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Connecting a SINAMICS G120 Drive to an S7-300/400 CPU in TIA Portal

SINAMICS G120 (CU 240E-2 PN(-F)), SIMATIC S7-300/400

http://support.automation.siemens.com/WW/view/en/60140921

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1 Task

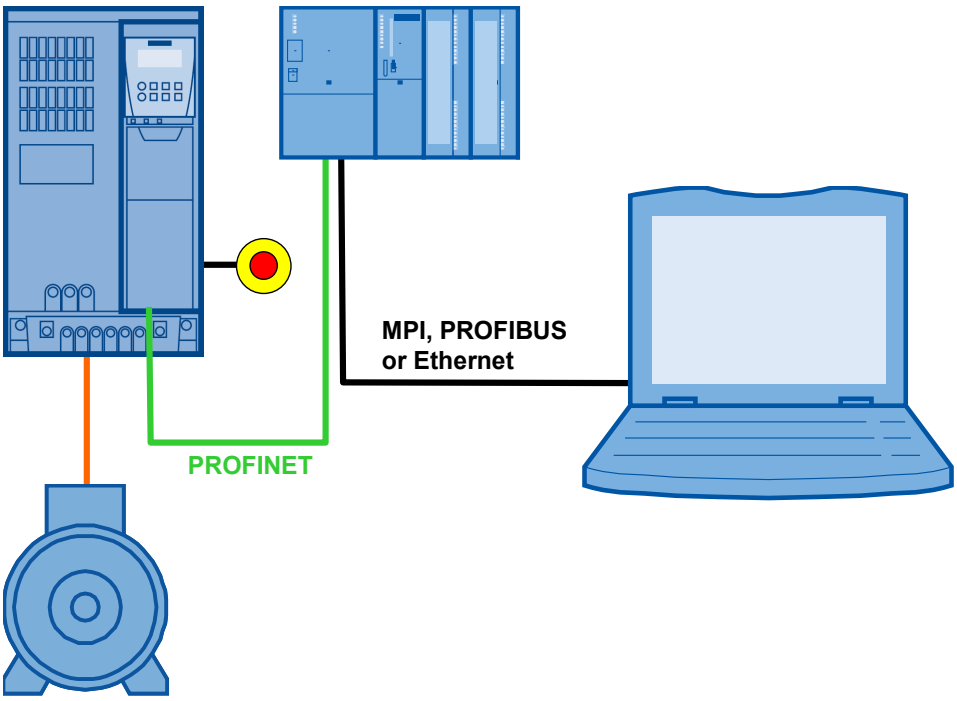
The SIMATIC S7 300/400 can be operated as a PROFINET controller.
A SINAMICS drive can be used as PROFINET device and be controlled by the S7-300/400.

This application example illustrates how to configure the SINAMICS and the S7-300/400, start it up and access process data and parameters.

Overview of the automation task

The following figure gives an overview of the automation task.

Figure 1-1: Overview of the task



Requirements for the automation task

Table 1-1: Requirements

Requirement	Explanation
Access to process data	The drive shall be switched on and off via the control word and the speed value is to be specified as quickly as possible.
Access to parameters	Read and write access from the controller to the parameters in the converter (in this example: ramp up and ramp down time) should be possible and be performed using as few resources as possible, i.e. small communication load.
Safety function of the converter	The SINAMICS converters have the option of performing a fail-safe shutdown (e.g. emergency-stop).

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2 Solution

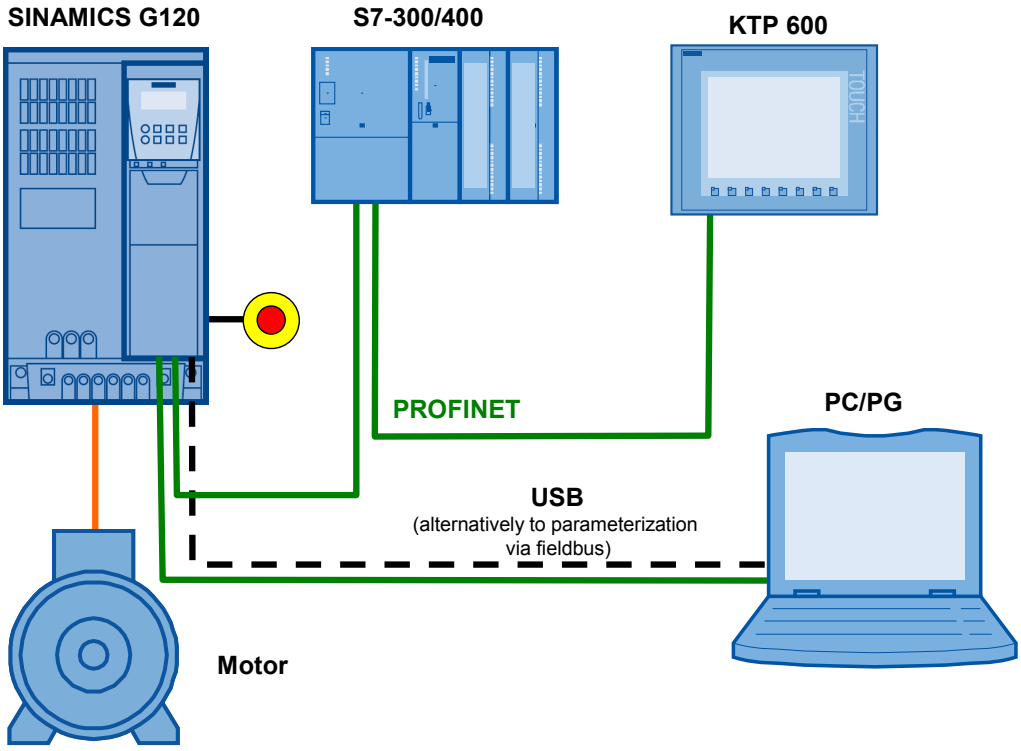
This application example gives an example of how to connect a SINAMICS G120 to an S7-300 using a GSD file in STEP 7 in the TIA Portal.

2.1 Overview of the general solution

Schematic layout

The following figure gives a schematic overview of the most important components of the solution:

Figure 2-1: Overview of the general solution



The example shows you how ...

- ...the S7-300/400 controller is configured.
- ...the communication is programmed in the S7-300/400 controller.
- ...the SINAMICS G converter is configured using STARTER.

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2.2 Description of the core functionality

2.2.1 Configuration for the communication

Controller and converter are programmed with independent software packages. Therefore, the communication data must be entered twice.

SINAMICS

The configuration of SINAMICS G120 is performed using the STARTER commissioning tool.

For SINAMICS one of several telegram types can be selected for the data exchange. This defines which data is transmitted or received in which order. It is important that the same telegram type is selected when configuring the controller.

SIMATIC S7-300/400

In this example SIMATIC S7-300/400 is programmed with STEP 7 Professional V13. For SINAMICS G120 and the telegram type to appear in the hardware catalog in TIA Portal, a device description file (GSD) must be imported. It is important that the same telegram type is selected as for the configuration of SINAMICS.

When inserting SINAMICS into the SIMATIC project, the I/O addresses which shall be used by the controller for accessing the converter are also specified.

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2.2.2 Data exchange

Data exchange between drive and PLC occurs in two areas:

- Process data,
  i.e. control word(s) and setpoint(s), or status word(s) and real value(s)
- Parameter area,
  i.e. reading/writing of parameter values

Note The two areas, process data and parameters, are independent from each other and can also be used individually.

Cyclic process data exchange

Process data is transferred cyclically, which means in each bus cycle, in order for them to be transferred as quickly as possible.

The S7-300/400 transmits the control word and the setpoint value to SINAMICS and receives the status word and the real value.

Depending on the telegram type, two further setpoint or real values, or extended control or status words respectively, can be transferred.

- On the controller side the process data is supplied as I/O input or output words.
- In the drive, the configuration specifies which bits of the control word are used and which data is transmitted to the controller.

Acyclic data exchange (parameter access)

To be able to transfer parameters, telegram types were defined where four words are provided for a parameter (PIV) transfer. Since these four words, like the process data (PZD), are always transmitted, a permanent communication load is produced even though the parameters themselves are generally only rarely transferred.

Apart from the cyclic data exchange there is also the option to use an acyclical data exchange that is only used if required. This makes it possible to transfer the parameter area acyclically on demand, without creating a permanent communication load. The acyclic transfer takes clearly longer than the cyclic transfer of the process data.

In the example the acyclical data exchange is used to access the parameters.

- In the controller, parameter jobs are sent to the drive by writing data record 47, and the response of the drive is read in by reading data record 47.
- No particular action is required on the drive side.

Note When using a CP342-1, the parameters of the drive cannot be accessed by acyclic data exchange.

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2.3 Hardware and software components used

The application document was generated using the following components:

Hardware components

Table 2-1: Hardware components

Component	Qty.	Article number	Note
CPU 315-2 DP/PN	1	6ES7315-2EH14-0AB0	or other S7-300/400 CPU with PROFINET
SM 323	1	6ES7323-1BH00-0AA0	or another module with DIs
SINAMICS G120	1	6SL3244-0BB13-1FA0 (CU 240E-2 PN-F) and 6SL3224-0BE22-2UA0 (PM240)	or another SINAMICS G120 with CU240x-2 PN (-F) or CU250S-2
SIMATIC Panel KTP600 Basic color PN	1	6AV6647-0AD11-3AX0	This panel is optional.
SINAMICS G120 PC converter connection kit 2m	1	6SL3255-0AA00-2CA0	Includes STARTER on DVD and USB cable. Alternatively, the software can be downloaded and a standard micro USB cable be used as well.
SINAMICS IOP or SINAMICS BOP-2	1	6SL3255-0AA00-4JA1 6SL3255-0AA00-4CA1	optional
PROFINET connector plug	6	6GK1901-1BB10-2AA0	The number is already taken into account for the connection with the PG/PC
PROFINET line		6XV1840-2AH10	
Motor	1	1LA7083-4AA60	

Standard software components

Table 2-2: Standard software components

Component	Qty.	Article number	Note
SIMATIC STEP 7 Professional V13	1	Floating License 6ES7822-1AA03-0YA5	
STARTER V4.3.1.0	1	6SL3072-0AA00-0AG0	Free download: see /6/
GSD file for SINAMICS G120	1	-	Free download: see /7/

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Example files and projects

The following list includes all files and projects used in this example.

Table 2-3: Example files and projects

Component	Note
60140921_SINAMICS_G120_at_S7-300400-PN_CODE_v11.zip	STEP 7 project.
60140921_SINAMICS_G120_at_S7-300400-PN_STARTER.zip	STARTER project The password for the safety settings is “12345”.
60140921_SINAMICS_G120_at_S7-300400-PN_DOKU_v11_en.pdf	This document

CAUTION **The STARTER example project is designed for the use with the example components listed in Table 2-1. If a SINAMICS G120 with a different output or a different motor is connected, without adjusting the respective parameters, converter and/or motor can be damaged or destroyed.**

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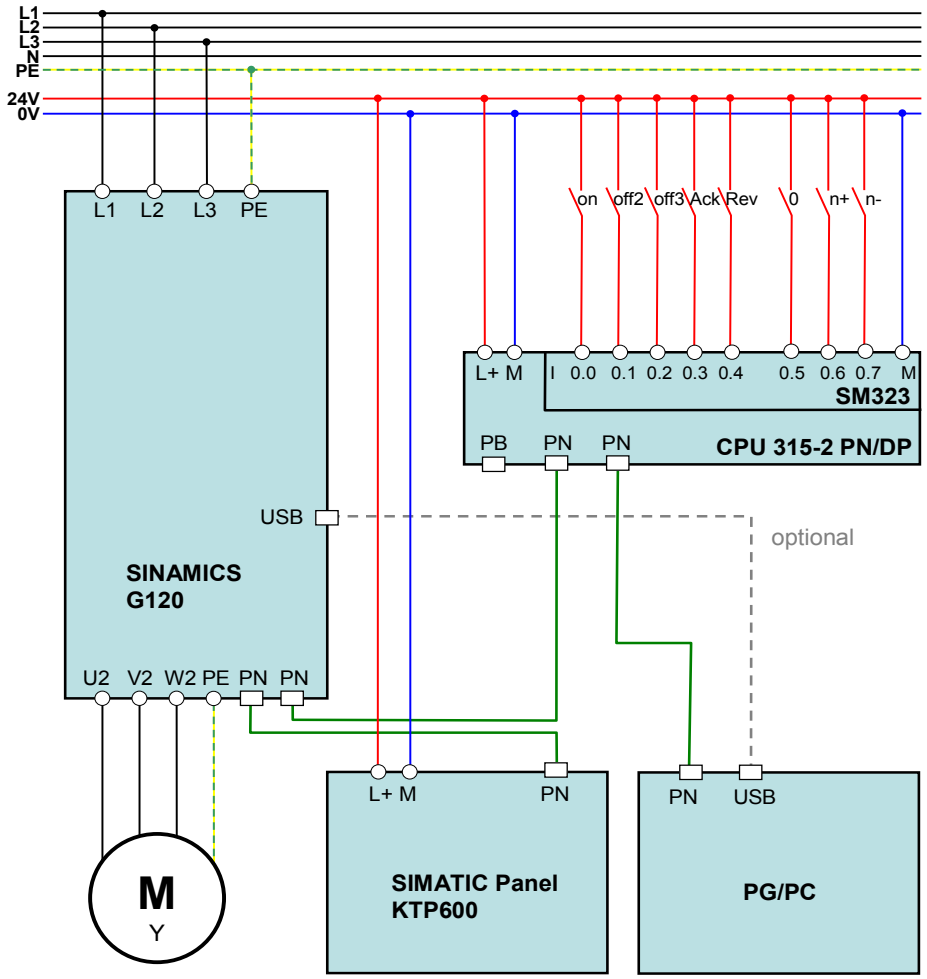
3 Setting Up and Commissioning the Application

3.1 Wiring

The figure below shows the hardware setup of the application.

Figure 3-1: Wiring



Note The setup guidelines in the SINAMICS G120 manual (see /8/) and SIMATIC must generally be followed.

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3.2 IP addresses and PN device names

In the example the following IP addresses and PROFINET device names are used:

Table 3-1: IP addresses and PN device names

IP	Component	PROFINET device name	Converted name[1]
192.168.0.1	S7-CPU	cpu 315-2 pn/dp	cpuxa315-2xapnxrdp1af8
192.168.0.2	CU240E-2PN -F	sinamics-g120-cu240e-v4.5	sinamics-g120-cu240e-v4.xd508bc
192.168.0.3	KTP600	simatic hmi-station	simaticxahmi-station4e5e
192.168.0.200	PG/PC	-	-

The network mask is always 255.255.255.0 and no router is used.

The PROFINET device name is made up of the (editable) device names that are assigned by default from the system and which can be found in the “Properties” of the respective device under “General”. However, in the end a converted name according to IEC 61158-6-10 is loaded in the appropriate device. If the PROFINET device name is already complying with the norm, it is accepted as converted name. More details on naming can be found, e.g. in the information system (online help) of the TIA Portal under “Assigning addresses and names for PROFINET devices”.

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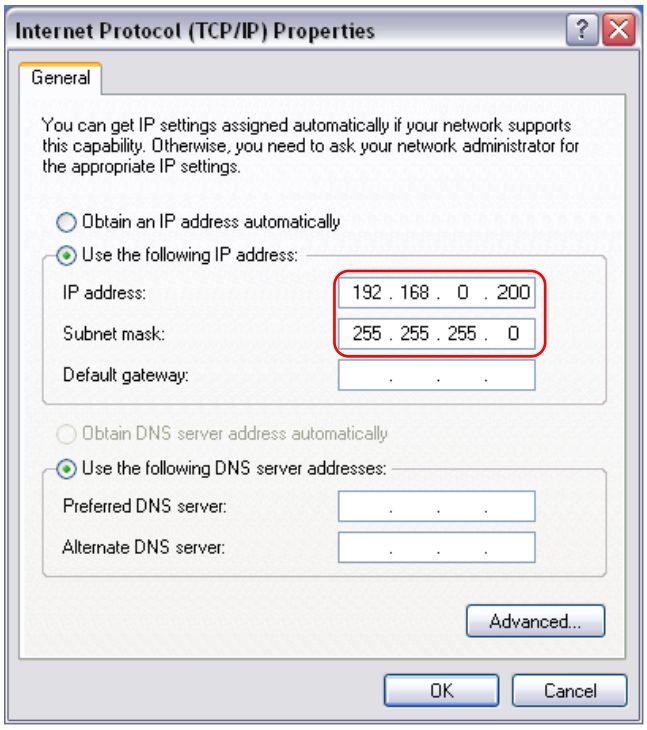
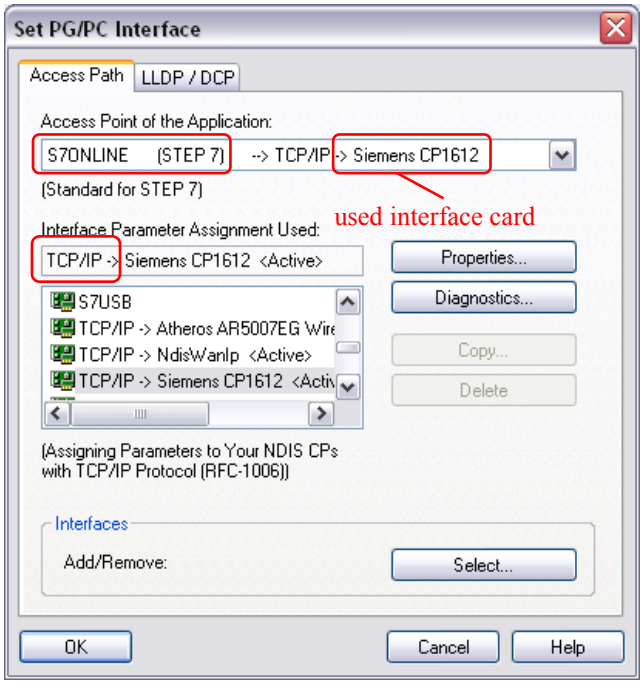
[1] Name convention according to IEC 61158-6-10

3.3 Settings on PG/PC

Table 3-2: Instruction – settings on PG/PC

No.	Action	Remarks
1.	Assign a free, fixed IP address 192.168.0.x to the network card used (e.g. x = 200) and assign the subnet mask 255.255.255.0. Navigate in Windows as follows: >Start >Settings >Network connections >Right click on network card >Properties >Internet protocol (TCP/IP) >Properties	
2.	Set the PG/PC interface. Select “S7ONLINE (STEP7)” as access point of the application and “TCP/IP -> network card used” as interface configuration used. Navigate in Windows as follows: >Start >System controller > Set PG/PC Interface 	

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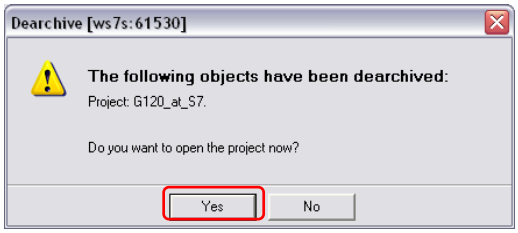
3.4 Downloading the SINAMICS configuration

This chapter describes the steps for downloading the example configuration. It is assumed that STARTER V4.3.1.0 or higher is already installed on your PG/PC.

