



SIEMENS

Application description • 07/2016

Speed Control with SINAMICS V90 and S7-1200 via PROFINET

SINAMICS V90 PROFINET Version



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

Warranty and liability

Note

The Application Examples are not binding and do not claim to be complete regarding the circuits shown, equipping and any eventuality. The Application Examples do not represent customer-specific solutions. They are only intended to provide support for typical applications. You are responsible for ensuring that the described products are used correctly. These Application Examples do not relieve you of the responsibility to use safe practices in application, installation, operation and maintenance. When using these Application Examples, you recognize that we cannot be made liable for any damage/claims beyond the liability clause described. We reserve the right to make changes to these Application Examples at any time without prior notice.

If there are any deviations between the recommendations provided in these Application Examples and other Siemens publications – e.g. Catalogs – the contents of the other documents have priority.

We do not accept any liability for the information contained in this document. Any claims against us – based on whatever legal reason – resulting from the use of the examples, information, programs, engineering and performance data etc., described in this Application Example shall be excluded. Such an exclusion shall not apply in the case of mandatory liability, e.g. under the German Product Liability Act (“Produkthaftungsgesetz”), in case of intent, gross negligence, or injury of life, body or health, guarantee for the quality of a product, fraudulent concealment of a deficiency or breach of a condition which goes to the root of the contract (“wesentliche Vertragspflichten”). The damages for a breach of a substantial contractual obligation are, however, limited to the foreseeable damage, typical for the type of contract, except in the event of intent or gross negligence or injury to life, body or health. The above provisions do not imply a change of the burden of proof to your detriment.

Any form of duplication or distribution of these Application Examples or excerpts hereof is prohibited without the expressed consent of the Siemens AG.

Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks. In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions only form one element of such a concept.

Customer is responsible to prevent unauthorized access to its plants, systems, machines and networks. Systems, machines and components should only be connected to the enterprise network or the internet if and to the extent necessary and with appropriate security measures (e.g. use of firewalls and network segmentation) in place.

Additionally, Siemens' guidance on appropriate security measures should be taken into account. For more information about industrial security, please visit <http://www.siemens.com/industrialsecurity>.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends to apply product updates as soon as available and to always use the latest product versions. Use of product versions that are no longer supported, and failure to apply latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under <http://www.siemens.com/industrialsecurity>.

Table of contents

	Warranty and liability.....	2
1	Task.....	4
1.1	Overview.....	4
2	Solution.....	5
2.1	Solution overview	5
2.2	Hardware and Software Components	6
2.2.1	Validity	6
2.2.2	Used Components.....	6
3	Basics	7
3.1	Basics regarding SINAMICS V90 PN version	7
3.2	Basic parameter configuration regarding SINAMICS V90 PN	7
3.2.1	Configure PROFINET settings via SINAMICS V-ASSISTANT	7
3.2.2	Configure ramp-function generator via SINAMICS V-ASSISTANT	9
3.2.3	Configure PROFINET settings via the TIA Portal	10
4	Installation and Startup.....	16
4.1	Installation of the hardware	16
4.2	Startup (JOG from drive side)	16
4.3	Startup (PROFINET communication).....	17
5	Operation of the application.....	18
5.1	Scenario A.....	18
5.2	Scenario B.....	20
6	Related literature	23
7	Contact.....	23
8	History.....	23

