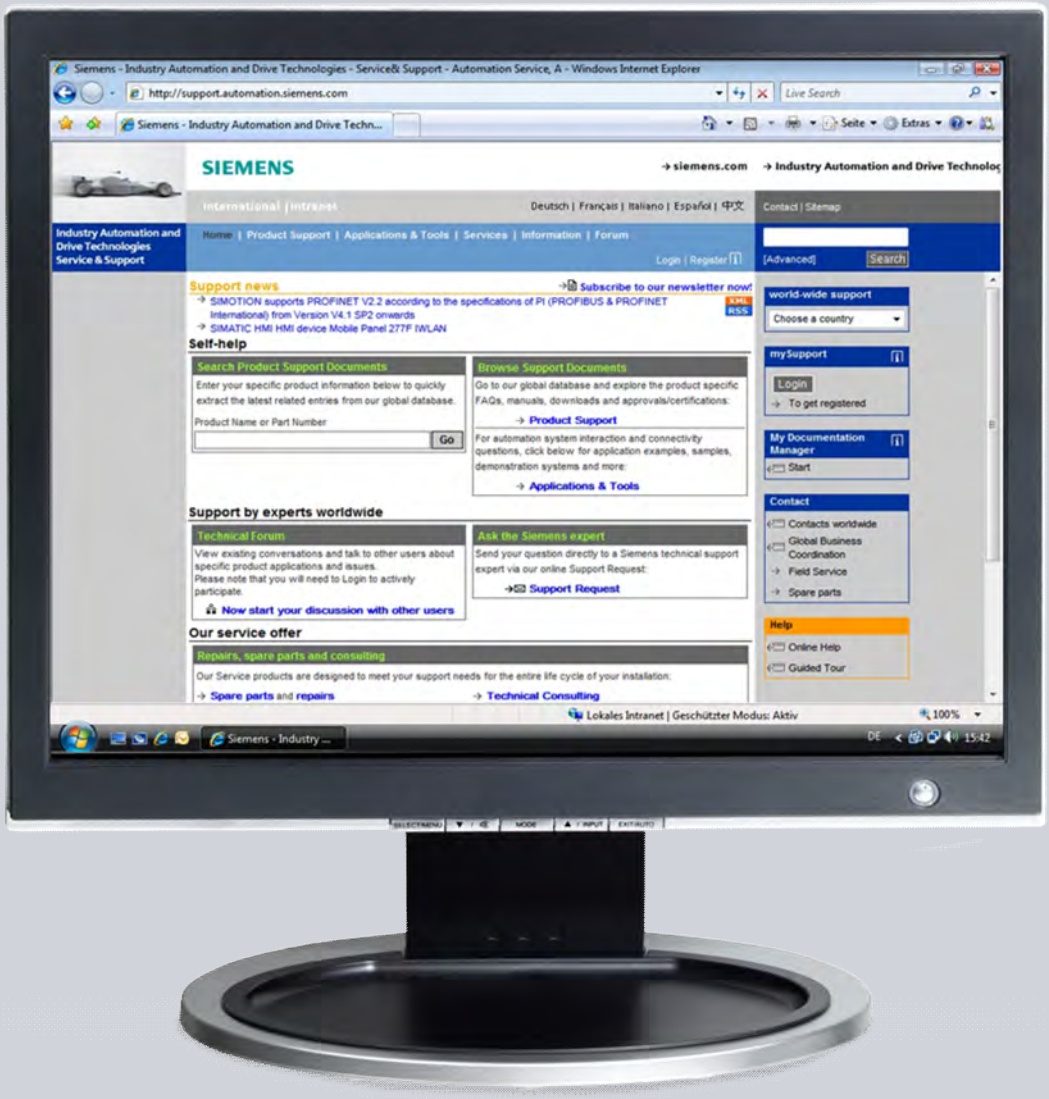
Changeover, CU240S to SINAMICS S110 with CU305 (firmware V4.4)

SINAMICS G120

FAQ • December 2011



Service & Support

Answers for industry.

SIEMENS

Question

What do I have to observe if I wish to replace a member of the CU240S family (CU240S, CU240S DP, CU240S DP-F, CU240S PN or CU240S PN-F) of SINAMICS G120 by a SINAMICS S110 with CU305 (Firmware V4.4)?

Answer

To respond to this question with the appropriate amount of detail, follow the instructions and notes listed in this document.

Restrictions

Only the topics relating to the changeover from CU240S to CU305 are discussed in this FAQ. The additional functions that the CU305 has, for example, the positioning functionality, are not discussed in any more detail in this FAQ.

Additional FAQs on this subject

There are already additional FAQs on this topic:

- Migration from CU240E to CU240E-2
  http://support.automation.siemens.com/WW/view/en/54997845
- Migration from CU240S to CU240E-2
  http://support.automation.siemens.com/WW/view/en/55644452

Table of contents

1 Presentation of SINAMICS S110 CU305

SINAMICS G120 with the CU240E-2, as successor to the CU240S (CU240S, CU240S DP and CU240S DP-F), presently has no encoder interface for vector control. If you require this interface in your application, then as an alternative, SINAMICS S110 with the CU305 is available.

When compared to the CU240S, the CU305 has the following differences:

Closed-loop control technique

- The CU305 has no vector control, but servo control. However, the servo control has no disadvantages when compared to the vector control of the CU240S.
- If you wish to use U/f control or SLVC (sensorless vector control) for your particular application, then we recommend that you use a SINAMICS G120 Control Unit, type CU240E-2. A separate migration guideline is available for this Control Unit **Link**.

Communication (see Chapter 3 for details)

- Slave-to-slave communication for direct data exchange between converters.

Safety functions (for details, refer to Chapter 7)

- The safety function STO (Safe Torque Off), SBC (Safe Brake Control) (a Safe Brake relay is required) and SS1 (Safe Stop 1) are integrated as standard in all of the versions.
- By purchasing a license, additional safety functions SLS (Safely Limited Speed) with up to 4 parameterizable limit values, SSM (Safe Speed Monitoring) and SDI (Safe Direction) can be enabled. Just as before, speed feedback using an encoder is not required for these safety functions when using an induction motor.
- One fail-safe output
- Maximum value of the SS1 down ramp has been increased (CU240S: max. 99s referred to 200Hz ➔ CU305: max. 1000s referred to the reference speed (e.g. 1500 rpm)).

Commissioning and optimization

- User-friendly, graphic commissioning using the STARTER parameterizing software, which is free-of-charge. Optimization of the parameterization using the trace function and the function generators. Connections established via the serial RS232 interface X22 or via fieldbus (Profibus and Profinet.

1.1 Comparison, CU240S and CU305

Unfortunately, it is still not possible to completely replace the CU240S family by the CU240E-2 family. The following overview will provide you with a first selection help as to which CU240S can be replaced with which CU240E-2 version, and when the use of the SINAMICS S110 with CU305 (marked in green) is recommended.

	Previous concept			New concept with CU240E-2 or CU305 family		
Communication	Implemented with	Is integrated safety technology being used?	Closed-loop control mode with encoder ?	Replaced by	Integrated safety technology	Comments
No communication or RS485 / USS	CU240S	No or implemented using external components	No	CU240E-2	STO	By using integrated safety technology it is possible that external safety relays and contactors can be eliminated
			Yes	CU305 DP	STO / SS1 / SBC	
	CU240S DP-F or CU240S PN-F	Yes	No	CU240E-2	STO	The CU240E-2 family does not support SBC
				CU240E-2 -F	STO / SS1 / SLS / SDI / SSM	
			Yes	CU305 DP	With Extended Safety license: STO / SS1 / SLS / SDI / SSM / SBC	
Profibus	CU240S DP	No or implemented using external components	No	CU240E-2 DP	STO	By using integrated safety technology it is possible that external safety relays and contactors can be eliminated
			Yes	CU305 DP	STO / SS1 / SBC	
	CU240S DP-F	Yes	No	CU240E-2 DP	STO	The CU240E-2 family does not support SBC
				CU240E-2 DP-F	STO / SS1 / SLS / SDI / SSM	
			Yes	CU305 DP	With Extended Safety license: STO / SS1 / SLS / SDI / SSM / SBC	
Profinet	CU240S PN	No or implemented using external components	No	CU240E-2 PN (being prepared)	STO	By using integrated safety technology it is possible that external safety relays and contactors can be eliminated
			Yes	CU305 PN	STO / SS1 / SBC	
	CU240S PN-F	Yes	No	CU240E-2 PN (being prepared)	STO	The CU240E-2 family does not support SBC
				CU240E-2 PN-F (being prepared)	STO / SS1 / SLS / SDI / SSM	
			Yes	CU305 PN	With Extended Safety license: STO / SS1 / SLS / SDI / SSM / SBC	

With the changeover from CU240S to CU305, you must observe the following restrictions:

- Power unit:
  - The CU305 can only be operated with power units, type PM340. The maximum power is 90kW.
- Digital I/Os:
  - CU240S and CU305 have different terminal designations (for details refer to Chapter 3.1).
- Analog I/Os:
  - The CU305 has a +/- 10V analog input. The 10V supply voltage via terminals 1 and 2 of the CU240S does not support the CU305.
  - The CU305 has no analog outputs.

1.2 Adaptations that must be made when making the changeover

As a result of the expanded functional scope of the CU305 family when compared to the CU240S family, the CU240S configuration has to be adapted. These will now be subsequently listed and explained in detail in the following chapters.

In addition, new functions will be listed in the individual chapters.

Hardware design (see Chapter 2)

- Changes to the height and depth of the CU.
- IO signal cables are routed from the top.

IO interface (see Chapter 3)

- When compared to the CU240S, the CU305 has more digital inputs (11 DIs for the CU305 family, compared to 9 DIs for the CU240S or 6 DIs for the CU240S DP-F and CU240S PN-F).
- Up to 3 fail-safe F-DIs for internal drive functions can be formed from these digital inputs. When using all F-DIs and the F-DO with a feedback signal contact, 4 DIs are still available.
- 4 digital outputs (transistor) can also be used as 4 digital inputs when appropriately parameterized.
- Safety sensors with two NC contacts or one NC and one NO contact can be directly connected.
- 1 fail-safe F-DO, optionally with feedback input, which can be used to output the status of the safety functions integrated in the drive. If this F-DO is not used, then it can be used as an additional standard DO.
- Only 1 analog input (+/- 10V).
- No analog outputs.
- Analog input; dead zone function has been modified.

Parameterization (refer to Chapter 4)

- It is not possible to directly migrate from CU240S projects to a CU305 project. The drive must be re-commissioned.
- Different STARTER parameterization to the CU240S.

Communication (refer to Chapter 5)

- Existing programs to control a SINAMICS G120 with CU240S via a fieldbus from a PLC, in most cases, can still be used for the CU305. For example, if parameters are accessed via cyclic or non-cyclic communication, then the only change that is required is as a result of the modified parameter numbers.
- When compared to the CU240S family, for the CU305 family, only the following PROFIDRIVE telegrams are available:
    - Telegram 1 (speed setpoint 16 bit).
    - Telegram 999 (freely parameterizable telegram).
    - For additional CU305-specific telegrams, see S110 Function Manual (Chapter 9.2) **Link**.

Safety functions (refer to Chapter 7)

- As a result of the more extensive safety functions of the CU305, a direct parameter migration is not possible. The safety functions must be re-commissioned.
- It is necessary to adapt the safety program in the F-CPU, in order to use the new safety functions (4 SLS limit values, SDI and SSM).
- With the exception of STO, the safety functions are not released for group drives.

Drive fault messages/signals (refer to Chapter 8)

- The fault messages/signals of the CU305 have changed when compared to the CU240S. If these are to be displayed on an HMI for diagnostic purposes, then the new fault messages must be integrated into the HMI.

2 Hardware

2.1 Dimensions

Changed dimensions between the CU240S and CU305

- Width:
  - No change
- Height without fieldbus connector (177 mm for CU240S, with shield connection plate, 220mm):
  - 183 mm (CU305 DP / CAN).
  - 195 mm (CU305 PN).
- Depth (63mm for the CU240S with/without BOP):
  - 55 mm with/without BOP20.

CU240S

CU305

2.2 Cable routing

For the CU305, the IO cable and the encoder connection are routed from the top.

3 IO interface

3.1 Terminal assignment

The terminals of the CU240S will be compared with those of the CU305 family.

Terminals that the CU240S has and that the CU305 does not have are marked in gray.

