Controlling an ALM with SIMATIC S7 CPU

SIMATIC / SINAMICS

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Question

How can you control the ALM (with Drive-CLIQ) of a SINAMICS S120 through the SIMATIC program?

Answer

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

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1 Objective

The SIMATIC S7-CPU and the SINAMICS S120 communicate with each other via PROFIBUS or PROFINET.

With the FB390 "ALM_Control" block you can control the ALM through the user program of the S7 if it is connected with a Drive-CLIQ with a CU320(-2).

2 Overview

The S7-CPU is connected via PROFIBUS or PROFINET with the CU320(-2) of a SINAMICS S120. The ALM is connected via Drive-CLIQ with the CU.

In the SINAMICS S120 a control and status telegram can be defined for each module (CU, ALM, motor module, etc.). If this is performed for an ALM, then it can be switched on and off from the S7.

The FB390 "ALM_Control" block checks the status of the ALM and allows the user to switch it on and off.

The block can be downloaded on the page of these FAQs. (Link see page 2.)

3 Communication Configuration

3.1 Telegram definitions

To configure the SINAMICS you can either use the STARTER software that is free of charge or one of the following (chargeable) packages:

- DRIVE ES
- S7 Technology
- SIMOTION Scout

The functionality of the STARTER is already integrated in these packages. Only one of the packages or the STARTER can be installed on a PC/PG. When using the STARTER the configuration of the communication has to be entered twice (once for the drive and once for the PLC), the other packages synchronize it automatically.

3.1.1 Telegram definition with STARTER

When using the STARTER software you may have to import the GSD or the GSDML file into STEP 7.

The GSD/GSDML file for the SINAMICS S 120 can be found on the CF memory card of the SINAMICS S 120. Copy it to your configuration PC and import it in HW Config.

Configuration in the starter

- 1. Open the Starter
- 2. Add a new infeed and select your infeed.

Figure 3-1

Process data exchange	Configure the infeed comp	oonent:			
Summary	Component name:	Einspeisung			
	Supply voltage range:	380 - 480 3-pł	nase V	AC	
	Cooling method:	Internal air coo	oling		
	Туре:	All			
	Selection				200
	Order no.	Rated power		Rated current	
	6SL3130-7TE21-6Axx	16 kW		27 A	
	6SL3130-7TE23-6Axx	36 kW		60 A	
	6SL3130-7TE25-5Axx	55 kW		92 A	
	6SL3130-7TE28-0Axx	80 kW		133 A	
-40.4%	6SL3130-7TE31-2Axx	120 kW		200 A	
Finner	6SL3330-7TE32-1AAx	132 kW		210 A	
	6SL333U-7TE32-6AAx	160 kW		260 A	
1	6SL333U-7TE33-8AAx	235 kW		380 A	
=	65L333U-71E35-UAAx	300 KW		490 A	
-	65L333U-71E36-1AAx	380 KW		605 A	
	65L333U-71E38-4AAX	500 KW		84U A	
	65L333U-71E41-UAAX	630 KW		385 A	
Bir and a second	63L3330-71E41-4AAX	300 KW		1405 A	
				1	
	1-1				<u></u>

3. Configure your additional module (in the example here, a filter).

⊘ Infeed	Infeed: Einspeisung_1
Infeed drive object - a Process data exchange	Line/DC-link identification at first switch-on
Summary	Caution:
	The determined values are stored safely against power loss. If the power supply or the DC link (removal/adding of devices) of the drive line-up is subsequently changed, an identification must be performed again.
	Device connection voltage: 400 V 3-phase AC 50-60 H
x _)	✓ Line filter available [31] Basic Line Filter booksize 400 V 16 kW (6SL3000-0BE21-6C ▼
• <u>•</u>	✓ Line filter available [31] Basic Line Filter booksize 400 V 16 kW (6SL3000-0BE21-6€)
••	
••	Line filter available [31] Basic Line Filter booksize 400 V 16 kW (6SL3000-0BE21-6C) Parallel connection infeed (6SL3130-7TE21-6Axx - 16 kW) Number of parallel modules:
· •	Line filter available [31] Basic Line Filter booksize 400 V 16 kW (6SL3000-0BE21-6C) Parallel connection infeed (6SL3130-7TE21-6Axx - 16 kW) Number of parallel modules: Voltage sensing module available Number of VSMs:
	 Line filter available [31] Basic Line Filter booksize 400 V 16 kW (6SL3000-0BE21-6C) [31] Basic Line Filter booksize 400 V 16 kW (6SL3000-0BE21-6C) Parallel connection infeed (6SL3130-7TE21-6Axx - 16 kW) Number of parallel modules: 0 Voltage sensing module available Number of VSMs: 0 Braking Module external

