

How can the Safety Functions of SINAMICS S120 be activated in an existing STEP 7 Project?

Technology CPU

FAQ • March 2011



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Question

How can the safety functions of SINAMICS S120 be activated in an existing STEP 7 project?

Answer

The instructions and notes listed in this document provide a detailed answer to this question.

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1 Introduction

Note

This FAQ is based on the Getting Started “CPU 317TF-2 DP: Controlling a SINAMICS S120 with Safety Functions” for S7 Technology V4.2.

The safety functions can only be activated on real axes of a STEP 7 project. They cannot be activated on virtual axes.

The drive system used in this FAQ consists of SINAMICS S120 in interaction with the failsafe Technology CPU 317TF-2 DP.

1.1 Requirement

The use of this FAQ requires a functional STEP 7 project with the failsafe Technology CPU 317TF-2 DP and real axes.

The following configuration is assumed:

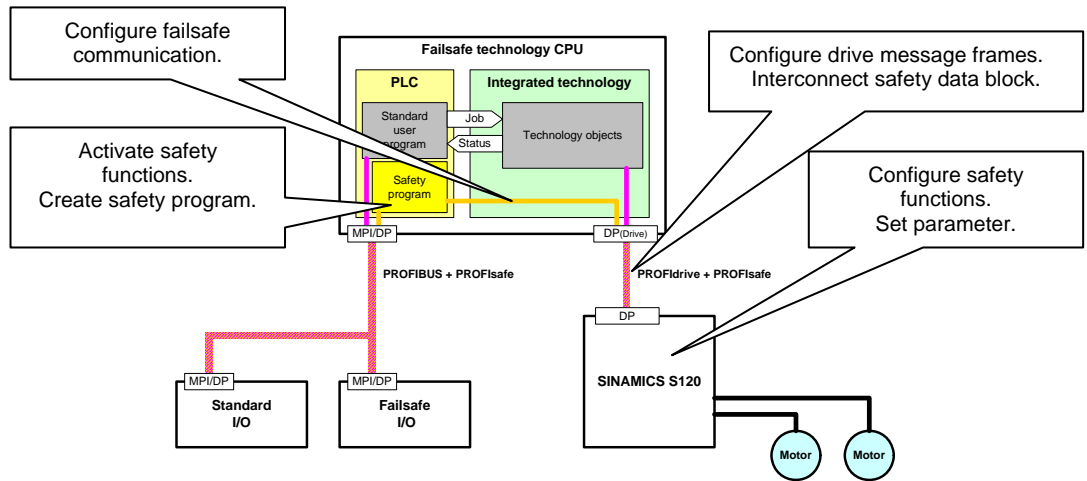
- A failsafe Technology CPU 317TF-2 DP exists in HW Config – even without an active safety program.
If necessary, the technology CPU that exists in HW Config has to be replaced by a failsafe Technology CPU 317TF-2 DP.
- A SINAMICS S120 drive has already been configured on the failsafe Technology CPU 317TF-2 DP and the connected axes have been configured in the integrated technology and can be controlled via the failsafe technology CPU.

1.2 Standard procedure

The following steps are necessary to activate the safety functions on the axes that exist in the project:

- Extend the drive message frames of the SINAMICS S120 drive system for each existing axis by PROFIsafe telegram and message frame extension.
- Interconnect safety data blocks of message frame extensions with SINAMICS parameters of the individual axes.
- Parameterize the settings for the deceleration ramp for each existing axis on SINAMICS S120.
- Configure the safety-related communication between the safety part of the failsafe technology CPU and the existing axes.
- Commission the safety function of the failsafe technology CPU.
- Create the safety program in the failsafe technology CPU.
- Configure the safety functions in the SINAMICS S120 drive.
- Program the control of the safety functions of the drive for each axis in the safety program in the failsafe technology CPU.

Figure 1-1 Control of the safety functions of SINAMICS S120

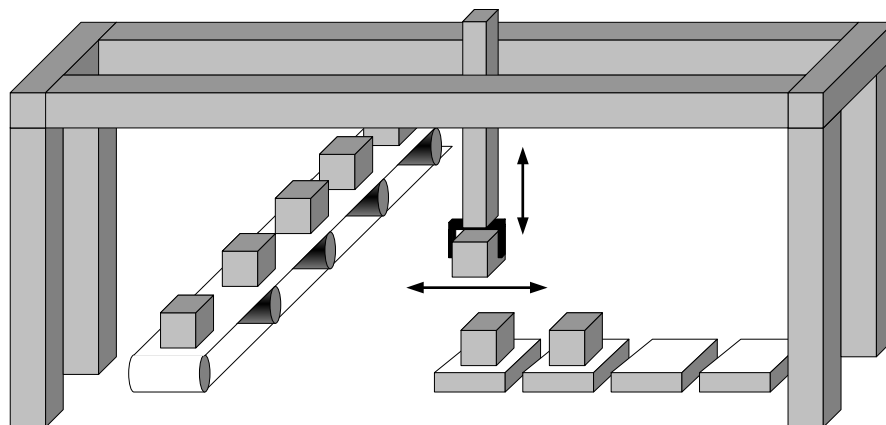


The following chapters of this FAQ provide a detailed explanation of the individual steps to activate the safety functions on the axes that already exist in a STEP 7 project.

1.3 Example

In this FAQ, the procedure is illustrated using a sample program for a palletizer with 2 axes.

Figure 1-2 Simple palletizer with two axes

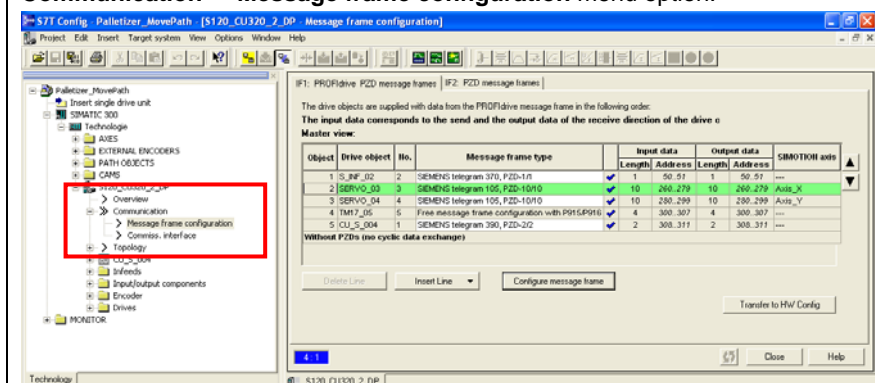
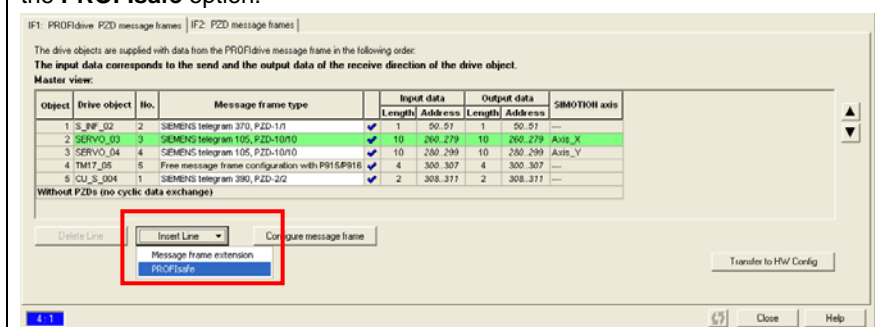
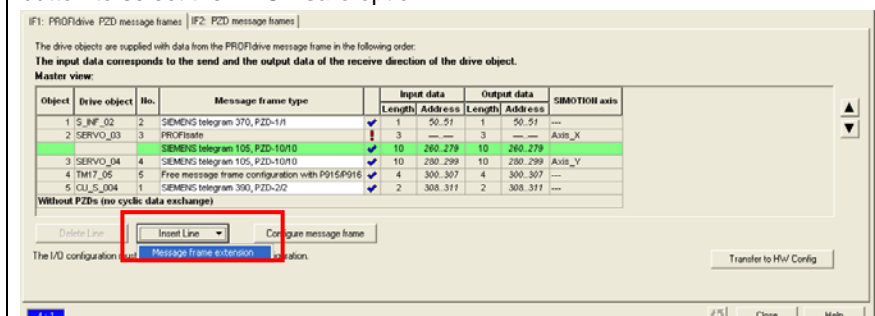


2 Configuration

2.1 SINAMICS: Extending the drive message frames

To transmit the safety signals, telegrams 105 of the axes that have already been created must be extended by the PROFIsafe data and a free message frame extension.

Table 2-1 SINAMICS: Extending the drive message frames

No.	Procedure / description																																																						
1.	<p>In the project tree in the desired SINAMICS S120 drive, open the Communication ⇒ Message frame configuration menu option.</p> 																																																						
2.	<p>Select telegram 105 of the desired axis and use the Insert Line button to select the PROFIsafe option.</p>  <table border="1"> <thead> <tr> <th>Object</th> <th>Drive object</th> <th>No.</th> <th>Message frame type</th> <th>Input data Length</th> <th>Input data Address</th> <th>Output data Length</th> <th>Output data Address</th> <th>SIMOTION axis</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>S_INF_02</td> <td>2</td> <td>SIEMENS telegram 370, PZD-1/I</td> <td>1</td> <td>50.51</td> <td>1</td> <td>50.51</td> <td>---</td> </tr> <tr> <td>2</td> <td>SERVO_03</td> <td>3</td> <td>PROFIsafe</td> <td>3</td> <td>---</td> <td>3</td> <td>---</td> <td>Axis_X</td> </tr> <tr> <td>3</td> <td>SERVO_04</td> <td>4</td> <td>SIEMENS telegram 105, PZD-10/I0</td> <td>10</td> <td>260.279</td> <td>10</td> <td>260.279</td> <td>Axis_X</td> </tr> <tr> <td>4</td> <td>TM17_05</td> <td>5</td> <td>Free message frame configuration with P915/P916</td> <td>4</td> <td>300.307</td> <td>4</td> <td>300.307</td> <td>---</td> </tr> <tr> <td>5</td> <td>CU_S_004</td> <td>1</td> <td>SIEMENS telegram 390, PZD-2/I</td> <td>2</td> <td>308.317</td> <td>2</td> <td>308.317</td> <td>---</td> </tr> </tbody> </table>	Object	Drive object	No.	Message frame type	Input data Length	Input data Address	Output data Length	Output data Address	SIMOTION axis	1	S_INF_02	2	SIEMENS telegram 370, PZD-1/I	1	50.51	1	50.51	---	2	SERVO_03	3	PROFIsafe	3	---	3	---	Axis_X	3	SERVO_04	4	SIEMENS telegram 105, PZD-10/I0	10	260.279	10	260.279	Axis_X	4	TM17_05	5	Free message frame configuration with P915/P916	4	300.307	4	300.307	---	5	CU_S_004	1	SIEMENS telegram 390, PZD-2/I	2	308.317	2	308.317	---
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3.	<p>Once again, select telegram 105 of the desired axis and use the Insert Line button to select the PROFIsafe option.</p>  <table border="1"> <thead> <tr> <th>Object</th> <th>Drive object</th> <th>No.</th> <th>Message frame type</th> <th>Input data Length</th> <th>Input data Address</th> <th>Output data Length</th> <th>Output data Address</th> <th>SIMOTION axis</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>S_INF_02</td> <td>2</td> <td>SIEMENS telegram 370, PZD-1/I</td> <td>1</td> <td>50.51</td> <td>1</td> <td>50.51</td> <td>---</td> </tr> <tr> <td>2</td> <td>SERVO_03</td> <td>3</td> <td>PROFIsafe</td> <td>3</td> <td>---</td> <td>3</td> <td>---</td> <td>Axis_X</td> </tr> <tr> <td>3</td> <td>SERVO_04</td> <td>4</td> <td>SIEMENS telegram 105, PZD-10/I0</td> <td>10</td> <td>260.279</td> <td>10</td> <td>260.279</td> <td>Axis_X</td> </tr> <tr> <td>4</td> <td>TM17_05</td> <td>5</td> <td>Free message frame configuration with P915/P916</td> <td>4</td> <td>300.307</td> <td>4</td> <td>300.307</td> <td>---</td> </tr> <tr> <td>5</td> <td>CU_S_004</td> <td>1</td> <td>SIEMENS telegram 390, PZD-2/I</td> <td>2</td> <td>308.317</td> <td>2</td> <td>308.317</td> <td>---</td> </tr> </tbody> </table>	Object	Drive object	No.	Message frame type	Input data Length	Input data Address	Output data Length	Output data Address	SIMOTION axis	1	S_INF_02	2	SIEMENS telegram 370, PZD-1/I	1	50.51	1	50.51	---	2	SERVO_03	3	PROFIsafe	3	---	3	---	Axis_X	3	SERVO_04	4	SIEMENS telegram 105, PZD-10/I0	10	260.279	10	260.279	Axis_X	4	TM17_05	5	Free message frame configuration with P915/P916	4	300.307	4	300.307	---	5	CU_S_004	1	SIEMENS telegram 390, PZD-2/I	2	308.317	2	308.317	---
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4. For **Message frame extension**, enter the desired message frame lengths from master view (Input data: **3 words**, Output data: **0 words**).