Note

- The download can be performed via Ethernet interface or USB. Below, the use of the Ethernet interface is shown.
- Should you use a different converter or motor you need to perform your own configuration. In that case, follow the instructions in chapter 6 “Configuration and Settings”.
- The screenshots below use a general project name: “G120_at_S7”. In this example, this stands for “G120_at_S7-300-PN”

Table 3-3: Instruction - downloading the SIMATIC configuration

No.	Action	Remark
1.	Connect the CU 240E-2 PN-F of SINAMICS G120 with the PG/PC.	
2.	Start the STARTER commissioning software.	
3.	Retrieve the STARTER project from Table 2-3 (“File > Retrieve…”) and open it.	

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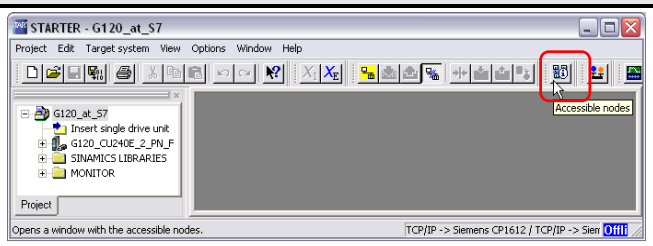
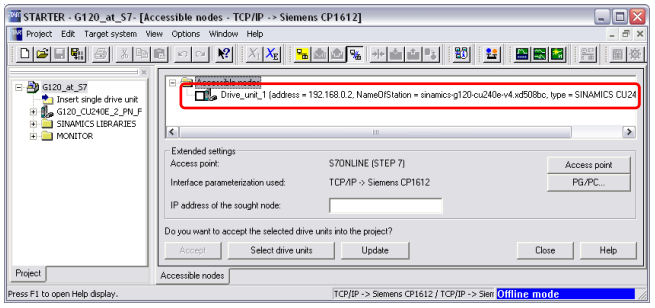
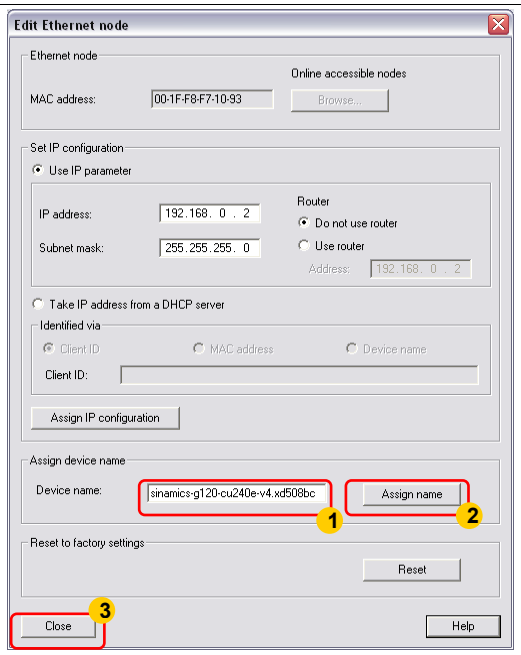
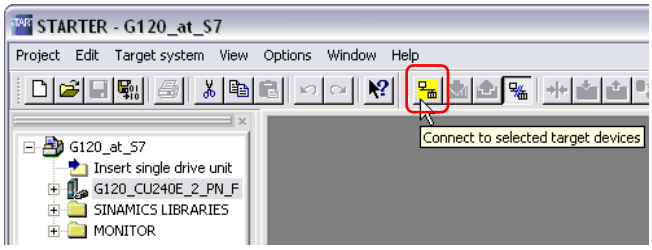
No.	Action	Remark
4.	Click on “Accessible nodes”.	
5.	Right click on the found drive and select “Edit Ethernet node…” from the context menu.	
6.	Assign the PROFINET device name to the IO device (drive) that is used in the network configuration of the CPU.	
7.	Select the converter in the tree and go online.	

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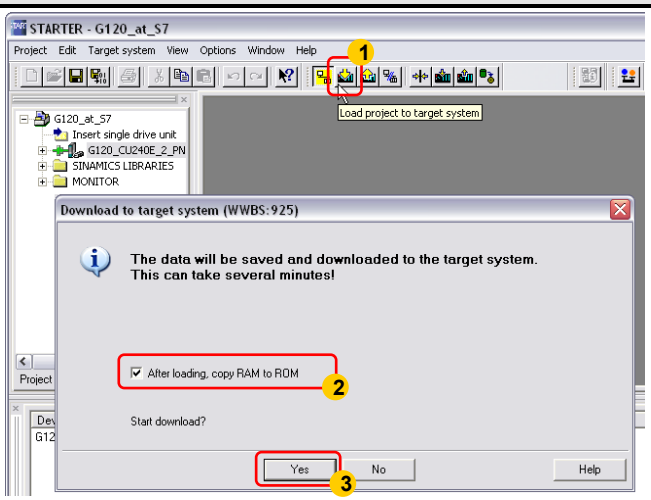
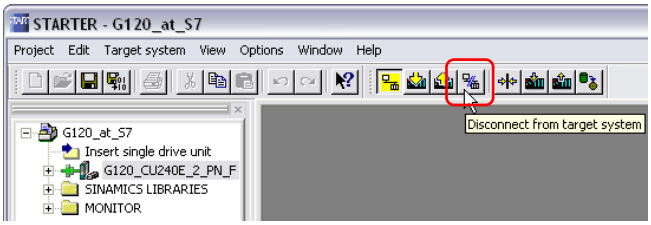
No.	Action	Remark
8.	Start the download and tick “After loading, copy RAM to ROM”. Should you receive a note which indicates different parameters for the power unit, you need to make your own configuration. In that case, follow the instructions in chapter 6 “Configuration and Settings”.	
9.	Go offline.	

3.5 Downloading the SIMATIC program

This chapter describes the steps for the installation of the example code into SIMATIC.

Requirements

- SIMATIC STEP 7 Professional V13 or higher is already installed on your PG/PC.
- The SINAMICS configuration according to chap. 3.4 has already been carried out.

Table 3-4: Instruction - downloading the SIMATIC program

No.	Action	Remarks
1.	Connect the controller with the PG/PC using a network cable.	You can connect both devices directly or via a switch.
2.	Retrieve the project on hand as zip file on Windows level.	The G120_at_S7-300-PN project folder is created.

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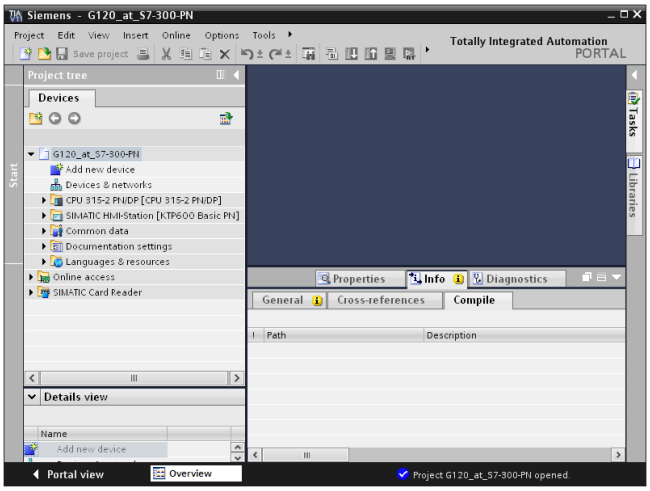
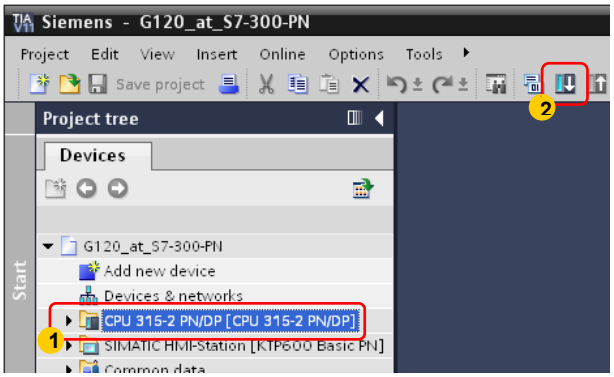
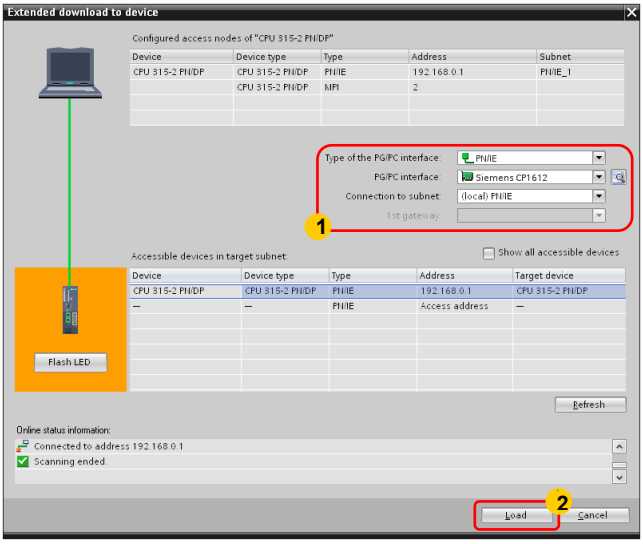
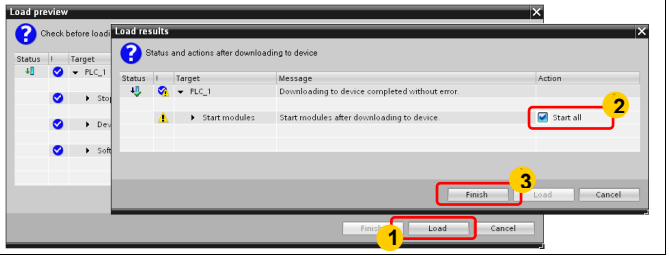
No.	Action	Remarks
3.	Double click the ap11 file in the project folder just retrieved in order to open the project in TIA Portal.	
4.	Select the controller and initiate the loading process.	
5.	Select the following interface data in the “Extended download to device” mask: • Type of PG/PC interface: ⇨ PN/IE • PG/PC interface: ⇨ network card used • Connection to subnet: ⇨ (local) PN/IE You may be prompted to tick “Show all accessible devices” in the online status information. Click “Load” as soon as the CPU is reached.	
6.	Exit the “Load preview” mask with the “Load” button… …and subsequently the “Load results” mask with the “Finish” button. “Start modules after downloading to device” has to be ticked.	

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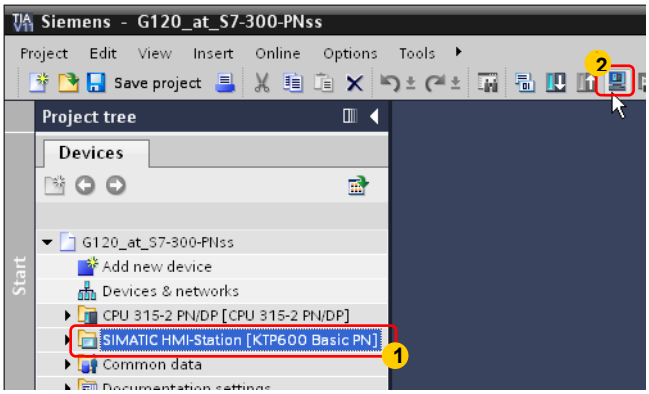
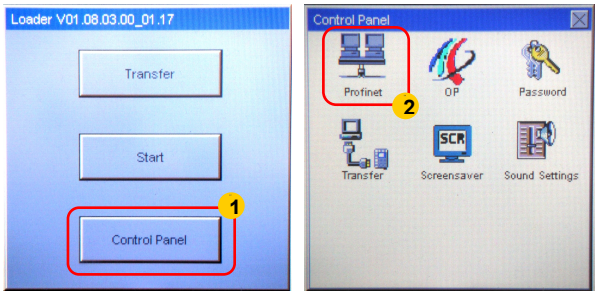
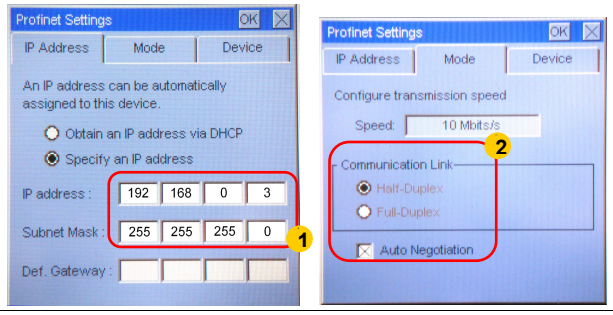
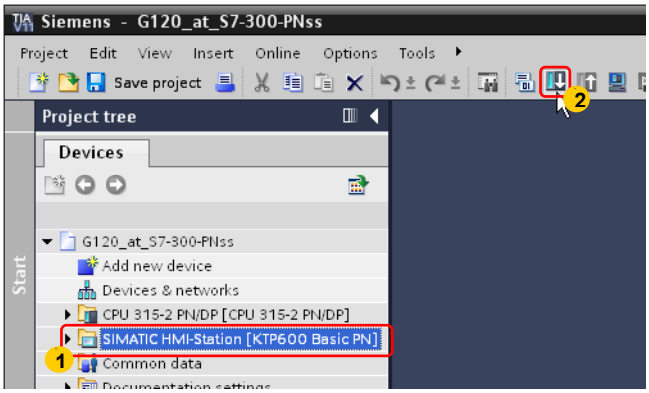
No.	Action	Remarks
7.	To be able to run the KTP600 operator panel as simulation on your PG/PC, select it and start the simulation. (If you would like to connect a real KTP600 to the controller instead of the simulation, continue with step 0.)	
8.	Connect the KTP600 to the power supply and open the PROFINET settings in the Control Panel.	
9.	Make the entries according to the screens on the right. Exit the PROFINET settings with “OK” and close the Control Panel. Subsequently prepare the loading process by clicking the “Transfer” button.	
10.	Connect the operator panel with an Ethernet patch cable directly to the PG/PC or via a switch and start the data transfer. The operator panel will subsequently start automatically. Now connect the operator panel with the controller (not necessary when using a switch)	
11.	Execute a restart of the controller	Using the stop/start button on the CPU. The new restart assigns the IP addresses to the IO devices (drive and operator panel) via the configured and already loaded PROFINET device names. The application is now ready for operation.

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4 Operating the Application

4.1 Requirements

To be able to switch on the drive via the digital inputs, the following points must be fulfilled:

- If the safety functions of the converter have been activated, then 24V must be supplied at terminals 16 and 17 (DI 4 and 5) of the SINAMICS G120; otherwise, the STO safety function is active, the yellow “SAFE” LED at the converter is blinking and the drive cannot be switched on.
- 24V must not be supplied at terminal 8 (DI 3) of the SINAMICS G120, otherwise the command data record is switched over.
- When using an IOP, please check that the network icon ( ) is displayed on the top right. If the hand icon ( ) is displayed there, press the Hand/Auto button ( ).
- When using a BOP-2, please check whether the hand icon ( ) is displayed. If yes, press the Hand/Auto button ( ).

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4.2 Operating the application

The drive is exclusively moved via digital inputs. The HMI is only used for monitoring.

Table 4-1: Digital inputs

Terminal	Name	Function
I 0.0	On	Switching the drive on/off, (Off2 and Off3 =1 must apply for the operation)
I 0.1	Off 2	0= Motor immediately switched off, drive spins out
I 0.2	Off 3	0= Fast stop, motor is decelerated with Off3 ramp down time (P1135) until it stops
I 0.3	Ack	Rising edge acknowledges a pending error in the drive
I 0.4	Rev	Reversed direction, the polarity of the setpoint value is negated
I 0.5	0	The setpoint is set to 0.
I 0.6	n+	The setpoint value is increased
I 0.7	n-	The setpoint value is decreased

4.2 Operating the application

To switch on the drive, please follow the steps below:

Table 4-2: Instruction – switching on drive

Steps	Action	Note / Result
1.	Apply 24V to Off2 (I0.1) and Off3 (I0.2).	The further required control bits for the operation are set to 1 by the program.
2.	Enter a pulse (switching on and back off) to Ack (I0.3).	This acknowledges a possibly pending error message.
3.	Enter a pulse (switching on and back off) to 0 (I0.5).	The setpoint is set to 0.
4.	Apply 24V to On(I0.0).	The drive switches on.
5.	Change the setpoint value with inputs n+ (I 0.6), n- (I0.7) and 0 (I0.5).	The speed of the motor changes.
6.	Remove the 24V from On (I0.0).	The drive switches back off.