	CU240S		CU305		
Function	Terminal	Designation	Terminal	Designation	Note
Power supply AI	1	+10V OUT			External 10V power supply required for analog input
	2	0V OUT			
Analog input AI0	3	AI0+	X132 / 7	AI 0+	Analog input +/- 10V, not a current input
	4	AI0-	X132 / 8	AI 0-	
Digital input 0	5	DI0	X133 / 1	DI 0	
Digitanl input 1	6	DI1	X133 / 2	DI 1	
Digital input 2	7	DI2	X133 / 3	DI 2	
Digital input 3	8	DI3	X133 / 4	DI 3	
Power supply of the DIs	9	U24V			External power supply required
Analog input AI1	10	AI1+			No AI1 available
	11	AI1-			
Analog output AO0	12	AO0+			No analog output available
	13	AO0-			
Thermal sensor	14	PTC+	X133 / 7	+ Temp	The temperature sensor can either be connected at X23 (encoder interface) or at X133 X23: Connection option for PTC, KTY 84-130 sensors and bemetallic switches X133: Connection option for PTC, KTY 84-130 sensors
			X23 / 1		
	15	PTC-	X133 / 8	- Temp	
			X23 / 8		
Digital input 4	16	DI4	X131 / 4	DI 22	DI 22 can be used as feedback signal contact F-DO 0 or as standard DI
Digital input 5	17	DI5	X132 / 4	DI/DO 11	The DI/DO 11 can be used as digital input or output
Relay output, DO0	18	DO0 NC			Changeover from relay to transistor output The DI/DO 8…10 can be used digital input or output. This is defined using the appropriate parameterization
	19	DO0 NO	X132 / 1	DI/DO 8	
	20	DO0 COM			
Relay / digital output DO1	21	DO1 NO	X132 / 2	DI/DO 9	
	22	DO1 COM			
Relay output, DO2	23	DO2 NC			
	24	DO2 NO	X132 / 3	DI/DO 10	
	25	DO2 COM			
Analog output AO1	26	AO1+			No analog output available
	27	AO1-			
Reference potential for +24V	28	U0V	X130 / 8	M1	Reference potential for F-DI 0 / 1
			X131 / 8	M1	Reference potential for F-DI 2 and F-DO 0
			X132 / 5	M	Reference potential for DI/DO8…11 and AI0
			X132 / 6	M	
			X133 / 5	M2	Reference potential DI0 … 3
			X133 / 6	M2	
RS485 interface	29	RS485 -A	X126	Profibus interface	The RS485 interface is located on the Profibus interface (only CU305 DP)
	30	RS485 -B	X126		
External 24V supply for the CU, instead of supply via the PM	31	+V24 IN	X124 / +	24 V	External 24V power supply is required for operation
	32	0V IN	X124 / -	M	
Speed encoder power supply	33	ENC+ Supply	X23 / 4	P_Encoder 5V / 24V	Via X23 (encoder interface)
			X23 / 5		
Digital input 6	40	DI6	X132 / 1	DI/DO 8	The DI/DO8 to 11 can be used used as digital input or output. Defined using the appropriate parameter assignment
Digital input 7	41	DI7	X132 / 2	DI/DO 9	
Digital input 8	42	DI8	X132 / 3	DI/DO 10	
Fail-safe digital input 0	60	FDI0A	X130 / 1	DI 16	At the CU305, sensors with 2 NC contacts or also sensors with one NC contact and one NO contact can be connected DI 16 / 18 / 20 = input for 1st NC contact DI 17+ / 19+ / 21+ = input for 2nd NC contact DI 17- / 19- / 21- = input for NO contact Additional interconnections that are required, refer to the operating instructions If no F-DIs are required, then these can also be used as standard DIs
	61	FDI0B	X130 / 2	DI 17+	
			X130 / 3	DI 17-	
Fail-safe digital input 1	62	FDI1A	X130 / 4	DI 18	
	63	FDI1B	X130 / 5	DI 19+	
			X130 / 6	DI 19-	
Power supply F-DI 0 / 1			X130 / 7	24 V1	
Fail-safe digital input 2			X131 / 1	DI 20	
			X131 / 2	DI 21+	
			X131 / 3	DI 21-	
Feedback signal contact, F-DO 0			X131 / 4	DI 22	DI 22 can be used as feedback signal contact for F-DO 0 or as standard DI
Fail-safe digital output 0			X131 / 5	DO 16+	DO 16+/- can be used as F-DO 0 or as standard DO (DO16+)
			X131 / 6	DO 16-	
Power supply F-DO 0			X131 / 7	24 V1	
Speed encoder interface	70	ENC AP	X23 / 15	A-track positive	A TTL or HTL encoder can be connected
	71	ENC AN	X23 / 14	A-track negativ	
	72	ENC BP	X23 / 13	B-track positive	
	73	ENC BN	X23 / 12	B-track negativ	
	74	ENC ZP	X23 / 10	R-track positive	
	75	ENC ZN	X23 / 11	R-track negativ	
			X23 / 7	Ground, encoder power supply	

3.2 Digital inputs

3.2.1 Changes to the number of digital inputs

When compared to the CU240S, the CU305 has more digital inputs (11 DIs for the CU305 family, compared to 9 DIs for the CU240S or 6 DIs for the CU240S DP-F and CU240S PN-F).

Up to 3 fail-safe F-DIs for internal drive functions can be formed from these digital inputs. When using all F-DIs, the F-DO with a feedback signal contact and all DOs, then 4 DIs are still available.

3.2.2 Change regarding the reference potential

The reference potential terminal 69 of the CU240S is distributed across several terminals for the CU305. Also refer to Chapter 3.1.

➔ Terminal X130 / 8: Reference potential for F-DI 0 / 1.

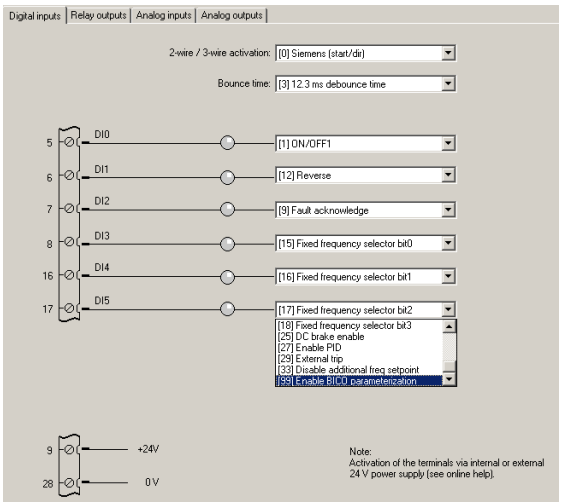
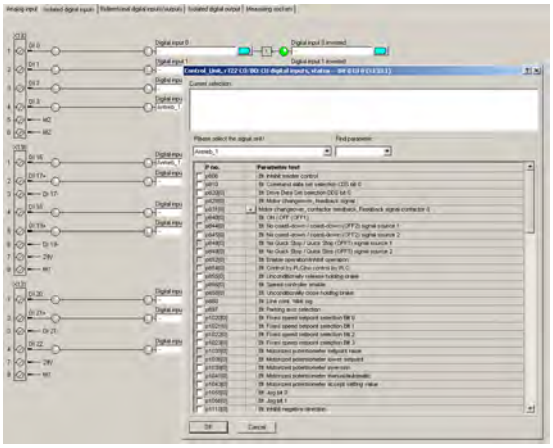
➔ Terminal X131 / 8: Reference potential for F-DI 2 and F-DO 0.

➔ Terminals X132 / 5 and 6: Reference potential for DI/DO 8 … 10 and analog input.

➔ Terminals X133 / 5 and 6: Reference potential for DI 0 … 3.

3.2.3 Changed BICO interconnection of the digital inputs

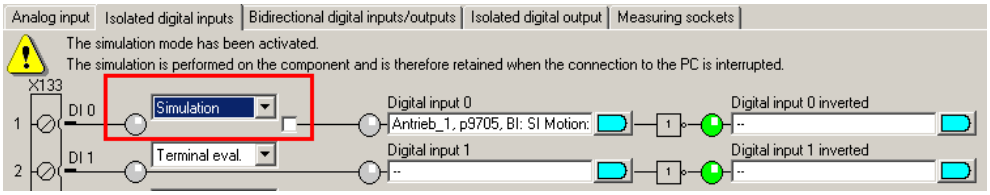
Previously, the digital inputs for BICO interconnection had to be enabled using the value 99; this is now no longer required. The interconnection can now be made directly without having to use p701…p706 or p701...p709 (no longer available in CU305). In addition, inverted signals of the digital inputs are available.

CU240S	CU305
	

3.2.4 Simulating the digital inputs

New function

The digital inputs can now be simulated for test purposes using the STARTER parameterizing software.



3.3 Digital outputs

3.3.1 Enabling the digital outputs

The CU305 has 4 digital inputs (DI 8 … 11), which can be re-parameterized to become 4 digital electronic outputs (DO 8 … 11).

In addition, there is an additional digital input (DO 16) that can be re-parameterized to become a fail-safe F-DO.

3.3.2 Modified parameter numbers

The parameter numbers of the DOs are shifted in the expert list (for example, DO0: CU240S = p731, CU305 = p738).

3.3.3 Hardware change, digital outputs

Contrary to the CU240S, the CU305 only has transistor outputs.

3.4 Analog inputs

3.4.1 Number of analog inputs

Contrary to the CU240S, the CU305 only has a +/- 10V analog input.

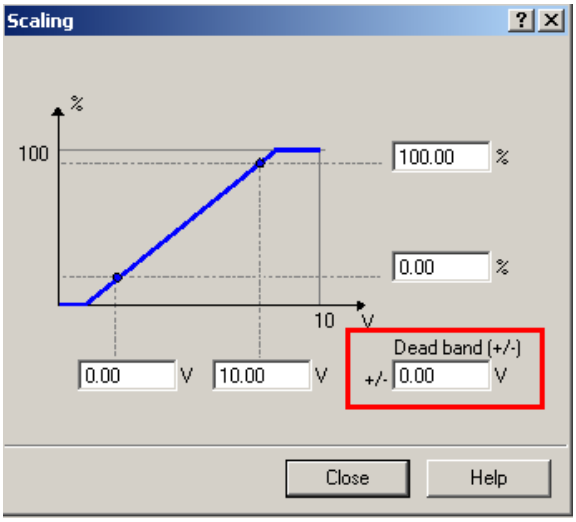
3.4.2 Power supply for the analog input

Contrary to the CU240S, the CU305 does not have a 10V power supply for the sensor connected at the analog input.

3.4.3 Changed ADU dead zone (p761)

This parameter does not exist for the CU305.

CU240S

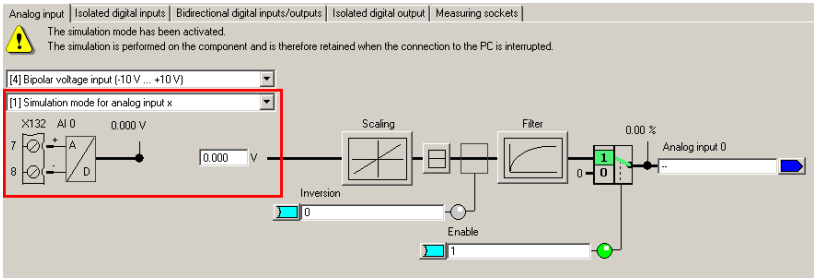


➔ Using this function in the CU240S, if the analog values around 0 V are suppressed, then this function can be implemented by using FFBs (free function blocks).

3.4.4 Simulation of the analog input

New function

Now, the analog input can be simulated for test purposes using the STARTER parameterizing software.



4 Parameterization

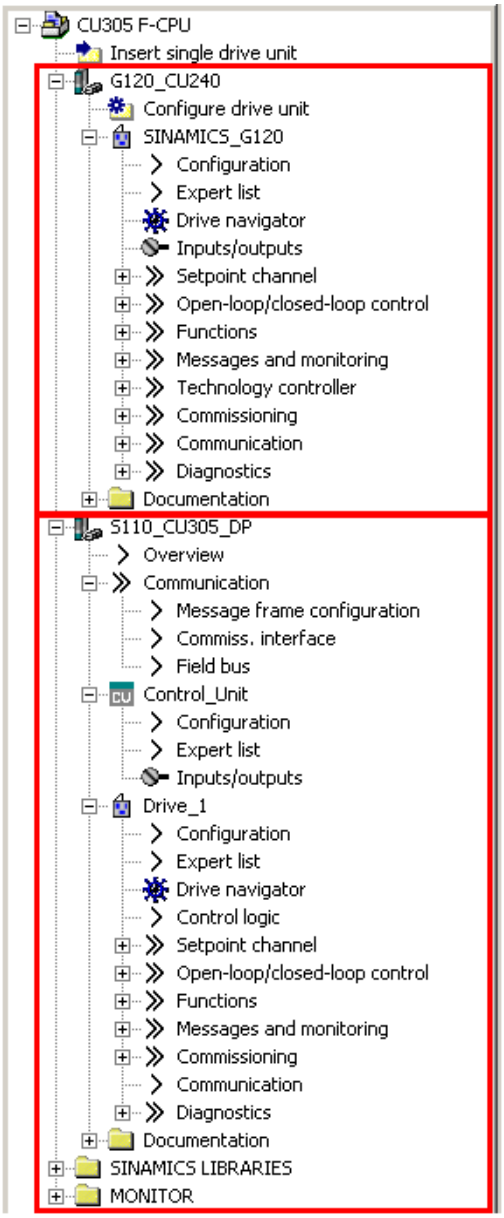
4.1 Basics

It is not possible to directly migrate from CU240S projects to a CU305 project as a result of the different parameter structure.

➔ The drive must be recommissioned using STARTER.

4.1.1 Structure of the SINAMICS S110

Contrary to the SINAMICS G120, in the project navigator, SINAMICS S110 comprises two drive objects. This means that the parameters in STARTER are distributed to two drive objects, in the example, Control Unit and drive_1.



SINAMICS G120:

All parameters in one drive object available (SINAMICS G120)

SINAMICS S110:

The parameters are split in different drive objects (Control_Unit and Drive_1).

For the communication a separate folder is available (Communication)

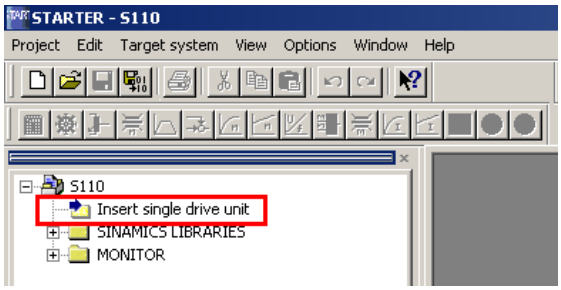
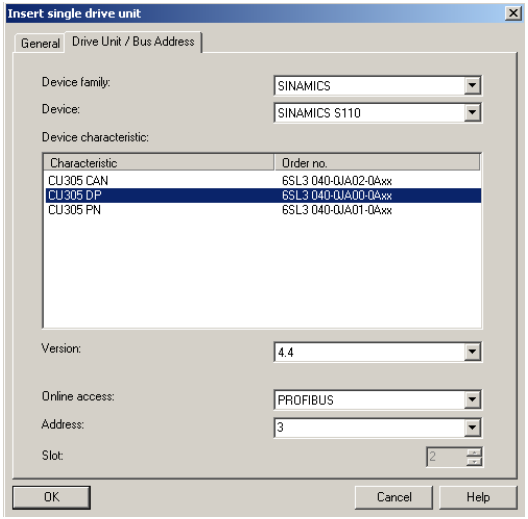
4.2 Commissioning the SINAMICS S110

Commissioning the SINAMICS S110 with CU305 differs regarding several points from the commissioning of SINAMICS G120 with CU240S.

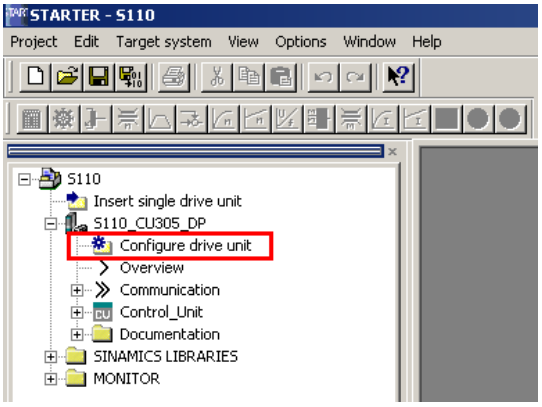
This is the reason that in the subsequent chapters, commissioning the CU305 using the STARTER parameterizing software is presented step-by-step.

