

Servo Controller SE-Power FS

- **Programming example
Profibus Siemens S7 V5.5**



Complementary document to the Operating Instruction
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This manual is a complementary document to the operating instructions and applies to:

Type	Order No.
SE-Power Profibus Interface	50036340

Version of this documentation: SE-Power FS programming example Profibus Siemens S7 V5.5 vers. 1.3 en.27.02.2017

Assembly and initial start-up may be carried out by qualified personnel only and according to these operating instructions.



Caution!

As this manual is a complementary document to the operating instructions it alone is not sufficient to carry out installation and commissioning of the device.

Please pay attention to the notes in:

1.1 Documentation

1 General

1.1 Documentation

For the Servo Controllers of the SE-Power series are considerably documentations available. There are main documents and complementary documents.

The documents contain safety instructions that must be followed.

Main document:

present	documentation / description
<input type="checkbox"/>	<ul style="list-style-type: none"> ▪ SE-Power FS Operating manual <p>Description of the technical data and the functions of the device as well as notes on the plug assignment, installation and operation of the SE-Power FS servo controller series.</p> <p>It is meant for persons who want to get familiar with the SE-Power FS servo controller</p>



Caution!

The operating manual is the main document and must be read by all means before installation and start-up of all devices of the SE-Power FS series.

Complementary documents to the operating manual:

present	documentation / description
<input type="checkbox"/>	<ul style="list-style-type: none"> ▪ SE-Power FS mounting instructions <p>This manual is included during delivery of the SE-Power FS devices and provides an extract from the manual represents the installation instructions contained therein make sure that they can easily operate the servo drive.</p>
<input type="checkbox"/>	<ul style="list-style-type: none"> ▪ SE-Power FS STO-manual <p>Description of the technical data and the device functionality, installation, and operation of the safety module STO.</p>
<input type="checkbox"/>	<ul style="list-style-type: none"> ▪ SE-Power FS MOV-manual <p>Description of the technical data and the device functionality, installation, and operation of the safety module MOV.</p>
<input type="checkbox"/>	<ul style="list-style-type: none"> ▪ SE-Power Software-manual <p>Description of the software SE-Commander with the individual functions.</p>
<input type="checkbox"/>	<ul style="list-style-type: none"> ▪ SE-Power CANopen-manual <p>Description of the implemented CANopen protocol according to CiA DSP402 and DS301.</p>

<input type="checkbox"/>	<ul style="list-style-type: none"> ▪ SE-Power FS PROFIBUS/PROFINET-manual <p>Description of the implemented PROFIBUS-DP and PROFINET protocols, the technical data and the device functionality, installation, and operation of the fieldbus-modules „SE-Power Profibus Interface“ and „SE-Power Profinet Interface“.</p>
<input type="checkbox"/>	<ul style="list-style-type: none"> ▪ SE-Power EtherCAT-manual <p>Description of the fieldbus control by using the CoE (CANopen over EtherCAT) protocol, the technical data and the device functionality, installation, and operation of the fieldbus-module „SE-Power EtherCAT Interface“.</p>
<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> ▪ SE-Power FS Programming example Profibus Siemens S7 V5.5 <p>Description of the configuration and program to the programming example Profibus for Siemens S7 V5.5.</p>
<input type="checkbox"/>	<ul style="list-style-type: none"> ▪ SE-Power FS Programming example Profibus Siemens S7 TIA V12 <p>Description of the configuration and program to the programming example Profibus for Siemens S7 TIA V12.</p>
<input type="checkbox"/>	<ul style="list-style-type: none"> ▪ SE-Power FS Programming example Profinet Siemens S7 TIA V13/V14 <p>Description of the configuration and program to the programming example for Profinet for Siemens S7 TIA V13.1 and V14.0.</p>

These documents are available for download on our homepage:

www.afag.com

2 Programming example Profibus for SIEMENS S7 V5.5

2.1 Introduction

For the servo positioning controller SE-Power FS, specifically for the Siemens PLC systems (SIMATIC S7 controllers) were written function blocks that facilitate integration of the servo positioning controller in a PLC program with PROFIBUS functionality significantly.

The blocks are packaged as a sample project to a file. This file is an archived SIMATIC STEP 7 project. The sample project is:

Mode of operation	Sample project
Positioning	SE-Power_POS_S7V5p5.zip



Download sample project configuration, function and data blocks under www.afag.com

The sample project can be retrieved under the Siemens SIMATIC Manager V5.5. Of this retrieved example project, the relevant FBs, DBs and if necessary, instructions can be copied.

In this manual, these blocks and the configuration and integration in a PLC program are described.

The function and data blocks (FB, DB) are the operating mode "Positioning" assigned.



This manual is intended to provide the user with a quick introduction to the function of the inputs and outputs as well as the handling of the FBs and DBs within the Siemens S7 world. **This manual does not replace the "SE-Power FS Profibus Manual", but is supplementary.**

The sample programs provided by Afag available can only be understood as such and give the basic procedure for handling the function and data blocks.

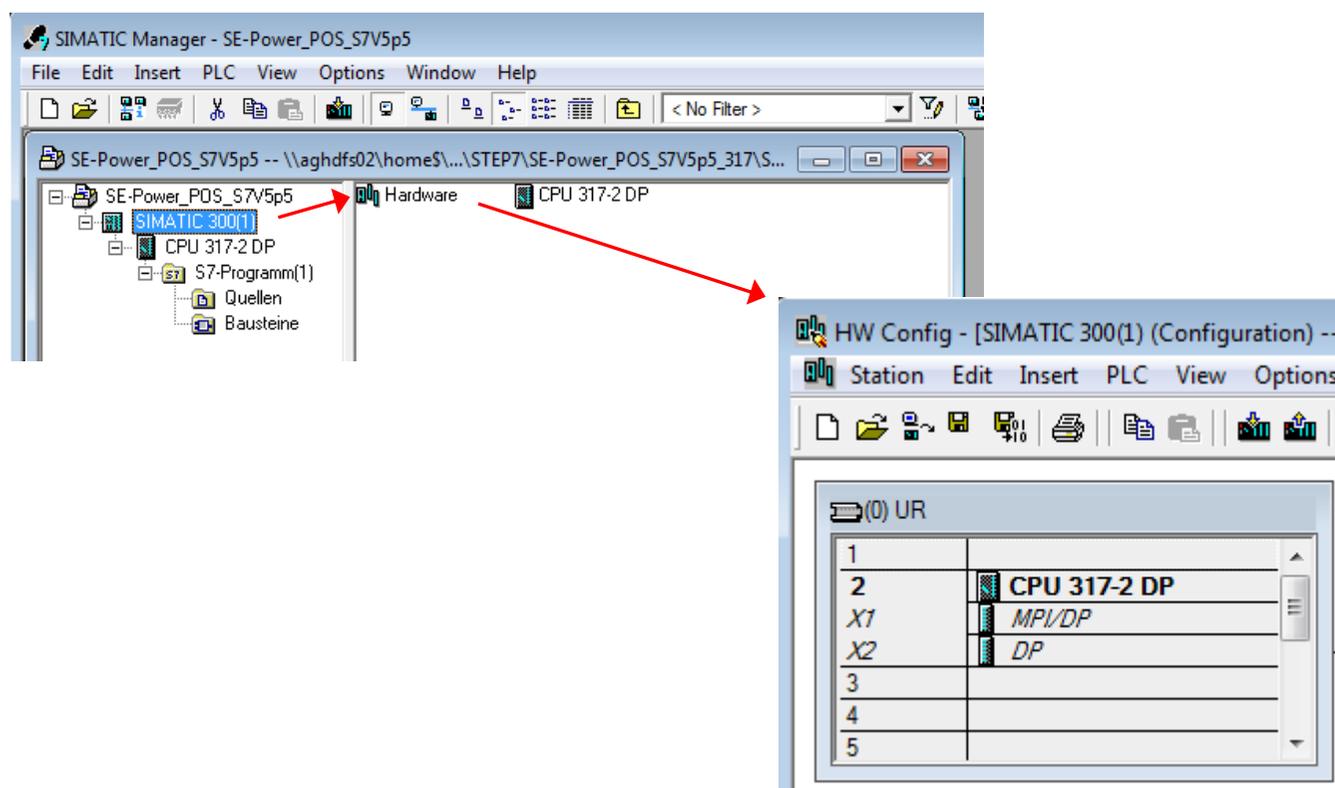
When using the sample programs in customer-specific applications, the user must verify that all functional and safety-relevant conditions are met.