Object	Drive object	No.	Message frame type	Input data		Output data		SIMOTION axis
				Length	Address	Length	Address	
1	S_INF_02	2	SIEMENS telegram 370, PZD-1/1	1	50..51	1	50..51	---
2	SERVO_03	3	PROFIsafe	3	---	3	---	Axis_X
			SIEMENS telegram 105, PZD-10/10	10	260..279	10	260..279	
			Message frame extension	3	???.???	0	---	
3	SERVO_04	4	SIEMENS telegram 105, PZD-10/10	10	280..299	10	280..299	Axis_Y
4	TM17_05	5	Free message frame configuration with P915/P916	4	300..307	4	300..307	---
5	CU_S_004	1	SIEMENS telegram 390, PZD-2/2	2	308..311	2	308..311	---

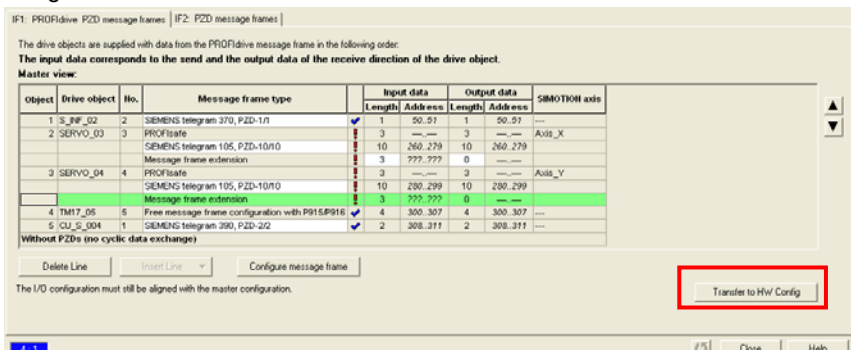
Without PZDs (no cyclic data exchange)

5. Repeat the extension of axis telegram 105 for all axes for which you want to activate the safety functions.

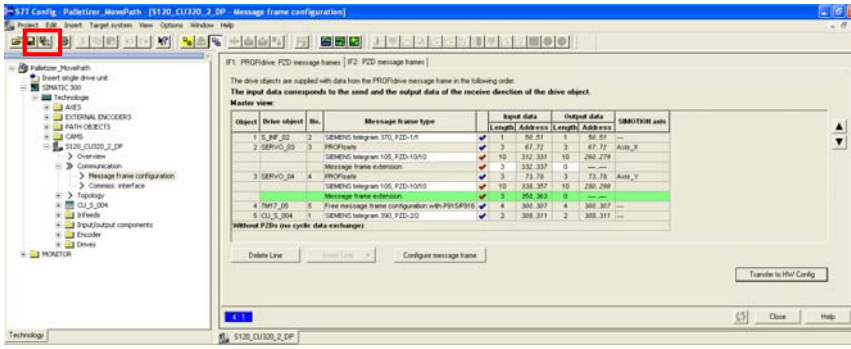
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			Message frame extension	3	???.???	0	---	
3	SERVO_04	4	PROFIsafe	3	---	3	---	Axis_Y
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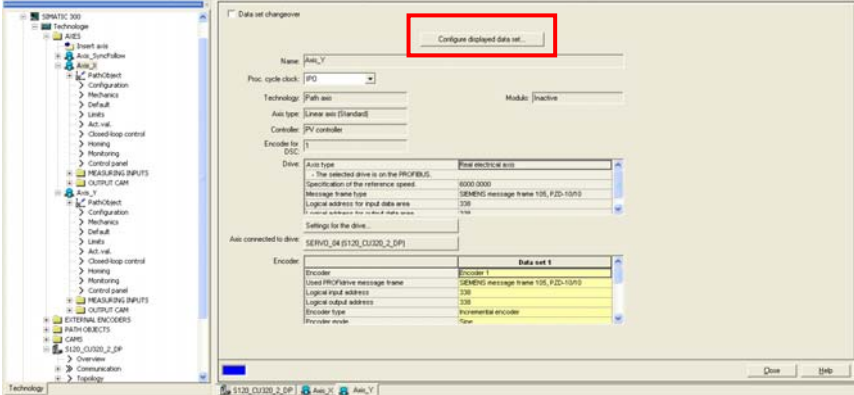
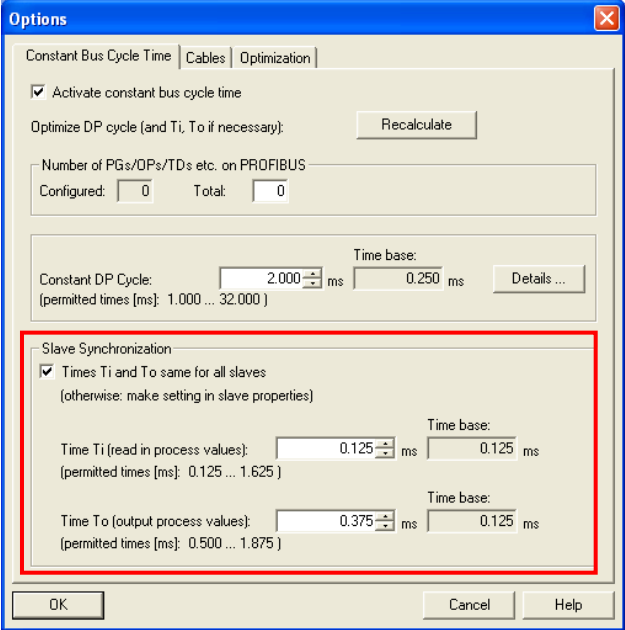
6. Use the **Transfer to HW Config** button and verify the correct address assignment.



7. Use the **Save and Compile** button of the changed configuration of the message frames for the drive.



If compiling fails due to inconsistency of the axis configuration, call the configuration of the axes in the technology and run the **axis configuration wizard** without making any changes. S7T Config then adapts the assignment of the message frame address in the axis configuration.

No.	Procedure / description
	
	<p>If compiling is still not possible, save the changed configuration, close S7T Config and in HW Config check the values of the times Ti and To set on the equidistant Profibus.</p>  <p>Save the changed hardware configuration, close HW Config and reopen S7T Config.</p> <p>It should now be possible to save and compile the changes in S7T Config without further error messages.</p>

2.2 SINAMICS: Interconnecting the safety data block

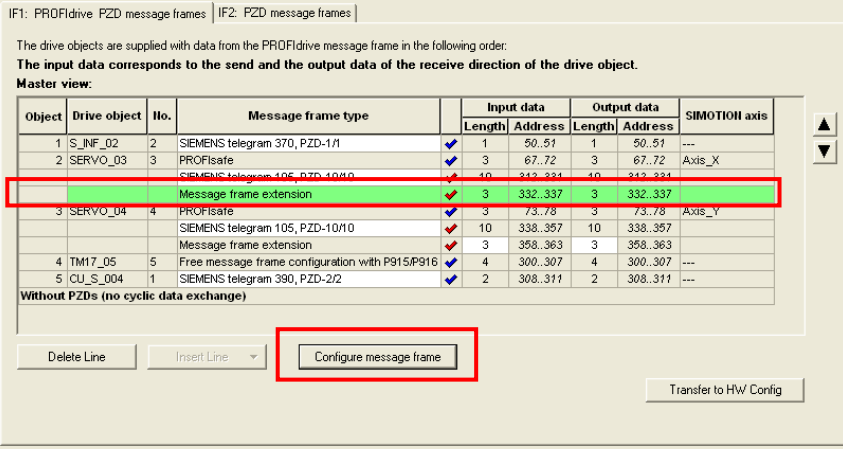
The current status of the drive safety functions is indicated with the safety data block of the technology. The signals are transmitted with the aid of the extension of the message frame by the safety data block. In the SINAMICS S120 drive, this message frame section must therefore be combined with the status signals of the drive safety functions as follows:

Table 2-2 SINAMICS: Safety data block interconnection

Bit...	...has to be interconnected with...		
	↔	Parameter	Meaning
0	↔	r9722.0	STO is active
1	↔	r9722.1	SS1 is active
2	↔	r9722.2	SS2 is active
3	↔	r9722.11	SOS is selected
4	↔	r9720.4	SLS is deselected (0 active)
5	↔		Reserved
6	↔		Reserved
7	↔	r9722.15	SSM (speed n is below the limit)
8	↔		Reserved
9	↔		Reserved
10	↔		Reserved
11	↔		Reserved
12	↔		Reserved
13	↔		Reserved
14	↔		Reserved
15	↔	r2139.5	At least one safety message is pending.

Proceed as follows:

Table 2-3 SINAMICS: Interconnecting the safety data block

No.	Procedure / description
1.	<p>In the message frame of the relevant axis, select Message frame extension and use the Configure message frame button.</p>  <p>The screenshot shows a configuration window with a table of message frame types. The table has columns for Object, Drive object, No., Message frame type, Input data (Length, Address), Output data (Length, Address), and SIMOTION axis. The row for 'Message frame extension' is highlighted in green. Below the table, there are buttons for 'Delete Line', 'Insert Line', and 'Configure message frame'. The 'Configure message frame' button is highlighted with a red box.</p>

No. **Procedure / description**

2. Select the **Transmit direction** tab and disable the **Suppress inactive interconnections** option to display the free interconnections. Select the **blue field (BICO interconnections)** in **line 11** to edit the interconnection of the message frame.

Receive direction | **Transmit direction** | Connector binector converter | Binector connector converter

Message frame: [105] SIEMENS telegram 105, PZD-10/10

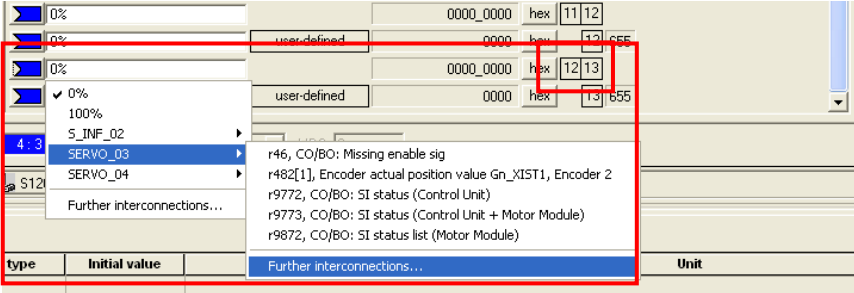
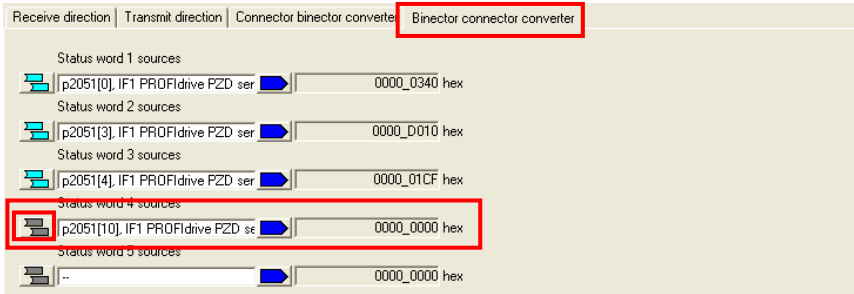
Suppress inactive interconnections Display unused interconnections

Parameter	Connector	Value	Hex	Bit 1	Bit 2
r2089[0]: Send binector-connector	ZSW1	0340	hex	1	2
0%		0340_FFFF	hex	1	2
0%	NIST_B	FFFF	hex	2	4
r63: CO: Actual speed smoothed		FFFF_EC01	hex	2	3
0%	NIST_B	EC01	hex	3	6
0%		EC01_B010	hex	3	4
r2089[1]: Send binector-connector	ZSW2	B010	hex	4	8
0%		B010_01CF	hex	4	5
r2089[2]: Send binector-connector	MELDW	01CF	hex	5	10
0%		01CF_0000	hex	5	6
r481[0]: Encoder status word Gr...	G1_ZSW	0000	hex	6	12
0%		0000_006A	hex	6	7
0%	G1_XIST1	006A	hex	7	14
r482[0]: Encoder actual position v...		006A_EE59	hex	7	8
0%	G1_XIST1	EE59	hex	8	16
0%		EE59_0000	hex	8	9
0%	G1_XIST2	0000	hex	9	18
r483[0]: Encoder actual position v...		0000_0000	hex	9	10
0%	G1_XIST2	0000	hex	10	20
0%		0000_0000	hex	10	11
0%	user-defined	0000	hex	11	655
0%		0000_0000	hex	11	12
0%	user-defined	0000	hex	12	655
0%		0000_0000	hex	12	13
0%	user-defined	0000	hex	13	655

3. As an interconnection, assign the **binector-connector converter** of the relevant axes via the **r2089[3]** parameter.

r1539, CO: Lower effective torque limit
r2089[1], Send binector-connector converter status word, Status word 2
r2089[2], Send binector-connector converter status word, Free status word 3
r2089[3], Send binector-connector converter status word, Free status word 4
r2120, CO/BO: Trigger word for faults and alarms
r2131, CO: Actual Fault code
r2132, CO: Actual alarm code