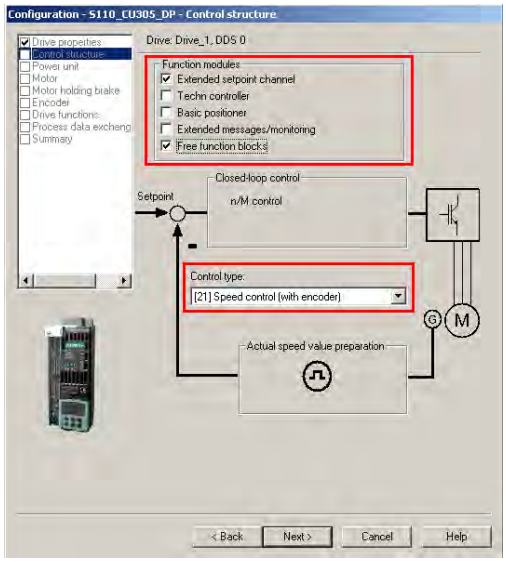
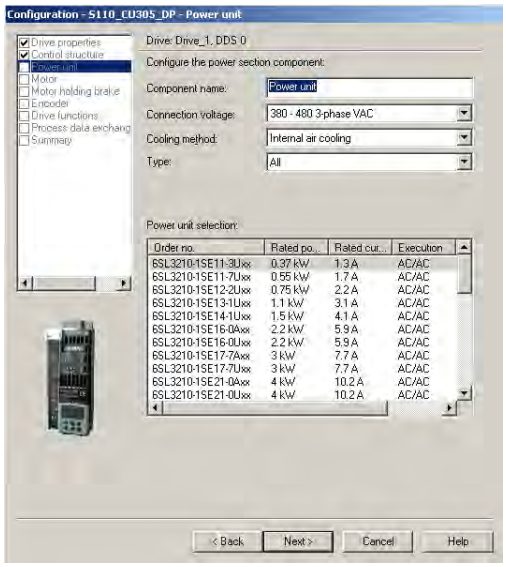
4.2.1 Defining the hardware

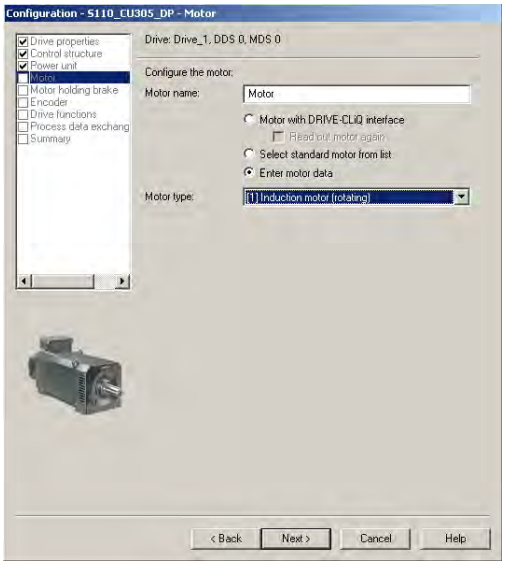
Create a new project via **Project ➔ New…**.

	Select **Insert single drive unit** (double-click).
	Under device family, select a **SINAMICS S110**, and under device version, a **CU305** corresponding to your hardware. Select the firmware **Version** of the CU and the type of **Online access**. Under **Address**, for Profibus, select the address of the CU. Continue with **OK**.

4.2.2 Performing the basic parameterization

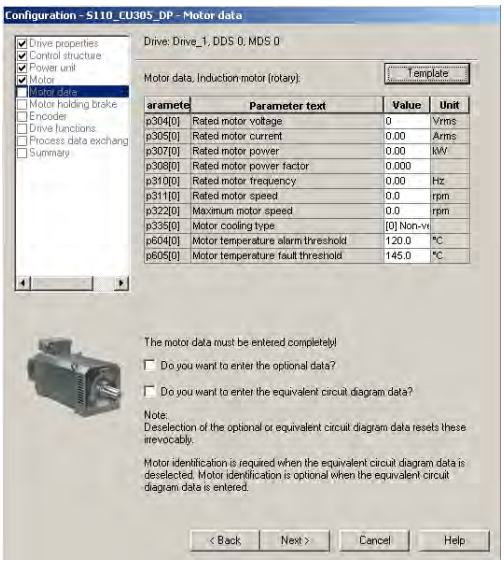
	Select **Configure drive unit** (double-click).

	Complete the screen form, and then press the **Next** button.
	Select **Extended setpoint channel** for the ramp-function generator. If you wish to use the **Free function blocks** integrated in the converter, then also activate these. You can obtain details on the function modules by pressing the **Help** button. Under **Control type**, select **[21] Speed control (with encoder)**. And then press the **Continue** button.
	Select the **Power unit**, corresponding to your hardware. And then press the **Next** button.



Select **Enter motor data** and under **Motor type**, select **[1], Induction motor (rotating)**.

And then press the **Next** button.

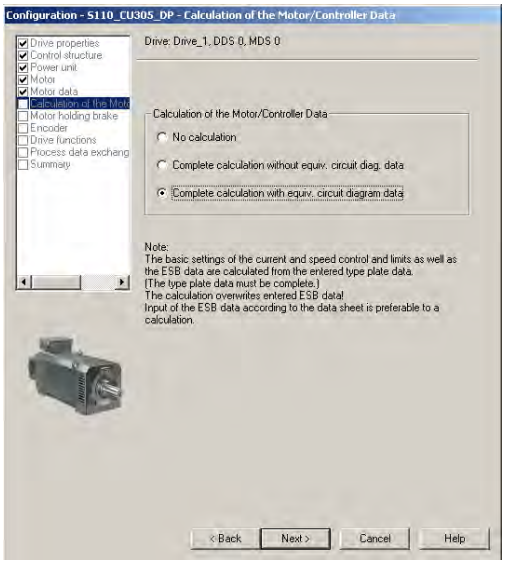


Enter the motor data according to the motor rating plate and the motor connection (star or delta).

Under **p311 (Rated motor speed)**, enter the rated motor speed (e.g. 1350 rpm).

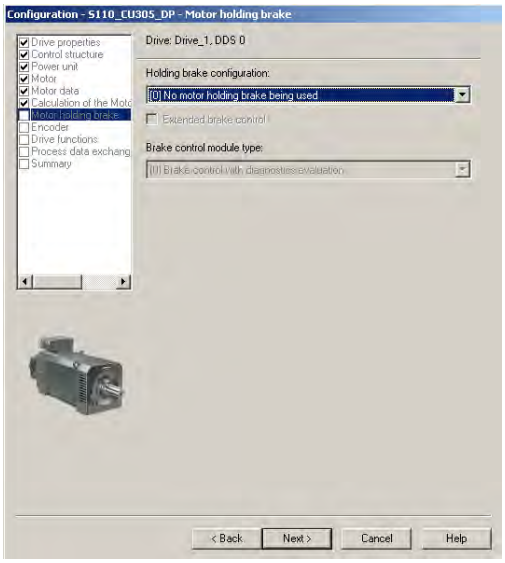
Under **p322 (Maximum motor speed)**, enter the maximum speed (e.g. 1500 rpm).

And then press the **Next** button.



Select **Complete calculation with equiv. circuit diagram data**.

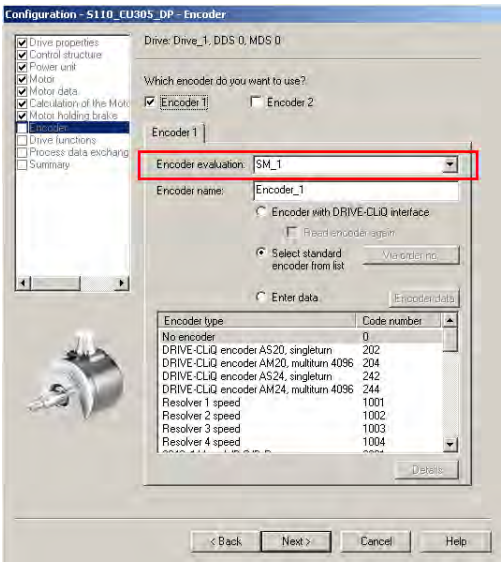
And then press the **Next** button.



If one is being used, parameterize the **Motor holding brake**.

More detailed information on this parameterizing screen form is available by pressing the **Help** button.

And then press the **Next** button.



In the subsequent screen form, **Encoder** should be parameterized for the closed-loop motor control.

Under **Encoder evaluation**, select how the encoder data should be read-in.

- **SM_1** = encoder is read-in via an external encoder module
- **CU305** = encoder is directly read-in via X23 of the CU

Under **Encoder type**, select the encoder to be used.

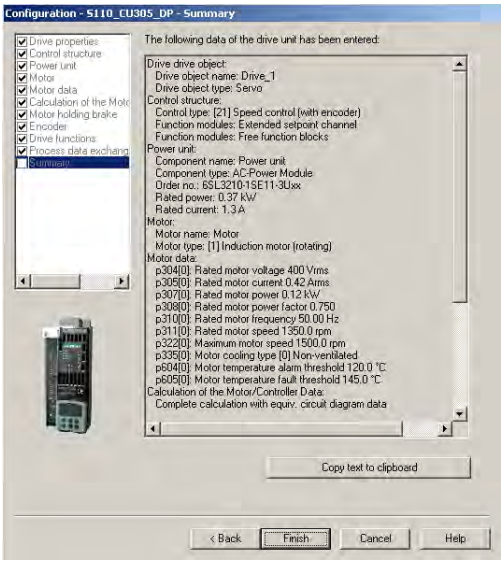
More detailed information on this parameterizing screen form is available by pressing the **Help** button.

And then press the **Next** button.

Under **Technological application**, **select 101 (Feed drive (limit current limitation))** or **102 (Spindle drive (rated current limitation))** depending on how the maximum motor current should be limited.

Under **Motor identification**, select **Stationary measurement with acceptance**. As a consequence, when starting for the first time after commissioning, a motor data identification routine is performed.

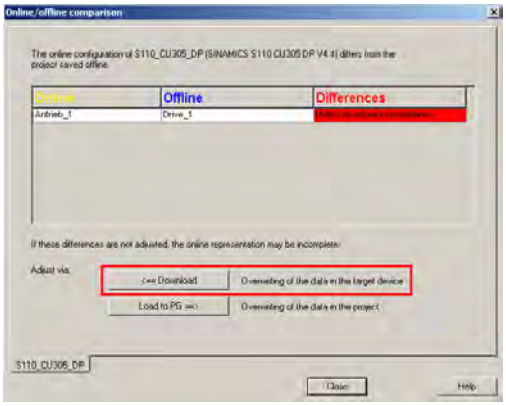
And then press the **Next** button.

	In the subsequent screen form, selected the telegram type for communication via Profibus or Profinet. Sensible settings for the replacement of a CU240S is **telegram 1** or **telegram 999**. All of the other telegrams known from the CU240S can be manually created via telegram 999. If you wish to control the SINAMICS S110 via the IO interface, and you do not require any communication, then here select telegram 999 with a length of 0 words. And then press the **Next** button.
	After finishing the basic parameterization, press the **Finish** button.

4.2.3 Loading the basic parameterization to the CU305

Establish an online connection by pressing the  button.

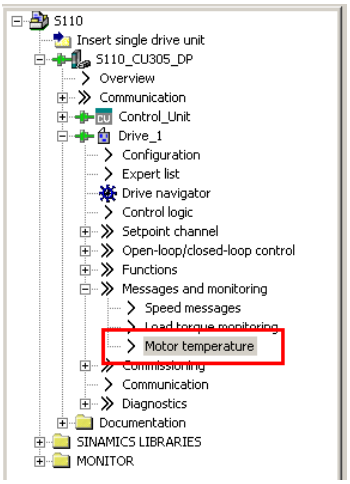
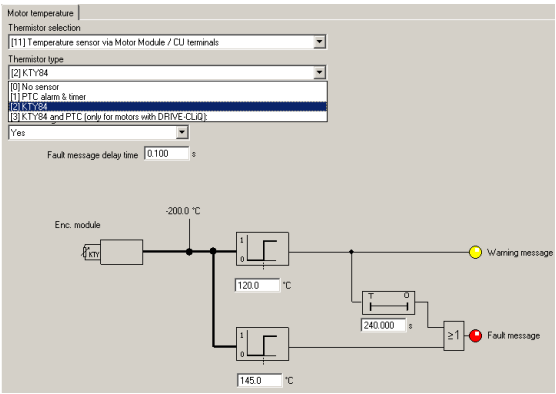
	In the subsequent screen form, select the previously created target device and the **S7ONLINE** access point.

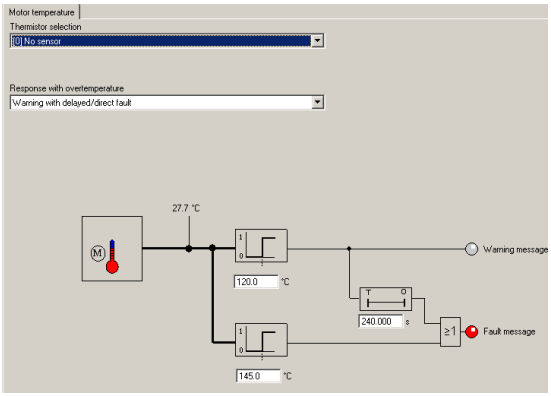
	After establishing the online connection, the differences between the offline and online project are signaled. To align, press the button **← Download**. Acknowledge the message that is then displayed, and wait until the dialog is shown without any differences. And then press the **Close** button.

4.2.4 Motor temperature sensor parameterization

After the basic commissioning has been completed, a motor temperature sensor is automatically activated via sensor interface X23.

To deactivate or activate signals to be read-in via terminals X133 / 7 and 8, proceed as follows.

	Under **Drive_1 ➔**, select **Messages and monitoring ➔** by double-clicking on **Motor temperature**.
	In order to activate the temperature sensor via X133 / 7 and 8, under **Thermistor selection**, select **[11] Temperature sensor via Motor Module / CU terminals**. Then, under **Thermistor type**, select the corresponding type. Further, you can also parameterize the response to an **Overtemperature e.g. thermistor failure**.