3 Integrate in SIEMENS S7 V5.5

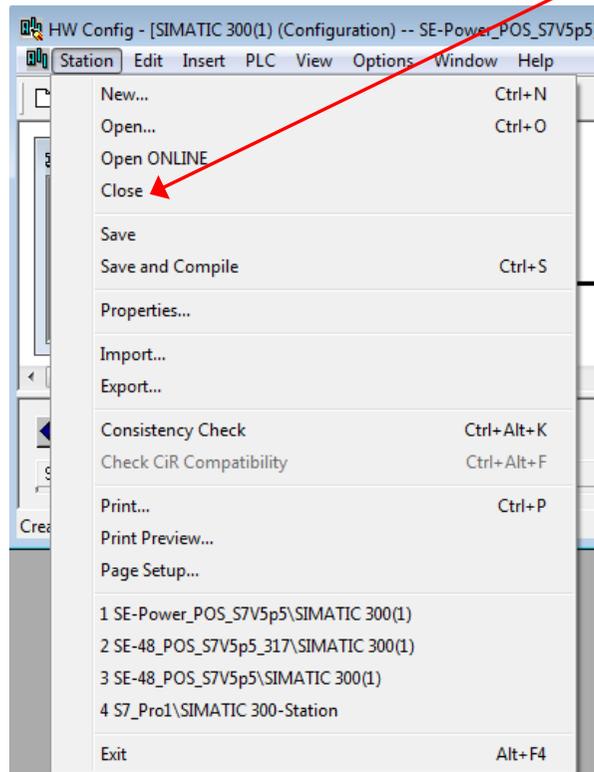
3.1 Configuration

3.1.1 Integrate of the GSD-File

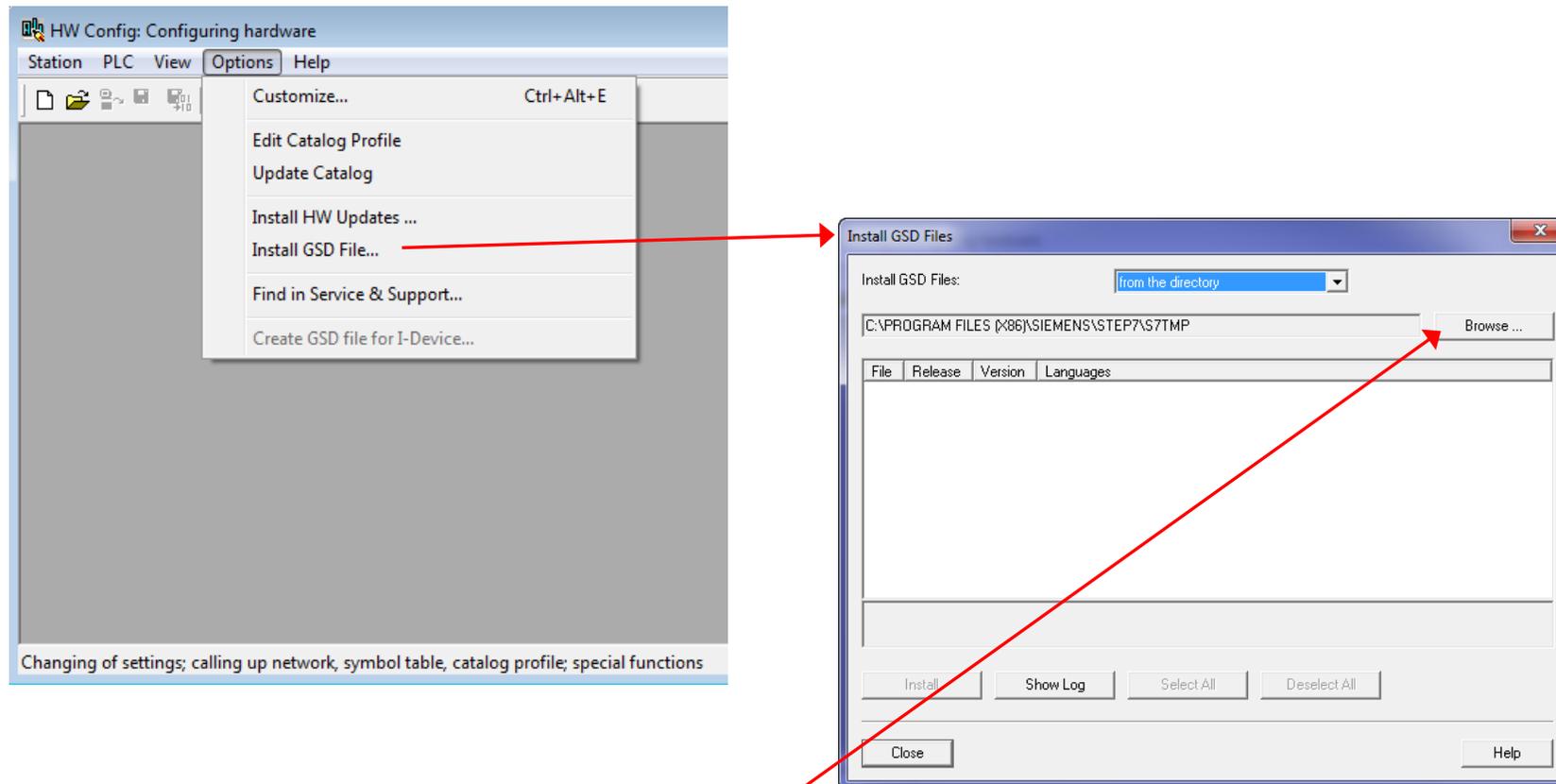
For integrate the GSD file in the Simatic S7-project, selected the appropriate station and then double-click the hardware and the HW-Config. will be open:



First, the station with the command **Station -> Close** closed without closing the hardware configurator.