4. Configure a "SIEMENS Telegram 370, PZD-1/1" for the ALM of the SINAMICS S120.

Figure 3-3

ZInfeed ZInfeed drive object - ac	Infeed: Einspeisung_1	
Process data exchang Summary	Select the PROFIdrive message frame type	3.
	[370] SIEMENS telegram 370, PZD-1	/1
	[370] SIEMENS telegram 370, PZD-1 [999] Free telegram configuration with	/1 BICO
		Length (words)
	Input data / actual values:	1
	Output data / setpoints:	1
	Notes:	
47	 The PROFIdrive process data will b parameters in accordance with the set These BICO parameters cannot be su 	e interconnected to BICO lected message frame type, bsequently changed,
	2. This data is relevant for Interface 1 settings on the control unit.	in accordance with the
1		

5. Complete the configuration of the infeed

Inteed Inteed drive object - ac Process data exchange Summary	Infeed component: Order no.: 65L3130-7TE21-6Axx Rated power: 16 kW Bated current: 27 A
	Infeed drive object - additional data: Supply system / DC link identification when first switched on: No Device connection voltage: 400 V Rated mains frequency: 3-phase AC 50-60 Hz Line filter: [31] Basic Line Filter booksize 400 V 16 kW (6SL3000-0BE21-6DA0) Voltage sensing module: Not available External braking module: Not available Master/Slave: not available Process data exchange (infeed drive object): PROFIBUS PZD message frame: [370] SIEMENS telegram 370, PZD-1/1
	Copy text to clipboard

- 6. Also configure the necessary telegram types for your application for all the other components (e.g. motor modules).
- 7. Load the configuration into the SINAMICS S120, save and start "Copy RAM to ROM"

Configuration in HW Config

- Configure your bus system and use the entries under other field devices for the SINAMICS S 120 (e.g. "PROFIBUS-DP\Additional FIELDDEVICES\Drives\ SINAMICS\SINAMICS S")
- 9. Configure the same telegram configuration as previously in the STARTER:

Figure 3-5

🖳 HW Config - [SIMATIC 300(1) (Configuration) ALM	_control]		X
🕅 Station Edit Insert PLC View Options Window Help		_ 8	×
D 😅 🐎 🖩 🗞 🎒 🖪 🛯 🛍 🏜 🚯 🗔 🚼	₩ ?		
Image: Constraint of the second state of the second sta	Address Comment 6257	Eind: Profile: Standard Profile: Standard Profile: Standard Profile: Standard Profile: Standard Devices Comparison of the standard Standard Standard Standard Standard Standard telegram 1, F2D-5/14 Standard telegram 4, F2D-5/19	
2 1 -> SIEMENS telegram 370, F2			4
3 195 SIEMENS telegram 390, PZD-2 258261 258	8261		
4 1 → SIEMENS talegram 390, F2		Free telegram, PZD length 16/16 words 🗧 🤁	١
	<u> </u>		
Press F1 to get Help.		Chg	//

10. Save and compile the configuration and load it to the CPU.

3.1.2 Telegram definition with DRIVE ES, S7 Technology or SIMOTION Scout

- NoteThe description below applies only for all S7-CPUs without integrated
technology!
If you are using a CPU with integrated technology (CPU 31xT or CPU 317TF),
the drives are connected to the technology and you have to use the PLC open
blocks of S7 Technology. The following entry provides information for
commissioning the S7 Technology with SINAMICS S120
http://support.automation.siemens.com/WW/view/en/48358172
- **Note** If you cannot find the SINAMICS firmware version you are using in the catalog of the HW Config, you may have to install a SSP (SINAMICS Support Package) first, in order to update the starter functionality in DRIVE ES, S7 Technology or SIMOTION Scout.