1 Task

1.1 Overview

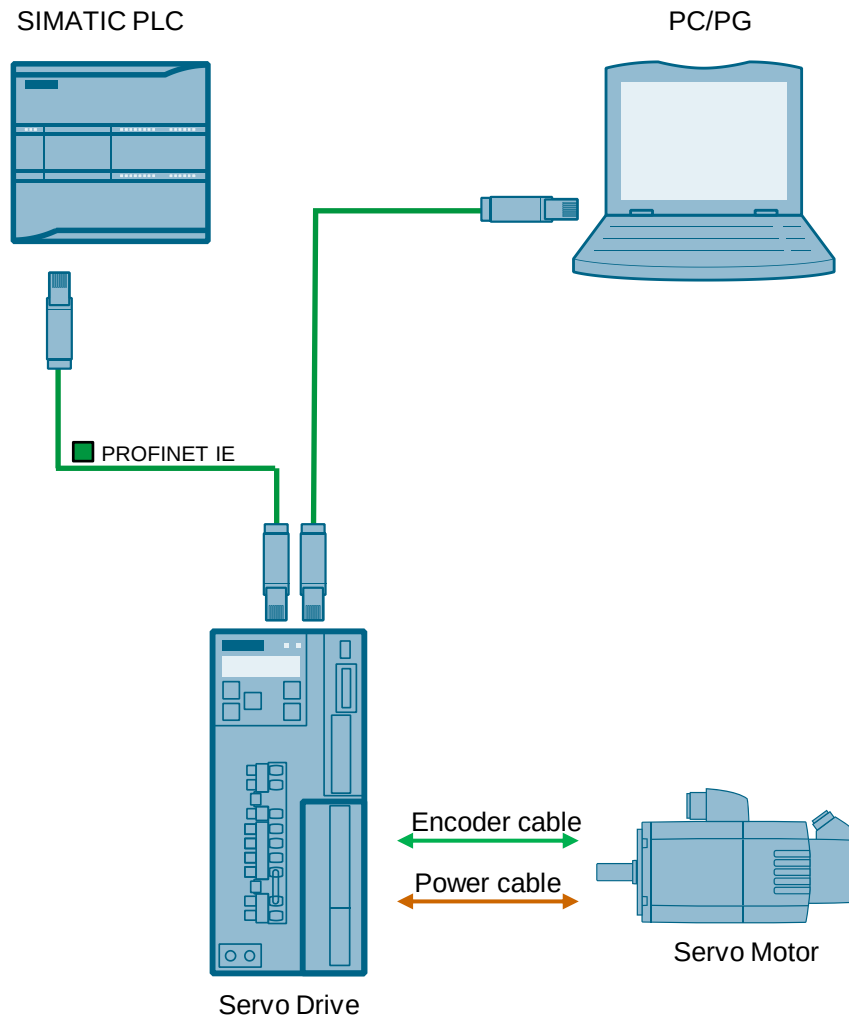
Introduction

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



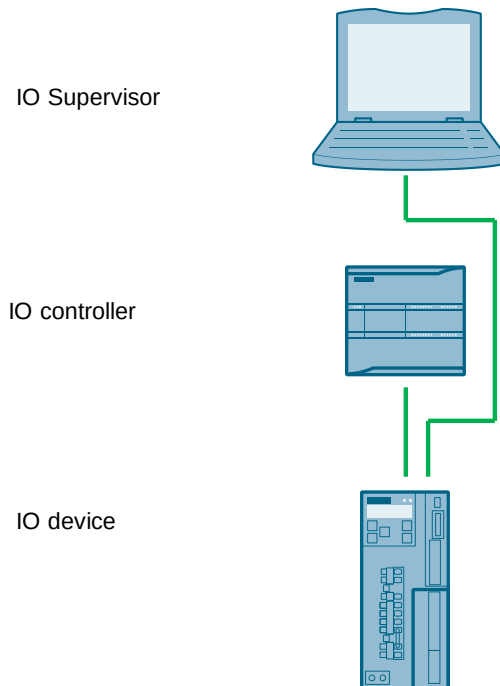
2 Solution

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:

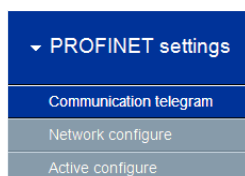
- Standard telegram 1
- Standard telegram 2
- Standard telegram 3
- Standard telegram 5
- Siemens telegram 102
- Siemens telegram 105

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:



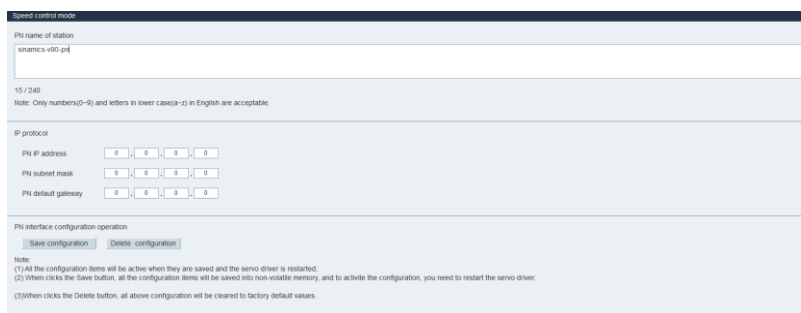
In this menu filed, you can configure:

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

Speed control mode			
Telegram selection			
The current telegram: 1: Standard telegram 1, PZD-2/2			
The PZD fields structure of current telegram and values of PZD fields are shown in below tables			
PZD structure and values			
Receptive direction (PZD count=2)		Transmit direction (PZD count=2)	
STW1 (PZD1)		ZSW1 (PZD1)	
Telegram	Description	Telegram	Description
STW1	Control word 1	ZSW1	Control word 1
bit0	rising edge = 1 ON (pulses can be enabled); 0 = OFF1 (braking with ramp)	bit0	1 = Ready for switching on
bit1	1 = No OFF2 (enable is possible); 0 = OFF2 (immediate pulse suppress)	bit1	1 = Ready for operation
bit2	1 = No OFF3 (enable is possible); 0 = OFF3 (braking with the OFF3 ramp)	bit2	1 = Operation enabled
bit3	1 = Enable operation (pulses can be enabled); 0 = inhibit operation (ru...)	bit3	1 = Fault present
bit4	1 = Operating condition (the ramp-function generator can be enabled); 0	bit4	1 = No coast down active (OFF2 inactive)
bit5	1 = Continue ramp-function generator; 0 = Freeze ramp-function gener...	bit5	1 = No test stop active (OFF3 inactive)
bit6	1 = Enable setpoint; 0 = inhibit setpoint (just the ramp-function generat...	bit6	1 = Switching on inhibited active
bit7	rising edge = 1 Acknowledge faults	bit7	1 = Alarm present
bit8	Reserved	bit8	1 = Speed setpoint - actual value deviation within tolerance 1, off
bit9	Reserved	bit9	1 = Control requested
bit10	1 = Control via PLC	bit10	1 = T or n comparison value reached/exceeded
bit11	1 = Setpoint inversion	bit11	1 = L, M, or P end reached
bit12	1 = Unconditionally opens the holding brake	bit12	1 = Opens the holding brake
bit13	1 = Motorized potentiometer setpoint raise	bit13	1 = No motor overtemperature alarm
bit14	1 = Motorized potentiometer setpoint lower	bit14	1 = Motor rotates forwards (n_act == 0); 0 = Motor rotates backwards (...)
bit15	Reserved	bit15	1 = No alarm, thermal overload, power and