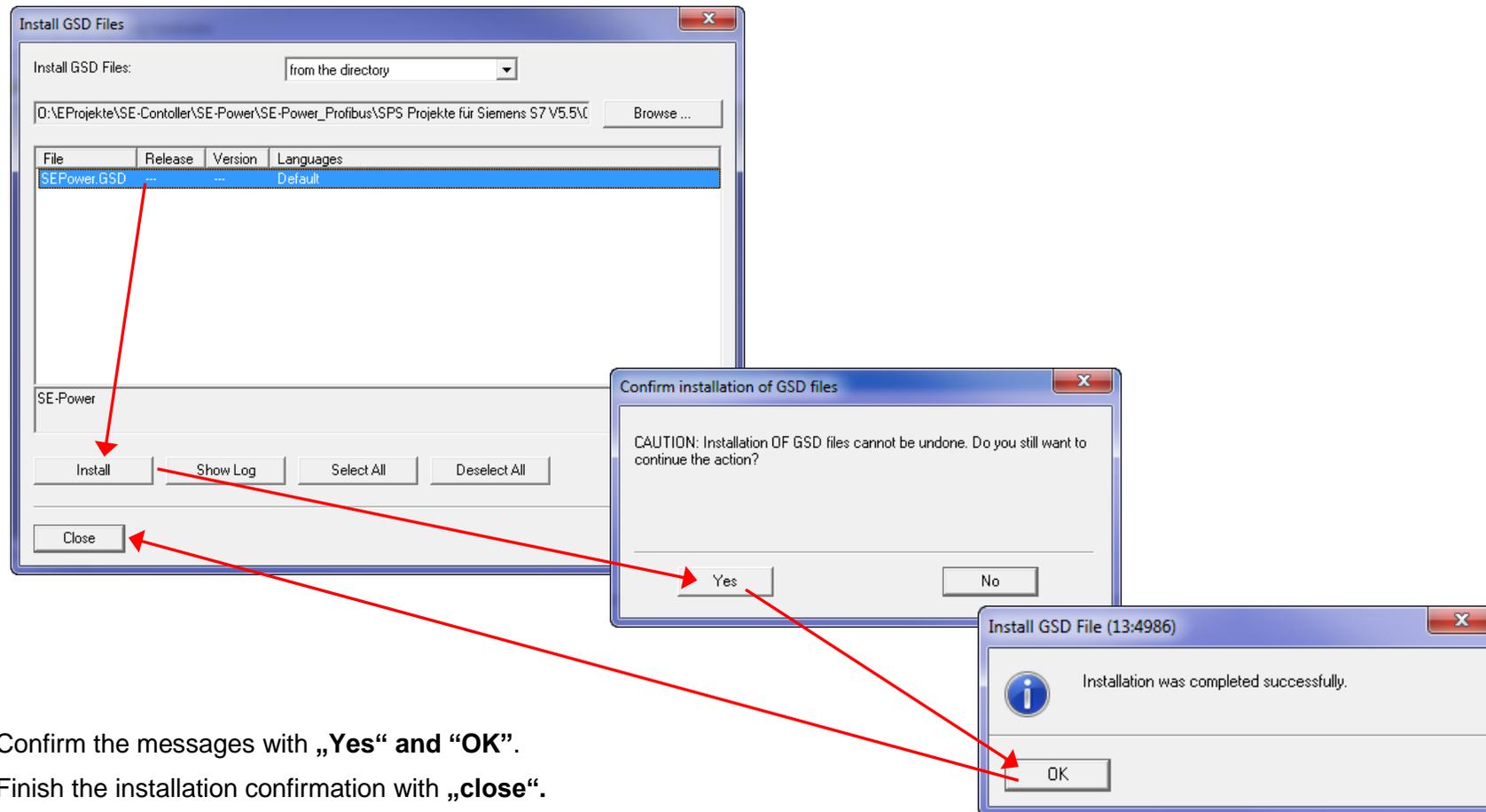
With the command **Options** → **Install GSD file** the window to select the GSD file open.



With the button „**Browse**“ open the path, which is stored under the corresponding GSD file.

All GSD-Files which will be located in this path will be displayed.

The File **SEPower.gsd** select and start **Install**.



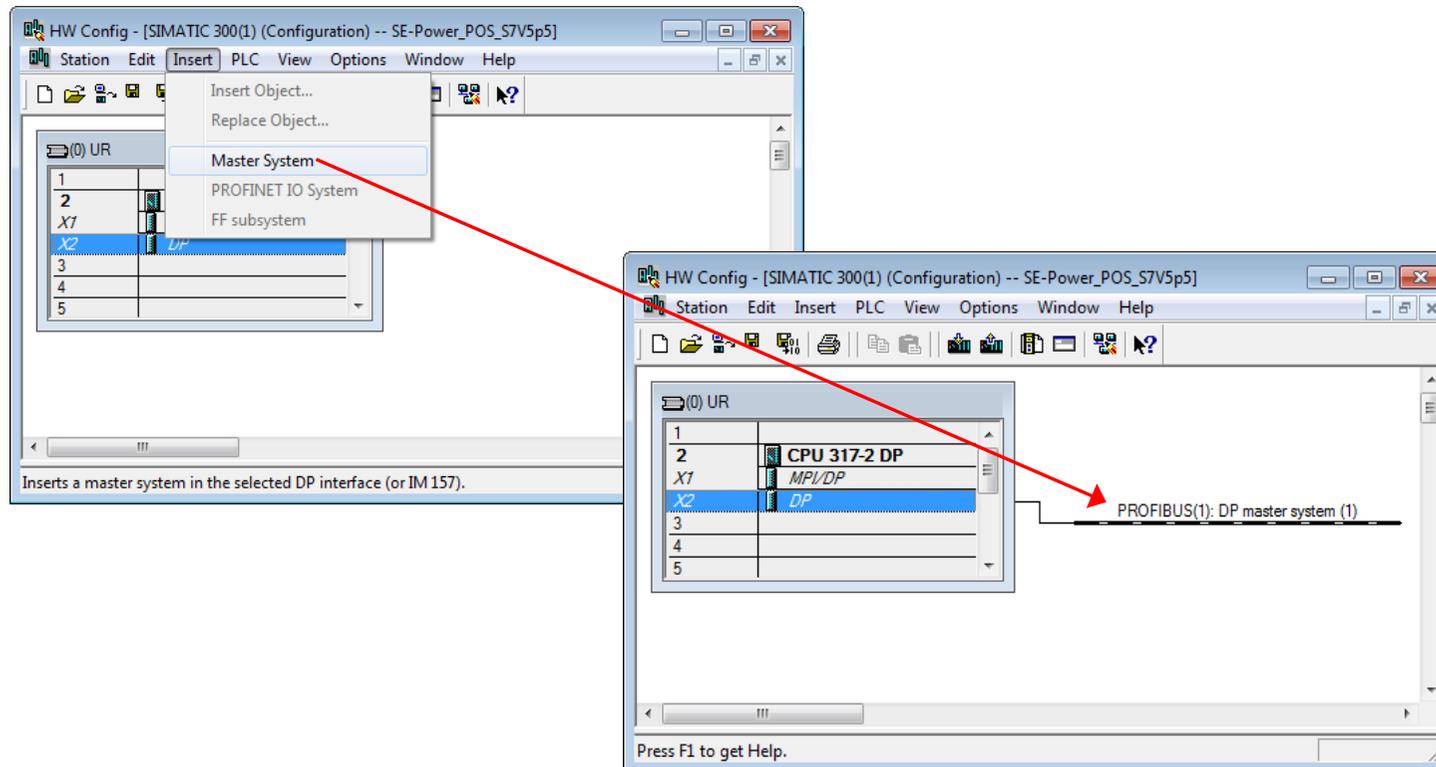
Confirm the messages with „Yes“ and “OK”.