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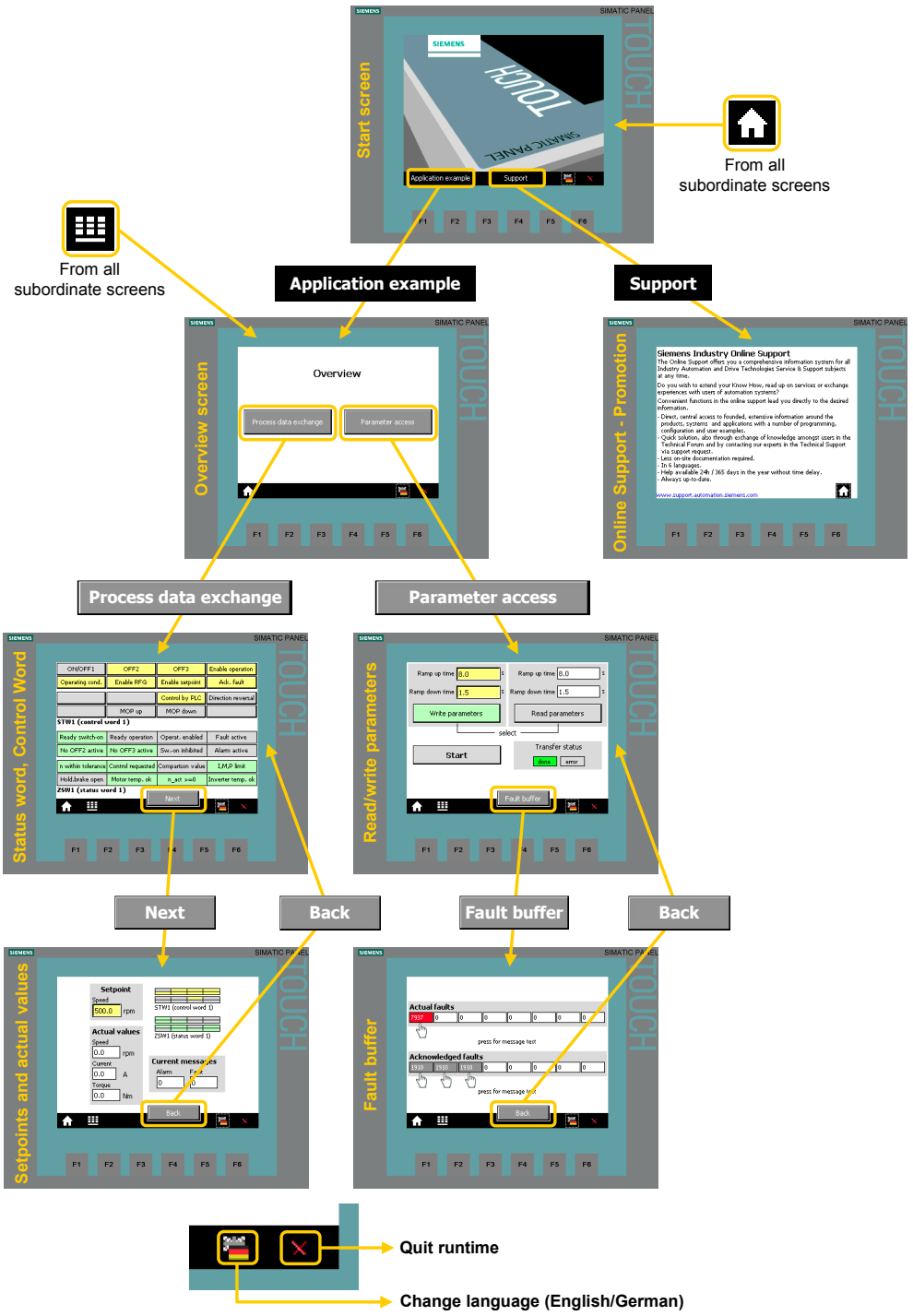
4.3 Monitoring and parameter access via operator panel

4.3.1 Screens and screen navigation

Figure 4-1: Screen navigation



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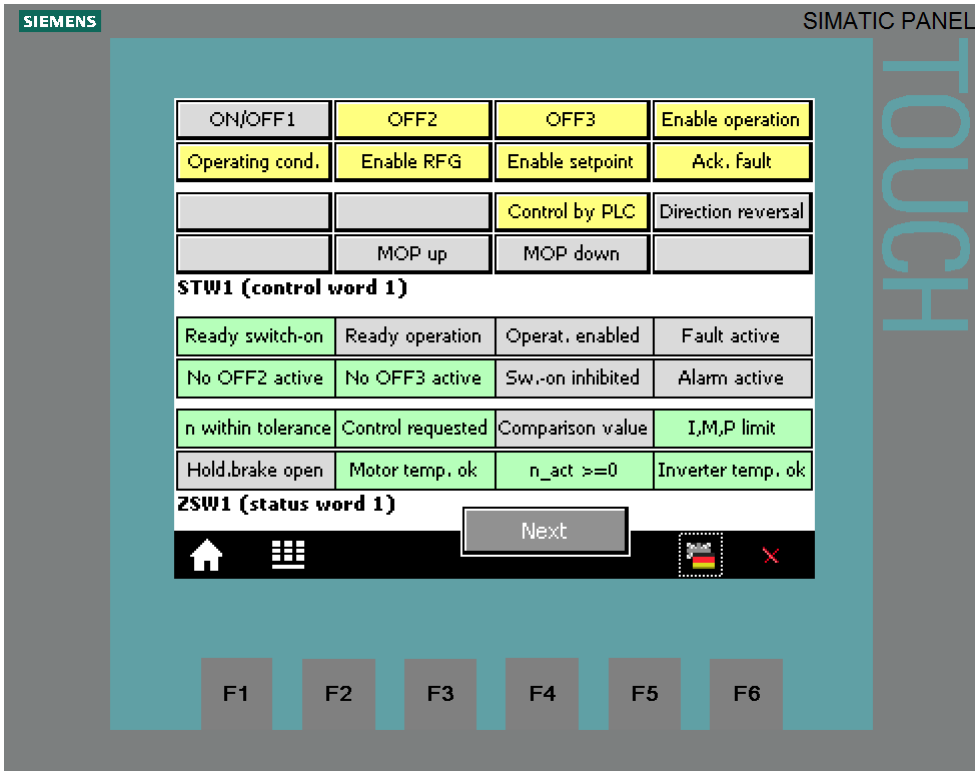
4.3.2 Process data exchange

Both screens for the process data exchange access the idb_Process_Data_SFC data block (DB11). The operator panel supports the process data exchange via SFC, which has been realized in this application (see chapter 5.1.3). When selecting a different method, the data block number must be modified accordingly in the tag assignment in WinCC flexible.

Control and status word

Figure 4-2: Control and status word



The bit commands, which you can partially specify via the digital input module, are displayed in the 16 bit wide control word.

The current state of the converter is given via the also 16 bit wide status word.

The displayed control or status word is identical with that in the respective VAT_Process_Data_... tag table.

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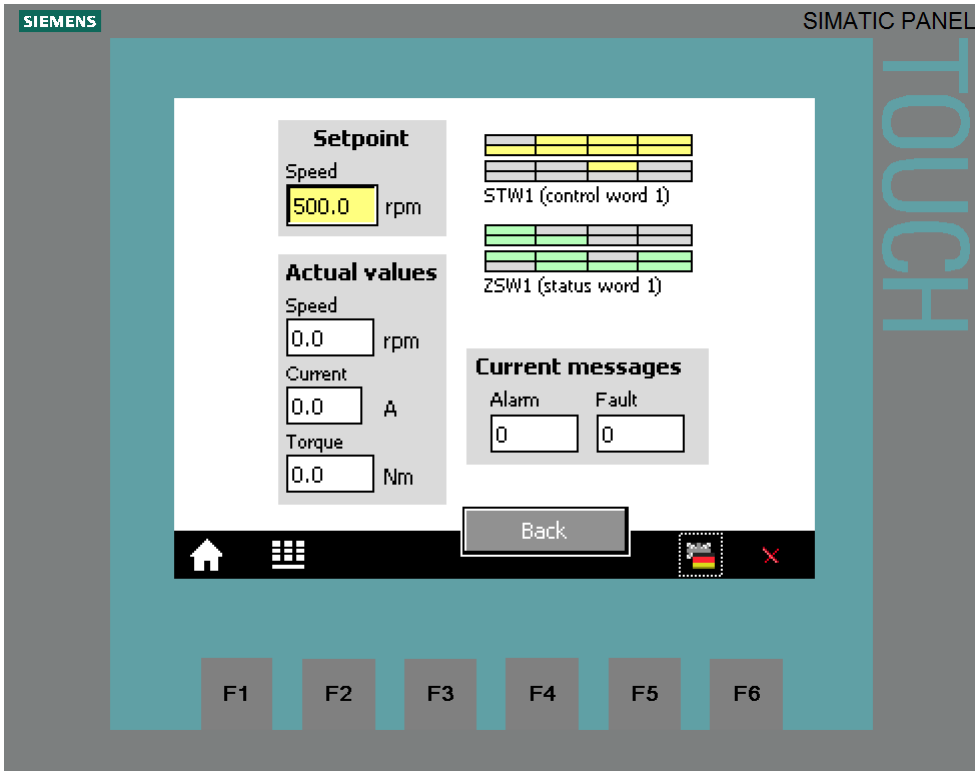
Setpoint and actual values

Figure 4-3: Setpoint and actual values



The control tags contained in the above screen are identical with those in the respective VAT_Process_Data_... tag table.

Setpoint speed value:
The yellow field, top left, indicates the setpoint speed value that is set via the digital inputs I0.4 to I0.7 (see Table 4-1) in this example.

Actual values:
The current actual values speed, current and torque are displayed below the speed setpoint value input.

Control and status word:
To keep an eye on control word and status word, without switching to the respective screen, they are also given here as a miniature display.

Current messages:
Current faults and warnings are displayed with a respective number. A “0” means, that no fault or alarm exists. If a message is pending it is displayed according to Figure 4-4.

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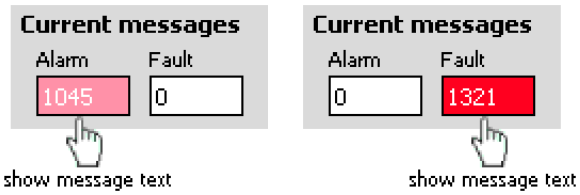
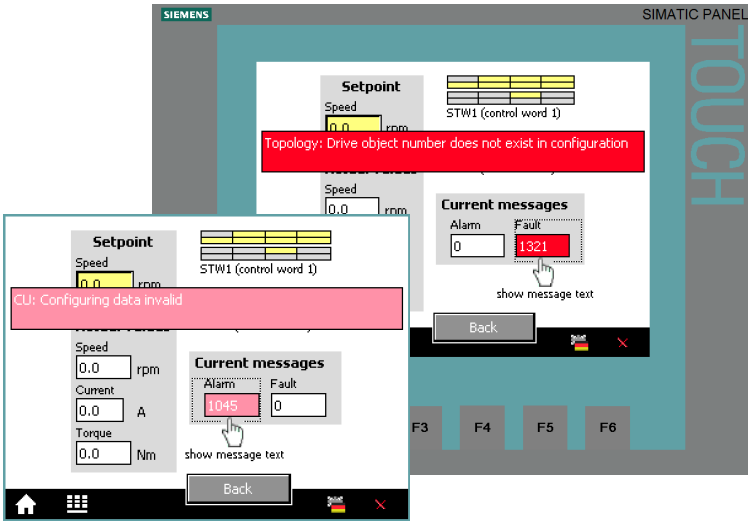
Figure 4-4: Current messages as message numbers



Tap or click on the message number to display the respective message text.

Figure 4-5: Current messages in plain text



The message text is displayed as long as the message number is pressed.

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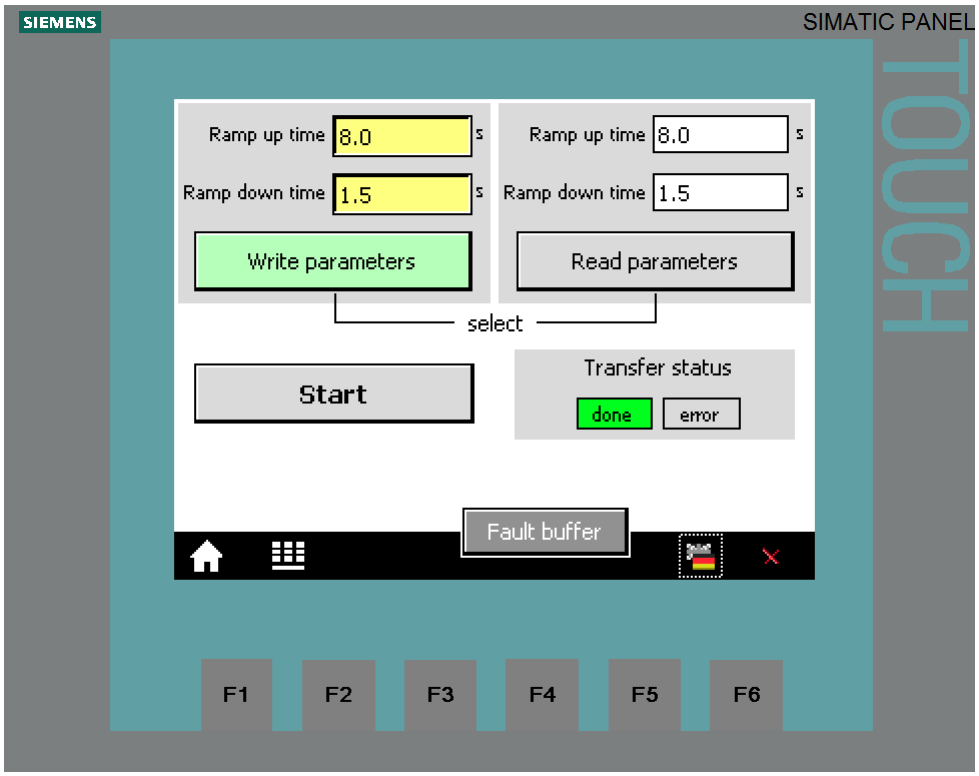
4.3.3 Parameter access

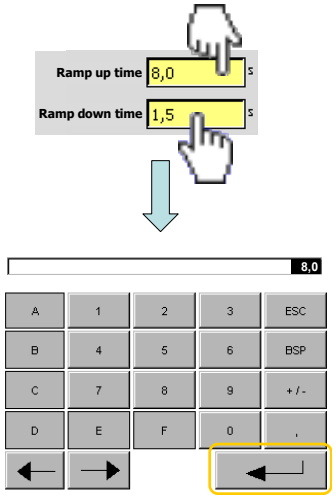
Reading/writing parameters

Figure 4-6: Reading/writing parameters



The control tags contained in the above screen are identical with those in the respective VAT_Parameter_access_... tag table.

Table 4-3: Instructions – writing/reading parameters

	Action	Remark
1.	Select the access type with the “Read parameters” and “Write parameters” buttons.	The selected access type is displayed via a bright green button.
2.	Read parameters: Proceed with point 3 in the table. Write parameters: When tapping or clicking the yellow input fields for the ramp up/ramp down time, a keyboard mask for the value input opens. Close your input with the Return key.	

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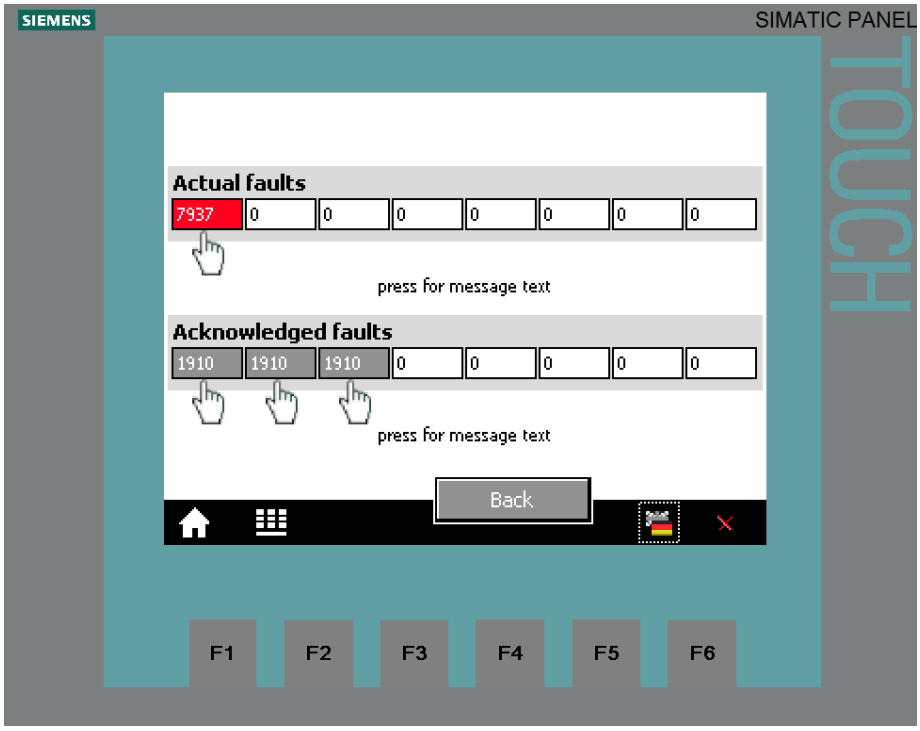
	Action	Remark
3.	Start the write or read job with the “Start” button. Note: After a write job the new data is adopted as read parameters in the white fields in the left part of the screen. After writing you need not trigger any additional read job for the update.	The job status specifies how the job was completed: done = completed without errors errori = completed with errors The status relates to the processing of the instructions “RDREC” and “WRREC” in FB20 “Parameter_Access” for the communication to the IO device. For fault diagnostics see /1/.

Fault buffer

The screen displays the fault codes of eight current and eight acknowledged faults, which are saved in the converter.

Figure 4-7: Display of fault buffer



The fault codes in the above screen correspond to the control tags V_3_Value_00 (DW18) to V_3_Value_15 (DW48) in the “answer_from_drive” data block (DB103).

Tap or click on the message number to display the respective message text.

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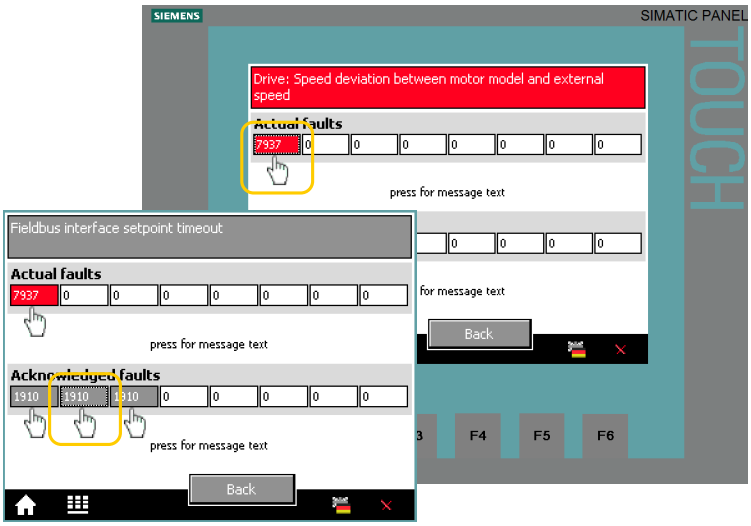
Figure 4-8: Display of fault buffer message in plain text



The message text is displayed as long as the message number is pressed.

