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

SINAMICS V90 PN

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Table of contents

1 Task

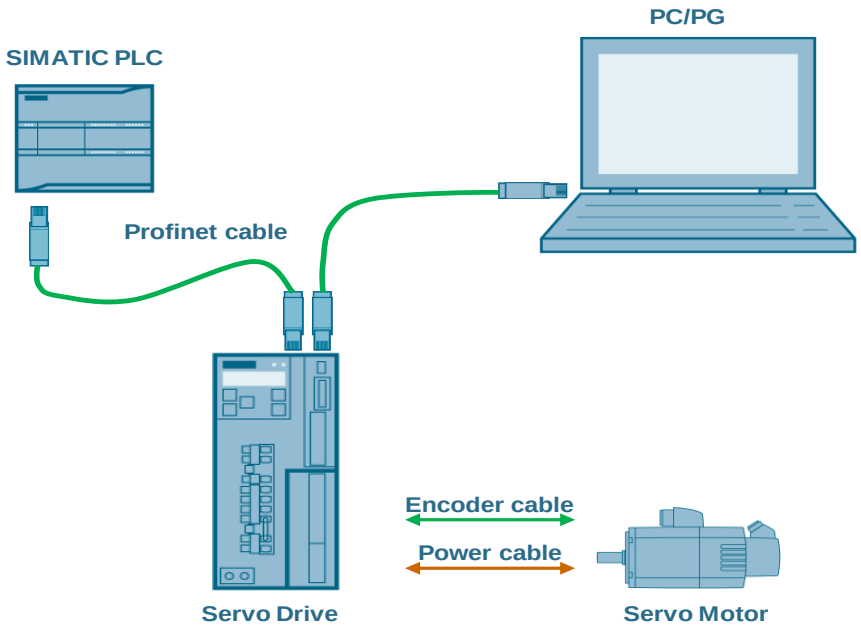
Introduction

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



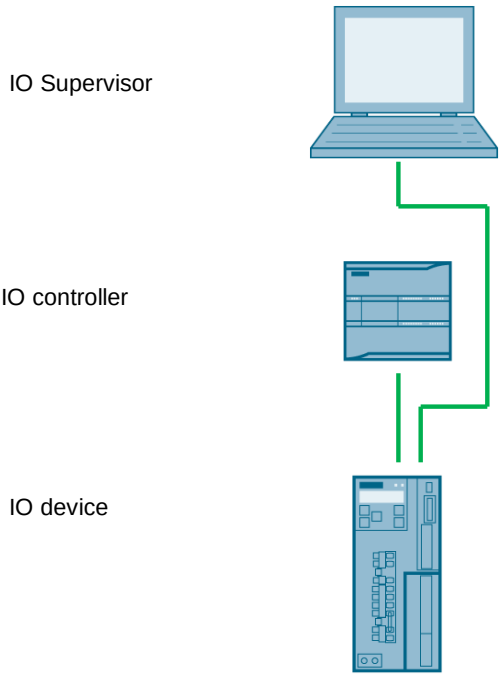
2 Solution

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:

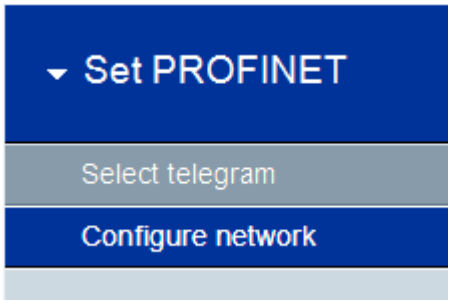
- Standard telegram 1
- Standard telegram 2
- Standard telegram 3
- Standard telegram 5
- Siemens telegram 102
- Siemens telegram 105

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

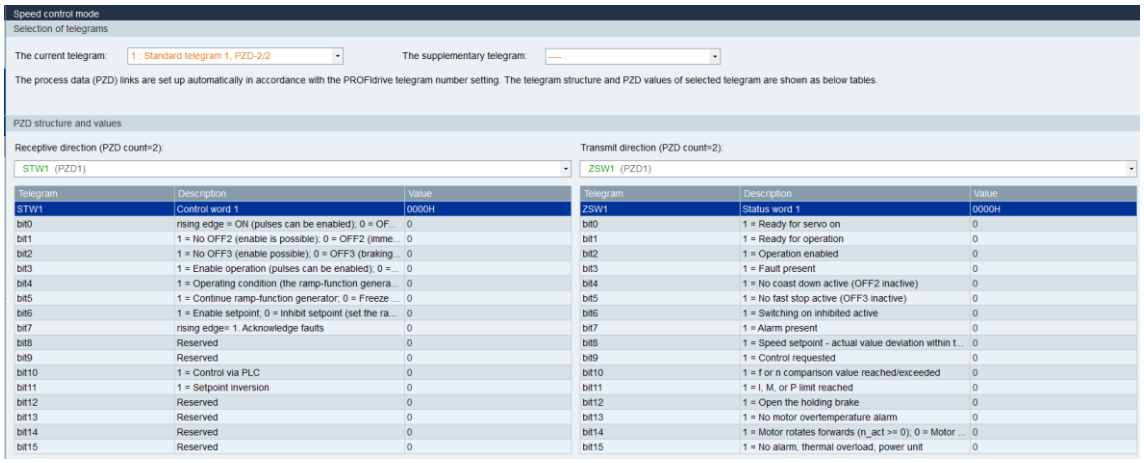
3.2.1 Configure PROFINET settings via SINAMICS V-ASSISTANT