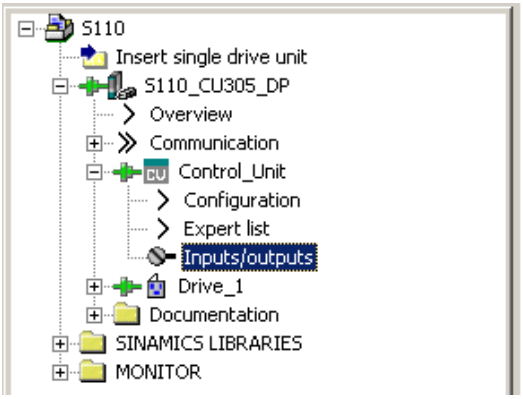
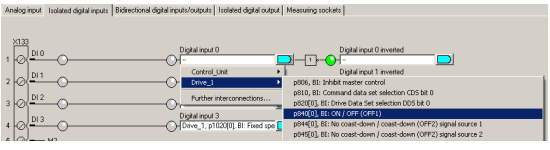
	If you do not wish to use a temperature sensor, then under **Thermistor selection**, select **[0] No sensor**.

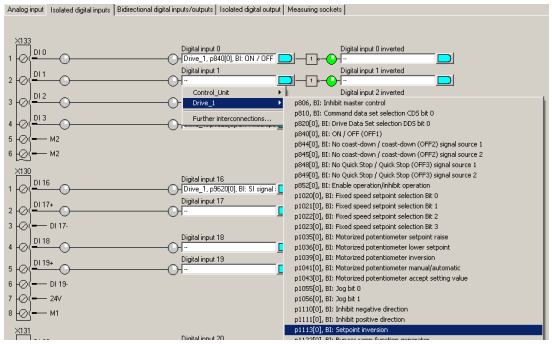
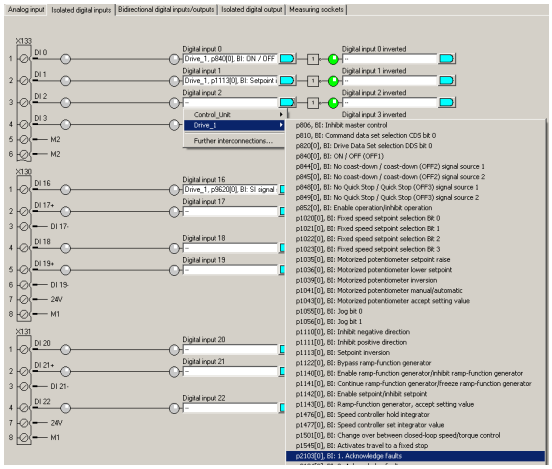
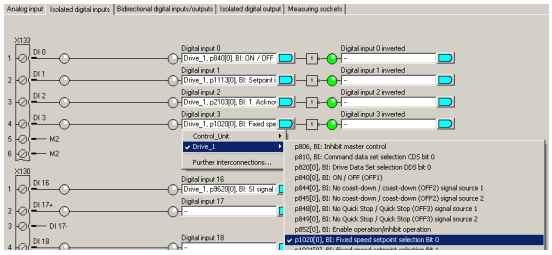
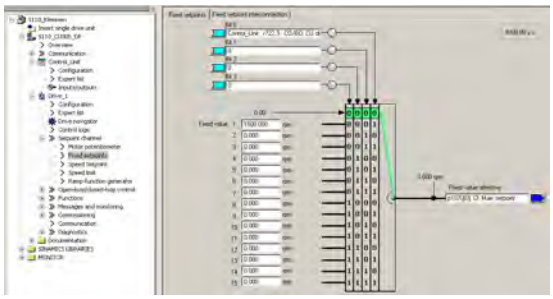
4.2.5 Switching over command and setpoint source to terminals

If you wish to address CU305 via Profibus or Profinet, then you can skip this chapter.

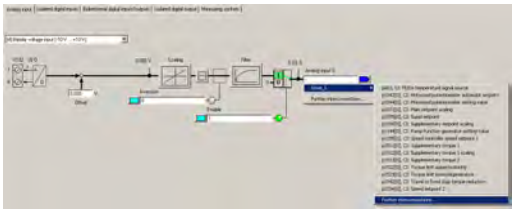
Contrary to the CU240S, during basic commissioning, the command and setpoint source cannot be switched over to terminals.

It will be subsequently described how this switchover is made. The prerequisite to do this is that during basic commissioning (see Chapter 4.2.2) as communication telegram, telegram 999 with a length of 0 words was parameterized.

	Under **Control_Unit** select **Inputs/outputs** by double-clicking.
Command sources	
	Interconnect **DI 0** with the function **p840[0], BI: ON / OFF (OFF1)** of the drive object **Drive_1**.

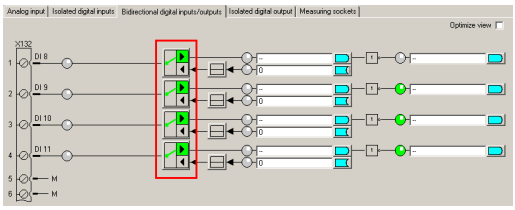
	Interconnect **DI 1** with the function **p1113[0], BI: Setpoint inversion** of the drive object **Drive_1**.
	Interconnect **DI 2** with the function **p2103[0], BI: 1. Acknowledge Faults** of the drive object **Drive_1**.
Speed setpoint via fixed setpoints	
	In the factory setting, the speed setpoint is interconnected with the fixed setpoints. If these fixed setpoints are to be used, then the corresponding digital inputs must be interconnected as described previously.
	The fixed setpoints are parameterized under **Drive_1 ➔ Setpoint channel ➔ Fixed setpoints**.

Speed setpoint from the analog input



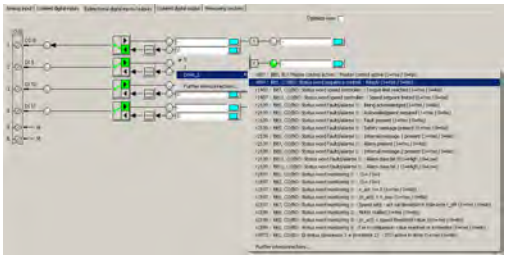
If the speed setpoint is to be entered via an analog input, then this must be interconnected via **Drive_1 ➔ Further interconnections…** with parameter **p1070[0] CI: Main setpoint**.

Digital outputs



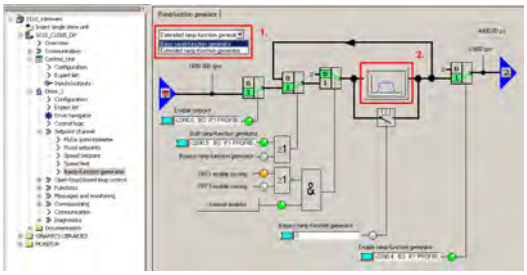
In the factory setting, the combined **DI / DO 8…11** are parameterized as digital inputs.

The terminal can be switched over to become a digital output by pressing the button (displayed in red).



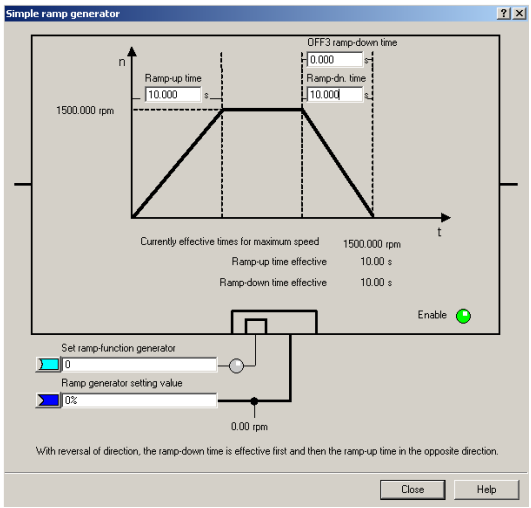
The **DOs** can then, for example, be interconnected with the function **r899: Bit1, Ready**.

Ramp-function generator



The ramp-up/ramp-down generator is parameterized under **Drive_1 ➔ Setpoint channel ➔ Ramp-function generator**.

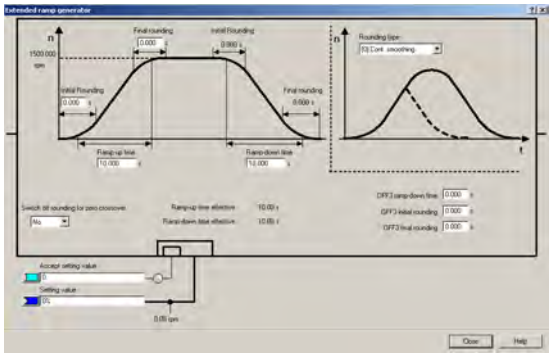
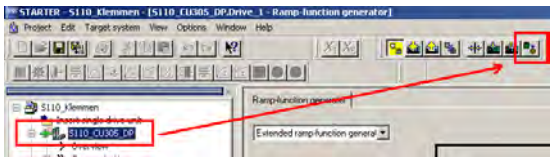
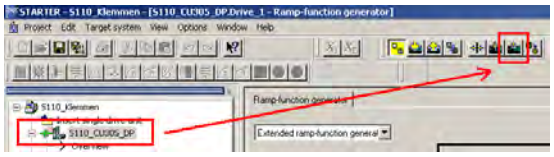
1. After selecting **Extended ramp-function generator**, the up/down ramp can be rounded off.
2. The screen form to parameterize the ramp function opens after pressing the button.



Simple ramp generator

The times under **Ramp-up time** or **Ramp-dn. time** are active after setting or resetting ON/OFF1.

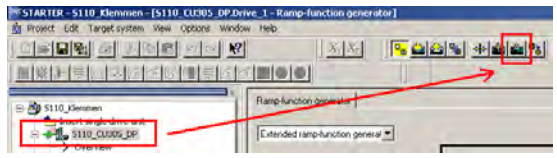
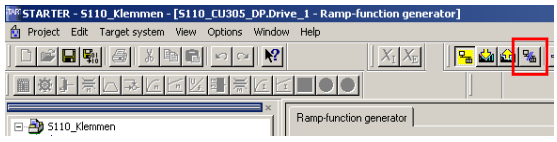
The **OFF3 ramp-down time** is a fast stopping ramp. This time value is also used for the Extended Safety function SS1.

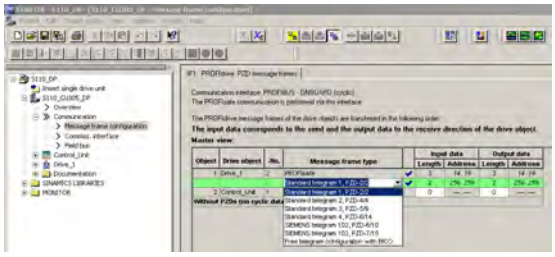
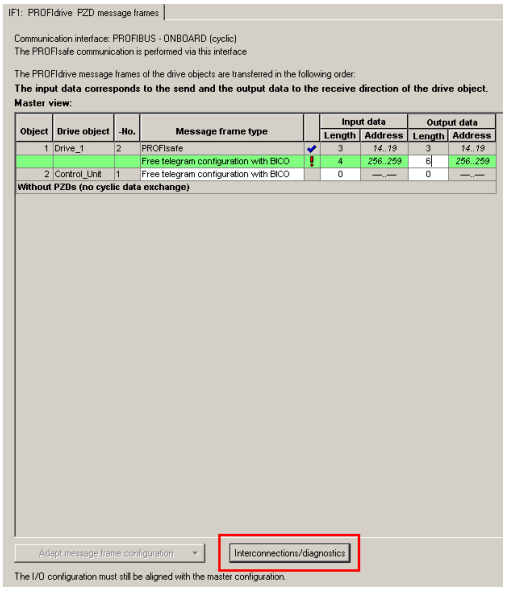
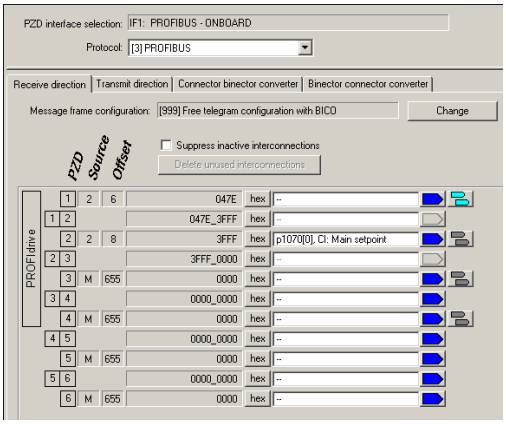
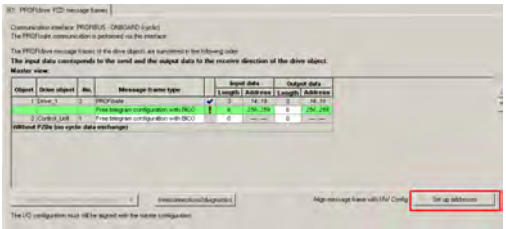
	Extended ramp generator (with initial- and final rounding).
Parameterizing non-volatile data storage (RAM to ROM)	
	All of the parameterizations up until now were performed in the RAM memory of the CU305. In order to save these in the converter in a non-volatile fashion, in the navigation tree, select the uppermost converter level and then press the  button.
Backing up the online configuration in the project	
	In order to also back up the parameterization in your project on the PG / PC, press the  button.

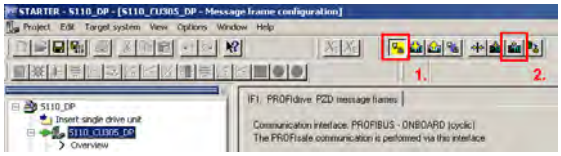
4.2.6 Adapting the fieldbus telegram

If you are not using the fieldbus for your application, but rather, as described in the previous chapter, the IO interface to control the SINAMICS S110, then you can skip this chapter.

During the basic parameterization (see Chapter 4.2.2), you could have also selected a communication telegram as command and setpoint source.

	If this has not already been done, backup the online configuration in your project by pressing the  button.
	To adapt the telegram configuration, initially switch STARTER into the offline mode.

	Select **Communication ➔ Message frame configuration**, and under **Drive_1**, select the required program type – for example **Free telegram configuration with BICO**. Then adapt the length of the input and output data. Note: The telegram (message frame) listed under **Control_Unit** is not used for the migration described here.
	Then press the **Interconnections / diagnostics** button.
	In the screen form which is then displayed, you can now adapt the telegram in the receive and send directions to your particular application. In this case, please note that the telegram components can be parameterized as word or as double word. Then press the **Close** button.
	To automatically align the modified telegram to the HW configuration of the control system, press the **Set up addresses** button. Confirm the dialog that is shown.
	Open the HW configuration of the control system and load this into the CPU.

