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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 Task

1.1 Overview

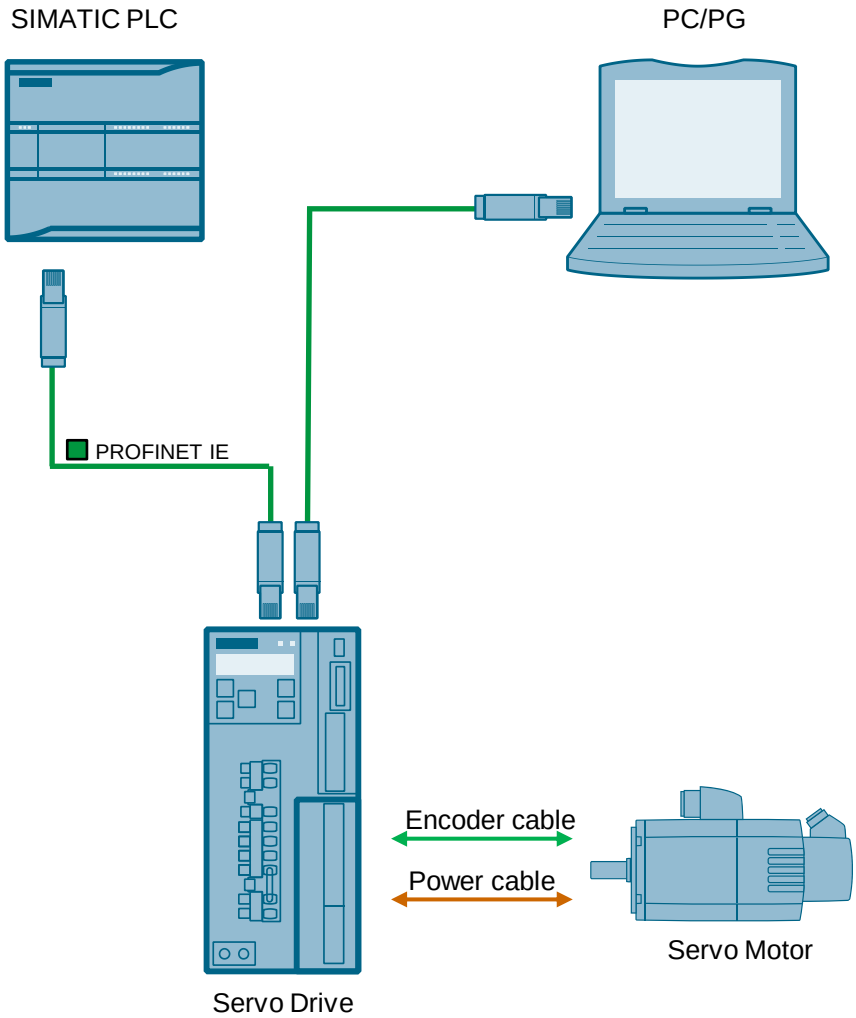
Introduction

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



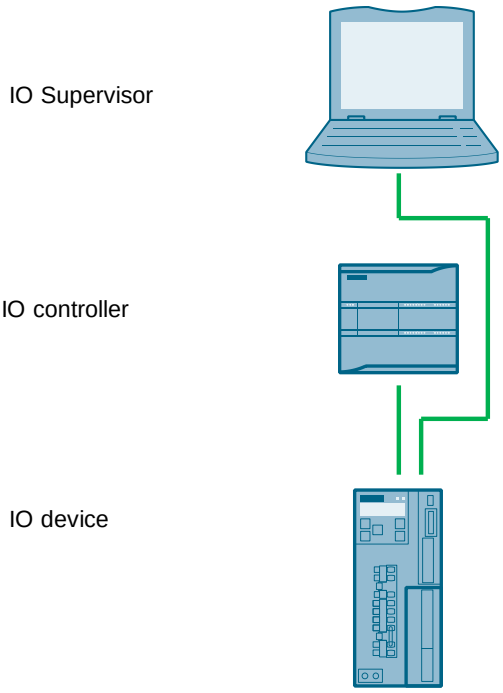
2 Solution

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 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	1	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 Basics

3.1 Basics regarding SINAMICS V90 PN version

SINAMICS V90 PN supports the following telegrams:

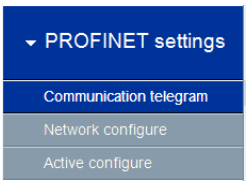
- Standard telegram 1
- Standard telegram 2
- Standard telegram 3
- Standard telegram 5
- Siemens telegram 102
- Siemens telegram 105