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

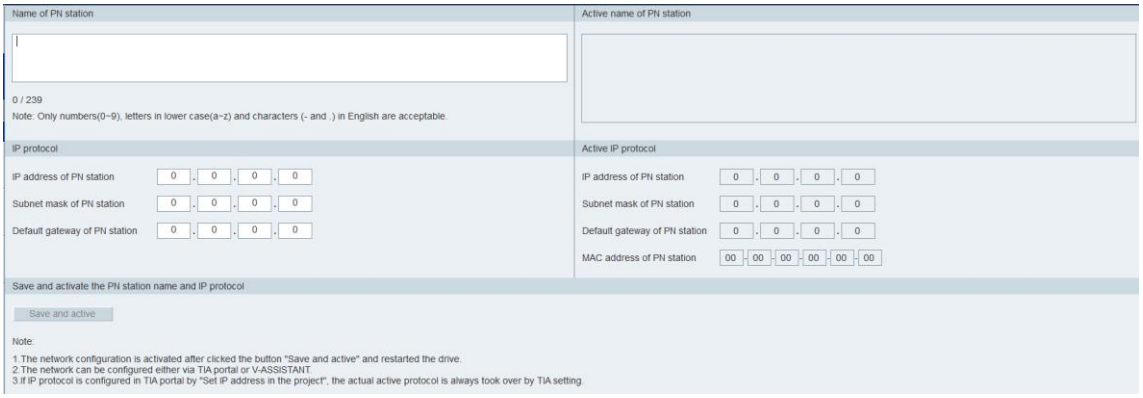


In this menu filed, you can configure:

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



- **Network:**



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

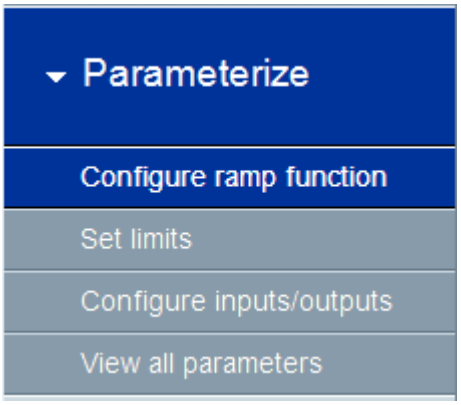
Table 3-1: PROFINET relevant parameters

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	

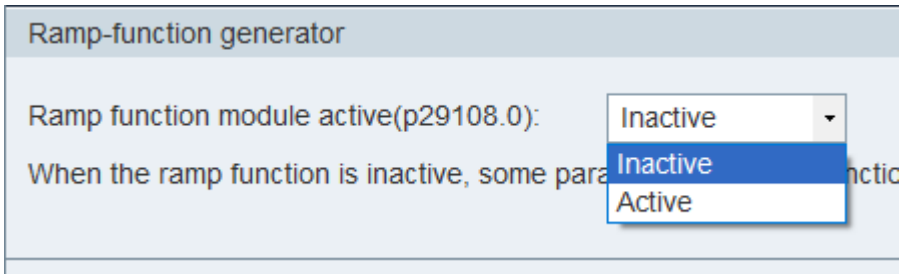
3.2.2 Configure ramp-function generator via SINAMICS V-ASSISTANT

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:

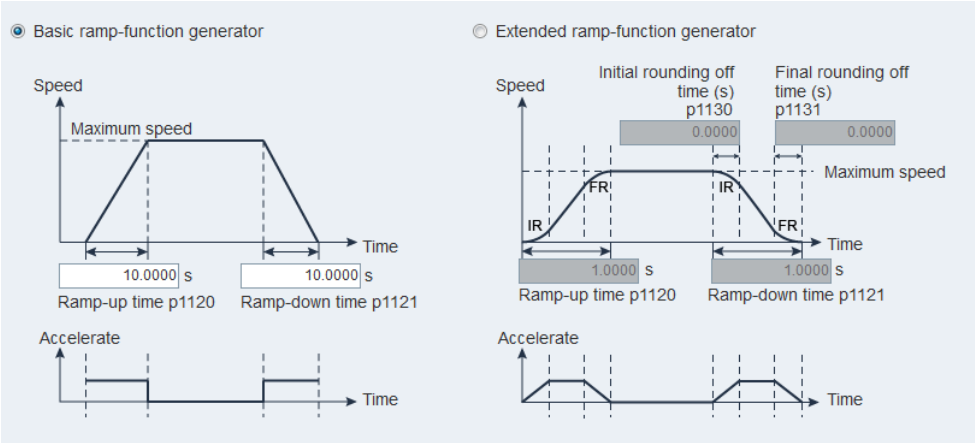


Table 3-2: Ramp-function generator relevant parameters

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

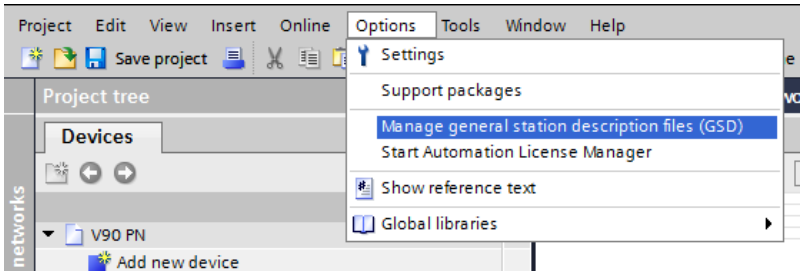
3.2.3 Configure PROFINET settings via the TIA Portal

3.2.3.1 Configure SINAMICS V90 PN

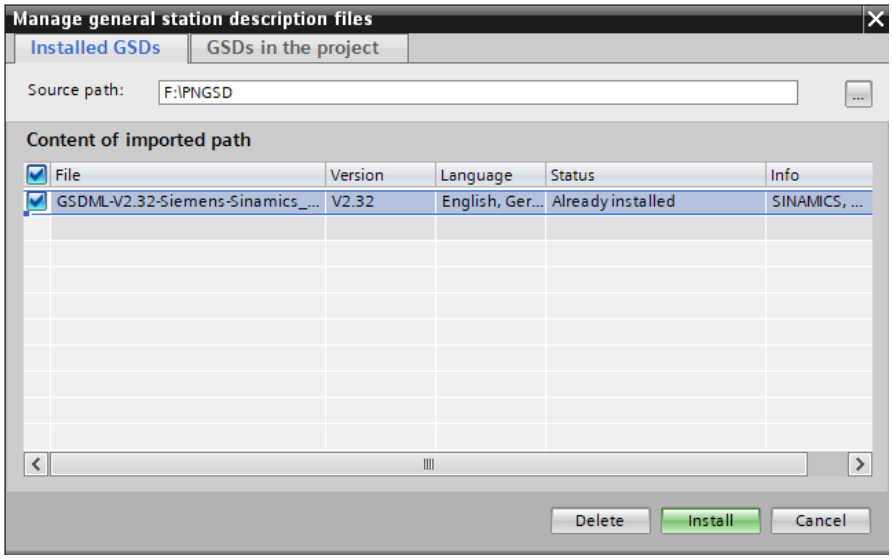
The PROFINET settings of SINAMICS V90 PN can be configured in the TIA Portal as follows:

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

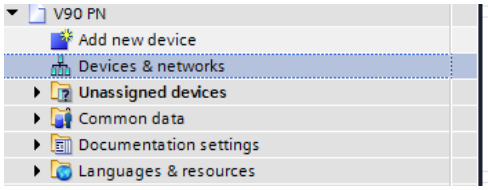
Note Installation of V90 PN GSD file is only necessary for TIA Portal prior to V13 (including V13).