	Activate the online connection (**1.**) and load the modified configuration into SINAMICS S110 (**2.**)

4.3 Others

4.3.1 Elimination of closed-loop control modes

CU305 supports the servo control mode, which can be used as replacement/equivalent for vector control.

If you wish to use U/f control or SLVC (sensorless vector control) for your particular application, then we recommend that you use a SINAMICS G120 Control Unit, type CU240E-2.

Separate migration guidelines are available for this Control Unit **Link**.

4.3.2 Changed reference quantities

The reference quantities (p2000 … 2004, drive expert list) apply in the CU305 as standard for all data sets. In addition, the reference quantities have been expanded by the reference temperature (p2006).

In the CU305, the speed setpoint and actual value do not refer to Hz but to rpm; this means that it is no longer necessary to convert the required speed into a frequency.

4.3.3 Fixed setpoints that can be freely used

New function

Fixed setpoints that can be freely used can be defined in p2900 / p2901 (+/- 100.00%) and p2930 (+/- 100000.00 Nm). In addition, fixed setpoints that are already defined are available in r2902 [0 … 14] (drive expert list).

4.3.4 Enabling the command/drive data sets

There are up to 2 command data sets (CDS) and up to 2 drive data sets (DDS) available in the CU305. Contrary to the CU240S, these must now first be enabled using parameter p170 (CDS) or p180 (DDS) (drive expert list).

4.3.5 Change for the second ramp function via JOG ramp-function generator

For the CU305, it is no longer possible to use the JOG ramp-function generator to implement a second ramp function as is the case for the CU240S.

➔ However, when using the data set changeover (DDS), up to 2 different parameterizable ramp functions are now available. The data set changeover can be implemented in operation via digital inputs or via the fieldbus. For details, refer to the Function Manual **Link** (Chapter 10.2).

4.3.6 Operating hours counter

New function

The actual operating hours can be read out of p650 and a maintenance interval can be activated in p651. Alarm A1590 is activated after the time in p651 has expired (drive expert list).

4.3.7 Changes to the braking chopper

For the CU305, the braking chopper is automatically activated when using a PM340. The braking resistor must be externally protected against overload.

➔ Connect the thermal sensor of the braking resistor to a DI of the converter and interconnect this input, for example, with parameter p2106 "External fault 1" (drive expert list). As a consequence, for an overtemperature, fault F07860 "External fault 1" will be activated.

➔ In addition, the VDCmax controller must be deactivated (drive expert list, p1240 ➔ 0).

4.3.8 Expansion of the motor holding brake function

The parameterization of the motor holding brake has been expanded. Various modes are now available, where the brake, as before, can be opened or closed from the process, but now also permanently or as a function of an external signal.

➔ For details, refer to the Function Manual **Link** (Chapter 7.2.6) or STARTER screen form.

➔ In addition, an extended brake control is available. For details, refer to the Function Manual **Link** (Chapter 7.3.4).

4.3.9 Changes to the free function blocks (FFBs)

The scope and functions of the free function blocks have been significantly expanded over the CU240S. As a consequence, it was necessary to shift the parameter numbers. Presently, the FFBs can only be interconnected via the drive expert list.

➔ For details, refer to the Function Manual **Link** (Chapter 7.3.8).

4.3.10 Changes to the phase failure monitoring

For the CU305, the phase failure monitoring (CU240S, p291) is always active and cannot be deactivated.

4.3.11 Change, operator panel LED can be deactivated

If a fieldbus is not used, then the OP-LED (operator panel LED) can be deactivated using parameter p2030 → 0 (Control Unit expert list) ➔ RAM to ROM ➔ POWER-ON reset.

4.3.12 Wobbulation generator has been eliminated

The wobbulation generator provided in the CU240S is not supported by the CU305.

4.3.13 Positioning down ramp has been eliminated

The positioning down ramp available in the CU240S (parameters p2480 … p2488) is not supported by the CU305.

➔ Implemented using a rapid traverse/crawl switchover based on FFBs or using EPOS (basic positioner) functionality.

4.3.14 Memory card

Just the same as for the CU240S, the memory card (MMC) is optional. An MMC with license is only absolutely necessary if the Extended Safety functions are used For more information, refer to the Function Manual **Link** (Chapter 10.3).

4.3.14.1 Transferring a project from CU240S into the CU305

Projects of a CU240S on an MMC card cannot be transferred into a CU305 as a result of the different parameter structures.

➔ Clear the memory card and write the CU305 project to it.

4.3.14.2 Handling memory cards

Writing data to an MMC card has been significantly simplified for the CU305. Parameter changes are automatically saved to the memory card using RAM ➔ ROM.

For details, refer to the Function Manual **Link** (Chapter 10.3).

5 Communication

Existing programs to control a SINAMICS G120 with CU240S via a fieldbus from a PLC, in most cases can still be used for the CU305. For example, if parameters are accessed via cyclic or non-cyclic communication, then the only change that is required is as a result of the modified parameter numbers.

In order to use the new or extended safety functions, the safety programs in an F-CPU must be correspondingly adapted (refer to Chapter 7).

5.1 GSD files

The new GSD/GSDML files are required for the CU305 family. These can be downloaded under the following **Link**.

5.2 Slave-to-slave communication

New function

With "Slave-to-slave communication" – also known as "Data Exchange Broadcast" – fast data exchange is possible between the converters (slaves) without the master being directly involved; for instance, to enter the actual value of one converter as setpoint for the other converter (more detailed information is provided in the Function Manual **Link** (Chapter 9.3.4).

6 Local operator control via BOP20 or IOP

The BOP used for the CU240S, cannot be used for the CU305. In this case, the BOP20 can be used.

BOP

BOP20

The IOP is also available for user-friendly, Wizard-prompted commissioning; this can be connected via the handheld to the SINAMICS S110 (from IOP FW 1.2 onwards).

IOP with handheld terminal

6.1 Comparison between BOP and BOP20

The BOP20 of the CU305 has a comparable functional scope as the BOP of the CU240S. For more information, refer to the Function Manual **Link** (Chapter 3.3 and 6).

6.2 Comparison between BOP and IOP

For the CU240S with BOP, manual operation has been realized by changing over the command data sets.

For the IOP, a manual button is used to switch over to manual operation. When activating manual operation, the control authority is taken over by the IOP. As a consequence, the parameterized/active command and setpoint sources are decoupled.

➔ Manual operation via the IOP can be inhibited using parameter p806 (drive expert list). This inhibit can be permanent, but can also be selected using a digital input or a fieldbus signal.

➔ Manual operation via the IOP permanently active: This function is not possible. After line supply on, manual operation must be reactivated at the IOP.

6.3 Status signals of the IOP operator control panels

IOP operator control panels can no longer be used as BICO sources – as for the CU240S with BOP via parameter r19.

7 Safety functions

The safety functions known from the CU240S have been expanded. The following table provides an overview of the available safety functions without encoder of the SINAMICS S110 with CU305 and how they are possibly controlled.

The safety functions of the SINAMICS S110 with encoder are not discussed in this document.

Device family	G120	S110		
Control Unit	CU240S DP-F CU240S PN-F	CU305 DP	CU305 PN	CU305 CAN
Firmware basis	FW3.2	FW4.4		
Standards:				
EN 954-1	Cat. 3			
IEC 61508	SIL 2			
ISO 13849-1	Pld			
Functions:				
STO	Yes	Yes		
SS1	Yes	Yes		
SSM	No	Yes *		
SDI	No	Yes *		
SLS	Yes	Yes *		
Number of SLS limit values	1	4 *		
SBC	Yes **	Yes **		
Safety control:				
F-DI	Yes	Yes		
Number of F-DI	2	up to 3		
PROFIsafe	Yes	Yes	Yes	No
F-DI and PROFIsafe together	Yes	Yes (only STO via F-DI)		No

* Extended Safety license required, ** Safe Brake relay required

Information:

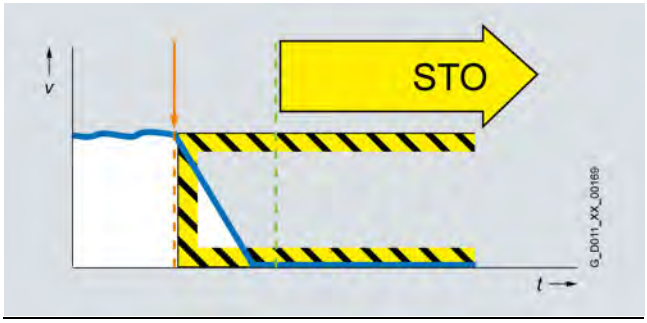
- Just as before, when using an induction motor, speed sensing using a speed encoder is not required for these safety functions.
- STO is permissible for all applications, where Emergency Stop functionality is required.
- SS1, SLS, SSM and SDI are not permissible for loads that drive the motor – and loads that are permanently in the generator mode.
- The F-DIs are formed by combining 2 standard DIs through the appropriate parameter assignment (also see Chapter 3.1).

More detailed information on the safety functions provided in the Function Manual **Link** (Chapter 8) or at the following Internet page **Link**.

In addition, the Function Manual Safety Integrated of the SINAMICS G120 can be helpful **Link**.

7.1 New / extended safety functions

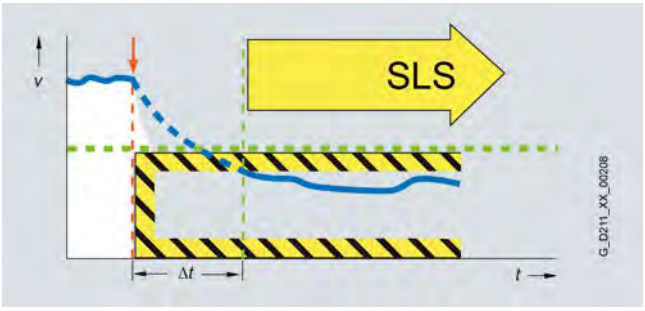
7.1.1 Extension SS1



The SS1 safety function was extended as follows when compared to the CU240S family.

- Braking the motor after activating SS1 can now be set using the following parameter assignment:
  - Braking ramp monitoring:
    - After selecting SS1, SINAMICS G110 automatically decelerates along the OFF3 ramp. The deceleration is monitored using the SBR ramp (Safe Brake Ramp). STO is activated when standstill is reached.
  - Acceleration monitoring:
    - After selecting SS1, SINAMICS S110 does not decelerate along the OFF3 ramp, but can be independently decelerated.
    - The speed is safely monitored regarding its rate of change.
    - When the "shutdown velocity/speed SS1“ is reached, or after the "SS1 delay time" has expired, then STO is activated.
- The SS1 ramp time (brake ramp monitoring mode) was increased, for the CU240S (99s referred to 200Hz), in the CU305 to 1000s (referred to the reference speed, e.g.1500 rpm).
  ➔ Safely and reliably stopping high moments of inertia.
- For the CU240S family, it was possible to interrupt/cancel SS1 by withdrawing the SS1 request before reaching the SS1 standstill detection frequency. This is no longer possible for the CU305. The SS1 request remains active until STO is internally activated.

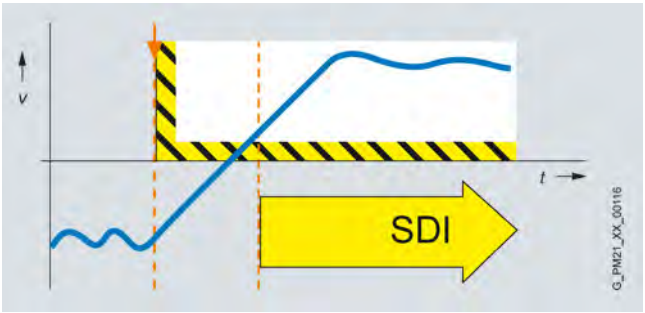
7.1.2 Extension to SLS



The SLS safety function was extended and revised as follows when compared to the CU240S family:

- The various SLS modes of the CU240S family have been integrated in the CU305 into one "mode". ➔ Simplifying commissioning and the possibility of implementing new safety concepts.
- With the CU305, 4 parameterizable SLS limit values are now available. ➔ New safety concepts can be implemented.
- When activating SLS at standstill, current must flow through the motor within 5 seconds. For the CU240S family, it is no longer necessary that a minimum speed is reached during these 5 seconds. ➔ Simplified control.
- The behavior of the SINAMICS S110 when activating SLS (automatic or manual speed reduction) can be set using the SS1 brake ramp or acceleration monitoring.
- The response to a limit value violation when SLS is active can be selected to either be a STOP A (STO) or STOP B (SS1) (CU240S, only STO is possible) ➔ In the case of a fault, the motor can now be safely braked and no longer coasts down unbraked.

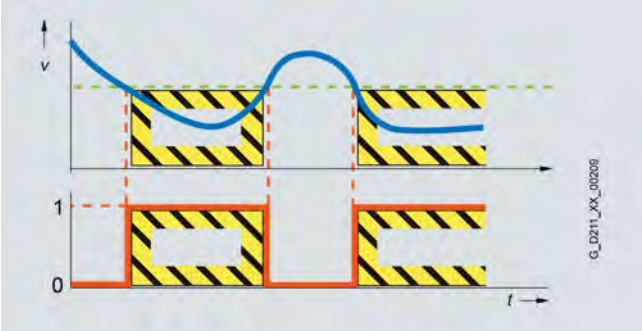
7.1.3 New safety function SDI (Safe Direction)



This safety function prevents the motor being operated in an unsafe direction of rotation. A speed encoder is not required for this safety function.

➔ New safety concepts can be implemented, for example, staying in a hazardous/dangerous area while a part of the system is being moved out of this hazardous/dangerous area or setting-up operation with a safely inhibited direction of rotation.

7.1.4 New safety function SSM (Safe Speed Monitor)



A PROFIsafe signal or the F-DO is used to indicate that the motor speed is below a parameterized speed limit. When the speed limit is exceeded, this signal is deactivated; however, the converter does not respond to this. A speed encoder is not required for this safety function.

➔ For example, using this signal, an F-CPU can release a protective door. As long as the parameterized SSM limit speed/velocity is not exceeded, the door is released. After the door has been opened and the motor speed increases above the SSM speed limit, the F-CPU activates a safe shutdown of the SINAMICS S110 via STO or SS1.