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

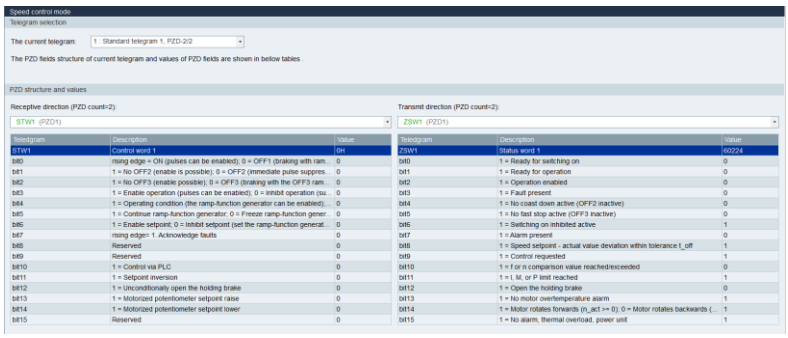
3.2.1 Configure PROFINET settings via SINAMICS V-ASSISTANT

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

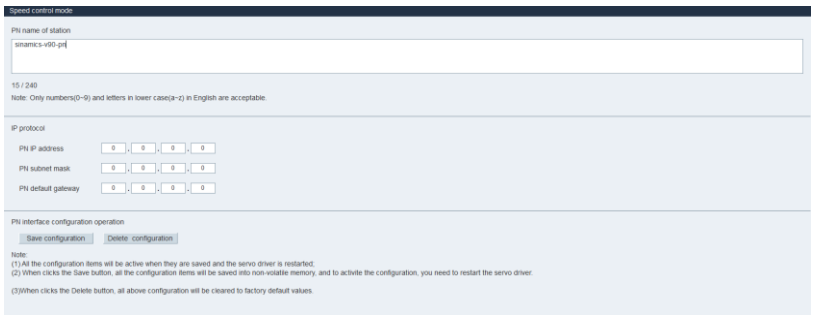


In this menu filed, you can configure:

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



- **Network:**



Note: *the configurations must be saved for activation.*

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

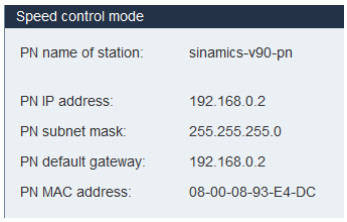


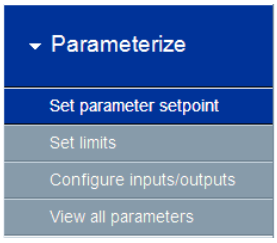
Table 3-1: PROFINET relevant parameters

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	

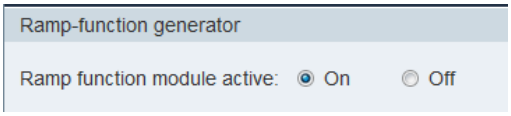
3.2.2 Configure ramp-function generator via SINAMICS V-ASSISTANT

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.



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



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:

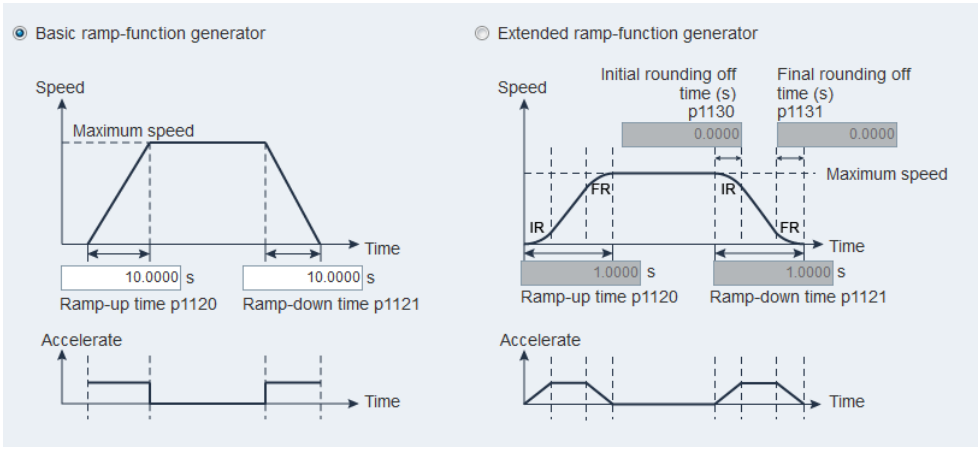


Table 3-2: Ramp-function generator relevant parameters

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

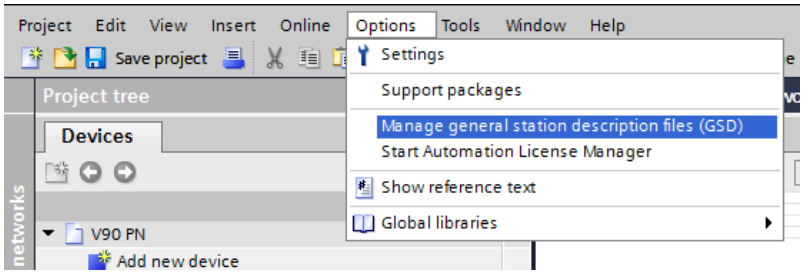
3.2.3 Configure PROFINET settings via the TIA Portal

