test File length: 1054 byte Version: 1 No. Parameters: 208 User: Serial No.: 01234567 UUID: fab 76f73-094c	1_IV_1072.bin is 8912345 14622b.3ed-376583593059	Load File
	And and a second se	Time Fren.
New Serial Number: lata Exchange Received Bytes (hex)	012345678912345	Update Serial No
Vew Serial Number: lata Exchange Received Bytes (hex)	012345678912345	Update Serial No
New Serial Number: lata Exchange Received Bytes (hex)	012345678912345	Update Serial No Send File Receive File
New Serial Number: lata Exchange Received Bytes (hex)	012345678912345	Update Serial No Send File Receive File Save Received File
New Serial Number: lata Exchange Received Bytes (hex)	012345678912345	Update Serial No Send File Receive File Save Received File Read System Info
New Serial Number: ata Exchange Received Bytes (hex)	012345678912345	Update Serial No Send File Receive File Save Received File Read System Info ASM7 Initialize
New Serial Number: Data Exchange Received Bytes (hex)	012345678912345	Update Serial No Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check
New Serial Number: ata Exchange Received Bytes (hex)	012345678912345	Update Serial No Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check

Fig. 3: Safe Container File loaded

- **7.** Click on the Send File button to start the download of the safe container file to the Advanced Safety Module.
 - ⇒ When the download is completed successfully, a Write Success message will be displayed.

	VIIIGAG	
onnection		
sed Interface Port:	Port#10 USB	Configure
		Connect
fe Container File		
File name: ASM7test 1 File length: 1054 byte /ersion: 1 Vo. Parameters: 208 Jser: Serial No.: 01234567 JUID: fab 76f73-094d	LJV_1072.bin s 8912345 -46224.3ed-376583593059	Load File
		Write File
lew Serial Number:	012345678912345	Update Serial No
ata Exchange (eceived Bytes (hex))		
ata Exchange Received Bytes (hex): Nrite Success.	1054 bytes sent in 1778ms	Send File
ata Exchange Neceived Bytes (hex): Nrite Success.	1054 bytes sent in 1778ms	Send File Receive File
ata Exchange Neceived Bytes (hex): Nrite Success.	1054 bytes sent in 1778ms	Send File Receive File Save Received File
ala Exchange Neceived Bytes (hex): Yrite Success.	1054 bytes sent in 1778ms	Send File Receive File Save Received File Read System Info
ata Exchange Neceived Bytes (hex): Mrite Success.	1054 bytes sent in 1778ms	Send File Receive File Save Received File Read System Info ASM7 Initialize
ata Exchange Received Bytes (hex): Write Success.	1054 bytes sent in 1778ms	Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check
ata Exchange Neceived Bytes (hex): Nrite Success.	1054 bytes sent in 1778ms	Send File Receive File Save Beceived File Read System Info ASM7 Initialize Motor and Encoder Parameter Check

Fig. 4: Safe Container File Sending Completed

As a result, the alarm "A.EB9" may occur to indicate a change of the ASM7 parameter set. This change must be activated by a power cycle to enable the new setting (a software reset with SigmaWin+ can also clear the "A.EB9" alarm).

- 8. Restart the SERVOPACK.
 - ⇒ The error display on the SERVOPACK shows "HWBB" for 5 seconds. After that, the display goes out and no more errors are displayed. The green LED on the Advanced Safety Module lights up.

2.1.3 Start-Up for other SERVOPACK / Safety Module Constellations

When combining a SERVOPACK or Advanced Safety Module that has been previously used in safety applications, the behaviour differs from the initial start-up.

2.1.3.1 SERVOPACK already in operation and new Safety Module

Use of the identical SafetyIn this case, the start-up procedure is identical to the procedure described in chapterModule type \Leftrightarrow Chap. 2.1.2 'Initial Start-Up' page 8.

Use of a different Safety Module type

- **1.** Switch on the control voltage of the SERVOPACK.
 - ⇒ The safety module stores the serial number of the connected SERVOPACK.



Fig. 5: Pairing of Safety Module and SERVOPACK

2. • Observe the devices.

The red LED on the Advanced Safety Module lights up. The error display on the SERVOPACK shows "A.E81" (Safety Option Module Unmatch Alarm).

Alarm cause: A safety module of a different type was connected.

3. Execute Fn014 (Reset Option Module Configuration Error) with SigmaWin+ or the Digital operator.

With the help of this step, the SERVOPACK deletes that a safety module was connected.



Fig. 6: Reset Option Module Configuration Error

⇒



Please note that the USB port can only be used by one tool at a time. In this case, you should first close the Advanced Safety Module Parameter Editor before opening SigmaWin+.

- **4.** Switch off the control voltage of the SERVOPACK.
- 5. Switch on the control voltage of the SERVOPACK.
 - \Rightarrow The SERVOPACK stores that the safety module is connected.
- 6. The Safety-related Servo Parameter Unmatch Alarm (A.EC1) is displayed.

Alarm cause: There is no valid safe container in the safety module.

7. Continue with the parameterisation via the *Advanced Safety Module Parameter Editor*.

Please note that the USB port can only be used by one tool at a time. In this case, you should first close SigmaWin+ before opening the Advanced Safety Module Parameter Editor.

The parameterisation is described in detail with an example in chapter \Leftrightarrow Chap. 3 'Creating a Project using the Advanced Safety Module Parameter Editor' page 22.

8. During parameterisation, you must enter the serial number of the Advanced Safety Module when configuring the General Device Parameters. Without this entry, it is not possible to generate a safe parameter container upon completion of the project file.

The Advanced Safety Module Serial Number consists of a total of 15 digits (2 characters and 13 numbers), e.g. D0207A000110004. Locate the serial number of the Advanced Safety Module to be deployed and enter it exactly in the applicable data entry field.

Rotary table application	
Will the Advanced Safety Module be connected to an -	Limit Violation Deactivation Delay Time (LVDDT) (ms
Yes	0
○ No 🚯	
FSoE Address	Encoder Filter (samples)
0x0001	
Advanced Safety Module Serial Number	
D0207A000110004	

- Fig. 7: The General Device Parameters dialog
- **9.** Enter your safety parameters as described in chapter & Chap. 3 'Creating a Project using the Advanced Safety Module Parameter Editor' page 22.

10. When all the necessary intermediate steps described in chapter & Chap. 3 'Creating a Project using the Advanced Safety Module Parameter Editor' page 22 have been carried out, click on CMIF Container Transfer in the Device menu.

Connection		
Jsed Interface Port:	Port#10 USB	Configure
		Connect
afe Container File		
File name: ASM7test 1 File length: 1054 byte Version: 1 No. Parameters: 208 User: Serial No.: 01234567: UUID: fab 76/73-094d	_IV_1072.bin s 8912345 4622-b3ed-376583593059	Load File
P		
New Serial Number: Data Exchange	012345678912345	Update Serial No
New Serial Number: Data Exchange Received Bytes (hex):	012345678912345	Update Serial No
New Serial Number: Nata Exchange Received Bytes (hex):	012345678912345	Update Serial No Send File Receive File
New Serial Number: Nata Exchange Received Bytes (hex):	012345678912345	Update Serial No Send File Receive File Save Receive File
New Serial Number: Nata Exchange Received Bytes (hex):	012345678912345	Update Serial No Send File Receive File Save Receive File Read System Info
New Serial Number: Nata Exchange Received Bytes (hex):	012345678912345	Update Serial No Send File Receive File Save Received File Read System Info ASM7 Initialize
New Serial Number: Nata Exchange Received Bytes (hex):	012345678912345	Update Serial No Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check
New Serial Number: Nata Exchange Received Bytes (hex):	012345678912345	Update Serial No Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check

Fig. 8: Safe Container File loaded

- **11.** Click on the Send File button to start the download of the safe container file to the Advanced Safety Module.
 - ⇒ When the download is completed successfully, a Write Success message will be displayed.

onnection		
sed Interface Port:	Port#10 USB	Configure
		Connect
afe Container File		
File name: ASM7test 1 File length: 1054 byte /ersion: 1 No. Parameters: 208 Jser: Serial No.: 01234567 JUD: 6b 7573.0944	_IV_1072.bin s 8912345 _4522.bad.376593593059	Load File
010.18070175-0540	40224360-376363333033	Write File
lew Serial Number:	012345678912345	Update Serial No
ata Exchange leceived Bytes (hex):		
ata Exchange Received Bytes (hex): Write Success.	1054 bytes sent in 1778ms	Send File
ata Exchange Received Bytes (hex): Write Success.	1054 bytes sent in 1778ms	Send File Receive File
ata Exchange Neceived Bytes (hex): Nizite Success.	1054 bytes sent in 1778ms	Send File Receive File Save Received File
ata Exchange Received Bytes (hex): Write Success.	1054 bytes sent in 1778ms	Send File Receive File Save Received File Read System Info
ata Exchange Neceived Bytes (hex): Write Success.	1054 bytes sent in 1778ms	Send File Receive File Save Received File Read System Info ASM7 Initialize
ata Exchange Received Bytes (hex) Write Success.	1054 bytes sent in 1778ms	Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check
ata Exchange Neceived Bytes (hex) Write Success.	1054 bytes sent in 1778ms	Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check

Fig. 9: Safe Container File Sending Completed

As a result, the alarm "A.EB9" may occur to indicate a change of the ASM7 parameter set. This change must be activated by a power cycle to enable the new setting (a software reset with SigmaWin+ can also clear the "A.EB9" alarm).

- 12. Restart the SERVOPACK.
 - ⇒ The error display on the SERVOPACK shows "HWBB" for 5 seconds. After that, the display goes out and no more errors are displayed. The green LED on the Advanced Safety Module lights up.

- 2.1.3.2 Safety Module already in operation and new SERVOPACK
 - **1.** Switch on the control voltage of the SERVOPACK.
 - \Rightarrow The SERVOPACK stores that the safety module is connected.



- Fig. 10: Pairing of Safety Module and SERVOPACK
- **2.** Observe the devices.

The red LED on the Advanced Safety Module lights up. The error display on the SERVOPACK shows "A.EC0" (Safety Module Confirmation Alarm).

Alarm cause: Serial number of the SERVOPACK and serial number of the SERVO-PACK stored in the safety module do not match.

- 3. With the Advanced Safety Module Parameter Editor: Click on button "ASM7 Initialize".
 - ⇒ This function deletes the serial number of the SERVOPACK, the homing information and the safe container in the non-volatile memory of the safety module.

Safe Container Dow	nload	×
onnection		
Ised Interface Port:	Port#10 USB	Configure
		Corned
afe Container File		
File name: ASM7test1	_IV_1072.bin	Load File
File length: 1054 bytes Version: 1 No. Parameters: 208 User:	8	
Serial No.: 012345678 UUID: fab76f73-094d	3912345 -4622-b3ed-376583593059	
		Wite Ele.
New Serial Number:	012345678912345	Update Serial No
lata Exchange		
Received Bytes (hex):		
Received Bytes (hex):		Send File
Received Bytes (hex):		Send File Receive File
Received Bytes (hex):		Send File Receive File Save Fecewed File
received Bytes (hex):		Send File Receive File Save Flectowed File Read System Info
received Bytes (hex):		Send File Receive File Cave Fectowed File Read System Info ASM7 Initialize
received Bytes (hex):		Send File Receive File Save Received File Read System Info ASM7 Initialize
received Bytes (hex):		Send File Receive File Save Flectwed File Read System Info ASM7 Initialize Motor and Encoder Parameter Check

Fig. 11: ASM7 Initialize Button

4. Alternative possibility with the Digital Operator (replaces step 3): Execute Fn040 (Safety Option Module Access Mode Setting).

To activate this function, the last four characters of the serial number of the safety module (attached to the SERVOPACK) must be entered (range = 0001 to 9999).

- \Rightarrow This function enables the execution of Fn043.
- **5.** Execute Fn043 (Safety Option Module Initializing Parameter Setting) with the Digital Operator.
 - ⇒ This function deletes the serial number of the SERVOPACK, the homing information and the safe container in the non-volatile memory of the safety module.
- Switch off the control voltage of the SERVOPACK.

7. Switch on the control voltage of the SERVOPACK.

⇒ The safety module stores the serial number of the connected SERVOPACK.

8. The Safety-related Servo Parameter Unmatch Alarm (A.EC1) is displayed.

Alarm cause: There is no valid safe container in the safety module.

9. Continue with the parameterisation via the *Advanced Safety Module Parameter Editor*.



Please note that the USB port can only be used by one tool at a time. In this case, you should first close SigmaWin+ before opening the Advanced Safety Module Parameter Editor.

The parameterisation is described in detail with an example in chapter \Leftrightarrow Chap. 3 'Creating a Project using the Advanced Safety Module Parameter Editor' page 22.

10. During parameterisation, you must enter the serial number of the Advanced Safety Module when configuring the General Device Parameters. Without this entry, it is not possible to generate a safe parameter container upon completion of the project file.

The Advanced Safety Module Serial Number consists of a total of 15 digits (2 characters and 13 numbers), e.g. D0207A000110004. Locate the serial number of the Advanced Safety Module to be deployed and enter it exactly in the applicable data entry field.

Rotary table application	~
	v
Will the Advanced Safety Module be connected to a FSoE Master?	n Limit Violation Deactivation Delay Time (LVDDT) (ms
Yes	0
○ No 🚺	
FSoE Address	Encoder Filter (samples)
0x0001	1
Advanced Safety Module Serial Number	
	_
D0207A000110004	
0	

Fig. 12: The General Device Parameters dialog

11. Enter your safety parameters as described in chapter & Chap. 3 'Creating a Project using the Advanced Safety Module Parameter Editor' page 22.

12. When all the necessary intermediate steps described in chapter \Leftrightarrow *Chap. 3 'Creating a Project using the Advanced Safety Module Parameter Editor' page 22* have been carried out, click on *CMIF Container Transfer* in the *Device* menu.

Jsed Interface Port:	Port#10 USB	Configure
		Connect
Safe Container File		
File name: ASM7test File length: 1054 byte Version: 1 No. Parameters: 208 User: Serial No.: 01234567 UUID: fab76f73-0944	1_UV_1072.bin :s 78912345 34622453ed-376583593059	Load File
		Write File
New Serial Number: Data Exchange Received Bytes (hex)	012345678912345	Update Serial No
New Serial Number: Data Exchange Received Bytes (hex)	012345678912345	Update Serial No Send File
New Serial Number: Data Exchange Received Bytes (hex)	012345678912345	Update Serial No Send File Receive File
New Serial Number: Data Exchange Received Bytes (hex)	012345678912345	Update Serial No Send File Receive File Save Received File
New Serial Number: Data Exchange Received Bytes (hex)	012345678912345	Update Serial No Send File Receive File Save Received File Read System Info
New Serial Number: Data Exchange Received Bytes (hex)	012345678912345	Update Serial No Send File Receive File Save Received File Read System Info ASM7 Initialize

Fig. 13: Safe Container File loaded

- **13.** Click on the Send File button to start the download of the safe container file to the Advanced Safety Module.
 - ⇒ When the download is completed successfully, a Write Success message will be displayed.

Connection		
Ised Interface Port:	Port#10 USB	Configure
		Connect
afe Container File		
File name: ASM7test File length: 1054 byte Version: 1 No. Parameters: 208 User: Serial No.: 01234567 UUID: fab76f73-094c	1_UV_1072.bin s 8912345 146224.3ed-376583593059	Load File
		Write File
New Serial Number: Nata Exchange Received Bytes (hex)	012345678912345	Update Serial No
New Serial Number: Data Exchange Received Bytes (hex) Write Success.	012345578912345	Update Serial No Send File
New Serial Number: Nata Exchange Received Bytes (hex) Write Success.	012345678912345 : 1054 bytes sent in 1778ms	Update Serial No Send File Receive File
Vew Serial Number: lata Exchange Received Bytes (hex) Write Success.	012345678912345	Update Serial No Send File Receive File Save Received File
New Serial Number: Nata Exchange Received Bytes (hex) Write Success.	012345678912345	Update Serial No Send File Receive File Save Received File Read System Info
New Serial Number: Data Exchange Received Bytes (nex) Write Success.	012345678912345	Update Serial No Send File Receive File Save Received File Read System Info ASM7 Initialize
New Serial Number: Data Exchange Received Bytes (nex) Write Success.	012345678912345	Update Serial No Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check
New Serial Number: Data Exchange Received Bytes (nex) Write Success.	012345678912345	Update Serial No Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check

Fig. 14: Safe Container File Sending Completed

As a result, the alarm "A.EB9" may occur to indicate a change of the ASM7 parameter set. This change must be activated by a power cycle to enable the new setting (a software reset with SigmaWin+ can also clear the "A.EB9" alarm).

- **14.** Restart the SERVOPACK.
 - ⇒ The error display on the SERVOPACK shows "HWBB" for 5 seconds. After that, the display goes out and no more errors are displayed. The green LED on the Advanced Safety Module lights up.

Creating a New Advanced Safety Module Project File

3 Creating a Project using the Advanced Safety Module Parameter Editor

3.1 Introduction

The software tool Advanced Safety Module Parameter Editor (henceforth ASM Parameter Editor) is used to create and modify project files (with file extension *.asm7). In addition, the ASM Parameter Editor is used to create safe parameter containers (with file extension *.bin) which can then be downloaded to the Advanced Safety Module (ASM).

3.2 System Requirements

A PC with the Windows 10 operating system is required. In order to download and upload safe parameter containers, the installation of SigmaWin+ Version 7.40 or greater is also required. In addition, the following Visual C++ Redistributable Package is required (if not already installed) for the correct operation of SigmaWin+:

Microsoft Visual C++ 2015-2019 Redistributable (x86)

The user is advised to check whether this entry appears in the list of *Programs and Features* (*Control Panel* \rightarrow *Programs and Features*). If the above entry does not appear in the list of *Programs and Features*, download the file *vc_redist.x86.exe* from the following Microsoft website:

https://www.microsoft.com/en-us/download/details.aspx?id=48145

3.3 Installation

The installation files for the ASM Parameter Editor can be downloaded from Yaskawa's homepage. In order to download the installation files, the user must first register himself/ herself at Yaskawa. Upon successful registration, the user will receive an e-mail containing a password. This password is required to be entered when the starting the Parameter Editor for the first time.

After downloading the installation files for the ASM Parameter Editor, simply run the file *setup.exe*. Upon completion of the installation, start the ASM Parameter Editor and enter the password obtained through the registration mentioned above. The user will then be prompted to enter a user-defined password.

3.4 Creating a New Advanced Safety Module Project File

The creation of a new project file using the Parameter Editor is straightforward. The ASM Parameter Editor guides the user while configuring the parameters for the ASM to ensure that a predefined sequence is observed.

When creating a new project, the very first action the user must perform is to select the type of ASM to be deployed in the application – either the SGD7S-OSB01A or the SGD7S-OSB02A module.