More detailed information on the safety functions is provided in the Function Manual **Link** (Chapter 8) or at the following Internet page **Link**.

7.2 Simplified parameterization

New function

The SINAMICS S110 safety functions are parameterized through one channel; only at the end of commissioning, is this duplicated for the second channel by pressing the appropriate key. As a consequence, it is no longer necessary to enter safety parameters through two channels (for instance Hz and kHz). Further, it is no longer necessary to confirm the checksum.

➔ This simplifies commissioning and avoids incorrect parameter assignments.

7.3 Offline safety parameterization

New function

SINAMICS S110 safety functions can be parameterized online and offline.

➔ Safety parameterization can already be prepared in an office environment.

7.4 Acceptance report

New function

Using the STARTER parameterizing software, an acceptance report for the safety functions can be generated; all of the relevant parameter values are automatically entered into this report.

➔ This can be found in STARTER under the drive unit in the folder **Documentation**.

7.5 Changing the reference quantity

In the CU305, speed-referred safety values no longer refer to Hz, but to rpm. Further, a gear factor can now be parameterized.

➔ As a consequence, it is no longer necessary to convert between the parameterization and the resulting motor speed.

7.6 Changes to the fail-safe inputs (F-DI)

Contrary to the CU240S family, the CU305 has no separate fail-safe digital inputs. For the CU305, the 3 F-DIs are each formed from two standard DIs (see Chapter 3.1).

7.7 Group drives

The STO safety function can be used in conjunction with group drives (when more than one motor is connected and operated with one converter). The additional safety functions (SS1, SLS, SDI and SSM) have still not been released for group drives.

7.8 Changes in the PROFIsafe telegram

As a result of the more comprehensive safety functions of the CU305 family, the PROFIsafe telegram has been expanded.

In order to be able to use these functions, the safety program of the F-CPU must be appropriately expanded.

7.8.1 CU240S PROFIsafe telegram 30

Control word															
Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
							SLS *				SLS *			SS1	STO

Status word															
Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
							SLS active *				SLS active *			SS1 active	Power removed

* Selecting whether byte 0 / bit 4 or byte 1 / bit 0 should be used to control SLS is realized through the appropriate parameter assignment

7.8.2 CU305 PROFIsafe telegram 30

Control word															
Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
		SDI negative *	SDI positive *		SLS-Limit Selection * 00 = Level 1 01 = Level 2 10 = Level 3 11 = Level 4			ACK			SLS *			SS1	STO

Status word															
Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Status SSM *		SDI negative active *	SDI positive active *		active SLS-Limit * 00 = Level 1 active 01 = Level 2 active 10 = Level 3 active 11 = Level 4 active			Internal event			SLS active *			SS1 active	Power removed

* Extended Safety functions (a license is required)

Changes to the CU240S PROFIsafe telegram (control word)

- **Byte 0 / bit 4 ➔** SLS is controlled exclusively using this bit.
- New: **Byte 0 / bit 7 ➔** acknowledgment signal for safety fault messages.
- New: **Byte 1 / bit 1 and 2 ➔** selects SLS limit value 1..4.
- New: **Byte 1 / bit 4 and 5 ➔** selects the corresponding safe direction of rotation.

Changes to the CU240S PROFIsafe telegram (status word)

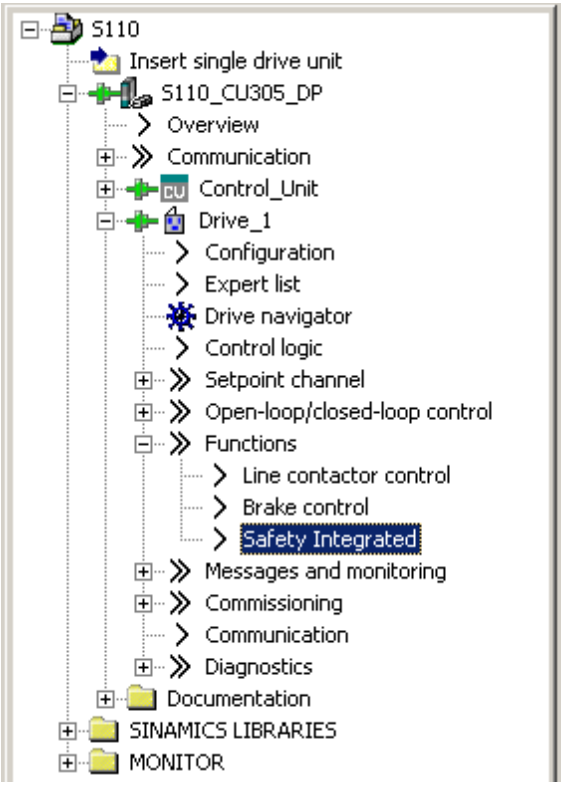
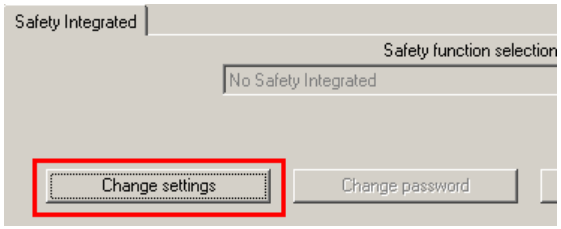
- **Byte 0 / bit 4 ➔** speed under SLS limit value, exclusively using this bit.
- New: **Byte 0 / bit 7 ➔** error, safety function.
- New: **Byte 1 / bit 1 and 2 ➔** feedback signal, active SLS limit value 1..4.
- New: **Byte 1 / bit 4 and 5 ➔** feedback signal, activation safe direction of rotation.
- New: **Byte 1 / bit 7 ➔** feedback signal status SSM.

7.9 Parameterizing the safety functions

The parameterization of the SINAMICS S110 safety functions differs from that of the CU240S. Commissioning the safety functions online is now explained step-by-step.

As explained under 7.3, the safety functions can also be parameterized offline. However, the parameterization does not basically change from the online parameterization that is described.

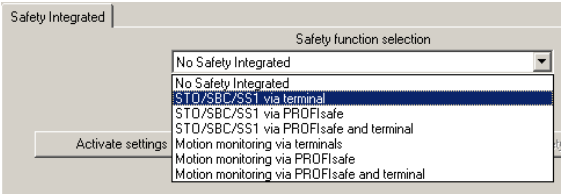
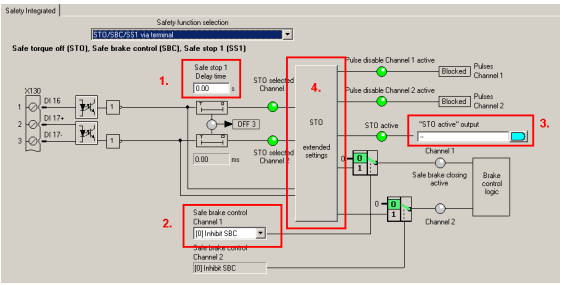
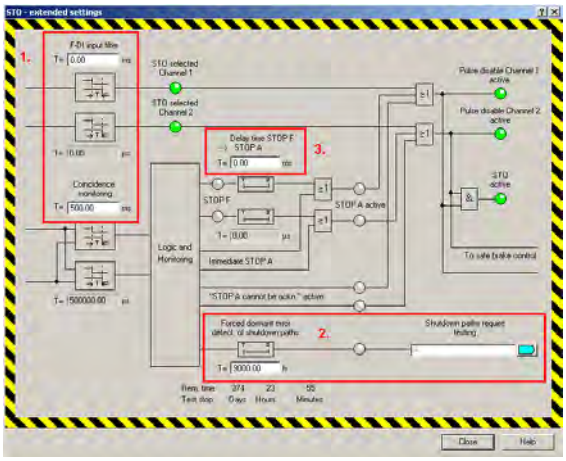
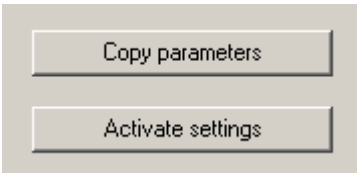
More detailed information on parameterizing the safety functions is also provided in the Function Manual **Link** (Chapter 8.4 (Basis Functions) and 8.5 (Extended Functions)).

Establish an online connection by pressing the  button.	
	Under **Drive_1 ➔ Functions ➔**, select **Safety Integrated** with a double-click
	Press the **Change settings** button.

The subsequent chapter explains the required settings, depending on which safety functions you wish to use, and how you wish to control these:

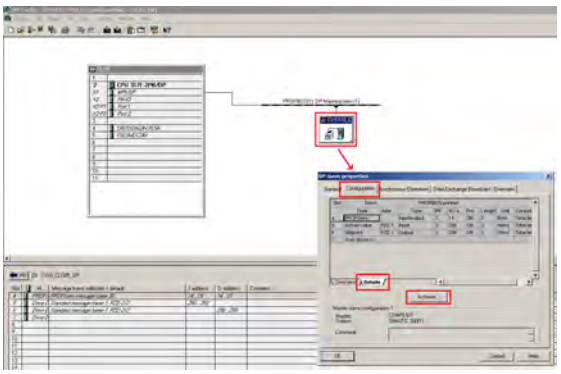
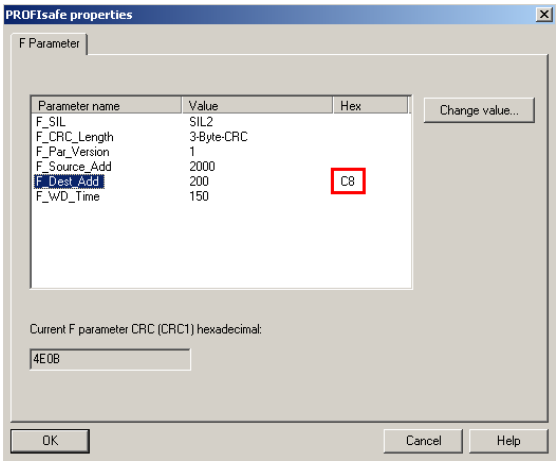
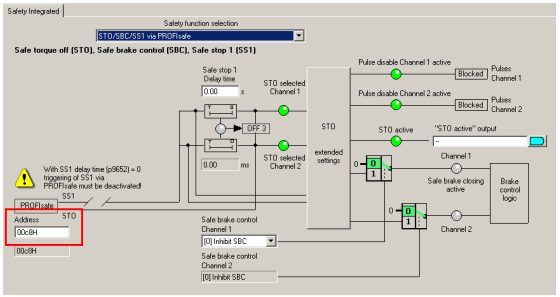
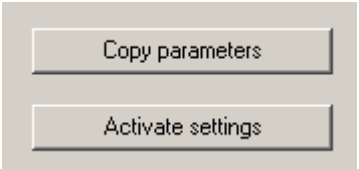
- STO, SS1 and SBC (Basic Safety) via terminal ➔ Chapter 7.9.1.
- STO, SS1 and SBC (Basic Safety) via PROFIsafe ➔ Chapter 7.9.2.
- STO, SS1 and SBC (Basic Safety) via PROFIsafe and terminal ➔ Chapter 7.9.3.
- Extended Safety (STO, SS1, SLS, SDI and SSM) via PROFIsafe ➔ Chapter 7.9.4.
- Extended Safety (STO, SS1, SLS, SDI and SSM) via terminals ➔ Chapter 7.9.5.
- Extended Safety (STO, SS1, SLS, SDI and SSM) via PROFIsafe and terminals ➔ Chapter 7.9.6.

7.9.1 Basic Safety via F-DI

	Select under **Safety function selection ➔ STO/SBC/SS1 via terminal**.
	**1.** Here, enter the **Safe stop 1 Delay time**. If you only wish to use STO, then keep the factory setting at 0.00s. **2.** If you wish to use **Safe brake control**, then activate this here. **3.** Here, you can interlink the **feedback signal** that STO was activated, for example, with a DO or the F-DO. **4.** Press this button for the **STO extended settings**.
	**1.** Using these settings, you can filter the F-DI signal, or influence the monitoring as to whether the two F-DI inputs occur simultaneously. **2.** Safety-relevant circuits must be checked at least once a year to ensure that they are functioning correctly. Here, parameterize the time interval after which you want an alarm to flag that it is necessary to test the shutdown channels. In addition to the alarm, you can also output the fact that it is necessary to test the shutdown channels for example, at a DO. **3.** Here, you can set the delay time between identifying an internal safety fault (STOP F) and automatically activating an STO (STOP A). Then close the screen form.
	To accept the parameterization, first press the button **Copy parameters** and then press the button **Activate settings**. When you are requested to do so, enter a new password. Please note down this password, as this cannot be read out of the SINAMICS S110.

7.9.2 Basic Safety via PROFIsafe

Parameterizing the Basic Safety functions with control via PROFIsafe changes only slightly from the procedure specified in Chapter 7.9.1. The main difference is that the F-DI is not parameterized – and the PROFIsafe address is parameterized.

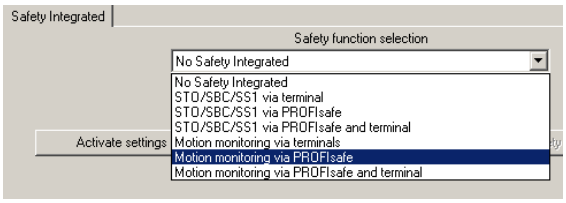
Parameterizing the PROFIsafe address	
	Call the HW configuration of the S7 program. Select the **SINAMICS S110** by double-clicking. Under **Configuration**, select **Details**, and then press the **Activate…** button. Confirm the message that is then displayed with **Yes**, and then press the **PROFIsafe…** button.
	Note down the hexadecimal value under **F_Dest_Add**. In this example, it is C8. Close the screen forms of the HW configuration by pressing the **Cancel** button and do <u>not</u> save the changes!
	Enter the previously noted value under **Address**.
	To accept the parameterization, first press the button **Copy parameters** and then press the button **Activate settings**. When you are requested to do so, enter a new password. Please note down this password, as this cannot be read out of the SINAMICS S110. Confirm the prompt to **Save parameters** with **Yes**.

To complete commissioning, carry out a POWER-ON reset (switch-off the SINAMICS S110 power supply and switch-on again).

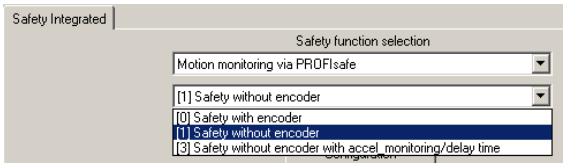
7.9.3 Basic Safety via PROFIsafe and terminal

This functionality is a combination of the parameterization described in 7.9.1 and 7.9.2.