Finish the installation confirmation with „close“.

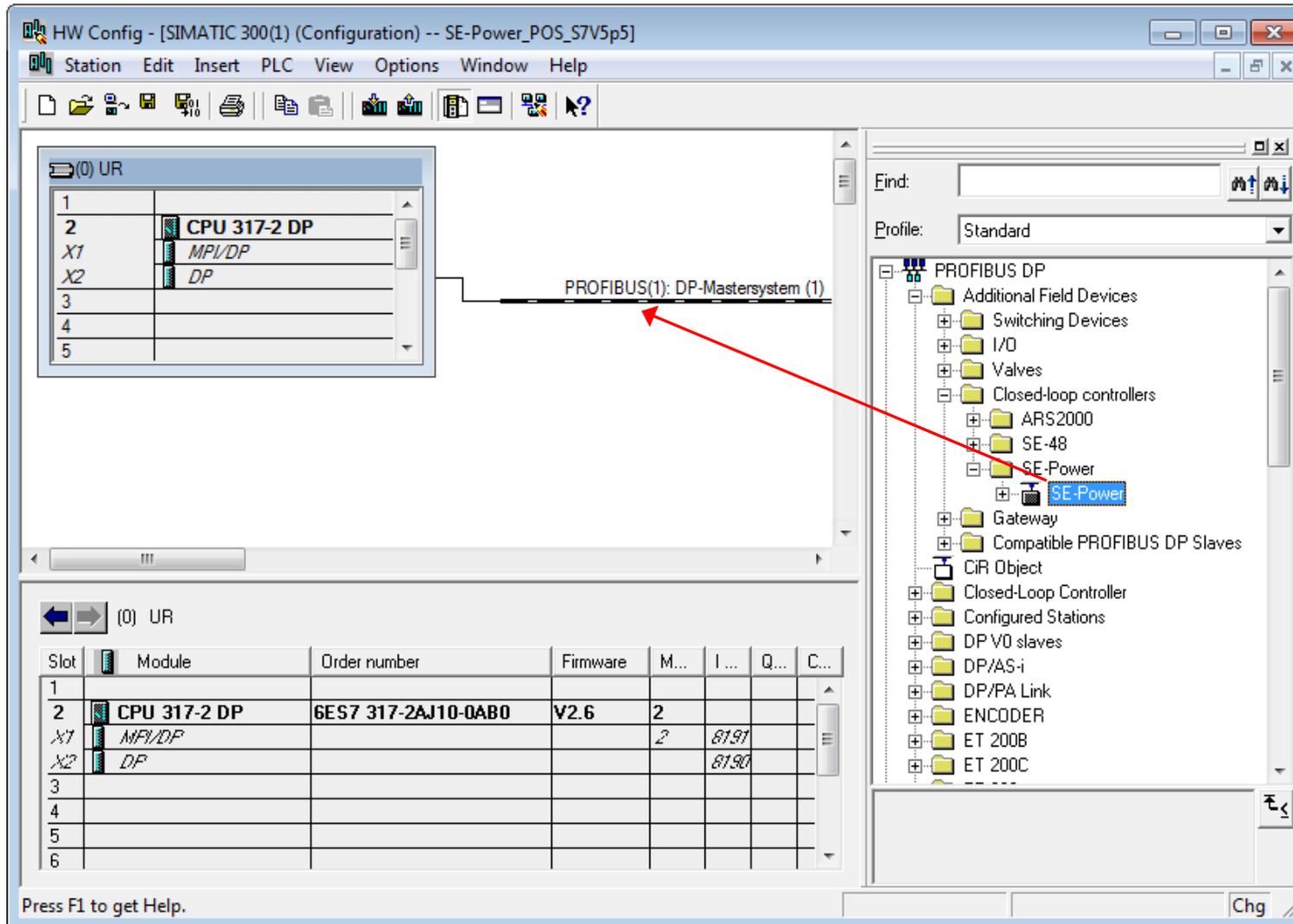
The GSD-file is now installed.