3.2.3.1 Configure SINAMICS V90 PN

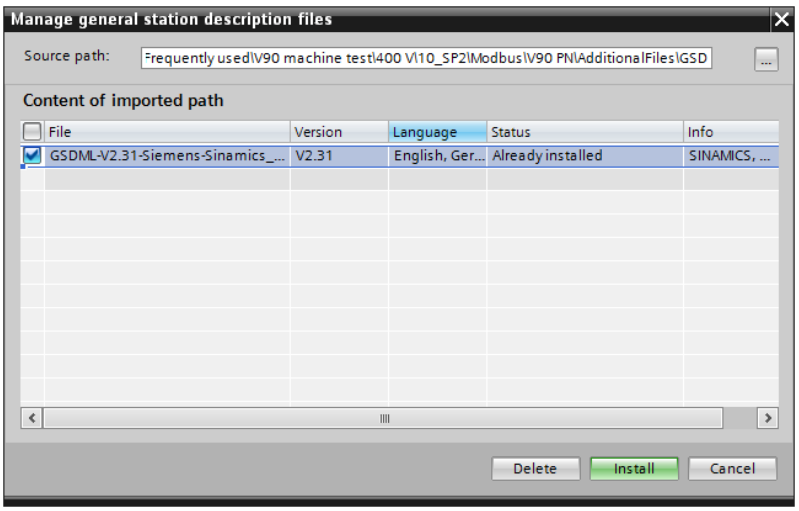
The PROFINET settings of SINAMICS V90 PN can be configured in the TIA Portal as follows:

1. Create a new project and switch to project view.
2. Input the V90 PN GSD file.

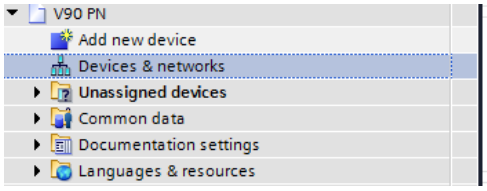
Note Installation of V90 PN GSD file is only necessary for TIA Portal prior to V13 (including V13).



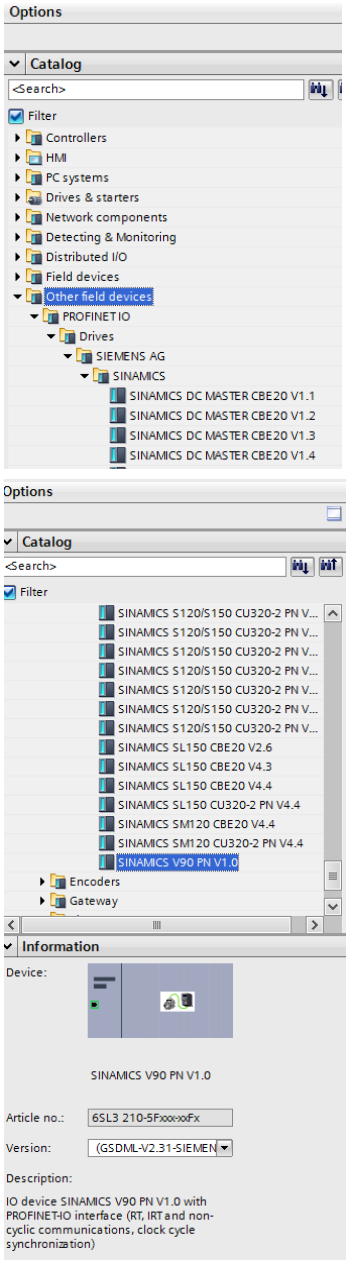
3. Find the GSD file and select it. Press the "**Install**" button to install it.



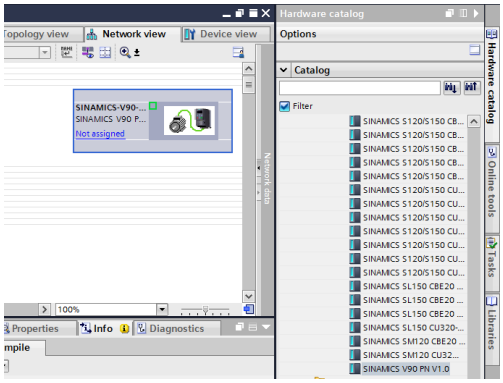
4. Click the node "**Devices & networks**" from the device tree on the left side.



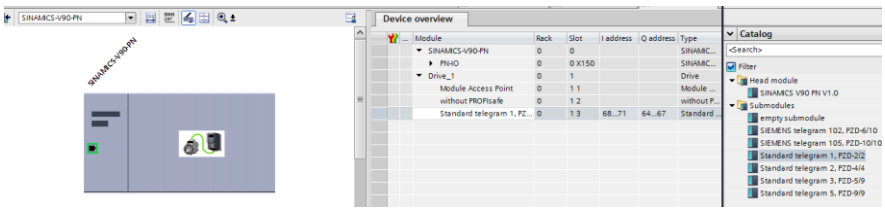
5. Select V90 PN from the "**other filed drives**" of catalog tree on the right side.