7.9.4 Extended Safety via PROFIsafe



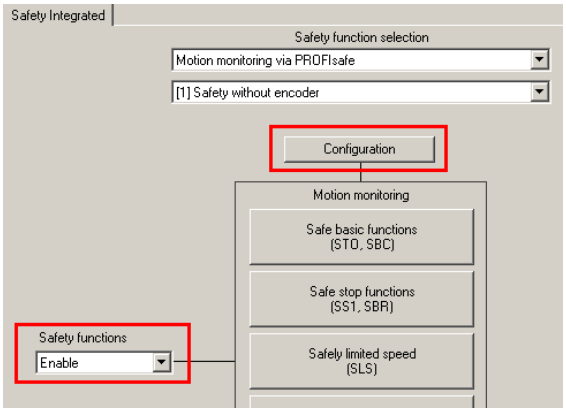
Select under **Safety function selection ➔ Motion monitoring via PROFIsafe**.



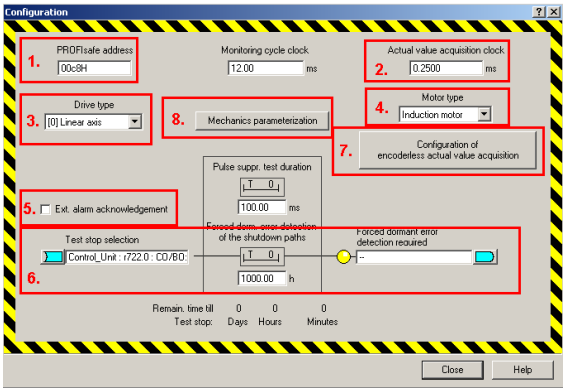
For a behavior comparable to that of the CU240S, select **[1] Safety without encoder**.

Details on the version **[3] Safety without encoder with accel_monitoring/delay time** are provided in the Function Manual **Link** (Chapter 8.5).

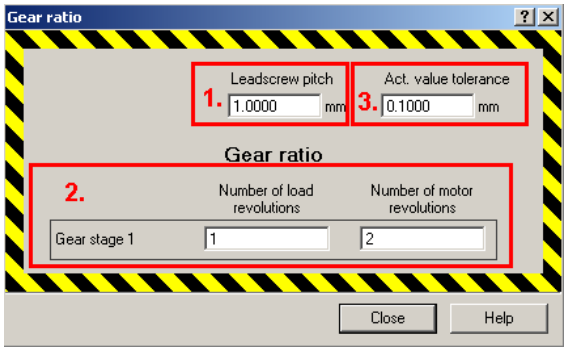
Configuration



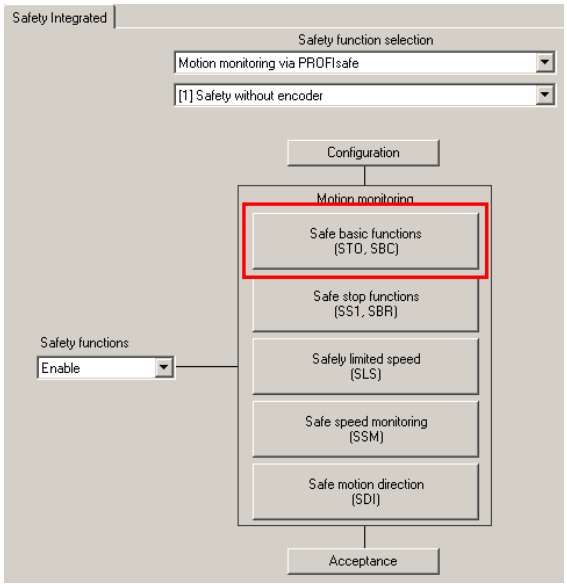
Enable the **Safety functions**. Then press the **Configuration** button.



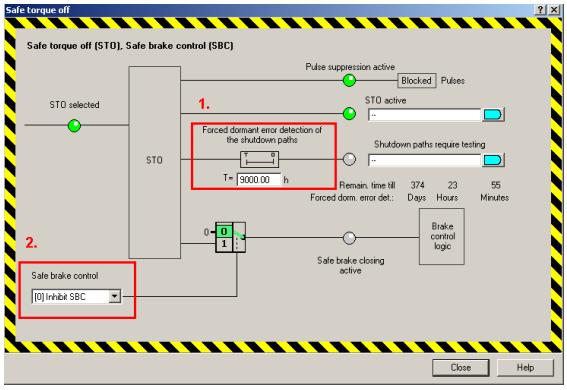
1. Set the **PROFIsafe address** analog to the HW configuration of the control. (also refer to Chapter 7.9.2).
2. Here, enter the value **0.250ms** (value of the current controller clock cycle (p0115)).
3. Select the **Drive type** of your application.
4. Under **Motor type**, select **Induction motor**.
5. With **Ext. alarm acknowledgement** all safety alarms are acknowledged, if STO is deselected.
6. Safety-relevant circuits must be checked at least once a year to ensure that they are functioning correctly. For the **Test stop**

	selection, select a fieldbus signal or a digital input. Here, parameterize the **time interval** after which you want an alarm to flag that it is necessary to test the shutdown channels. In addition to the alarm, you can also output the fact that it is necessary to test the shutdown channels for example, at a DO. **7.** **Configuration of encoderless actual value acquisition** only has to be changed very infrequently. **8.** Select the **Mechanics parameterization** button.
	**1.** Parameterize the **Leadscrew pitch** of your application. For an application comparable with CU240S, enter a spindle pitch of 1mm. **2.** Parameterize the **Gear ratio** between the motor and load. The value of **Number of motor revolutions** is obtained from the number of motor revolutions * motor pole pair number (r0313). Example: You have a 2-pole motor and no gearbox ➔ enter a value of 2. **3.** The value for the **Act. value tolerance** generally does not have to be changed. Close this screen form and the configuration screen form.

Safe basic functions (STO, SBC)



Select **Safe basic functions (STO, SBC)**.

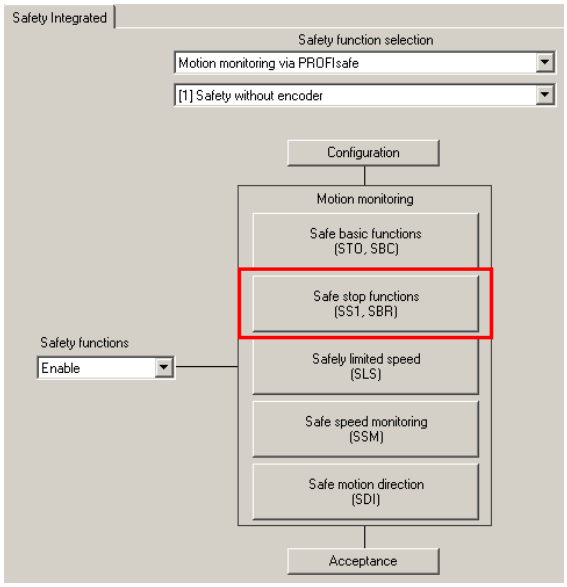


1. Parameterize the time value to be 9000h so that you only obtain an alarm regarding the forced checking procedure.
2. If you wish to use **Safe brake control**, then activate this here.

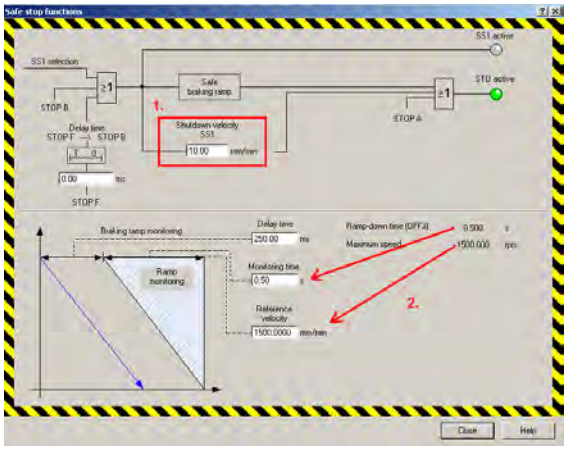
More information regarding STO is provided in the Function Manual **Link** (Chapter 8.5.2).

Close the screen form.

Safe stop functions (SS1, SBR)



If you wish to use the SS1 safety function, then select **Safe stop functions (SS1, SBR)**.

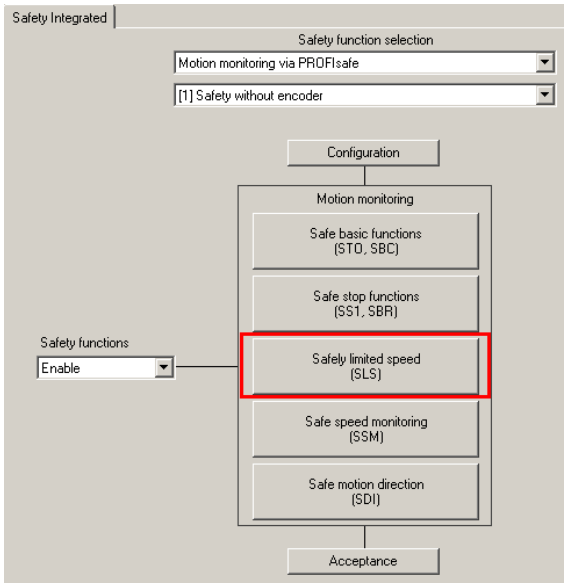


1. Parameterize the speed where the SS1 ramp is ended and STO is activated. More detailed information is provided in the Function Manual **Link** (Chapter 8.3.5).
2. Use the displayed value of the **Ramp-down time (OFF3)** for the SS1 **Monitoring time**, as well as the displayed **Maximum speed** for the **Reference velocity**.

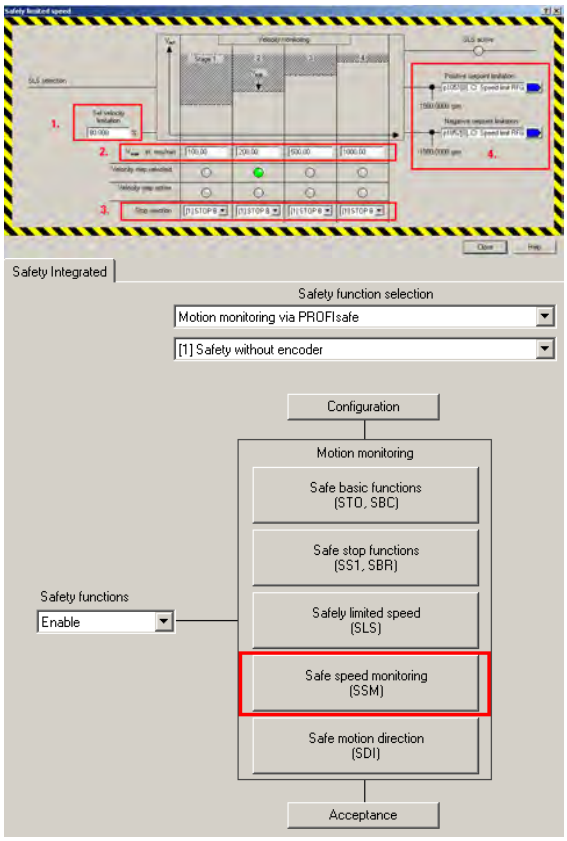
More information regarding SS1 is provided in the Function Manual **Link** (Chapter 8.5.3.2).

Close the screen form.

Safely limited speed (SLS)



If you wish to use the SLS safety function, then select **Safely limited speed (SLS)**.

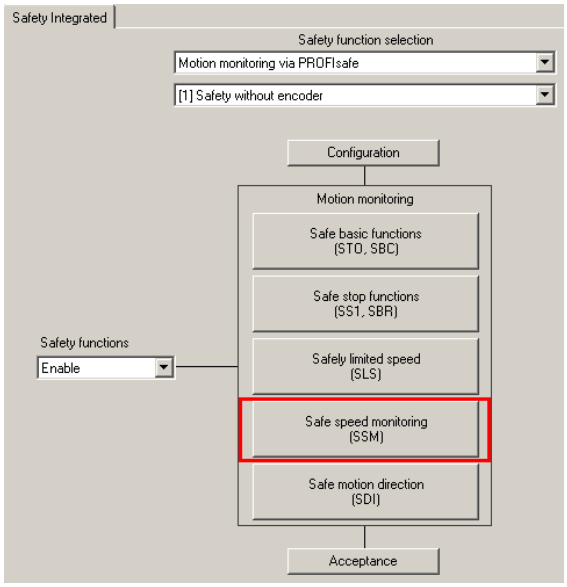


1. Here, parameterize the % of the limit speed parameterized under **2.** to which the motor speed should be limited (example: level 1 with 100 rpm is selected at 80% **Set velocity limitation** ➔ the resulting speed is 80 rpm).
2. Speed limits of the 4 SLS levels.
3. Parameterize the stop response when the SLS limit speed level is exceeded (STOP A = STO, STOP B = SS1).
4. Interconnect parameter **p1051(0)** with **Positive setpoint limitation** and parameter **p1052 (0**) with **Negative setpoint limitation**.

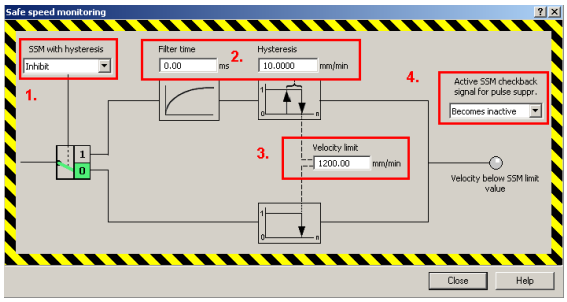
More information regarding SLS is provided in the Function Manual **Link** (Chapter 8.5.6.2).

Close the screen form.

Safe speed monitoring (SSM)



If you wish to use the SSM safety function, then select **Safe speed monitoring (SSM)**.