3.1.2 Configuration Connection servo controller SE-Power FS on Profibus

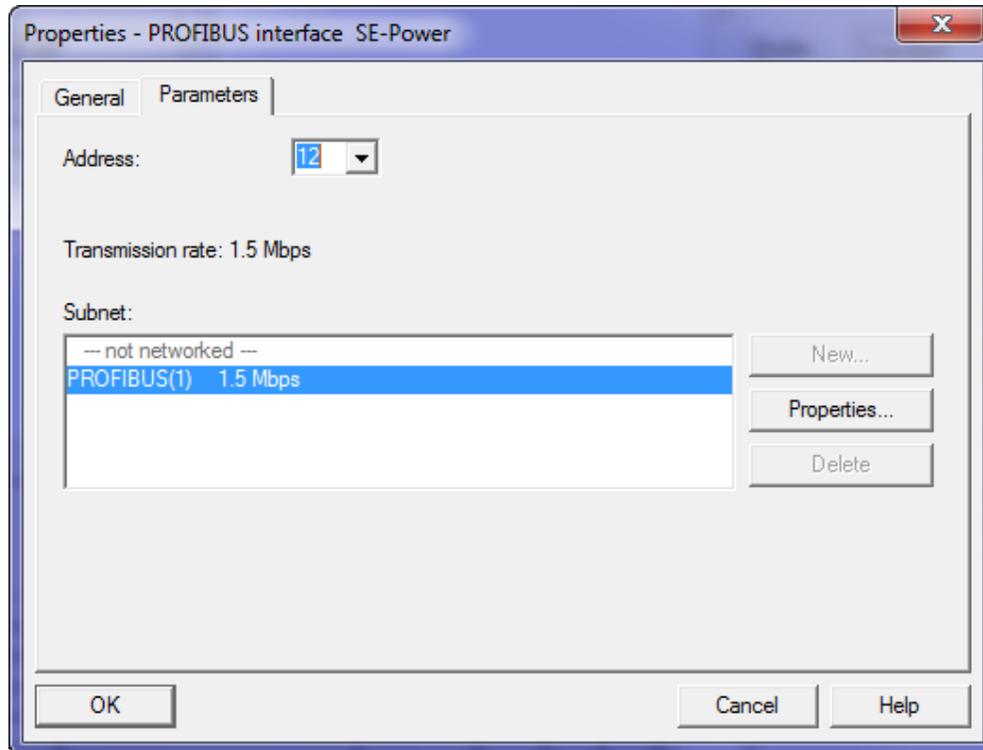
Thereby, the servo controller SE-Power FS can be connected as a slave on the Profibus, a master system must be available. We open the station again with the hardware configurator. Then we mark the line X2 DP and complement the PLC with the command **Insert / Master system** with the Profibus master system



To insert the servo controller SE-Power into the station, he is pulled by drag and drop from the catalog to the Profibus.

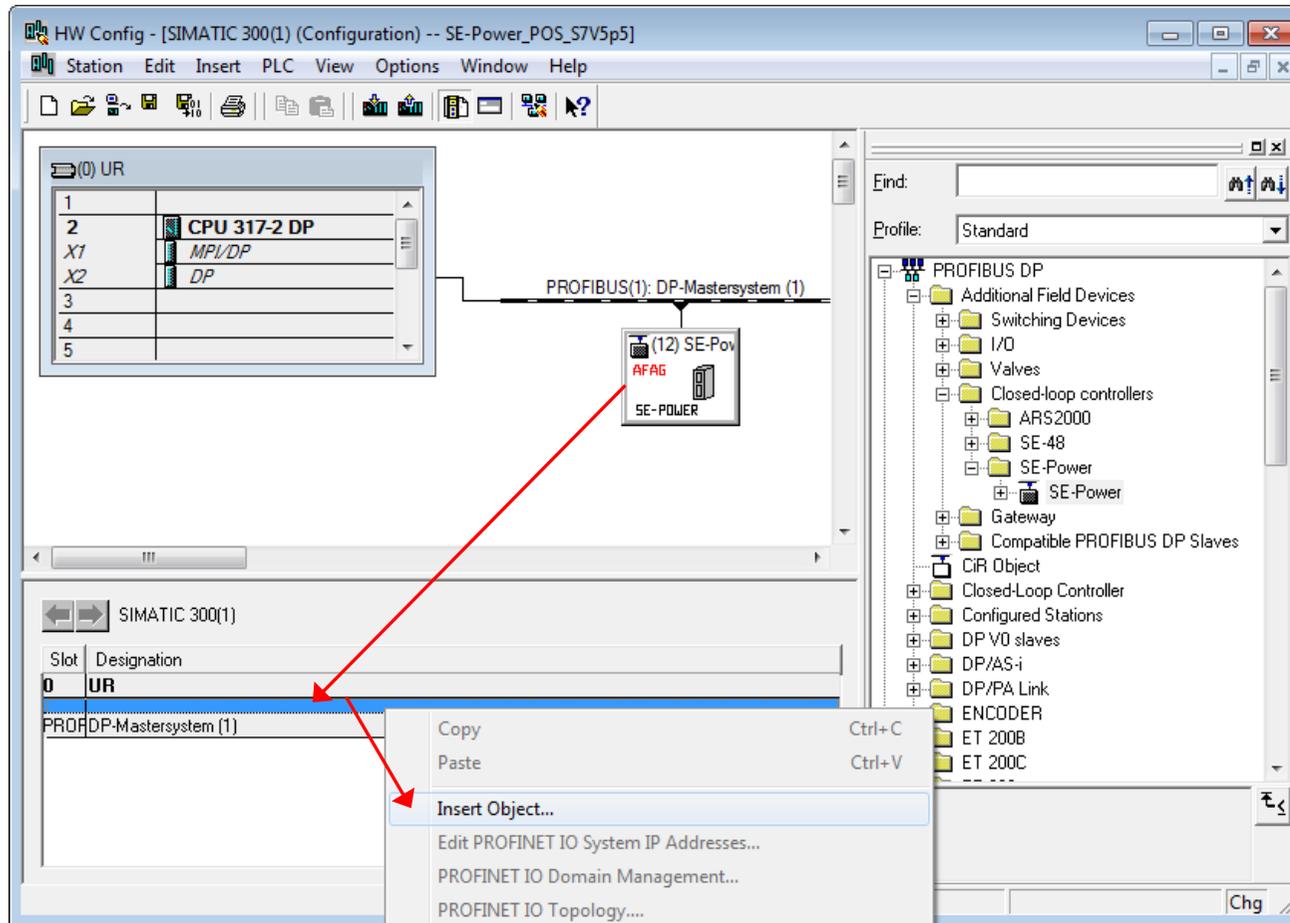


The window for the properties of the Profibus interface SE-Power opens automatically. Here the Profibus address must be set, which coincides with the physical address of the connected servo controller (see document "SE-Power FS Profibus manual").



