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Speed Control with SINAMICS V90 and S7-1200 via PROFINET

SINAMICS V90 PROFINET Version



https://support.industry.siemens.com/cs/ww/en/view/109739222

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1.1 Overview

1 Task

1.1 Overview

Introduction

Speed control is one of the three basic functions for SINAMICS V90 and PROFINET communication is a new and advanced feature. In this manual, the basic application of speed control with PROFINET communication for SINAMICS V90 will be described in detail.

Overview of the automation task

The figure below provides an overview of the automation task. Figure 1-1



Servo Drive

2.1 Solution overview

2 Solution

2.1 Solution overview

Schema Display

The following figure displays the most important components of the solution: Figure 2-1



Delimitation

This application does not include a description of

- PROFINET communication
- SINAMICS V90 PN version
- BOP operation of SINAMICS V90

Basic knowledge of these topics is assumed.

Required knowledge

Basic knowledge on TIA Portal is assumed.

2.2 Hardware and Software Components

2.2 Hardware and Software Components

2.2.1 Validity

This application example is valid for

- TIA Portal V13 or newer
- S7-1200 CPU with PN interface
- SINAMICS V90 PN FW V10000.4 or newer
- SIMOTICS S-1FL6 Li motor

2.2.2 Used Components

The application was generated with the following components:

Hardware components

Table 2-1

Component	No.	Article number	Note
SIMATIC S7-1200 1214C DC/DC/DC	1	6ES7214-1AG31-0XB0	
SINAMICS V90 PN 200V 1		6SL3210-5FB10-2UF0	200W
SIMOTICS S-1FL6 Li motor		1FL6032-2AF21-1AA1	200W

Standard software components

Table 2-2

Component	No.	Article number	Note	
TIA Portal	1		V13	
SINAMICS V-ASSISTANT	1		V1.04.00.02	

Sample files and projects

The following list includes all files and projects that are used in this example. Table 2-3

Component	Note
109739222_SpeedControl_V90_S7-1200_MOVE_PROJ.pdf	Project file for Scenario A
109739222_SpeedControl_V90_S7-1200_SINA_SPEED_PROJ.zip	Project file for Scenario B
109739222_SpeedControl_V90_S7-1500_DOC_en.pdf	Documentation

3.1 Basics regarding SINAMICS V90 PN version

3 Basics

3.1 Basics regarding SINAMICS V90 PN version

SINAMICS V90 PN supports the following telegrams:

- Standard telegram 1
- Standard telegram 2
- Standard telegram 3
- Standard telegram 5
- Siemens telegram 102
- Siemens telegram 105

Siemens telegram 105 is the default telegram for SINAMICS V90 PN. Since Siemens telegram 105 is for IRT application, which S7-1200 1214C does not support, **the standard telegram 1 has to be used in this basic application**.

3.2 Basic parameter configuration regarding SINAMICS V90 PN

3.2.1 Configure PROFINET settings via SINAMICS V-ASSISTANT

The following parameters can be configured with the SINAMICS V-ASSISTANT from the PROFINET settings menu field:



In this menu filed, you can configure:

• **Communication telegram:** in this tab you can also check the PZD structure and values:

Speed control mode					
Telegram selection					
-					
The current telegram: 1:1	3tandard telegram 1, PZD-2/2				
The PZD fields structure of cur	rent telegram and values of PZD fields are shown in bellow tables .				
PZD structure and values					
Recentive direction (PZD count	(27)		Transmit direction (PZD count	1:7)	
STW1 (P2D1)			ZSW1 (PZ01)		•
Teledgram	Description	Value	Teledgram	Description	Value
STW1	Control word 1	он	ZSW1	Status word 1	60224
080	rising edge = ON (pulses can be enabled); 0 = OFF1 (braking with ram	0	bit0	1 = Ready for switching on	0
681	1 = No OFF2 (enable is possible); 0 = OFF2 (immediate pulse suppres	0	bitt	1 = Ready for operation	0
b#2	1 = No OFF3 (enable possible); 0 = OFF3 (braking with the OFF3 ram	0	bit2	1 = Operation enabled	0
b#3	1 = Enable operation (pulses can be enabled); 0 = inhibit operation (su	0	bit3	1 = Fault present	0
b84	1 = Operating condition (the ramp-function generator can be enabled);	0	bit4	1 = No coast down active (OFF2 inactive)	0
b#5	1 = Continue ramp-function generator, 0 = Freeze ramp-function gener	0	bit5	1 = No fast stop active (OFF3 inactive)	0
b85	1 = Enable setpoint; 0 = Inhibit setpoint (set the ramp-function general	0	bit6	1 = Switching on inhibited active	1
b87	rising edge= 1. Acknowledge faults	0	bit7	1 = Alarm present	0
b#8	Reserved	0	bit8	1 = Speed setpoint - actual value deviation within tolerance t_off	1
b89	Reserved	0	bit9	1 = Control requested	1
bit10	1 = Control via PLC	0	bit10	1 = f or n comparison value reached/exceeded	0
b811	1 = Setpoint inversion	0	bit11	1 = I, M, or P limit reached	1
bit12	1 = Unconditionally open the holding brake	0	bit12	1 = Open the holding brake	0
b813	1 = Motorized potentiometer setpoint raise	0	bit13	1 = No motor overtemperature alarm	1
DI14	1 = Motorized potentiometer setpoint lower	0	bit14	1 = Motor rotates forwards (n_act >= 0): 0 = Motor rotates backwards (1
bit15	Reserved	0	bit15	1 - No alarm, thermal overload, power unit	1

• Network:

Shead control mode
apear commission
PN name of station
tinamics-v90-pn
15/240
Note: Only numbers(0-9) and letters in lower case(a-z) in English are acceptable.
IP protocol
PN P address 0 . 0 . 0 . 0
PN subnet mask 0 , 0 , 0
PN default asteway
Pri interace comparation operation
Save configuration Delete configuration
Note:
(1) All the configuration items will be active when they are saved and the serve of restarted; (2) When cities the Save building all the configuration items will be saved into non-activitie memory and to article the configuration, you need to restart the serve driver.
(3)/When clicks the Delete button, all above configuration will be cleared to factory default values.

Note: the configurations must be saved for activation.

• Active configure: The active PROFINET settings can be checked from the tab.

Speed control mode			
PN name of station:	sinamics-v90-pn		
PN IP address:	192.168.0.2		
PN subnet mask:	255.255.255.0		
PN default gateway:	192.168.0.2		
PN MAC address:	08-00-08-93-E4-DC		

Table 3-1: PROFINET relevant parameters

Par. No.	Description	Set value
P922	Telegram selection	1
P8921	PN IP address. There are four indexes. Each index maps to a segment of the IP address. Note: after successful configuration, the values will be changed to 0 automatically.	Example IP address: 192.168.0.2 P8921[0]=192 P8921[1]=168 P8921[2]=0 P8921[3]=2
P8923	PN Subnet Mask of Station. There are four indexes. Each index maps to a segment of the subnet mask. Note: after successful configuration, the values will be changed to 0 automatically.	Example Subnet mask: 255.255.255.0 P8923[0]=255 P8923[1]=255 P8923[2]=255 P8923[3]=0
P8925	PN interface configuration Note: after successful configuration, the values will be changed to 0 automatically.	2 Note: after setting p8921 and p8923, p8925 should be set to be 2 for activating the PN communication.
r8931	PN IP address of station active	
r8932	PN default gateway of station active	
r8933	PN MAC address of station	

3.2.2 Configure ramp-function generator via SINAMICS V-ASSISTANT

The configuration of ramp-function generator should be configured via the SINAMICS V-ASSISTANT.

The ramp-function generator can be configured with the Parameterize menu field of SINAMICS V-ASSISTANT.

Set parameter setpoint		
Set limits		
Configure inputs/outputs		
View all parameters		

At the tab "**Set parameter setpoint**", you can choose to activate the ramp-function generator or deactivate it:

Ramp-function generator		
Ramp function module active:	On	© Off

Note

There is a need to restart the drive after you've activated or deactivated the ramp-function generator.

