Drive System Application

applications
& TOOLS

Commissioning of the Control Unit CU230P-2 DP with PROFIBUS

Application description
for SINAMICS G120 and MICROMASTER 440

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Commissioning of the Control Unit CU230P-2 DP with PROFIBUS   ID-No: 35934076

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Commissioning of the Control Unit CU230P-2 DP with PROFIBUS   ID-No: 35934076

Preposition

Aim of the application

This application was created in order to provide the user with an easy introduction to the subject of commissioning the CU230P-2 DP control unit with PROFIBUS interface.

This application contains general instructions on how to connect the CU230P-2 DP to a PROFIBUS DP network.

The application describes each of the steps involved in setting up an S7 project to control a SINAMIC G120 with the CU230P-2 DP via PROFIBUS, and how to control the inverter using a variable table.

Scope

The following core issues are discussed in this application:

- Instructions for connecting the CU230P-2 DP to a PROFIBUS DP network.

- Commissioning the CU230P-2 DP with PROFIBUS interface

Exclusion

This description can be applied for SINAMICS G120 frequency inverters with Control Units CU230P-2 DP.

- This application does not include any description of the following

- The SIMATIC STEP 7 programming tool

- The basic commissioning of the frequency inverter

- Commissioning higher-level controls

It is assumed that readers have basic knowledge about these two subjects.

Reference to the Automation and Drives Service & Support

This article is from the Internet Application Portal of the Automation and Drives Service & Support. You can go directly to the download page of this document using this link.

http://support.automation.siemens.com/WW/view/en/35934076

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Application description

This section provides an overview of how to commission a SINAMICS G120 with a CU230P-2 DP control unit and PROFIBUS.

1   Description

The CU230 is a Control Unit that has been optimized for pumps and fans. It can be operated with all power units of the PM240 and PM250 series.

The CU230 Control Units are available in three versions:

- CU230P HVAC with USS interface via RS485
- CU230P CAN with CANopen interface
- CU230P DP with PROFIBUS DP interface

Figure 1-1 CU230P-2 DP with PROFIBUS DP interface, doors closed and open

They can be commissioned either using the STARTER commissioning software or using the optional "Intelligent Operator Panel - IOP".

Figure 1-2 Intelligent Operator Panel (IOP)

This application describes the commissioning of the CU230P-2 DP with PROFIBUS DP interface.

It provides general instructions on how to connect the CU230P-2 DP to a PROFIBUS DP network, and explains how to commission a SINAMICS G120 with CU230P-2 DP and SIMATIC S7.

It is assumed for the purpose of this application that the motor and inverter (the power module and the control unit) have been assembled and that the inverter has undergone the quick commissioning process.

The information required here can be found in the operating instructions for the SINAMICS G120 and the CU230P-2 DP control units.

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2 Connecting CU230P-2 DP to the PROFIBUS DP network

2.1 Integrating an inverter into the PROFIBUS DP fieldbus system

To integrate the inverter into the PROFIBUS DP fieldbus system, a 9-pin sub-D connector conforming to the PROFIBUS standard can be found on the underside of the CU230P-2 DP control unit. The terminals in this connector are short-circuit proof and potential-free.
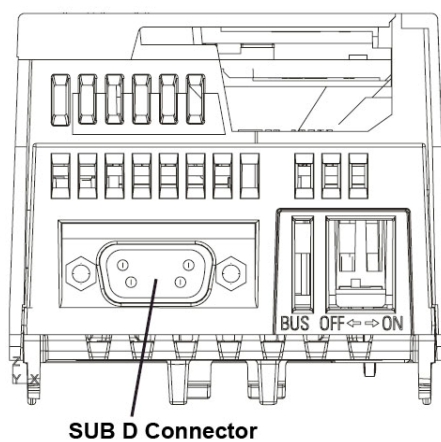
SUB D Connector

Figure 2-1 Sub-D connector on the CU230P-2 DP

You will find the pin assignments in the following table:

Table 2-1 Pin assignments for the 9-pin sub D connector (socket)

	Contact	Designation	Description
	1	PE/shield	Ground connection
	2	---	---
	3	DPB	Data P receive/transmit (B/B')
	4	RTS	Control signal
	5	0V	Reference potential for PROFIBUS data (C/C')
	6	5V	Supply voltage plus
	7	---	---
	8	DPA	Data N receive/transmit (A/A')
	9	---	---
	Enclosure	PE/shield	Cable shield

2.2   PROFIBUS DP cable connector and permitted cable lengths

PROFIBUS DP cable connector

For connecting the SINAMICS G120 frequency inverter, we recommend the following

PROFIBUS DP cable connectors:

- 6GK1 500-0FC00

- 6GK1 500-0EA02

They are equipped with a switch through which the bus terminating resistor can be connected.

Permissible cable lengths

The permissible cable lengths depend on the baud rate and the PROFIBUS cable.

For more information, visit:

(http://www.automation.siemens.com/net/html_76/support/printkatalog.htm)

2.3   General specifications and requirements for fault-free communication

You can integrate up to 126 stations into a PROFIBUS DP network. These must be subdivided into segments of up to 32 stations. You must activate the bus terminating resistor for the first and last stations of each segment.

You can disconnect one or more slaves from the bus (by unplugging the bus connector) without interrupting the communication for the other stations. It is important to ensure that a bus terminating resistor is connected to the "first" and "last" nodes.

Note

Communication with the controller, even when the line voltage is switched off

You will have to supply the Control Unit with 24 V DC on terminals 31 and 32 if you require communication to take place with the controller when the line voltage is switched off.

2.4   Setting the PROFIBUS DP address

Before the PROFIBUS DP interface is used, the address of the node point (inverter) must be set.

The following methods are available for setting the PROFIBUS DP address:

- Using the address switch on the Control Unit

- Using parameter p0918

Note

Important notes for setting the PROFIBUS address

The address setting on the DIP switch takes priority over the p0918 settings.

The PROFIBUS DP address can only be set using p0918 when the address 0 is set on the DIP switches of the Control Unit (factory setting). When the address switch is set to a value ≠ 0, the setting in p0918 is ignored.

The valid address range for Siemens controllers is 1 to 125. Addresses 126 and 127 cannot be used with SIMATIC controllers.