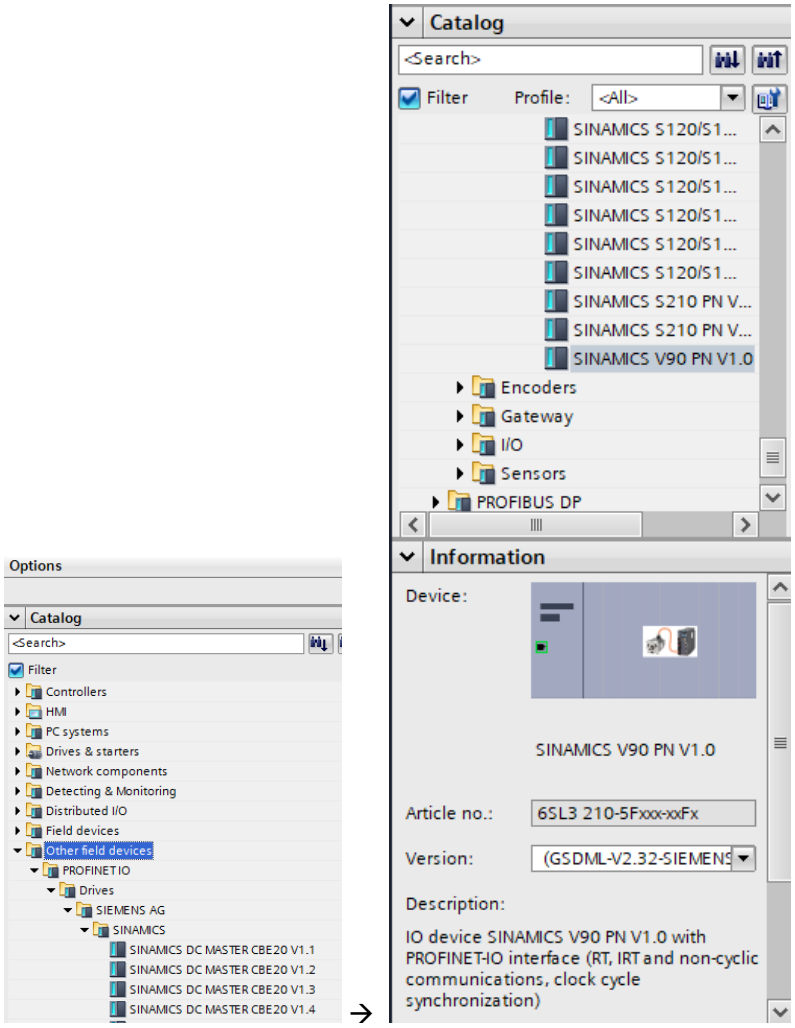
3. Find the GSD file and select it. Press the "**Install**" button to install it.



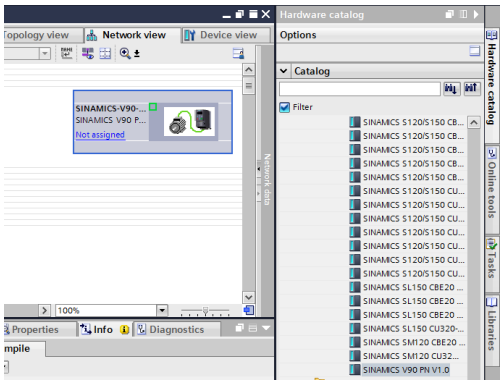
4. Click the node “**Devices & networks**” from the device tree on the left side.



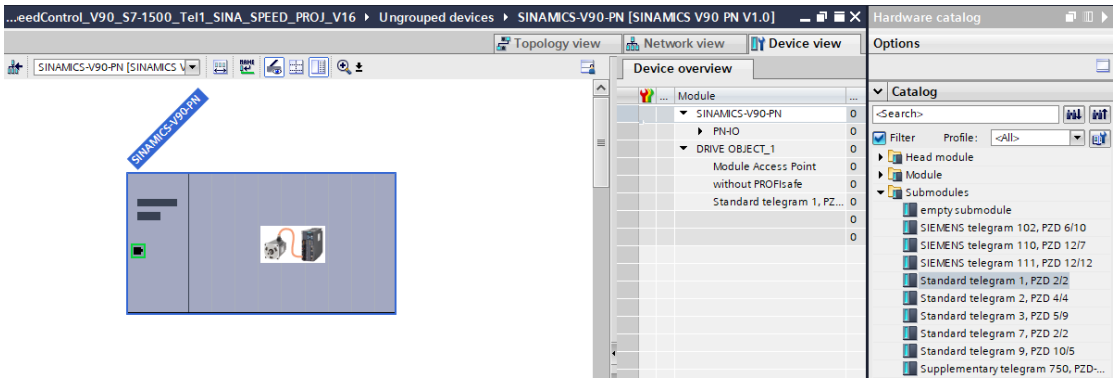
5. Select V90 PN from the “**other filed drives**” of catalog tree on the right side.