3.1.3 Setting the Profibus telegram data

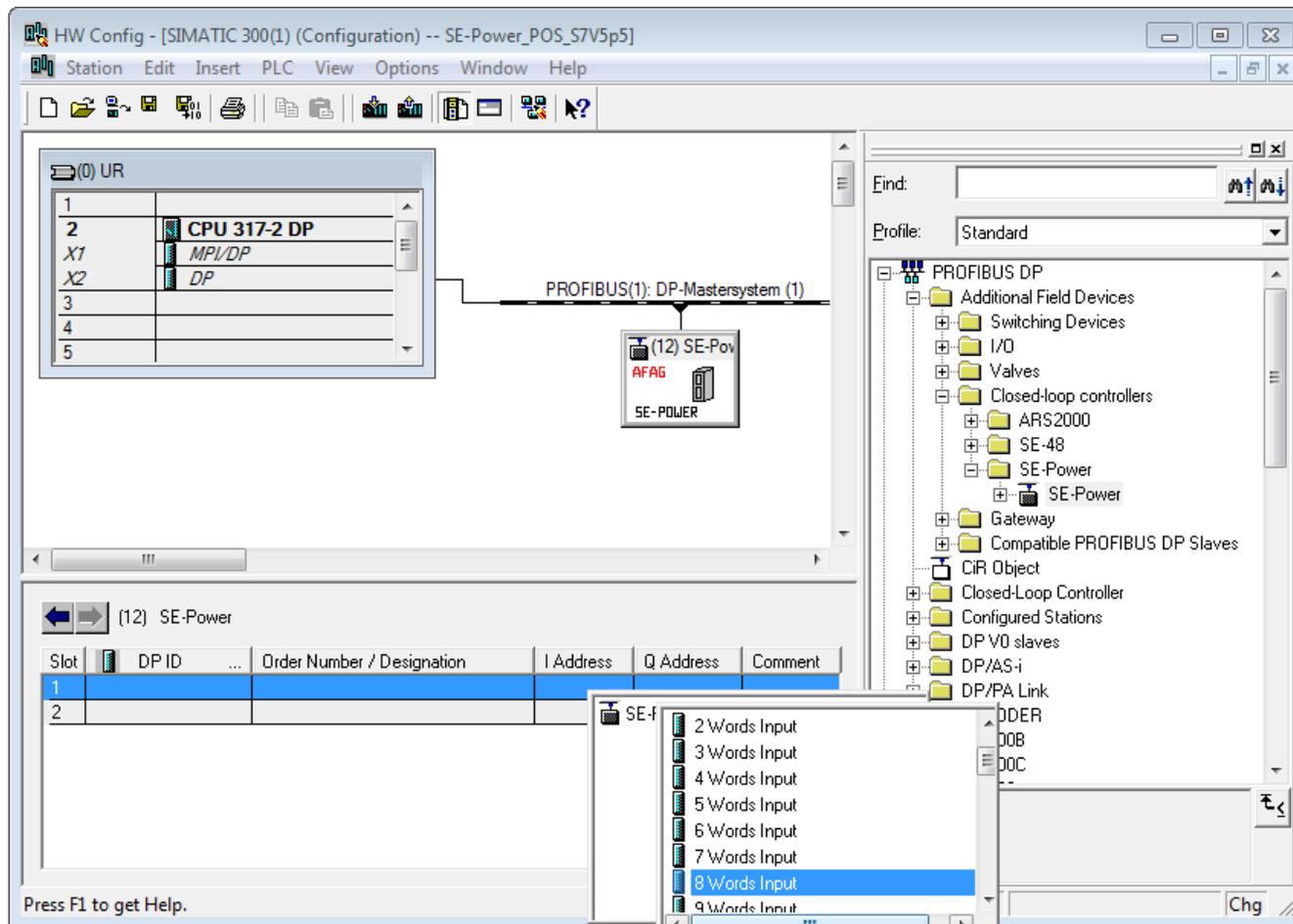
Next, the message elements will be inserted. They must match the data blocks for the target and actual values. For this, the Profibus slave is selected and then open the context menu in the 1st line in the lower part of the window by right-clicking and select **Insert Object** command



The data are to be considered from the perspective of the PLC. The blocks are inserted individually, it is advisable to keep using the sequence and size of the data in the associated data blocks.

First, the output data are created, they correspond to the desired values from the servo controller.

After the input data are created, they correspond to the actual values from the servo controller.



In the selection of modules each telegram length is considered.

Concretely, the module for positioning mode for the target telegram must be **8 Words Output**

and the actual value for the module must be **10 Input Words**.

When all data are configured, the project should look like this:

The screenshot shows the HW Config window for a SIMATIC 300(1) system. The main configuration area shows a rack with a CPU 317-2 DP in slot 2, and an SE-Power module in slot 12. The SE-Power module is connected to a PROFIBUS DP-Mastersystem (1). The SE-Power module configuration table is highlighted with a red oval.

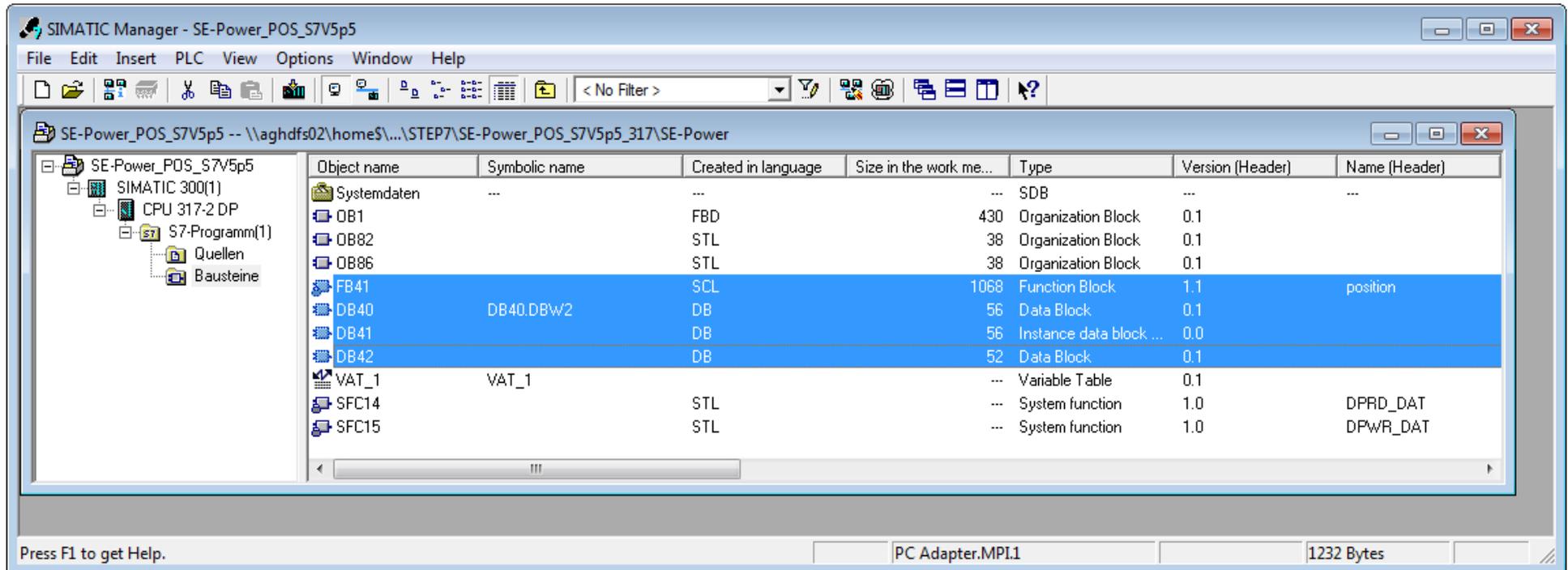
Slot	DP ID	...	Order Number / Designation	I Address	Q Address	Comment
1	215		8 Words Input	256...271		
2	233		10 Words Output		256...275	

3.2 Program blocks

3.2.1 Importing the function- and data blocks and the observation table

Select the sample project click on the desired function and data blocks with the right mouse button and select **"copy"**.