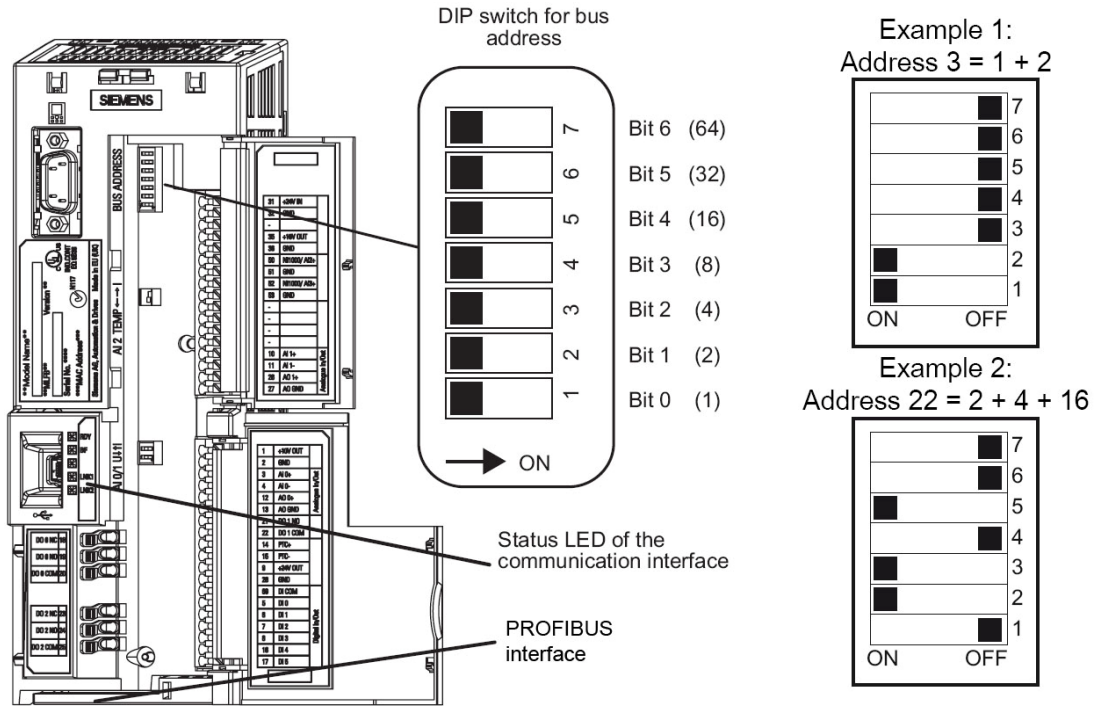**Arrangement of the DIP switches on the Control Unit and address examples**

Figure 2-2 Arrangement of the DIP switches on the Control Unit and address examples

Note

A newly set PROFIBUS DP address will only come into effect after switching off and on again. It is particularly important that any external 24 V supply is switched off.

2.5   Communication settings for PROFIBUS DP

PROFIBUS DP parameters

You can fully integrate your inverter with a CU230P-2 DP Control Unit into a PROFIBUS communication system without the need for any PROFIBUS-specific parameter settings when the following preconditions are met:

- The PROFIBUS address is set using a DIP switch

- The communication procedure uses standard telegram 1

If you want to modify the communication settings, the parameters that you can use to make changes are listed in the table below.

Table 2-2 PROFIBUS DP parameters

Parameter	Description
P0918	PROFIBUS address
P0922	Selection of the PROFIBUS standard telegram
P2038	Selection of the communication profile (PROFIdrive profile 4.1 / VIK NAMUR)
P2042	Selection of the profile code for the controller (PROFIdrive profile 4.1 / VIK NAMUR)
r2050	Set-point source for process data (BICO)
P2051	Actual values for process data (BICO)
P2030	Fieldbus interface telegram selection
P2037	PROFIdrive processing mode
P2040	Fieldbus telegram off time
P2044	PROFIdrive fault delay for setpoint
P2047	PROFIBUS additional monitoring time
r2054	Diagnostics of the communication module
r2055	PROFIBUS diagnostics - standard
r2075	PROFIdrive diagnostics telegram offset
P2079	PROFIdrive PZD extended telegram selection

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3   Prerequisites

3.1   Hardware components

Table 3-1 Hardware components

Component	Type	Order No. [MLFB]/ordering data	No.	Manufacturer
S7 control				
Power supply	PS307 5A	6ES7307-1EA00-0AA0	1	SIEMENS
S7-F CPU	CPU 317F-2 PN/DP	6ES7317-2FK13-0AB0	1	
Memory Card	MMC 8 MB	6ES7953-8LP11-0AA0	1	
Drive				
SINAMICS G120 Control Unit	CU230P-2 DP	6SL3243-0BA30-1PA0	1	SIEMENS
SINAMICS G120 Power Module	PM240	6SL3224-0BE13-7UA0	1	
Operator Panel IOP*	Intelligent Operator Panel IOP	6SL3255-0AA00-4AA0	1	
PROFIBUS				
PROFIBUS Cable 3 m	SIMATIC NET, PB FC Standard Cable GP, 2-wire, shielded, min. ordering quantity: 20 m sold by the meter	6XV1830-0EH10	1	SIEMENS
PB connector	PB FC RS 485 PLUG 180, PB connector w. fast connect connector	6GK1500-0FC00	2	
PB connector	SIMATIC DP, bus connector for PROFIBUS up to 12 Mbit/s with tilted outgoing cable	6ES7972-0BA41-0XA0	2	
Motor / Line				
Motor	Asynchronous motor	1LA7060-4AB10	1	SIEMENS
Motor cable, 1.5 m	Motor cable	6ES7194-1LA01-0AA0	1	
Line supply feeder cable	Line supply feeder cable	-	1	-
PG/PC				
PG/PC	SIMATIC Field PG M	6ES7712-1BB10-0AG2	1	SIEMENS

Note:

The functionality was tested using the specified hardware components.
Similar products can be used that deviate from the list above.

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* The Intelligent Operator Panel IOP is required in order to parameterize the drive. The STARTER commissioning tool can also be used (refer to the software prerequisites).

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3.2   Software components

Table 3-2 Software components

Component	Type	Order No. [MLFB]/ordering data	No.	Manufacturer
SIMATIC STEP 7	V5.4 + SP2	6ES7810-4CC08-0YA5	1	SIEMENS
STARTER [*]	V4.2	6SL3072-0AA00-0AG0 or Downloads	1	
MS Windows	MS Windows 2000 SP3 / MS Windows XP / Windows 2003 Server	-	1	Microsoft

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[*] The STARTER commissioning tool is required to parameterize the drive. The operator panel can also be used (refer to the hardware prerequisites).

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4   Configuration and wiring