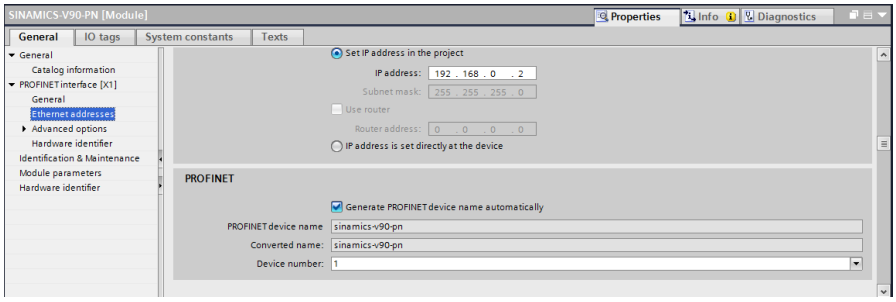
6. Double-click the V90 PN node or drag it to the network view:



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

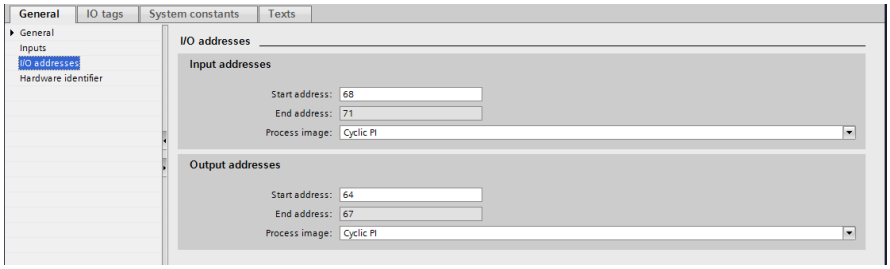


8. Now from the Properties tab, you can the Ethernet address and device name.



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

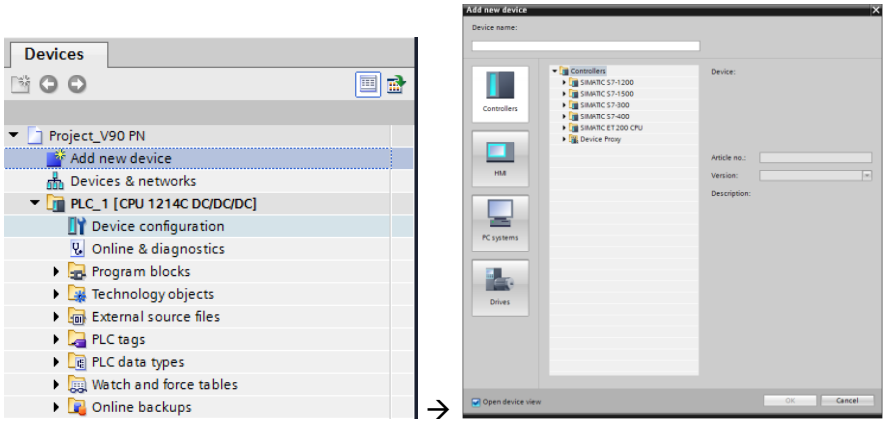
9. You can also configure the I/O address of the communication telegram from the Properties Tab:



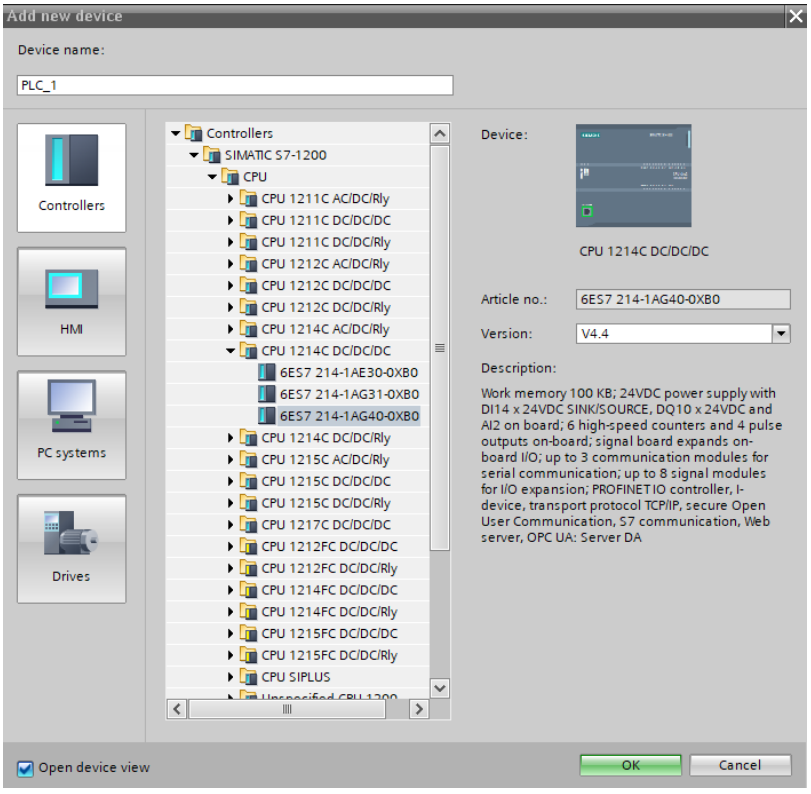
3.2.3.2 Configure S7-1200 CPU

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

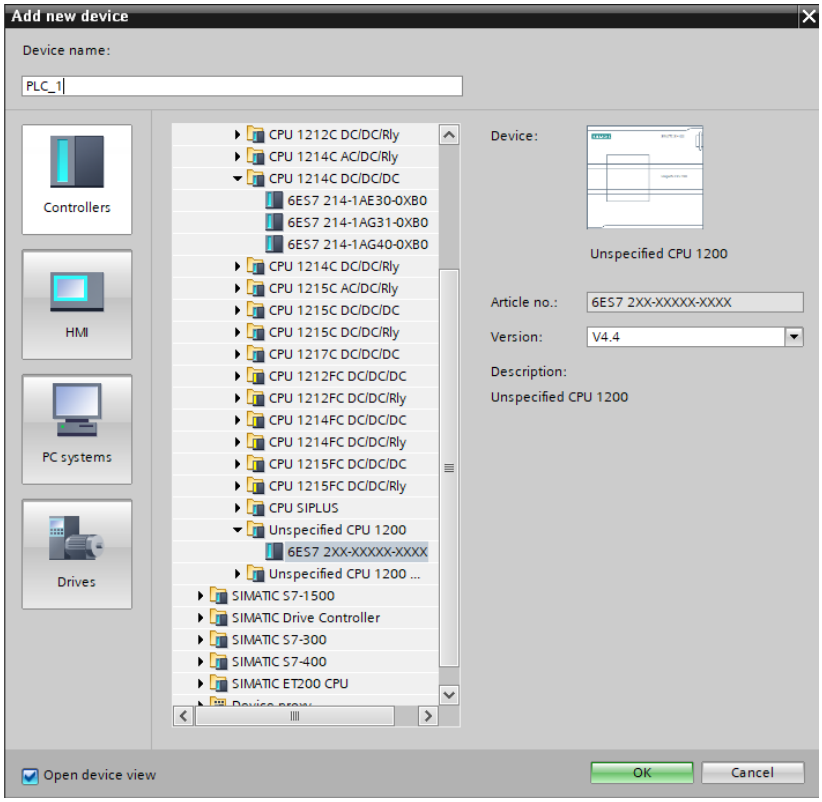
1. Double-click the node "**Add new device**" from the Device tree:



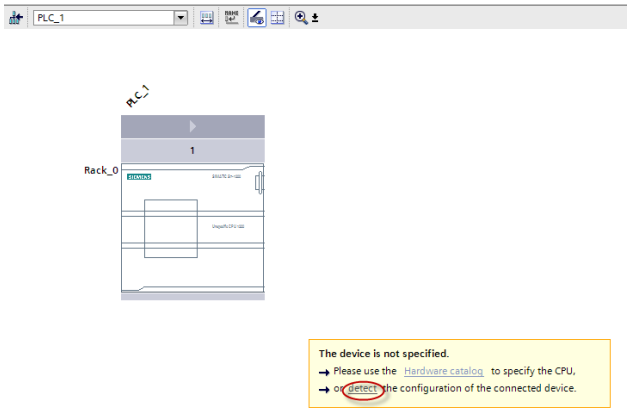
2. Here, if you know the detailed information about the S7-1200 modules, you can directly find the type and add it into the project



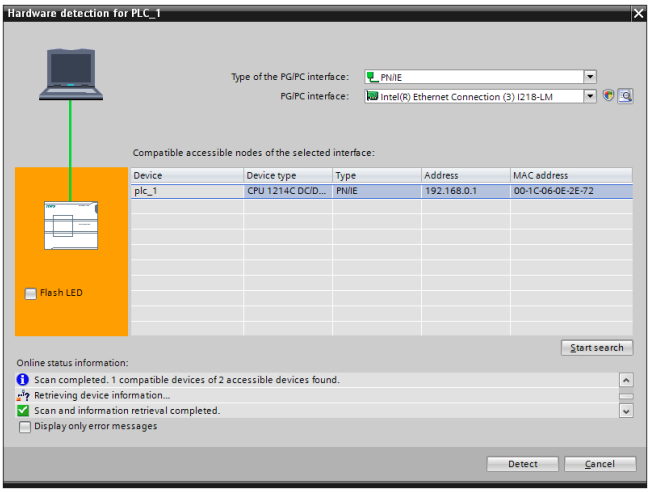
Otherwise, you can add an unspecified CPU 1200 into the project:



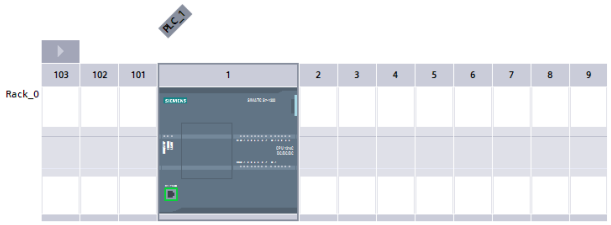
3. If an unspecified 1200 CPU has been added into the project, you can detect the connected CPU by clicking the "**Detect**" and search it with online access:



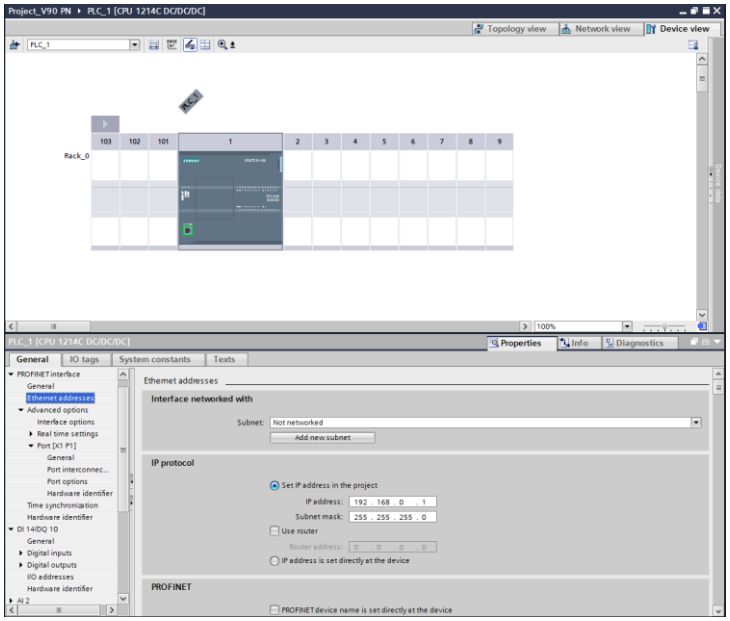
Start the search by clicking the "**Start search**" button, and the connected S7-1200 CPU will be found if the PROFINET network communication works properly:



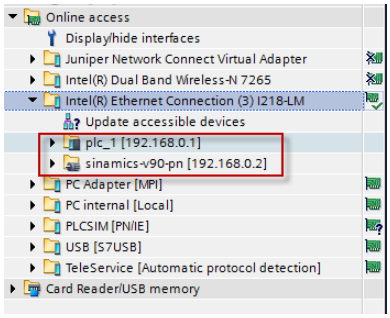
4. Press "**Detect**" button to detect the connected CPU:



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



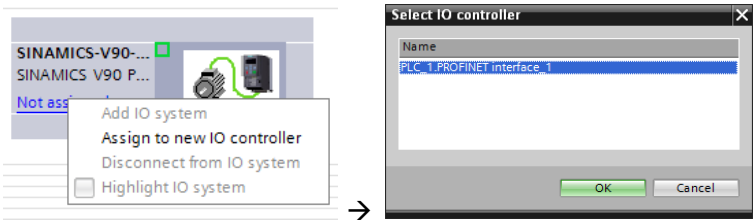
Here, you can configure information about the device name, Ethernet address…You can also use the "**Online access**" node to find the accessible device and make sure the information are consistent:



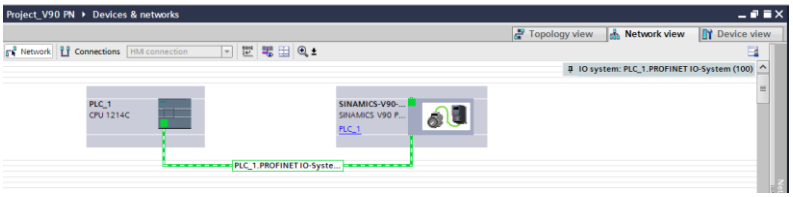
3.2.3.3 Connect SINAMICS V90 PN with S7-1200 CPU

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:

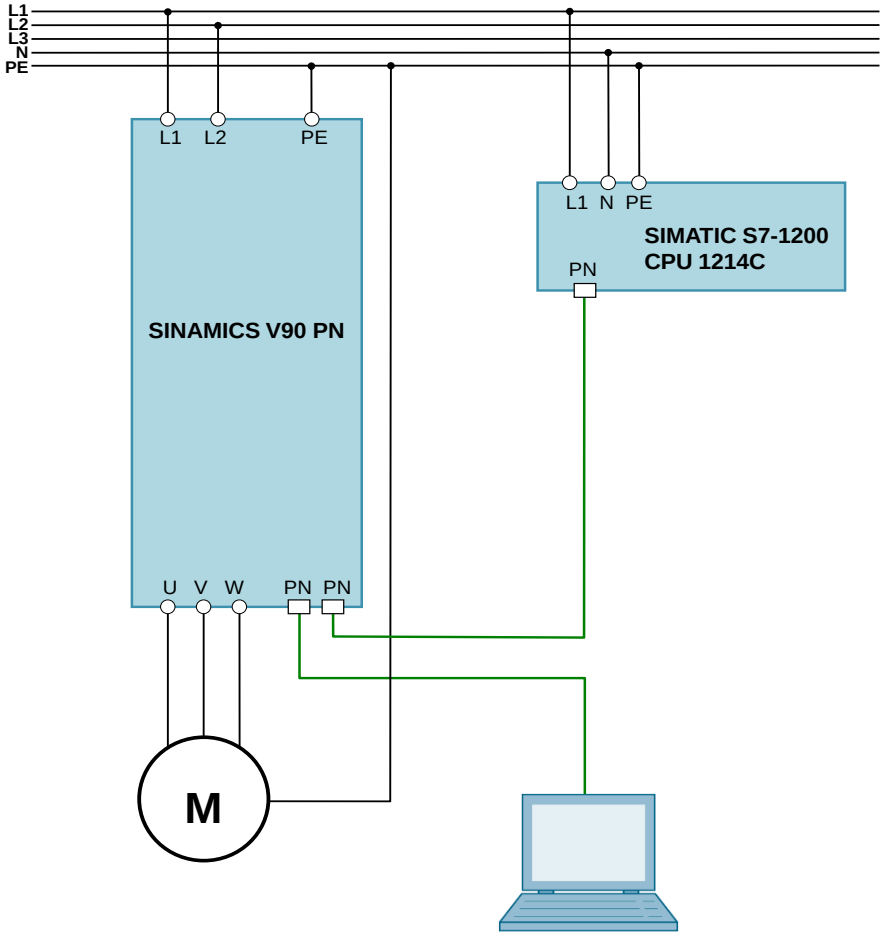


4 Installation and Startup

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

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 ▲ or ▼ 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

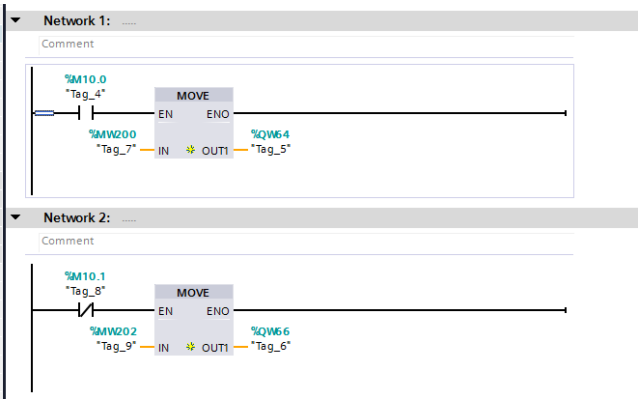
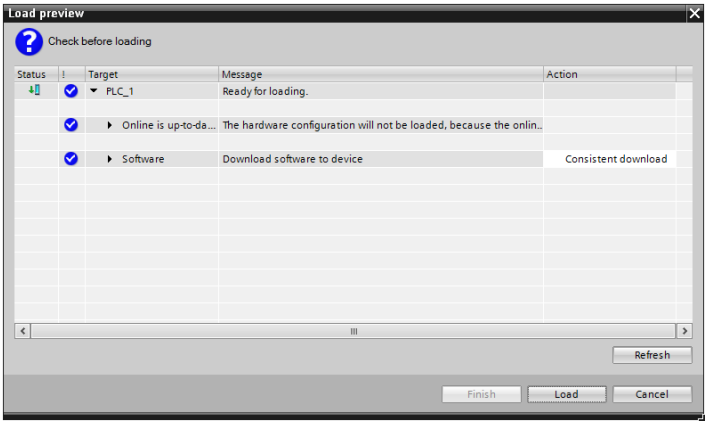
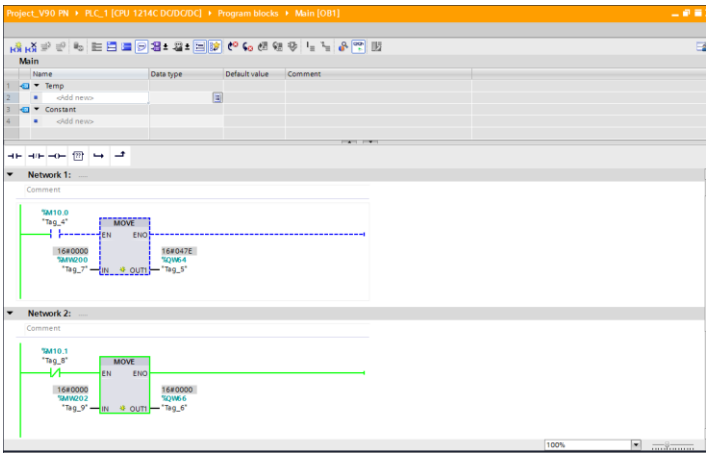
Nr.	Action	Remarks
1.	Set drive parameter p922 to be 1.	Select standard telegram 1
2.	Make device & network configurations in the TIA Portal: • *Device name* • *IP address* • *Telegram*	As shown in section 3.2.3
3.	Go online to test the Profinet communication.	
4.	Download configurations into controller and device if the communication works.	