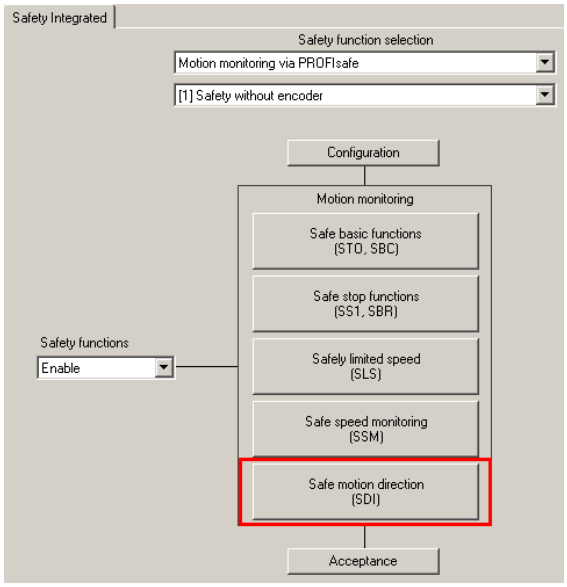


1. If you wish to use **SSM with hysteresis**, then activate this here. Please note that after activating hysteresis, a ModID can no longer be performed.
2. Setting the hysteresis.
3. Here, parameterize the speed limit for SSM.
4. Behavior when the motor is switched off.

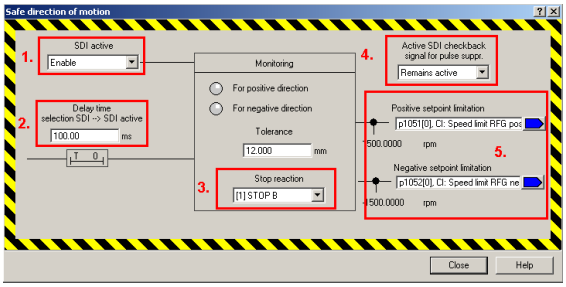
More information regarding SSM is provided in the Function Manual **Link** (Chapter 8.5.7.2).

Close the screen form.

Safe motion direction (SDI)



If you wish to use the SDI safety function, then select **Safe motion direction (SDI)**.

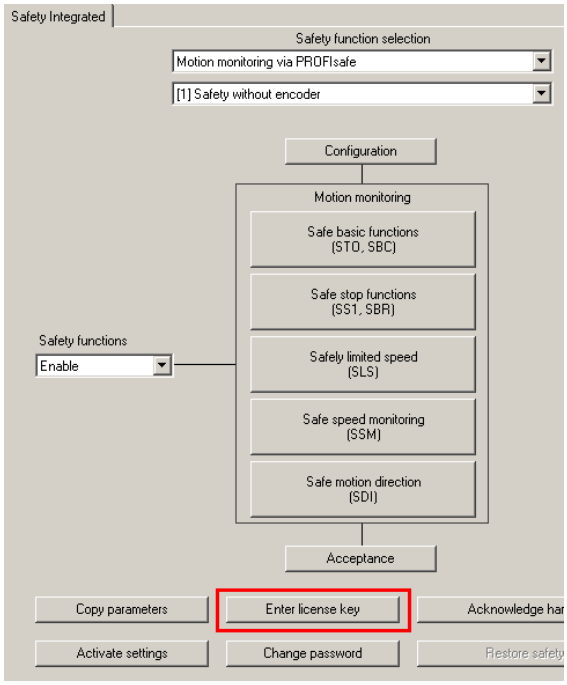


1. Enable the safety function.
2. Here, you can parameterize a **Delay time** between selecting and activating SDI.
3. Set the **Stop reaction** when the direction of rotation is violated (STOP A = STO, STOP B = SS1).
4. Behavior when the motor is switched off.
5. If this has not already been done when parameterizing SLS, interconnect **parameter p1051(0)** with **Positive setpoint limitation** and parameter **p1052 (0)** with **Negative setpoint limitation.**

More information regarding SDI is provided in the Function Manual **Link** (Chapter 8.5.10.2).

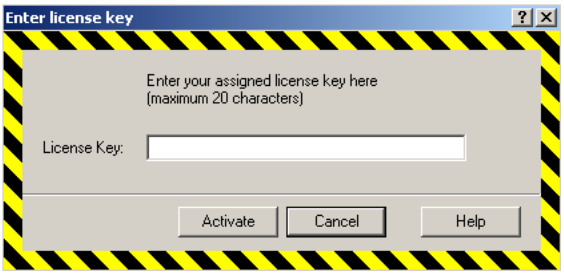
Close the screen form.

Entering the license key



A license is required in order that the Extended Safety functions can be used.

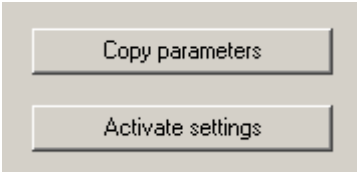
Insert an MMC card with the Extended Safety license into the CU305, and press the button **Enter license key** .



Enter the license number printed on the license certificate and press the **Activate** button.

More information on licensing is provided in the Function Manual **Link** (Chapter 10.8).

Completing parameterization



To accept the parameterization, first press the button **Copy parameters** and then press the button **Activate settings**.

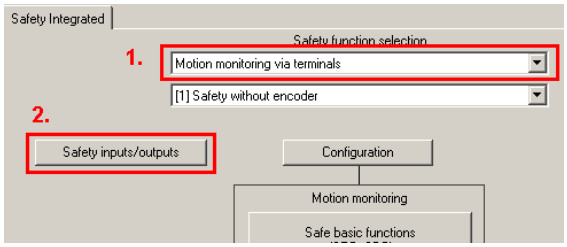
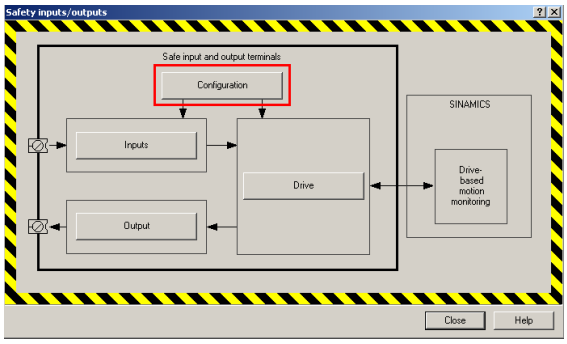
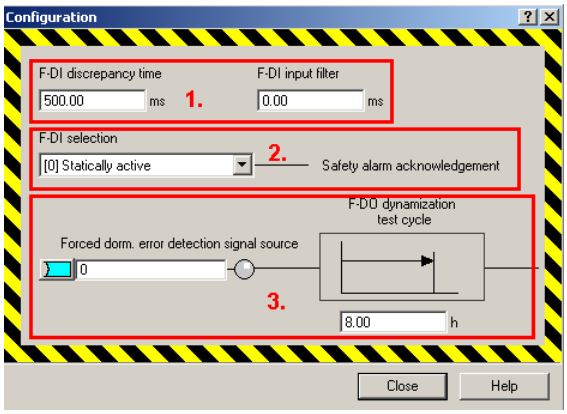
When you are requested to do so, enter a new password. Please note down this password, as this cannot be read out of the SINAMICS S110.

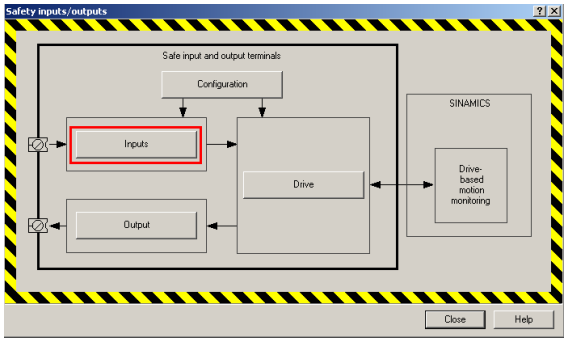
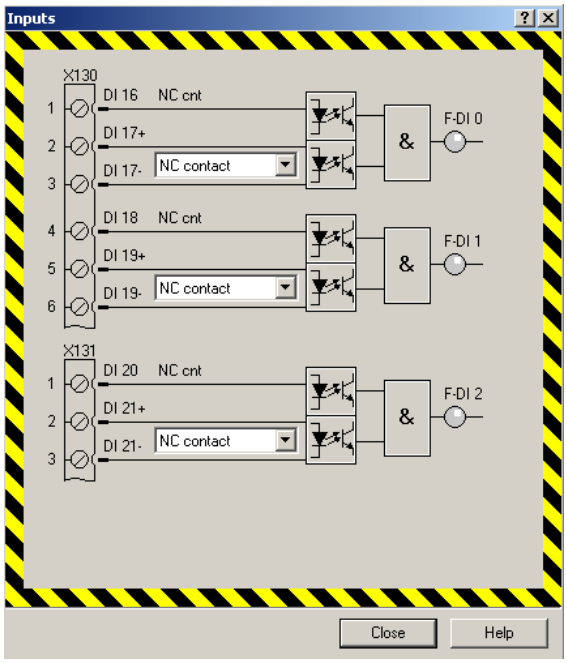
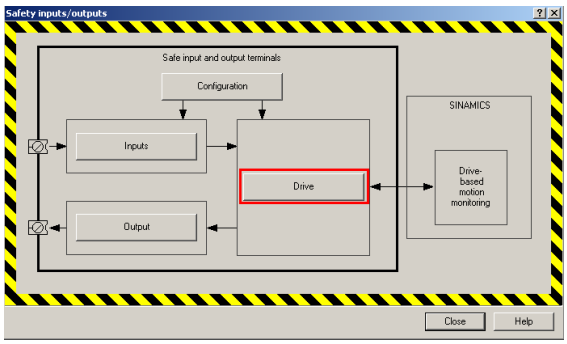
Confirm the prompt to **Save parameters** with **Yes**.

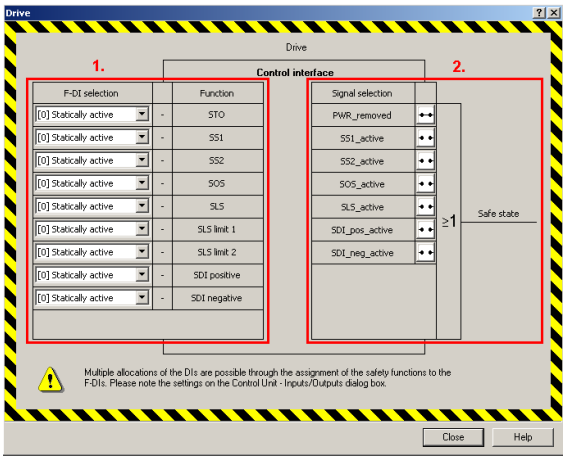
To complete commissioning, carry out a POWER-ON reset (switch-off the SINAMICS S110 power supply and switch-on again).

7.9.5 Extended Safety via terminals

Parameterizing the Extended Safety functions with control via terminals changes only slightly from the procedure specified in Chapter 7.9.4. The main difference is the parameterization of the fail-safe inputs.

<table>
<tr><td> 
</td><td>Under Safety function selection, select Motion monitoring via terminals.
Then press the Safety inputs/outputs button.</td></tr>
<tr><td colspan="2">Configuration</td></tr>
<tr><td> 
</td><td>In the screen form that is then displayed, press the Configuration button.</td></tr>
<tr><td> 
</td><td>Using these settings, you can influence the monitoring of the two F-DI inputs as to whether they occur simultaneously and filter the F-DI signal.
Interconnect the Safety alarm acknowledgement with a free F-DI. If you no longer have any free F-DI available, then select [255] static inactive. As a consequence, safety alarms can only be acknowledged using a POWER-ON reset.
Safety-relevant circuits must be checked at least once a year to ensure that they are functioning correctly. For the Forced dorm. error detection signal source of the F-DO, select a fieldbus signal or a digital input. Here, parameterize the Time cycle after which you want an alarm to flag that it is necessary to test the shutdown channels.
Close the screen form.</td></tr>
<tr><td colspan="2">Parameterizing the F-DIs</td></tr>
</table>

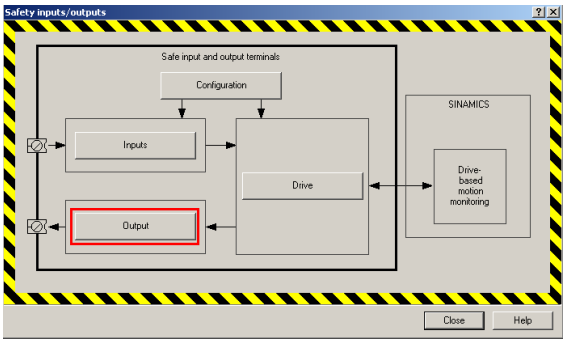
	Press the **Inputs** button.
	In this screen form you can parameterize the F-DIs to match your particular sensor type. Sensors with two NC contacts or one NC and one NO contact can be directly connected. Close the screen form.
Assigning the safety functions to the F-DIs	
	Press the **Drive** button.



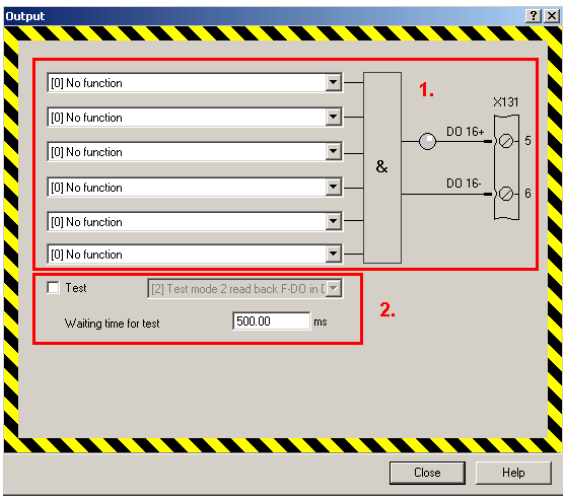
1. Assign the safety functions that you require to an F-DI. Safety functions that are not used should be interconnected with **[255] Statically inactive** .
2. Here, you can assign the internal fail-safe signals to the **Safe state** signal. In turn, you can interconnect this signal with F-DO, which can then be additionally processed.

Close the screen form.

Parameterizing the F-DO



If you wish to use the F-DO, then press the **Output** button.



1. Interconnect the corresponding functions with the F-DO.
2. If you wish to use the feedback input DI22 for the F-DO, then activate **Test** and parameterize the feedback input corresponding to your particular application.

Close this screen form and the **Safety inputs/outputs** screen form.

7.9.6 Extended Safety via PROFIsafe and terminal

This functionality is a combination of the parameterization described in 7.9.4 and 7.9.5.

8 Drive fault messages

The fault messages/signals of the CU305 have changed when compared to the CU240S. If the fault texts are to be displayed on an HMI for diagnostic purposes, then the corresponding fault texts can be downloaded under the following **Link**.