4.1   Hardware configuration
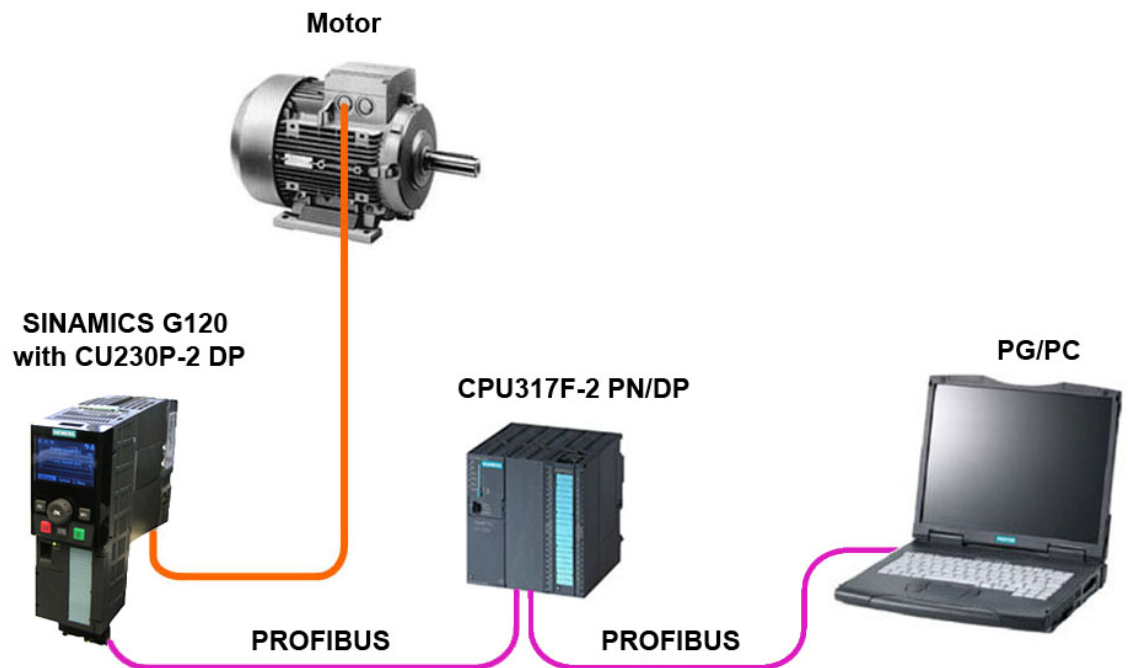
Connect all of the devices as shown in Fig. 4-1.

Figure 4-1 Hardware configuration

4.2   Setting the PROFIBUS-DP address of the CU230P-2 DP

Set the **PROFIBUS-DP address** of the CU230P-2 DP either via the
address switch on the control unit or via parameter p0918.

5   Configuring the CU230P-2 DP

The CU230P-2 DP control units are preconfigured for use with PROFIBUS, i.e. PROFIBUS has been selected as the factory setting for the command and set-point source (P0700 and P1000) and standard telegram 1 has been selected as the telegram type (P0922).

The IOP or STARTER can be used to check parameters P0700, P1000 and P0922 in the CU230P-2 DP and, if necessary, adjust them as follows:

Parameter No.	Designation	Parameter value	Note / comments
P0922	Selection of the PROFIBUS standard telegram	1	1: Standard telegram 1
P0700[0]	Selection of command source	6	6: PROFIBUS
P1000[0]	Selection of frequency setpoint	6	6: PROFIBUS

Table 5-1 Configuring the CU230P-2 DP

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6   Set PG/PC interface

Open the SIMATIC Manager and set the PG/PC interface. To do this, press the button **"Options -> Set PG/PC Interface…"** in the SIMATIC Manager menu.

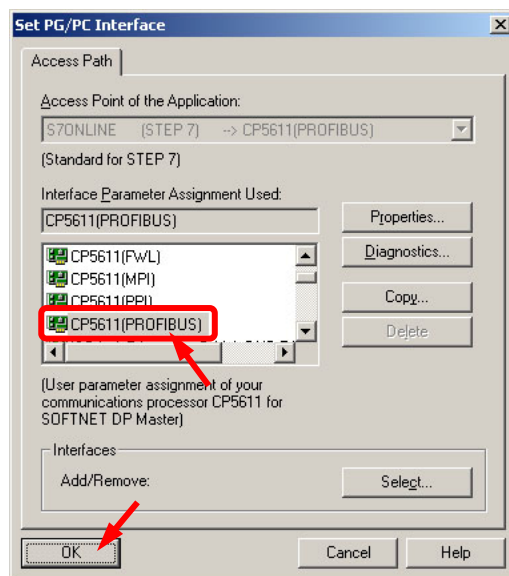From the list, select the PROFIBUS interface and acknowledge your selection with **"OK"**.

Figure 6-1 Set PG/PC interface

Acknowledge the alarm **"The following access path(s) was (were) changed: S7ONLINE (STEP 7) => CP5611(PROFIBUS)"** with **"OK"**.
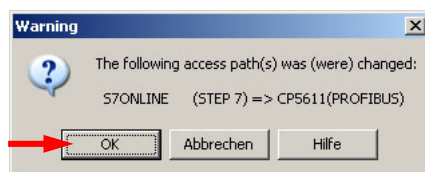
Figure 6-2 Acknowledge the alarm

This means that the PROFIBUS interface of your PG/PC can be accessed from STEP 7.

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7   Create a project and add a SIMATIC 300 station

Create a new project and add a SIMATIC 300 station to the project by clicking the **"Insert -> Station -> 2 SIMATIC 300 Station"** button in the menu (see Figure 7-1).
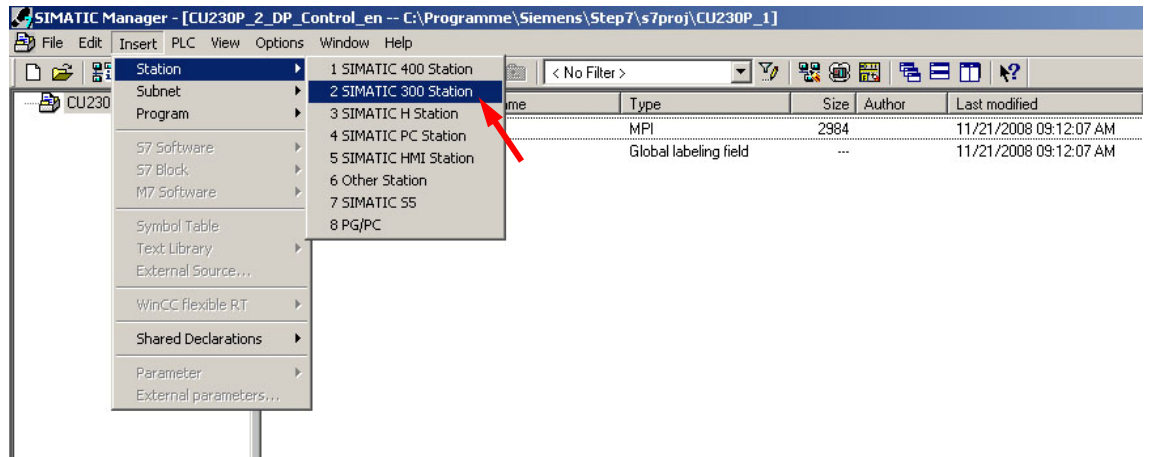

Figure 7-1 Adding a SIMATIC 300 station

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8 Creating the hardware configuration

8.1 Creating the SIMATIC hardware

Open the hardware configuration by double-clicking the **"Hardware"** button
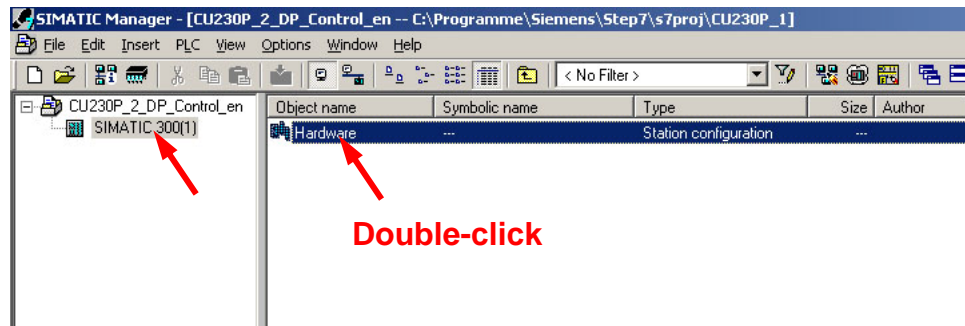(see Figure 8-1).