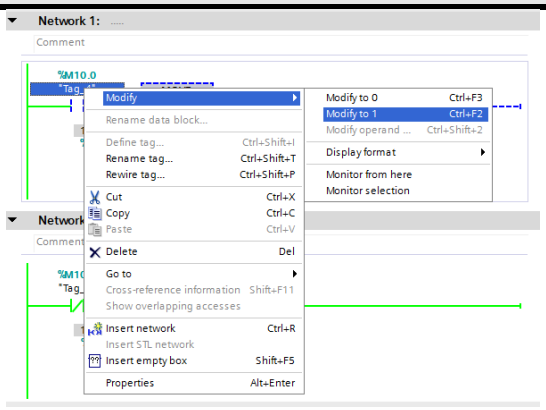
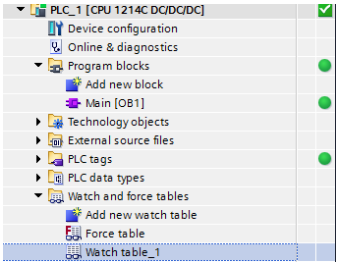
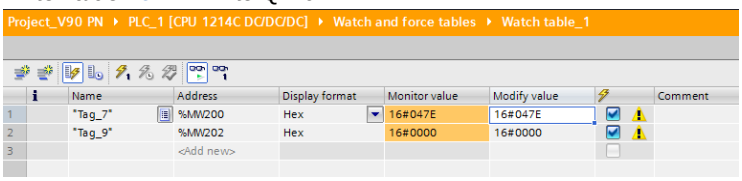
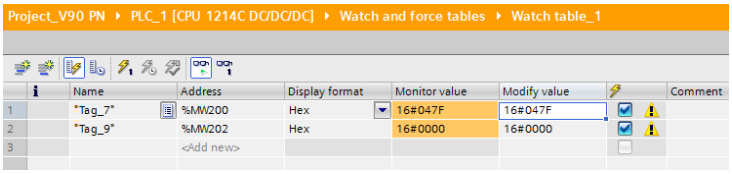
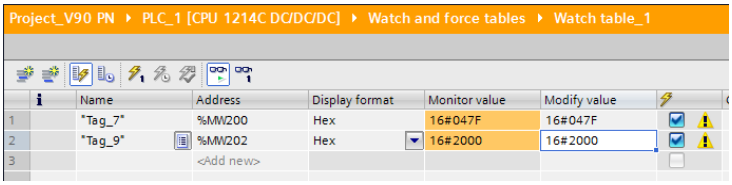
5 Operation of the application

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: 	
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:	

Nr.	Action	Remarks
		
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 “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).

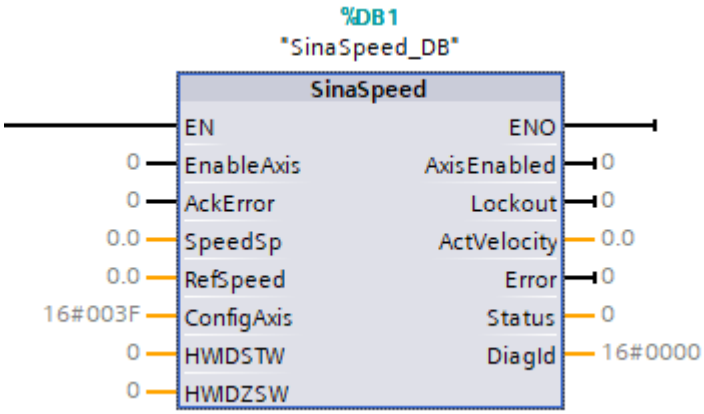


Table 5-2-1 **Input interface of “SinaSpeed”**

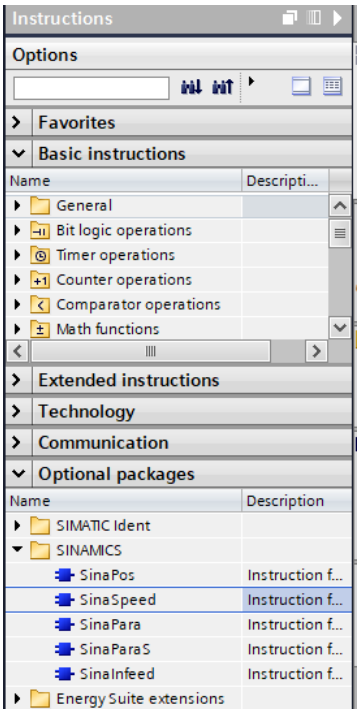
Input signal	Type	Default	Meaning
EnableAxis	BOOL	0	“Off1” = 1 → switch on the drive
AckError	BOOL	0	Acknowledgement of axis faults → “AckFlt” = 1
SpeedSp	REAL	0.0 [rpm]	Speed setpoint
RefSpeed	REAL	0.0 [rpm]	Rated speed of the drive → p2000
ConfigAxis	Word	16#003F	Configure of the drive control
HWIDSTW	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 (**A**ctual **V**alue)