Further interconnections...
user-defined 0000 hex 13 655

No.	Procedure / description																																																
4.	<p>Select the blue field (BICO interconnections) in line 12/13 and use Further interconnections to assign the p9733[0] parameter as an interconnection.</p>  <p>SERVO_03, p2061[11] IF1 PROFIdrive PZD send double word, PZD 12 + 13</p> <p>Please select the signal source: <input type="text" value="SERVO_03"/> Find parameter: <input type="text"/></p> <table border="1"> <thead> <tr> <th>P no.</th> <th>Parameter text</th> </tr> </thead> <tbody> <tr><td>p2930</td><td>CO: Fixed value M [Nm]</td></tr> <tr><td>r3113</td><td>CO/BO: NAMUR message bit bar</td></tr> <tr><td>r3131</td><td>CO: Current fault value</td></tr> <tr><td>r3840</td><td>CO/BO: Friction characteristic, status word</td></tr> <tr><td>r3841</td><td>CO: Friction characteristic output</td></tr> <tr><td>r3875</td><td>CO/BO: Long stator status word</td></tr> <tr><td>p3878</td><td>CO: Long stator commutation angle 1</td></tr> <tr><td>p3879</td><td>CO: Long stator commutation angle 2</td></tr> <tr><td>p4688[0]</td><td>+ Zero mark monitoring, differential pulse count, Encoder 1</td></tr> <tr><td>r8850[0]</td><td>+ IF2 PZD receive word, PZD 1</td></tr> <tr><td>r8860[0]</td><td>+ IF2 PZD receive double word, PZD 1 + 2</td></tr> <tr><td>r8889[0]</td><td>+ IF2 send binector-connector converter status word, Status word 1</td></tr> <tr><td>r9719</td><td>CO/BO: SI Motion control signals 2</td></tr> <tr><td>r9720</td><td>CO/BO: SI Motion control signals integrated in the drive</td></tr> <tr><td>r9721</td><td>CO/BO: SI Motion status signals</td></tr> <tr><td>r9722</td><td>CO/BO: SI Motion status signals integrated in the drive</td></tr> <tr><td>r9723</td><td>CO/BO: SI Motion diagnostic signals integrated in the drive</td></tr> <tr><td>r9733[0]</td><td>- SI Motion setpoint speed limit effective, Setpoint limiting positive</td></tr> <tr><td>r9733[1]</td><td>- SI Motion setpoint speed limit effective, Setpoint limiting negative</td></tr> <tr><td>r9772</td><td>CO/BO: SI status (Control Unit)</td></tr> <tr><td>r9773</td><td>CO/BO: SI status (Control Unit + Motor Module)</td></tr> <tr><td>r9774</td><td>CO/BO: SI status (group STO)</td></tr> <tr><td>r9872</td><td>CO/BO: SI status list (Motor Module)</td></tr> </tbody> </table>	P no.	Parameter text	p2930	CO: Fixed value M [Nm]	r3113	CO/BO: NAMUR message bit bar	r3131	CO: Current fault value	r3840	CO/BO: Friction characteristic, status word	r3841	CO: Friction characteristic output	r3875	CO/BO: Long stator status word	p3878	CO: Long stator commutation angle 1	p3879	CO: Long stator commutation angle 2	p4688[0]	+ Zero mark monitoring, differential pulse count, Encoder 1	r8850[0]	+ IF2 PZD receive word, PZD 1	r8860[0]	+ IF2 PZD receive double word, PZD 1 + 2	r8889[0]	+ IF2 send binector-connector converter status word, Status word 1	r9719	CO/BO: SI Motion control signals 2	r9720	CO/BO: SI Motion control signals integrated in the drive	r9721	CO/BO: SI Motion status signals	r9722	CO/BO: SI Motion status signals integrated in the drive	r9723	CO/BO: SI Motion diagnostic signals integrated in the drive	r9733[0]	- SI Motion setpoint speed limit effective, Setpoint limiting positive	r9733[1]	- SI Motion setpoint speed limit effective, Setpoint limiting negative	r9772	CO/BO: SI status (Control Unit)	r9773	CO/BO: SI status (Control Unit + Motor Module)	r9774	CO/BO: SI status (group STO)	r9872	CO/BO: SI status list (Motor Module)
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r9733[0]	- SI Motion setpoint speed limit effective, Setpoint limiting positive																																																
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r9772	CO/BO: SI status (Control Unit)																																																
r9773	CO/BO: SI status (Control Unit + Motor Module)																																																
r9774	CO/BO: SI status (group STO)																																																
r9872	CO/BO: SI status list (Motor Module)																																																
5.	<p>Now call the binector-connector converter and interconnect the signals listed in the above table on the p2051[10] parameter.</p>  <p>Receive direction Transmit direction Connector binector converter Binector connector converter</p> <p>Status word 1 sources</p> <p><input type="text" value="p2051[0]. IF1 PROFIdrive PZD ser"/> <input type="text" value="0000_0340 hex"/></p> <p>Status word 2 sources</p> <p><input type="text" value="p2051[3]. IF1 PROFIdrive PZD ser"/> <input type="text" value="0000_D010 hex"/></p> <p>Status word 3 sources</p> <p><input type="text" value="p2051[4]. IF1 PROFIdrive PZD ser"/> <input type="text" value="0000_01CF hex"/></p> <p>Status word 4 sources</p> <p><input type="text" value="p2051[10]. IF1 PROFIdrive PZD ser"/> <input type="text" value="0000_0000 hex"/></p> <p>Status word 5 sources</p> <p><input type="text" value="--"/> <input type="text" value="0000_0000 hex"/></p>																																																

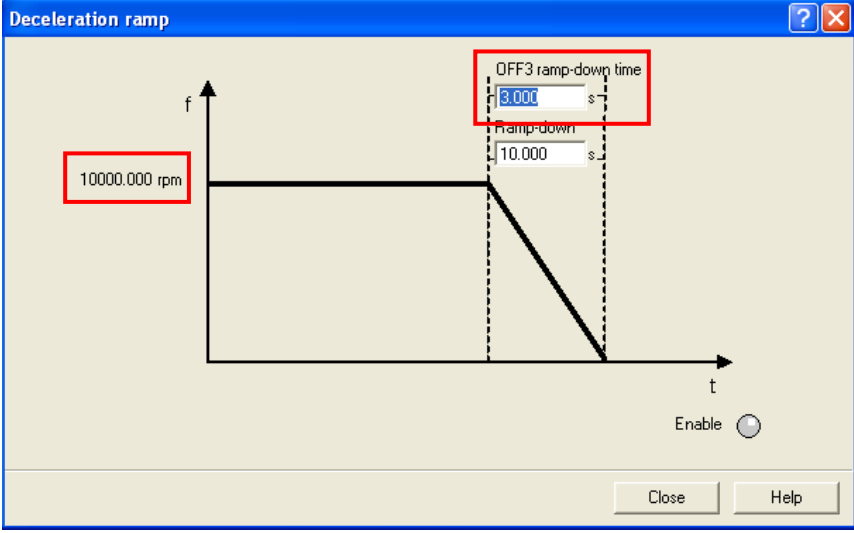
No.	Procedure / description
6.	<p>For the respective bits, select the relevant blue field (BICO interconnections) next to the parameter and use Further interconnections to assign the signals listed in the above table.</p>
7.	Repeat the interconnection of the safety data block for all axes for which you want to activate the safety functions.
8.	Save and compile the changes you have made.

2.3 SINAMICS: Setting the parameter

On the SINAMICS S120 drive system, the setting of the OFF 3 deceleration ramp must be made or checked to use the safety functions.

Table 2-4 SINAMICS: Setting the parameter

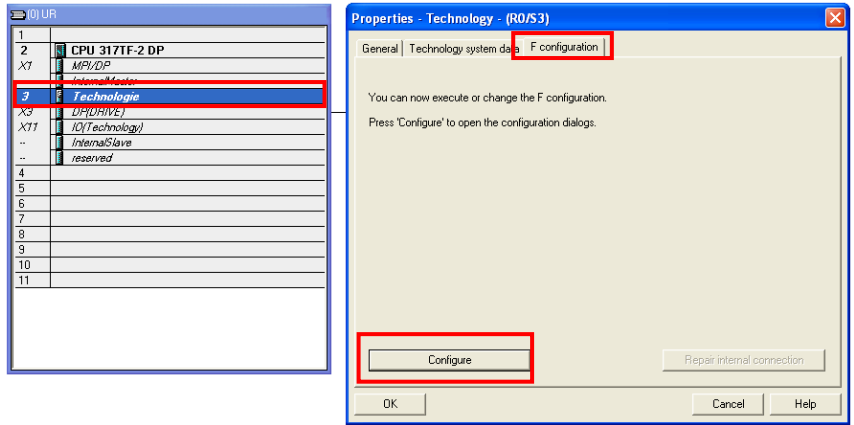
No.	Procedure / description
1.	<p>In the project tree for the relevant axis, select Open-loop/closed-loop control and click on Setpoint addition. Then click on Deceleration ramp.</p>

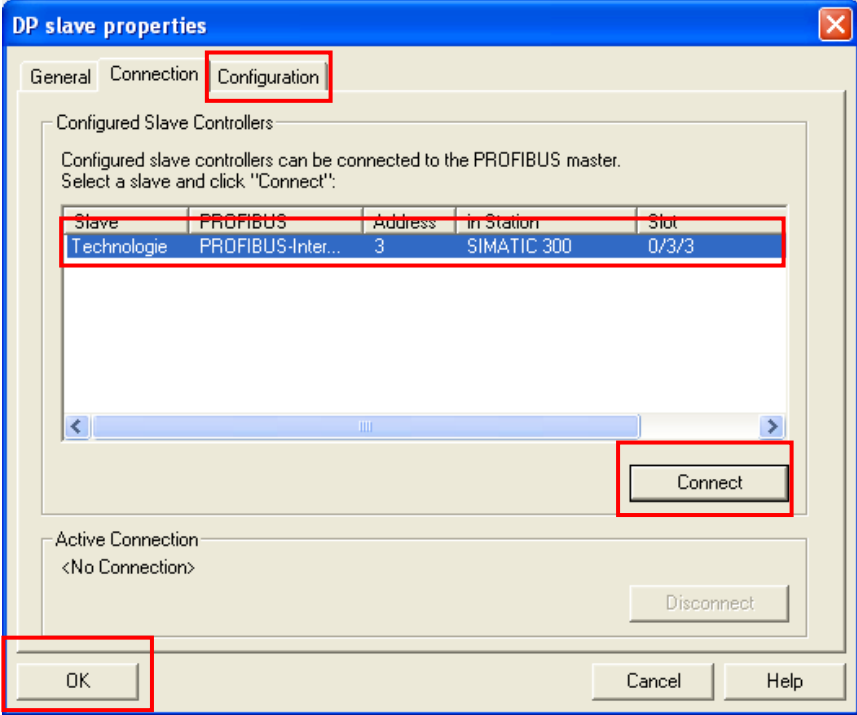
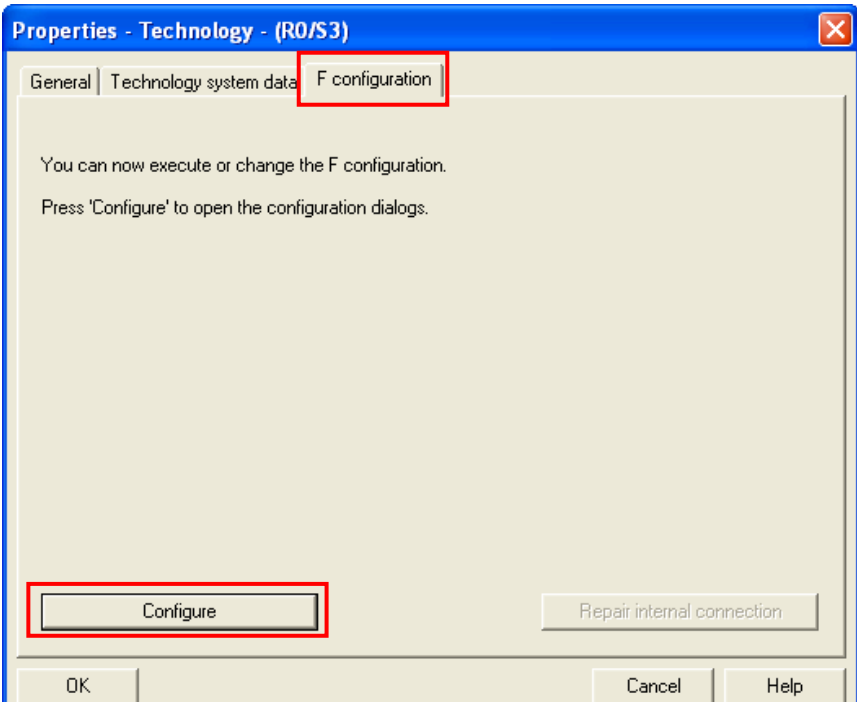
No.	Procedure / description
2.	<p>Enter the setting for the OFF 3 deceleration ramp (e.g., 3s) in the screen form. Please note that the deceleration ramp is designed for maximum motor speed.</p> 
3.	Repeat the parameter setting for all axes for which you want to activate the safety functions.
4.	Save and compile the changes you have made.

