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NEWS

Speed control with SIMATIC S7-1200 and SINAMICS V90PN via PROFINET

SINAMICS V90 PN

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

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1 Task

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



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

2.2.1 Validity

This application example is valid for

- TIA Portal V16
- S7-1200 CPU with PN interface
- SINAMICS V90 PN FW V10401
- 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	6ES7214-1AG40-0XB0	V4.4
SINAMICS V90 PN 200V	1	6SL3210-5FB10-2UF0	200W
SIMOTICS S-1FL6 Li motor	1	1FL6032-2AF21-1AA1	200W

Standard software components

Table 2-2

Component	No.	Article number	Note
TIA Portal	1		V16
SINAMICS V- ASSISTANT	1		V1.06.02

Sample files and projects

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

Component	Note
109739222_S7-1200_V90PN_Speed_Dezentral_ DOC_v13.en.pdf	Documentation
109739222_SpeedControl_V90_S7-1200_MOVE_ PROJ_V16.zip	Project file for Scenario A
109739222_SpeedControl_V90_S7-1200_SINA_SPEED_ PROJ_V16.zip	Project file for Scenario B

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:

Selection of telegrams					
The current telegram:	1 : Standard telegram 1, PZD-2/2 •	The supplementary telegram:		•	
The process data (PZD) line	ks are set up automatically in accordance with the PROFIdrive te	elegram number setting. The telegra	m structure and PZD values of s	selected telegram are shown as below tables.	
PZD structure and values					
Receptive direction (PZD co	punt=2):		Transmit direction (PZD c	count=2):	
CTIMA (DZD4)			- 70W4 (07D4)		
SIWI (P2DI)			· 25W1 (P2D1)		
Telegram	Description	Value	Telegram	Description	Value
STW1	Control word 1	0000H	ZSW1	Status word 1	0000H
bit0	rising edge = ON (pulses can be enabled); 0 = OF	0	bit0	1 = Ready for servo on	0
bit1	1 = No OFF2 (enable is possible); 0 = OFF2 (imme	0	bit1	1 = Ready for operation	0
bit2	1 = No OFF3 (enable possible); 0 = OFF3 (braking	0	bit2	1 = Operation enabled	0
bit3	1 = Enable operation (pulses can be enabled); 0 =	0	bit3	1 = Fault present	0
bit4	1 = Operating condition (the ramp-function genera	0	bit4	1 = No coast down active (OFF2 inactive)	0
bit5	1 = Continue ramp-function generator; 0 = Freeze	0	bit5	1 = No fast stop active (OFF3 inactive)	0
bit6	1 = Enable setpoint; 0 = Inhibit setpoint (set the ra	0	bit6	1 = Switching on inhibited active	0
bit7	rising edge= 1. Acknowledge faults	0	bit7	1 = Alarm present	0
bit8	Reserved	0	bit8	1 = Speed setpoint - actual value deviation within t	0
bit9	Reserved	0	bit9	1 = Control requested	0
bit10	1 = Control via PLC	0	bit10	1 = f or n comparison value reached/exceeded	0
bit11	1 = Setpoint inversion	0	bit11	1 = I, M, or P limit reached	0
bit12	Reserved	0	bit12	1 = Open the holding brake	0
bit13	Reserved	0	bit13	1 = No motor overtemperature alarm	0
bit14	Reserved	0	bit14	1 = Motor rotates forwards (n_act >= 0); 0 = Motor	0
bit15	Reserved	0	bit15	1 = No alarm, thermal overload, power unit	0

Network:

•

Name of PN station	Active name of PN station			
0 / 239 Note: Only numbers(0-9), letters in lower case(a-z) and characters (- and .) in English are acceptable.				
IP protocol	Active IP protocol			
IP address of PN station 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0	IP address of PN station 0 0 0 Subnet mask of PN station 0 0 0 0 Default gateway of PN station 0 0 0 0 0 MAC address of PN station 00 00 00 00 00 00			
Save and activate the PN station name and IP protocol				
Save and active Note: 1. The network configuration is activated after clicked the button "Save and active" and restarted the drive. 2. The network can be configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configured either via TLAportal or VASSISTANT 3. If Protocols is configu				



the configurations must be saved and active. Then should restart the drive.

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	

Table 3-1: PROFINET	relevant parameters
---------------------	---------------------

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.

Configure ramp function			
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(p29108.0):	Inactive	-
When the ramp function is inactive, some para	Inactive	hctic
······	Active	

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

Table 3-2: Ramp-function generator relevant parameters

Configure PROFINET settings via the TIA Portal 3.2.3

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.
- Installation of V90 PN GSD file is only necessary for TIA Portal prior Note to V13 (including V13).