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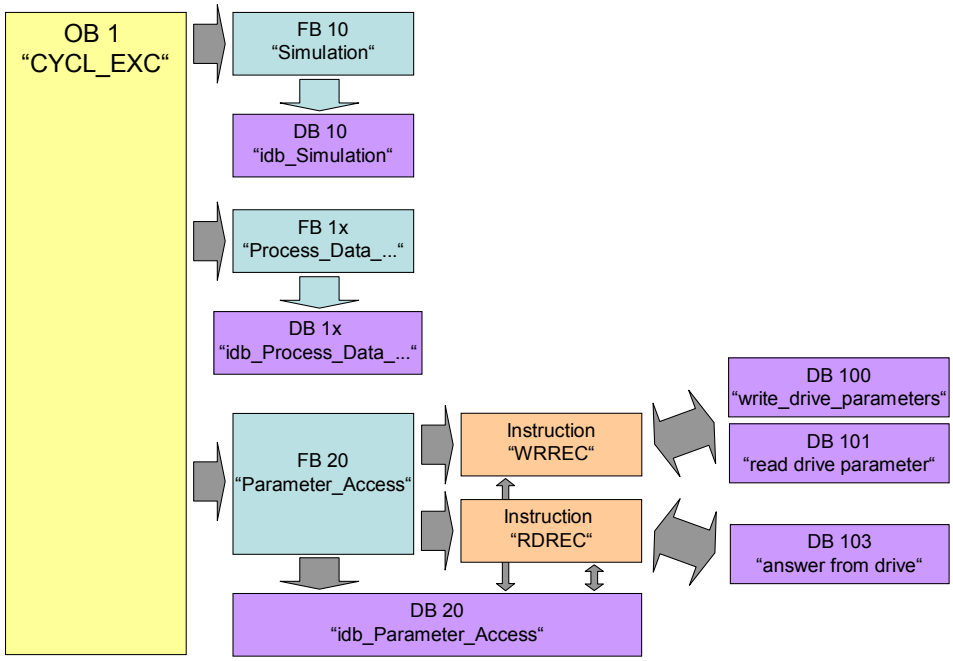
5 Functional Mechanisms of this Application

Program overview

Figure 5-1: Block structure (overview)



The SIMATIC program consists of three areas:

- Simulation
  In this area, the control signals are created for the converter, which are then transmitted as process data to the drive.
- Process data exchange
  In this area, the process data for the converter is transmitted (e.g. one command and setpoint) or received (status and actual values)
- Parameter access
  In this area, the parameters from the converter are accessed.

Note The two communication areas, process data and parameter access, are independent from each other and can each also be used individually.

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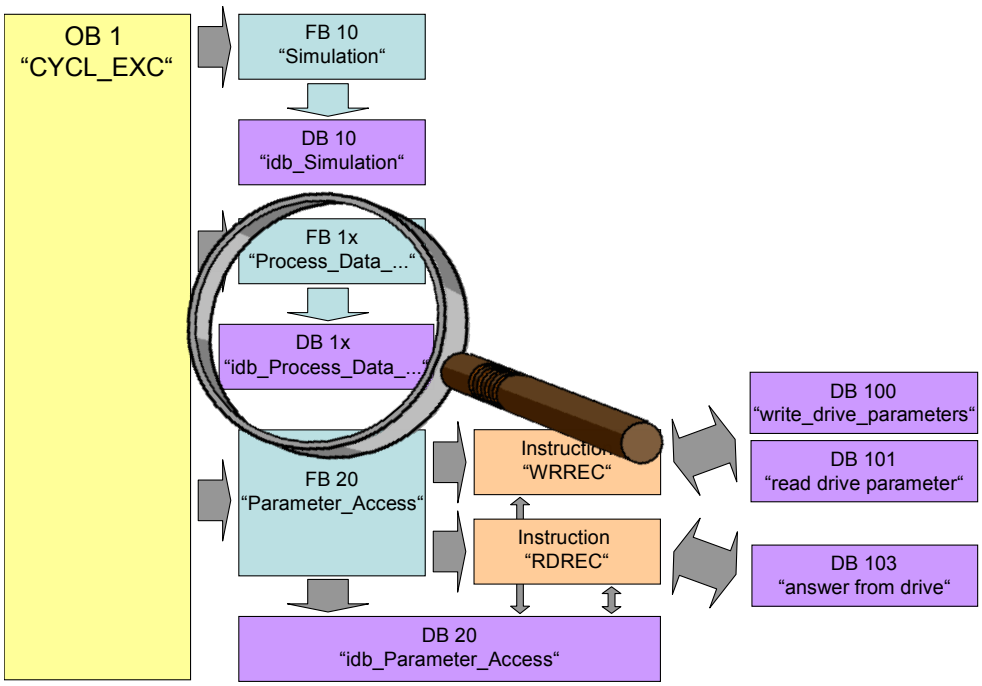
5.1 Functionality of process data exchange

Figure 5-2: Block structure of process data exchange



The process data contains values which are regularly exchanged between controller and converter. These values are at least the control and status word as well as the setpoint and actual value. Selecting the telegram type specifies the exact length and structure.
The “Siemens Telegram 352, PZD 6/6” telegram type used in the example exchanges 6 words in both directions.

5.1.1 Accessing process data in the user program of the controller

At the start of the cycle, the operating system of S7-300/400 stores the (user) data received by the converter in the I/O input area of the CPU and transmits the data stored in the I/O output area to the converter at the end of the cycle. In the user program, the data can be accessed by copying from or into the I/O area.
The address areas used are defined when specifying the hardware configuration. See step 11 in Table 6-1.

5.1.2 Standardizing the setpoint and actual values

The setpoint and actual values are transferred as standards. The standardization and reference values are stored in parameters P2000 to P2006 of the SINAMICS G120.
16384dez = 4000hex = 100% applies here, with 100% referring to the reference value for the transferred variable.

Example:

If P2000 (reference speed or reference frequency) is 1500 rpm and if a speed of 500 rpm shall be run, then 33% or 5461dec must be transferred.

Further information is available in chapter 6 “Configuring the field bus” in the operating instructions (/8/) of SINAMICS G120.

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5.1.3 Transfer methods

To copy the process data into or from the I/O area, the following methods can be used depending on the requirements:

1. Load and transfer command (STL) or “MOVE” (FBD and LAD)
2. Instructions “DPRD_DAT“ / “DPWR_DAT“
3. The instructions “PNIO_SEND“ / “PNIO_RECV“ for the use of a CP 343-1

All three methods are contained in the example program. However, in OB1 only the method with “DPRD_DAT” / “DPWR_DAT” is called up.

Load / transfer or MOVE

The simplest way is using load and transfer commands (STL) or “MOVE” (FBD and LAD). This ensures consistency for each command (1, 2 and 4 bytes) and hence also the consistency within the individual elements, such as control word and setpoint value.
However, the individual elements can origin from different bus cycles or occur in different bus cycles.
However, for the applications for which the SINAMICS G120 is usually used, this is sufficient.

FB 13 “Process_Data_LT” in the example program illustrates the use of this method in STL and the FB 14 “Process_Data_MOVE” in FBD/LAD.

“DPRD_DAT“ / “DPWR_DAT“

As opposed to the load, transfer or MOVE command, these instructions ensure that the consistency is maintained across the entire process data, i.e. all elements of the process data of a slave are transferred from the same bus cycle or are transferred within a bus cycle. This is necessary, e.g. to enable a distributed synchronization. In the example program, all of the 6 words are copied consistently.

Using “DPRD_Dat” / “DPWR_Dat” has no disadvantages, apart from the necessary use of more complex instructions, which are often avoided by newcomers to programming, and a slightly longer processing duration than for the respective load, transfer or MOVE commands.

In the “Instructions” task card of the TIA Portal you will find the instructions under

> Expanded instructions
> Distributed I/Os
> Others

FB11 “Process_Data_SFC” in the example program shows the use of this method.

“PNIO_SEND“ / “PNIO_RECV“

When using a CP 343-1, it is mandatory that the process data is transferred with the instructions “PNIO_SEND“ / “PNIO_RECV”. The consistency is provided across the entire process data. In the “Instructions” task card of the TIA Portal you will find the instructions under…

> Communication
> Communications processor
> Simatic NET CP

When compiling the block that contains the instructions, STEP 7 generates the system blocks[2] FC1 (“PNIO_SEND“) and FC0 (“PNIO_RECV“).

FB12 “Process_Data_CP” in the example program shows the use of this method.

[2] in the project navigation under the CPU in the
> Program blocks > System blocks > Program resources folder

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5.1.4 Control and status word

The control and status word has already been defined. The subsequent figures illustrate the control and status word when selecting the “Siemens Telegram 352, PZD 6/6” telegram type.

Figure 5-3: Control word of the “Siemens Telegram 352, PZD 6/6” telegram type

Bit	Value	Significance	Comments
0	0	OFF1	Motor brakes with the ramp-down time p1121 at standstill ($f < f_{min}$) the motor is switched off.
	1	ON	With a positive edge, the inverter goes into the "ready" state, with additionally bit 3 = 1, the inverter switches on the motor.
1	0	OFF2	Switch off motor immediately, motor coasts to a standstill.
	1	No OFF2	---
2	0	Quick stop (OFF3)	Quick stop: Motor brakes with the OFF3 ramp-down time p1135 down to standstill.
	1	No quick stop (OFF3)	---
3	0	Disable operation	Immediately switch-off motor (cancel pulses).
	1	Enable operation	Switch-on motor (pulses can be enabled).
4	0	Lock ramp-function generator	The ramp-function generator output is set to 0 (quickest possible deceleration).
	1	Operating condition	Ramp-function generator can be enabled
5	0	Stop ramp-function generator	The output of the ramp-function generator is "frozen".
	1	Ramp-function generator enable	
6	0	Inhibit setpoint	Motor brakes with the ramp-down time p1121.
	1	Enable setpoint	Motor accelerates with the ramp-up time p1120 to the setpoint.
7	1	Acknowledging faults	Fault is acknowledged with a positive edge. If the ON command is still active, the inverter switches to"closing lockout" state.
8		Not used	
9		Not used	
10	0	PLC has no master control	Process data invalid, "sign of life" expected.
	1	Master control by PLC	Control via fieldbus, process data valid.
11	1	Direction reversal	Setpoint is inverted in the inverter.
12		Not used	
13	1	MOP up	The setpoint stored in the motorized potentiometer is increased.
14	1	MOP down	The setpoint stored in the motorized potentiometer is decreased.
15	1	Not used	Changes over between settings for different operation interfaces (command data sets).

Note A control word for which all bits are 0 is rejected as invalid by the converter. Therefore, at least bit 10 must always be set.

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Figure 5-4 Status word of the “Siemens Telegram 352, PZD 6/6” telegram type

Bit	Value	Significance	Comments
0	1	Ready for switching on	Power supply switched on; electronics initialized; pulses locked.
1	1	Ready for operation	Motor is switched on (ON1 command present), no active fault, motor can start as soon as "enable operation" command is issued. See control word 1, bit 0.
2	1	Operation enabled	Motor follows setpoint. See control word 1, bit 3.
3	1	Fault present	The inverter has a fault.
4	1	OFF2 inactive	Coast to standstill not activated (no OFF2)
5	1	OFF3 inactive	No fast stop active
6	1	Closing lockout active	The motor is only switched on after a further ON1 command
7	1	Alarm active	Motor remains switched on; acknowledgement is not required; see r2110.
8	1	Speed deviation within tolerance range	Setpoint/actual value deviation within tolerance range.
9	1	Control requested	The automation system is requested to assume control.
10	1	Comparison speed reached or exceeded	Speed is greater than or equal to the corresponding maximum speed.
11	0	I, M or P limit reached	Comparison value for current, torque or power has been reached or exceeded.
12	1	Holding brake open	Signal to open and close a motor holding brake.
13	0	Alarm motor overtemperature	--
14	1	Motor rotates forwards	Internal inverter actual value > 0
	0	Motor rotates backwards	Internal inverter actual value < 0
15	1	No alarm, thermal power unit overload	

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5.1.5 FB 11 “Process Data_SFC”

This FB shows the access to the process data with the use of the “DPRD_DAT” / “DPWR_DAT” instructions. It is called up cyclically in OB1.

Figure 5-5: FB 11 “Process_Data_SFC“

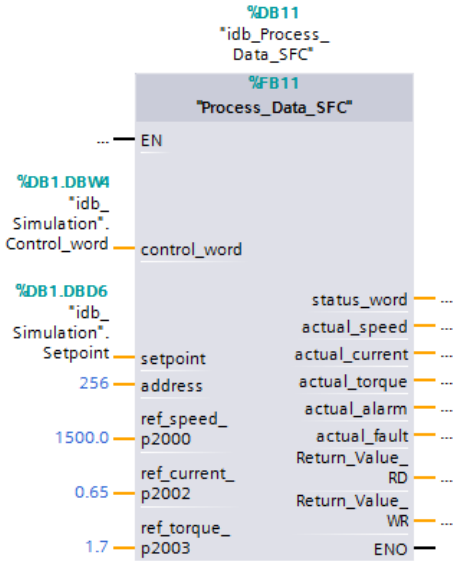

Table 5-1: Interface assignment of FB 11 “Process_Data_SFC“

Name	Type	Start value	Function
Inputs			
control_word	WORD	16#047E	Control word of SINAMICS G120 The initial value sets the bits - Bit 01 OFF2 - Bit 02 OFF3 - Bit 03 Operation block - Bit 04 HLG block - Bit 05 HLG stopping - Bit 06 Setpoint value block - Bit 10 PLC control to “1” at a controller restart, so the SINAMICS drive alone can be started with Bit 00 → “1”.
setpoint	REAL	0.0	Setpoint speed value [rpm]
address	INT	0	I/O start address of SINAMICS G120
ref_speed_ p2000	Real	1500.0	Reference value for the speed according to the converter configuration. Here, the same value must be entered as in parameter P2000 of SINAMICS G120.
ref_current_ p2002	Real	0.0	Reference value for the motor current according to the converter configuration. Here, the same value must be entered as in parameter P2002 of SINAMICS G120.

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Name	Type	Start value	Function
ref_torque_ p2003	Real	0.0	Reference value for the motor torque according to the converter configuration. Here, the same value must be entered as in parameter P2003 of SINAMICS G120.
Outputs			
status_word	WORD	-	Status word of the SINAMICS G120
actual_speed	REAL	-	Actual speed value [rpm]
actual_current	REAL	-	Actual current value [A]
actual_torque	REAL	-	Actual torque value [Nm]
actual_alarm	WORD	-	Number of a pending alarm
actual_fault	WORD	-	Number of a pending fault
Return_value_ RD	WORD	-	Return value of the DPRD_DAT system instruction called in this FB
Return_value_ WR	WORD	-	Return value of the DPWD_DAT system instruction called in this FB

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Structure

The FB 11 “Process_Data_SFC” consists of the following networks:

Table 5-2: Networks of FB 11 “Process Data_SFC”

Network	Function
1.	The IO address of the drive (INT) is copied to a temporary WORD tag in order to adjust the data type.
2.	The temporary data area #InData is initialized with 0.
3.	The process data is copied from the I/O area into the temporary #InData data area using the “DPRD_Dat” instruction.
4.	Status word, warning and faults are copied from the temporary #InData data area to the respective block outputs, and the current actual values (WORD) are copied into temporary tags (INT) for data type adjustment.
5.	
6.	The current speed is converted into REAL format by calling FC10.
7.	The current electrical current is converted into REAL format by calling FC10.
8.	The current torque is converted into REAL format by calling FC10.
9.	The setpoint value (REAL) is converted into the standardized WORD format by calling FC11.
10.	Control word and setpoint (WORD) are copied to the temporary #OUTData data area. 0 is written to the remaining 4 words.
11.	
12.	The process data is copied from the temporary #OutData data area into the I/O area using SFC 15 “DPWR_Dat”.

5.1.6 The FB 13 “Process_Data_LT” and FB 14 “Process_Data_MOVE“

These FBs illustrate the access to the process data with load/transfer commands (STL) or MOVE commands (FBD/LAD).
They are not called in the program example, since FB 11 “Process_Data_SFC” with the same function is used there.

Figure 5-6 FB 13 “Process Data_LT” or FB 14 “Process Data_MOVE”

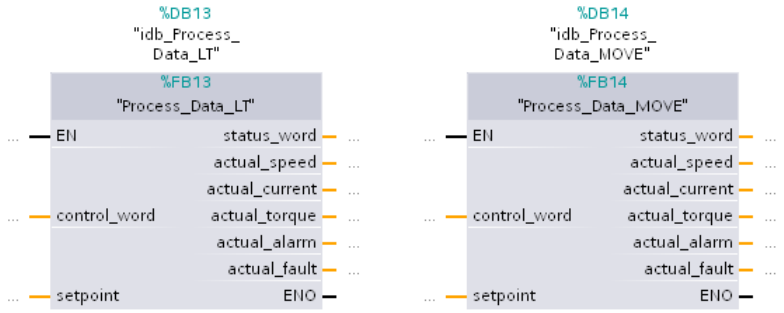

Table 5-3: Interface assignment of FB 13 “Process Data_LT“ or FB 14 “ Process Data_MOVE“

Name	Type	Start value	Function
Inputs			
control_word	WORD	16#047E	Control word of SINAMICS G120 The initial value sets the bits - Bit 01 OFF2 - Bit 02 OFF3 - Bit 03 Operation block - Bit 04 HLG block - Bit 05 HLG stopping - Bit 06 Setpoint value block - Bit 10 PLC control to “1” at a controller restart, so the SINAMICS drive alone can be started with Bit 00 → “1”.
setpoint	REAL	0.0	Setpoint speed value [rpm]
Outputs			
status_word	WORD	-	Status word of the SINAMICS G120
actual_speed	REAL	-	Actual speed value [rpm]
actual_current	REAL	-	Actual current value [A]
actual_torque	REAL	-	Actual torque value [Nm]
actual_alarm	WORD	-	Number of a pending alarm
actual_fault	WORD	-	Number of a pending fault

The I/O address and the standardization values of SINAMICS G120 are programmed in the FBs and need to be adjusted there.