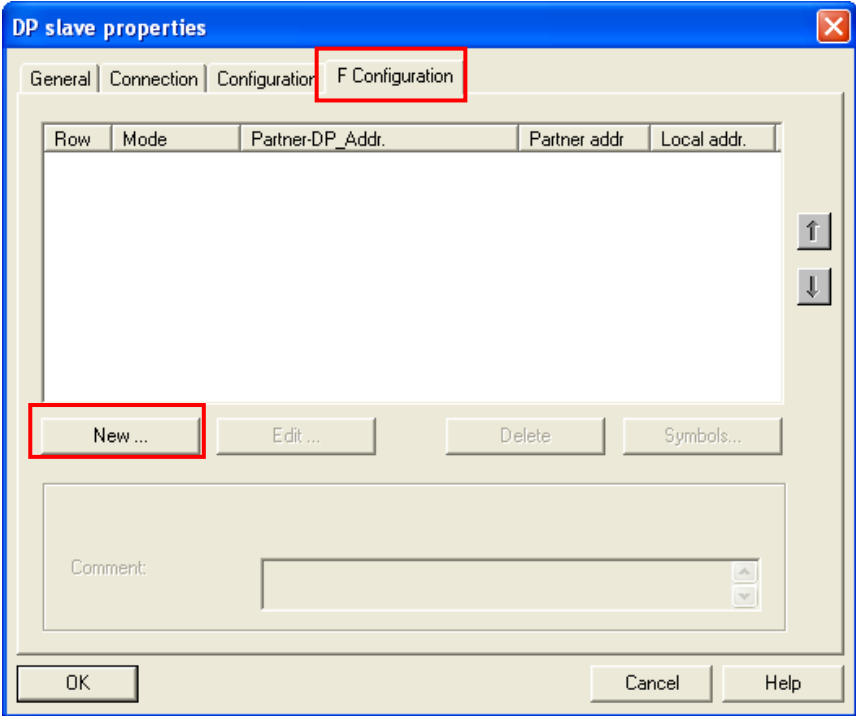
2.4 TF-CPU: Configuring failsafe communication

To transmit the safety signals from the safety program in the PLC part of the failsafe technology CPU to the integrated technology for output on the DP(Drive), internal failsafe communication must be configured in the failsafe technology CPU.

Table 2-5 TF-CPU: Configuring failsafe communication

No.	Procedure / description
1.	<p>Open HW Config and in the rack double-click on Technologie. In the Configuration dialog box, select the F configuration tab and use the Configure button.</p> 

No.	Procedure / description
2.	<p>In the Connection tab, select the Technologie line and click on the Connect button.</p> <p>The Technologie ID as an internal DP slave is then displayed in the Active Connection field at the bottom of the screen form.</p>  <p>Then close the screen form using the OK button.</p>
3.	<p>In the Configuration dialog box, once again select the F configuration tab and use the Configure button.</p> 

No.	Procedure / description
4.	<p>Now select the newly added F Configuration tab and use the New button to create the safety-related communication link.</p> 
5.	<p>In the dialog box of the newly created safety-related communication link, set the following parameters:</p> <ul style="list-style-type: none"> • DP partner Make sure that the correct axis of the drive is selected. Note down the displayed F target address. This address will later be needed for the configuration of the safety functions in the drive. • local Apply the suggested address or enter an available address >63. • Master Use Address (LADDR) to specify the start address via which the drive is to be accessed in the safety program. The address must be within the process image. This source address will later be used to set or reset the safety functions in SINAMICS S120 in the safety program. For program generation, additionally note down the address assigned for the axis.

No.	Procedure / description																																								
	<div style="border: 1px solid black; padding: 5px;"> <div style="background-color: #0056b3; color: white; padding: 2px; font-weight: bold;">DP slave properties - F Configuration - Row 1</div> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Parameter</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td> F-Configuration</td> <td></td> </tr> <tr> <td> Mode</td> <td>F-MS modules</td> </tr> <tr> <td> DP partner (F-I/O)</td> <td></td> </tr> <tr> <td> DP address</td> <td>4: Slave</td> </tr> <tr> <td> Name</td> <td>S120_CU320_2_DP</td> </tr> <tr> <td> Address</td> <td>67: PROFIsafe Module</td> </tr> <tr> <td> Process image</td> <td>...</td> </tr> <tr> <td> F source address</td> <td>2000: CPU 317TE-2 DP</td> </tr> <tr> <td> F target address</td> <td>1022</td> </tr> <tr> <td> local</td> <td></td> </tr> <tr> <td> DP address</td> <td>3: I-slave</td> </tr> <tr> <td> CPU name</td> <td>IIB</td> </tr> <tr> <td> Address</td> <td>64</td> </tr> <tr> <td> Process image</td> <td>...</td> </tr> <tr> <td> Diagnostic address</td> <td>8189</td> </tr> <tr> <td> Master (safety program)</td> <td></td> </tr> <tr> <td> Address (LADDR)</td> <td>100</td> </tr> <tr> <td> Process image</td> <td>...</td> </tr> <tr> <td> Interrupt 0</td> <td></td> </tr> </tbody> </table> <div style="margin-top: 10px; text-align: right;"> <input type="button" value="OK"/> <input type="button" value="Apply"/> <input type="button" value="Cancel"/> <input type="button" value="Help"/> </div> </div>	Parameter	Value	F-Configuration		Mode	F-MS modules	DP partner (F-I/O)		DP address	4: Slave	Name	S120_CU320_2_DP	Address	67: PROFIsafe Module	Process image	...	F source address	2000: CPU 317TE-2 DP	F target address	1022	local		DP address	3: I-slave	CPU name	IIB	Address	64	Process image	...	Diagnostic address	8189	Master (safety program)		Address (LADDR)	100	Process image	...	Interrupt 0	
Parameter	Value																																								
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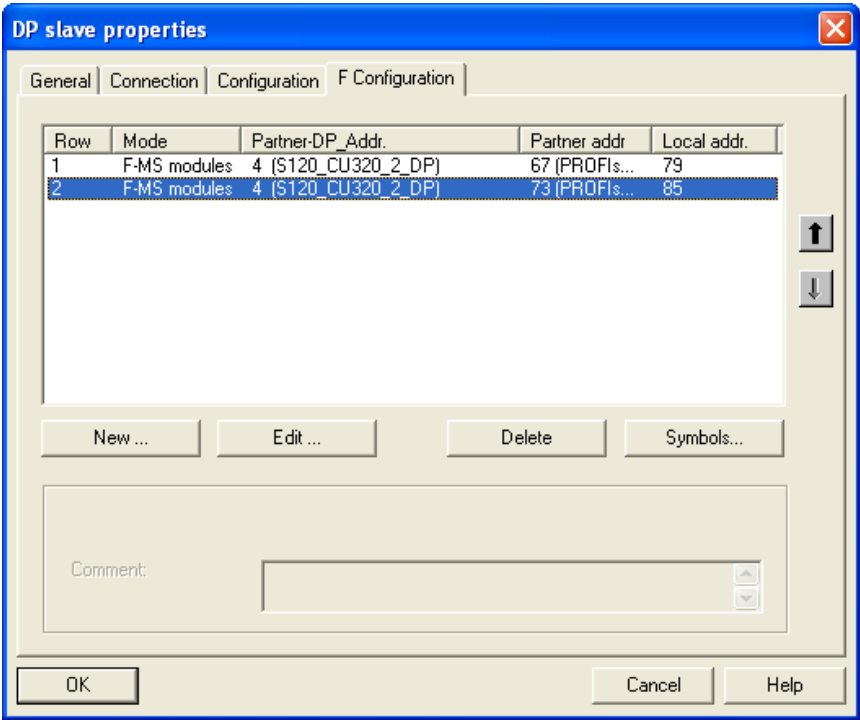
Then close the screen form using the **OK** button.

If the address suggested or entered in the **local** section is not possible in the configuration, a respective dialog box will be displayed. It displays the **next available address**, which you can simply apply using the **OK** button or freely change.

Local addr.: Change value

64: The address you have entered is not valid.

New address:	79
--------------	----

No.	Procedure / description
6.	<p>Repeat the setup of the safety-related communication link for all axes for which you want to activate the safety functions.</p>  <p>Then close the screen form using the OK button.</p>
7.	Save and compile the changes you have made.

2.5 TF-CPU: Commissioning the safety function

To use the safety functions in the integrated technology, the safety functionality must be enabled on the axes that have been created in the technology and interconnected with the drive.

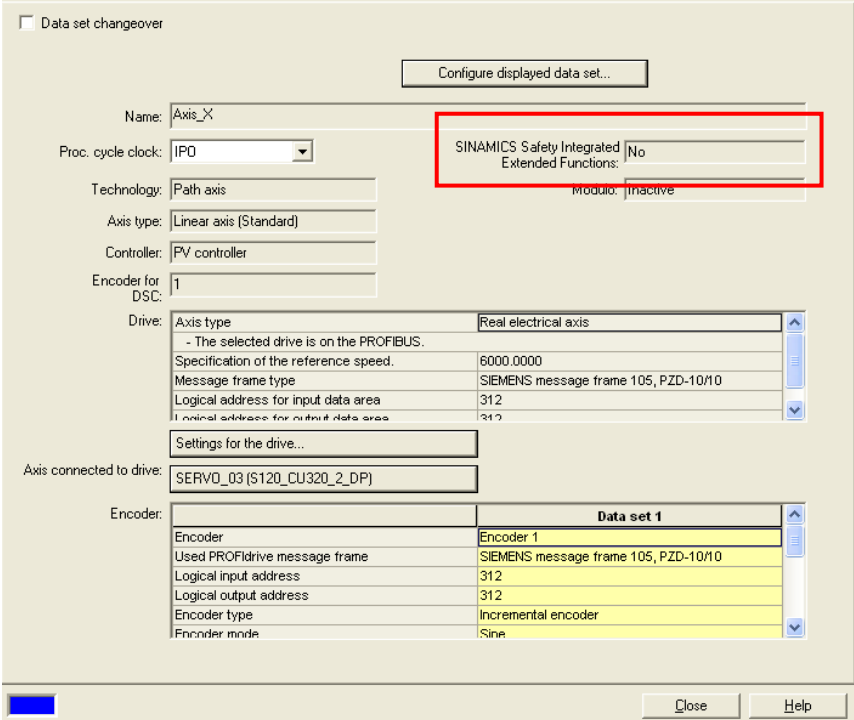
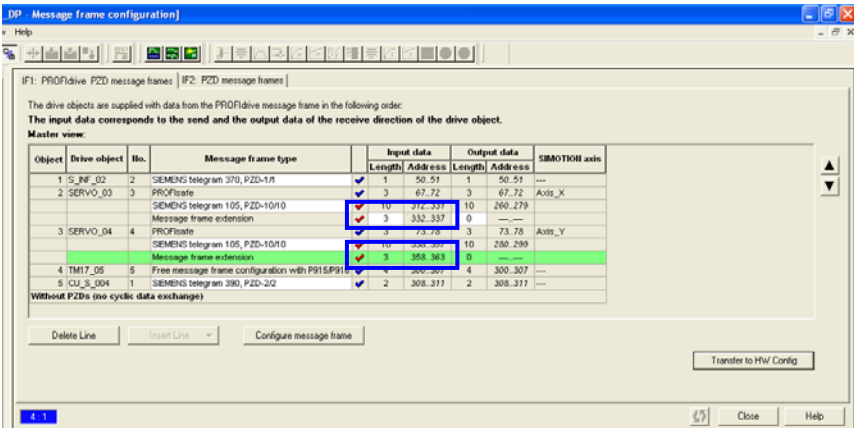
Note

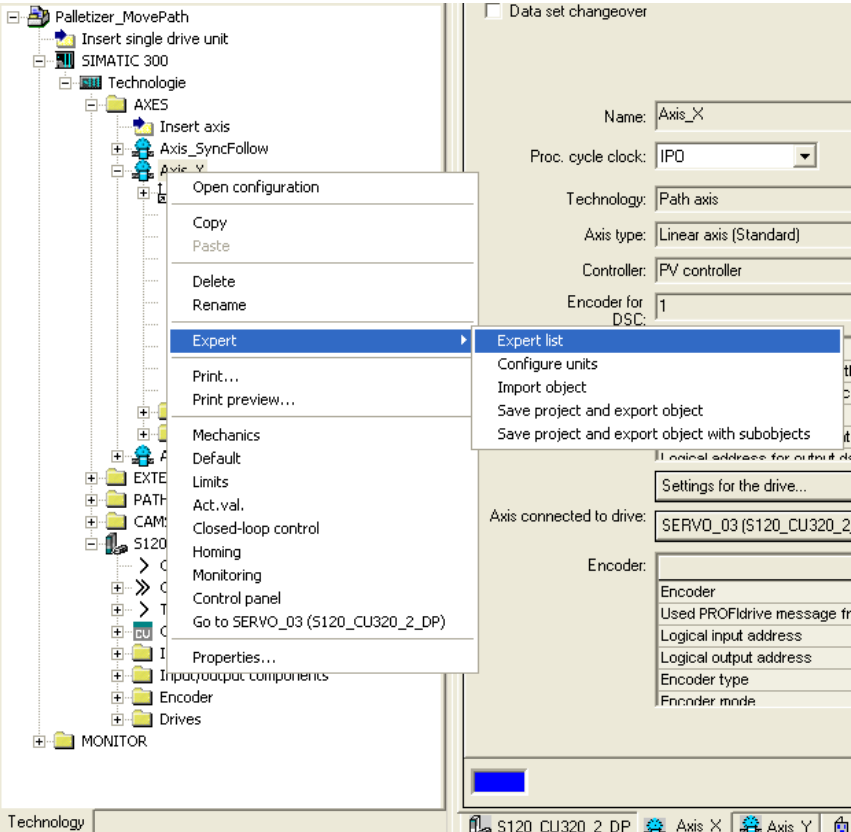
If the safety function has already been activated on the axes of the drive before the axes are created in the integrated technology, the safety functions will be automatically enabled and activated in the integrated technology.