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

manage general	station description	imes			
Installed GSDs	GSDs in the p	project			
Source path:	F:\PNGSD				
Content of imp	orted path				
File		Version	Language	Status	Info
GSDML-V2.32	-Siemens-Sinamics	V2.32	English, Ger	Already installed	SINAMICS,
					_
					_
<					>
				Delete Install	Cancel

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



5. Select V90 PN from the "**other filed drives**" of catalog tree on the right side.

	~	Catalog	9			
	< <u>s</u>	earch>			ini ini	tini U
		Filter	Profile:	<all></all>	1	- 📑
			S S	INAMICS	S120/S1.	
			1 s	INAMICS	\$120/\$1	
				NAMICS	\$120/51	
				NAMES	6120/61	
			>	INAMICS	5120/51.	
			S	INAMICS	\$120/\$1.	
			S 📘 S	INAMICS	S120/S1.	
			🚺 S	INAMICS	S210 PN	V
			🚺 S	INAMICS	S210 PN	V
			🚺 s	INAMICS	V90 PN V	1.0
		🔹 🕨 🫅	Encoders			
		> 🖬	Gateway			
		•	1/0			
		• 🖬	Sensors			
						~
	(
				_		~
Options	~	Inform	ation			
	De	vice:				<u>^</u>
✓ Catalog						
<earch></earch>				5		
Filter						
Controllers						
► I HM						
Grives & starters			SINAM	ICS V90	PN V1.0	≡
In Network components						
Im Detecting & Monitoring						
Distributed I/O	Art	icle no.:	6SL3 (210-5Fxx	x-xxFx	
Field devices						
Other field devices	Ve	rsion:	(GSD	ML-V2.32	2-SIEMENS	-
▼ U PROFINETIO						
Im SIEMENS AG	De	scription	:			
	10	dan ing c	IN A RECEIPT		oith	
SINAMICS DC MASTER CBE20 V1.1	10	DEVICE S	INAMICS VS	0 PN V1	.0 with	alia.
SINAMICS DC MASTER CBE20 V1.2	FRO	mmunice	tions close	k cycle	na non-cy	,ciic
SINAMICS DC MASTER CBE20 V1.3	COI SUM	chroniza	tion)	k cycle		
SINAMICS DC MASTER CBE20 V1.4	syr	iemonize	nuon)			~

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





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

SINAMICS-V90-PN [Module]	ig, Pr	operties 🚺 Info 👔 🗓 Diagnostics 📰 🖃 🥆
General IO tags System constants Texts		
General Catalog information PROFINET interface [X1] General	 Set IP address in the project IP address: 192.168.0.2 Subnet mask: 255.255.0 	
General Ethernet addresses ▶ Advanced options Hardware identifier Identifications & Maintenance	Use router Router address: 0 . 0 . 0 . 0 P address is set directly at the device	
Module parameters PROFINET		
	Generate PROFINET device name automatically	
PROFINET device	ame sinamics-v90-pn	
Converted	ame: sinamics-v90-pn	
Device n	nber: 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	Sys	tem constants	Texts	
 General 			NO addresses		
Inputs			I/O addresses		
1/O addre	ses		Input address	es	
Hardware	identifier				
				Start add	ress: 68
				End add	ress: 71
				Process im	age: Cyclic PI
			Output addre	sses	
				Start add	ress: 64
				End add	ress: 67
				Process im	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:



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

Add new device		-	_	×
Device name:				
PLC 1			1	
Controllers Controllers HM PC systems PC systems Drives			Device: Article no.: Version: Description: Work memory DI14 × 24VDC Al2 on board; outputs on-bo board I/O; up 1 serial commu for I/O expans device, transp User Commu server, OPC U.	CPU 1214C DC/DC/DC CPU 1214C DC/DC/DC 6E57 214-1AG40-0XB0 V4.4 100 KB; 24VDC power supply with SINK/S OURCE, DQ10 x 24VDC and 6 high-speed counters and 4 pulse ardt, signal board expands on- nication; up to 8 signal modules for nication; up to 8 signal modules to 3 communication modules for nication; PROFINETIO controller, I- boart protocol TCP/IP, secure Open nication; S7 communication, Web A: Server DA
	CPU SIPLUS	~		
🖌 Open device view				OK Cancel



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

3. 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:



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:

		Type of the PG/PC inter	face: 📃	PN/IE	•
		PG/PC inter	face: 🔊	Intel(R) Ethernet Connectio	n (3) I218-LM 💌 🖲
	Compatible acce	ssible nodes of the selected	l interface:		
	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					
Inline status informatio	in:				<u>S</u> tart search
 Scan completed. 1 	compatible devices	of 2 accessible devices four	nd.		~
Retrieving device in	formation				
	and an address of the second se	ad			

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	*
 Intel(R) Ethernet Connection (3) I218-LM 	100 V
Update accessible devices	
plc_1 [192.168.0.1]	
Image: Sinamics-v90-pn [192.168.0.2]	
PC Adapter [MPI]	
PC internal [Local]	
PLCSIM [PN/IE]	2
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":

SINAMICS-V90	Select IO controller X Name PLC 1 PROFINET interface 1
Not ass Add IO system Assign to new IO controller	
Disconnect from IO system	OK Cancel

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

Project_V90 PN → Devices & networks					- *	=×
		ē	Topology view	Network view	🛐 Device vi	iew
Network 11 Connections HMI connection	- 🗹 👯 🖽 🍳 ±				-	
			# IO system	n: PLC_1.PROFINET IO	-System (100)	_
						-
PLC_1	SINAMICS-V90-					
	PLC_1					
	PLC 1 PROFINETIO-Syste					
	PLC_1.PROFINETIO-Syste					

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

Nr.	Action	Remarks
1.	Set drive parameter p29108 to be 1.	JOG function is enabled when p29108=1
2.	Save the parameters and then restart the drive again.	
3.	Switch to JOG menu with drive BOP operation.	
4.	Press \blacktriangle or \blacktriangledown button to run the motor.	
5.	After finish the JOG funtion, set P29108 to 0.	
6.	Save the parameters and then restart the drive again.	