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Structure

The FB 13 “Process_Data_LT” consists of the following networks:

Table 5-4: Networks of FB 13 “Process Data_LT”

Network	Function
1.	Status word, warning and faults are copied from the #InData I/O area to the respective block outputs, and the current actual values (WORD) are copied into temporary tags (INT) for data type adjustment.
2.	The current actual values are converted into REAL format by calling FC 10.
3.	Control word and setpoint are (after conversion to the standardized WORD format by FC 11) copied to the I/O area.

The FB 14 “Process_Data_MOVE” consists of the following networks:

Table 5-5: Networks of FB 14 “Process_Data_MOVE“

Network	Function
1.	Status word, warning and faults are copied from the I/O area to the respective block outputs, and the current actual values (WORD) are copied into temporary tags (INT) for data type adjustment.
2.	
3.	The current speed is converted into REAL format by calling FC10.
4.	The current electrical current is converted into REAL format by calling FC10.
5.	The current torque is converted into REAL format by calling FC10.
6.	Control word and setpoint are (after conversion to the standardized WORD format by FC11) copied to the I/O area.

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5.1.7 FB 12 “Process_Data_CP“

This FB shows the access to the process data when using a CP343-1.
It is not called in the program example, since the hardware configuration used in the example does not contain a CP343-1.

PNIO devices that are addressed via a CP343-1 require the use of this method.

Figure 5-7: FB 12 “Process_Data_CP“

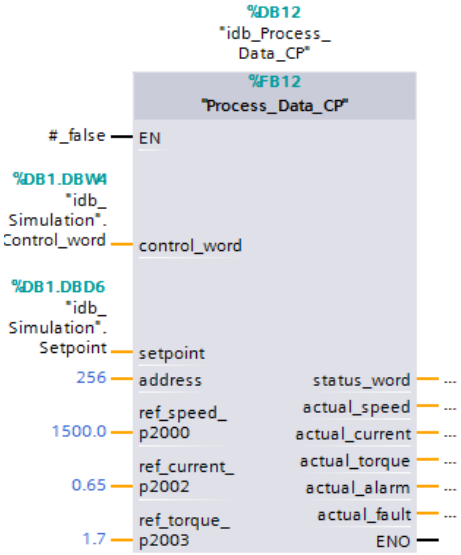

Table 5-6: Interface assignment of FB 11 “Process_Data_SFC“

Name	Type	Start value	Function
Inputs			
control_word	WORD	16#047E	Control word of SINAMICS G120 The initial value sets the bits - Bit 01 OFF2 - Bit 02 OFF3 - Bit 03 Operation block - Bit 04 HLG block - Bit 05 HLG stopping - Bit 06 Setpoint value block - Bit 10 PLC control to “1” at a controller restart, so the SINAMICS drive alone can be started with Bit 00 → “1”.
setpoint	REAL	0.0	Setpoint speed value [rpm]
address	INT	0	I/O start address of SINAMICS G120
ref_speed_p2000	Real	1500.0	Reference value for the speed according to the converter configuration. Here, the same value must be entered as in parameter P2000 of SINAMICS G120.

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Name	Type	Start value	Function
ref_current_ p2002	Real	0.0	Reference value for the motor current according to the converter configuration. Here, the same value must be entered as in parameter P2002 of SINAMICS G120.
ref_torque_ p2003	Real	0.0	Reference value for the motor torque according to the converter configuration. Here, the same value must be entered as in parameter P2003 of SINAMICS G120.
Outputs			
status_word	WORD	-	Status word of the SINAMICS G120
actual_speed	REAL	-	Actual speed value [rpm]
actual_current	REAL	-	Actual current value [A]
actual_torque	REAL	-	Actual torque value [Nm]
actual_alarm	WORD	-	Number of a pending alarm
actual_fault	WORD	-	Number of a pending fault
Return_value_ RD	WORD	-	Return value of the DPRD_DAT system instruction called in this FB
Return_value_ WR	WORD	-	Return value of the DPWD_DAT system instruction called in this FB

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Structure

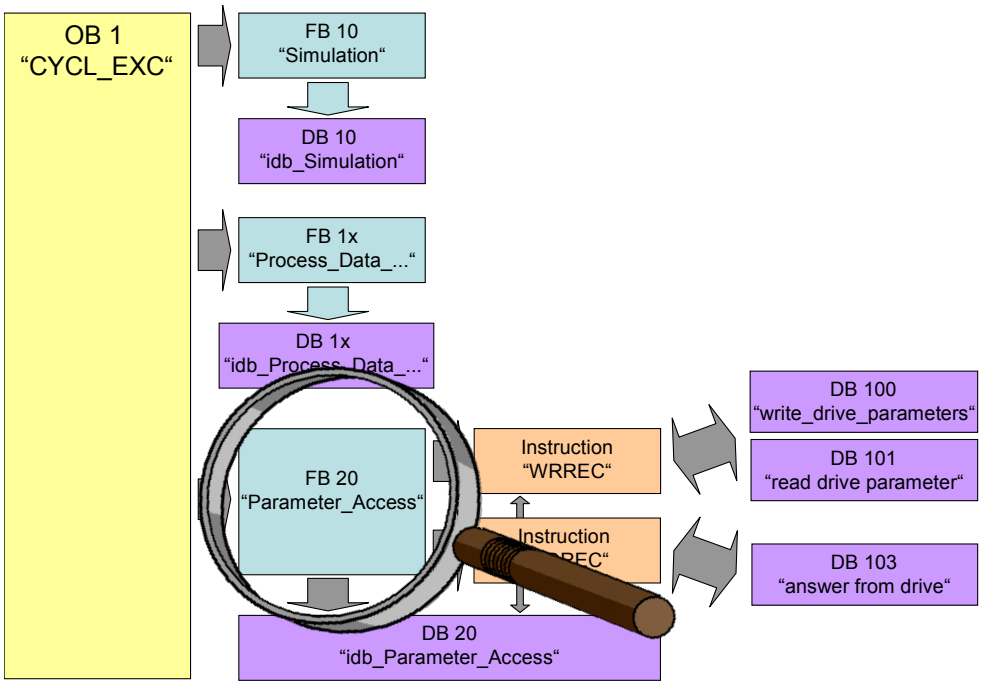
The FB 12 “Process_Data_CP” consists of the following networks:

Table 5-7: Networks of FB 12 “Process_Data_CP“

Network	Function
1.	The IO address of the drive (INT) is copied to a temporary WORD tag in order to adjust the data type.
2.	The temporary data area #InData is initialized with 0.
3.	The process data is copied from the I/O area into the temporary #InData data area using FC 2 “PNIO_RECV”.
4.	• Status word, warning and fault are copied from the #InData temporary data area to the respective block outputs.
5.	• The current actual values (WORD) are copied into temporary tags (INT) for data type adjustment.
6.	The current speed is converted into REAL format by calling FC10.
7.	The current electrical current is converted into REAL format by calling FC10.
8.	The current torque is converted into REAL format by calling FC10.
9.	The setpoint value (REAL) is converted into the standardized WORD format by calling FC11.
10.	Control word and setpoint (WORD) are copied to the temporary #OUTData data area, and 0 is written to the remaining 4 words.
11.	
12.	The process data is copied from the temporary #OutData data area into the I/O area using FC 1 “PNIO_SEND”.

5.2 Parameter access functionality

Figure 5-8: Block structure of parameter access



Acyclic parameter access occurs parallel to the cyclic process data exchange. This saves resources, since the connection is only established on demand, i.e. when a parameter is to be accessed.

In the controller, the “Write data record” and “Read data record” functions must be used for this. Data record 47 must always be used.

Writing data record 47 sends a job to the converter which performs the job and provides a response. Reading data record 47 makes the response of the converter available in the controller so it can be evaluated.

The instructions “WRREC” and SFB 52 “RDREC” are used in the controller for reading and writing data records.

Note Since “WRREC” and “RDREC” cannot be used with CP343-1, accessing the parameters when using the CP is not possible.

5.2.1 Job and response structure

The structure of the jobs and responses can be found in chapter 7.3.2.1 “Configuring the fieldbus, PROFIdrive profile for PROFIBUS and PROFINET, acyclic communication” in the manual (/8/).

Note Since the structure of the data record to be sent or received depends on the number of jobs and their number format, a generally valid structure cannot be used.

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5.2.2 The DBs “read/write_drive_parameters” and “answer_from_drive”

The job to access a parameter consists of at least 10 words. Therefore, the job should be assembled in a DB or in the memory area. In this example, this is performed using DB 101 “read_drive_parameters” and DB 100 “Write Drive Parameter”.
The response by the converter also consists of several words. Therefore, the example uses DB 103 “answer_from_drive”.

A job may contain the access to several parameters. Since the length of the data to be transferred per job depends on the number and data types of the converter parameters, no generally valid structure can be devised.

Therefore, in this example, only the ramp up and ramp down times (P1120 and P1121) and a part of the fault memory (P945.x) is accessed. The job to read the parameters is stored in DB 101 “read_drive_parameters“. The job to write them is stored in DB 100 “write_drive_parameters”.

The response of the converter is copied to DB 103 “answer_from_drive“. The structure contained therein corresponds to the structure for a successful reading of the parameters.

Figure 5-9: DB 100 for writing the ramp up and ramp down times

...▸ CPU 315-2 PN/DP [CPU 315-2 PN/DP] ▸ Program blocks ▸ write_drive_parameters [DB100]

write_drive_parameters

	Name	Data type	Offset	Start value	Retain	Visible in ...	Comment
1	Static						
2	H_Reference	B...	0.0	0	☑	☑	HEAD: Reference number
3	H_Request_ID	Byte	1.0	B#16#2	☑	☑	HEAD: Request ID: 1=read, 2=write
4	H_Axis	Byte	2.0	B#16#1	☑	☑	HEAD: Allways 1 for SINAMICS G120
5	H_Number_of_parameters	Byte	3.0	B#16#2	☑	☑	HEAD: Number od parameters to transfer
6	A_1_Attribute	Byte	4.0	B#16#10	☑	☑	Address: 16#10= parameter value
7	A_1_Number_of_indices	Byte	5.0	0	☑	☑	Address: Number od elements (0 to 234)
8	A_1_Parameter_number	Int	6.0	1120	☑	☑	Address: Parameter number
9	A_1_Index	Int	8.0	0	☑	☑	Address: Index number
10	A_2_Attribute	Byte	10.0	B#16#10	☑	☑	Address: 16#10= parameter value
11	A_2_Number_of_indices	Byte	11.0	0	☑	☑	Address: Number od elements (0 to 234)
12	A_2_Parameter_number	Int	12.0	1121	☑	☑	Address: Parameter number
13	A_2_Index	Int	14.0	0	☑		number
14	V_1_Format	Byte	16.0	B#16#8	☑		f parameter value
15	V_1_Number_of_index_valu	Byte	17.0	B#16#1	☑	☑	Value: Number of index values
16	V_1_Value	Real	18.0	1.000000e+001	☑		alue
17	V_2_Format	Byte	22.0	B#16#8	☑		rameter value
18	V_2_Number_of_index_valu	Byte	23.0	B#16#1	☑	☑	Value: Number of index values
19	V_2_Value	Real	24.0	1.500000e+001	☑	☑	Value: Parameter value

Ramp up time 10s

Ramp down time 15s

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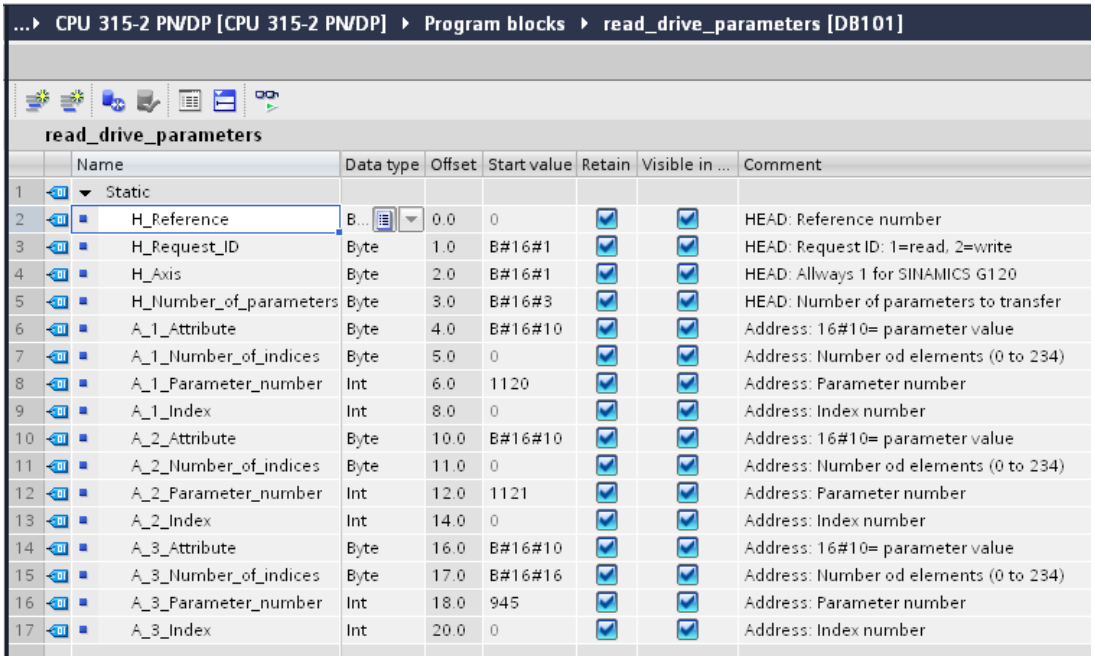
Figure 5-10: DB 101 for reading the ramp up and ramp down time and 16 values of the fault memory

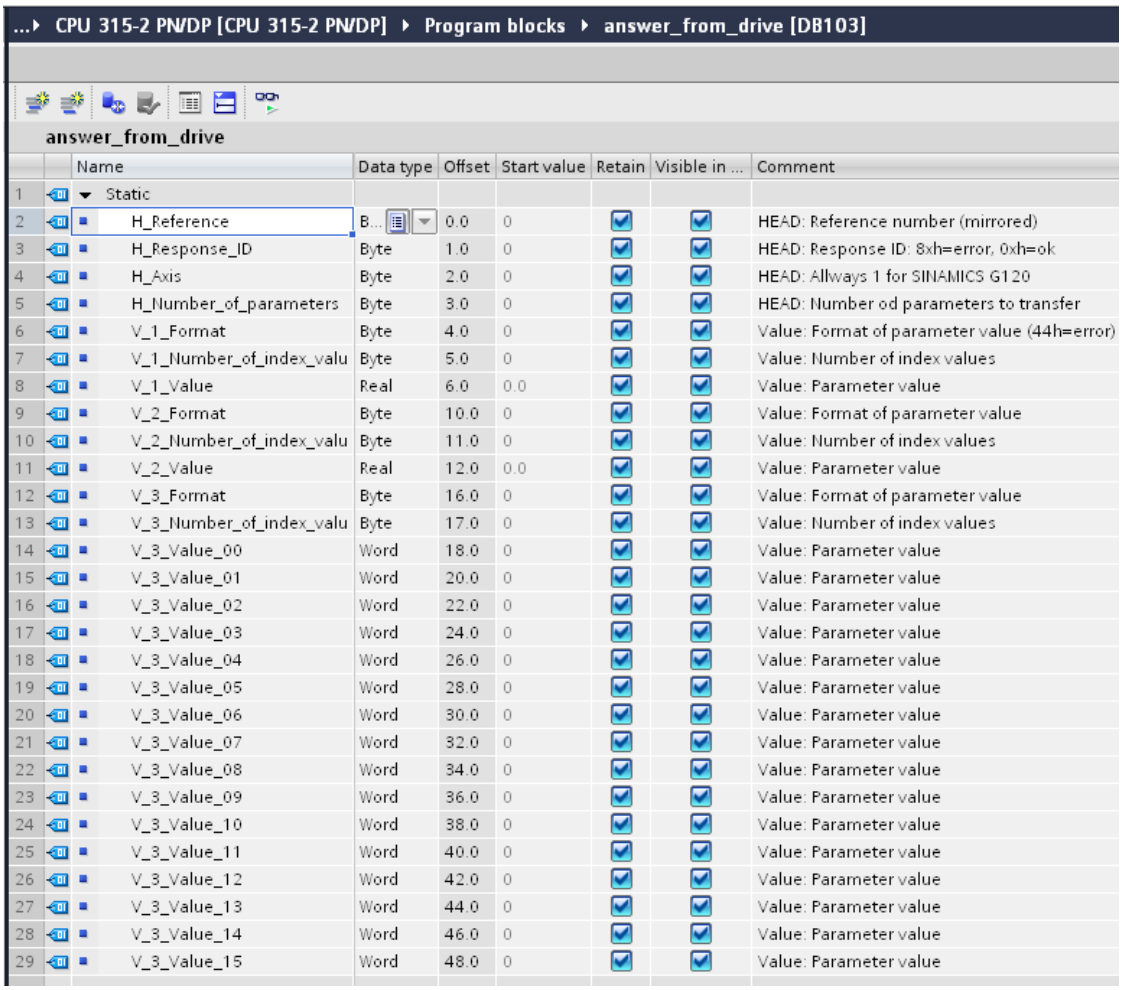


...▸ CPU 315-2 PN/DP [CPU 315-2 PN/DP] ▸ Program blocks ▸ read_drive_parameters [DB101]

read_drive_parameters

	Name	Data type	Offset	Start value	Retain	Visible in ...	Comment
1	Static						
2	H_Reference	B...	0.0	0	☑	☑	HEAD: Reference number
3	H_Request_ID	Byte	1.0	B#16#1	☑	☑	HEAD: Request ID: 1=read, 2=write
4	H_Axis	Byte	2.0	B#16#1	☑	☑	HEAD: Allways 1 for SINAMICS G120
5	H_Number_of_parameters	Byte	3.0	B#16#3	☑	☑	HEAD: Number of parameters to transfer
6	A_1_Attribute	Byte	4.0	B#16#10	☑	☑	Address: 16#10= parameter value
7	A_1_Number_of_indices	Byte	5.0	0	☑	☑	Address: Number od elements (0 to 234)
8	A_1_Parameter_number	Int	6.0	1120	☑	☑	Address: Parameter number
9	A_1_Index	Int	8.0	0	☑	☑	Address: Index number
10	A_2_Attribute	Byte	10.0	B#16#10	☑	☑	Address: 16#10= parameter value
11	A_2_Number_of_indices	Byte	11.0	0	☑	☑	Address: Number od elements (0 to 234)
12	A_2_Parameter_number	Int	12.0	1121	☑	☑	Address: Parameter number
13	A_2_Index	Int	14.0	0	☑	☑	Address: Index number
14	A_3_Attribute	Byte	16.0	B#16#10	☑	☑	Address: 16#10= parameter value
15	A_3_Number_of_indices	Byte	17.0	B#16#16	☑	☑	Address: Number od elements (0 to 234)
16	A_3_Parameter_number	Int	18.0	945	☑	☑	Address: Parameter number
17	A_3_Index	Int	20.0	0	☑	☑	Address: Index number