The parameters are divided into groups based upon their function are listed below in the sequence (order) they are to be configured:

- General Device Parameters: These parameters apply to the ASM in general and include the FSoE Address of the ASM, the Limit Violation Deactivation Delay Time (LVDDT) and the Encoder Filter.
- **2.** Motor and Encoder Parameters: These parameters are configured in accordance with the actual electromechanical components deployed in the machine.

Example of Creating a New Advanced Safety Module Project File

- 3. I/O Configuration Parameters: These parameters are applicable to the SGD7S-OSB02A module (with physical I/O terminals) only and are used to define the configuration of the I/O ports, e.g. Digital Input or Digital Output, and their associated attributes, e.g. Filter Time and Discrepancy Time in the case of digital inputs, or Test Pulse Length for digital outputs.
- **4.** Slot Parameters: Up to 10 slots can be configured with the available 16 safety functions. A Safe Homing Position (SHP) function (only one per project) as well as Mapping function can also be configured. In addition to the selection of a safety function, the selection of an Activation Input and an Output Signal Type as well as the associated Output Signal Behaviour can be performed in each slot. Additional parameters associated with the selected Safety Function itself are also configured during the configuration of a safety slot.



The General Device Parameters, the Motor and Encoder Parameters, and the I/O Configuration parameters strongly influence the selection possibilities in the configuration of the Slot Parameters. It is therefore imperative that the General Device Parameters, the Motor and Encoder Parameters, and the I/O Configuration parameters are configured correctly **before** proceeding with the Slot Parameters.

Important!

With respect to the General Device Parameters, once these parameters have been checked, committed and confirmed and this dialog closes, it is no longer possible to modify the selection "Will the Advanced Safety Module be connected to an FSoE Master?" Once slot parameters have been configured, i.e. checked, committed and confirmed, it is afterwards not possible to edit **any** Motor and Encoder Parameters nor is it possible to edit those I/O Configuration parameters for which their I/O's that have been selected in the slot configuration(s).

The order in which the safety slots themselves are configured is immaterial.

3.5 Example of Creating a New Advanced Safety Module Project File

An example of how to create a new ASM project file is shown below. Before beginning with the creation of the project, consider the following characteristics, features and requirements of a hypothetical machine that will be used in this example:

- 1. The ASM SGD7S-OSB02A will be deployed a configuration of the I/O ports is therefore necessary
- 2. The ASM will be connected to an FSoE Master virtual I/O can therefore be used in the slot configuration
- 3. Linear Application with Rotary Motor:
 - Sigma-7 Motor/Encoder: SGM7G-1ED7F** 15 kW, 400Vac, 24-bit absolute encoder, rated motor speed 1500 rpm, maximum motor speed 2000 rpm
 - Motor Encoder Usage: Absolute Multi-Turn
 - External linear (2nd) encoder (Heidenhain®) with 20 µm scale pitch to be used for safety only
 - Sigma-7 Serial Converter Unit with 12-bit interpolation (JZDP-J□□□-□□-E)
 - Gearbox ratio: 10:1
 - Ball screw pitch: 6 mm (6000 μm)

Creating a New Project File

4. I/O Configuration:

- Port A: Digital Output Test Pulse A
- Port B: Digital Output
- Port C: Digital Output EDM
- Port D: Digital Input
- Port E: Digital Input Test Pulse A
- Port F: Analog Input (0-10V)
- Port G: G1: 4-20mA, G2: PT1000

5. Safety Slot Configuration:

- One slot with safety function SLS (Safely Limited Speed) a "safe motion" type safety function
- One slot with safety function SS1-r (Safe Stop 1, deceleration monitored and time controlled) a "safe standstill" type safety function (aka a *stopping* method this slot will be "linked" to the above slot via a "Limit Violation")
- One slot with safety function SMT (Safe Motor Temperature) a "safe monitoring" type safety function

3.6 Creating a New Project File

Select the from the *File* menu *New Project* or click the following icon on the toolbar shown inside the red rectangle:

VASKAWA Advanced Safety Module Parameter Editor File Edit Device Help VASKAWA VASKAWA VASKAWA VASKAWA

Fig. 15: Start a new project icon on the toolbar The following *Create New Project* dialog will appear:

Creating a New Project File

Device:	
Sigma7 Servopack	
ASM7 Module Type	
○ SGD7S-OSB01A (FSoE only)	
○ SGD7S-OSB02A (FSoE + IO)	
Description:	
This is a sample project description	

Fig. 16: Create New Project dialog

In accordance with the example characteristics and features given above, select SGD7S-OSB02A for the ASM7 Module Type.

For the project *Description*, up to 260 characters can be entered. This enables the user to enter a meaningful and detailed description of the project. For this example, the following was entered in the *Create New Project* dialog:

Sigma7 Servopack	c
ASM7 Module Ty	vpe
⊖ SGD7S-OSB	01A (FSoE only)
SGD7S-OSB	02A (FSoE + IO)
Description:	with Rotary Motor

Fig. 17: Completed Create New Project dialog

Creating a New Project File

Click OK.	
	<i>Important!</i> Once the OK button is clicked and this dialog closes, it no longer possible to modify the ASM7 Module Type!
	For carriage return line feed (new line) inside the Description data entry field, use the short-cut key combination CTRL + Enter.
	The project Description can also be entered in the General Device Parameters dialog as well as in the Project Details window (lower left grey area of the ASM Parameter Editor). The Project Details window dis- plays the details of the current parameter project and provides a context menu (right mouse click) for changing the project Description and for set- ting a serial number.
Before pro	oceeding to the configuration of the parameters, save the project by clicking the

icon on the toolbar inside the red rectangle:



Fig. 18: Save the current project icon on the toolbar

In the *Save Project File* dialog, select the directory, enter a file name and click the button *Save*. Note that project files always have the file extension ***.asm7**.



For path and file names, use only printable and permissible characters from the <u>standard</u> ASCII character set. Non-permissible standard ASCII characters are the following; > < : "/\|?*

The Project Details windowpane will now appear as shown below:

Configuring the General Device Parameters

Project file: MyFirst Description: Sigma kW, 400Vac, 24-b motor speed 2000	ASM-Project.asm7 a-7 Motor/Encoder: SGD7G-1ED7F** - 15 it absolute multi-tum encoder, maximum rpm
Version: 0 User:	
Module: SGD7S-C Serial No.:	SB02A
Checksum:	

Fig. 19: The Project Details windowpane

3.7 Configuring the General Device Parameters

In the windowpane *Parameter Groups*, click the *General Device Parameters* group. The following dialog will appear as shown below:

Sigma-7 Motor/Encoder: SGD7G-1ED7F** – 15 kW, 100Vac, 24-bit absolute multi-turn encoder, maximum notor speed 2000 rpm	
Will the Advanced Safety Module be connected to an FSoE Master? Yes No	Limit Violation Deactivation Delay Time (LVDDT) (ms)
	Encoder Filter (samples)
Advanced Safety Module Serial Number	
0	

Fig. 20: The General Device Parameters dialog

Configuring the General Device Parameters

In accordance with item 2 of the characteristics, features and requirements given above (\Leftrightarrow Chap. 3.5 'Example of Creating a New Advanced Safety Module Project File' page 23), select Yes in the group box entitled Will the Advanced Safety Module be connected to an FSoE Master? and in the data entry field for the FSoE Address the hexadecimal value **0x0007**.

Enter the value **1000** in the data entry field for Limit Violation Deactivation Delay Time (LVDDT). The parameter LVDDT is used to prevent output chatter. Click the icon **1** inside the group box for LVDDT for more information.

The parameter *Encoder Filter* is applicable only when the safety function SLA (**S**afely Limited **A**cceleration) will be used. Since SLA will not be implemented in this example project, leave the default value of 1 as is.

The *Advanced Safety Module Serial Number* consists of a total of 15 digits (2 characters and 13 numbers), e.g. D0207A000110004. Locate the serial number of the *Advanced Safety Module* to be deployed and enter it exactly in the applicable data entry field.



Upon completion of the project file, a safe parameter container can be generated which can then be downloaded to the Advanced Safety Module. The correct serial number is a prerequisite for the error-free download of the binary safe container to the Advanced Safety Module.

The completed dialog for *General Device Parameters* should now appear similar to the following (the *Project Description* and *Serial Number* are examples only):

near Application with Rotary Motor igma-7 Motor/Encoder: SGD7G-1ED7F** – 5 kW, 400Vac, 24-bit absolute multi-turn encoder,	
aximum motor speed 2000 rpm	
Vill the Advanced Safety Module be connected to an SoE Master?	Limit Violation Deactivation Delay Time (LVDDT) (ms)
Yes	1000
○ No (1)	
SoE Address	Encoder Filter (samples)
0x0007	1
dvanced Safety Module Serial Number	
D0207A000110004	
•	

Fig. 21: Completed General Device Parameters dialog

Click the yellow Check and Commit button. The Compare and Confirm dialog will appear:

Configuring the Motor and Encoder Parameters

	General Device Parameters	Input Value	Equal	Stored Value	Committed
Pc070	FSoE Hardware Address	0x7		0x7	Yes
Pc09E	Limit Violation Deactivation Delay Time (LVDDT)	1000	-	1000	Yes
PcF37	Encoder Filter - Encoder Safety Usage	1		1	Yes

Fig. 22: Compare and Confirm dialog for the General Device Parameters

Since the *Input Values* and the *Stored Values* for the *FSoE Address*, *LVDDT* and *Encoder Filter* are identical, click the Confirm button and the *Compare and Confirm* dialog closes.

	and this dialog closes, it is no longer possible to modify the "Will the Advanced Safety Module be connected to an FSoE
For further details concerning the Compare and Confirm procedure,	er details concerning the Compare and Confirm procedure,
please refer to the Online Help utility of the ASM Parameter Editor by	fer to the Online Help utility of the ASM Parameter Editor by
simply clicking the icon on the toolbar inside the red rectangle:	cking the icon on the toolbar inside the red rectangle:



Fig. 23: Help icon on the toolbar

3.8 Configuring the Motor and Encoder Parameters

In the windowpane *Parameter Groups*, click the *Motor and Encoder Parameters* group.

Configuring the Motor and Encoder Parameters

- **1.** In the group box *Basic Application*, click **Linear Application**.
- 2. In the group box *Motor Type*, click Rotary Motor.
- 3. From the pull-down menu in the group box *Motor/Encoder Type*, select **SGM7G**-*****7***.
- **4.** In the group box *Motor Encoder Usage*, click **Absolute Multi-Turn**. Leave the value of **65535** for *Multi-Turn Limit* as is do not change.
- **5.** In the group box *Motor Direction*, select **Forward (CCW)**. Note: Set Sigma-7 parameter Pn000.0 to 0.
- 6. In the group box *Motor Maximum Speed*, enter the value 2000.
- **7.** In the group box *External Encoder*, click **Used for safety only** and from the pulldown menu for *Serial Converter Type*, select **JZDP-J*****_***.
- In the group box *External Encoder Direction*, click **Equal to Motor Encoder**.
 Tip: Click the icon (1) inside the group box for *External Encoder Direction* for more detailed information on how to make the correct selection.
 Note: Set Sigma-7 parameter Pn00E.3 to 1.
- **9.** In the group box *External Encoder Scale Pitch*, enter the value **2000**. (20/0.01 μm = 2000)
- **10.** In the group box *Encoder Deviation*, enter the value **1000**.
- 11. In the group box Encoder Deviation Window, enter the value 1000.
- 12. Within the displayed graphic are two data entry fields for *Gearbox Input* and *Gearbox Output*. Enter the value 10 in the *Gearbox Input* data entry field and enter the value 1 in the *Gearbox Output* data entry field.
- **13.** In the group box *Linear Feed*, enter the ball screw pitch **6000**.
- **14.** In the group box *User Units Input Mode*, leave the selection **Set the user units** with graphical assistance as is do not change.

Upon completion of the selections and data entries listed above, the *Motor and Encoder Parameters* dialog will appear as shown below:



Fig. 24: Motor and Encoder Parameters dialog Click the yellow Check and Commit button. The *Compare and Confirm* dialog will appear:

Configuring the I/O Parameters

ID	Motor and Encoder Parameters	Input Value	Equal	Stored Value	Committed
PcF37	Encoder Filter - Encoder Safety Usage	257		257	Yes
Pc050	Motor Setting Switch	0	-	0	Ves
Pc051	Function Setting Switch	0	-	0	Yes
Pc05A	External Encoder Setting Switch	2		2	Ves
Pc05C	Encoder Number of Pulses (External Encoder)	0		0	Yes
Pc060	Encoder Data Format Configuration 1 (Motor Encoder)	24	-	24	Yes
Pc062	Motor Max.Speed (Motor Encoder)	258		258	Yes
Pc063	Linear Scale Pitch, Mantissa Part (Motor Encoder)	0	14	0	Yes
Pc065	Linear Scale Pitch, Exponent Linear Encoder Resolution (Motor Encoder)	0		0	Yes
Pc066	Encoder Number of Pulses (Motor Encoder)	16777216	1.2	16777216	Yes
Pc068	Encoder Information (Motor Encoder)	257	=	257	Yes
Pc069	Encoder Data Format Configuration2 (Motor Encoder)	20536		20536	Yes

Fig. 25: Compare and Confirm dialog for the Motor and Encoder Parameters

Use the scrollbar at the right of the *Compare and Confirm* dialog and while scrolling down verify that the *Input Values* and the *Stored Values* are identical. It is necessary to scroll to the very bottom of the dialog in order to activate the *Confirm* button. If the *Input Values* and the *Stored Values* for the *Motor and Encoder Parameters* are identical, click the *Confirm* button and the *Compare and Confirm* dialog closes.



Important!

Once the Confirm button is clicked and this dialog closes, <u>it is no longer</u> possible to modify:

- The Basic Application (Rotary or Linear Application)
- The Motor Type (Rotary or Linear Motor)

3.9 Configuring the I/O Parameters

In the windowpane *Parameter Groups*, click the *I/O Configuration* parameters group.

Prior to proceeding with the I/O configuration, it is instructive to review the port functions available. In the pull-down menus for ports A to G, the function of the respective port can be selected. The following table shows which assignments are possible for which port.

Safe	Function Type	Α	В	С	D	Е	F	G1	G2
2-channel	Digital Input	•	•	•	•	•	•	_	_
2-channel	Digital Input Test Pulse A	_	•	•	•	•	•	_	_
2-channel	Digital Input Test Pulse B	•	_	•	•	•	•	_	_
2-channel	Analog Input (0-10V)	_	_	_	_	_	•	_	_
1-channel	Analog Input (4-20mA)	-	_	_	_	_	-	•	_
1-channel	Analog Input (PT1000)	_	_	_	_	_	_	-	•
2-channel	Digital Output	•	•	•	•	-	-	-	-

I/O Port Function Types

Configuring the I/O Parameters

Safe	Function Type	Α	В	С	D	Е	F	G1	G2
no	Digital Output EDM	•	•	•	•	-	_	_	_
2-channel	Digital Output Test Pulse	•	•	-	-	-	_	_	_

• = Available

- = Not available

In addition, additional I/O port parameters are to be configured dependent upon the port function as shown in the following table:

I/O Port Parameter Dependencies

Port Function	Filter Time	Discrep- ancy Time	Test Pulse Length	Channel Tolerance
00: None	-	-	-	-
01: Digital Input	•	•	-	-
02: Digital Input Test Pulse A	•	•	-	-
03: Digital Input Test Pulse B	•	•	-	-
04: Analog Input (0-10V)	-	-	-	•
06: Analog Input (4-20mA and PT1000)	-	-	-	-
07: Digital Output	-	-	•	-
08: Digital Output EDM	-	-	-	-
09: Digital Output Test Pulse	-	-	•	-

In accordance with item 4 of the characteristics, features and requirements given above (\Leftrightarrow *Chap.* 3.5 *'Example of Creating a New Advanced Safety Module Project File'* page 23), the I/O Configuration will now be carried out:

- **1.** In the group box *Port A Function*, click the pull-down menu and select *Digital Output Test Pulse A*.
- **2.** In the group box *Port A Test Pulse Length*, enter the value **100** in the data entry field.
- 3. In the group box *Port B Function*, click the pull-down menu and select *Digital Output*.
- 4. In the group box Port B Test Pulse Length, enter the value 50 in the data entry field.
- **5.** In the group box *Port C Function*, click the pull-down menu and select *Digital Output EDM*.
- 6. In the group box Port D Function, click the pull-down menu and select **Digital Input**.
- 7. In the group box Port D Filter Time, enter the value 250 in the data entry field.
- **8.** In the group box *Port D Discrepancy Time*, enter the value **150** in the data entry field.
- **9.** In the group box *Port E Function*, click the pull-down menu and select *Digital Input Test Pulse A*.
- **10.** In the group box *Port E Filter Time*, enter the value **200** in the data entry field.
- **11.** In the group box *Port E Discrepancy Time*, enter the value **150** in the data entry field.

- **12.** In the group box *Port F Function*, click the pull-down menu and select *Analog Input* (0-10Vdc).
- **13.** In the group box *Port F Channel Tolerance*, enter the value **5** in the data entry field.
- **14.** In the group box *Port G Function*, click the pull-down menu and select *G1: 4-20mA*, *G2: PT1000*.

Upon completion of the selections and data entries listed above, the *I/O Configuration* parameters dialog will appear as shown below:

D Configuration			
Port A Function	Port A Filter Time (ms)	Port A Discrepancy Time (ms)	Port A Test Pulse Length (ms)
Digital Output Test Pulse A 🛛 🗸	0	0	100
Port B Function	Port B Filter Time (ms)	Port B Discrepancy Time (ms)	Port B Test Pulse Length (ms)
Digital Output 🗸 🗸			50
Port C Function	Port C Filter Time (ms)	Port C Discrepancy Time (ms)	Port C Test Pulse Length (ms)
Digital Output EDM V			
Port D Function	Port D Filter Time (ms)	Port D Discrepancy Time (ms)	Port D Test Pulse Length (ms)
Digital Input V	250	150	
Port E Function	Port E Filter Time (ms)	Port E Discrepancy Time (ms)	
Digital Input Test Pulse A \sim	200	150	
Port F Function	Port F Filter Time (ms)	Port F Discrepancy Time (ms)	Port F Channel Tolerance (%)
Analog Input (0-10V) V			5
Port G Function (Analog Inputs)			
G1: 4-20 mA, G2: PT1000 🗸	D		

Fig. 26: Completed I/O Configuration parameters dialog

Important!

The Test Pulse Length parameterised for Port A must be shorter than the Filter Time parameterised at the corresponding input (to which the test pulse returns) – in this example Port E. If this is not the case, the signal received at the input is not interpreted as a test pulse, but rather as a signal which activates the safety function parameterised with this particular input.