Figure 8-1 Opening HW-Configuration

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In the HW-Config:

- insert a SIMATIC S7-300 rack into the configuration,

- and then draw the desired power supply module from the product tree to slot **1** and the CPU to the slot **2** in the SIMATIC rack.

  - When you insert the CPU the window for the settings of the Ethernet interface opens. Close the window with **"OK"** (Fig. 8-2).
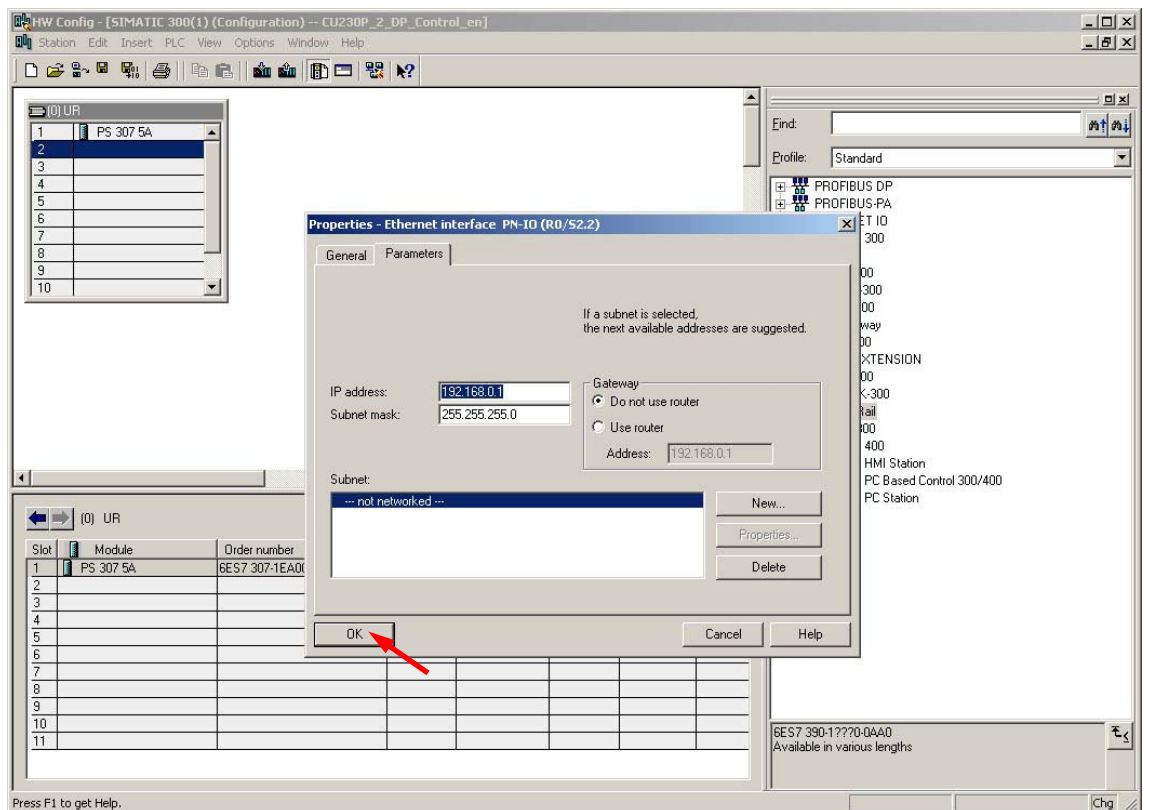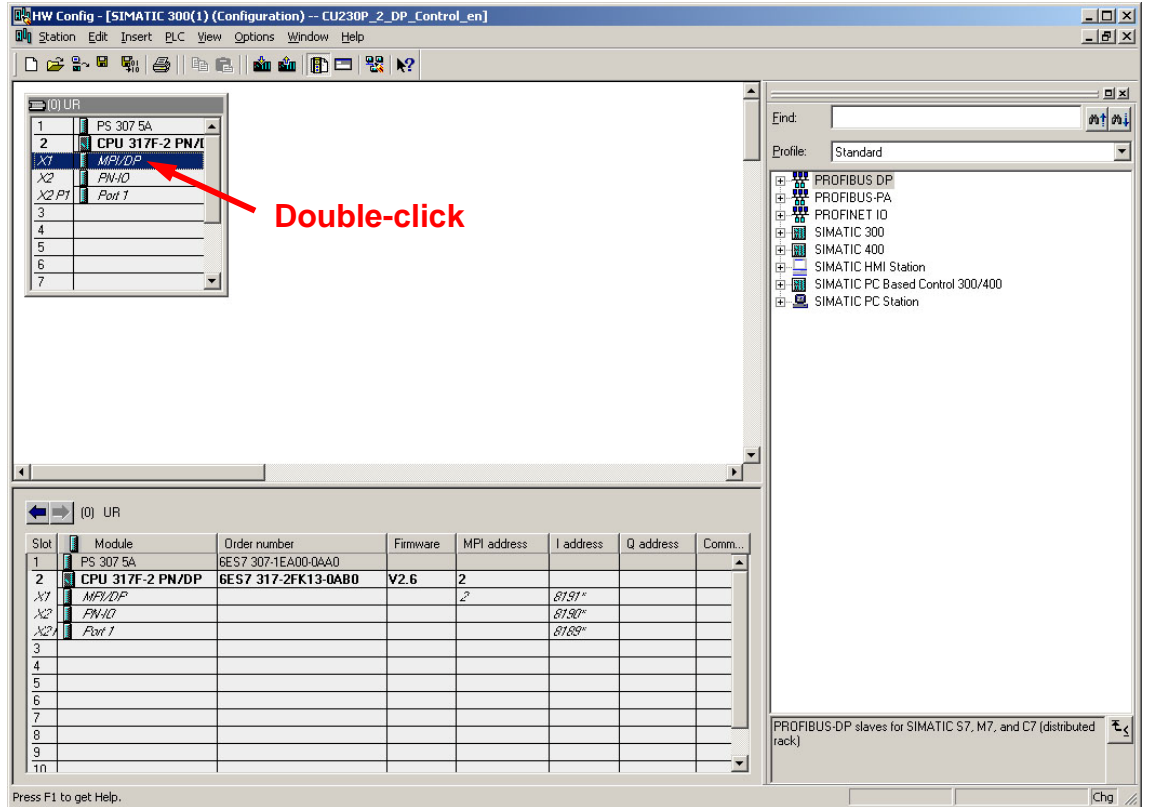
Figure 8-2 Inserting the CPU

Result:

Figure 8-3 HW Config after setting-up the SIMATIC hardware

8.2   Creating the PROFIBUS interface

To create the PROFIBUS interface, double-click on slot **3 – MPI/DP** (refer to Fig. 8-3).