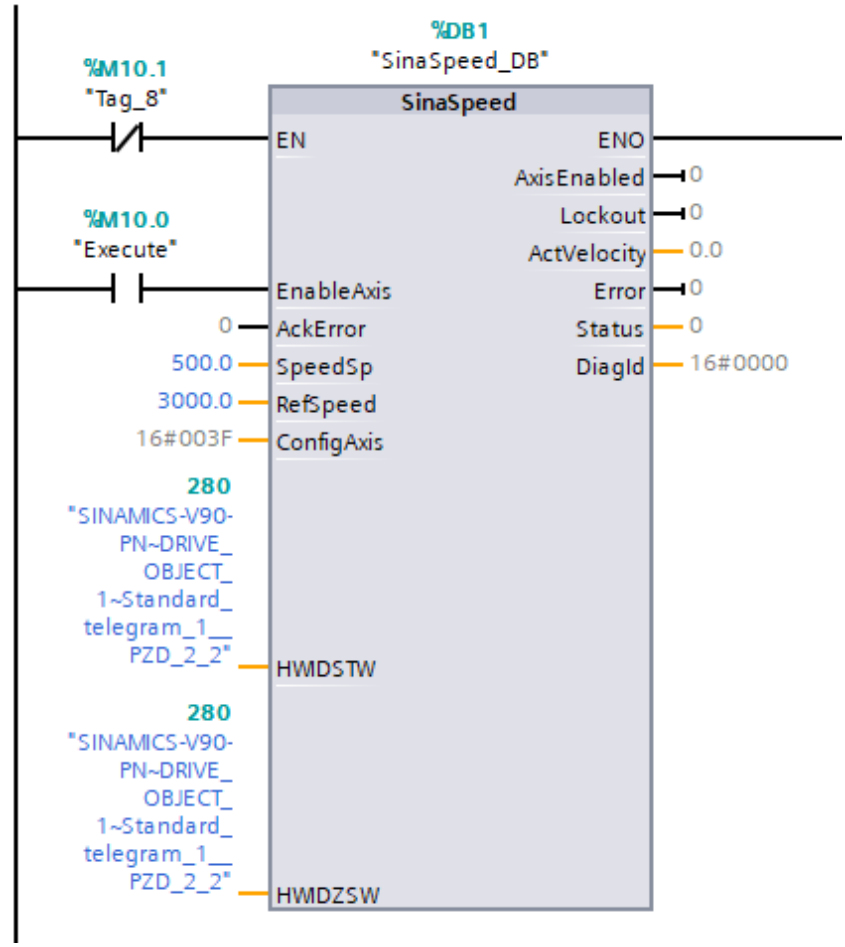
Table 5-2-2 **Output interface of "SinaSpeed"**

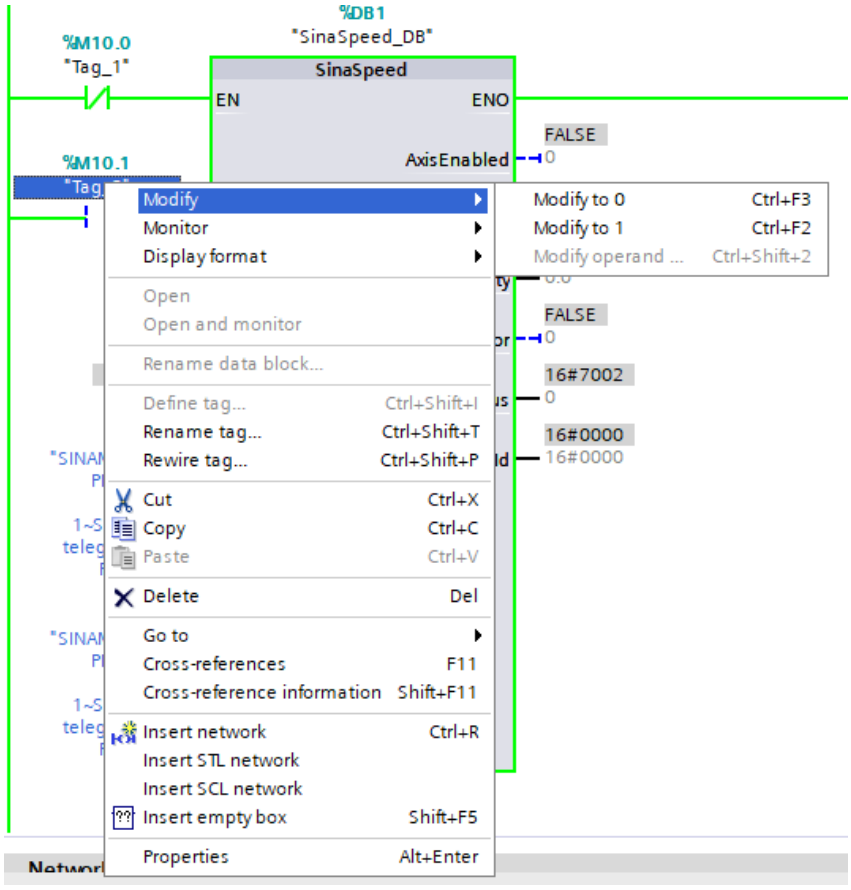
Input signal	Type	Default	Meaning
AxisEnabled	BOOL	0	Operating mode is executed or enabled
Lockout	BOOL	0	1= switch-on inhibit active
ActVelocity	real	0.0[rpm]	Actual speed
Error	BOOL	0	1=group fault present
Status	INT	0	Status of the function block
DiagID	WORD	0	Expanded communication error

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

Table 5-2-3 **Operation with "SinaSpeed"**

Nr.	Action	Remarks
1.	When you have installed the startdrive, you can find it at the optional package as follows: 	

Nr.	Action	Remarks
2.	Insert or drag “SinaSpeed” into the PLC main block and make program as follows: 	
3.	Switch to online mode and activate the monitoring function.	

Nr.	Action	Remarks
4.	Modify M10.0 to 1 and then the motor starts running at the speed of 500 rpm. 	

6 Appendix

6.1 Service and support

Industry Online Support

Do you have any questions or need assistance?

Siemens Industry Online Support offers round the clock access to our entire service and support know-how and portfolio.

The Industry Online Support is the central address for information about our products, solutions and services.

Product information, manuals, downloads, FAQs, application examples and videos – all information is accessible with just a few mouse clicks:
support.industry.siemens.com

Technical Support

The Technical Support of Siemens Industry provides you fast and competent support regarding all technical queries with numerous tailor-made offers – ranging from basic support to individual support contracts. Please send queries to Technical Support via Web form:
www.siemens.com/industry/supportrequest

SITRAIN – Digital Industry Academy

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

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6.3 Links and literature

Table 6-1

No.	Topic
\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