Click the yellow **Check and Commit** button. The Compare and Confirm dialog will appear:

Configuring the Slot Parameters

ID	I/O Configuration	Input Value	Equal	Stored Value	Committed
Pc0C0	Safe Port A - Configuration	9		9	Yes
Pc0C1	Safe Port A - Filter Time	0	-	0	Yes
Pc0C2	Safe Port A - Discrepancy Time	10	-	10	Yes
Pc0C3	Safe Port A - Test Pulse Length	1000		1000	Yes
Pc0C8	Safe Port B - Configuration	7		7	Yes
Pc0C9	Safe Port B - Filter Time	0	-	0	Yes
PcOCA	Safe Port B - Discrepancy Time	10		10	Yes
PcOCB	Safe Port B - Test Pulse Length	500		500	Yes
Pc0D0	Safe Port C - Configuration	8	12	8	Yes
Pc0D1	Safe Port C - Filter Time	0	-	0	Yes
Pc0D2	Safe Port C - Discrepancy Time	10	=	10	Yes
Pc0D3	Safe Port C - Test Pulse Length	20		20	Yes

Fia.	27: Compare	and Confirm	dialog for the	I/O Configuration	parameters

Use the scrollbar at the right of the *Compare and Confirm* dialog and while scrolling down verify that the *Input Values* and the *Stored Values* are identical. It is necessary to scroll to the very bottom of the dialog in order to activate the *Confirm* button. If the *Input Values* and the *Stored Values* for the *I/O Configuration* parameters are identical, click the *Confirm* button and the *Compare and Confirm* dialog closes.

3.10 Configuring the Slot Parameters

For the sake of convenience, the characteristics, features and requirements for safety slot configuration (item 5, & Chap. 3.5 'Example of Creating a New Advanced Safety Module Project File' page 23) are given below:

- One slot with safety function SLS (Safely Limited Speed) a "safe motion" type safety function
- One slot with safety function SS1-r (Safe Stop 1, deceleration monitored and time controlled) a "safe standstill" type safety function (aka a *stopping* method this slot will be "linked" to the above slot via a "Limit Violation")
- One slot with safety function SMT (Safe Motor Temperature) a "safe monitoring" type safety function

In accordance with the given above requirements, the safety slot configuration will now be undertaken beginning with *Slot 1*:

- **1.** In the windowpane *Parameter Groups*, click the *Slot 1 Parameters* group.
- **2.** In the group box Safety Function, click the pull-down menu and select SLS.
- **3.** In the group box *Activation Input*, click the pull-down menu and select *Virtual Input 0*.
- **4.** In the group box *Output Signal Type*, click the pull-down menu and select **Safe Port B: Digital Output**.
- **5.** In the group box *Output Signal Behaviour*, click the pull-down menu and select *LOW during safe state*.
- **6.** In the group box *Waiting Time t1*, enter the value **1000** in the data entry field.
- **7.** In the group box *Monitoring Time t2*, enter the value **3000** in the data entry field.
- **8.** In the group box *Speed Limit s1*, enter the value **1000** in the data entry field.
- **9.** In the group box *Speed Limit s2*, enter the value **100** in the data entry field.

Configuring the Slot Parameters

Upon completion of the selections and data entries listed above for Slot 1, the Slot 1 Parameters dialog will appear as shown below:



Fig. 28: Completed Slot 1 Parameters dialog

Click the yellow **Check and Commit** button. The Compare and Confirm dialog will appear:

ID	Slot 1 Parameters	Input Value	Equal	Stored Value	Committed
Pc300	Slot 1 - Configuration I	16392		16392	Yes
Pc301	Slot 1 - Configuration II	4368	-	4368	Ves
Pc310	Slot 1 - Waiting Time (t1)	100	-	100	Yes
Pc311	Slot 1 - Monitoring Time (t2)	300		300	Ves
Pc312	Slot 1 - Speed Limit (s1)	1000		1000	Ves
Pc314	Slot 1 - Speed Limit (s2)	100	-	100	Yes
Pc316	Slot 1 - Acceleration Limit (a1)	0		0	Yes
Pc318	Slot 1 - Distance Limit (p1)	0	-	0	Yes
Pc31A	Slot 1 - Distance Limit (p2)	0	-	0	Yes
Pc31C	Slot 1 - Distance Limit (p3)	0		0	Yes
Pc31E	Slot 1 - Torque Limit (tq1)	0	=	0	Yes
Pc31F	Slot 1 - Temperature Limit (tp1)	0		0	Yes

Fig. 29: Compare and Confirm dialog for the Slot 1 Parameters

Use the scrollbar at the right of the *Compare and Confirm* dialog (if necessary) and while scrolling down verify that the *Input Values* and the *Stored Values* are identical. It is necessary to scroll to the very bottom of the dialog in order to activate the *Confirm* button. If the *Input Values* and the *Stored Values* for the *Slot 1 Parameters* are identical, click the *Confirm* button and the *Compare and Confirm* dialog closes.

Continuing with the configuration of the Slot 2 Parameters:

1. In the windowpane *Parameter Groups*, click the *Slot 2 Parameters* group.

2. In the group box Safety Function, click the pull-down menu and select SS1-r.

Configuring the Slot Parameters

- **3.** In the group box *Activation Input*, click the pull-down menu and select *Limit Violation Slot 1*.
- **4.** In the group box *Output Signal Type*, click the pull-down menu and select *Vir-tual Output 0*.
- **5.** In the group box *Output Signal Behaviour*, click the pull-down menu and select *HIGH during working safety function*.
- 6. In the group box *Waiting Time t1*, enter the value **500** in the data entry field.
- **7.** In the group box *Monitoring Time t2*, enter the value **1500** in the data entry field.
- **8.** In the group box *Speed Limit s*1, enter the value **100** in the data entry field.
- 9. In the group box *Speed Limit s2*, enter the value **10** in the data entry field.

Upon completion of the selections and data entries listed above for *Slot 2*, the *Slot 2 Parameters* dialog will appear as shown below:



Fig. 30: Completed Slot 2 Parameters dialog

Click the yellow **Check and Commit** button. The Compare and Confirm dialog will appear:
Configuring the Slot Parameters

ID	Slot 2 Parameters	Input Value	Equal	Stored Value	Committed
Pc380	Slot 2 - Configuration I	4099		4099	Yes
Pc381	Slot 2 - Configuration II	8240	-	8240	Yes
Pc390	Slot 2 - Waiting Time (t1)	50	-	50	Yes
Pc391	Slot 2 - Monitoring Time (t2)	150		150	Yes
Pc392	Slot 2 - Speed Limit (s1)	100		100	Yes
Pc394	Slot 2 - Speed Limit (s2)	10	-	10	Yes
Pc396	Slot 2 - Acceleration Limit (a1)	0		0	Yes
Pc398	Slot 2 - Distance Limit (p1)	0	=	0	Yes
Pc39A	Slot 2 - Distance Limit (p2)	0	-	0	Yes
Pc39C	Slot 2 - Distance Limit (p3)	0		0	Yes
Pc39E	Slot 2 - Torque Limit (tq1)	0	=	0	Yes
Pc39F	Slot 2 - Temperature Limit (tp1)	0		0	Yes

Fig. 31: Compare and Confirm dialog for the Slot 2 Parameters

Use the scrollbar at the right of the *Compare and Confirm* dialog (if necessary) and while scrolling down verify that the *Input Values* and the *Stored Values* are identical. It is necessary to scroll to the very bottom of the dialog in order to activate the *Confirm* button. If the *Input Values* and the *Stored Values* for the *Slot 2 Parameters* are identical, click the *Confirm* button and the *Compare and Confirm* dialog closes.

Continuing with the configuration of the Slot 3 Parameters:

- **1.** In the windowpane *Parameter Groups*, click the *Slot 3 Parameters* group.
- 2. In the group box Safety Function, click the pull-down menu and select SMT.
- 3. In the group box *Activation Input*, click the pull-down menu and select **Safe Port D: Digital Input**.
- **4.** In the group box *Data Input*, click the pull-down menu and observe the available choices: Safe Port F: Analog Input (0-10Vdc), Port G1: Analog Input (4-20mA), Port G2: PT1000. Select **Port G2: PT1000**.
- 5. In the group box *Output Signal Type*, click the pull-down menu and select *Port C2: EDM Output*.
- **6.** In the group box *Output Signal Behaviour*, click the pull-down menu and select *HIGH after limit violation*.
- 7. In the group box *Temperature Limit tp1*, enter the value **150** in the data entry field.
- **8.** In the group box *Temperature Limit tp2*, enter the value **100** in the data entry field.

Upon completion of the selections and data entries listed above for Slot 3, the Slot 3 Parameters dialog will appear as shown below:

Configuring the Slot Parameters

	-					
Safety Function	1					
SMT	~					
	0					
Activation Input						
Safe Port D: Digital Input	~	Activation ON	OFF (Safety Euroction Execut	ion Request)		
	0	Input	(Surety Function execut	ion nequest		
	U		1			
Data Input		Temperature	1			
Port G2: PT1000	~		Temperature limit 1		_	
	0	Actual temperature	Temperature li	mit 2		
Detroit Signal Turne						
out C1: EDM Output	~		tp1 = 0 °C			
				tp2 = 0 °C		
Dutput Signal Behaviour	1	0	4		t	
HGH after limit violation	~					
	•	2.				
		Please note that this is a monito	oring function that does not activate a sto	pping method after a limit violation).	_
afety Function Parameters						
Waiting Time t1 (ms)	Speed Limit s	1 (mm/s)	Distance Limit p1 (micron)	- Torque Limit tq1 (·)		
0 *	0		0	0	4	
	0	0	1	0		
Monitoring Time t2 (ms)	Speed Limit s	2 (mm/s)	Distance Limit p2 (micron)	Temperature Limit tp1 ((°C)	
0	0	*	0	0.0	[4]	
1 ¹⁰ ¥	D	• 1	<u>v</u> +	0.0		1.9
Safe Homing Postion (SHP)	- Acceleration I	umit a1 (mm/s^2)	Distance Limit p3 (micron)	Temperature Limit tp2	°C)	
Safe Homing Postion (SHP) Position Difference (deg.) Offset to Home (micron)	Acceleration (.imit a1 (mm/s^2)	- Distance Limit p3 (micron)	Temperature Limit tp2 ("C)	

Fig. 32: Completed Slot 3 Parameters dialog

Click the yellow **Check and Commit** button. The Compare and Confirm dialog will appear:

ID	Slot 3 Parameters	Input Value	Equal	Stored Value	Committed
Pc400	Slot 3 - Configuration I	14351		14351	Yes
Pc401	Slot 3 - Configuration II	1285	-	1285	Yes
Pc410	Slot 3 - Waiting Time (t1)	0	-	0	Yes
Pc411	Slot 3 - Monitoring Time (t2)	0		0	Yes
Pc412	Slot 3 - Speed Limit (s1)	0		0	Yes
Pc414	Slot 3 - Speed Limit (s2)	0	-	0	Yes
Pc416	Slot 3 - Acceleration Limit (a1)	0		0	Yes
Pc418	Slot 3 - Distance Limit (p1)	0		0	Yes
Pc41A	Slot 3 - Distance Limit (p2)	0	-	0	Yes
Pc41C	Slot 3 - Distance Limit (p3)	0		0	Yes
Pc41E	Slot 3 - Torque Limit (tq1)	0	=	0	Yes
Pc41F	Slot 3 - Temperature Limit (tp1)	1500		1500	Yes

Fig. 33: Compare and Confirm dialog for the Slot 3 Parameters

Use the scrollbar at the right of the *Compare and Confirm* dialog (if necessary) and while scrolling down verify that the *Input Values* and the *Stored Values* are identical. It is necessary to scroll to the very bottom of the dialog in order to activate the *Confirm* button. If the *Input Values* and the *Stored Values* for the *Slot 3 Parameters* are identical, click the *Confirm* button and the *Compare and Confirm* dialog closes.

The configuration and parameterisation of the example project is now complete. Before proceeding with the creation of a safe parameter container, save the project by clicking the icon on the toolbar inside the red rectangle:



Fig. 34: Save the current project icon on the toolbar

For path and file names, use only printable and permissible characters from the <u>standard</u> ASCII character set. Non-permissible standard ASCII characters are the following; > < : "/\|? *

3.11 Generating Parameter Files

After completion of the parameter configuration and all parameters have been checked and committed, a validation check (which includes a final plausibility check) can be performed. Upon successful validation, a checksum is generated. When subsequently creating the Safe Parameter Container, this checksum is applied to the safe container in order to "protect" its contents. Prior to creation of a safe container, it is essential that a successful validation check is performed.

To do this, press the *Validate Parameter* button in the *Device* menu or the button shown in the following figure in the toolbar.



It is not mandatory to first click on the Validate Parameter menu item from the menu bar or directly on the icon with the warning triangle in the toolbar. When clicking on the Export Safe Container item in the menu bar or directly on the corresponding icon in the toolbar, a validation check is first performed automatically. The user can therefore skip the Validate Parameter step and proceed directly to the Export Safe Container step. If the validation fails, no Safe Container will be created.

Advanced S	afety	Module Parameter Editor - < <unsaved>></unsaved>	Advanced Safety Module Parameter Editor - < <unsaved>></unsaved>
File Edit	Dev	ice Help	File Edit Device Help
2 🖻 🔒 .	Δ	Validate Parameter	: ") 🖻 🔒 🗽 📐 🗶 😫 🕼 🔟
Parameter G		Export Safe Container CMIF Container Transfer	SGD7S-OSBO2A Calculate a checksum for validation
O General Dev O Motor and E	*	Remove Safe Container File Import Safe Container (Expert)	O General Device Parameters O Motor and Encoder Parameters

If the validation check was successful, the tool displays the message "CRC calculation successful:" with the resulting CRC32 checksum for the safe parameter container in the message log. If the validation fails, an error message is displayed.

Adv	anced Safety Module Parameter Editor - < <unsaved>></unsaved>
<u>F</u> ile	<u>E</u> dit <u>D</u> evice <u>H</u> elp
1 🗅 🖻	ד 🛃 🎿 🛦 🖄 🖻 🖨 👔
S S	GD7S-OSB02A
Paran	neter Groups
🔿 Gen	eral Device Parameters
O Mot	or and Encoder Parameters
🔿 Use	r Unit & Encoder Parameters
0 1/0 0	Configuration
Slot	1 Parameters
O Slot	2 Parameters
O Slot	3 Parameters
O Slot	4 Parameters
O Slot	5 Parameters
○ Slot	6 Parameters
O Slot	7 Parameters
 ○ Slot 	8 Parameters
O Slot	9 Parameters
O Slot	10 Parameters
(Check and Commit
Edit	Parameter Group

If the parameter validation was successful, a binary safe container file can be generated. This is done by pressing the *Export Safe Container* button.



The tool opens a file save dialogue to enter the desired file name in the current output directory. The default extension for the parameter files is ".bin", which indicates binary content.

Advanced Safety Module Paramet	er Editor - < <unsaved>></unsaved>						
File Edit Device Help							
0 😂 🛦 🛦 🖄 😂 🙆 🔟							
SGD7S-OSB02A		Slot 1 Parameters					
Parameter Groups O General Device Parameters O Motor and Encoder Parameters	Save Binary File	SKAWA > ASM7 Parameter Ed	tor > data	~ N	Search data		× م
O User Unit & Encoder Parameters	Organize - New fold	er				812 +	0
I/O Configuration Slot 1 Parameters	 OneDrive 	^ Name	Date modifi	ed	Туре	Size	
O Slot 2 Parameters O Slot 3 Parameters	This PC 3D Objects		No items match your	search.			
O Slot 4 Parameters O Slot 5 Parameters	Desktop						
Slot 6 Parameters Slot 7 Parameters Slot 8 Parameters	Music	1					
O Slot 9 Parameters O Slot 10 Parameters	Videos						
	File name: Exp	ort1.bin					v
Check and Commit	Save as type: bina	ny files (".bin)					~
Edit Parameter Group	A Hide Folders				Save	Cance	

The parameter files are set to read-only after export to prevent accidental deletion. If the same file is to be overwritten, the write protection must be removed. This can be done in the file save dialogue by right-clicking on the existing file and removing the read-only property as shown in the following figure.

File Edit Device Help			
0 🔤 🖬 🛓 🛦 🖄 😫 🎒 📓			
SGD7S-OSB02A	Slot 1 Parameters		
Parameter Groups General Device Parameters Motor and Encoder Parameters User Unit & Encoder Parameters Slot 1 Parameters Slot 2 Parameters Slot 3 Parameters Slot 5 Parameters Slot 6 Parameters Slot 8 Parameters Slot 8 Parameters Slot 8 Parameters Slot 9 Parameters	Save Binary File Save Binary File	Export1.bin Properties X General Security Details Previous Versions Export1.bin Type of file: BIN File (bin) Opens with: Pick an app Dhange Location: C:\Users\Public\Documents\YASKAWA\ASM7 Par Size: 1.02 KB (1.054 bytes) Size on disk: 4,00 KB (4.095 bytes) Created: Today, 5. November 2019, 13 22:13 Modified: Today, 5. November 2019, 13 22:13 Accessed: Today, 5. November 2019, 13 22:13	х р Size 2 KB
O Slot 10 Parameters Check and Commit	File name: Export1.bin Save as type: binary files (*.bin)	Attributes: Read-only Hidden Advanced	~
Edit Parameter Group	▲ Hide Folders	OK Cancel Apply	Cancel

The tool increments an internal version counter and writes this value to **<u>both</u>** the project file and to the binary safe parameter container when the following steps have been executed:

- **1.** A parameter value has been modified.
- **2.** The modified parameter value has been checked and committed.
- **3.** A new binary safe parameter container is generated.
- **4.** The project is saved.

The last step completes the configuration. Save the project before closing the tool.

Ac	Ivanced Safety Module F	Parameter Editor - < <unsaved>></unsaved>
File	Edit Device He	lp
1	New Project	2
	Open Project	
	Save Project	
E	Save Project As	
-34	Clos Save the current p	project settings
Î	Delete Project File	
3	Print	-
*	Exit	
	ou rarameters	



3.12 CMIF Container Transfer

The generated parameter files can be downloaded to the Advanced Safety Module. The Advanced Safety Module Parameter Editor offers a direct download function via the CMIF interface to the SERVOPACK CmServer. Therefore, the PC with the installed tool requires the installation of SigmaWin+ Version 7.40 (or later) including the communication service CmServer.



Communication with the SERVOPACK is only possible when one and only one software program uses the designated interface (typically USB). For example, it is not possible to have an online connection to the SER-VOPACK using SigmaWin+ and simultaneously use the Safe Container Download function of the Advanced Safety Module Parameter Editor. Otherwise, communication will fail. Either close SigmaWin+ or close the Safe Container Download window of the Advanced Safety Module Parameter Editor.

By clicking on *CMIF Container Transfer* in the *Device* menu the following download dialogue is displayed.



Downloading a safe container file to the Advanced Safety Module

1. Configure the connection to the SERVOPACK.



At present, the port to which the SERVOPACK is connected can be only the USB port (Port#10 USB). Do NOT select an Ethernet connection!