3.2 Basic parameter configuration regarding SINAMICS V90 PN

- **Network:**



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

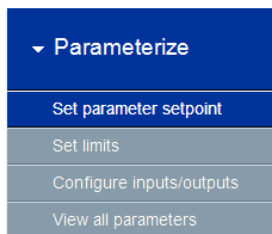
Table 3-1: PROFINET relevant parameters

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	

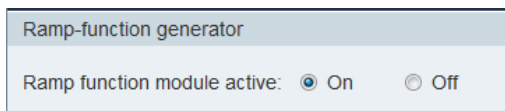
3.2.2 Configure ramp-function generator via SINAMICS V-ASSISTANT

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.



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:

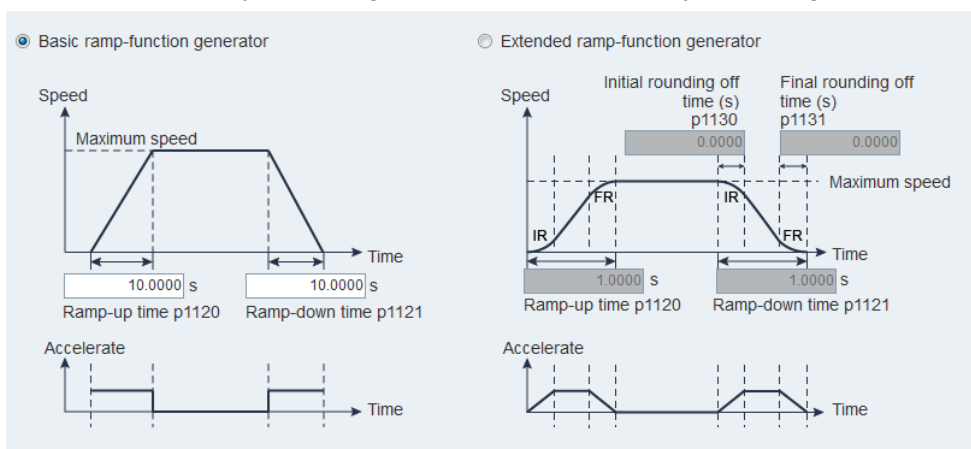


Table 3-2: Ramp-function generator relevant parameters

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

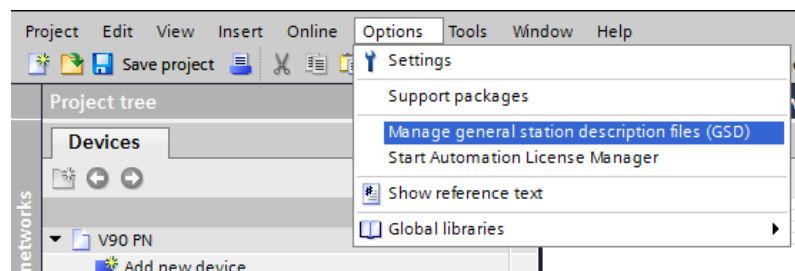
3.2.3 Configure PROFINET settings via the TIA Portal

3.2.3.1 Configure SINAMICS V90 PN

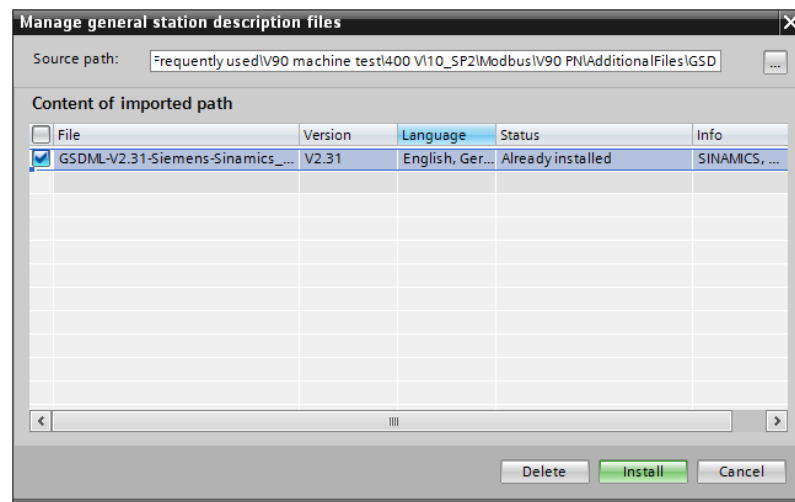
The PROFINET settings of SINAMICS V90 PN can be configured in the TIA Portal as follows:

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

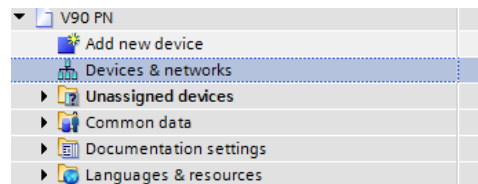
Note Installation of V90 PN GSD file is only necessary for TIA Portal prior to V13 (including V13).