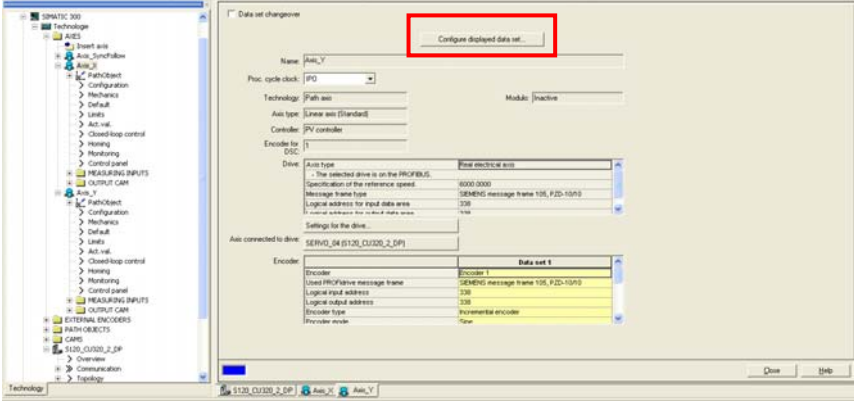
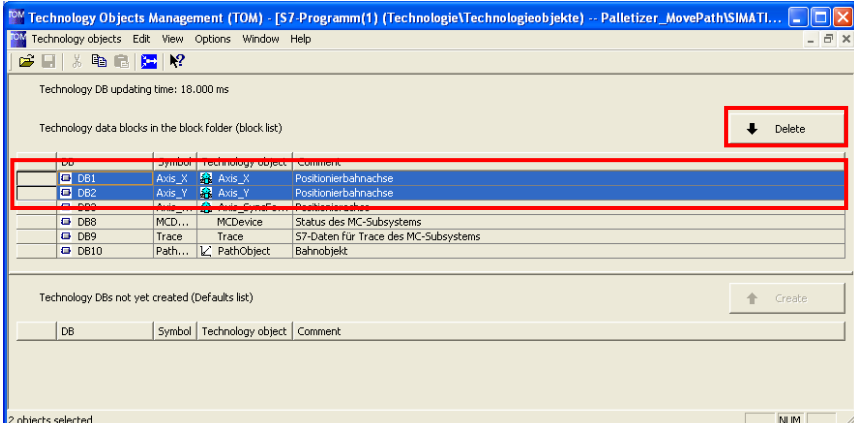
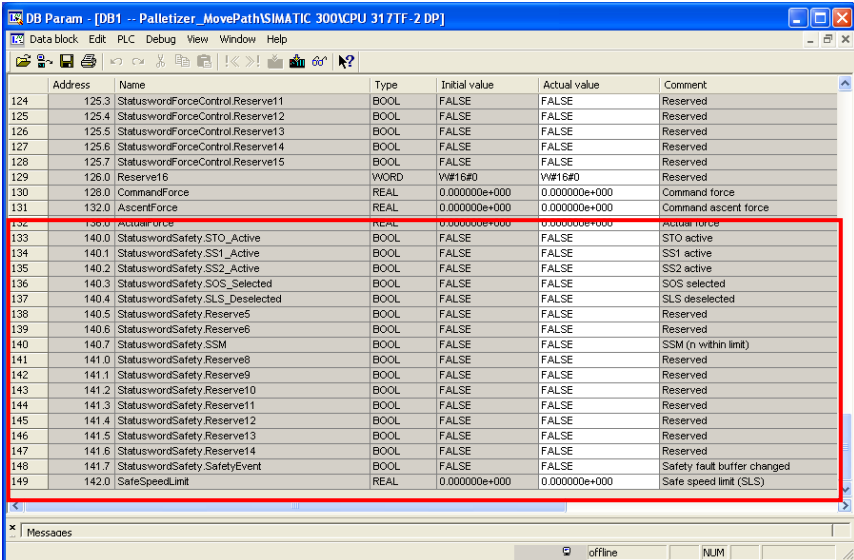
If the safety functions on the axes of the drive are subsequently activated, the safety functions have to be activated in the integrated technology as described here.

Activation of the functionality should be checked in any case.

Table 2-6 Commissioning the safety function

No.	Procedure / description
1.	<p>Open S7T Config and double-click on the configuration of an axis connected to the drive.</p> <p>In this configuration, check whether the Safety Integrated Extended Functions are enabled.</p>  <p>If the Safety Integrated Extended Functions are <u>not</u> enabled, please proceed with the following steps. Otherwise, you can go to the next chapter of this documentation.</p>
2.	<p>In the project tree in the desired SINAMICS S120 drive, open the Communication ⇒ Message frame configuration menu option and note down the start addresses of the message frame extension.</p> 

No.	Procedure / description																																										
3.	<p>Open the Expert list of the relevant axis of the integrated technology of the technology CPU.</p> 																																										
4.	<p>Configuration data tab TypeOfAxis parameter ⇒ TechnologicalData ⇒ driveSafetyExtendedFunctionsEnabled</p> <table border="1" data-bbox="502 1288 1356 1377"> <tr> <td>SwkLimit</td> <td>Software limit switch</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>SystemDeadTimeData</td> <td>System-related dead times</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>TechnologicalData</td> <td>Drive interface for specific parameters</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>driveSafetyExtendedFunctionsEnabled</td> <td>Activation of the SINAMICS Safety Integrated Ext</td> <td>[91] NO</td> <td>-</td> <td>Download</td> <td>'Enum/YesNo' = enum</td> </tr> <tr> <td>enable</td> <td>Activation of the technology data</td> <td>[91] NO</td> <td>-</td> <td>Download</td> <td>'Enum/YesNo' = enum</td> </tr> <tr> <td>velocityPosstopProfile</td> <td>Settings for the V(S) profile</td> <td>[172] YES</td> <td>-</td> <td>Download</td> <td>'Enum/YesNo' = enum</td> </tr> <tr> <td>typeOfAxis</td> <td>Axis type</td> <td>[9] REAL_AXIS</td> <td>-</td> <td>Download</td> <td>'Enum/AxisIdentifier'</td> </tr> </table>	SwkLimit	Software limit switch					SystemDeadTimeData	System-related dead times					TechnologicalData	Drive interface for specific parameters					driveSafetyExtendedFunctionsEnabled	Activation of the SINAMICS Safety Integrated Ext	[91] NO	-	Download	'Enum/YesNo' = enum	enable	Activation of the technology data	[91] NO	-	Download	'Enum/YesNo' = enum	velocityPosstopProfile	Settings for the V(S) profile	[172] YES	-	Download	'Enum/YesNo' = enum	typeOfAxis	Axis type	[9] REAL_AXIS	-	Download	'Enum/AxisIdentifier'
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enable	Activation of the technology data	[91] NO	-	Download	'Enum/YesNo' = enum																																						
velocityPosstopProfile	Settings for the V(S) profile	[172] YES	-	Download	'Enum/YesNo' = enum																																						
typeOfAxis	Axis type	[9] REAL_AXIS	-	Download	'Enum/AxisIdentifier'																																						
5.	<p>A new line is displayed: DriveSafetyExtendedFunctionsInfoData1. In this line, enter the noted down start address of the message frame extension.</p> <table border="1" data-bbox="502 1489 1356 1568"> <tr> <td>SystemDeadTimeData</td> <td>System-related dead times</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>TechnologicalData</td> <td>Drive interface for specific parameters</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>DriveSafetyExtendedFunctionsInfoData1</td> <td>Drive interface for SINAMICS Safety Integrated E</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>LogicalAddress</td> <td>Logical address</td> <td>[30]</td> <td>-</td> <td>Download</td> <td>UDINT [64]</td> </tr> <tr> <td>driveSafetyExtendedFunctionsEnabled</td> <td>Activation of the SINAMICS Safety Integrated Ext</td> <td>[173] YES</td> <td>-</td> <td>Download</td> <td>'Enum/YesNo' = enum</td> </tr> <tr> <td>enable</td> <td>Activation of the technology data</td> <td>[91] NO</td> <td>-</td> <td>Download</td> <td>'Enum/YesNo' = enum</td> </tr> </table>	SystemDeadTimeData	System-related dead times					TechnologicalData	Drive interface for specific parameters					DriveSafetyExtendedFunctionsInfoData1	Drive interface for SINAMICS Safety Integrated E					LogicalAddress	Logical address	[30]	-	Download	UDINT [64]	driveSafetyExtendedFunctionsEnabled	Activation of the SINAMICS Safety Integrated Ext	[173] YES	-	Download	'Enum/YesNo' = enum	enable	Activation of the technology data	[91] NO	-	Download	'Enum/YesNo' = enum						
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enable	Activation of the technology data	[91] NO	-	Download	'Enum/YesNo' = enum																																						
6.	<p>Once again, run the axis configuration wizard without making a change.</p>																																										