2. Click on the *Connect* button to connect the SERVOPACK.

3. When the connection is established, click on the *Load File...* button at the top right of the dialogue.

Connection		
Used Interface Port:	Port#10 USB	Configure
		Connect
afe Container File		
		Load File
File	e Information Box	
		Write File
New Serial Number:		Update Senal No
Data Exchange		
and annunge		
Received Bytes (hex):	
Received Bytes (hex):	Send File
Received Bytes (hex):	Send File Receive File
Received Bytes (hex):	Send File Receive File Save Received File
Received Bytes (hex):	Send File Receive File Save Received Re. Read System Info
Received Bytes (hex):	Send File Receive File Save Received File Read System Info ASM7 Initialize
Received Bytes (hex):	Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check
Received Bytes (hex):	Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check

Connected to port 10

4. Select the desired file in the *Load Safe Container File* dialogue. The serial number currently associated with the safe container file is displayed in the file information box and in the *New Serial Number* data entry field.

onnection		
Ised Interface Port:	Port#10 USB	Configure
		Connect
afe Container File		
File name: ASM7test File length: 1054 byte Version: 1 No. Parameters: 208 User: Serial No.: 0123456: UUID: fab.76f73-094	1_IV_1072.bin es 78912345 d-4622-b3ed-376583593059	Load File
		Write File,
Vew Serial Number:	012345678912345	Lindate Secial No.
ata Exchange Received Bytes (hex):	update Senai No
ata Exchange Received Bytes (hex):	Send File
ata Exchange Received Bytes (hex):	Send File Receive File
ata Exchange Received Bytes (hex):	Send File Receive File Save Received File.
ata Exchange Received Bytes (hex):	Send File Receive File Save Received File. Read System Info
ata Exchange Received Bytes (hex	:	Send File Receive File Save Received File. Read System Info ASM7 Initialize
lata Exchange Received Bytes (hex	:	Send File Receive File Save Received File. Read System Info ASM7 Initialize Motor and Encoder Parameter Check

Connected to port 10

5. Determine the serial number of the connected Advanced Safety Module. If the serial number of the connected Advanced Safety Module matches the serial number displayed as described step 4, proceed to step 6.

If the serial number of the connected Advanced Safety Module differs from the serial number displayed as described in step 4, the safe container file must be updated with the serial number of the connected Advanced Safety Module.

Click the *Update Serial No...* button to apply the new serial number to the safe container file.

The new serial number will be shown in the file information box (and in the *New Serial Number* data entry field) and will be applied to the safe container file for sending. Writing this serial number to the safe container file is not required. If, however, it is desired to make this serial number persistently associated with the safe container file, click the button *Write File*.



Important information for machine manufacturers engaged in serial production

It is possible to assign a serial number without having to save the safe container file again and again for each and every machine axis. Use the one applicable safe container file and update the serial number as required for the whole series. If identical machine axes are to be furnished with the same safe container file, the serial number is entered during the download (see step 5 above) without having to save a new safe container file.

6. Click on the Send File button to start the download.

7. When the download is completed successfully, a *Write Success* message will be displayed.

	wnload	
Connection		
Used Interface Port:	Port#10 USB	Configure
		Connect
Gafe Container File		
File name: ASM7tes File length: 1054 byt Version: 1 No. Parameters: 200 User: Serial No.: 0123456 UUID: fab76f73-094	t1_IV_1072.bin es 3 78912345 Id-4622-b3ed-376583593059	Load File
		Write File
New Serial Number:	012345678912345	Update Serial No
Data Exchange		
Data Exchange Received Bytes (hex Write Success): . 1054 bytes sent in 1778ms	Send File
Data Exchange Received Bytes (hex Write Success	:): . 1054 bytes sent in 1778ms	Send File Receive File
Data Exchange Received Bytes (hex Write Success): . 1054 bytes sent in 1778ms	Send File Receive File Save Received File
Data Exchange Received Bytes (hex Write Success): . 1054 bytes sent in 1778ms	Send File Receive File Save Received File Read System Info
Data Exchange Received Bytes (hex Write Success): . 1054 bytes sent in 1778ms	Send File Receive File Save Received File Read System Info ASM7 Initialize
Data Exchange Received Bytes (hex Write Success): . 1054 bytes sent in 1778ms	Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check
Data Exchange Received Bytes (hex Write Success): . 1054 bytes sent in 1778ms	Send File Receive File Save Received File. Read System Info ASM7 Initialize Motor and Encoder Parameter Check

Write Success. 1054 bytes sent in 1778ms

In addition to downloading, it is also possible to upload a parameter file from the connected Advanced Safety Module.

1. Configure the connection to the SERVOPACK.



At present, the port to which the SERVOPACK is connected can be only the USB port (Port#10 USB). Do NOT select an Ethernet connection!

2. Click on the *Connect* button to connect the SERVOPACK.

Uploading a safe container file from the connected Advanced Safety Module

- **3.** When the connection is established, click on the *Receive File* button to start the upload.
- **4.** If the upload was successful, save the received container file by clicking on the *Save Received File* button.

onn	ectio	n													
lsed	Inte	face	Port	tt	P	ort#	10 L	JSB							Configure
															Connect
afe	Cont	ainer	File												
1															Load File
															Write File
					-									_	
Vew	/ Seri	al Nu	umbe	er:											Indate Sedal No
lata	Excl	hang	e e	avl											opure contraction
ata Rec 1E	Excl eived	nang d Byte 00	e es (h 70	ex):	71	01	00	D0	00	73	6F	B7	FA	^	Send File
Rec	Exch eived 04 09 33	oo 22 34	e es (h 70 46 35	ex): 00 B3 36	71 ED 37	01 37 38	00	D0 83 31	00 59 32	73 30 33	6F 59	B7 30	FA 31 00	^	Send File
Ata Rec 1E 4D 32	Exch eived 04 09 33 00	00 22 34 00	e es (h 70 46 35 00	ex): 00 B3 36 00	71 ED 37 00	01 37 38 00	00 65 39 00	D0 83 31 00	00 59 32 00	73 30 33 00	6F 59 34	B7 30 35 00	FA 31 00 00	^	Send File Receive File
ata Rec 1E 4D 32 00	Exch eived 04 09 33 00 00	00 22 34 00 66	e es (h 70 46 35 00 52	ex): 00 B3 36 00 50	71 ED 37 00 00	01 37 38 00 00	00 65 39 00	D0 83 31 00 51	00 59 32 00 00	73 30 33 00 00	6F 59 34 00	B7 30 35 00 5A	FA 31 00 00	î	Send File Receive File Save Received File
Pata Rec 1E 4D 32 00 00	Exch eived 04 09 33 00 00 00	00 22 34 00 66 5C	e es (h 70 46 35 00 52 00	ex): 00 B3 36 00 50	71 ED 37 00 00	01 37 38 00 00	00 65 39 00 00	D0 83 31 00 51 60	00 59 32 00 00	73 30 33 00 00 18	6F 59 34 00 00	B7 30 35 00 5A 62	FA 31 00 00 00 00	^	Send File Receive File Save Received File
Pata Rec 1E 4D 32 00 00 30 00	Exch eived 04 09 33 00 00 00 00	00 22 34 00 66 5C 63 00	e es (h 70 46 35 00 52 00 00 00	ex): 00 B3 36 00 50 00 00	71 ED 37 00 00 00 00	01 37 38 00 00 00 00	00 65 39 00 00 00 00	D0 83 31 00 51 60 65 69	00 59 32 00 00 00 00	73 30 33 00 00 18 00 38	6F 59 34 00 00 00 00	B7 30 35 00 5A 62 66	FA 31 00 00 00 00 00	^	Send File Receive File Save Received File Read System Info
Pata Rec 1E 4D 32 00 00 3C 00 FF	Exct eived 04 09 33 00 00 00 00 00 FF	nang 1 Byt 00 22 34 00 66 5C 63 00 68	e es (h 70 46 35 00 52 00 00 00 00	ex): 00 B3 36 00 50 00 00 68 00	71 ED 37 00 00 00 00 00 00	01 37 38 00 00 00 00 00 01 6C	00 65 39 00 00 00 00 00	D0 83 31 00 51 60 65 69 00	00 59 32 00 00 00 00 00 00	73 30 33 00 00 18 00 38 6D	6F 59 34 00 00 00 00 50 00	B7 30 35 62 62 64 00	FA 31 00 00 00 00 00 00 00	^	Send File Receive File Save Received File Read System Info
Pata Rec 1E 4D 32 00 00 3C 00 FF 00	Exch eived 04 09 33 00 00 00 00 00 00 00 FF 00	00 22 34 00 66 50 63 00 68 67	e es (h 70 46 35 00 52 00 00 00 01 00 00	ex): 00 B3 36 00 50 00 00 68 00 00	71 ED 37 00 00 00 00 00 00	01 37 38 00 00 00 00 00 00 00 01 6C 70	000 655 399 000 000 001 000 001 000	D0 83 31 60 65 69 00 07	000 59 322 000 000 000 000 000 000	73 30 33 00 18 00 38 6D 00	6F 59 34 00 00 00 50 00 00	B7 30 35 62 66 6A 00 00	FA 31 00 00 00 00 00 00 00 00 00	^	Send File Receive File Save Received File Read System Info ASM7 Initialize
ata Rec 1E 4D 32 00 00 3C 00 FF 00 01	Exch eived 04 09 33 00 00 00 00 00 00 00 00 00 00 00 00	00 22 34 00 66 50 63 00 68 67 64	e es (h 70 46 35 00 52 00 00 00 00 00 00	ex): 00 B3 36 00 50 00 00 68 00 00 00 00	71 ED 37 00 00 00 00 00 00 00 00	01 37 38 00 00 00 00 01 6C 70 32	00 65 39 00 00 00 00 00 00 00	D0 83 31 60 65 69 00 07 03	000 59 322 000 000 000 000 000 000 000 001	73 30 33 00 18 00 38 6D 00 00	6F 59 34 00 00 00 00 50 00 01 00	B7 30 35 62 66 66 00 00 04	FA 31 00 00 00 00 00 00 00 00 00 00 00		Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder
Pata Rec 4D 32 00 00 3C 00 5F 00 01 00	Exch eived 04 09 33 00 00 00 00 00 00 00 00 00 00 00 00	00 22 34 00 66 50 63 00 68 67 64 72	e es (h 70 46 35 00 00 00 00 00 00 00 00	ex): 00 B3 36 00 50 00 68 00 00 00 00 00 00 00 00	71 ED 37 00 00 00 00 00 00 00 00 00 00	01 37 38 00 00 00 01 6C 70 32 10	00 65 39 00 00 00 00 00 00 00 00	D0 83 31 60 65 69 00 07 03 74	000 599 322 000 000 000 000 000 000 001 000	73 30 33 00 18 00 38 6D 00 0A 68	6F 59 34 00 00 00 50 00 01 00 01	B7 30 35 62 66 62 66 60 00 00 00	FA 31 00 00 00 00 00 00 00 00 00 00 00 00 00		Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check
Pata Rec 1E 4D 32 00 00 3C 00 5FF 00 01 00 76	Exch eived 04 09 33 00 00 00 00 00 00 00 00 00 00 00 00	00 22 34 00 66 5C 63 00 6B 6F 64 72 01	e es (h 70 46 35 00 52 00 00 00 00 00 00 00 00	ex): 000 B3 36 000 500 000 000 000 000 000 00	71 ED 37 00 00 00 00 00 00 00 00 00 00 00	01 37 38 00 00 00 00 01 6C 70 32 10 78	000 655 399 000 000 000 000 000 000 000 000	D0 83 31 00 51 60 65 69 00 07 03 74 01	00 59 32 00 00 00 00 00 00 00 00 00 00	73 30 33 00 00 18 00 38 6D 00 0A 68 00	6F 59 34 00 00 50 00 00 01 00 01 00	B7 30 35 62 66 6A 00 00 04 00 7A	FA 31 00 00 00 00 00 00 00 00 00 00 00 00 00		Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check
Rec 1E 4D 32 00 00 00 00 00 00 00 00 00 0	Exch eived 04 09 33 00 00 00 00 00 00 00 00 00 00 00 00	00 22 34 00 66 5C 63 00 68 67 64 72 01 10	e es (h 70 46 35 00 00 00 00 00 00 00 00 00 0	ex): 00 B3 36 00 50 00 00 00 00 00 00 00 00	71 ED 37 00 00 00 00 00 00 00 00 00 00 00 00	01 37 38 00 00 00 01 6C 70 32 10 78 3C	000 655 399 000 000 001 000 000 000 000 000	D0 83 31 00 51 60 65 69 00 07 03 74 01 00	000 599 322 000 000 000 000 000 000 000 000 000	73 30 33 00 18 00 38 6D 00 04 68 00 7E	6F 59 34 00 00 00 00 00 00 00 00 00 00 00	B7 30 35 62 66 6A 00 00 04 00 7A 01	FA 31 00 00 00 00 00 00 00 00 00 00 00 00 00	^	Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check
Pata Rec 1E 4D 32 00 00 3C 00 5F 00 00 76 00 00 84	Exch eived 04 09 33 00 00 00 00 00 00 00 00 00 00 00 00	ang 00 22 34 00 66 5C 63 00 6B 6F 64 72 01 10 80 C0	e es (h 70 46 35 00 00 00 00 00 00 00 00 00 0	ex): 00 B3 36 00 50 00 00 68 00 00 00 00 00 00 00 00 00 0	71 ED 37 00 00 00 00 00 00 00 00 00 00 00 00 00	01 37 38 00 00 00 01 6C 70 32 10 78 3C 00 86	000 655 399 000 000 000 000 000 000 000 000 000	D0 83 31 00 51 60 65 69 00 07 03 74 01 00 82 01	000 559 322 000 000 000 000 000 001 000 000 000 0	73 30 33 00 18 00 38 6D 00 04 68 00 7E 00 00	6F 59 34 00 00 00 00 00 00 00 00 00 00 00 00	B7 30 35 62 66 6A 00 04 00 7A 01 10	FA 31 00 00 00 00 00 00 00 00 00 00 00 00 00	^	Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check
ata Rec 1E 4D 32 00 00 3C 00 00 5F 00 00 00 76 00 84 10	Exch eived 04 09 33 00 00 00 00 00 00 00 00 00 00 00 00	000 22 34 00 66 5C 63 00 68 67 64 72 01 10 80 C0 00	e (h 70 46 35 00 52 00 00 00 00 00 00 00 00 00 00 00 00 00	ex): 00 B3 36 00 50 00 00 68 00 00 00 00 00 00 00 00 00 0	71 ED 37 00 00 00 00 00 00 00 00 00 00 00 00 00	01 37 38 00 00 00 01 6C 70 32 10 78 3C 00 86 64	00 65 39 00 00 00 00 00 00 00 00 00 00 00 00 00	D0 83 31 00 51 60 65 69 00 07 03 74 01 00 82 01 88	000 599 322 000 000 000 000 000 000 000 000 000	73 30 33 00 18 00 38 6D 00 38 6D 00 00 7E 00 00 67	6F 59 34 00 00 00 00 00 00 00 00 00 00 00 00 00	B7 30 35 62 66 6A 00 04 00 7A 01 10 88 8C	FA 31 00 00 00 00 00 00 00 00 00 00 00 00 00		Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check

Receive file finished.

Motor and Encoder Parameter Check button (Servo Parameter Confirmation) The safety-related servo parameters contain information about the motor and encoder configuration of the SERVOPACK and are managed by the Advanced Safety Module. This information is held in the SERVOPACK, but it is also managed in the Advanced Safety Module with different parameter numbers.

When the unit consisting of SERVOPACK and Advanced Safety Module is switched on, the values of this parameter group stored in the SERVOPACK are compared with the values of the corresponding parameters in the Advanced Safety Module. If the values do not match, alarm A.EC1 (Safety-related Servo Parameter Unmatch Alarm) is displayed.

The safety-related servo parameters that do not match between SERVOPACK and Advanced Safety Module can be displayed by pressing the button *Motor and Encoder Parameter Check*.

Non-matching parameters are displayed in the following dialogue box.

Servo Parameter	Confirmation		×
Pc Number	ASM7 Parameter	SERVOPACK Setting	Help
Pc005C	16384	1048576	Show
Pc006C	0x5042	0x503C	Show
			Close

At the same time the following message appears in the Message Log:

Safety related servo parameter confirmation failed. Number of unmatching parameters: 2

If all parameters match, the following message is displayed in the Message Log without the *Servo Parameter Confirmation* dialogue box being displayed.

Safety related servo parameter confirmation successful



When using the Digital Operator, the function described here corresponds to Fn042 (Safety-related Servo Parameter Confirmation).

ASM7 Initialize button If an Advanced Safety Module that is already in operation is initialized with a new SER-VOPACK, the ASM7 Initialize button is helpful.

This Advanced Safety Module has the following features:

- SERVOPACK serial number stored
- Optional: Safe container stored
- Optional: Homing information stored

If an Advanced Safety Module with these properties is connected to a new SERVOPACK, the Safety Module Confirmation Alarm (A.EC0) is displayed.

By clicking on the *ASM7 Initialize* button, the stored serial number of the SERVOPACK, the homing information and the safe container in the non-volatile memory of the Advanced Safety Module are deleted.

Click on the ASM7 Initialize button.
 A message box will appear with the instructions to switch the power supply of the SERVOPACK off and on.



Fig. 35: ASM7 Initialize Cycle Power Dialogue box

After clicking OK in the message box, the message "ASM7 Parameter Initialization successful" will appear.

onnection		
sed Interface Port:	Port#10 USB	Configure
		Connect
afe Container File		
File name: ASM7test File length: 1054 byte Version: 1 No. Parameters: 208 User: Serial No.: 01234567	1_IV_1072.bin *5 78912345	Load File
UUID: tab /6t /3-094c	1-4622-03ed-376583593059	Write File
New Serial Number:	012345678912345	Update Serial No
ata Exchange Received Bytes (hex)	£)	
ata Exchange Received Bytes (hex)	£	Send File
ata Exchange Received Bytes (hex)	:	Send File Receive File
ata Exchange Received Bytes (hex)	<u></u>	Send File Receive File Save Received File
ata Exchange Received Bytes (hex)	c	Send File Receive File Save Received File Read System Info
ata Exchange Received Bytes (hex)	ε	Send File Receive File Save Received File Read System Info ASM7 Initialize
ata Exchange Received Bytes (hex)		Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check

The initialization of the Advanced Safety Module can then be continued as described in the product manual.



When using the Digital Operator, the function described here corresponds to Fn043 (Safety Option Module Initializing Parameter Setting).

4 Application Example: Rotary Table



Fig. 36: Rotary table application

This application consisting of a gearbox and a rotary motor is to be realised with the safety requirements described below.

User unit:

- Position unit in degrees
- Speed in deg/s

Safety requirements A light curtain is hardwired to the Advanced Safety Module and sets the servomotor to STO (Safe Torque Off).