Configuration in HW Config

1. Only create the SINAMICS station in HW Config without configuring it any further:

Figure 3-6

<u>8</u> ~ 04 0	k 4 4 6 🛦 🛦 🚯 🗖 🕄 I	\$?
🛋 (0) UR		
1	PS 307 5A	
2	CPU 315-2 PN/DP	
XT	MPI/DP	COOCIDIIS(1) DO Masteriation (1)
X2	PN-IO	PROFIBUS(1): DP-Mastersystem(1)
X2 P1	Port 1	
3	-	🗎 (4) SINAMI
4		1718
5		
6		
7		
8	100	
0	<u> </u>	

2. Save the configuration

Configuration in Drive Monitor, S7T Config or Scout

- 3. Go to the Drive Monitor, S7T Config or Scout.
- 4. Configure the message frame you need to use.

Figure 3-7										
→S7T Config - ALM_Test_Labor - [SINAM	ICS_5120_	CU320 - Mes	sage	frame configuration]						
🇓 Project Edit Insert Targetsystem Vie	w Options	Window Hel	Þ							
	N?	<mark>*</mark> 🖄 %	* +] -	₩L0	-36 (n)	n V _F	- <u>-</u>	
ALM_Test_Labor	IF1: PROFI	drive PZD mes	sage f	rames IF2: PZD message frames						
→ Insert single drive unit The drive objects are supplied with data from the PROFIdrive message frame in the following order: → ■ SIMATIC 300(1) The input data corresponds to the send and the output data of the receive direction of the drive object.							t.			
Overview Master view: Master view: Diject Drive object No. Moscore forma time. Input data						Input data Output data				
	Object	DI IVE ODJECI	NU.	Message frame type		Length	Address	Length Address		SIMOTION axis
E ⊂ CU_S_003	1	Einspeisung_1	2	SIEMENS telegram 370, PZD-1/1	*	1	256257	1	256257	
Inreeds	2 Mithout	CU_S_003	1 in dat	SIEMENS telegram 390, PZD-272	~	2	260263	2	260263	
⊕ Drives ⊕ MONITOR	Dek	ete Line		Insett Line 🔻 Configure mess	age	frame				
<u> </u>	4:1									
Technology	Isinamic	S_S120_CU32	0							

5. Then click the "Transfer to HW Config" button.

Figure 3-8

I Encode of the log of th	I Inclusion Inclusion Inclusion Address Length Address 1 Einspeisaurg_1 2 SIEMENIS telegram 370, PZD-1/1 # 1 256, 257 1 256, 267	Improvement Improvement Length Address Length Address 1 Einspeisung_1 2 SEMENS telegram 370, PZD-1/1 Improvement 2 256.267 1 256.267 1 2 2 200.263 1 SEMENS telegram 390, PZD-2/2 Improvement 2 200.263 2 200.263 2 200.263 2 2 200.263 2 200.263 2 200.263 2 200.263
1 Einspeisung_1 2 SEMENS telegram 370, PZD-1/1	1 Einspeisung_1 2 SIEMENS telegram 370, PZD-1/1	Imspelsiong_1 2 SEMENS telegram 370, PZD-1/I ✓ 1 256267 2 CUL_S_003 1 SEMENS telegram 390, PZD-2/2 ✓ 2 260263 2 260263 Rthout PZDs (no cyclic data exchange)
2 (CU_S_003 1 SEMENS telegram 390, PZD-2/2 🐓 2 260263 2 260263 hout PZDs (no cyclic data exchange)	2 (CU_S_003 1 SIEMENS telegram 390, PZD-2/2	2 (CU_S_003 1 SEMENS telegram 390, PZD-222
hout PZDs (no cyclic data exchange)	hout PZDs (no cyclic data exchange)	thout PZDs (no cyclic data exchange)
		Dolota Line V Configure message frame
Defetre Line ▼ Configure message frame	Defete Line Configure message frame	Delete Line V Configure message frame
Delete Line Configure message frame	Delete Line Configure message frame	Delete Line V Configure message frame
Delete Line Configure message frame	Delete Line Configure message frame	Delete Line Insett Line Configure message frame
Delete Line Configure message frame	Delete Line Configure message frame	Delete Line Configure message frame