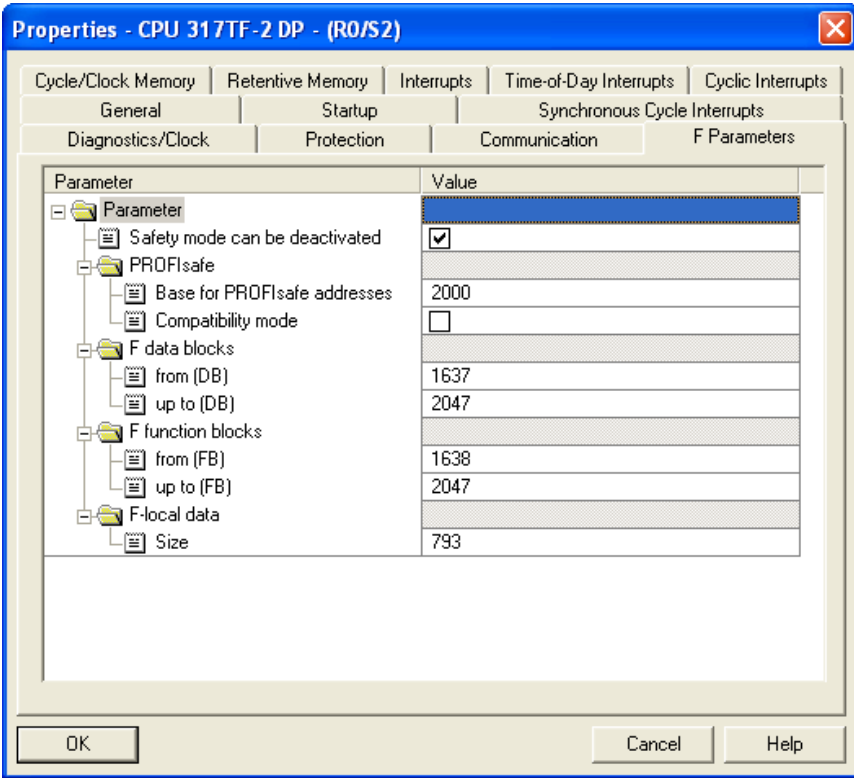
No.	Procedure / description																																																																																																																																																																		
																																																																																																																																																																			
7.	<p>Save and compile the changes you have made.</p>																																																																																																																																																																		
8.	<p>You may now have to delete the technology data blocks of the relevant axes in the Technology Objects Management (TOM) and recreate them under the same block number.</p> 																																																																																																																																																																		
	<p>The end of the technology data block of the axis should then contain the StatuswordSafety data block.</p>  <table border="1" data-bbox="496 1413 1353 1839"> <thead> <tr> <th>Address</th> <th>Name</th> <th>Type</th> <th>Initial value</th> <th>Actual value</th> <th>Comment</th> </tr> </thead> <tbody> <tr><td>124</td><td>125.3 StatuswordForceControl Reserve11</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>Reserved</td></tr> <tr><td>125</td><td>125.4 StatuswordForceControl Reserve12</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>Reserved</td></tr> <tr><td>126</td><td>125.5 StatuswordForceControl Reserve13</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>Reserved</td></tr> <tr><td>127</td><td>125.6 StatuswordForceControl Reserve14</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>Reserved</td></tr> <tr><td>128</td><td>125.7 StatuswordForceControl Reserve15</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>Reserved</td></tr> <tr><td>129</td><td>126.0 Reserve16</td><td>WORD</td><td>W#16#0</td><td>W#16#0</td><td>Reserved</td></tr> <tr><td>130</td><td>128.0 CommandForce</td><td>REAL</td><td>0.000000e+000</td><td>0.000000e+000</td><td>Command force</td></tr> <tr><td>131</td><td>132.0 AscentForce</td><td>REAL</td><td>0.000000e+000</td><td>0.000000e+000</td><td>Command ascent force</td></tr> <tr><td>132</td><td>130.0 ActualForce</td><td>REAL</td><td>0.000000e+000</td><td>0.000000e+000</td><td>Actual force</td></tr> <tr><td>133</td><td>140.0 StatuswordSafety.STO_Active</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>STO active</td></tr> <tr><td>134</td><td>140.1 StatuswordSafety.SS1_Active</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>SS1 active</td></tr> <tr><td>135</td><td>140.2 StatuswordSafety.SS2_Active</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>SS2 active</td></tr> <tr><td>136</td><td>140.3 StatuswordSafety.SOS_Selected</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>SOS selected</td></tr> <tr><td>137</td><td>140.4 StatuswordSafety.SLS_Deselected</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>SLS deselected</td></tr> <tr><td>138</td><td>140.5 StatuswordSafety.Reserve5</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>Reserved</td></tr> <tr><td>139</td><td>140.6 StatuswordSafety.Reserve6</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>Reserved</td></tr> <tr><td>140</td><td>140.7 StatuswordSafety.SSM</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>SSM (n within limit)</td></tr> <tr><td>141</td><td>141.0 StatuswordSafety.Reserve8</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>Reserved</td></tr> <tr><td>142</td><td>141.1 StatuswordSafety.Reserve9</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>Reserved</td></tr> <tr><td>143</td><td>141.2 StatuswordSafety.Reserve10</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>Reserved</td></tr> <tr><td>144</td><td>141.3 StatuswordSafety.Reserve11</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>Reserved</td></tr> <tr><td>145</td><td>141.4 StatuswordSafety.Reserve12</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>Reserved</td></tr> <tr><td>146</td><td>141.5 StatuswordSafety.Reserve13</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>Reserved</td></tr> <tr><td>147</td><td>141.6 StatuswordSafety.Reserve14</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>Reserved</td></tr> <tr><td>148</td><td>141.7 StatuswordSafety.SafetyEvent</td><td>BOOL</td><td>FALSE</td><td>FALSE</td><td>Safety fault buffer changed</td></tr> <tr><td>149</td><td>142.0 SafeSpeedLimit</td><td>REAL</td><td>0.000000e+000</td><td>0.000000e+000</td><td>Safe speed limit (SLS)</td></tr> </tbody> </table>	Address	Name	Type	Initial value	Actual value	Comment	124	125.3 StatuswordForceControl Reserve11	BOOL	FALSE	FALSE	Reserved	125	125.4 StatuswordForceControl Reserve12	BOOL	FALSE	FALSE	Reserved	126	125.5 StatuswordForceControl Reserve13	BOOL	FALSE	FALSE	Reserved	127	125.6 StatuswordForceControl Reserve14	BOOL	FALSE	FALSE	Reserved	128	125.7 StatuswordForceControl Reserve15	BOOL	FALSE	FALSE	Reserved	129	126.0 Reserve16	WORD	W#16#0	W#16#0	Reserved	130	128.0 CommandForce	REAL	0.000000e+000	0.000000e+000	Command force	131	132.0 AscentForce	REAL	0.000000e+000	0.000000e+000	Command ascent force	132	130.0 ActualForce	REAL	0.000000e+000	0.000000e+000	Actual force	133	140.0 StatuswordSafety.STO_Active	BOOL	FALSE	FALSE	STO active	134	140.1 StatuswordSafety.SS1_Active	BOOL	FALSE	FALSE	SS1 active	135	140.2 StatuswordSafety.SS2_Active	BOOL	FALSE	FALSE	SS2 active	136	140.3 StatuswordSafety.SOS_Selected	BOOL	FALSE	FALSE	SOS selected	137	140.4 StatuswordSafety.SLS_Deselected	BOOL	FALSE	FALSE	SLS deselected	138	140.5 StatuswordSafety.Reserve5	BOOL	FALSE	FALSE	Reserved	139	140.6 StatuswordSafety.Reserve6	BOOL	FALSE	FALSE	Reserved	140	140.7 StatuswordSafety.SSM	BOOL	FALSE	FALSE	SSM (n within limit)	141	141.0 StatuswordSafety.Reserve8	BOOL	FALSE	FALSE	Reserved	142	141.1 StatuswordSafety.Reserve9	BOOL	FALSE	FALSE	Reserved	143	141.2 StatuswordSafety.Reserve10	BOOL	FALSE	FALSE	Reserved	144	141.3 StatuswordSafety.Reserve11	BOOL	FALSE	FALSE	Reserved	145	141.4 StatuswordSafety.Reserve12	BOOL	FALSE	FALSE	Reserved	146	141.5 StatuswordSafety.Reserve13	BOOL	FALSE	FALSE	Reserved	147	141.6 StatuswordSafety.Reserve14	BOOL	FALSE	FALSE	Reserved	148	141.7 StatuswordSafety.SafetyEvent	BOOL	FALSE	FALSE	Safety fault buffer changed	149	142.0 SafeSpeedLimit	REAL	0.000000e+000	0.000000e+000	Safe speed limit (SLS)
Address	Name	Type	Initial value	Actual value	Comment																																																																																																																																																														
124	125.3 StatuswordForceControl Reserve11	BOOL	FALSE	FALSE	Reserved																																																																																																																																																														
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127	125.6 StatuswordForceControl Reserve14	BOOL	FALSE	FALSE	Reserved																																																																																																																																																														
128	125.7 StatuswordForceControl Reserve15	BOOL	FALSE	FALSE	Reserved																																																																																																																																																														
129	126.0 Reserve16	WORD	W#16#0	W#16#0	Reserved																																																																																																																																																														
130	128.0 CommandForce	REAL	0.000000e+000	0.000000e+000	Command force																																																																																																																																																														
131	132.0 AscentForce	REAL	0.000000e+000	0.000000e+000	Command ascent force																																																																																																																																																														
132	130.0 ActualForce	REAL	0.000000e+000	0.000000e+000	Actual force																																																																																																																																																														
133	140.0 StatuswordSafety.STO_Active	BOOL	FALSE	FALSE	STO active																																																																																																																																																														
134	140.1 StatuswordSafety.SS1_Active	BOOL	FALSE	FALSE	SS1 active																																																																																																																																																														
135	140.2 StatuswordSafety.SS2_Active	BOOL	FALSE	FALSE	SS2 active																																																																																																																																																														
136	140.3 StatuswordSafety.SOS_Selected	BOOL	FALSE	FALSE	SOS selected																																																																																																																																																														
137	140.4 StatuswordSafety.SLS_Deselected	BOOL	FALSE	FALSE	SLS deselected																																																																																																																																																														
138	140.5 StatuswordSafety.Reserve5	BOOL	FALSE	FALSE	Reserved																																																																																																																																																														
139	140.6 StatuswordSafety.Reserve6	BOOL	FALSE	FALSE	Reserved																																																																																																																																																														
140	140.7 StatuswordSafety.SSM	BOOL	FALSE	FALSE	SSM (n within limit)																																																																																																																																																														
141	141.0 StatuswordSafety.Reserve8	BOOL	FALSE	FALSE	Reserved																																																																																																																																																														
142	141.1 StatuswordSafety.Reserve9	BOOL	FALSE	FALSE	Reserved																																																																																																																																																														
143	141.2 StatuswordSafety.Reserve10	BOOL	FALSE	FALSE	Reserved																																																																																																																																																														
144	141.3 StatuswordSafety.Reserve11	BOOL	FALSE	FALSE	Reserved																																																																																																																																																														
145	141.4 StatuswordSafety.Reserve12	BOOL	FALSE	FALSE	Reserved																																																																																																																																																														
146	141.5 StatuswordSafety.Reserve13	BOOL	FALSE	FALSE	Reserved																																																																																																																																																														
147	141.6 StatuswordSafety.Reserve14	BOOL	FALSE	FALSE	Reserved																																																																																																																																																														
148	141.7 StatuswordSafety.SafetyEvent	BOOL	FALSE	FALSE	Safety fault buffer changed																																																																																																																																																														
149	142.0 SafeSpeedLimit	REAL	0.000000e+000	0.000000e+000	Safe speed limit (SLS)																																																																																																																																																														

2.6 TF-CPU: Creating the safety program

To be able to create the safety program and to use the safety functions of the technology CPU, the safety program must be activated in the PLC part of the failsafe technology CPU.

Table 2-7 Creating the safety program

No.	Procedure / description
1.	Open HW Config and open the properties of the technology CPU by double-clicking on the CPU 317TF-2 DP in the rack. In the Properties dialog box, select the Protection tab.
2.	Activate <u>at least</u> the first CPU protection level by checking the password protection for 1: Access protect. for F CPU or selecting a higher protection level (2 or 3). Enter a password for the safety functions and confirm the entered password. Activate the “CPU contains safety program” setting by checking it. <div data-bbox="496 824 1353 1518" style="border: 1px solid black; padding: 5px; margin-top: 10px;"> </div>
3.	In the Properties dialog box, select the F Parameters tab. You will be prompted to enter and confirm a password for the safety program (program blocks of the safety program, not the safety CPU properties). <div data-bbox="663 1630 1185 1993" style="border: 1px solid black; padding: 5px; margin-top: 10px;"> </div>

No.	Procedure / description
4.	<p>Check the F parameter settings. Normally, the settings that are suggested here can be applied for the safety program and the blocks of the safety program.</p>  <p>If the "Safety mode can be deactivated" setting is active, the safety program (for commissioning purposes) can be deactivated via the PLC program. This process deactivates only the crosswise data comparison of the safety program, not the execution of the safety program, i.e. the signals from the safety program to the drive continue to be transmitted.</p>
5.	<p>Save and compile the changes you have made.</p>

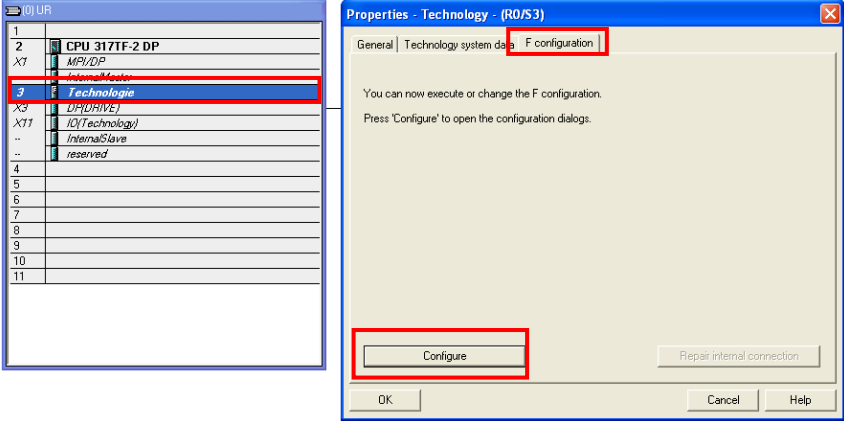
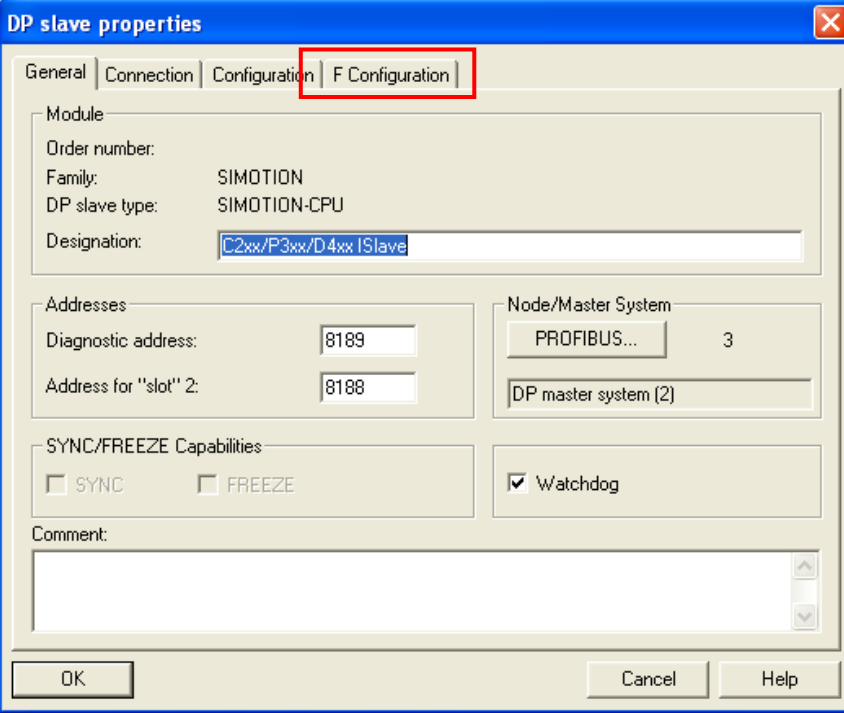
2.7 SINAMICS: Configuring the safety functions

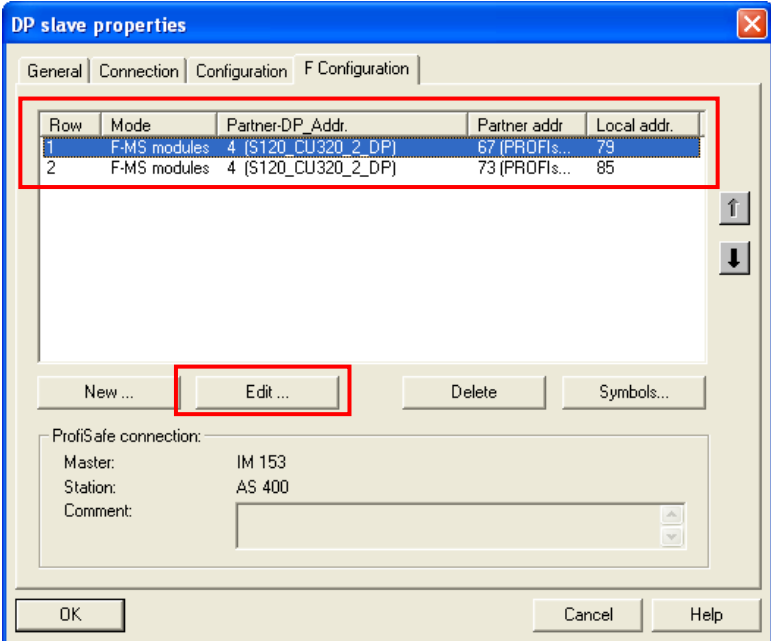
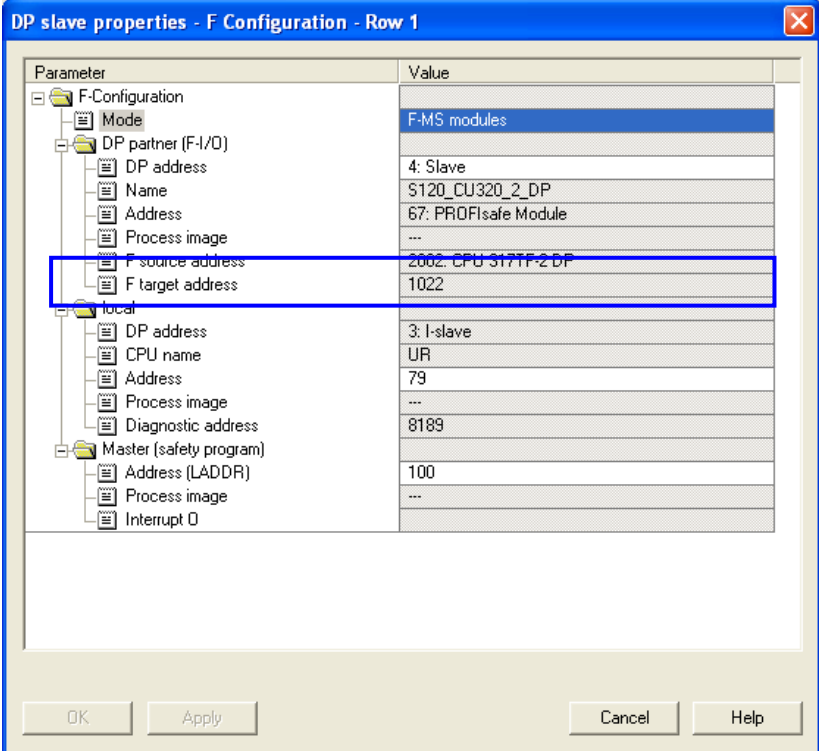
Configuring the safety functions of SINAMICS S120 requires two steps. First the address data necessary for the configuration in the drive must be read out of HW Config. Then the relevant data must be entered in the configuration screen form of SINAMICS S120.