The SLS (Safely Limited Speed) function is activated via FSoE. In the Advanced Safety Module, we realise this via virtual input 0.

The maximum allowable speed is one turn per second.

A safe output is connected to a safety relay which, in the event of STO, activates a warning light and switches off the downstream axes.



Fig. 37: Rotary table application - Safety requirements



Yaskawa's scope of supply in the above illustration is limited to the Advanced Safety Module (ASM7).

Starting the Advanced Safety Module Parameter Editor and Login

O Th Ea Us tic

The creation of a project with the Advanced Safety Module Parameter Editor is described in detail in chapter & Chap. 3 'Creating a Project using the Advanced Safety Module Parameter Editor' page 22. Only particularly significant points for the example application are described here.

You must enter the password to obtain full parameterisation rights when starting the application.

User Name	e: John Doe	
Password:	1	

Fig. 38: Login

The main window is displayed when the application is started. You can now create a new project.

YASKAWA Advanced Safety Modul	Paramieter Editor	— (B) ×
File Edit Device Help		
003*4*231		
YASKAWA	Porameter List	
par concern		
No project.		
INFO 2021-8-27 16:00:52 >> Supported m INFO 2021-8-27 16:00:52 >> Supported m	dule: SGD7S-OSB01A	^
INFO 2021-8-27 16:00 52 Tool successfully INFO 2021-8-27 16:00 52 Password warfaid	ctivated for user yaskewa?	
and see over 10.00 ver oppingit verses	and a second products of the second se	

Fig. 39: Successful Start of the Application

Creating a Project

File	Edit Device H	lelp
b	New Project	2
	Open Project	List
	Save Project St	art a new project
H	Save Project As	
	Close Project	
Î	Delete Project File	
3	Print	
	Exit	



Before parameters can be configured, a project must first be created. Click *New Project* in the File menu to create a new project. The *Create New Project* dialogue box appears.

gma7 Servopack	
ASM7 Module Type	
SGD7S-OSB01A	(FSoE only)
SGD7S-OSB02A	(FSoE + IO)
escription:	
otary table application	n

Fig. 41: Create New Project - Rotary table application

Select the ASM7 Module Type:

- SGD7S-OSB01A (FSoE only)
- SGD7S-OSB02A (FSoE + IO)



Important!

Once the OK button is clicked and this dialogue closes, it no longer possible to modify the ASM7 Module Type!

A short description of the application project should always be entered.

After validating the *Create New Project* dialogue, the parameter groups on the left are active and the parameters are available for editing.



Fig. 42: New Project Ready for Editing

Here you can check whether you have selected the correct ASM7 Module Type.

The displayed parameter groups must always be edited starting at the top. When the parameterisation of a parameter group has been completed, the **Check and Commit** button becomes active. Clicking this button displays the *Compare & Confirm* dialogue box to check and confirm the stored values.

General	Device	Parame-	
ters			

Select the parameter group General Device Parameters.

Project Description	
Rotary table application	
Will the Advanced Safety Module be connected to an FSoE Master?	Limit Violation Deactivation Delay Time (LVDDT) (ms
Yes	0
FSoE Address	Encoder Filter (samples)
Advanced Safety Module Serial Number D0207A000110004	
0	

Fig. 43: General Device Parameters group

In the *General Device Parameters* group, indicate whether you are using an FSoE master or not, and if so, enter the FSoE address.

You also enter the serial number of the Advanced Safety Module, which is indicated on the sticker of the board.



Before you install the SERVOPACK (e.g. in a control panel), please ensure that the serial number of the product is recorded. If the SERVO-PACK is already installed, the serial number can also be read out with SigmaWin+.

If you are unsure about the meaning of a certain parameter, use the 1 buttons that display a small help text.

Rotary table application	¢	
Will the Advanced Safety Module b	e connected to an - Limit Violation	Deactivation Delay Time (LVDDT) (ms)
FSoE Master?		
Yes		0
() No	•	
FSoE Address	If a "Limit Violation" is detect. SERVOPACK is set to the safe Module in accordance with y If the Limit Violation is cleare LVDDT time delays the time b Module leaves this safety fun A constant state change of or Range: 0 - 1000 ms	ed in a safety function, the state by the Advanced Safety our parameterisation. d, i.e. no longer present, the efore the Advanced Safety iction and thus the safe state. utputs is thus avoided.
Advanced Safety Module Ser		
		OF
		UK I

Fig. 44: Limit Violation Deactivation Delay Time Help Text

When you have entered all values and made all selections, click on the Check and Commit button.

	General Device Parameters	Input Value	Equal	Stored Value	Committed
Pc070	FSoE Hardware Address	0x1		0x1	Yes
Pc09E	Limit Violation Deactivation Delay Time (LVDDT)	0		0	Yes
PcF37	Encoder Filter - Encoder Safety Usage	1		1	Yes

Fig. 45: Compare & Confirm General Device Parameters

In the *Compare & Confirm* dialogue you will now see the previous entries with the corresponding parameter number.

If all input values match the saved values, click on Confirm!

Motor and Encoder Parameters

Now select the next parameter group *Motor and Encoder Parameters*.

Let's assume you have only one motor and no second encoder (with this configuration, SIL 2 is achievable) and want to use the Advanced Safety Module for a rotary table application.



Fig. 46: Rotary table application

Fill in the *Motor and Encoder Parameters* group and click on **Check and Commit** after completing the entry.

User unit:

Position unit in degrees

Speed in deg/s

action a submound of the	i	Notor Type	Motor Maximum Speed (rpm)		External Encoder:	
Rotary Application		Rotary Motor			None or not used for safety	
O Linear Application	0	📄 Linear Motor	6000	0	O Used for safety and fully-closed loop O Used for safety only	
Motor/Encoder Type		Notor Encoder Usage:	Multi-Tum Limit:			
SGM7J7*	~	Incremental Absolute Single-Tum Absolute Multi-Turn	9	0		
Mater Direction:	0	incorder Davistion (dagrae)	Encoder Devision Window (mp)			
		alcoder Deviation (degree)	Dicoder Deviatori fundom (ins)			
 Forward (CCW) Reverse (CW) 	0	5	10	0		
	- F	Position Units	Velocity Units			
		degree	degree/s v	0		
	Sigma-7	Input: Gearbox Output: LOA	D			
(Sigma-7 Encoder					
(Sigma-7	Jser Units Input Mode				
	Sigma-? Encoder	Jeer Units Input Mode				

Fig. 47: Motor and Encoder Parameters

Basic Application: Motor Maximum Speed (rpm):	Rotary Application 6000 The maximum motor speed is determined by the motor used.
External Encoder:	None or used for safety
Motor/Encoder Type:	SGM7J-***7*
Motor Encoder Usage:	Absolute Multi-Turn
Multi-Turn Limit:	9
	Since a gearbox with a reduction of 1:10 is used, the value 9 must be selected here if the rotary table is to be set to 360 degrees.
Motor Direction:	Forward (CCW)
Encoder Deviation (degree):	5
Encoder Deviation Window (ms):	10
Position Units:	degree
Velocity Units:	degree/s
Gearbox Input:	10
Gearbox Output:	1
Ocarbox Output.	1

I/O Configuration

Now select the next parameter group I/O Configuration.

Fill in the I/O Configuration group and click on Check and Commit after completing the entry.



Fig. 48: I/O Configuration

Port A Function: Port B Function: Port A Filter Time (ms):	Digital Input Digital Output 100
	If the light curtain output works via relays, note that relays bounce (20 ms). Due to this assumption, the value 100 ms was chosen.
Port A Discrepancy	200
Time (ms):	The Discrepancy Time was chosen according to the previous
- (-)	assumption if a delay occurs due to a test pulse.
	When setting these values, the test pulse lengths given in the
	light curtain operating instructions must be observed.
Port B Test Pulse	10
Length (ms):	
	Warning



Fig. 49: Rotary table application - Safety requirements

Slot 1 Parameters

Now select the next parameter group Slot 1 Parameters.



Each slot can only contain one safety function!



Fig. 50: Slot 1 Parameters

Safety Function:STOActivation Input:Safe Port A: Digital InputOutput Signal Type:Safe Port B: Digital OutputOutput Signal Behaviour:LOW during safe state

Slot 2 Parameters

Now select the next parameter group *Slot 2 Parameters*.

Each slot can only contain one safety function!



Fig. 51: Slot 2 Parameters

Safety Function: Activation Input:	SLS Virtual Input 0 The SLS function is activated via the virtual input 0.
Output Signal Type:	Virtual Output 0
Output Signal Behaviour:	None
Waiting Time t1 (ms):	0
Speed Limit s1 (degree/s):	3600
	6000 rpm (Motor Maximum Speed) / 10 (Gear Ratio = 1:10) = 600 rpm
	600 rpm = 10 turns/s = 3600°/s
Speed Limit s2 (degree/s):	360
	The maximum allowable speed is one turn per second = 360°/s
Monitoring Time t2 (ms):	100

Writing a Save Container File

Save your project file.

1	YASKAWA > Advanced Safety Module Parameter Editor > data	v 0	P	Search data
File name:	Rotary table application			
Save as type:	ASM7 files (*.asm7)			

Fig. 52: Save Project File

If there are unused slots in your parameter set, the following information appears.



Fig. 53: Unused Slots

Calculate a Checksum for Validation.

SGD7S-OSB02A	Slot 2 Parameters	
Calculate a checksum f	or validation Safety Function	
Parameter Groups	SLS	
General Device Parameters	have a second se	
Motor and Encoder Parameters		
User Unit & Encoder Parameters	Activation Input	
O I/O Configuration	Virtual Input 0	
O Slot 1 Parameters		
Slot 2 Parameters	Data Input	
Slot 3 Parameters	None	
Slot 4 Parameters		
Slot 5 Parameters	Output Signal Type	
Slot 6 Parameters	Virtual Output 0	
Slot 7 Parameters	he can be a set of the set	
Slot 8 Parameters	The second statement of the second statement of the	
Slot 9 Parameters	Output Signal Behaviour	
O Slot 10 Parameters	None	
Check and Commit		

Fig. 54: Calculate a Checksum for Validation

Finally, all parameter groups must be displayed with a green background. Write a Safe Container File.

YASKAWA Advanced Safety Module Parameter E	ditor - <rotary application.asm7="" table=""></rotary>
<u>File Edit Device H</u> elp	
🖹 🗁 🖬 🎿 🔺 🛃 😫 🖉 👔	
	Slot 2 Parameters
Write a safe container file	Safety Function
Parameter Groups	SLS





Fig. 56: Save Binary File

Parameter File Transfer Transfer your Save Container File to the Advanced Safety Module.



Fig. 57: Start the CMIF Download

Connection		
Jsed Interface Port:	Port#10 USB	Configure
		Connect
afe Container File		
		Load File
File	Information Box	
		Write File
New Serial Number		Hadata Court Ma
)ata Exchange Received Bytes (hex)		Opporte Senial No
lata Exchange Received Bytes (hex)	8	Send File
ata Exchange Received Bytes (hex)		Send File
hata Exchange Received Bytes (hex)	8	Send File Receive File Save Received File
hata Exchange Received Bytes (hex)	8	Send File Receive File Save Receive File Read System Info
Jata Exchange Received Bytes (hex)	<u>.</u>	Send File Receive File Save Received File Read System Info ASM7 Initialize
Jata Exchange Received Bytes (hex)	8 	Send File Receive File Save Receive File Read System Info ASM7 Initialize Motor and Encoder Parameter Check
Jata Exchange Received Bytes (hex)	8	Send File Receive File Save Received File Read System Info ASM7 Initialize Motor and Encoder Parameter Check

Fig. 58: Safe Container Download

- **1.** Click on the Load File button.
- **2.** Check your file name in the File Information Box.
- **3.** Check the serial number of your Advanced Safety Module in the File Information Box.

4. Click on the *Connect* button and after making sure that the correct file has been selected, click on the *Send File* button to start the download.



At present, the port to which the SERVOPACK is connected can be only the USB port (Port#10 USB). Do NOT select an Ethernet connection!

5. When the download is completed successfully, a *Write Success* message will be displayed.

Starting the execution on the Advanced Safety Module

- **1.** Cycle the power of the SERVOPACK.
 - ⇒ After about 5 seconds HWBB should disappear and the servo can be switched on.
- 2. A.9C0 indicates that slot 1 (STO) is activated, immediately HWBB (STO) is displayed.
- 3. A.9C1 indicates that Slot 2 (SLS) is activated.
 - \Rightarrow If no safety function is active, only the green LED lights up.

When a safety function is activated, the red LED starts flashing.

If the red LED lights up continuously, the Advanced Safety Module has set the SERVOPACK to the safe state (STO).

Hardware Setup > EK1914 | EtherCAT Coupler with Integrated Digital Standard and Safety I/Os

5 Commissioning of an Advanced Safety Module via TwinCAT 3

5.1 Hardware Setup

5.1.1 C6915-0010 | Fanless Control Cabinet Industrial PC | Intel Atom®



Fig. 59: Beckhoff PLC C6915

The C6915 industrial PC is designed for installation in control cabinets. The compact housing is equipped with a 3½-inch motherboard with Intel Atom® with up to four cores. All connections of the PC are located on the front of the housing. The industrial PC is cooled by internal cooling fins without a fan and allows operation up to 55 °C.

5.1.2 EK1914 | EtherCAT Coupler with Integrated Digital Standard and Safety I/Os



Fig. 60: Beckhoff EtherCAT coupler EK1914

Hardware Setup > EL6910 | TwinSAFE Logic

The EK1914 EtherCAT coupler combines the functionalities of the EK1100 EtherCAT coupler with standard and safe digital I/Os. The resulting compact design is particularly suitable for applications with a low number of I/Os. Like the EK1100, the EK1914 can be extended with all EL/ES terminals. The EK1914 has four digital inputs and four digital outputs as well as two fail-safe inputs and two fail-safe outputs.

5.1.3 EL6910 | TwinSAFE Logic





The TwinSAFE Logic EL6910 can establish 212 connections to other TwinSAFE devices. Several EL6910s can be cascaded in a TwinSAFE network with up to 65,535 TwinSAFE devices.

The EL6910 EtherCAT terminal has certified safety function blocks that are configured according to the application. Safety functions such as emergency stop, safety door monitoring, two-hand control, etc. can thus be selected and linked very easily. All function blocks can be interconnected and are supplemented by operators such as AND, OR, etc.

In addition to the Safety over EtherCAT protocol, the EL6910 also supports TwinSAFE SC technology. TwinSAFE SC enables secure data transmission from standard EtherCAT I/Os with the identifier -009x (TwinSAFE SC extension) to the TwinSAFE Logic EL6910. The EL6910 also supports the processing of analogue signals (16/32 bit, signed and unsigned). These signals are sent to the logic from standard, TwinSAFE SC or Safety over EtherCAT I/Os. This allows analogue signals to be analysed within the logic, checked for plausibility and subjected to a "voting". For safety reasons, at least one of the data sources must be a TwinSAFE SC component. The other data can come from other standard I/Os, drive controllers or measuring transducers. The entire calculation and scaling is carried out in the safety-related TwinSAFE Logic EL6910 at the SIL 3/PL e safety level. Certified components such as ADD, SUB, MUL, DIV, but also more complex ones such as Counter, Limit or Compare are available for processing analogue signals.

The required functions are programmed with the TwinCAT Safety Editor under TwinCAT 3.1 and loaded into the TwinSAFE Logic EL6910 via the fieldbus.

Hardware Setup > EL1904 | 4-Channel Digital Input Terminal, TwinSAFE, 24 V DC

5.1.4 EL1904 | 4-Channel Digital Input Terminal, TwinSAFE, 24 V DC



Fig. 62: Beckhoff TwinSAFE input terminal EL1904

The EL1904 Safety EtherCAT terminal is a digital input terminal for sensors with potentialfree contacts for 24 V DC. The EtherCAT terminal has four fail-safe inputs. Hardware Setup > EL9410 | Power Supply Terminal for E-bus Refresh, with Diagnostics

5.1.5 EL9410 | Power Supply Terminal for E-bus Refresh, with Diagnostics



Fig. 63: Beckhoff power supply terminal EL9410

The EL9410 power supply terminal is used to refresh the E-bus, via which the data exchange between EtherCAT coupler and terminals takes place. Each EtherCAT terminal requires a certain current from the E-bus. This current is fed into the E-bus by the power supply unit of the respective EtherCAT coupler. In configurations with a large number of EtherCAT terminals, the EL9410 can be used to increase the power supply of the E-bus by 2 A. The EL9410 has a diagnostic function that is displayed via LED and in the process image.

Prerequisite for the Configuration

5.1.6 EL2904 | 4-Channel Digital Output Terminal, TwinSAFE, 24 V DC



Fig. 64: Beckhoff TwinSAFE output terminal EL2904

The EL2904 Safety EtherCAT terminal is a digital output terminal with four channels. It switches 24 V DC actuators with up to 0.5 A current per channel. If the EtherCAT terminal detects an error, it switches off automatically (fail-stop).

5.2 Prerequisite for the Configuration

Software: TwinCAT 3 Build 4024.10

This software version has been updated on the computer and the Beckhoff PLC.

- Firmware versions:
 - SERVOPACK SGD7S: 002F_F910
 - Interface version: 0008-0015
 - Advanced Safety Module: 0007 or higher

Creating a new TwinCAT Project > Creating a New TwinCAT Project File

5.3 Creating a new TwinCAT Project

5.3.1 Creating a New TwinCAT Project File

	New	•	Project	Ctrl+Shift+N	
62	Open Start Page	•	* File	Ctrl+N	-
•	Close		→ ₽ ×	Start Page → ×	
2	Close Solution			Twin	CAT 2
	Save Selected Items Save Selected Items As Save as Archive Send by E-Mail Save All	Ctrl+S Ctrl+Shift+S		Recent Today	
	Source Control	•			
	Page Setup Print	Ctrl+P			
	Recent Files Recent Projects and Solutions	*			
	Fyit	Alt+F4			

1. ▶ Select: Menu *File* \Rightarrow *New* \Rightarrow *Project...*

Fig. 65: TwinCAT 3 - Create new project

Creating a new TwinCAT Project > Creating a New TwinCAT Project File

2. Select the *TwinCAT XAE Project (XML format)* project template in the dialogue box that opens.

New Project						? ×
Recent		Sort by: Default		TuinCAT Brolotte	Search (Ctrl+E) Type: TwinCAT Projects	م
InvinCAT Measure TwinCAT Project TwinCAT PLC TcXaeShell Solut	rement 3	TwinCAT XAE Proj	(XML format)	TwinCAT Projects	Type: WillCAT Projects	ger
Not finding what Open Visual Name:	you are looking for? Studio Installer TwinCAT Project1				Browne	
Solution name:	TwinCAT Project1				Create directory for solutio Add to Source Control	n
					ОК	Cancel

Fig. 66: TwinCAT 3 - Create new project - Select TwinCAT XAE Project

⇒ In the field *Name:* the file name can be changed, taking into account the file path conventions of the operating system. Dots in the name are not allowed.