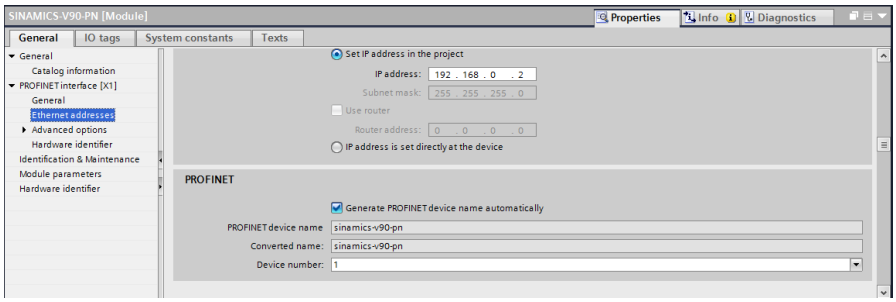
6. Double-click the V90 PN node or drag it to the network view:



7. Configure the **Communication Telegram** in the device view; for example, standard telegram 1:

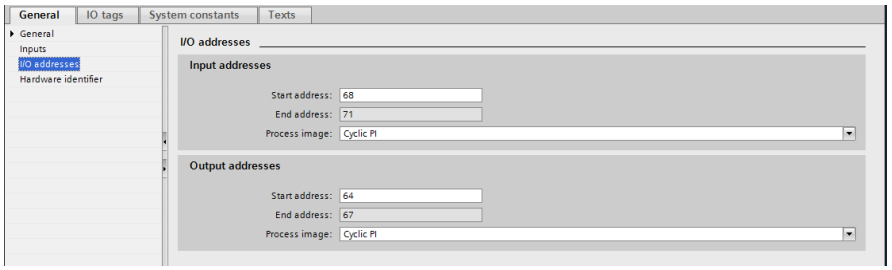


8. Now from the Properties tab, you can edit the Ethernet address and device name.



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

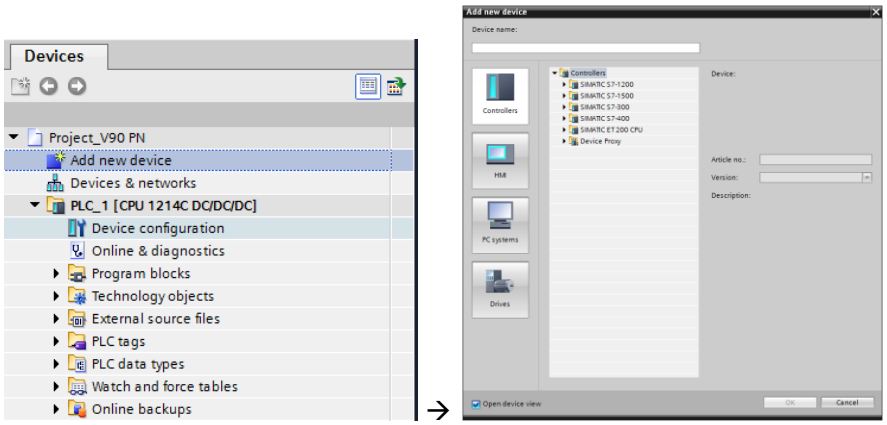
9. You can also configure the I/O address of the communication telegram from the Properties Tab:



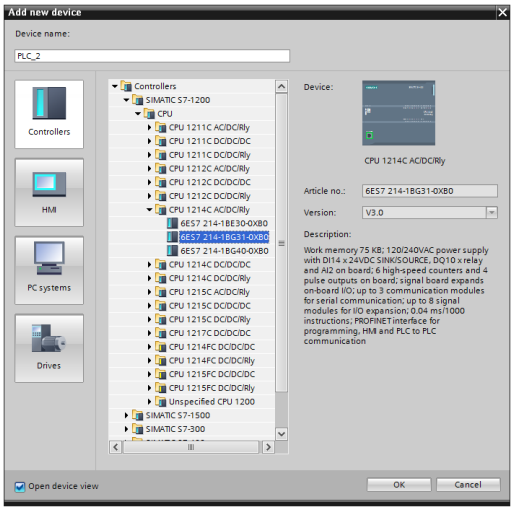
3.2.3.2 Configure S7-1200 CPU

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

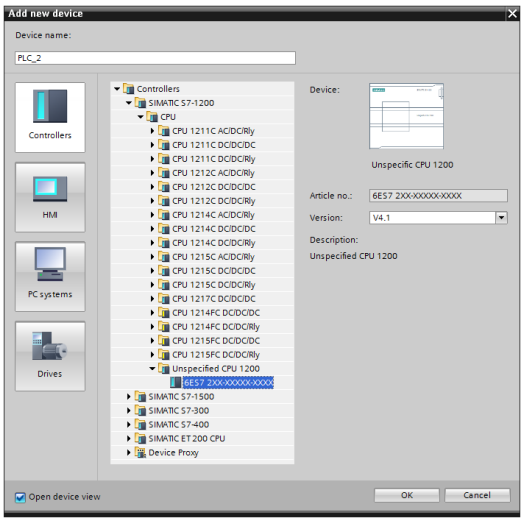
1. Double-click the node "**Add new device**" from the Device tree:



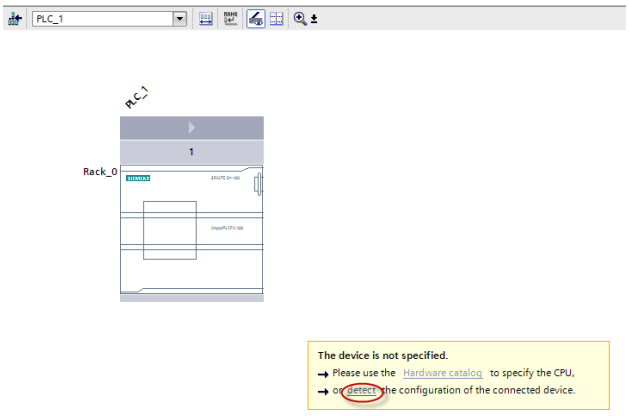
2. Here, if you know the detailed information about the S7-1200 modules, you can directly find the type and add it into the project



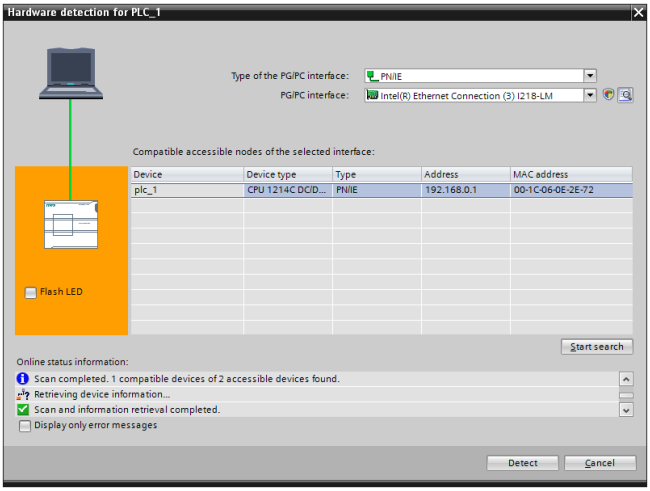
Otherwise, you can add an unspecified CPU 1200 into the project:



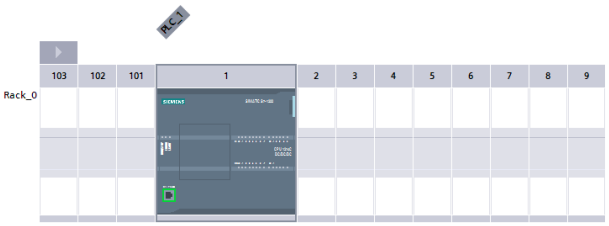
3. If an unspecified 1200 CPU has been added into the project, you can detect the connected CPU by clicking the "**Detect**" and search it with online access:



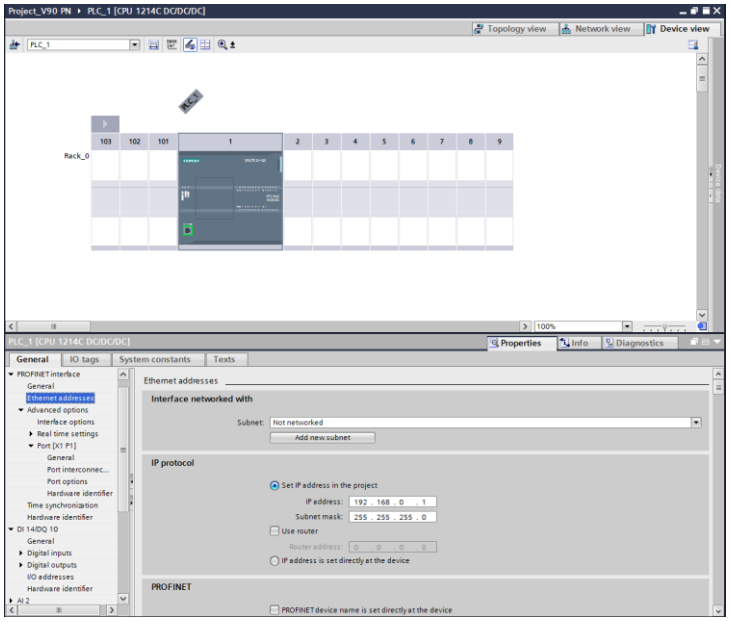
Start the search by clicking the "**Start search**" button, and the connected S7-1200 CPU will be found if the PROFINET network communication works properly:



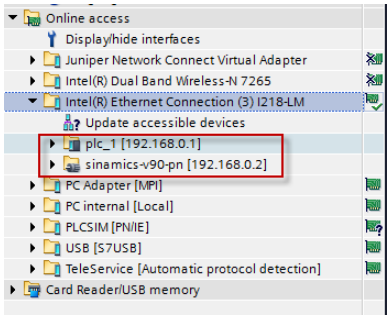
4. Press "**Detect**" button to detect the connected CPU:



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



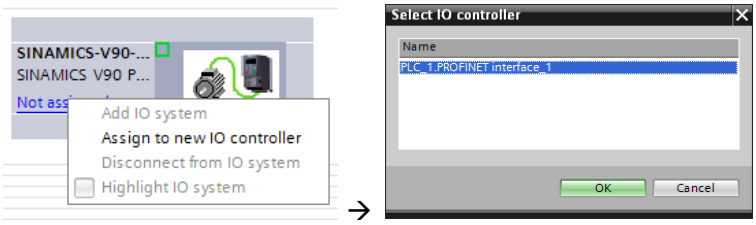
Here, you can configure information about the device name, Ethernet address…You can also use the "**Online access**" node to find the accessible device and make sure the information are consistent:



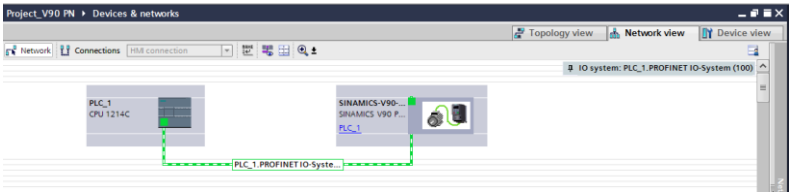
3.2.3.3 Connect SINAMICS V90 PN with S7-1200 CPU

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":



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

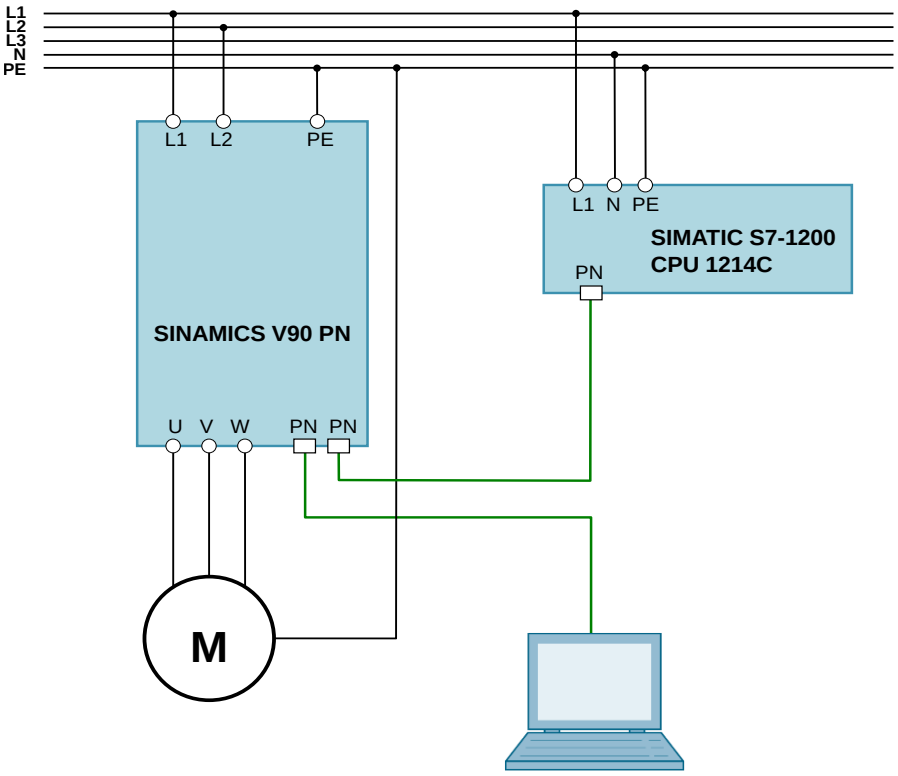


4 Installation and Startup

4.1 Installation of the hardware

The figure below shows the hardware configuration of the application:

Figure 4-1



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 ▲ or ▼ button to run the motor.	