Figure 5-11: DB 103 for the response of the converter (read job)



...▸ CPU 315-2 PN/DP [CPU 315-2 PN/DP] ▸ Program blocks ▸ answer_from_drive [DB103]

answer_from_drive

	Name	Data type	Offset	Start value	Retain	Visible in ...	Comment
1	Static						
2	H_Reference	B...	0.0	0	☑	☑	HEAD: Reference number (mirrored)
3	H_Response_ID	Byte	1.0	0	☑	☑	HEAD: Response ID: 8xh=error, 0xh=ok
4	H_Axis	Byte	2.0	0	☑	☑	HEAD: Allways 1 for SINAMICS G120
5	H_Number_of_parameters	Byte	3.0	0	☑	☑	HEAD: Number od parameters to transfer
6	V_1_Format	Byte	4.0	0	☑	☑	Value: Format of parameter value (44h=error)
7	V_1_Number_of_index_valu	Byte	5.0	0	☑	☑	Value: Number of index values
8	V_1_Value	Real	6.0	0.0	☑	☑	Value: Parameter value
9	V_2_Format	Byte	10.0	0	☑	☑	Value: Format of parameter value
10	V_2_Number_of_index_valu	Byte	11.0	0	☑	☑	Value: Number of index values
11	V_2_Value	Real	12.0	0.0	☑	☑	Value: Parameter value
12	V_3_Format	Byte	16.0	0	☑	☑	Value: Format of parameter value
13	V_3_Number_of_index_valu	Byte	17.0	0	☑	☑	Value: Number of index values
14	V_3_Value_00	Word	18.0	0	☑	☑	Value: Parameter value
15	V_3_Value_01	Word	20.0	0	☑	☑	Value: Parameter value
16	V_3_Value_02	Word	22.0	0	☑	☑	Value: Parameter value
17	V_3_Value_03	Word	24.0	0	☑	☑	Value: Parameter value
18	V_3_Value_04	Word	26.0	0	☑	☑	Value: Parameter value
19	V_3_Value_05	Word	28.0	0	☑	☑	Value: Parameter value
20	V_3_Value_06	Word	30.0	0	☑	☑	Value: Parameter value
21	V_3_Value_07	Word	32.0	0	☑	☑	Value: Parameter value
22	V_3_Value_08	Word	34.0	0	☑	☑	Value: Parameter value
23	V_3_Value_09	Word	36.0	0	☑	☑	Value: Parameter value
24	V_3_Value_10	Word	38.0	0	☑	☑	Value: Parameter value
25	V_3_Value_11	Word	40.0	0	☑	☑	Value: Parameter value
26	V_3_Value_12	Word	42.0	0	☑	☑	Value: Parameter value
27	V_3_Value_13	Word	44.0	0	☑	☑	Value: Parameter value
28	V_3_Value_14	Word	46.0	0	☑	☑	Value: Parameter value
29	V_3_Value_15	Word	48.0	0	☑	☑	Value: Parameter value

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5.2.3 FB 20 “Parameter_Access”

In the example, the parameters are accessed in FB 20 “Parameter_Access”. It is called cyclically in OB 1.

Figure 5-12: FB20 „Parameter_Access“

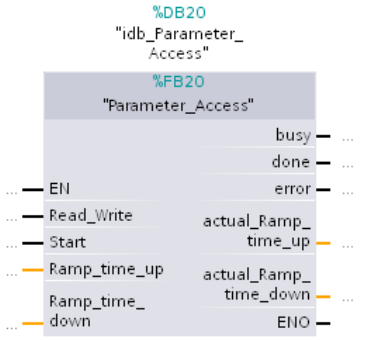

Table 5-8: Interface assignment of FB 20 “Parameter_Access“

Name	Type	Function
Inputs		
Read_Write	BOOL	0= Read parameters 1= Write parameters
Start	BOOL	A rising edge starts the transfer, the FB automatically sets the signal back to 0
Ramp_time_up	REAL	Ramp up time to be written
Ramp_time_down	REAL	Ramp down time to be written
Outputs		
busy	BOOL	Access in progress
done	BOOL	Access successful
error	BOOL	Access aborted with an error
actual_Ramp_time_up	REAL	Read ramp up time
actual_Ramp_time_down	REAL	Read ramp down time

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Setup

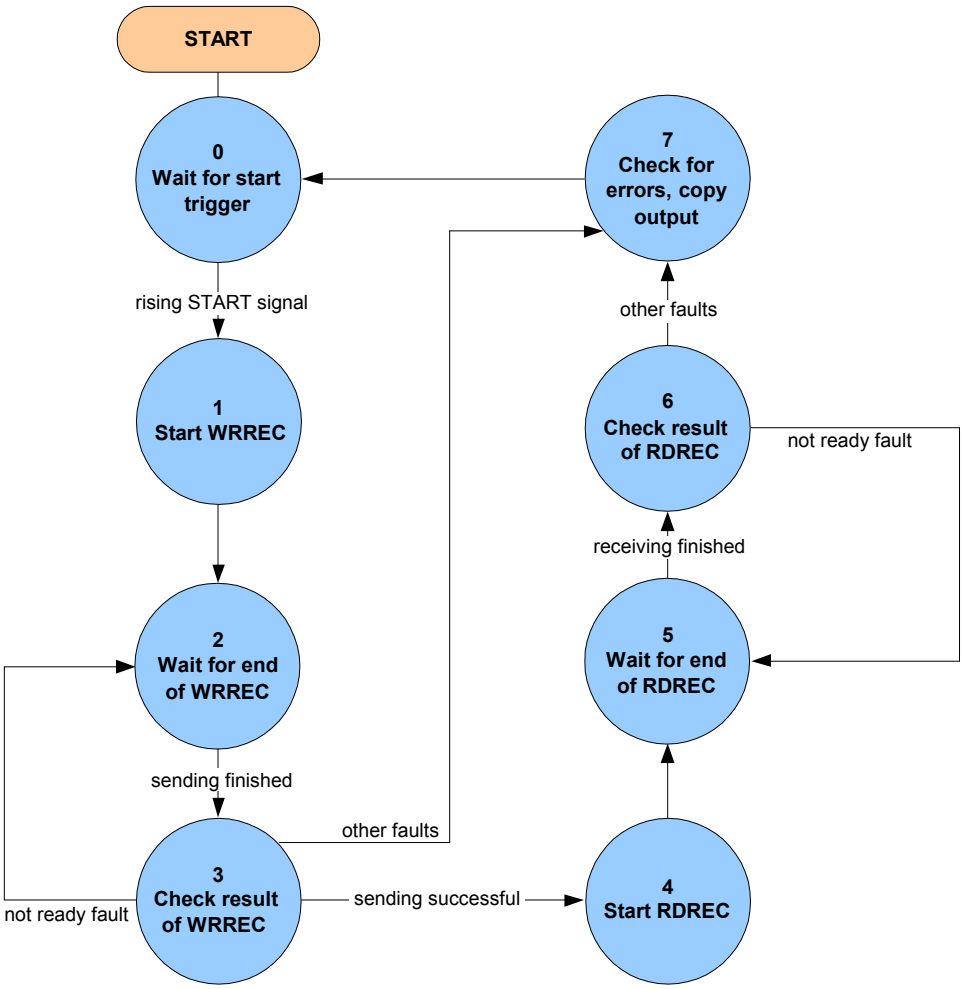
The FB 20 "Parameter_Access” consists of two parts:

- a step sequence which controls the sequence of the parameter access. (Networks 1 to 9)
- call of the system functions “Write data record” or “Read data record”. (network 10).

Step sequence

The individual steps of FB 20 “Parameter_access” are represented in the following graphic. The possible transitions between the individual steps are also displayed there.

Figure 5-13: Step sequence parameter access



In the individual states of the step sequence, the following functions are executed:

Table 5-9: Function of the states of FB 20 “Parameter_Access”

State		Function
0	Wait for start trigger	A rising edge of the “Start” signal is waited for. If it is detected, all output signals are deleted, “busy” is set and step 1 is activated.
1	Start WRREC	The “Start” signal is reset, the “REQ” signal of the “WRREC” instruction is set and step 2 is activated.
2	Wait for end of WRREC	It is waited until the “BUSY” signal of the “RDREC” instruction becomes 0 again. Then step 3 is activated.

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State		Function
3	Check result of WRREC	It is checked whether the data record was written successfully. If yes, the “REQ” signal of the “WRREC” instruction is deleted again and step 4 is activated. If the “WRREC” instruction reports error 16#DF80_B500 (peer not ready), step 3 is activated again so that “WRREC” repeats the job. If a different error has occurred, the “REQ” signal of the “WRREC” instruction is deleted, an internal error bit is set and step 7 is activated.
4	Start RDREC	The “REQ” signal of the “RDREC” instruction is set and step 5 is activated.
5	Wait for end of RDREC	It is waited until the “BUSY” signal of the “RDREC” instruction becomes 0 again. Then step 6 is activated.
6	Check result of RDREC	It is checked whether the data record was read successfully. If yes, the “REQ” signal of the “RDREC” instruction is deleted again and step 7 is activated. If “RDREC” reports error 16#DE80_B500 (peer not ready), step 5 is activated again so that the “RDREC” instruction repeats the job. If a different error has occurred, the “REQ” signal of the “RDREC” instruction is deleted, an internal error bit is set and step 7 is activated.
7	Check for errors, copy outputs	It is checked whether one of the internal error bits is set or whether an error bit has been set in the response of the converter. In the event of an error - the “error“ output parameter of FB 20 is set, - the “busy“ output parameter of FB 20 is deleted, - 999999.9s is output as read time and - step 0 is activated. If no error bit has been set, the read times are output, the “busy” output parameter of FB 20 is deleted and step 0 is activated.

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Calling the system functions “Write data record” or “Read data record”

Once the currently required control bits have been set in the sequence chart of FB 20 “Parameter_Access”, the “WRREC” instruction for writing the data record and the “RDRE” instruction for reading the data record are called in network 10. They can be found in the “instructions” task card of the TIA Portal under…

> Expanded instructions
> Distributed I/Os

Via the “Read_Write” input variable it is selected which of the two calls enables the “WRREC” instruction. Both calls only differ in which DB is sent to the drive: the one to write parameters or the one to read parameters.

6 Configuration and Settings

Note If you only wish to download and commission the example program, please follow the instructions in chapter 3“Setting Up and Commissioning the Application”.

The step tables below describe what you have to do if you do not want to or cannot use the sample code and you want to or have to configure SINAMICS G120 and SIMATIC S7 CPU yourself.

6.1 Configuring the S7-300/400 controller

This chapter describes how the S7-300/400 must be configured for the example program. This chapter does not discuss integrating the operator panel or programming the S7-300/400.

Note The screenshots below use a general STEP 7 project name: “G120_at_S7”. In this example, this stands for “G120_at_S7-300-PN”.

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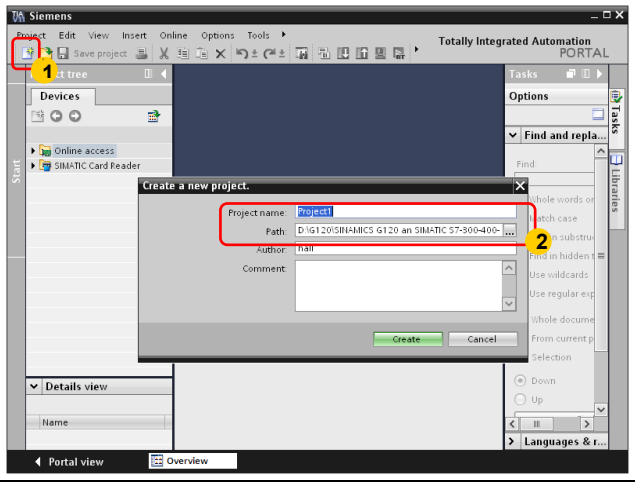
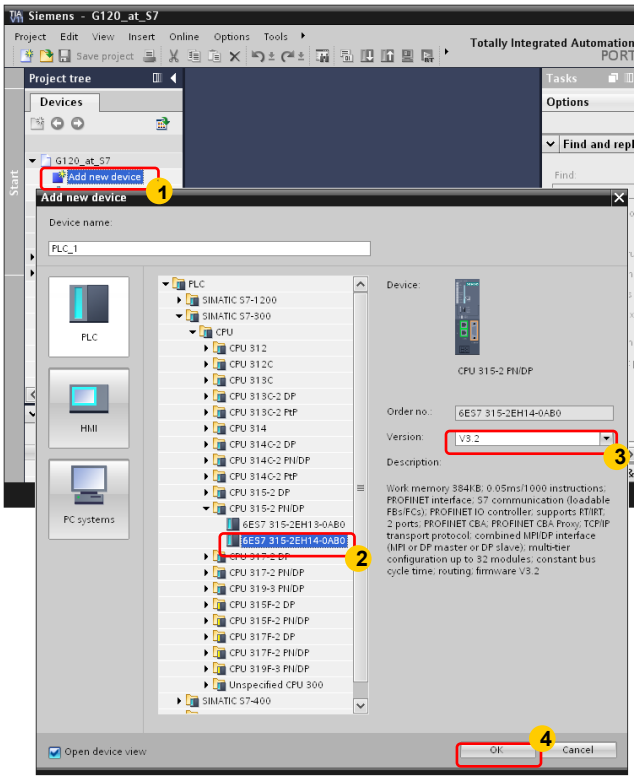
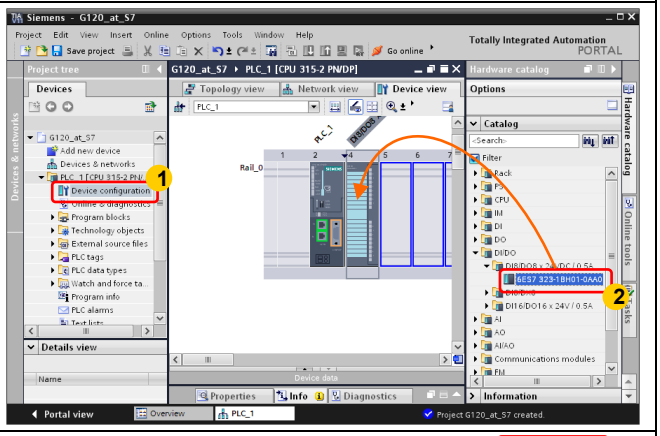
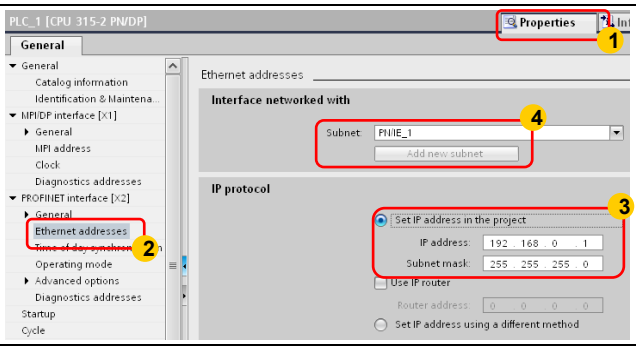
Table 6-1: Instruction for configuring the S7-300/400 controller

No.	Action	Remarks
1.	Start the TIA Portal V13. Go to project view if the portal view has opened.	
2.	Create a new project. Assign a project name and select a storage path.	

No.	Action	Remarks
3.	Insert your CPU (e.g. CPU 315-2 PN/DP). Make sure that the firmware versions match.	
4.	Open “Device configuration” and drag the required modules (here a DI8/DO8 module) from the hardware catalog to the rack. The example software uses IB0. For this reason, leave at least the I address of the inserted DI or DI/DO module at 0 (default value) in the “Properties”.	
5.	Open the “Properties” in the device configuration of the CPU and configure the PROFINET interface. Go to “Ethernet addresses” in the tree. Select “Set IP address in the project” and enter the desired IP address. Add a new subnet and select it.	