Create copy in the target project data blocks with the right mouse button and select **"insert"**.



The screenshot shows the SIMATIC Manager interface for a project named 'SE-Power_POS_S7V5p5'. The left pane displays a project tree with folders for 'SE-Power_POS_S7V5p5', 'SIMATIC 300(1)', 'CPU 317-2 DP', 'S7-Programm(1)', 'Quellen', and 'Bausteine'. The main window displays a table of objects with the following data:

Object name	Symbolic name	Created in language	Size in the work me...	Type	Version (Header)	Name (Header)
Systemdaten	---	---	---	SDB	---	---
OB1	---	FBD	430	Organization Block	0.1	---
OB82	---	STL	38	Organization Block	0.1	---
OB86	---	STL	38	Organization Block	0.1	---
FB41	---	SCL	1068	Function Block	1.1	position
DB40	DB40.DBW2	DB	56	Data Block	0.1	---
DB41	---	DB	56	Instance data block ...	0.0	---
DB42	---	DB	52	Data Block	0.1	---
VAT_1	VAT_1	---	---	Variable Table	0.1	---
SFC14	---	STL	---	System function	1.0	DPRD_DAT
SFC15	---	STL	---	System function	1.0	DPWR_DAT

At the bottom of the window, there is a status bar with the text 'Press F1 to get Help.', 'PC Adapter.MPI1', and '1232 Bytes'.

3.2.2 Data Block actual value SE-Power FS

DB40 -- "DB40.DBW2" -- SE-Power_POS_S7V5p5\SIMATIC 300(1)\CPU 317-2 DP\...\DB40

Address	Name	Type	Initial val.	Comment
0.0		STRUCT		
+0.0	Telegram_identifier	BYTE	B#16#0	
+1.0	operating_mode	BYTE	B#16#0	manufacturer-specific
+2.0	PROFIDRIVE_Statusword	WORD	W#16#0	
+4.0	actual_position	DINT	L#0	transmitted parameters in default-parameterization
+8.0	actual_speed	DINT	L#0	transmitted parameters in default-parameterization
+12.0	active_current_value	DINT	L#0	transmitted parameters in default-parameterization
+16.0	gigital_inputs	DINT	L#0	transmitted parameters in default-parameterization
=20.0		END_STRUCT		

3.2.3 Data block target value SE-Power FS

DB42 -- SE-Power_POS_S7V5p5\SIMATIC 300(1)\CPU 317-2 DP

Address	Name	Type	Initial val.	Comment
0.0		STRUCT		
+0.0	Telegram_identifier	BYTE	B#16#0	
+1.0	free	BYTE	B#16#0	preliminary placeholder variable
+2.0	PROFIDRIVE_Controlword	WORD	W#16#0	
+4.0	target_position	DINT	L#0	transmitted parameters in default-parameterization
+8.0	driving_speed	DINT	L#0	transmitted parameters in default-parameterization
+12.0	acceleration	DINT	L#0	transmitted parameters in default-parameterization
=16.0		END_STRUCT		

3.2.4 Function block FB 41 (Positioning mode)

The function block (FB) is responsible for monitoring the status diagram implemented in the servo controller.

The current status of the servo controller is symbolized by the Status word 1 in the data block DB40, (Bytes 2 and 3). The Control word 1 serves to control the servo controller it's present in the DB42 (Bytes 2 and 3) and will be written by the FB.

The master connection provides the PLC with the input and output data of the servo controller in defined I/O areas. This data is read from the slave through the SFC14 and written to the slave with the SFC15. The SFCs 14 and 15 are system functions, which **must** be used for consistent reading and writing of telegrams for lengths > 4 bytes.

The corresponding SFCs are used to deposit the data in the data blocks defined for the operating mode. The SFCs are not integrated in the function blocks, and **must** be loaded as S7-program elements.

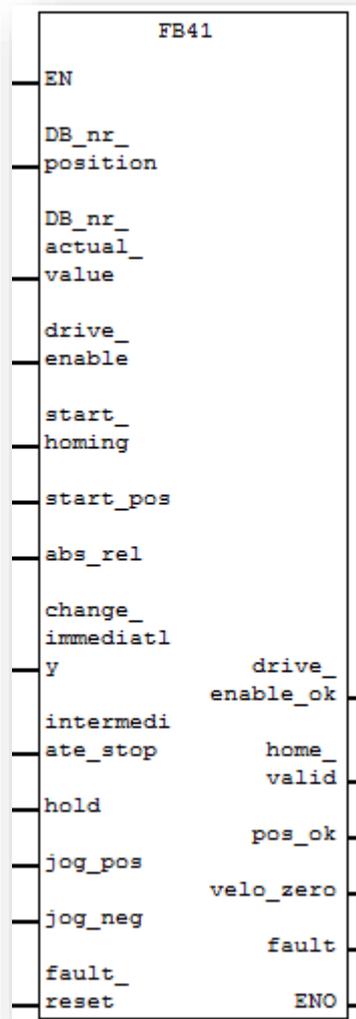
The DBs practically serve as I/O modules, which are used for controlling the statuses of the servo controller and for transferring the data that is to be sent to the servo controller.

Separate function modules are required for each operating mode per servo controller. Under certain conditions, the use of multiple servo controllers in different operating modes can lead to bottlenecks with regard to the memory utilization in the application.



Information

The sequence of the data within the data modules is identical to that which was defined in the telegram format of the respective operating mode (FB).



Parameters:

DB_nr_position:

Number of the data module in which the data for the operating mode Positioning has been stored (INT).

DB_nr_actual_value:

Number of the data module in which the actual value data is stored (INT).

Inputs:

drive_enable:

Activation of the control release in the positioning mode. The motor is held with position control on its position.

start_homing:

Starts homing, the motor starts to move. Prerequisite is an active controller enable, i.e. the output drive_enable_ok must be set. A resetting of the input start_homing during homing breaks this without error.

start_pos:

A rising edge indicates that a new motion task should be adopted. A falling edge has no effect.

During homing, this input has no effect.

abs_rel:

If this input is set during a rising edge at the input start_pos, the positioning is performed relative to the current position setpoint. If this input is not set during a rising edge on start_pos, an absolute positioning is performed.

change_immediatly:

If this input is set during a rising edge at the input start_pos, then an ongoing positioning is immediately terminated and replaced by the new movement order. If this input is not set during a rising edge at the start_pos, the new movement order is appended at the end of an ongoing positioning. In this case, the output pos_ok is not set at the end of the ongoing positioning, but only at the end of the attached positioning.

intermediate_stop

If this input is not set, a started positioning is performed. If the input is set during a running positioning, the drive is stopped and remains in position control. The current positioning is **not** completed. It will resume when the input intermediate_stop reset.