The properties window of the MPI/DP interface opens (refer to Fig. 8-4).Select the PROFIBUS interface (Fig. 8-4).
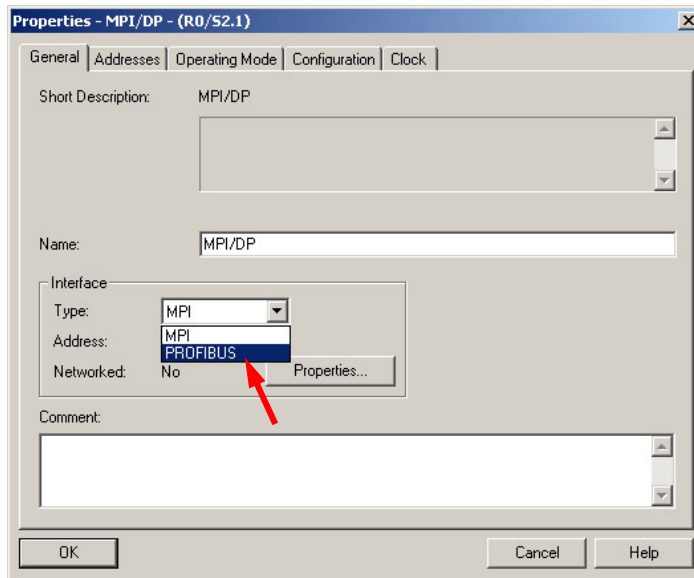

Figure 8-4 Properties of the MPI/DP interface

The next window appears in which a new subnet must be set-up. Now, select the PROFIBUS address **2** and press on the button **"New…"** (Fig. 8-5).
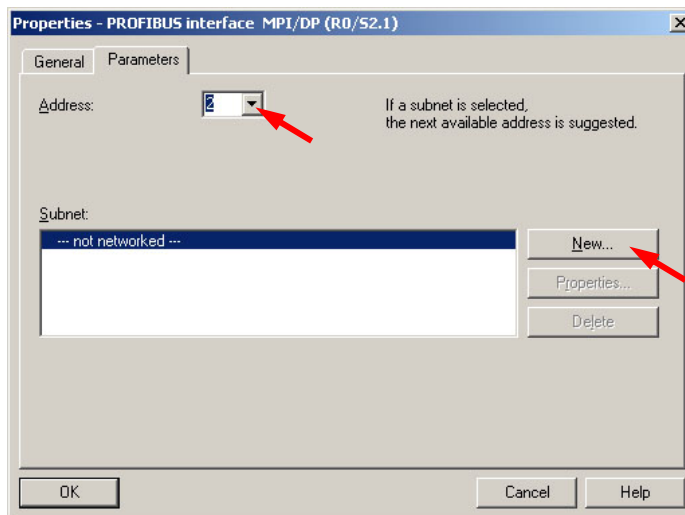

Figure 8-5 Creating a new subnet

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In the window **"Properties – New subnet PROFIBUS"** you can assign a name to the subnet or leave the default setting.
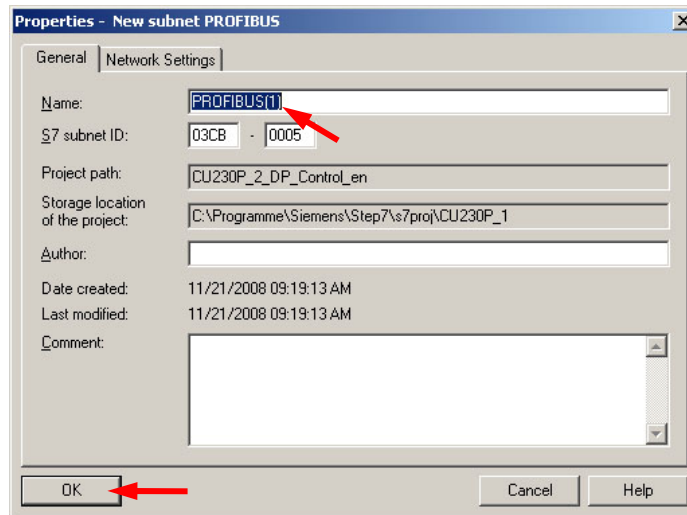
Close the window with **"OK"** (Fig. 8-6).

Figure 8-6 Assign a name to the PROFIBUS subnet

In the properties box, select the subnet **PROFIBUS(1)** and accept PROFIBUS address **2** by pressing the **"OK"** key (Fig. 8-7).

Figure 8-7 Accepting the PROFIBUS address
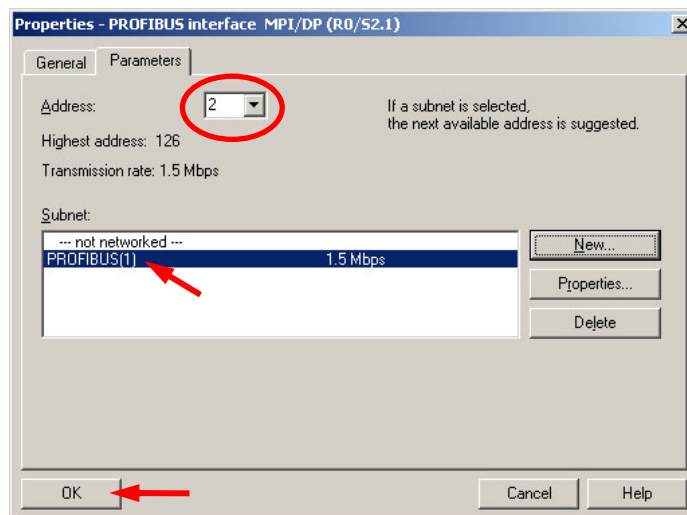
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Result:

The PROFIBUS (bus) line (DP master system) is displayed in HW Config.
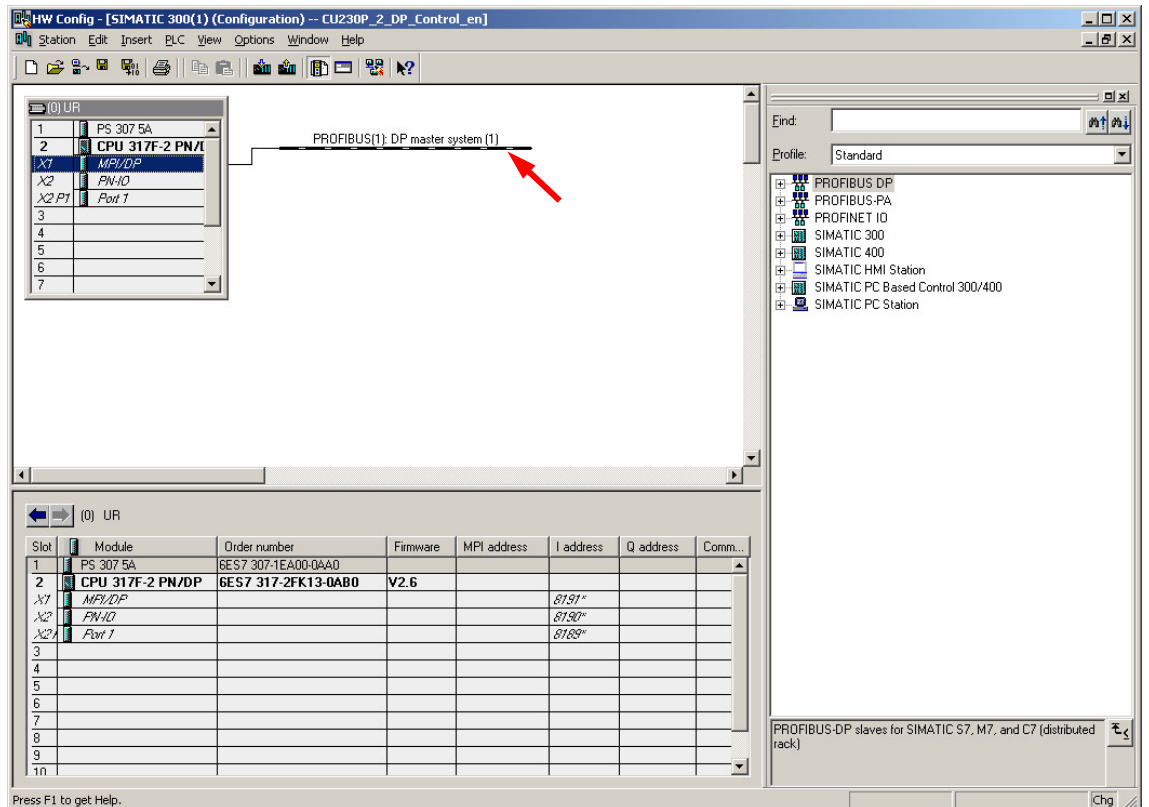
Figure 8-8 HW Config after creating the PROFIBUS interface

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8.3   Inserting the SINAMICS G120

Prerequisite

PROFIBUS GSD files for SINAMICS G120 V4.1 must have been installed in order that the Control Unit CU230P-2 DP can be accessed via PROFIBUS.

Installing the GSD file

Install the PROFIBUS GSD file via the menu item **"Options -> Install GSD File…"** of HW-Config.

In the window that pops up, select the GSD files that you want to install and click the **"Install"** button (see Figure 8-9).
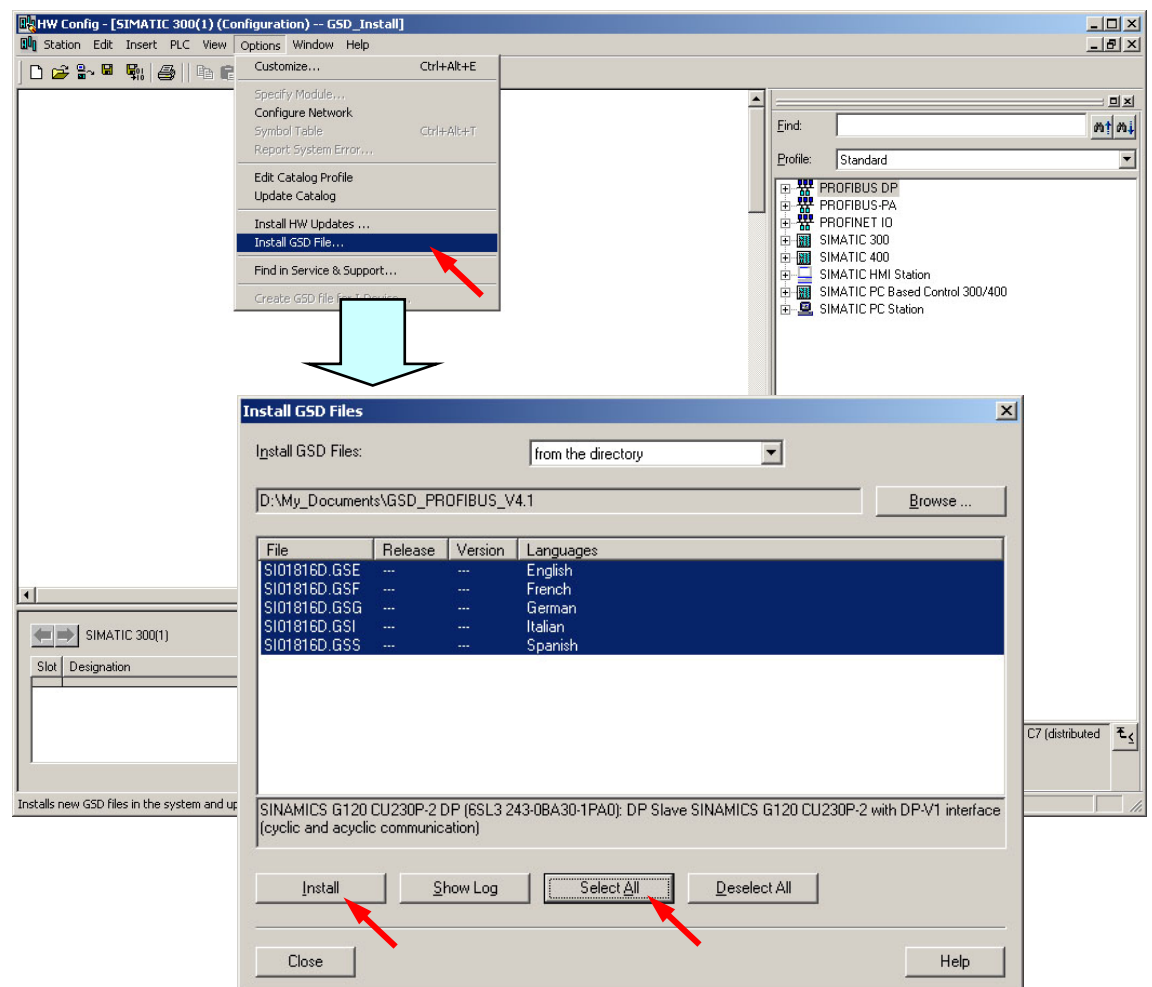
Figure 8-9 Installing the GSD file

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Result:

> After you have installed the PROFIBUS GSD files the corresponding files appear in the HW Catalog under the "**Standard Profile**" in the folder "**PROFIBUS DP\Additional Field Devices\Drives\SINAMICS\ SINAMICS G120 CU230P-2 DP** ".

Setting-up the frequency inverter

> For inserting the SINAMICS G120 you draw the SINAMICS G120 CPU230P-2 DP from the hardware catalog over the Profibus string at the CPU (Fig. 8-10).