If the Create directory for solution checkbox is selected, all files created in connection with this application are stored in the same project folder directory.

3. Confirm the creation of the new TwinCAT project file with OK.
Creating a new TwinCAT Project > Creating a New TwinCAT Project File



Fig. 67: TwinCAT 3 - New TwinCAT project created

The nodes displayed in the project folder have the following meaning:

- SYSTEM: Routes, Licences, Task, Real-time
- MOTION: NC configuration
- PLC: PLC programming
- SAFETY: Safety programming
- C++: Creation of C++ modules
- ANALYTICS: Analysis
- I/O: Hardware configuration

General notes

The TwinCAT system can only be configured or programmed when it is in configuration mode. Scanning the fieldbus is also only possible in configuration mode. This is indicated by the TwinCAT icon (*Restart TwinCAT (Config Mode)*) with a purple background in the task bar.



Fig. 68: TwinCAT 3 - Restart TwinCAT (Config Mode)

Creating a new TwinCAT Project > Scanning the Hardware Configuration

The nodes PLC and SAFETY are completely separated, communication (in the sense of programming) between these areas usually only takes place by linking variables from the node PLC to the node SAFETY (see & Chap. 5.3.5.1 'Combining ErrorAcknowledgement.sds and Run.sds with a Standard Signal' page 90).



Fig. 69: TwinCAT 3 - PLC and SAFETY are separated items

5.3.2 Scanning the Hardware Configuration

Store the ESI file in the following directory before scanning the hardware configuration: This PC \Rightarrow Windows (C:) \Rightarrow TwinCAT \Rightarrow 3.1 \Rightarrow Config \Rightarrow lo \Rightarrow EtherCAT. If the ESI file is in this directory, the SERVOPACK will also be found with the Advanced Safety Module installed.

Commissioning of an Advanced Safety Module via TwinCAT 3

Creating a new TwinCAT Project > Scanning the Hardware Configuration

$\leftrightarrow \rightarrow \checkmark \uparrow$	> This PC > Windows (C:) > TwinCAT	> 3.1 > Config > lo	> EtherCAT >	
	Name ^	Date modified	Туре	Size
	Beckhoff ER8xxx	14.03.2016 11:52	XML Document	207 KB
	Beckhoff EtherCAT EvaBoard	04.02.2015 12:57	XML Document	72 KB
	Beckhoff EtherCAT Terminals	04.02.2015 12:57	XML Document	53 KB
	Beckhoff FB1XXX	24.05.2017 13:26	XML Document	49 KB
	Beckhoff FCxxxx	04.02.2015 12:57	XML Document	21 KB
	Beckhoff FM3xxx	29.06.2018 16:05	XML Document	367 KB
	Beckhoff ILxxx-B110	04.02.2015 12:57	XML Document	8 KB
	😫 EtherCATBase.xsd	02.03.2018 14:55	XML Schema File	30 KB
	😫 EtherCATDiag.xsd	02.03.2018 14:55	XML Schema File	1 KB
	😫 EtherCATDict.xsd	02.03.2018 14:55	XML Schema File	1 KB
	😫 EtherCATInfo.xsd	04.12.2018 12:42	XML Schema File	50 KB
	😫 EtherCATModule.xsd	02.03.2018 14:55	XML Schema File	2 KB
	Yaskawa_SGD7SxxxD	19.08.2020 11:27	XML Document	352 KB

111 items 1 item selected 351 KB

Fig. 70: TwinCAT 3 - Local path for Sigma-7 ESI file

1. Scan the hardware configuration to find the devices present on the fieldbus.





Fig. 71: TwinCAT 3 - Scan Hardware configuration

Creating a new TwinCAT Project > Scanning the Hardware Configuration

2. Confirm the note that not all types of devices can be found automatically.

	TcXaeShell		×
	HINT: Not all types of d	levices can be found a	utomatically
		OK	Cancel
Fig. 72: Twir	nCAT 3 Hint - Not all type:	s of devices can be fo	ound automatically

3. Confirm the newly found device.

1 new I/O devices found	×
Device 2 (EtherCAT) [Local Area Connection (TwinCAT-Intel PCI Ethernet A]	ОК
	Cancel
	Select All
	Unselect All

Fig. 73: TwinCAT 3 - New IO devices found

 \Rightarrow This device is the EtherCAT master.



If the Sigma-7 ESI file is not placed in the correct directory, the device will only be referred to and found as a box.

Creating a new TwinCAT Project > Scanning the Hardware Configuration

4. Click Yes in the Scan for boxes dialogue box.



Fig. 74: TwinCAT 3 - Scan for boxes

5. The devices found are now displayed under the *Devices* node.



Fig. 75: TwinCAT 3 - Found devices after scanning for boxes

5.3.3 Creating a Safety Project

1. Use the context menu of the SAFETY node to create a new safety project via Add New Item....



Fig. 76: TwinCAT 3 - SAFETY - Add New Item

2. A dialogue box opens, select *TwinCAT Safety Project Preconfigured Inputs* and assign a name to the project.



Fig. 77: TwinCAT 3 - SAFETY - Add New Item - Select TwinCAT Safety Project Preconfigured Inputs

 Installed 	Sort	oy: Default	• # E		Search (Ctrl+E)	P
TwinCAT Safety Pr	roject	TwinCAT Safety Pr	oject Preconfigured ErrAck	TwinCAT Safety Project	Type: TwinCAT Safety Project	
	4	TwinCAT Safety Pr	oject Preconfigured Inputs	TwinCAT Safety Project	TwinSAFE group with preconfigured ErrAck and Run mappings.	
	e e e e e e e e e e e e e e e e e e e	TwinCAT Empty Sa	afety Project	TwinCAT Safety Project		
Name:	Safety_Prog					
	Levu			1	Demuse	

3. Use the Add button to create the safety project.

Fig. 78: TwinCAT 3 - SAFETY - Add New Item - Select TwinCAT Safety Project Preconfigured Inputs - Create Safety Project

4. The *TwinCAT Safety Project Wizard* now opens. Select the setting *Hardware Safety PLC* as the target system and the graphical editor as the programming language. Author and internal project name can be freely chosen.



We recommend not choosing Safety C as the programming language, because in that case there are no certified function blocks available, these must be programmed yourself (and are also not certified!).

Make the selection as shown in the figure and then confirm by clicking OK.



Target System	Hardware Safety PLC	~
Programming Language	Graphical Editor	~
Author	63	
Internal Project Name	Safety_Prog	

OK	Cancel
OK	Cancel

Fig. 79: TwinCAT 3 - TwinCAT Safety Project Wizard

⇒ The created safety project is now created in the Solution Explorer under the SAFETY node.



Fig. 80: TwinCAT 3 - Safety Project is created in the Solution Explorer

5.

Before the safety project can be linked with the physical TwinSAFE terminal EL6910, the hardware configuration must be scanned!

By selecting the *Target System* node, the assignment of the safety project to the physical TwinSAFE terminal EL6910 (for example) is carried out.

The Target System is selected by double-clicking on the Target System node.

ease TwinCAT RT	(x64) • Attach •	* 🗖 wait	•	쥐 🌶 💭 🏛 📽 🍪 🖸 - 🖕 🖋 😻
TwinCAT_Project_Safety	- 3303893-003	-	· · · · · · · · · · · · · · · · · · ·	- 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
iafety_Prog +⊨ ×				
Target System User Administration Backup/Restore	Configuration: N/A	Platf	orm: N/A	
Documentation Project Settings		Target System: Physical Dovice. Software Version: Sofal Number: Project CRC: Map Serial Number: Version Number: Safe Address: Hardware Address: Terminal View. AmsNetId AmsPort:	EL6000 AX891x EJ1914 EJ1914 EJ2918 EJ2914 EJ2918 EJ2910 EL2910 EL2912 EL6000 EL2912 EL6000 EL2912 EL6000 EL2913 EL2912 EL6000 CM DECEMBER	TwinCAT System Manager Process Image Connection Info Data Show Input/Output Data as byte array (old configuration) ConnectionInputs/Outputs Take over Safety Alas Device names Oconnecton Info Data names will also be adjusted) StandardInputs/Outputs Take over Standard Alias Device names

Fig. 81: TwinCAT 3 - Select Target System EL6910 for Safety Project

Choose physical terminal for mapping

Creating a new TwinCAT Project > Creating a Safety Project

6. The target system is set to EL6910 via the drop-down list and linked to the EL6910 terminal via the link button **15** next to *Physical Device*.

		ОК
rch:		Cancel
ice:]	Devices Device 2 (EtherCAT) ☐ Term 1 (EK1914)	

Fig. 82: TwinCAT 3 - Choose physical terminal for mapping

se • TwinCAT RT	x64) • Attach •	- 🏓 wait	•	🖓 🎢 🛱 🏜 🍪 🖸 📲 蒙 💱
TwinCAT_Project_Safety	• 3303893-003 • •	-[]-	+ 日日日日 +	· 100 首因自 00.
ety_Prog* ↔ ×				
arget System*	Configuration: N/A	Plat	form: N/A	
ser Administration				
ackup/Restore				
ocumentation		Transf Carlos	CI 0010	TwinCAT Stretem Manager Process Image
roject Settings		Target System:	EL6910	TwildAt System Manager Process Image
		Physical Device:	Term 2 (EL6910)	Connection Info Data
		College Married	Device is an external device	Show Input/Output Data as byte array (old configuration)
	C 0. 4	Software version.	1602064	
		Senai Number:	0,2551	ConnectionInputs/Outputs
		Man Serial Number	Man Project CBC:	Take over Safety Alias Device names
		Version Number:	1	be adjusted)
		Safe Address:	1	StandardInnute/Outpute
		Hardware Address:	1	
			12345678910	Take over Standard Alias Device
		Terminal View:	On Off	2
		AmsNetId	172.16.171.46.3.1	
		AmsPort:	1002	

Fig. 83: TwinCAT 3 - Physical device is mapped

⇒ Term 2 (EL6910) is now entered in the field next to *Physical Device*, and the hardware address has also been recognised.

The two checkboxes *Take over Safety Alias Device names (Connection Info Data names will also be adjusted)* and *Take over Standard Alias Device names* should be selected, as this ensures consistent naming (and thus easy recognition) even of alias device names.



- The TwinSAFE terminal (EL6910) has a 10-position DIP switch on the side via which a hardware address must be assigned.
 - TwinSAFE addresses from 1 to 1023 are available.
 - Address 0 is not a valid TwinSAFE address!
 - The EtherCAT coupler (EK1914) must also have an address different from 0!
 - Each set TwinSAFE address may only occur once within a network/configuration!

7. Save the configuration with Save all.



Fig. 84: TwinCAT 3 - Save all

5.3.4 Importing the Alias Devices from the I/O Configuration

The communication between the EL6910 TwinSAFE terminal and the I/O level is realised via an alias level. In this alias level (sub-node *Alias Devices*), corresponding alias devices are created for all safe inputs and outputs, but also for standard signals. This can also be done automatically for the safe inputs and outputs using the I/O configuration. The connection- and device-specific parameters are set via the Alias Devices.

In the TwinSafeGroup1 there are already two alias devices that the *TwinCAT Safety Project Wizard* has created:

ErrorAcknowledgement.sds

ErrorAcknowledgement is to be linked to a PLC output or a standard input (such as a push button) and used to acknowledge safety group errors: An error must additionally be acknowledged manually so that it is reset.

Linking standard variables is always a two-step process: First they must be linked from within the logic to the alias, and then from the alias to the PLC or the physical I/Os.

ErrorAcknowledgement is already important when going online with the PLC project. In this case, the signals of the safety PLC indicate that there is a communication error (or ComErr). To reset the communication error, a $0 \Rightarrow 1 \Rightarrow 0$ transition must be seen on the *ErrorAcknowledgement* signal.

Run.sds

Run/Stop sets the complete TwinSafeGroup in *Run* mode (activated) or in *Stop* mode (deactivated).

When working on a safety system (e.g. plugging or unplugging), an error occurs if the TwinSafeGroup concerned is not in Stop mode. In addition, for machines with several safety areas (and thus several TwinSafeGroups), each area can be specifically set to *Run* or *Stop* mode.

Commissioning of an Advanced Safety Module via TwinCAT 3

Creating a new TwinCAT Project > Importing the Alias Devices from the I/O Configuration

⇒ Start the automatic import of the alias devices from the I/O configuration via the context menu of *Alias Devices*.



Fig. 85: TwinCAT 3 - Import Alias Device(s) from IO configuration

2. A selection dialogue opens in which the individual terminals to be imported can be selected.



Only select the terminals that are also used in the safety project, as an error is reported if alias devices of terminals not used in the safety project are present!

▲ [Devic	ce 2 (Ethe	rCAT) [EtherCAT M	aster]			
	▲ Te	erm 1 (EK	1914) [Jule 1 (F	ek1914, 2 C Sof)	h. Safety Inpu	t/Output 24V, T	[winSAFE]	
	4	Term 3	(EL1904) [EL1904,	4 Ch. Safety Ir	nput 24V, TwinS/	AFE]	
	4	Term 5	(EL2904	(FSOES) [EL2904,	4 Ch. Safety C	output 24V, 0.5A	, TwinSAFE]	
		V N	Module	1 (FSOES)				
	▲ D	vrive 16 (S	GD7S-x lule 1 (S	oxDA0xxxF afety Proces	91 CoE Drive) ss Data)	[SGD7S-xxxDA	0xxxxF91 EtherC	AT(Co
		_						
c								>

- Fig. 86: TwinCAT 3 Select Alias Devices from IO tree
 - After closing the dialogue via OK, the alias devices are created in the safety project.



Fig. 87: TwinCAT 3 - Importing and mapping of Alias Devices succeeded

After importing, you can access the inputs and outputs of the safety terminals in the safety project. This would not have been possible before.



Fig. 88: TwinCAT 3 - Alias Devices in TwinSafeGroup imported

3. Double-click on the alias device in the safety project structure to open the settings. The *Linking* tab contains the FSoE address, the checkbox for setting as *External Device* and the link to the physical I/O device.

Actually, the FSoE address should be transferred automatically from the hardware address (dip switch); if this is not the case, the FSoE address must be written manually into the corresponding field.

To be on the safe side, press the refresh button in advance so that the current status of the configuration is displayed.



Fig. 89: TwinCAT 3 - Properties of the Safety Project structure

⇔

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5

With the Advanced Safety Module, the FSoE address is transmitted by the Safe Container. Therefore, before importing the alias devices, the container should be in the Advanced Safety Module and the corresponding inputs should also be mapped.

The Safe Container is created using the Advanced Safety Module Parameter Editor.

The Advanced Safety Module does not have a dip switch, the FSoE address is only assigned via the Advanced Safety Module Parameter Editor!



Fig. 90: TwinCAT 3 - Properties of the SGD7S Alias Device

5.3.5 Safety Programming in the TwinSAFE Group

5.3.5.1 Combining ErrorAcknowledgement.sds and Run.sds with a Standard Signal

This step must be carried out before the safety programming of the Twin-SAFE group can be carried out.

1. *ErrorAcknowledgement.sds* and *RUN.sds* must always be linked to a standard signal. Therefore, we now create a PLC programme and declare two Boolean variables (RUN, ERR ACK).

Right-click in the PLC node and select Add New Item

Run and ErrACK of the TwinSAFE Group Error acknowledgement is not performed automatically, i.e. the ERR ACK input must always be linked to a standard signal. For the EL6910 and newer logics, the RUN input must also always be linked to a standard signal. TwinCAT_Project_Safety - TcXaeShell File Edit View Build Debug Project TwinCAT TwinSAFE 8 *1 - 😭 (2 0 - 0 * * ¥ D £ Releas ે 🛃 \diamond Build 4024.10 (Loaded) + * -Solution Explorer **Ψ**× 004 🛱 -· · · Q Search Solution Explorer (Ctrl+ü) Solution TwinCAT_Project_Safety (1 project) TwinCAT_Project_Safety SYSTEM License Real-Time 1/O Idle Task Tasks Routes Type System TcCOM Objects MOTION *1 Add New Item... Ins Shift+Alt+A 1 Add Existing Item... Add Project from Source Control... Ctrl+V â Paste Paste with Links **Hide PLC Configuration** Nu

Fig. 91: TwinCAT 3 - Add New Item in PLC

2. In the dialogue box that opens, select *Standard PLC Project*, assign a name to the new project and create the project with *Add*.



Fig. 92: TwinCAT 3 - Create Standard PLC Project

⇒ The project structure is now created in the Solution Explorer.



Fig. 93: TwinCAT 3 - Standard PLC Project created

3. Open the *MAIN* PLC programme.



Fig. 94: TwinCAT 3 - Open MAIN PLC program

- **4.** Two Boolean variables are declared in *MAIN*, which we subsequently need for *ErrorAcknowledgement.sds* and *Run.sds*:
 - bErrACK AT %Q* : BOOL;
 - bStartStop AT %Q* : BOOL;



The variables must be entered manually.

PLC	Team Scope Tools Window Help	
lease	TwinCAT RT (x64) Attach	- 🎜 w
Twine	inCAT_Project_Safety • 3303893-003 • 🚽 PLC_Safe	ety 👻
MAIN H	→ × TwinCAT_Project_Safety Run.sds Erro	orAcknowledgement
1 2	PROGRAM MAIN VAR	
4 5 6	bErrAck AT %Q* : BOOL; bStartStop AT %Q* : BOOL;	
7 8	END_VAR	

Fig. 95: TwinCAT 3 - Variables in MAIN PLC program



⇔

ErrorAcknowledgement.sds is an input in the safety project, therefore the variable must be declared as an output ($%Q^*$) in the standard PLC.

5. Save the programme.



Fig. 96: TwinCAT 3 - Save all

Commissioning of an Advanced Safety Module via TwinCAT 3

Creating a new TwinCAT Project > Safety Programming in the TwinSAFE Group

6. Activate the configuration.



Fig. 97: TwinCAT 3 - Activate Configuration

 \Rightarrow Confirm the activation of the configuration.

roject:	TwinCAT_Project_Safety			
Target:	3303893-003			

Fig. 98: TwinCAT 3 - Activate Configuration Dialog box

A restart of the TwinCAT system in Run Mode is not necessary.



Fig. 99: TwinCAT 3 - Restart TwinCAT System in Run Mode - Cancel

7. Link the variables to the alias devices.



By linking the variables to the alias devices, the connection between the standard PLC and the safety project is established.

Double-click on *ErrorAcknowledgement.sds* in the Solution Explorer to call up the alias device.