4.3 Startup (PROFINET communication)

Table 4-2

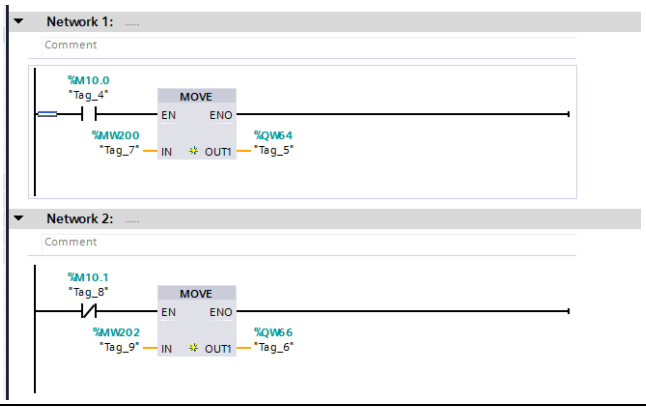
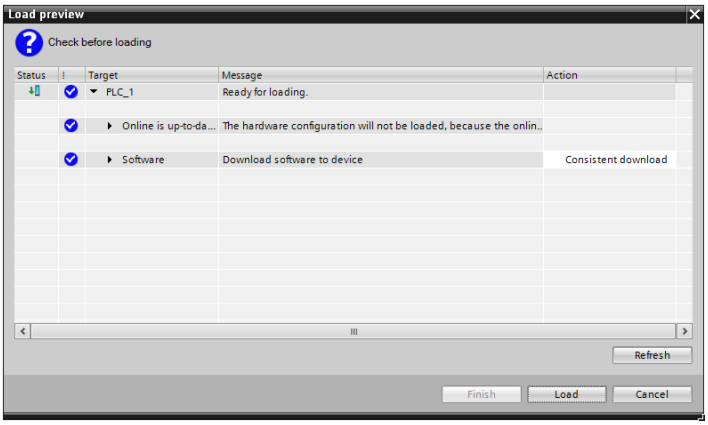
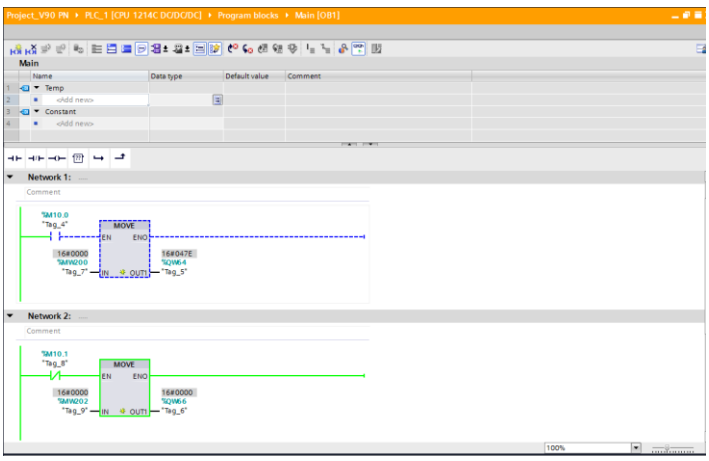
No.	Action	Remarks
1.	Set drive parameter p922 to be 1.	Select standard telegram 1
2.	Make device & network configurations in the TIA Portal: • *Device name* • *IP address* • *Telegram*	As shown in section 3.2.3
3.	Go online to test the PROFINET communication.	
4.	Download configurations into controller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

5 Operation of the application

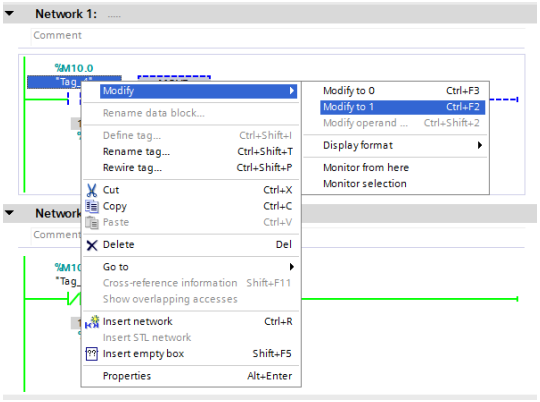
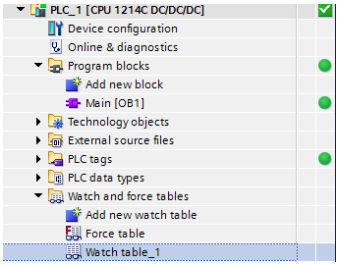
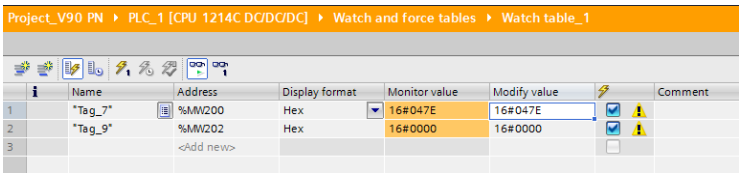
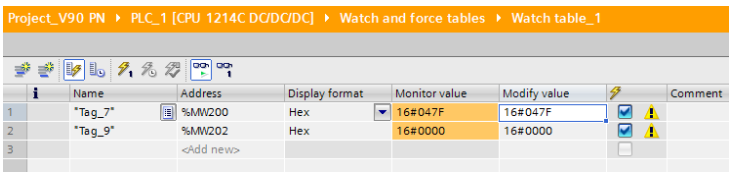
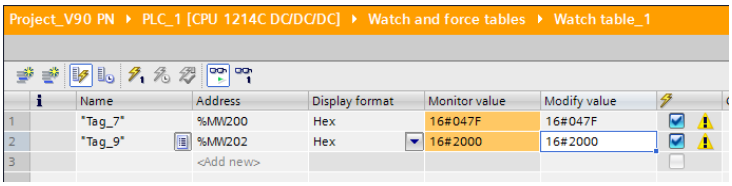
5.1 Scenario A

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: 	
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: 	

5.1 Scenario A

No.	Action	Remarks
4.	Modify M10.0 to 1: 	
5.	Open the watch table 1: 	
6.	Write value *16#47E* into QW64: 	**Q address:** 64 … 67
7.	Write value *16#47F* into QW64, and then the drive turns to servo on. 	
8.	Write value *16#2000* into QW66, and then the motor starts running at the speed of 1500 rpm. 	**QW66:** speed setpoint. **Scaling factor:** 4000 hex = value of drive parameter p2000

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 (http://support.automation.siemens.com/WW/view/en/68034568) and un-pack the library to the "***Sys***" installation folder of the TIA Portal.