Figure 8-10 Inserting the SINAMICS G120

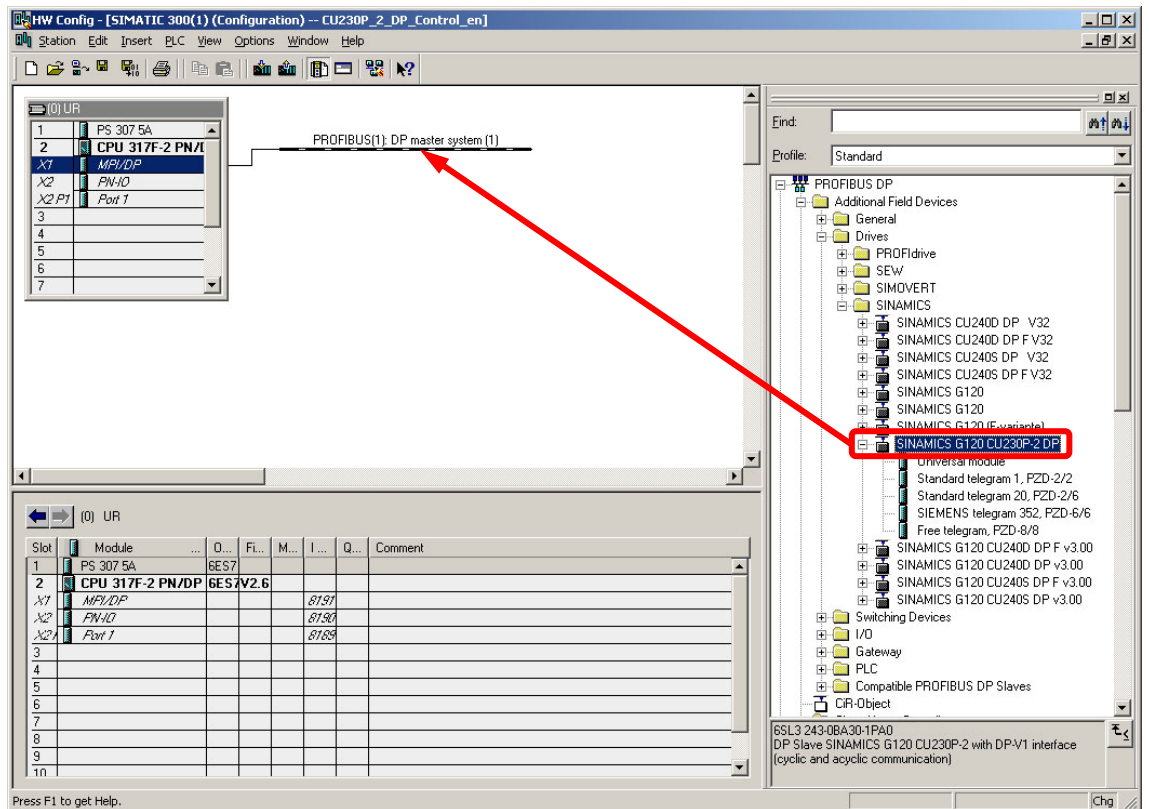**SIEMENS**

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After inserting the G120 the property window **Properties – PROFIBUS interface SINAMICS G120 CU230P-2 DP** opens.

In this property window set the Profibus address for the CU230P-2 DP to **3** and accept the setting with **"OK"** (Fig. 8-11).
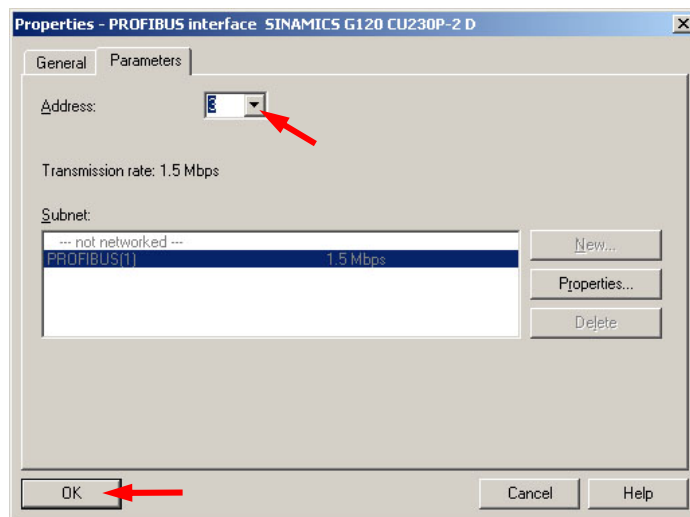
Figure 8-11 Set the Profibus address for the CU230P-2 DP

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Selecting the telegram

Select **"Standard telegram 1"** and locate this in the first free slot in the lower section of the window (Fig. 8-12).
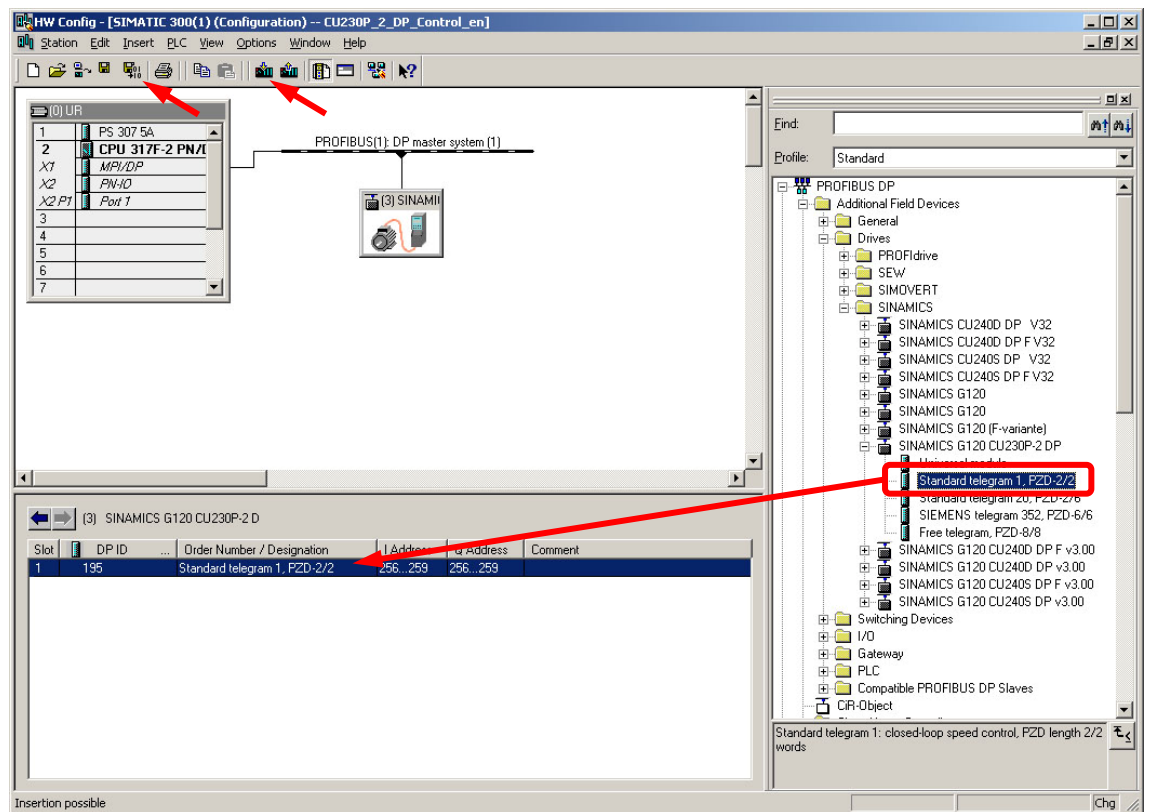
Figure 8-12 Selecting the telegram