Fig. 100: TwinCAT 3 - ErrorAcknowledgement Alias Device in Solution Explorer

8. In the main window, click on the link button on the right side of the *Linked to:* field.

PLC T	eam Scope T	ools Window	Help					
ase	- TwinCAT RT (xe	i4) -	Attach •			- 🏓	wait	
TwinCA	T_Project_Safety	3303893-003	•	Ţ PLC_S	afety		- 1	- ->
/AIN	TwinCAT_Proje	ct_Safety	Run.sd:	s	ErrorAck	nowledgem	ent.sds	-¤ ×
Linking	Process Image							
			Linking Mode:	Manual	~			
Full Name	: TIID^Device 2 (E	therCAT)^Term	1 (EK1914)^Te	rm 2 (EL69	10)^Sta			
Linked to						🛃 🥩		
Name:	TwinSafeGroup	1.ErrorAcknowled	igement_1			63		

Fig. 101: TwinCAT 3 - ErrorAcknowledgement - Link Button

9. Select the variable bErrAck and confirm the dialogue box with OK.



Fig. 102: TwinCAT 3 - Attach Variable bErrAck to ErrorAcknowledgement

⇒ The *Linked to:* field shows that the link has been successfully established.

ase 🔹	TwinCAT RT	x64)	-)	Attach •		*	7	wait	
TwinCAT_	Project_Safety	→ 33038 → → →	93-003	-	Ţ PLC_Sat	fety		- 1	- -
IAIN	TwinCAT_Pro	ject_Safety	i.	Run.so	ds Er	rorAcknowl	edgem	ent.sds	+ X
Linking F	Process Image								
			1	Linking Mode	Manual	~			
Full Name:	TIID*Device 2	(EtherCAT)^Term 1	(EK1914)*T	erm 2 (EL691	0)^Sta			
Linked to:	TIPC^PLC_Sa	fety^PLC_	Safety Ins	stance*PlcTa	sk Outputs^M	AIN.be	2		
Name:	TwinSafeGrou	p1.ErrorAc	knowledg	gement_1					

Fig. 103: TwinCAT 3 - Variable bErrAck attached to ErrorAcknowledgement



10. Double-click on *Run.sds* in the Solution Explorer to call up the alias device.



11. In the main window, click on the link button on the right side of the *Linked to:* field.

ease .	TwinCAT RT (x64) -	Attach		*	🏓 wait
TwinCAT	Project_Safety		03 -		ty	• 1 •
MAIN	TwinCAT_Pro	oject_Safety	Run.se	ds 🕫 🗙 Erro	orAcknowledg	gement.sds
Linking	Process Image					
			Linking Mode	Manual	~	
Full Name	TIID^Device 2	(EtherCAT) [^] Ter	m 1 (EK1914)^T	erm 2 (EL6910)^Sta	
Linked to:					1	2
Name:	TwinSafeGrou	p1.Run_2	Links the c	orresponding v	variable	
Name:	TwinSafeGrou	p1.Run_2	Links the c	orresponding v	variable	

Fig. 105: TwinCAT 3 - Run - Link Button

12. Select the variable bStartStop and confirm the dialogue box with OK.

× 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 ☐ Array Mode Offsets ☐ Continuous ☐ Ignore Gaps ☐ Show Dialog
Variable Name / Comment

Fig. 106: TwinCAT 3 - Attach Variable bStartStop to Run

 \Rightarrow The Linked to: field shows that the link has been successfully established.

ase •	TwinCAT RT (:	(64)	• •	Attach •	N PIC	Safety	~ P	wait	- 1 - 3
	TwinCAT_Pro	ject_Safety	595-005	Run.so	s ⊕ ×	ErrorAckn	owledgem	ent.sds	
Linking F	Process Image								
			Lir	king Mode	Manual	~			
Full Name:	TIID*Device 2	EtherCAT)^Term 1 (E	K1914)^T	erm 2 (ELG	910)^Sta			
Linked to:	TIPC^PLC_Sa	ety^PLC_	Safety Insta	nce^PlcTa	sk Outputs	MAIN.bs	*		
Name:	TwinSafeGrou	o1.Run_2							

Fig. 107: TwinCAT 3 - Variable bStartStop attached to Run

13. Save the programme.



- Fig. 108: TwinCAT 3 Save all
- **14.** Activate the configuration.



- Fig. 109: TwinCAT 3 Activate Configuration
 - \Rightarrow Confirm the activation of the configuration.



Fig. 110: TwinCAT 3 - Activate Configuration Dialog box A restart of the TwinCAT system in *Run Mode* is not necessary.



Fig. 111: TwinCAT 3 - Restart TwinCAT System in Run Mode - Cancel

5.3.5.2 Configuring a Safety Function Block in the TwinSAFE Group

1. Double-click on the *TwinSafeGroup1.sal* safety application in the *Solution Explorer* to open an empty safety application.

The *TwinCAT Safety Project Wizard* has automatically created the first "network". The safety programme is written with the function plan (FUP) and is divided into "networks". *Network1* can be renamed to a meaningful name (such as *safeAnd*).



Fig. 112: TwinCAT 3 - Start Programming in TwinSafeGroup1



⇔

TwinSAFE group

Safety programming takes place in the TwinSAFE group (here: TwinSafeGroup1.sal).

TwinSAFE groups are a way to logically separate safety programmes. If an application consists of, for example, two physically separate work cells that are both controlled by the same TwinSAFE EL6900 safety PLC, it makes sense to separate the logic into two separate TwinSAFE groups, since logically they are two different machines.

The purpose of the groups is to manage error responses. If a safety malfunction is detected, then the entire group goes into a faulty state, all outputs return to their "safe" state (i.e. logical "0"), and the error must be acknowledged with the error acknowledgement signal. In the event that you have two physically separate machines controlled by the same safety PLC, it makes sense to separate them into two groups so that a malfunction of the safety device on one machine does not cause the other machine to stop.

A communication error is indicated by the output (COM ERR) of the TwinSAFE group and acknowledged via the input ERR ACK. A function block error is indicated by the FB ERR output and acknowledged by the same ERR ACK input as the communication error. The safe state of the outputs of the TwinSAFE group is only cancelled when the error is no longer present and has been acknowledged.

In addition, the TwinSAFE group has an input (RUN) with which the processing of the assigned function blocks can be started or stopped. In the stopped state, all outputs assigned to the Twin-SAFE group are in the safe state. The RUN input must always be linked to a standard signal for the EL6910 and newer logics.

2. Now we start adding function blocks to the network. The available safety function blocks are located in the toolbox window on the right-hand side of the screen.





⇒

If there are no safety function blocks when you first open the toolbox, save and close the project. After reloading the project, there should be safety function blocks in the toolbox.

3. Click on the desired safety function block and drag it into the network.



Fig. 114: TwinCAT 3 - safeAnd dropped in TwinSafeGroup1



⇒

There must be at least 1 network with a safety function block so that the safety project can be transferred to the controller.

The safety function block *safeAnd* was selected here because it can be connected to a non-safe input at the first terminal. Due to the AND link, the safety of the application is guaranteed, because the second terminal must be connected to a safe input.

4. Click on the green plus sign in the *Variables* tab of the *Variable Mapping* window to create the variable *Var_In1*. Then click on the green plus sign again and create the variable *Var_In2*.

The Variable Mapping window at the bottom of the screen is not displayed automatically. It must be explicitly selected.

/ariable	Scope	Assignment	Usages	Online Value	Comment
 Local 		and the second se	the second part of the second	and the second se	
GroupPort_ErrAck	Local	ErrorAcknowledgement.In (TwinSafeGroup1)	TwinSafeGroup1.Err Ack		
GroupPort_RunStop	Local		TwinSafeGroup1.Run/Stop		
Var_In1	Local				
Var_In2	Local				
				-	

Fig. 115: TwinCAT 3 - Create variables Var_In1 and Var_In2 for safeAnd

5. We now link these two variables to the inputs of the safeAnd.

Click on the Map to button in the Var_In1 row.

👉 💳 🎽 Group						
Variable	Scope	Assignment	Us	ages	Online Value	Commen
Local					-	
GroupPort_ErrAck	Local	ErrorAcknowledgement.In (TwinSafeGroup	o1)	TwinSafeGroup1.Err Ack		
GroupPort_RunStop	Local	Run.In (TwinSafeGroup1)		TwinSafeGroup1.Run/Stop		
Var_In1	Local					
Var_In2	Local	147 -		v ²		

Fig. 116: TwinCAT 3 - Open Usage Map to dialog for variable Var_In1

6. In the *Map to* dialogue box, select the *AndIn1* input of the *safeAnd* and confirm with *OK*.



Fig. 117: TwinCAT 3 - Map Usage to AndIn1 for variable Var_In1

7. In the Var_In2 row, click on the Map to button under Usage.

🕂 🗕 🎬 Group						
Variable	Scope	Assignment	Us	ages	Online Value	Comment
 Local 						
GroupPort_ErrAck	Local	ErrorAcknowledgement.In (TwinSafeGroup1)		TwinSafeGroup1.Err Ack	1	
GroupPort_RunStop	Local	Run.In (TwinSafeGroup1)		TwinSafeGroup1.Run/Stop		
Var_In1	Local			TwinSafeGroup1.Network1.FBAnd1.AndIn1		
Var_In2	Local	70	R			
Var_in2	Local		1			

Fig. 118: TwinCAT 3 - Open Usage Map to dialog for variable Var_In2

8. In the *Map to* dialogue box, select the *AndIn2* input of the *safeAnd* and confirm with *OK*.



Fig. 119: TwinCAT 3 - Map Usage to AndIn2 for variable Var_In2

 \Rightarrow As Usage, the two variables are now linked to the inputs of the safeAnd.

TwinSafeGroup1.sal* -	• ×				
ľ					
		SafeAnd FBAnd 1	A3		
		Var_In1 O AndIn1 Var_In2 O AndIn2 O AndIn3	&		
		Andin4 Andin5 Andin6			
		D Andin8			
× *					
Command :					
Variable Mapping					
Variables Group Por	rts Repla	acement Values Max Start Deviation			
🕂 💳 🛅 Group					
Variable	Scope	Assignment	Usages	Online Value	Comment
 Local 					
GroupPort_ErrAck	Local	ErrorAcknowledgement.In (TwinSafeGroup1)	TwinSafeGroup1.Err Ack		
GroupPort_RunStop	Local	Run.In (TwinSafeGroup1)	TwinSafeGroup1.Run/Stop		
Var_In1	Local	245	TwinSafeGroup1.Network1.FBAnd1.AndIn1		
Var_In2	Local	272	TwinSafeGroup1.Network1.FBAnd1.AndIn2		

Fig. 120: TwinCAT 3 - Variable Var_In1 and Var_In2 linked to safeAnd
9. We now assign the variable *Var_In2* to *InputChannel1* of the TwinSAFE input terminal EL1904.

In the Var_In2 row, click on the Map to button under Assignment.

variable	Scope	Assignment	Usages	Online Value	Commen
▲ Local					
GroupPort_ErrAck	Local	ErrorAcknowledgement.In (TwinSafeGroup1)	TwinSafeGroup1.Err Ack	1	
GroupPort_RunStop	Local	Run.In (TwinSafeGroup1)	TwinSafeGroup1.Run/Stop		
Var_In1	Local		TwinSafeGroup1:Network1.FBAnd1.AndIn1	1	
Var_In2	Local	R	TwinSafeGroup1.Network1.FBAnd1.AndIn2		
voi	Loca	el?	TWING BOILDUP THE WORK IT WAS INCOME.	1	

Fig. 121: TwinCAT 3 - Open Assignment Map to dialog for variable Var_In2

10. In the *Map to* dialogue box, select the input *InputChannel1* of *EL1904* and confirm with *OK*.



Fig. 122: TwinCAT 3 - Map variable Var_In2 to InputChannel1 of EL1904

⇒ The variable *Var_In2* is now assigned to *InputChannel1* of the TwinSAFE input terminal EL1904.

Var_Ini Q Andini Var_Ini Q Andini Q And	TwinSafeGroup1.sal*	e X						
Andins Andina Andina Andina Andinadin Andina Andinadinad Andinad Andinad Andina			Var_In1 Var_In2	Andin1 Andin2 Andin3 Andin4 Andin5 Andin5 Andin5 Andin5 Andin6 Andin6 Andin6	& AndOut			
Image: Source of the second secon				Andin8				
Command	X V <							
Variable Mapping Variables Group Ports Replacement Values Max Start Deviation	Command :							
Yariable Scope Assignment Usages Online Value Comment O Local Image: Comment of the state of the	Variable Mapping Variables Group Pol	rts Repl	acement Values Max Start De	viation				
Variable Scope Assignment Usages Online Value Comment Chocal Image: Comment of the state o	💠 💳 👕 Group	240740						Tel la
O Local GroupPort_ErrAck Local ErrorAcknowledgement.in (TwinSafeGroup1) TwinSafeGroup1.Err Ack GroupPort_RunStop Local Run.in (TwinSafeGroup1) TwinSafeGroup1.Run/Stop Var_In1 Local TwinSafeGroup1.Network1.FBAnd1.Andin1 Var_Un2 Local TwinSafeGroup1.Err Ack	Variable	Scope	Assignment	_		Usages	Online Value	Comment
Group or_enrick 2008 (Chronologenetic) (Chronolo	GroupPort ErrAck	Local	ErrorAcknowledgement is	(TurinSafeGroup1)		TuinSafaGroup1 Err Ack	1	
Var_In1 Local Tom 2//E1 1990, Maddin 1 // SOCE) January Character Control Cont	GroupPort BunSton	Local	Run In /TwinSafeGround			TuinSefeGroup1 Run/Stop	1	
Version Loope Term 2021 1004 Medicia 4/CODES Janu Channel 4 Turis Sed Court of Court Medicia 4 Art Po	Var In1	Local				TuisSefeCroup1 Network1 EBApd1 Apd[a1	1	
	Var In?	Local	Term 3NEI 1904) Modul	a 1 (ESOES) InputChan	nel1 (TwinSafeGroup1)	TwinSelectroup1.Network1.FBAnd1.Andin1		-

Fig. 123: TwinCAT 3 - Variable Var_In2 assigned to InputChannel1 of EL1904

Fields with a yellow background belong to Safe I/O, fields with a green background belong to GroupPort and fields with a purple background belong to FunctionBlock Port.

This colour code is displayed as context-sensitive help when the mouse pointer is on the Assignment or Usage fields.

Variable	Scope	Assignment	Usages	N	Online Value	Commer
 Local 			Colorador	63	-	
GroupPort_ErrAck	Local	ErrorAcknowledgement.In (TwinSafeGroup1)	Group Port	rr Ack		
GroupPort_RunStop	Local	Run.In (TwinSafeGroup1)	Group Port is not valid anymore	un/Stop		
Var_In1	Local		FunctionBlock Port	etwork1.FBAnd1.Andin1	1	
Var_In2	Local	Term 3 (EL1904) - Module 1 (FSOES).inputChanne	Safe I/O	etwork1.FBAnd1.AndIn2		
			Standard I/O			-
				1		

Fig. 124: TwinCAT 3 - Color code for variable mapping

11.

Only safe inputs can be selected as Assignment via Map to. The use of non-safe inputs is only possible via Alias Devices.

We therefore add an alias for the non-safe input in *TwinSafeGroup1* under *Alias Devices*.



Fig. 125: TwinCAT 3 - Add Alias Device in TwinSafeGroup1

⇒ In the Add New Item dialogue box, select 1 Digital Input (Standard) and confirm with Add.



Fig. 126: *TwinCAT* 3 - *Add Digital Input as Alias Device in TwinSafeGroup1*

The digital input is set up as an Alias Device.



Fig. 127: TwinCAT 3 - Digital Input as Alias Device in TwinSafeGroup1 added

12. Rename the created digital input via *Rename* in the context menu.

 SAFETY Safety_Prog Safety_Prog Project References Target System GVLs User FBs Safety_Prog Project TwinSafeGroup1 Safety_Prog 		× * <	
 1 Digital Input Drive 16 (SGD ErrorAcknowle Run.sds Term 3 (EL190- Term 5 (EL290- TwinSafeGroup1.s 	د ا	Goto Link Variable Take Name Over from linked Variable Open Scope to This New Solution Explorer View	
Safety_Prog Instance C++ ANALYTICS I/O Devices	- % × E *	Cut Delete Rename Properties	Ctrl+X Del Alt+Enter

Fig. 128: TwinCAT 3 - Rename added Digital Input in TwinSafeGroup1

 \Rightarrow The digital input is renamed Var_from_PLC_ALIAS.



Fig. 129: TwinCAT 3 - Digital Input in TwinSafeGroup1 renamed as Var_from_PLC_ALIAS

13. We now assign the *Alias Device* we just created *Var_from_PLC_ALIAS Var_In1*.

Double-click on *Var_from_PLC_ALIAS.sds* in the *Solution Explorer* to call up the *Alias Device*.

In the Var_In1 row, click on the Map to button under Assignment.

In the *Map to* dialogue box, select the input *In (Channel 1)* of *Var_from_PLC_ALIAS* and confirm with *OK*.



Fig. 130: TwinCAT 3 - Assign Var_In1 to Var_from_PLC_ALIAS

⇒ The created Alias Device Var_from_PLC_ALIAS is assigned to Var_In1. The white background in the Var_In1 line shows that the Alias Device is of the Standard I/O type.

Variable Mapping				
Variables Group Por	Replacement Values Max Start Deviation			
🕂 🗕 👕 Group				
Variable	Scope Assignment	Usages	Online Value	Comment
 Local 				
GroupPort_ErrAck	Local ErrorAcknowledgement.in (TwinSafeGroup1)	TwinSafeGroup1.Err Ack]	
GroupPort_RunStop	Local Run.In (TwinSafeGroup1)	TwinSafeGroup1.Run/Stop]	
Var_in1	Local Var_from_PLC_ALIAS.In (TwinSafeGroup1)	TwinSafeGroup1.Network1.FBAnd1.AndIn1		
Var_In2	Local Term 3 (EL1904) - Module 1 (FSOES).InputChannel1 (TwinSafeGroup	1) TwinSafeGroup1.Network1.FBAnd1.AndIn2		

Fig. 131: TwinCAT 3 - Var_from_PLC_ALIAS assigned to Var_In1

The Alias Device Var_from_PLC_ALIAS can be linked to a variable declared in the PLC node.

We now link Var_from_PLC_ALIAS to an input of the 4-channel digital input terminal EL1004, to which a switch is connected.

14. Double-click on *Var_from_PLC_ALIAS.sds* in the *Solution Explorer* to call up the *Alias Device*.



Fig. 132: TwinCAT 3 - Open Var_from_PLC_ALIAS in Solution Explorer

15. In the main window, click on the link button on the right side of the *Linked to:* field.

currently r	Process Image				
			Linking Mode	: Manual	~
ull Name:	TIID*Device 2	2 (EtherCAT)^T	erm 1 (EK1914)^T	erm 2 (EL6910	0)^Sta
inked to:					-
lame:	TwinSafeGro	up1.Var_from_I	PLC_ALL Links the	corresponding	g variable

Fig. 133: TwinCAT 3 - Link Button of Var_from_PLC_ALIAS

16. Select the input of Term 6 (EL1004) and confirm the dialogue box with OK.



Fig. 134: TwinCAT 3 - Link Var_from_PLC_ALIAS to EL1004

⇒ The Linked to: field shows that the link has been successfully established.