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



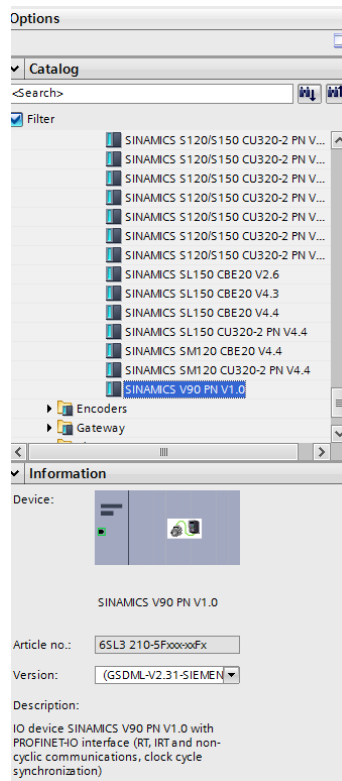
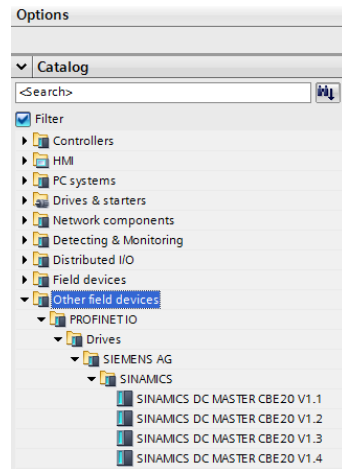
4. Click the node **“Devices & networks”** from the device tree on the left side.



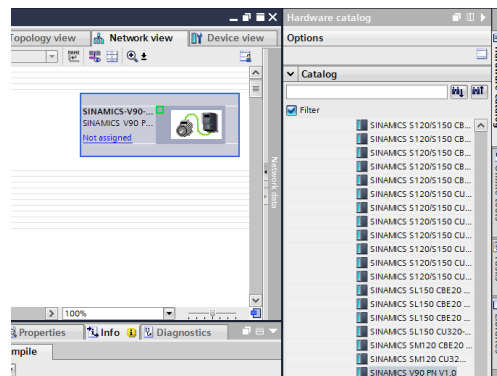
3 Basics

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.



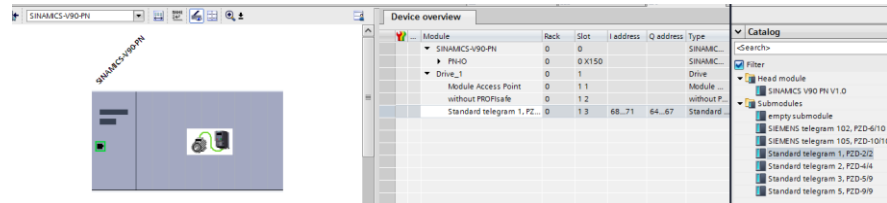
6. Double-click the V90 PN node or drag it to the network view:



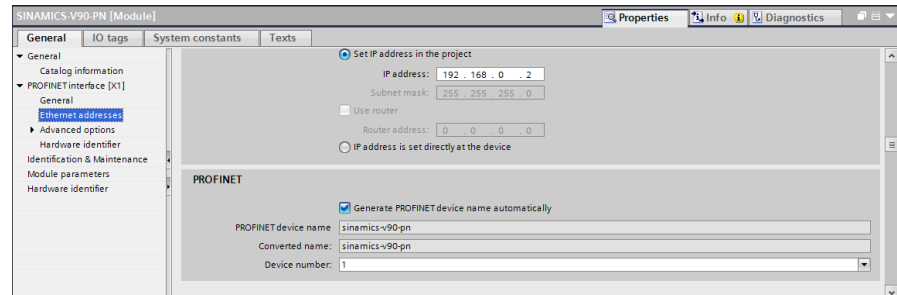
3 Basics

3.2 Basic parameter configuration regarding SINAMICS V90 PN

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

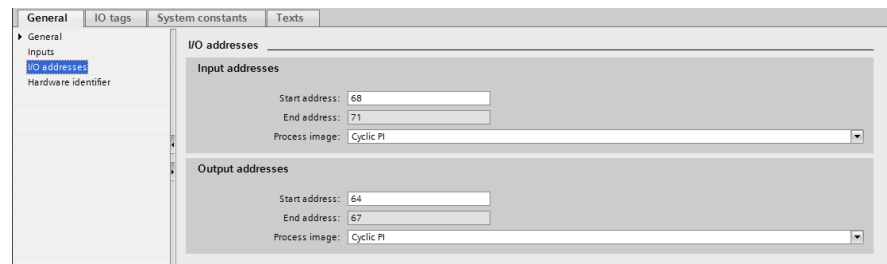


8. Now from the Properties tab, you can edit the Ethernet address and device name.



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

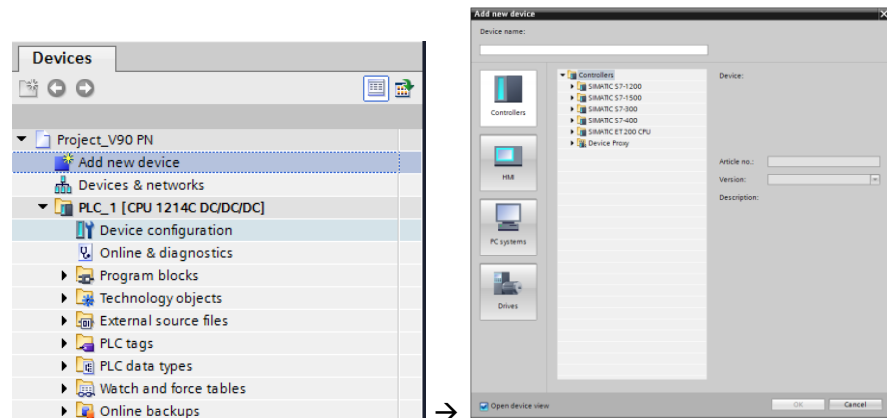
9. You can also configure the I/O address of the communication telegram from the Properties Tab:



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:

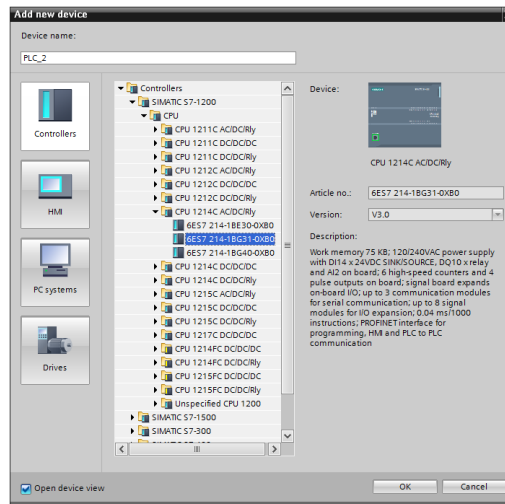
1. Double-click the node “Add new device” from the Device tree:



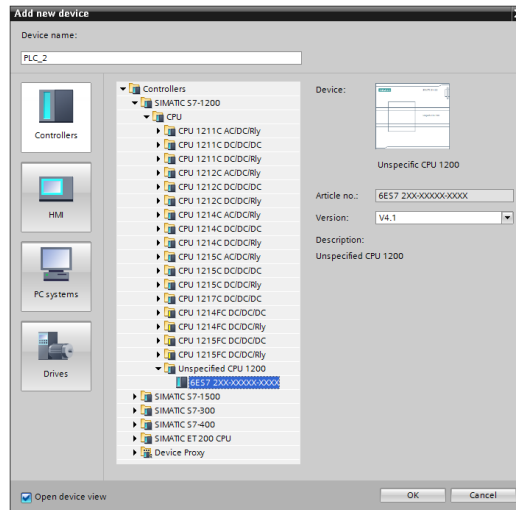
3 Basics

3.2 Basic parameter configuration regarding SINAMICS V90 PN

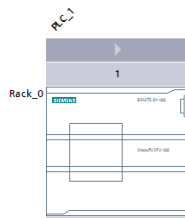
- Here, if you know the detailed information about the S7-1200 modules, you can directly find the type and add it into the project



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



- 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:

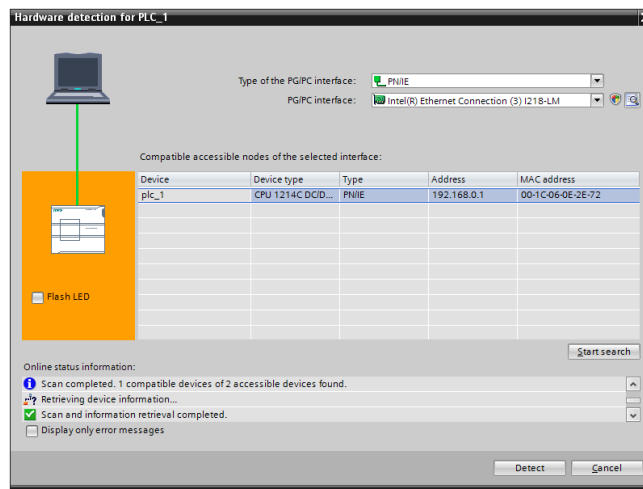


The device is not specified.
→ Please use the [Hardware catalog](#) to specify the CPU,
→ or **detect** the configuration of the connected device.