In our example, the ramp-function generator should be activated. You can choose to use the basic ramp-function generator or extended ramp-function generator:





Par. No.	Description	Set value
P1115	Ramp-function generator selection	0
P1120	Ramp-up time	10 s
P1121	Ramp-down time	10 s
P1130	Initial rounding-off time	0 s
P1131	Final rounding-off time	0 s

3.2.3 Configure PROFINET settings via the TIA Portal

3.2.3.1 Configure SINAMICS V90 PN

The PROFINET settings of SINAMICS V90 PN can be configured in the TIA Portal as follows:

- 1. Create a new project and switch to project view.
- 2. Input the V90 PN GSD file.
- **Note** Installation of V90 PN GSD file is only necessary for TIA Portal prior to V13 (including V13).



3. Find the GSD file and select it. Press the "**Install**" button to install it.

anage general station description				· · · · · · · · · · · · · · · · · · ·				
Source path: Frequently used/V90 machine test/400 V/10_SP2\Modbus\V90 PN\AdditionalFiles\GSD								
Content of imported path								
File Version Language Status Info								
GSDML-V2.31-Siemens-Sinamics	V2.31	English, Ger	Already installed	SINAMICS,				
<		1		>				
			Delete Install	Cancel				

4. Click the node "Devices & networks" from the device tree on the left side.

V90 PN	ł
🎽 Add new device	
🛱 Devices & networks	I
Unassigned devices	
🕨 🥁 Common data	I
Documentation settings	I
Languages & resources	ł

3 Basics

- 3.2 Basic parameter configuration regarding SINAMICS V90 PN
 - 5. Select V90 PN from the "**other filed drives**" of catalog tree on the right side.



6. Double-click the V90 PN node or drag it to the network view:



3 Basics

- 3.2 Basic parameter configuration regarding SINAMICS V90 PN
 - 7. Configure the **Communication Telegram** in the device view; for example, standard telegram 1:



8. Now from the Properties tab, you can edit the Ethernet address and device name.

SINAMICS-V9	0-PN [Modu	le]				Q Properties	违 Info 🚺 🗓 Diagnostics 👘 🗉 📼
General	IO tags	Syst	em constants	Texts			
▼ General					 Set IP address in the project 		^
Catalog in	formation				IP address: 192 . 168 . 0 . 2		
 PROFINET inte 	erface [X1]						
General							
Ethernet a	ddresses				Use router		
Advanced	options				Router address: 0 . 0 . 0 . 0		
Hardware	identifier	_			IP address is set directly at the device		
Identification	& Maintenanc	e 4					
Module para	meters	-	PROFINET				
Hardware ide	entifier	1					
					Generate PROFINET device name automatically		
			PROFI	NET device n	ame sinamics-v90-pn		
				Converted na	me: sinamics-v90-pn		
				Device num	iber: 1		•

The device name should be the same as the accessible device shown at the Online access tree.

9. You can also configure the I/O address of the communication telegram from the Properties Tab:

General	IO tags	Syst	tem constants	Texts	
General					
Inputs			1/O addresses		
I/O addresse:			Input address	es	
Hardware ide	ntifier				
				Start add	ress: 68
				End add	ress: 71
				Process in	age: Cyclic PI
		,	Output addre	sses	
				Start add	ress: 64
				End add	ress: 67
				Process in	age: Cyclic PI

3.2.3.2 Configure S7-1200 CPU

The PROFINET settings of SIMATIC S7-1200 CPU can be configured in the TIA Portal as follows:

1. Double-click the node "Add new device" from the Device tree:

	Device name:	
Devices		
	Controllers Controllers Controllers Controllers	Device:
Project_V90 PN	SIMATIC ET 200 CPU SWATIC ET 200 CPU SWATIC ET 200 CPU	
🗳 Add new device		Article no.:
🛗 Devices & networks	нл	Version:
PLC_1 [CPU 1214C DC/DC/DC]		Description:
T Device configuration	2	
😓 Online & diagnostics	PC systems	
🕨 🔜 Program blocks		
Technology objects	Drives	
External source files		
🕨 🚂 PLC tags		
PLC data types		
Watch and force tables		
Online backups	Open device view	OK Cancel

- 3.2 Basic parameter configuration regarding SINAMICS V90 PN
 - 2. Here, if you know the detailed information about the S7-1200 modules, you can directly find the type and add it into the project



Otherwise, you can add an unspecified CPU 1200 into the project:

P.C.2 Controllers <	Device name:			
Image: Standing 57:1200 Unipecific CPU 1211 CADDRDN Image: Standing 57:1200 Image: Standing 57:1200 Image: Standing 57:1500 Image: Standing 57:1500 Image: Standing 57:1500 Image: Standing 57:1500 <td< th=""><th>PLC_2</th><th></th><th></th><th></th></td<>	PLC_2			
	Controllers Controllers HMA PC systems Drives	Controllers Controlers Controlers Controllers Controllers Controllers	Device: Article no.: Version: Description: Unspecified	Unspecific CPU 1200 (E57 20000000000 V4.1 *
		, de octooriony		

 If an unspecified 1200 CPU has been added into the project, you can detect the connected CPU by clicking the "Detect" and search it with online access:

de PLC_1		- 🖽 🕅 🍓 🖽 🖲	ί.±
	*c)		
		•	
F	Rack_0	1 2007 2~00	
		Unputs OF E 168	
			The device is not specified. Please use the <u>Hardware catalog</u> to specify the CPU,
			→ or detect the configuration of the connected device.

Start the search by clicking the "**Start search**" button, and the connected S7-1200 CPU will be found if the PROFINET network communication works properly:

Hardware detection for PLC_1					
	Compatible accessi	Type of the PG/PC inter PG/PC inter ble nodes of the selected	face: <u>• PN/IE</u> face: intel(l interface:	(R) Ethernet Connectio	n (3) 1218-LM 🔹 🖲 🔇
	Device	Device type	Туре	Address	MAC address
	plc_1	CPU 1214C DC/D	PN/IE	192.168.0.1	00-1C-06-0E-2E-72
Flash LED					
Online status information:					<u>Start search</u>
 Scan completed. 1 cc 	ompatible devices of	2 accessible devices four	nd.		<u>^</u>
2 Retrieving device information					
Scan and information	retrieval completed.				*
Display only error me	ssages				
					Detect <u>C</u> ancel

4. Press "Detect" button to detect the connected CPU:



5. Double-click the PLC CPU to enter properties of the CPU in the device view:



Here, you can configure information about the device name, Ethernet address...You can also use the "**Online access**" node to find the accessible device and make sure the information are consistent:

	▼ 🔚 Online access	
	🍟 Display/hide interfaces	
	🕨 🛄 Juniper Network Connect Virtual Adapter	×
	Intel(R) Dual Band Wireless-N 7265	*
1	 Intel(R) Ethernet Connection (3) I218-LM 	je k
	Dpdate accessible devices	
	plc_1 [192.168.0.1]	
	sinamics-v90-pn [192.168.0.2]	
	PC Adapter [MPI]	
	PC internal [Local]	
	PLCSIM [PN/IE]	-
	USB [S7USB]	
	TeleService [Automatic protocol detection])
	Eard Reader/USB memory	

3.2.3.3 Connect SINAMICS V90 PN with S7-1200 CPU

After the configurations of both SINAMICS V90 PN and S7-1200 CPU, you need to connect SINAMICS V90 PN to S7-1200 CPU:

1. Right-click the "Not assign":

	Select IO controller ×
SINAMICS V90 P	PLC_1.PROFINET interface_1
Assign to new IO controller Disconnect from IO system	
Highlight IO system	OK Cancel

2. And the connected network view is shown as follows:

	🛃 Topology view 🔥 Network view 📑 Device vie
Network 🚹 Connections HM connection 💌 📰 🖏 🔂 🍳 🛓	
	# IO system: PLC_1.PROFINET IO-System (100)
PLC_1 SINAMICS-V90	
CPU 1214C SINAMICS V90 P 🚳 🔍	

4.1 Installation of the hardware

4 Installation and Startup

4.1 Installation of the hardware

The figure below shows the hardware configuration of the application:



4.2 Startup (JOG from drive side)

Table 4-1

No.	Action	Remarks
1.	Set drive parameter p29108 to be 1.	JOG function is enabled when p29108=1
2.	Switch to JOG menu with drive BOP operation.	
3.	Press \blacktriangle or \blacktriangledown button to run the motor.	

4.3 Startup (PROFINET communication)

4.3 Startup (PROFINET communication)

Table 4-2

No.	Action	Remarks
1.	Set drive parameter p922 to be 1.	Select standard telegram 1
2.	Make device & network configurations in the TIA Portal: • Device name • IP address • Telegram	As shown in section 3.2.3
3.	Go online to test the PROFINET communication.	
4.	Download configurations into controller and device if the communication works.	