Result:

The SINAMICS G120 frequency inverter with the CU230P-2 DP Control Unit and with standard telegram 1 is configured in HW Config.

8.4 Save and compile

After completing the configuration of the SINAMICS G120 the hardware configuration must be saved and compiled.

Save and compile your configuration by pressing the „**Save and compile**" button (Figure 8-12).

8.5 Download to Module

Now load the hardware configuration into the CPU by clicking the button **"Download to Module"** button (Figure 8-12).

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9   Creating and Configuring Modules

To control the drive, the organisation block OB1 must now be modified and a variable table added to the project.

Modify organisation block OB1

Add the following entries to OB1 (see Figure 9-1):

```
Network 1: Controlling the drive

Comment:


    L    MW    0              // MW0 includes the control word 1 which comes from the variable table VAT_1
    T    PQW  256             // transfers into the PCD1 word (address --> STEP7 HW Config)

    L    MW    2              // MW2 includes the main frequency setpoint which comes from the variable table VAT_1
    T    PQW  258             // transfers it into the PCD2 word (address --> STEP7 HW Config)

    L    PIW  256             // reads the status word 1 (ZSW1) from PCD1
    T    MW    4              // transfers it into the MW4

    L    PIW  258             // reads the actual frequency (HIW) from PCD2
    T    MW    6              // transfers it into the MW6
```

Figure 9-1 Text and comments for OB1

Add variable table

Add a variable table using the SIMATIC Manager menu item **"Insert -> S7 Block -> 6 Variable Table"** (see Figure 9-2).
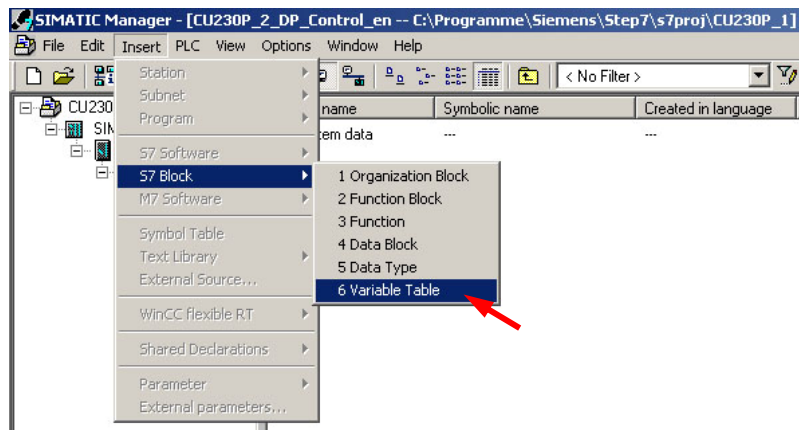

Figure 9-2 Adding a variable table

In the variable table, add the following entries for flag words MW0, MW2, MW4 and MW6 (see Figure10-1).

Load into CPU

Then load OB1 into the CPU by clicking the ▓ **"Download"** button.

10   Controlling the drive

Control word 1 (STW1) and the main set-point (HSW) are sent to the drive via the PROFIBUS interface. Status word 1 (ZSW1) and the main actual value (HIW) are received from the drive.

The drive is started by sending the typical control word 047E, followed by 047F (edge of bit 0: ON). In order to stop the drive, word 047E should be sent to the drive (edge of bit 0: OFF). The control word is sent together with process data word 1 (PZD1) that should be specified in the variable table VAT_1 (bit memory word MW0, refer to Fig. 10-1).

Status word 1 (ZSW1) is received from the drive (PZD1) and is transferred into the bit memory word MW4. The MW4 can be taken from variable table VAT_1 (refer to Fig. 10-1).

The main setpoint is sent, together with PZD2 to the drive - and the main actual value is received from the drive in PZD2. The main set-point should be specified in the variable table VAT_1 (bit memory word MW2, refer to Fig. 10-1). The response - the main actual value - is saved in the MW6 and can be taken from the variable table (refer to Fig. 10-1).

The frequency setpoint and actual value are normalized so that 4000(hex) corresponds to 50Hz. The highest value that should be sent is 7FFF. The normalization frequency (reference frequency) can be modified in P2000 (default, 50Hz).

Figure 10-1 Controlling the drive

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11   Other links

The following article illustrates how to control the inverter: Article ID 22078757 Function block (FC14) to control a drive inverter via Profibus-DP.

This example illustrates how to quickly and easily connect the inverter to a SIMATIC S7-300/400 controller via Profibus-DP.

The following options are illustrated in the program:

- Sending the IN/OUT command

- Reversing the inverter

- Fault acknowledgement

- Setpoint specification for the inverter

Read the following articles for more information about "Reading and writing inverter parameters":

1. Reading and writing parameters of the frequency inverters SINAMICS G120/G120D, ET200S FC and ET200pro via PROFINET and PROFIBUS

2. How do I control a G120 using the system functions SFC58 and SFC59?

3. How can I use SFC58 and SFC59 to read parameters from my G120?

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Appendix and references

12   References

12.1   Internet link data

This list is in no way complete and only reflects a selection of suitable references.

Table 12-1

	Subject area	Title
\1\	Documentation	SINAMICS G120
\2\	Application	Function block (FC14) to control a drive inverter via Profibus-DP
\3\	Application	Reading and writing parameters of the frequency inverters SINAMICS G120/G120D, ET200S FC and ET200pro via PROFINET and PROFIBUS
\4\	FAQ	How do I control a G120 using the system functions SFC58 and SFC59?
\5\	FAQ	How can I use SFC58 and SFC59 to read parameters from my G120?
\6\	FAQ	Are there program examples for the Instruction Manual of the MICROMASTER PROFIBUS option module?
\7\	FAQ	How do I read / write parameters using PROFIBUS on the MICROMASTER 4 and CU240S/D DP/DP-F and PROFINET on the CU240S/D PN/PN-F?
\8\	FAQ	For MM 4 and for G120/G120D frequency inverters, which parameters can be read-out using PZD?

12.2   History

Table 12-2 History

Version	Datum	Change
V1.0	May 2009	First edition