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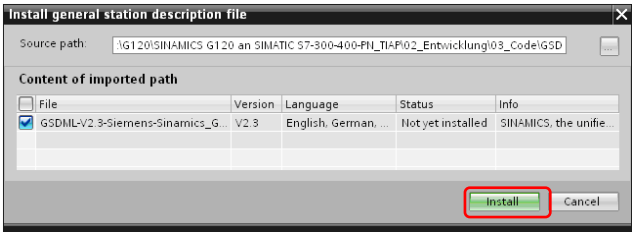
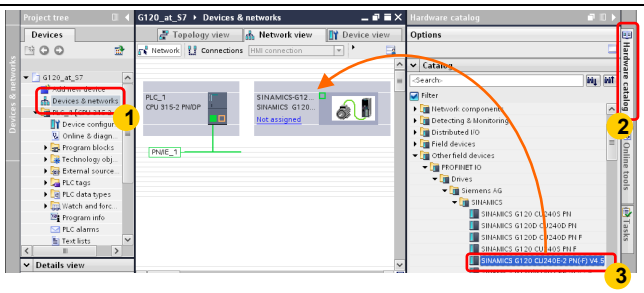
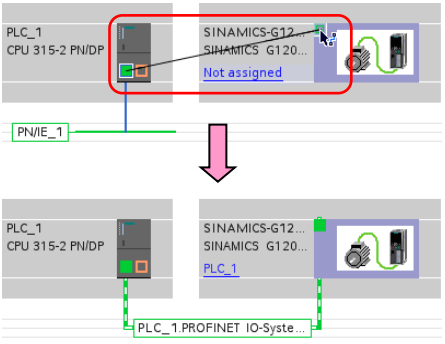
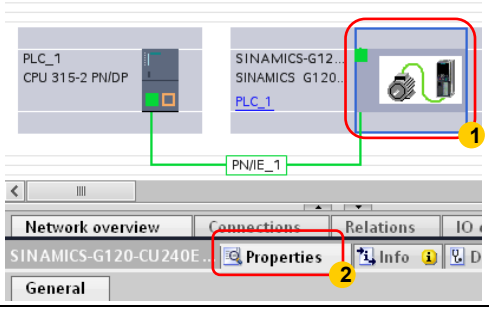
No.	Action	Remarks
6.	Now install the GSD file that corresponds to the control unit of the drive if not done yet. For this purpose, close the hardware and the network editor. Load the GSDML file from the respective Online Support page (see /7/) to your PG/PC and retrieve it. Open the dialog in the TIA Portal to select the required GSD and install it via >Options >Install general station description file (GSD).	
7.	Go to the network view and open the hardware catalog. Drag the desired drive into the graphic area of the network view. Use the drive "SINAMICS G120 CU240E-2 PN-(F) V4.5" from the catalog path >Other field devices >PROFIBUS IO >Drives >Siemens AG >SINAMICS	
8.	Connect the IO device (drive) via PROFINET with the CPU. For this purpose drag a line with the mouse button pushed down between the Ethernet connections of the two devices. The drive automatically contains the next free IP address.	
9.	To be able to change the IP address of the drive, go to its properties. For this purpose, click the drive and open the "Properties" tab.	

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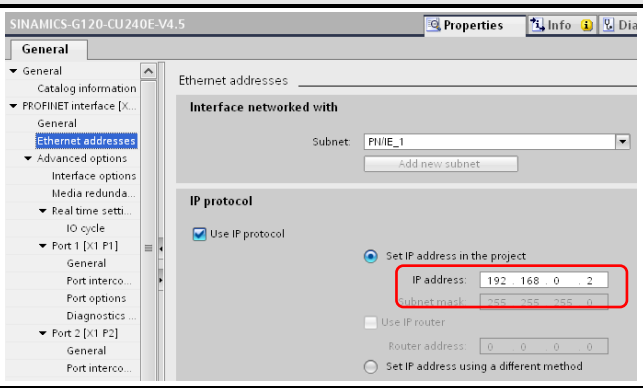
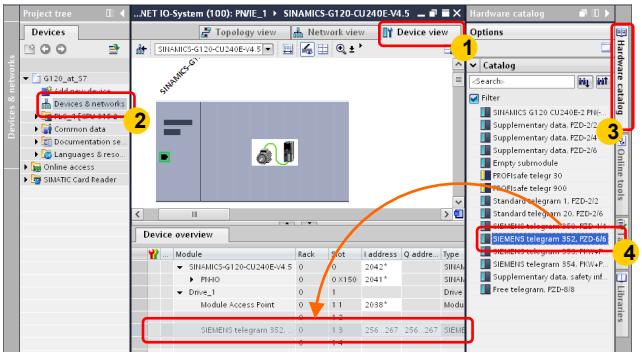
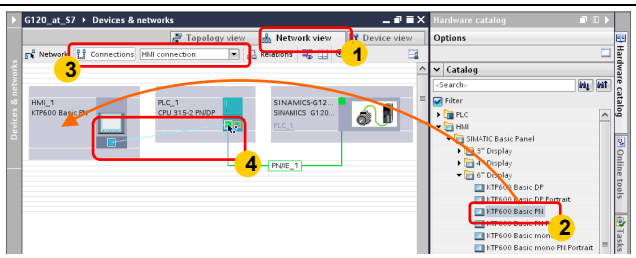
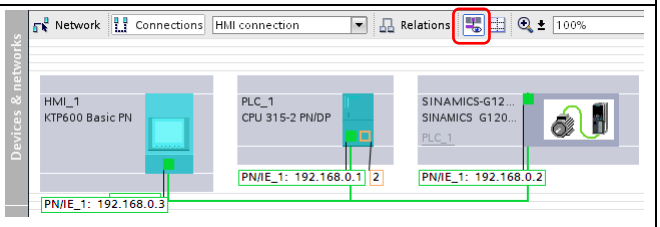
No.	Action	Remarks
10.	If required, change the IP address of the drive. (In the example configuration the 192.168.0.2 default address is left as it is.)	
11.	Select the data records to be transferred. For this purpose, go to the device view of the drive and drag its device view open. Subsequently drag the "SIEMENS telegram 352, PZD-6/6" from the catalog into the device view.	
12.	Go to the network view again. Configure the operator panel by dragging “KTP600 Basic PN” from the catalog to the workspace. Enable the connection mode and select “HMI connection” from the drop-down list. Create a connection graphically between the Ethernet connections of the KTP600 and the PLC by dragging the mouse.	
13.	Show the addresses. The KTP600 is automatically assigned to the next free the IP address 192.168.0.2.	

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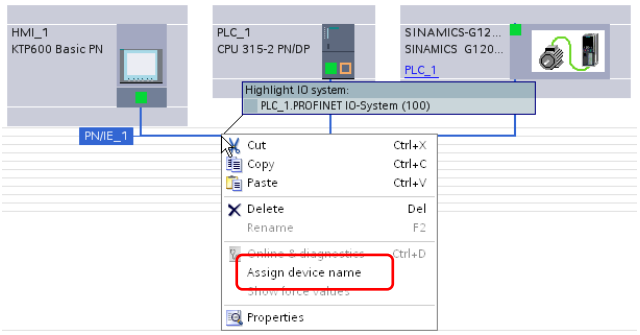
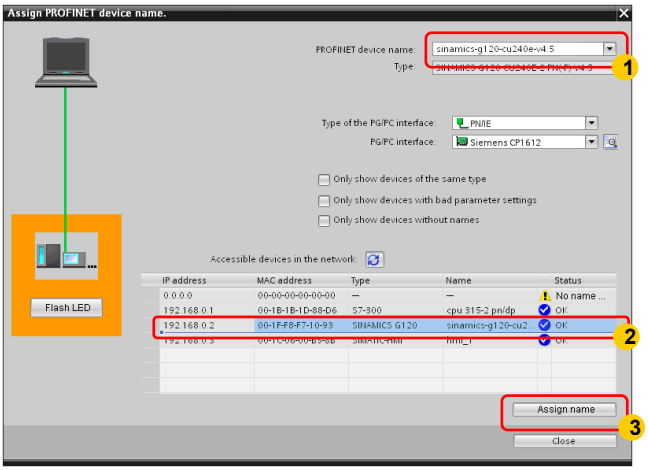
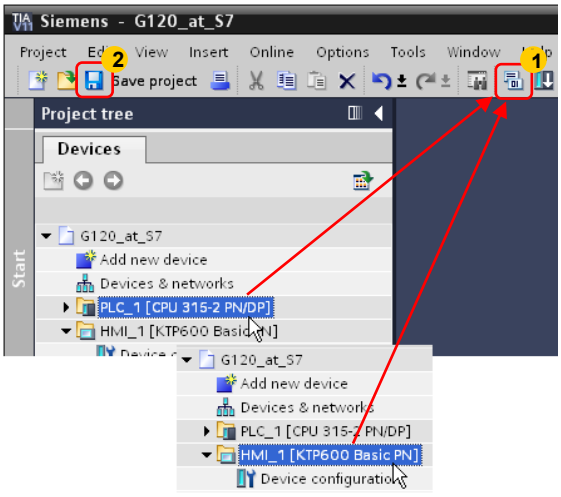
No.	Action	Remarks
14.	Assign the devices their PROFINET device name online, if not done yet already in a different way. For this purpose, make a right click on the PROFINET IO system in the graphic area of the network view and select “Assign device name” from the context menu.	If not done yet already – create a physical connection between the device via Ethernet patch cables and possibly a switch. 
15.	All available PROFINET IO nodes are listed. Now successively assign each device the configured PROFINET device name and click “Assign name”. Select the names from the drop-down list on the top right. Afterwards refresh the window with and check the data transfer.	
	The PROFINET device names themselves cannot be changed. They are derived from the editable device name that the system assigns to each device by default in its “Properties” tab under “General”.	
16.	The device and network configuration is now completed. Successively compile the configurations of CPU and HMI device for control purposes. The compiling results can be seen in the inspection window. The CPU is compiled without errors. For the operator panel you only receive the error message that no start screen has been defined yet, since no images have probably been configured yet. Save the project.	

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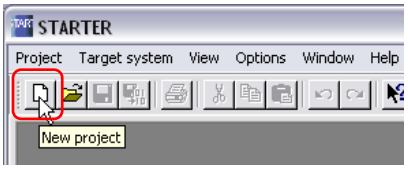
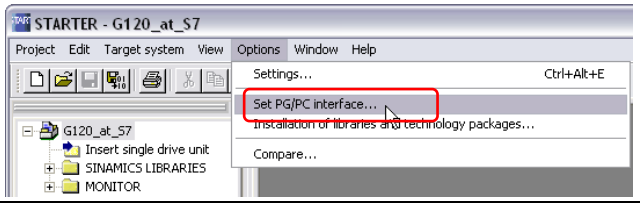
6.2 Configuration of the SINAMICS G120 drive via Ethernet

Note The screenshots below use a general STARTER project name: “G120_at_S7”. In this example, this stands for “G120_at_S7-300-PN”

Table 6-2: Instruction drive configuration via PROFINET

No.	Action	Remarks
1.	Install the STARTER commissioning software (see also /6/).	
2.	Connect the SINAMICS G120 with your PG/PC using an Ethernet patch cable.	
3.	Start the STARTER commissioning software.	
4.	Create a new project.	
5.	Open “Set PG/PC interface“.	

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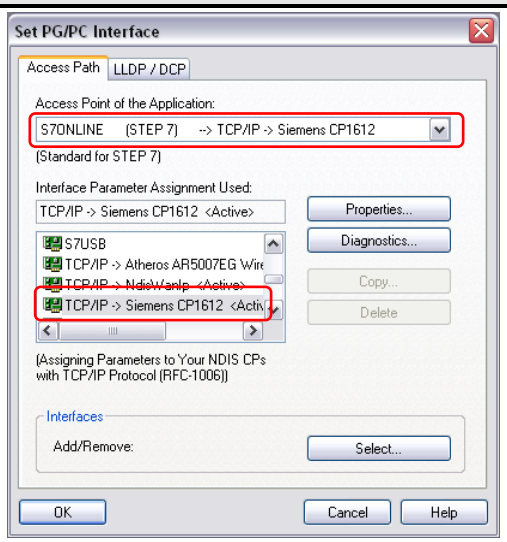
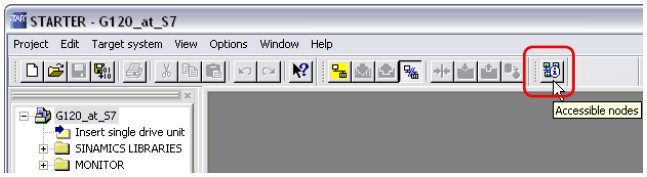
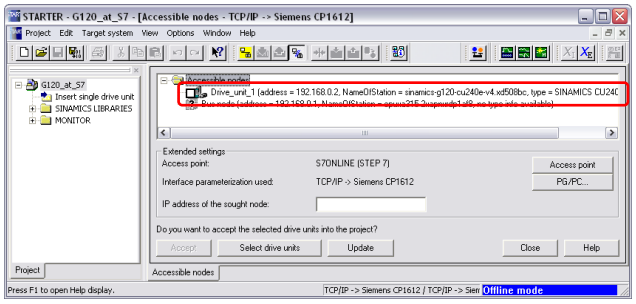
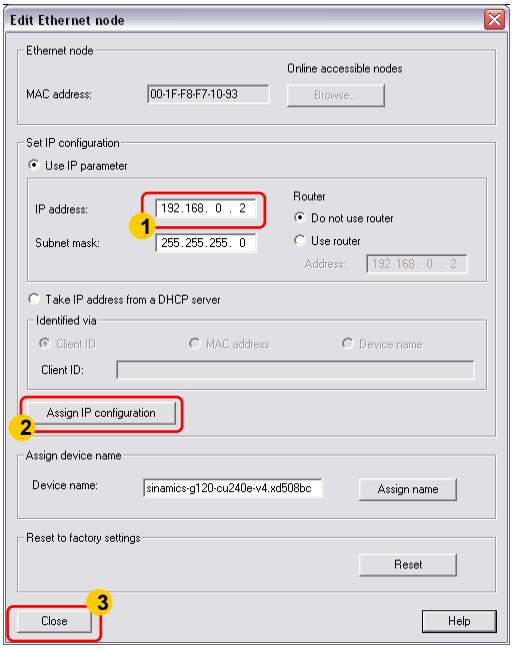
No.	Action	Remarks
6.	Select "S7ONLINE (STEP 7)" as access point and TCP/IP ⇨ internet card used as interface configuration used.	
7.	Click on "Accessible nodes".	
8.	Right click on the found drive and select "Edit Ethernet node…" from the context menu.	
9.	If required, change the IP address of the drive to the one that corresponds to the future configuration.	

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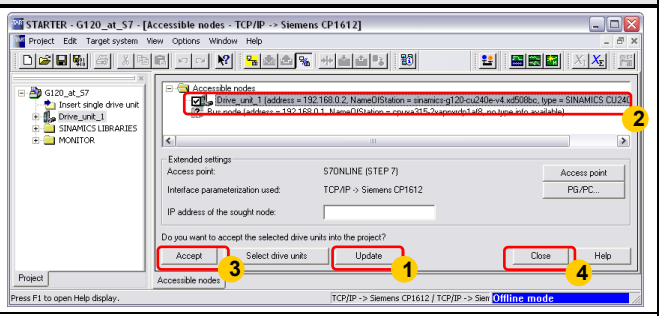
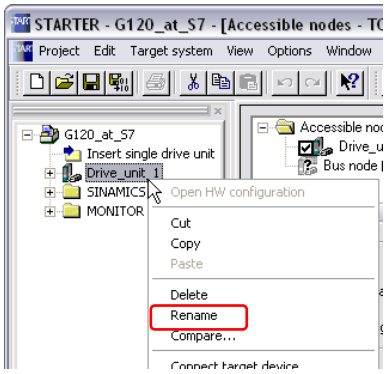
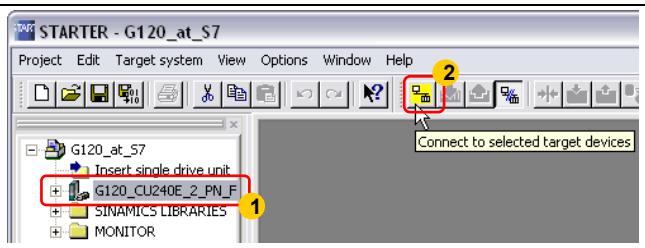
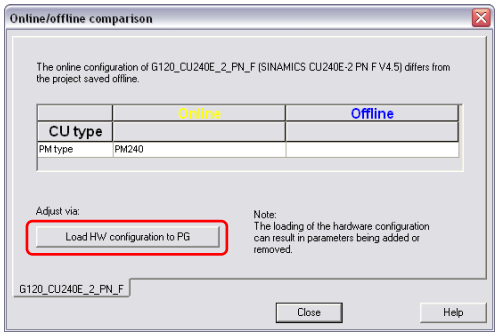
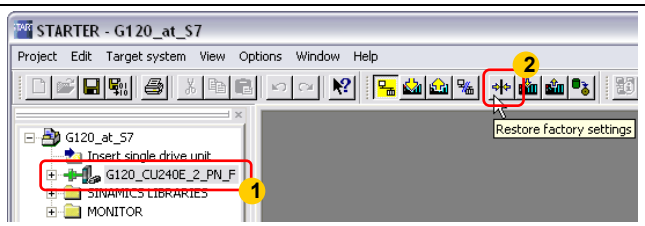
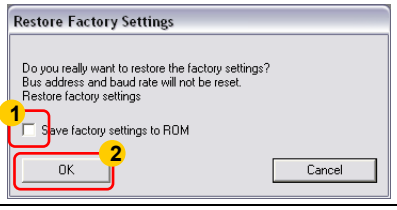
No.	Action	Remarks
10.	• Update the “Accessible nodes”. • Tick the found converter. • Click “Accept“. • Click “Close“.	
11.	Change the name of the drive unit according to your wishes. Right click the drive unit and select “Rename” in the context menu.	
12.	Select the converter in the tree and go online.	
13.	Download the hardware configuration into your CPU.	
14.	Select the converter in the tree and then press “Restore factory settings”.	
15.	Remove the checkmark for “Save factory settings to ROM” and then click “OK”.	