6. Save and compile the configuration and load it to the drive.

By transferring it, the configuration of the SINAMICS S120 was adjusted in HW Config:

Figure 3-9							
HW Config - [SIMATIC 300(1) (Configuration) ALM Test Labor]							
In Station Edit Insert PLC View Options Window	Help	-					
」L ≥ ≌~ [©] ♥: ⇔ ♥ E थ̀и थ́и [)							
DO UR PS 307 5A PS 307 5A CPU 315-2 PN/DP X7 MPI/DP X2 PN-40 X2 P1 Pod 1 3		1	PROFIBUS(1): DP-Mastersystem (1)				
3							
<u>10 1</u>							
(4) SINAMICS_S120_CU320							
Slot M. Message frame selection / default	address	0 address	Comment				
4 Drive SIEMENS message frame 370, FZD-1/1	256257						
5 Drive SIEMENS message trame 370, FZD-1/1		256257					
6 Drive							
7 Drive SIEMENS message frame 390, FZD-2/2	280263						
8 🛽 Drive SIENENS message frame 390, FZD-2/2		280263					
9							
10							

7. Save and compile the configuration and load it to the S7 CPU.

4 STEP 7 Programming

Copy the FB390 "ALM_Control" block into the block container of your SIMATIC project. Integrate the block through a cyclic call (e.g. in OB1) into your program and load the modified program into the CPU.

Figure 4-1

```
CALL "ALM_Control", "IDB"
ALMEnable :=
ALMQuitError :=
PZDReceive_IN:=
ALMOn :=
ALMRdy :=
ALMError :=
PZDSend_OUT :=
```

4.1 Block interface

Table 4-1

Parameters	Data type	Initial value	Description			
Inputs						
ALMEnable	BOOL	FALSE	As long as ALMEnable = TRUE, it will be attempted to switch on ALM. The ALM goes into RUN state if no error is pending that stops the enable.			
ALMQuitError	BOOL	FALSE	If the ALM has an error, it can be acknowledged with ALMQuitError = TRUE.			
PZDReceive_IN	WORD	W#16#0	Byte input start address of the ALM (telegram 370) from the hardware configuration e.g. PIW 256			
			Image: Weight of the second			
Outputs						
ALMOn	BOOL	FALSE	ALM feedback indicating that it is in operation state.			
ALMRdy	BOOL	FALSE	Feedback whether ALM is ready to be switched on.			
ALMError	BOOL	FALSE	An error is pending at ALM.			
PZDSend_OUT	WORD	W#16#0	Byte output start address of the ALM (telegram 370) from the hardware configuration, e.g. PQW 256			
			(4) SINAMICS_S120_CU320 Slot M. Message frame selection / default I address D address 4 Drive SIEMENS message frame 370, F2D-1/1 256257 256257 5 Drive SIEMENS message frame 370, F2D-1/1 256257 256257 6 Drive SIEMENS message frame 370, F2D-1/1 256257 256257 6 Drive SIEMENS message frame 370, F2D-2/2 260263 260263 8 Drive SIEMENS message frame 390, F2D-2/2 260263 260263			

Appendix

5 Block Description

5.1 Description of the block networks

Table 5-1

Network	Contents	Remark
1.	Load status word of the ALM	
2.	Switch on ALM or acknowledge error	
3.	Processing the switch-on sequence of the ALM	 It is checked whether an error is pending on the ALM The control right of the CPU is demanded OUT 2 is checked Readiness to switch-on is checked The ALM is switched on
4.	Status request of the ALM	The status of the ALM is requested here
5.	Processing of temporary data	