2.7.1 TF-CPU: Determining the address data

Determine the address data necessary to configure the safety functions in the SINAMICS S120 drive system in HW Config of the technology CPU.

Table 2-8 Configuring the safety functions – determining the address data

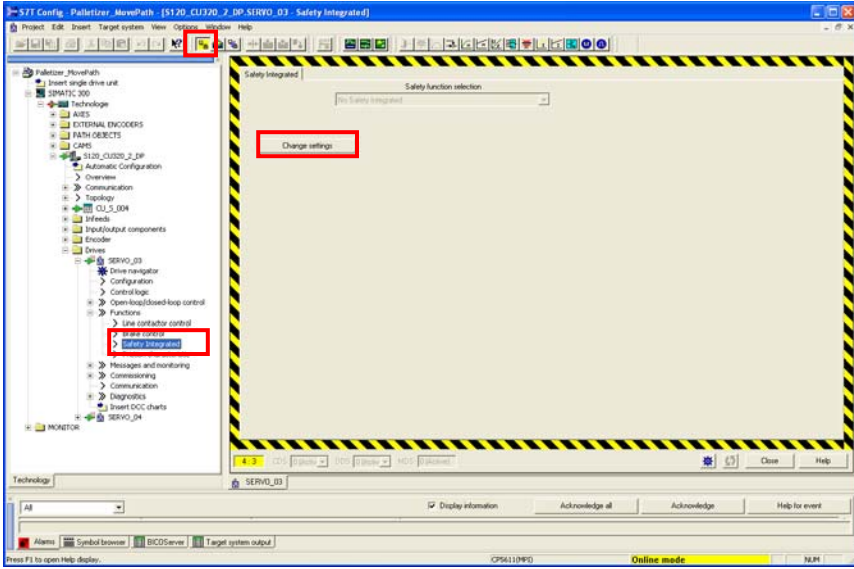
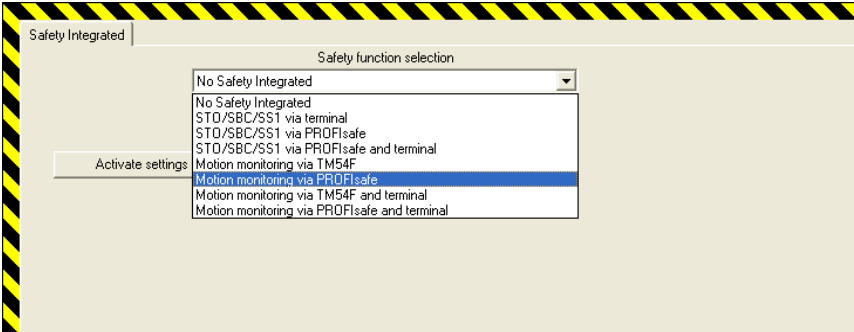
No.	Procedure / description
1.	<p>Open HW Config and in the rack double-click on Technologie. In the Configuration dialog box, select the F configuration tab and use the Configure button.</p> 
2.	<p>In the Properties dialog box, select the F Configuration tab.</p> 

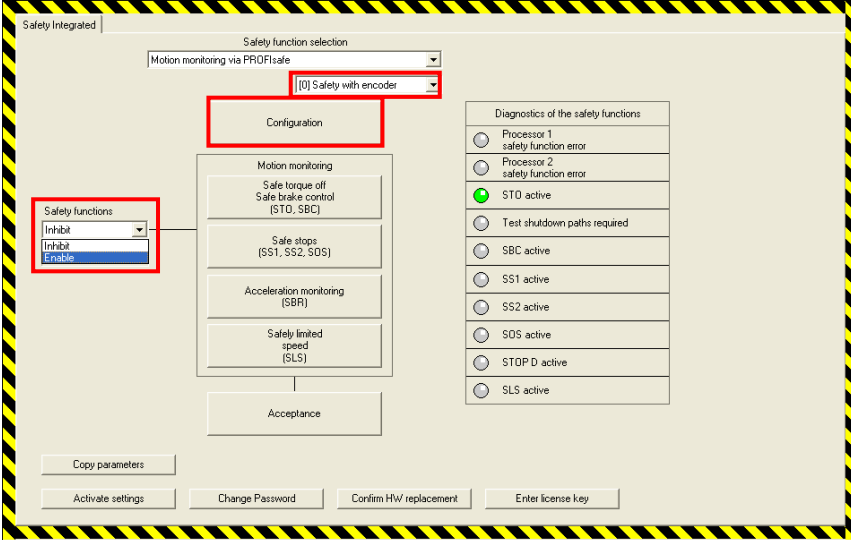
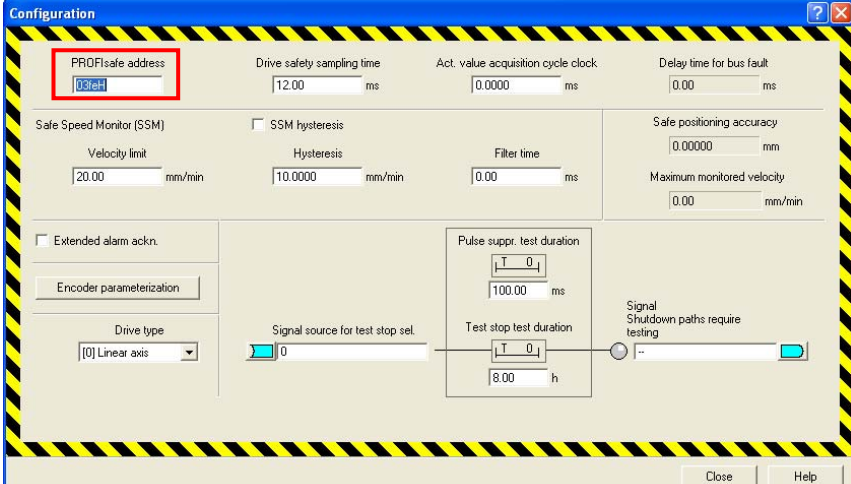
No.	Procedure / description																																								
3.	<p>In the selection list, select the desired axis (recognizable by the partner address) and use the Edit button.</p>  <p>The screenshot shows the 'DP slave properties' dialog box with the 'F Configuration' tab selected. A table lists two rows of configuration data. The 'Edit ...' button is highlighted with a red box.</p> <table border="1" data-bbox="517 472 1214 555"> <thead> <tr> <th>Row</th> <th>Mode</th> <th>Partner-DP_Addr.</th> <th>Partner addr</th> <th>Local addr.</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>F-MS modules</td> <td>4 (S120_CU320_2_DP)</td> <td>67 (PROFIs...</td> <td>79</td> </tr> <tr> <td>2</td> <td>F-MS modules</td> <td>4 (S120_CU320_2_DP)</td> <td>73 (PROFIs...</td> <td>85</td> </tr> </tbody> </table>	Row	Mode	Partner-DP_Addr.	Partner addr	Local addr.	1	F-MS modules	4 (S120_CU320_2_DP)	67 (PROFIs...	79	2	F-MS modules	4 (S120_CU320_2_DP)	73 (PROFIs...	85																									
Row	Mode	Partner-DP_Addr.	Partner addr	Local addr.																																					
1	F-MS modules	4 (S120_CU320_2_DP)	67 (PROFIs...	79																																					
2	F-MS modules	4 (S120_CU320_2_DP)	73 (PROFIs...	85																																					
4.	<p>In the DP partner (F-I/O) section, note down the F target address of the relevant axis. For input to the configuration screen form of SINAMICS S120, convert the noted down decimal value to hexadecimal format. Example: $(1022)_{DEC} = (3FE)_{HEX}$ OR $(1021)_{DEC} = (3FD)_{HEX}$</p>  <p>The screenshot shows the 'DP slave properties - F Configuration - Row 1' dialog box. The 'F target address' parameter is highlighted with a blue box, showing a value of 1022.</p> <table border="1" data-bbox="517 1211 1270 1682"> <thead> <tr> <th>Parameter</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>F-Configuration</td> <td></td> </tr> <tr> <td>Mode</td> <td>F-MS modules</td> </tr> <tr> <td>DP partner (F-I/O)</td> <td></td> </tr> <tr> <td>DP address</td> <td>4: Slave</td> </tr> <tr> <td>Name</td> <td>S120_CU320_2_DP</td> </tr> <tr> <td>Address</td> <td>67: PROFIsafe Module</td> </tr> <tr> <td>Process image</td> <td>...</td> </tr> <tr> <td>F source address</td> <td>2002: CPU 317TF-2 DP</td> </tr> <tr> <td>F target address</td> <td>1022</td> </tr> <tr> <td>local</td> <td></td> </tr> <tr> <td>DP address</td> <td>3: 1-slave</td> </tr> <tr> <td>CPU name</td> <td>UR</td> </tr> <tr> <td>Address</td> <td>79</td> </tr> <tr> <td>Process image</td> <td>...</td> </tr> <tr> <td>Diagnostic address</td> <td>8189</td> </tr> <tr> <td>Master (safety program)</td> <td></td> </tr> <tr> <td>Address (LADDR)</td> <td>100</td> </tr> <tr> <td>Process image</td> <td>...</td> </tr> <tr> <td>Interrupt 0</td> <td></td> </tr> </tbody> </table>	Parameter	Value	F-Configuration		Mode	F-MS modules	DP partner (F-I/O)		DP address	4: Slave	Name	S120_CU320_2_DP	Address	67: PROFIsafe Module	Process image	...	F source address	2002: CPU 317TF-2 DP	F target address	1022	local		DP address	3: 1-slave	CPU name	UR	Address	79	Process image	...	Diagnostic address	8189	Master (safety program)		Address (LADDR)	100	Process image	...	Interrupt 0	
Parameter	Value																																								
F-Configuration																																									
Mode	F-MS modules																																								
DP partner (F-I/O)																																									
DP address	4: Slave																																								
Name	S120_CU320_2_DP																																								
Address	67: PROFIsafe Module																																								
Process image	...																																								
F source address	2002: CPU 317TF-2 DP																																								
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Address (LADDR)	100																																								
Process image	...																																								
Interrupt 0																																									
5.	<p>Repeat the noting down of the F target address for all axes displayed in the selection list for which the safety functions are to be activated.</p>																																								

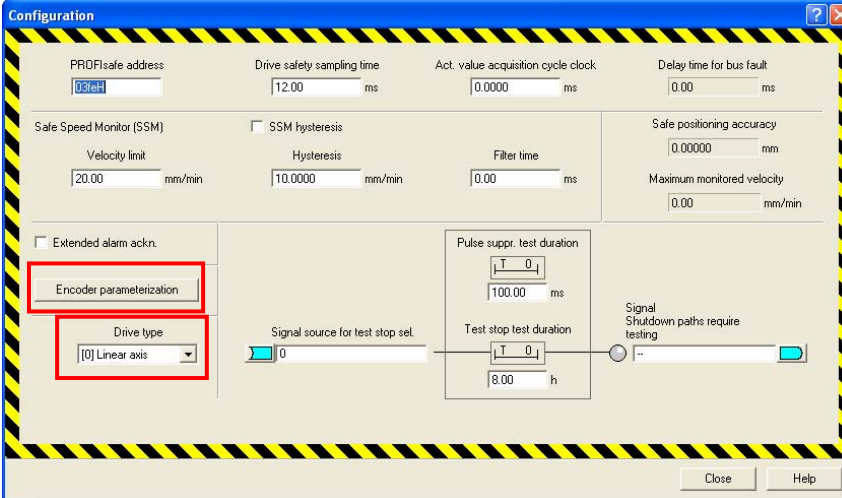
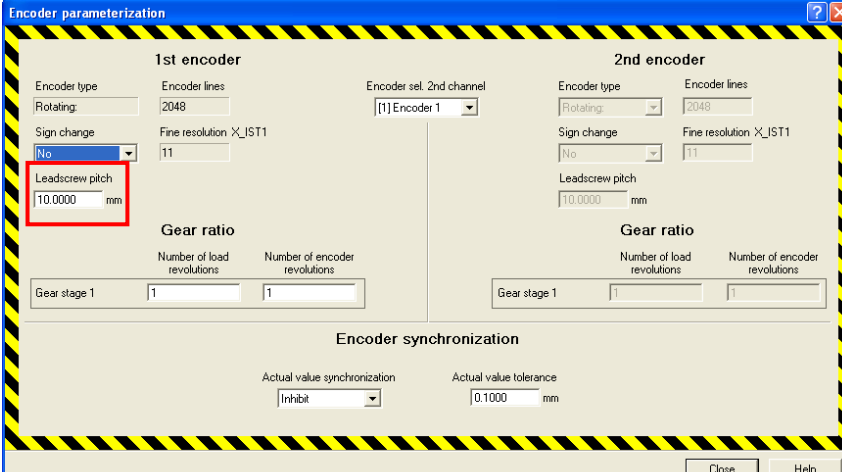
2.7.2 SINAMICS: Configuring