Linking F	Process Image	
		Linking Mode: Manual 🗸
ull Name:	TIID^Device 2 (Ether	rCAT)^Term 1 (EK1914)^Term 2 (EL6910)^Sta
inked to:	TIID^Device 2 (Ether	rCAT)^Term 1 (EK1914)^Term 6 (EL1004)^Ch
Name:	TwinSafeGroup1.Va	r_from_PLC_ALIAS_6

Fig. 135: TwinCAT 3 - Var_from_PLC_ALIAS linked to input of EL1004

17. The *AndOut* output of the safety function block *safeAnd* is now assigned to a virtual input in the *Advanced Safety Module* as an activation input.

For this purpose, another variable must be created in the variable mapping of the safety function block. We give this variable the name *Out_to_ASM7_Input*.

PIC SAFETY Safety_Prog Safety_Prog Safety_Prog Safety_Prog Project Safety_Project Safe			Andin6 Andin7 Andout Andin8	
 □ User FBs □ TwinSafeGroup1 □ TwinSafeGroup1 □ Drive 16 (SGD7S-xxxDA0xxxxF91 CoE Drive Bill ErrorAcknowledgement.sds Bill Run.sds □ Term 3 (EL1904) - Module 1 (FSOES).sds □ Term 5 (EL2904) - Module 1 (FSOES).sds □ Term 5 (EL2904) - Module 1 (FSOES).sds 	X	s Repla	cement Values Max Start Deviation	
TwinSafeGroup1.sal		acope	Assignment	Usages
Image Image Image Image	GroupPort_ErrAck GroupPort_RunStop Var_In1 Var_In2 Out_to ASM9_Input	Local Local Local Local		TwinSafeGroup TwinSafeGroup TwinSafeGroup TwinSafeGroup TwinSafeGroup

Fig. 136: TwinCAT 3 - Create variable Out_to_ASM7_Input in TwinSafeGroup1

18. In the Out_to_ASM7_Input row, click on the Map to button under Assignment.

In the *Map to* dialogue box, select the *AndOut* output of *FBAnd1* and confirm with *OK*.



Fig. 137: TwinCAT 3 - Assign Out_to_ASM7_Input to FBAnd1

⇒ The created Alias Device Out_to_ASM7_Input is assigned to FBAnd1. The purple background in the line Out_to_ASM7_Input shows that the Alias Device is of type FunctionBlock Port.

Variable Mapping					
Variables Group Port	s Repla	cement Values Max Start Deviation			
🕂 🗕 👕 Group					
Variable	Scope	Assignment	Usages	Online Value	Comment
Local	-	the second se			
GroupPort_ErrAck	Local	ErrorAcknowledgement.In (TwinSafeGroup1)	TwinSafeGroup1.Err Ack		
GroupPort_RunStop	Local	Run.In (TwinSafeGroup1)	TwinSafeGroup1.Run/Stop		
Var_In1	Local	Var_from_PLC_ALIAS.In (TwinSafeGroup1)	TwinSafeGroup1.Network1.FBAnd1.AndIn1		
Var_In2	Local	Term 3 (EL1904) - Module 1 (FSOES).InputChannel1 (TwinSafeGroup1)	TwinSafeGroup1.Network1.FBAnd1.AndIn2		
Out_to ASM7_Input	Local	TwinSafeGroup1.Network1.FBAnd1.AndOut			

Fig. 138: TwinCAT 3 - Out_to_ASM7_Input assigned to FBAnd1

19. In the Out_to_ASM7_Input row, click on the Map to button under Usages.

In the *Map to* dialogue box, select the input *Virtual Input 0* of *SGD7S-xxxDA0xxxxF91 CoE Drive* and confirm with *OK*.



Fig. 139: TwinCAT 3 - Assign Virtual Input 1 to Advanced Safety Module

⇒ The created Alias Device Out_to_ASM7_Input is assigned to Virtual Input 0. The yellow background in the line Out_to_ASM7_Input shows that the Alias Device is of type Safe I/O.

Variables Group Port	a Reola	cement Values Max Start Deviation			
- Group				Search:	
Variable	Scope	Assignment	Usages	Online Value	Commen
 Local 		All and a second se			
GroupPort_ErrAck	Local	ErrorAcknowledgement.In (TwinSafeGroup1)	TwinSateGroup1.Err Ack		
GroupPort_RunStop	Local	Run.In (TwinSafeGroup1)	TwinSafeGroup1.Run/Stop		
Var_In1	Local	Var from PLC_ALIAS.in (TwinSafeGroup1)	TwinSafeGroup1.Network1.FBAnd1.Andin1		
Var_In2	Local	Term 3 (EL1904) - Module 1 (FSOES).InputChannel1 (TwinSaleGroup1)	TwinSafeGroup1.Network1.FBAnd1.Andin2		
Out_to ASM7_Input	Local	TwinSafeGroup1.Network1.FBAnd1.AndOut	Drive 16 (SGD7S-xxxDA0xxxxF91 CoE Drive) - Module 1 (Safety Process Data). Virtual Input 0 (TwinSafeGroup	1)	

Fig. 140: TwinCAT 3 - Out_to ASM7_Input assigned to Advanced Safety Module

20. Click on the Verify Safety Project icon in the TwinCAT Safety toolbar.



⇒ This checks the validity of the safety project.

Fig. 141: TwinCAT 3 - Verify Safety Project

If errors are detected during the check, this is indicated with the dialogue box *There were validation errors, continue save*? In addition, the *Error List* at the bottom of the screen, alongside other messages or warnings, indicates which error was detected.



Fig. 142: TwinCAT 3 - Verify Safety Project - There were validation errors

If *No* was clicked in this dialogue box, the following dialogue box appears, indicating that not all files of the safety project could be saved.

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			& safeAnd FBAnd1		as	
					CD S	
		Var_In1	AndIn1	&		
		Var_In2	AndIn2			
		ł	AndIn3		1	
		5	Andins			
		F	AndIn6			1.
		E	AndIn7	_	AndOut	Out_to ASM7_Input
		f	D. Andlat			
						~
			Could not save	all safety project	t files. Please try	to save all project files
			manually befor	e retrying to veri	fy the safety pro	oject.
*v ≮		-				
ar list		_				ОК
or List			-	-		

Fig. 143: TwinCAT 3 - Verify Safety Project - Could not save all safety project files

When the safety project has been successfully checked for validity, the message *Verification Process Succeeded* is displayed at the bottom left of the screen.



Fig. 144: TwinCAT 3 - Verify Safety Project - Verification Process Succeeded

Creating a new TwinCAT Project > Download the Safety Project

5.3.6 Download the Safety Project

If no errors were detected when checking the safety project for validity (message "Verification Process Succeeded"), you can continue with the download of the project.

1. In the *TwinCAT Safety* toolbar, click on the *Multi-Download Safety Project(s)* icon. This allows multiple safety projects to be downloaded to the corresponding logic components at the same time.



Fig. 145: TwinCAT 3 - Multi-Download Safety Project(s)

2. In the Select Valid Project(s) dialogue box, select the projects for which a simultaneous download is to be performed (in the scenario described here, there is only one project).



CAT System' (10000): TCIOETH Server started: TCIOETH.

Fig. 146: TwinCAT 3 - Select Valid Project(s)

Creating a new TwinCAT Project > Download the Safety Project

3. In the *General Download Settings* dialogue box, the user name and password are entered first.

The default user is *Administrator* and the default password is *TwinSAFE*. The input is case sensitive.

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Select Valid Project(s) General Download Settings	Complete Download Download complete project data with default group customization settings (customization is possible after the
Select Valid Project(s) General Download Settings	Complete Download Download complete project data with default group customization settings (customization is possible after the download) and use these login credentials for each project:
Select Valid Project(s) General Download Settings	Complete Download Download complete project data with default group customization settings (customization is possible after the download) and use these login credentials for each project: Username: Administrator
Soloct Valid Project(s) General Download Settings	Complete Download Download complete project data with default group customization settings (customization is possible after the download) and use these login credentials for each project: Username: Administrator Password:
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Soloct Valid Project(s) General Download Settings	Complete Download Download complete project data with default group customization settings (customization is possible after the download) and use these login credentials for each project: Username: Administrator I Password: ••••••• Please verify the Serial Number of each project:
Soloct Valid Project(s) General Download Settings	Complete Download Download complete project data with default group customization settings (customization is possible after the download) and use these login credentials for each project: Username: Administrator I Password: ••••••• Please verify the Serial Number of each project: Verified Project Name, Physical Device, Serial Number Target S
Soloct Valid Project(s) General Download Settings	Complete Download Download complete project data with default group customization settings (customization is possible after the download) and use these login credentials for each project: Username: Administrator I Password: •••••• Please verify the Serial Number of each project: Verified Project Name: Physical Device Serial Number Target S S Safety_Prog Term 2 (EL6910) 1502054 EL6910 <

- Fig. 147: TwinCAT 3 General Download Settings
 - ⇒ In the *Verified* checkbox, confirm that the correct serial numbers are displayed and used. Start the download with the *Next* button.

Creating a new TwinCAT Project > Download the Safety Project

4. In the *Final Verification* dialogue box, confirm the correctness of the checksums (*Online CRC* and *Calculated CRC*) by selecting the checkbox and clicking *Next*.

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Var_In2 AndIn2			
Multi-Download			
Steps	Final Ve	rification	
Select Valid Project(s)	Project Name Physical Device		Downloa
General Download Settings		Configured Datasets	Online CRC
Circul Man IC and an	Safety_Prog Term 2 (EL6910)	Safe Logic Data	0xF66E
Final verification		Manning Data	0.0007
Activation		wapping bata	UXBUU7
Activation Multi-Download Result		Parameter Data	0x973D
Activation Multi-Download Result		Parameter Data	0x973D
rnal verncauon Activation Multi-Download Result		Parameter Data	0x973D
rnal vernication Activation Multi-Download Result	(Parameter Data	0x973D
Activation Multi-Download Result	< I have manually verified the that the correct functionality	data shown here and	0x973D

- Fig. 148: TwinCAT 3 Final Verification
- **5.** In the *Activation* dialogue box, enter the password of the user you are using again and click *Next*.



Fig. 149: TwinCAT 3 - Activation

6. In the *Multi-Download Result* dialogue box, all projects with the status *Activated* and *Downloaded* are listed. Use the *Finish* button to finish the download.

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Select Valid Project(s)					
General Download Settings	Activated	1 Downloaded	Project Name Safety Prog	Physical Device Term 2 (EL6910)	Target Syst EL6910
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Activation Multi-Download Result					
Activation Multi-Download Result					
Activation Multi-Download Result					
Activation Multi-Download Result					
Activation Multi-Download Result	4				

Fig. 150: TwinCAT 3 - Multi-Download Result

- 5.3.7 Activate Configuration and Display Online Data
 - **1.** Activate the downloaded configuration by clicking the *Activate Configuration* icon.



Fig. 151: TwinCAT 3 - Activate Configuration

2. Confirm the activation of the configuration by clicking *OK* in the *Activate Configuration* dialogue box.



Fig. 152: TwinCAT 3 - Confirm Activation

3. Restart the TwinCAT system in Run Mode by clicking OK.



Fig. 153: TwinCAT 3 - Restart TwinCAT System in Run Mode

4. Click on the Show Online Data icon in the TwinCAT Safety toolbar.



Fig. 154: TwinCAT 3 - Show Online Data

⇒ This causes the display to change to the current values within the safety project.

In the following example, the TwinSafeGroup1.sal worksheet is outlined in dark red. This indicates that the group is in *Unknown* state.





Fig. 155: TwinCAT 3 - Group is in state Unknown

In this example, the TwinSafeGroup1.sal worksheet is outlined in green. This indicates that the group is in *Run* state.



Fig. 156: TwinCAT 3 - Group is in state RUN

6 EDM output concept of SGD7S-OSB01A/OSB02A compared to SGDV-OSA01A





Fig. 157: Input behaviour of SGDV-OSA01A

- tm Time period during which time measurement is performed: Measurement is performed until an alarm occurs.
- t_alm Specified value
- td Alarm output delay time (40 ms max.)

The time period *tm* is the *Discrepancy Time* and is equal to 10 seconds within the SGDV-OSA01A.

You can set the same time (up to 1000 ms) inside the SGD7S-OSB01A/ OSB02A.

The following figure shows the parameterisation of the *Discrepancy Time* in the *Advanced Safety Module Parameter Editor*.

Port A Function		Port A Filter Time (ms)		Port A Discrepancy Time (ms)	1	Port A Test Pulse Length (ms)	_
Digital Input	× 🕕	3	1	10000	1		1

Fig. 158: Setting Discrepancy Time in the Advanced Safety Module Parameter Editor

These signals are output when the following two conditions are met:

- The safety function is operating normally.
- No malfunction occurs in the safety function.

If a malfunction occurs in the safety function when the safety function is operating, this signal will not be output.

By monitoring this signal from an external device, a sequence can be designed for returning to normal operations from the safety function operation state. The following figure shows the relationship between the External Device Monitor Signal and safety function.

External Device Monitor output signals of SGDV-OSA01A



Fig. 159: Relationship between the External Device Monitor Signal and safety function



Each safe output of the SGD7S-OSB01A/OSB02A can be used as 2 EDM outputs.

Output Signal Type	
Port C1: EDM Output	~
	()
Output Signal Behaviour	
None	~
None	
HIGH during operation	
HIGH during working safety function	
HIGH after limit violation	
HIGH during safe state	

Fig. 160: Output Signal Type and Output Signal Behaviour

Failure of the safety functions can be detected by monitoring the Safety Request Input Signals and the External Device Monitor Output Signals.

The following table shows the logic for the Safety Request Input Signals and the External Device Monitor Output Signals.

Signal Name	Code	Logic			
Safety Request Input Signal A1	SRI-A1	ON	ON	OFF	OFF
Safety Request Input Signal A2	SRI-A2	ON	OFF	ON	OFF
External Device Monitor Output Signal A	EDM-A	OFF	OFF	OFF	ON

This logic is the same for the Safety Request Input Signal B.

EDM remains OFF, it takes the specified time until a malfunction can be recognized.

Only when both Inputs (A1, A2) are OFF the External Device Monitor can change to ON ... even if the safety function is already running.



In the SGD7S-OSB01A/OSB02A we test the inputs continuously. There is no need to use an unsafe External Device Monitor.

EDM output functions of SGDV-OSA01A



Fig. 161: Operation Timing When Pc01.0 = 0 (Output Condition = Safety Function Operation)

This signal behaviour corresponds to EDM = ON (HIGH) during working safety function.



Fig. 162: Operation Timing When Pc01.0 = 1 (*Output Condition* = Safe State) This signal behaviour corresponds to EDM = ON (HIGH) during safe state.



SGD7S-OSB01A/OSB02A has **four** possible External Device Monitor signals:

- HIGH during operation
- HIGH during working safety function
- HIGH after limit violation
- HIGH during safe state

Output Signal Type	
Port C1: EDM Output	~
	(
Output Signal Behaviour	
None	~
None	
HIGH during operation HIGH during working safety function HIGH after limit violation HIGH during safe state	

Fig. 163: Output Signal Type and Output Signal Behaviour



Fig. 164: EDM output behaviour of SGDV-OSA01A



The SGDV-OSA01A can have a delay of the specified time (state does not change to ON until both inputs are OFF).

Activation Input (channel 1)	ON	OFF (Activation of a safety function)
Activation Input (channel 2)	ON	OFF (Activation of a safety function)
Safety Function		Operating Safe (HWBB) state
EDM Signal Output	OFF	ON (EDM output ON during operation)

Fig. 165: EDM output behaviour of SGD7S-OSB01A



The SGD7S-OSB01A/OSB02A can immediately have the "ON state" when the safety function is in operation.

Another advantage of the SGD7S-OSB01A/OSB02A (compared to competitor products) is that it provides the EDM signal **without** an additional relay. A change of an OSSD output (such as is present in safety light curtains) directly changes the state of the EDM output. Change EDM State behavior of SGD7S-OSB01A/OSB02A to SGDV-OSA01A If it is desired that SGD7S-OSAB01A/OSB02A behaves like SGDV-OSA01A, this can be achieved as shown in the following figure.





Troubleshooting

7 Error Handling

7.1 Introduction

There are several indicators for the status of security:

- The 2 LEDs on the Advanced Safety Module board
- The Alarm display of the SERVOPACK
- The FSoE status message
- The monitor function in SigmaWin+

For detailed information on the indicators mentioned, please refer to the Product Manual of the Advanced Safety Module:

Name	Manual number
Advanced Safety Module for Sigma-7 SERVOPACKs SGD7S-DDDA0D8DDF91, 400 V, Product Manual	SIEP YEUOS7S 01

7.2 Advanced Safety Module LEDs

Refer to chapter 12.5 "Status Display" of the Advanced Safety Module Product Manual.

7.3 SERVOPACK Alarm Display

Refer to chapter 14.3 "List of alarms" of the Advanced Safety Module Product Manual.

7.4 FSoE Status

Refer to the chapters A.3.2.2 "Rx Process Data" and A.3.2.2.1 "Detailed Parameter Description of Rx Process Data" in the Appendix of the Advanced Safety Module Product Manual.

7.5 SigmaWin+ Monitoring

Refer to chapter A.4 "Monitoring Parameters" in the Appendix of the Advanced Safety Module Product Manual.

7.6 Troubleshooting

Refer to chapter 14.4 "Troubleshooting of alarms" of the Advanced Safety Module Product Manual.

8 Revision History

The revision dates and numbers of the revised manuals are given on the bottom of the back cover.



- 1 Manual version
- 2 Date of publication
- 3 Date of original publication
- 4 Revision number

Date of publication	Manual version	Rev. no.	Section	Revised content
March 2022	А	0	-	First edition

Advanced Safety Module for Sigma-7 SERVOPACK SGD7S-DDDDA0D8DDF91, 400 V Application Manual

YASKAWA EUROPE GmbH

Hauptstraße 185 65760 Eschborn Germany Phone: +49-6196-569-500 http://www.yaskawa.eu.com

YASKAWA AMERICA, INC.

2121, Norman Drive South, Waukegan, IL 60085, U.S.A. Phone: 1-800-YASKAWA (927-5292) or +1-847-887-7000 Fax: +1-847-887-7310 http://www.yaskawa.com

YASKAWA ELECTRIC CORPORATION

2-1 Kurosakishiroishi, Yahatanishi-ku, Kitakyushu 806-0004 Japan Phone: +81-93-645-8801 http://www.yaskawa.co.jp

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SIEP YEUOS7S 02A Revision 0 March 2022 Published in Germany Original Instructions