5.1 Scenario A

5 Operation of the application

5.1 Scenario A

In scenario A, we use Move instruction for programming and run the motor with watch table:

Table 5-1

No.	Action	Remarks
1.	Program as follows: Network 1: Comment ''Tag_4' MOVE ''Tag_4' Network 2: Comment ''Tag_5' Network 2: Comment ''Tag_9'	
2.	Compile the PLC program and download the program and its configurations into S7-1200 CPU.	
3.	Switch to online mode and enable monitor function:	

5 Operation of the application

5.1 Scenario A

No.	Action	Remarks
4.	Modify M10.0 to 1: Network 1:	
5.	Open the watch table 1: • [a] PtC-1 [CPU 1214C DC/DC/DC] • Device configuration • Online & diagnostics • Program block • Main (OB1) • Technology objects • Bethermal source files • PLC tags • PLC tags • Watch and force tables • Add new watch table • Different table	
6.	Write value 16#47E into QW64: Project_V90 PN > PLC_1 [CPU 1214C DC/DC/DC] > Watch and force tables > Watch table_1 Image: Tag_7* Image: Tag_7*	Q address: 64 67
7.	Write value 16#47F into QW64, and then the drive turns to servo on. Project_V90 PN > PLC_1 [CPU 1214C DC/DC/DC] > Watch and force tables > Watch table_1 # # # # # # # # # # # # # # # # # # #	
8.	Write value 16#2000 into QW66, and then the motor starts running at the speed of 1500 rpm. Project_V90 PN ▶ PLC_1 [CPU 1214C DC/DC/DC] ▶ Watch and force tables ▶ Watch table_1 Image: Start	QW66: speed setpoint. Scaling factor: 4000 hex = value of drive parameter p2000

5.2 Scenario B

5.2 Scenario B

The function block FB285 <SINA_SPEED> is integrated in TIA Portal, especially for speed control with standard telegram 1.

Note The library is integrated in the Startdrive. You can download the latest library from SIEMENS product and information pages (<u>http://support.automation.siemens.com/WW/view/en/68034568</u>) and un-pack the library to the "**Sys**" installation folder of the TIA Portal.



Table 5-2-1 Input interface of FB285

Input signal	Туре	Default	Meaning
Execute	BOOL	0	"Off1" = 1 \rightarrow switch on the drive
Velocity	REAL	0.0 [rpm]	Speed setpoint
FactRPM	REAL	0.0 [rpm]	Rated speed of the drive \rightarrow p2000
AckFlt	BOOL	0	Acknowledgement of axis faults → "AckFIt" = 1
LAddr SP	HW_IO/INT	0	Symbolic name or HW ID/IO address on the SIMATIC S7-1200 of the setpoint slot (S et P oint)
LAddr AV	HW_IO/INT	0	Symbolic name or HW ID/IO address on the SIMATIC S7-1200 of the actual value slot (A ctual V alue)

5.2 Scenario B

Table 5-2-2 Output interface of FB285

Output signal	Туре	Default	Meaning
Error	BOOL	0	1 = general fault active
Errorld	INT	0	 Mode fault / block fault: 0=no fault active 1=drive fault active 2=drive switching on inhibited active 3=error of the SFB call active
PwrInhibit	BOOL	0	Switching on inhibited active \rightarrow PwrInhibit=1
Busy	BOOL	0	Mode is being executed orenabled
VeloAct	REAL	0.0 [rpm]	Current velocity → dependent on scaling factor FactRPM
DiagId	WORD	0	Extended communication error → error during SFB call

In scenario B, we will use FB285 in the library for programming and run the motor.

Table 5-2-3 Operation with FB285



5 Operation of the application

5.2 Scenario B



6 Related literature

Table 6-1

	Торіс	Title / Link
\1\	Siemens Industry Online Support	http://support.industry.siemens.com
\2\	Download page of this entry	https://support.industry.siemens.com/cs/ww/en/view/1097392 22
\3\		

7 Contact

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8

History

Table 8-1

Version	Date	Modifications
V1.0	03/2016	First version