4.3 Startup (Profinet communication)

Table 4-2

Nr.	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 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

Nr.	Action	Remarks
1.	Program as follows: Network 1: Comment ''Tag_4" MOVE ''Tag_4" MOVE ''Tag_4" MOVE ''Tag_4" Network 2: Comment ''Tag_5" ''Tag_9" N WOVE ''Tag_5" ''Tag_5" ''Tag_9" N WOVE ''Tag_5" '''Tag_6" '''Tag_6" '''''''''''''''''''''''''''''''''	
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:	
4.	Modify M10.0 to 1:	

5 Operation of the application



5.2 Scenario B

The function block "SinaSpeed" 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 (http://support.automation.siemens.com/WW/view/en/109771710).



Table 5-2-1 Input interface of "SinaSpeed"

Input signal	Туре	Default	Meaning
EnableAxis	BOOL	0	"Off1" = 1 \rightarrow switch on the drive
AckError	BOOL	0	Acknowledgement of axis faults → "AckFIt" = 1
SpeedSp	REAL	0.0 [rpm]	Speed setpoint
RefSpeed	REAL	0.0 [rpm]	Rated speed of the drive \rightarrow p2000
ConfigAxis	Word	16#003F	Configure of the drive control
HWIDSTW	HW_IO/INT	0	Symbolic name or HW ID/IO address on the SIMATIC S7-1200 of the setpoint slot (S et P oint)
HWIDZSW	HW_IO/INT	0	Symbolic name or HW ID/IO address on the SIMATIC S7-1200 of the actual value slot (Actual Value)

Input signal	Туре	Default	Meaning
AxisEnabled	BOOL	0	Operating mode is executed or enabled
Lockout	BOOL	0	1= switch-on inhibit active
ActVelocity	real	0.0[rpm]	Actual speed
Error	BOOL	0	1=group fault present
Status	INT	0	Status of the function block
DiagID	WORD	0	Expanded communication error

Table 5-2-2 Output interface of "SinaSpeed"

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

Table 5-2-3 Operation with "SinaSpeed"

Nr.		Remarks		
1.	When you have instal as follows:	led the star	tdrive, you can find it at the optional package	
	Instructions	∎ 🗉 🕨		
	Options			
	tin tin			
	> Eavorites			
	Resic instructions			
	Name	Descripti		
	General	>		
	Bit logic operations	=		
	Timer operations			
	Counter operations			
	Comparator operations			
	The second	~		
		>		
	 Extended instructions Technology Communication Optional packages 			
	Name	Description		
	🕨 🛅 SIMATIC Ident			
	▼ SINAMICS			
	=- SinaPos	Instruction f		
	SinaSpeed	Instruction f		
	=- SinaPara	Instruction f		
	=- Sina Para S	Instruction f		
	=- SinaInfeed	Instruction f		
	Energy Suite extensions			

5 Operation of the application



5 Operation of the application



Appendix 6

6.1 Service and support

Industry Online Support

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We support you with our globally available training courses for industry with practical experience, innovative learning methods and a concept that's tailored to the customer's specific needs.

For more information on our offered trainings and courses, as well as their locations and dates, refer to our web page: www.siemens.com/sitrain

Service offer

Our range of services includes the following:

- Plant data services
- Spare parts services
- Repair services .
- On-site and maintenance services
- Retrofitting and modernization services
- Service programs and contracts

You can find detailed information on our range of services in the service catalog web page:

support.industry.siemens.com/cs/sc

Industry Online Support app

You will receive optimum support wherever you are with the "Siemens Industry Online Support" app. The app is available for iOS and Android: support.industry.siemens.com/cs/ww/en/sc/2067

6.2 Contact

Siemens Ltd., China DF M3-BF GMC No. 18 Siemens Road Jiangning Development Zone Nanjing, 211100 China mailto: mc_gmc_mp_asia.cn@siemens.com

6.3 Links and literature

Table 6-1

No.	Торіс		
\1\	Siemens Industry Online Support		
	https://support.industry.siemens.com		
\2\	Link to this entry page of this application example		
	https://support.industry.siemens.com/cs/ww/en/view/109739222		
\3\			

6.4 Change documentation

Table 6-2

Version	Date	Modifications
V0.1	02/2016	First version
V1.0	03/2016	Final version
V1.1	03/2018	Upgrade project to TIA V15
V1.2	05/2019	Upgrade project to TIA V15 SP1
V1.3	04/2020	Upgrade project to TIA V16