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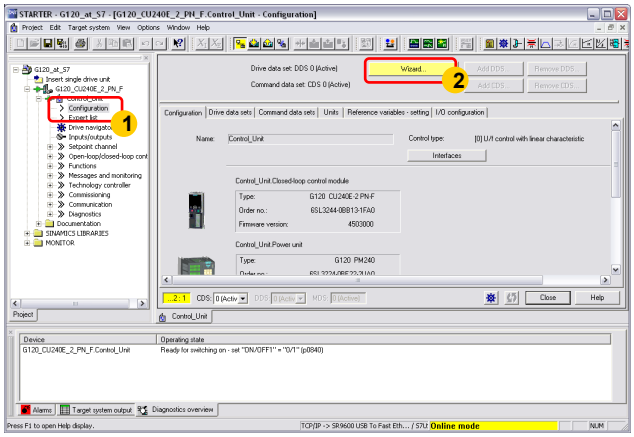
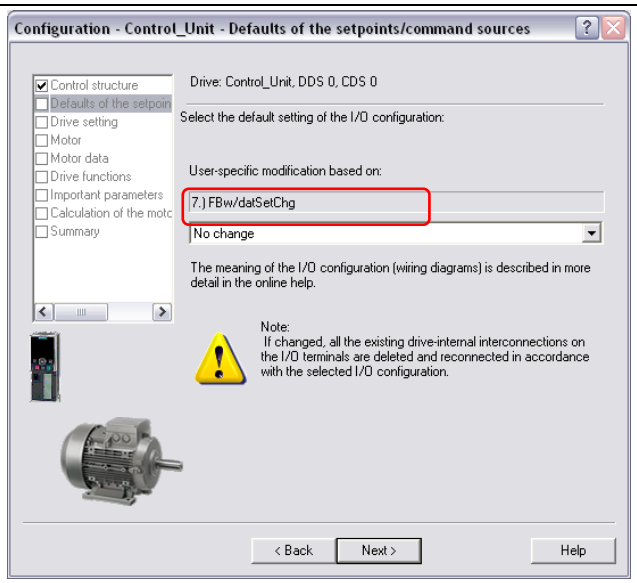
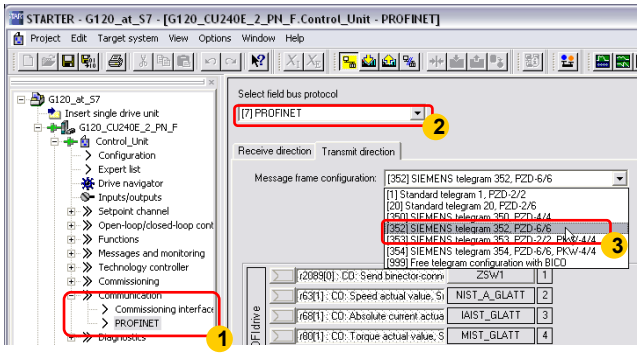
No.	Action	Remarks
16.	Expand the tree and double click on “Configuration”. Then call up the wizard.	
17.	Run the wizard and enter the data you need. Ensure that the “Defaults of the setpoint/command sources” step is selected in the field bus.	
18.	Double click “Communication > PROFINET” in the project navigation, select one of the tabs “Receive direction” or “Transmit direction”, and select “Siemens telegram 352, PZD-6/6)”. Note: The telegram type matches the example. It is decisive here, that the same telegram is selected as for the hardware configuration in STEP 7.	
19.	If you do not wish to use any safety functions, proceed with step 26.	When using an F-CPU you can also call the safety functions via the field bus. However, this is not part of this example. More information on this subject can be found in the Safety Integrated function manual for the SINAMICS G120 (/8/).

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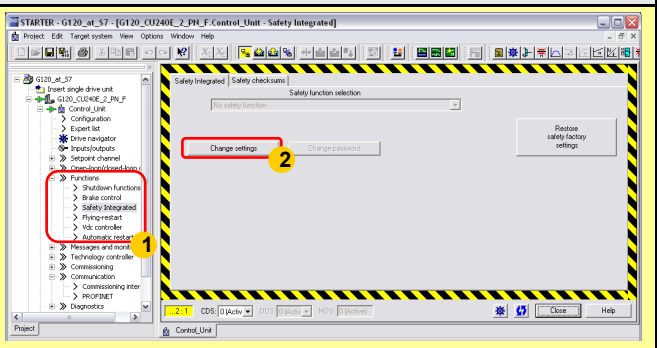
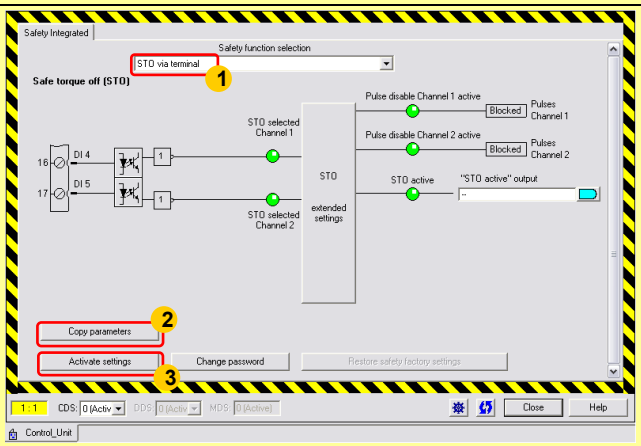
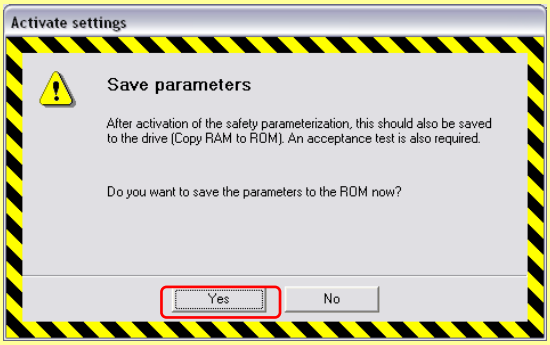
No.	Action	Remarks
20.	Open “Safety Integrated” in the project navigation and click “Change settings”.	
21.	Select “STO via terminal“, and click “Copy parameters” and then “Activate settings”.	
22.	Specify a password. Then click “Activate settings“ again. (The password used in this example is “12345”)	
23.	Choose “Yes”, to save the parameters in ROM.	

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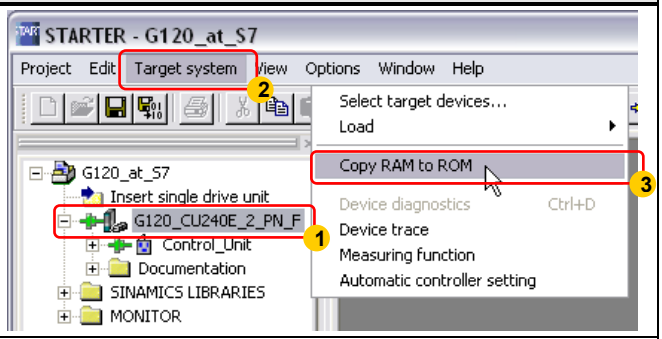
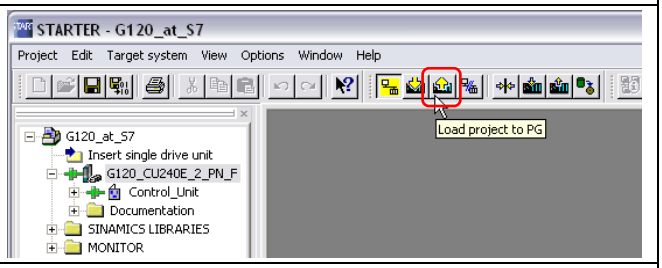
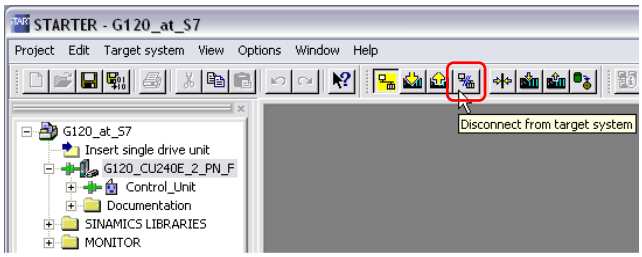
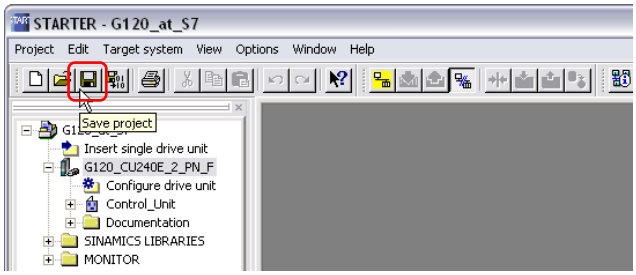
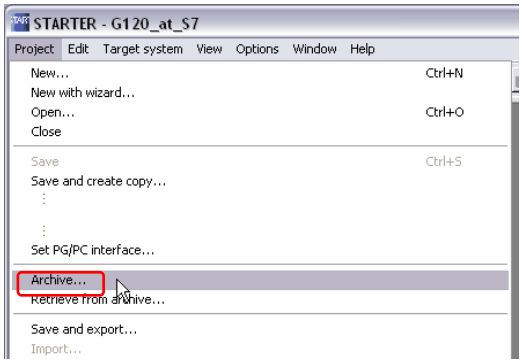
No.	Action	Remarks
24.	Save the configuration in ROM (if not done yet). For this purpose, select the drive and choose “Copy RAM to ROM” from the “Target system” menu.	
25.	Briefly interrupt the supply voltage of the control unit.	Thus the CU transfers the parameters via a reboot.
26.	Download the configuration created online into the PG.	
27.	Go offline.	
28.	Save the project on your hard disc.	
29.	Archive the project.	

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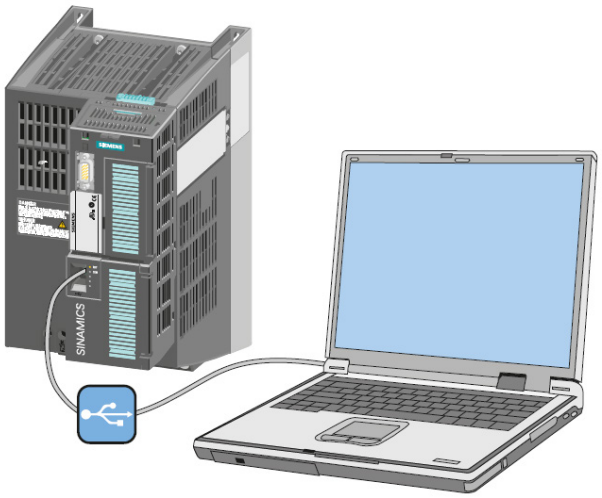
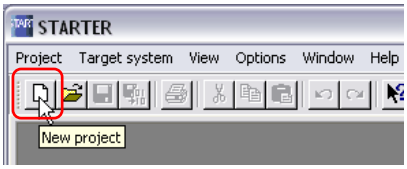
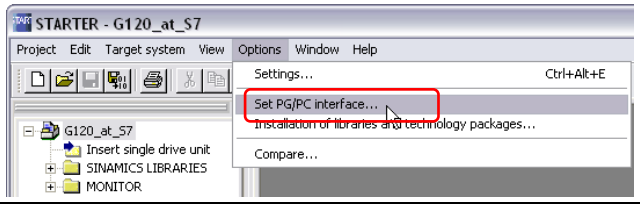
6.3 Configuring the SINAMICS G120 drive via USB

You can also configure the SINAMICS G120 via USB (PROFIBUS or PROFINET) rather than via field bus.

Table 6-3: Instruction drive configuration via USB

No.	Action	Remarks
1.	Connect the CU 240E-2 PN(-F) of SINAMICS G120 with the PG/PC using a USB cable.	
2.	Start the STARTER commissioning software.	
3.	Create a new project	
4.	Open “Set PG/PC interface“.	

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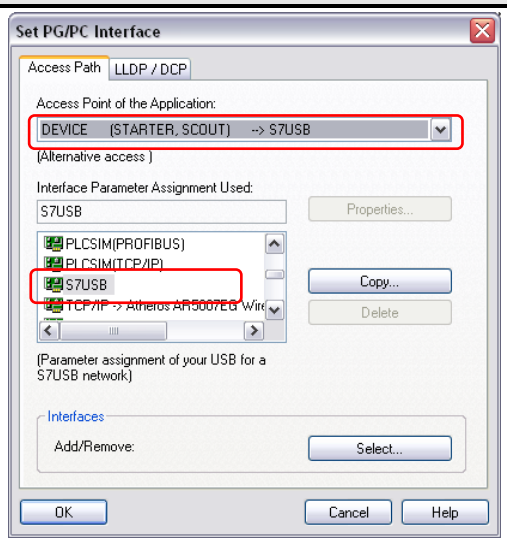
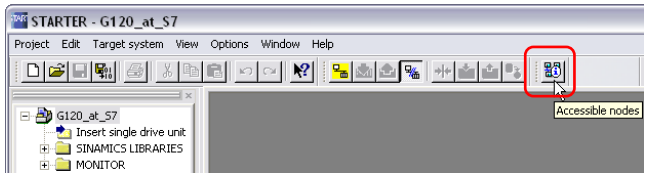
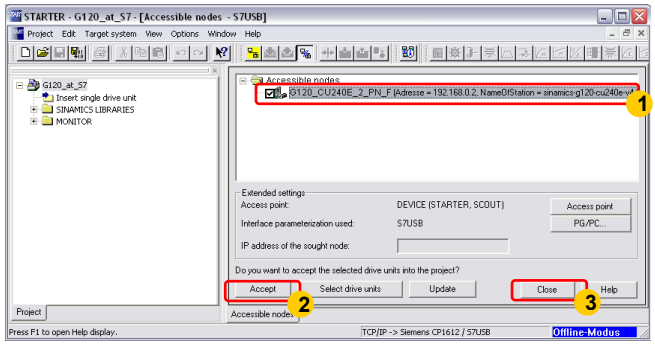
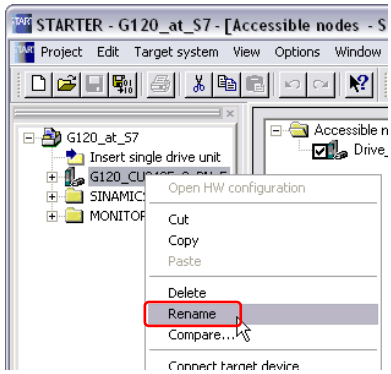
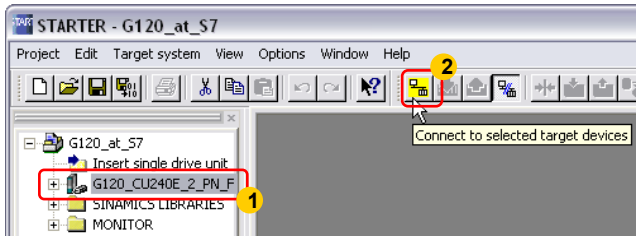
No.	Action	Remarks
5.	Select "DEVICE (STARTER, SCOUT)" as access point and "S7USB" as interface configuration used.	
6.	Click on "Accessible nodes".	
7.	Tick the detected converter and click "Accept" to transfer the drive unit into the project.	
8.	Change the name of the drive unit according to your wishes. Right click the drive unit and select "Rename" in the context menu.	
9.	Select the converter in the tree and go online.	

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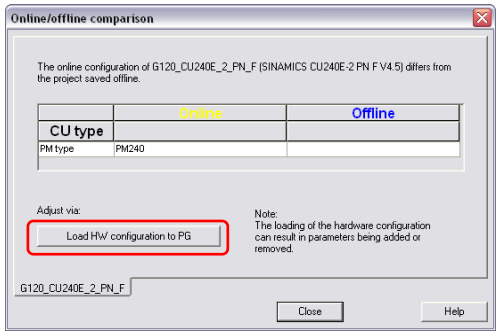
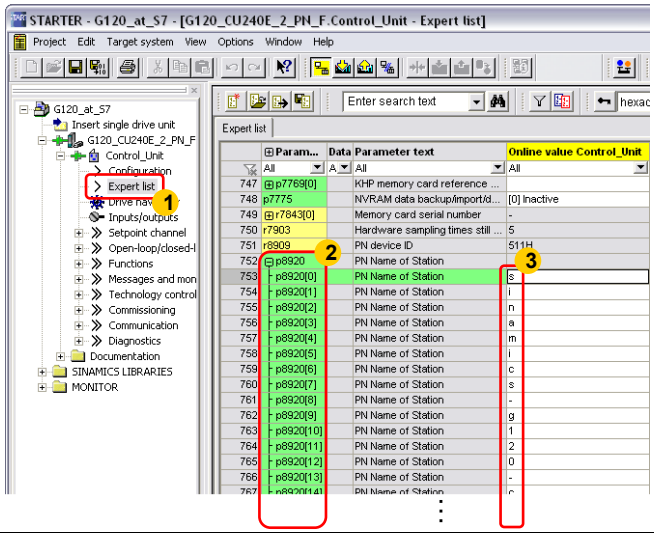
No.	Action	Remarks
10.	Download the hardware configuration into the PG/PC.	
11.	Now execute the steps 14 to 23 already explained in Table 6-2.	• Resetting the drive to factory settings. • Configuring the drive via the wizard • Specifying the data to be transferred (Siemens Tel. 352) • Configuring safety functions
12.	Assign the PROFINET device name to the IO device (drive) that is used in the network configuration of the CPU. For this purpose, go to the expert list of the control unit and enter the PROFINET name in parameter 8920 (PN Name of Station).	
13.	Proceed with step 24 in Table 6-2.	• Copying RAM to ROM • Forcing new CU reboot • Loading configuration to PG/PC • Going offline • Saving project on hard disk • Archiving the project

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7 Literature

The following list is by no means complete and only provides a selection of appropriate sources.

Table 7-1: Literature

	Topic	Title / link
/1/	STEP7 SIMATIC S7-300/400	Reference Manual System Software for S7-300/400 System and Standard Functions Volume 1/2 http://support.automation.siemens.com/WW/view/en/44240604
/2/		Automating with SIMATIC S7-300 inside TIA Portal Author: Hans Berger Publisher: Publicis ISBN-13: 978-3-89578-382-1 http://www.publicis-books.de
/3/		Automating with SIMATIC S7-400 inside TIA Portal (Jan 2013) Author: Hans Berger Publisher: Wiley VCH ISBN-13: 978-3895783838 http://www.publicis-books.de
/4/	Reference to this entry	http://support.automation.siemens.com/WW/view/en/60140921
/5/	Siemens Industry Online Support	http://support.automation.siemens.com
/6/	STARTER	http://support.automation.siemens.com/WW/view/en/26233208
/7/	GSD files for SINAMICS G120	http://support.automation.siemens.com/WW/view/en/26641490
/8/	SINAMICS G120 Manuals	Operating instructions CU240x-2: http://support.automation.siemens.com/WW/view/en/94020562 Operating instructions CU250S-2: http://support.automation.siemens.com/WW/view/en/94020554 List manual CU240x-2 (parameters and error list): http://support.automation.siemens.com/WW/view/en/49946755 List manual CU250S-2 (parameters and error list): http://support.automation.siemens.com/WW/view/en/49946755 Function manual Safety Integrated: http://support.automation.siemens.com/WW/view/en/94003326

8 History

Table 8-1: History

Version	Date	Modifications
V1.0	05/2012	First issue
V1.2	06/2014	Standardization assigned to FB11 and FB12 and initialization of the TEMP tag **InData** added

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