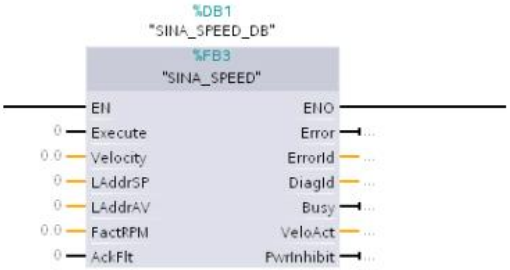


Table 5-2-1 **Input interface of FB285**

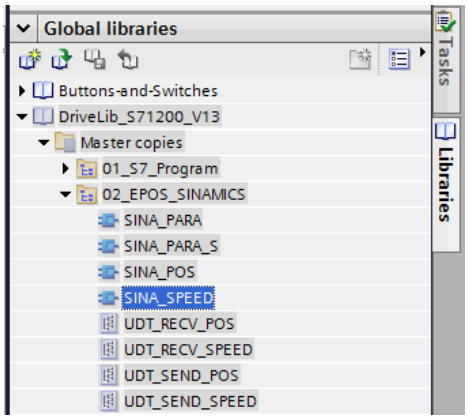
Input signal	Type	Default	Meaning
Execute	BOOL	0	"Off1" = 1 → switch on the drive
Velocity	REAL	0.0 [rpm]	Speed setpoint
FactRPM	REAL	0.0 [rpm]	Rated speed of the drive → p2000
AckFlt	BOOL	0	Acknowledgement of axis faults → "AckFlt" = 1
LAddr**SP**	HW_IO/INT	0	Symbolic name or HW ID/IO address on the 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)

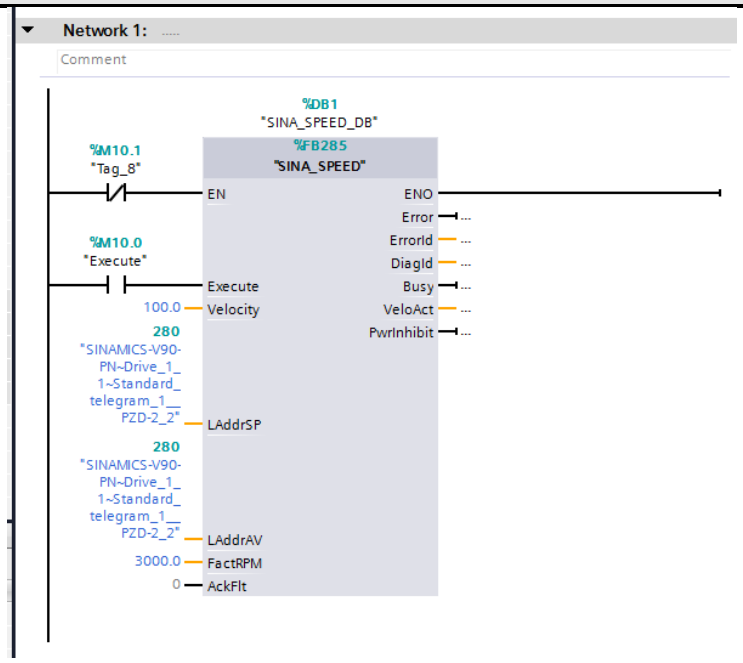
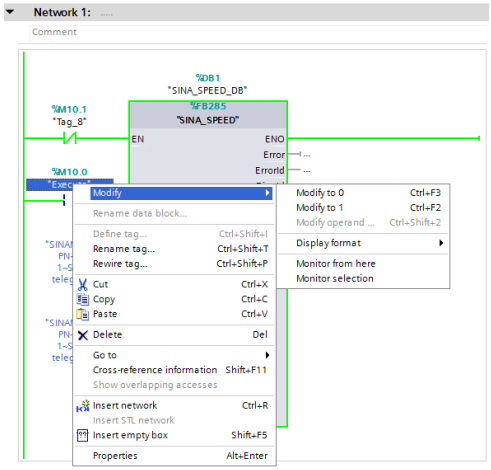
Table 5-2-2 **Output interface of FB285**

Output signal	Type	Default	Meaning
Error	BOOL	0	1 = general fault active
ErrorId	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 → 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**

No.	Action	Remarks
1.	When you have installed the library, you can find it at the library view as follows: 	
2.	Insert or drag FB285 <SINA_SPEED> into the PLC main block and make program as follows:	

No.	Action	Remarks
		
3.	Switch to online mode and activate the monitoring function.	
4.	Modify M10.0 to 1 and then the motor starts running at the speed of 100 rpm. 	

6 Related literature

Table 6-1

	Topic	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/109739222
\3\		

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8 History

Table 8-1

Version	Date	Modifications
V1.0	03/2016	First version