During homing, this input has no effect.

hold:

If this input is set, the ongoing positioning is terminated. The braking acceleration applicable for this positioning is used for braking. The resetting of the input has no effect.

During homing, this input has no effect.

jog_pos:

If this input is set, the drive accelerates with the acceleration set in the position set TIPP 0 to the movement velocity also parameterized in this position set.

In case of a falling edge at this input, the drive brakes to a standstill with the braking acceleration set in the position set TIPP 0.

During homing, this input has no effect.

jog_neg:

If this input is set, the drive accelerates with the acceleration set in the position set TIPP 1 to the movement velocity also parameterized in this position set.

In case of a falling edge at this input, the drive brakes to a standstill with the braking acceleration set in the position set TIPP 1.

During homing, this input has no effect.

fault_reset:

In case of a rising edge at this input, the queued error messages are acknowledged.

Outputs:

drive_enable_ok:

The controller release of the servo controller is active.

home_valid:

This output is set when a valid home position exists. The output is not set during an active homing. He is set for the first time or again only after a successfully executed homing.

pos_ok:

This output is set, when the current position is in the target window after the positioning run has been completed.

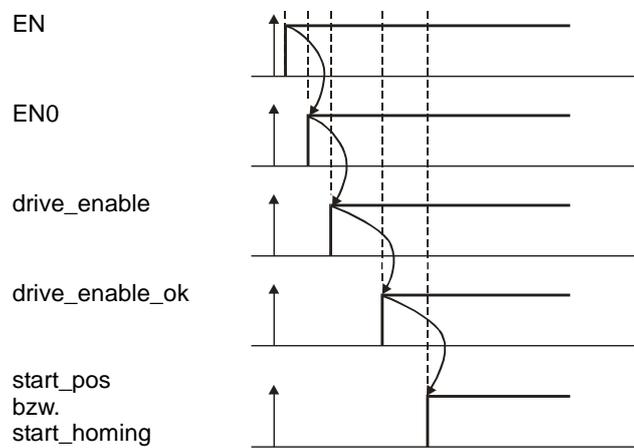
velo_zero:

If this output is set, the drive stands still.

fault:

When output is set, there is an error. The controller enabling is cancelled. The output is reset when the fault is acknowledged.

Please note the timing shown in the diagram when using the function blocks.



3.3 Profibus communication call in the PLC program

For consistent data exchange between the PROFIBUS master and the PROFIBUS slave the system functions SFC14 (consistent read) and SFC15 (consistent writing) must be used. The blocks must be provided with the following parameters:

3.3.1 Reading data from the servo controller via the SFC14:

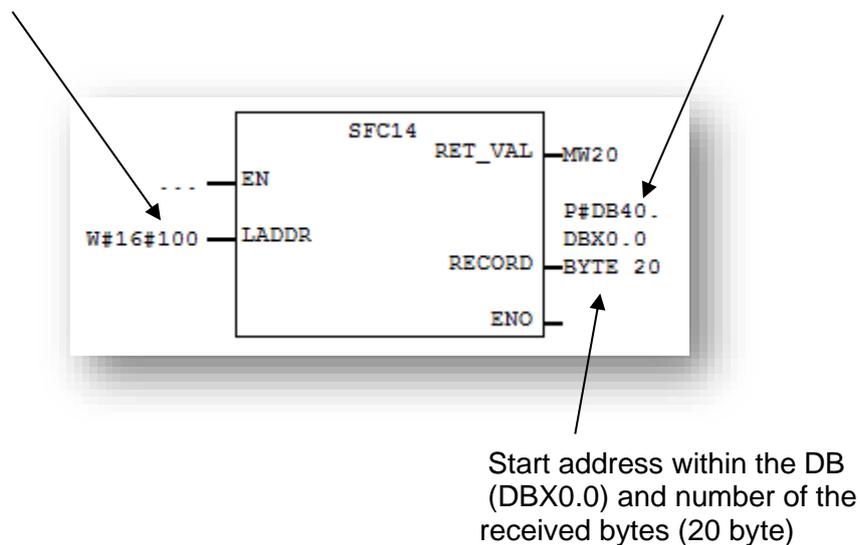
Input data area

(I-address from HW-Config.)

256dez = 100hex

Data block number

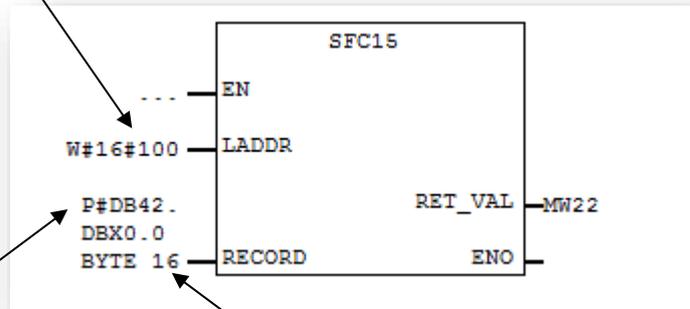
for data from the Slave



Parameter	Declaration	Data type	Storage area	Description
LADDR	INPUT	WORD	E(I), A(Q), M, D, L, constant	Configured start address of the input area of the module, from which have to be read.
RET_VAL	OUTPUT	INT	E(I), A(Q), M, D, L,	If an error occurs during the processing of the function, the return value contains an error code.
RECORD	OUTPUT	ANY	E(I), A(Q), M, D, L,	Target area for the useful data read. This area has to be as long as has been projected for the selected module with STEP 7. Only the data type BYTE is permitted.

3.3.2 Writing data to the servo controller via the SFC15:

Output data area
(Q-address from HW-Config.)
256dez = 100hex



Data block number,
for data to the Slave

Start address within the DB (DBX0.0) and
number of the Bytes (16 Byte) to transmit.

Parameter	Declaration	Data type	Storage area	Description
LADDR	INPUT	WORD	E(I), A(Q), M, D, L, constant	Configured start address of the output area of the module to which is to be written
RECORD	INPUT	ANY	E(I), A(Q), M, D, L,	Source area for the user data to be written. It must be as long as was configured for the selected module with STEP 7. Only the data type BYTE is permitted.
RET_VAL	OUTPUT	INT	E(I), A(Q), M, D, L,	If an error occurs during the processing of the function, the return value contains an error code.

4 Profibus configuration of the servo controller

To generate a functional PROFIBUS interface Profibus communication must also be enabled on the servo controller.

Notes on this please refer to the document "SE-Power FS Profibus-Manual".



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