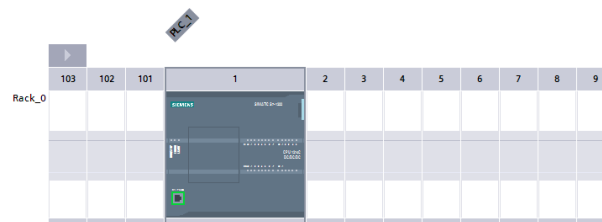
3 Basics

3.2 Basic parameter configuration regarding SINAMICS V90 PN

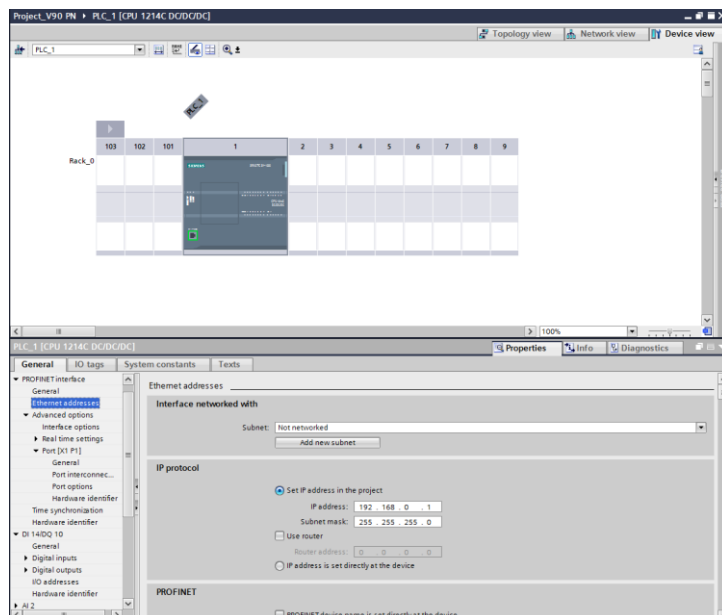
Start the search by clicking the **“Start search”** button, and the connected S7-1200 CPU will be found if the PROFINET network communication works properly:



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



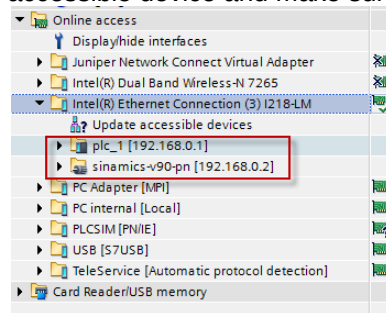
5. Double-click the PLC CPU to enter properties of the CPU in the device view:



3 Basics

3.2 Basic parameter configuration regarding SINAMICS V90 PN

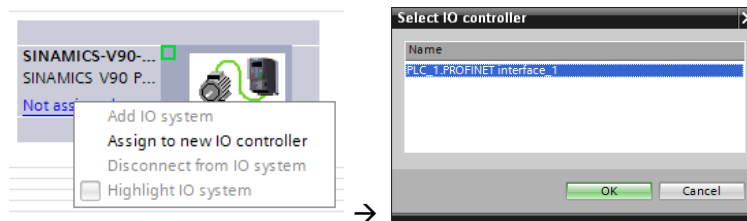
Here, you can configure information about the device name, Ethernet address... You can also use the “**Online access**” node to find the accessible device and make sure the information are consistent:



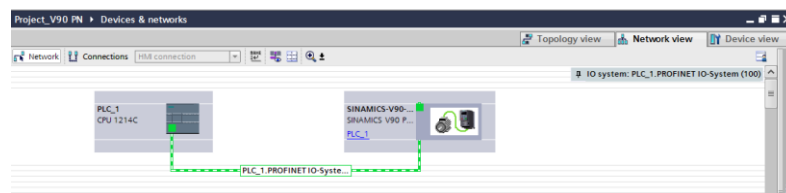
3.2.3.3 Connect SINAMICS V90 PN with S7-1200 CPU

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:

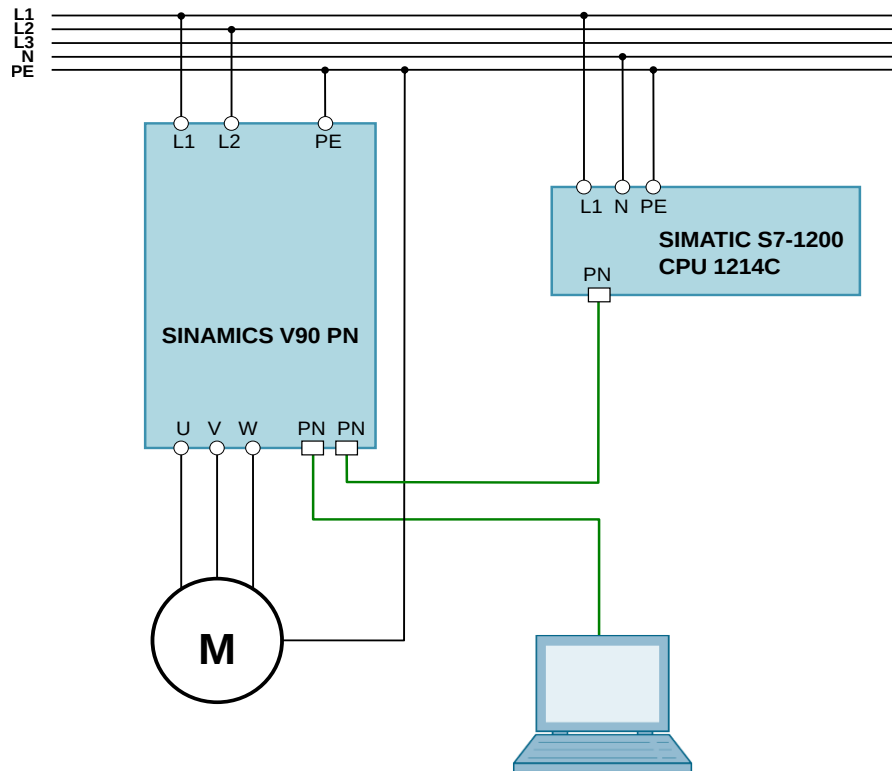


4 Installation and Startup

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

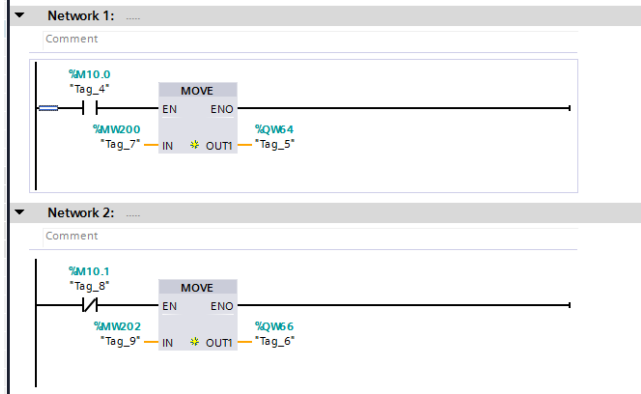
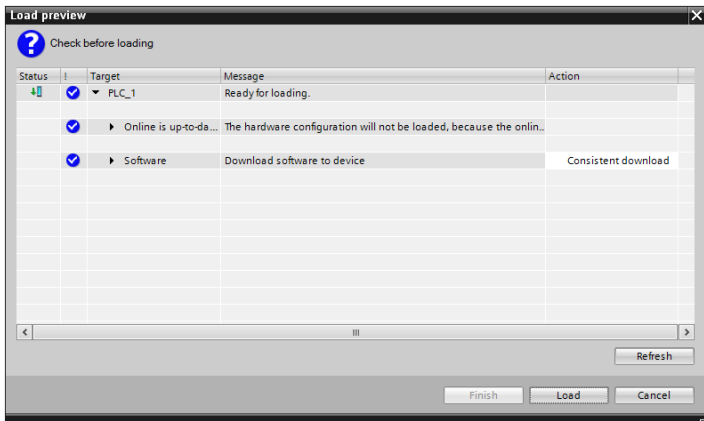
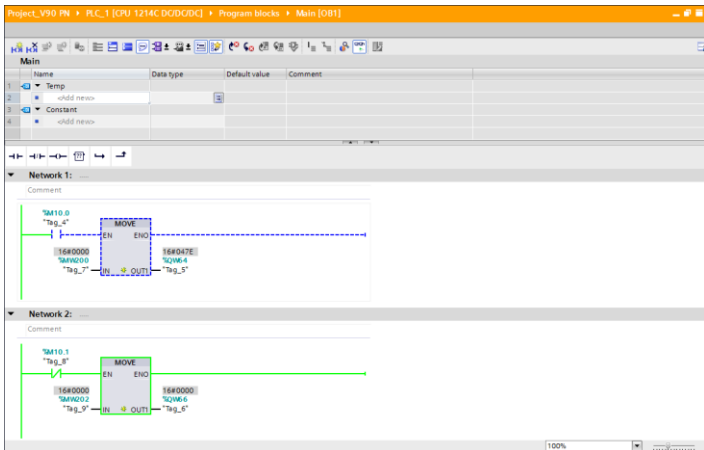
No.	Action	Remarks
1.	Set drive parameter p922 to be 1.	Select standard telegram 1
2.	Make device & network configurations in the TIA Portal: • <i>Device name</i> • <i>IP address</i> • <i>Telegram</i>	As shown in section 3.2.3
3.	Go online to test the PROFINET communication.	
4.	Download configurations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

5 Operation of the application

5.1 Scenario A

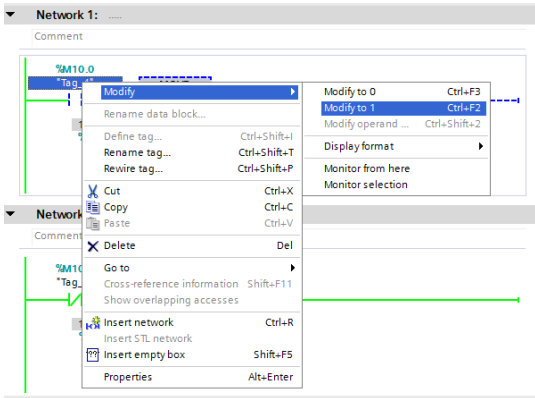
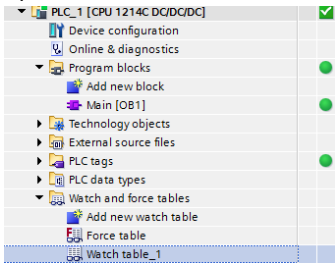
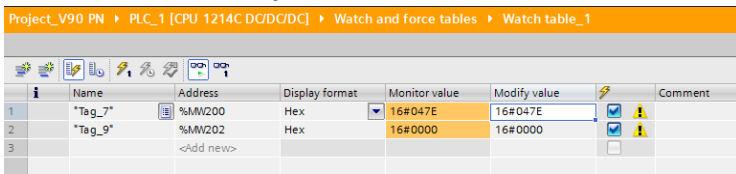
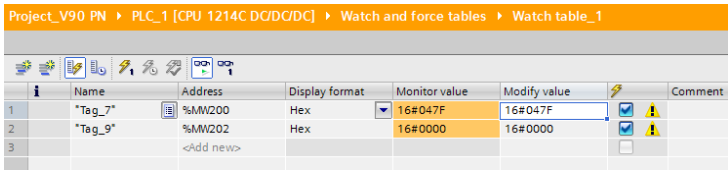
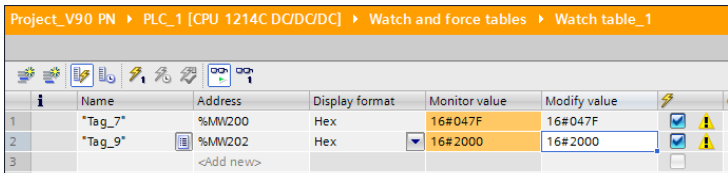
In scenario A, we use Move instruction for programming and run the motor with watch table:

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 Operation of the application

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.

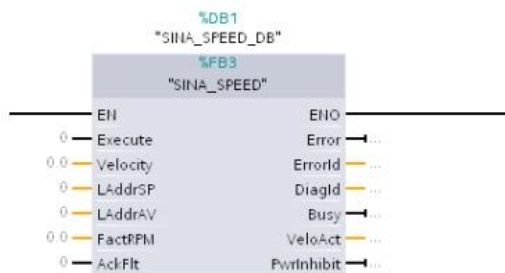


Table 5-2-1 Input interface of FB285

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
LAddrSP	HW_IO/INT	0	Symbolic name or HW ID/IO address on the SIMATIC S7-1200 of the setpoint slot (SetPoint)
LAddrAV	HW_IO/INT	0	Symbolic name or HW ID/IO address on the SIMATIC S7-1200 of the actual value slot (Actual Value)

5 Operation of the application

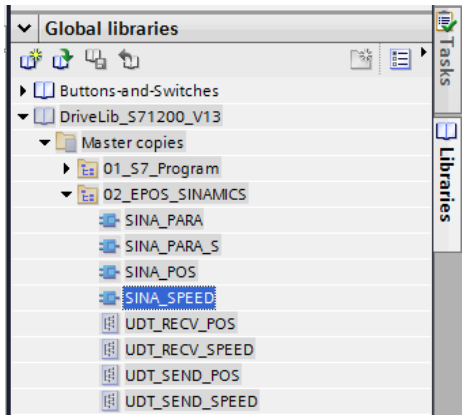
5.2 Scenario B

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 or enabled
VeloAct	REAL	0.0 [rpm]	Current velocity → dependent on scaling factor FactRPM
DiagId	WORD	0	Extended communication error → error during SFB call

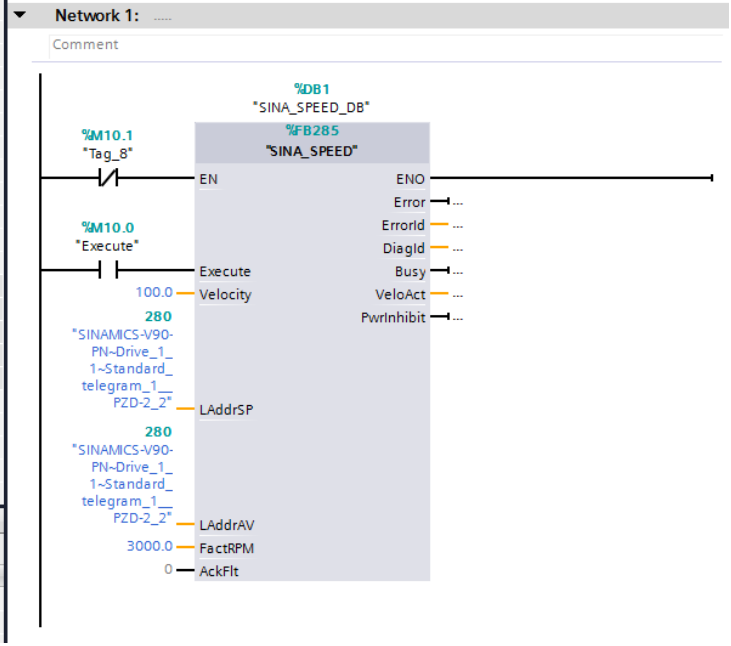
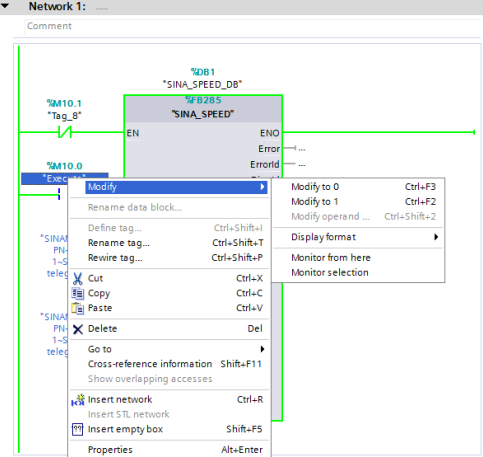
In scenario B, we will use FB285 in the library for programming and run the motor.

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:	

5 Operation of the application

5.2 Scenario B

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\		

7 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

8 History

Table 8-1

Version	Date	Modifications
V1.0	03/2016	First version