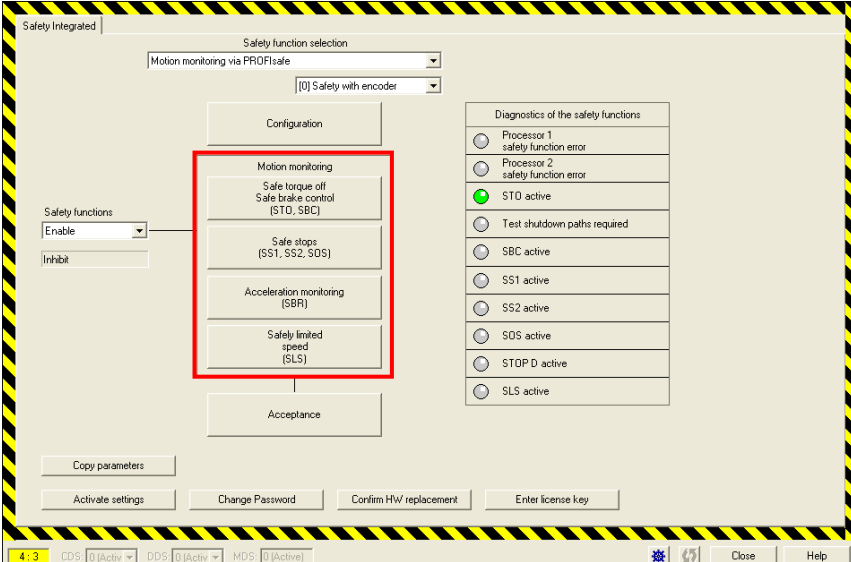
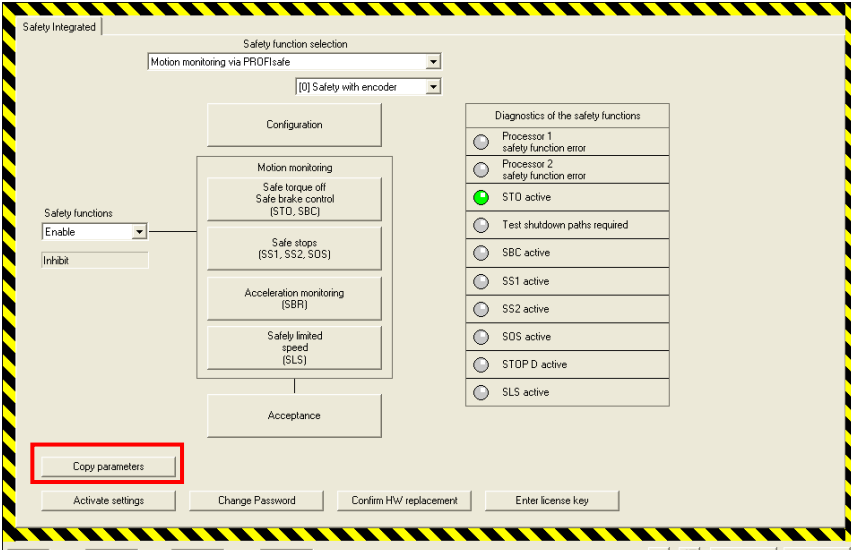
Transfer the determined address data and make the additionally required parameterization of the safety functions of SINAMICS S120 in S7T Config (Starter).

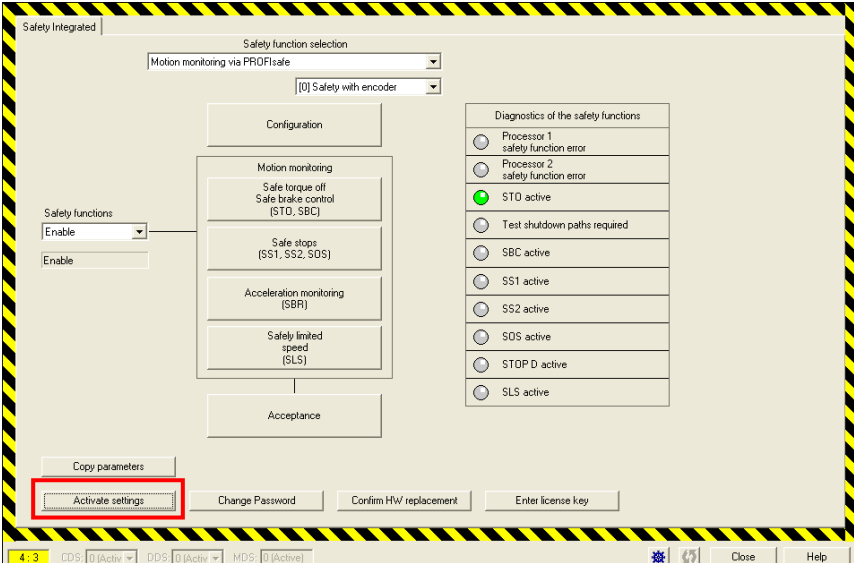

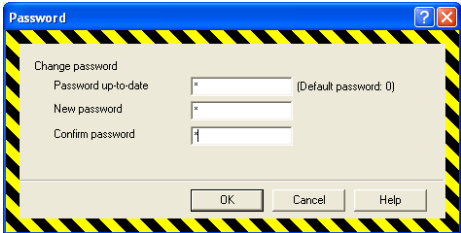
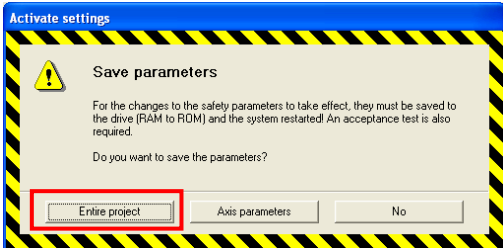
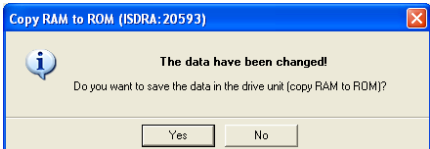
Table 2-9 Configuring the safety functions – configuring

No.	Procedure / description
1.	<p>Open S7T Config and select the relevant SINAMICS S120 drive. Then navigate to the desired Axis and in Functions ⇒ Safety Integrated, call the screen form to configure the safety functions.</p> <p>Go to Online mode of S7T Config so that the safety functions of SINAMICS S120 can be parameterized directly in the drive.</p> <p>Select the Change settings button to be able to make changes in the drive.</p> 
2.	<p>Activate the Extended Safety Functions of SINAMICS S120 via PROFIsafe by selecting the relevant item in the list box.</p> <p>The following applies:</p> <ul style="list-style-type: none"> • STO/SBC/SS1 via ... = Basic Safety Functions • Motion Monitoring via ... = Extended Safety Functions 

No.	Procedure / description
3.	<p>Activate the Enable of the safety functions and check the setting of the safety functions with encoder. Then select the Configuration button.</p> 
4.	<p>In the Configuration dialog box, enter the noted down F target address of the relevant axis in hexadecimal format. Make sure that you assign the correct F target address to the axis.</p> 

No.	Procedure / description
5.	<p>For axis velocity monitoring by the drive, also set the Drive type of the relevant axis. Select the same settings as in the axis configuration for the technology. Then click on the Encoder parameterization button.</p>  <p>Also in Encoder parameterization, set the same settings as in the axis configuration for the technology, for example the Leadscrew pitch setting of the axis.</p> 

No.	Procedure / description
6.	<p>Check the parameter settings of all safety functions and, if necessary, correct deviations from the basic settings. The settings of the parameters are application-specific and depend on the results of the application's safety evaluation.</p> 
7.	<p>Perform the listed actions or make the settings for all axes for which the safety functions are to be activated.</p>
8.	<p>Click on the Copy parameters button to activate the made settings for the crosswise data comparison in both safety channels of the SINAMICS S120 drive.</p> 

No.	Procedure / description
9.	<p>Select the Activate settings button to activate the made changes in the drive.</p> 
10.	<p>You may be prompted to change the safety password of the drive.</p>  <p>Enter the same password or a changed password.</p> 
11.	<p>Save the made changes to the drive by copying from RAM to ROM.</p>  <p>To do so, confirm the Copy dialog box with Yes.</p> 

No.	Procedure / description
12.	Then go to Offline mode of S7T Config and switch the SINAMICS S120 drive off and back on .
13.	Go back to Online mode of S7T Config and load the made changes to the PG.
14.	Then return to Offline mode of S7T Config.

2.8 TF-CPU: Programming the safety program

After successful configuration and commissioning of the safety functions, these functions must now be controlled via the safety program of the failsafe technology CPU.

Note

Please note that the safety functions of the drive are activated at 0 signal (False) and deactivated at 1 signal (True).

To be able to move the axes of the drive with safety function, the safety functions of the axis have to be deactivated first, i.e. the relevant signals for the deselection of the safety functions of the axis via the PROFIsafe telegram must be transferred from the safety program to the drive.

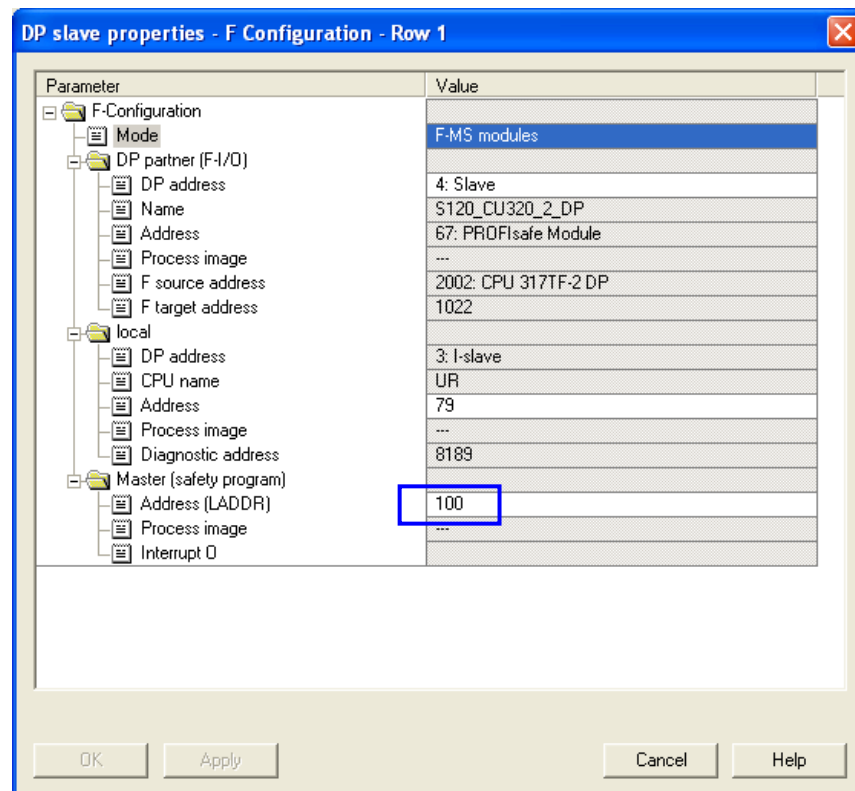
The individual bits of the PROFIsafe telegram of the relevant axis are used to activate or deactivate the safety functions.

Table 2-10 Control word of PROFIsafe telegram 30

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
STW	SLS Bit 1	SLS Bit 0	.	Int. Event ACK	.	.	SLS	SOS	SS2	SS1	STO

The bits of the PROFIsafe telegram are accessed as an output in the I/O area within the safety program of the failsafe technology CPU. The respective address was defined when configuring the failsafe communication on the technology CPU.

Figure 2-1 Address of the bits of PROFIsafe telegram 30



The resulting assignment is, for example, as follows:

Table 2-11 Assignment between bits and addresses (example)

PROFIsafe telegram 30		Active	Address	Note
Bit	Name			
0	STO	0 signal	100.0	Safe Torque Off
1	SS1	0 signal	100.1	Safe Stop 1
2	SS2	0 signal	100.2	Safe Stop 2
3	SOS	0 signal	100.3	Safe Operating Stop
4	SLS	0 signal	100.4	Safely-Limited Speed
7	Int. Event ACK		100.7	
9	SLS Bit 0	1 signal	101.1	Selection of 4 possible setting values of safe speed
10	SLS Bit 1	1 signal	101.2	

Due to the 1 active signal of the safety functions of a safety axis, all bits of the PROFIsafe telegram must always be written.

Depending on the configured addresses (LADDR), different address assignments result for all other safety axes.

Figure 2-2 Programming example

