

# AP04

**Siemens S7-300®  
PROFINET® Interface Module  
for SIMATIC® Manager V5.5 + SP3  
via HMS Anybus® Communicator™**

Software Description



## Table of contents

<b>1</b>	<b>General Notes.....</b>	<b>3</b>
1.1	Trademarks .....	3
1.2	Liability .....	3
1.3	Limitations .....	3
1.4	Requirements .....	4
1.5	Versions Overview .....	4
1.6	List of Abbreviations .....	4
<b>2</b>	<b>Hardware Configuration .....</b>	<b>5</b>
2.1	Setup of Anybus® Communicator™ .....	5
2.1.1	ABC Configuration File .....	5
2.1.2	Transfer Configuration .....	5
2.1.3	ABC Cycle Time .....	6
2.2	Setup of PLC, ABC and PROFINET® .....	7
2.2.1	Add Your PLC to the Project .....	7
2.2.2	Register the GSDML Device Description File for ABC .....	8
2.2.3	Configure the PLC and the PROFINET® .....	9
2.2.4	Add New Module to Your Hardware Configuration .....	11
2.2.5	Configure the Data Input / Output of ABC .....	12
2.3	Communication settings .....	13
2.3.1	Display accessible nodes .....	13
2.3.2	Set up of the communication settings of the device .....	14
2.3.3	Check settings .....	15
<b>3</b>	<b>Software Configuration .....</b>	<b>16</b>
3.1	Import the SIKO-library .....	16
3.1.1	Integrate the Symbole from the Library to Project .....	16
3.2	Add required function blocks .....	18
3.3	Call SIKO function block cyclically .....	18
3.3.1	Setup the input and output addresses of the SIKO function block .....	19
3.4	Insert variable table for testing .....	20
3.5	Complete the Project .....	20
3.6	Work with the Project .....	21
<b>4</b>	<b>Communication settings .....</b>	<b>22</b>
4.1	Data Exchange .....	22
4.2	Parameter Access .....	22
4.2.1	Read Parameters .....	22
4.2.2	Write Parameters .....	22
4.2.3	Copy Parameters from Read to Write .....	22
4.3	S-Commands .....	22
4.4	Counter Value .....	23
4.4.1	Error Codes .....	24

## **1 General Notes**

### **1.1 Trademarks**

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### **1.2 Liability**

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### **1.3 Limitations**

The library and its function were tested with SIMATIC® S7-300 CPU 6ES7 314-6EH04-0AB0. The interface module was engineered in STL using SIMATIC® Manager V5.5 + SP3.

The configuration file and its function were tested on an Anybus® Communicator™ AB7013. The file was setup using Anybus® Configuration Manager - Communicator RS232/422/485 version v.4.4.1.3 (Win 2000/XP/Vista/7).

## 1.4 Requirements

- Basic knowledge of handling and programming Siemens systems.
- Familiarity with PROFINET® IO.
- Basic knowledge of setup and handling Anybus® Communicator™
- Familiarity with Anybus® Configuration Manager

## 1.5 Versions Overview

This manual is related to

- AP04 firmware version  $\geq 1.03$
- Library "SIKO\_SN5-PNvABC\_LIB\_V500"
- Function block FB304 "SIKO\_DRV\_AP04vPN"
- Anybus® configuration file "SIKO\_EPN\_31-SN5\_pattern"
- Anybus® Communicator™ file "GSDML-V2.3-HMS-ABC\_PROFINET\_IO-20141127.xml"

## 1.6 List of Abbreviations

EPN	PROFINET®	ABC	Anybus® Communicator™
SN5	SIKONETZ-5	ACM	Anybus® Configuration Manager
SW	Status Word	FB	Function Block
CW	Control Word	DB	Data Block

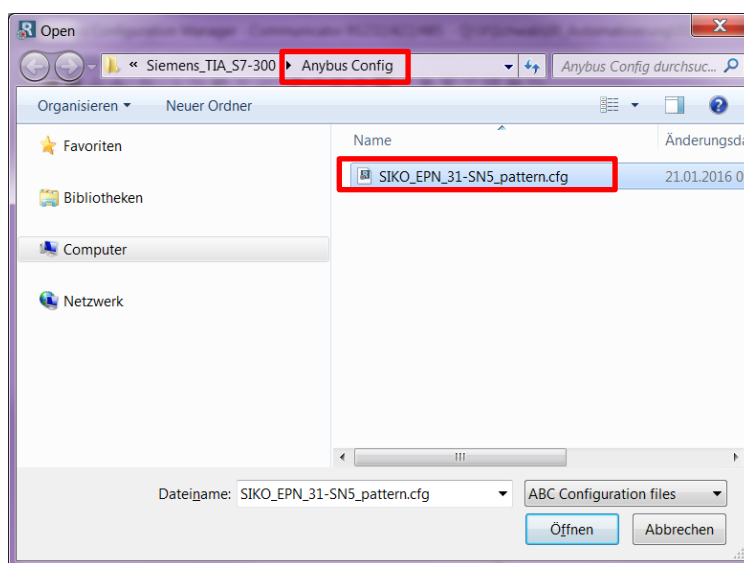
## 2 Hardware Configuration

### 2.1 Setup of Anybus® Communicator™

Please note, that the Anybus® configuration file is designed for a flexible SIKONETZ-5 participant numbers of minimum 1 to maximum 31. Later IP Address and PROFINET® device name has to be modified according to your network requirements. Please consider an IP Address modification when reading further on.

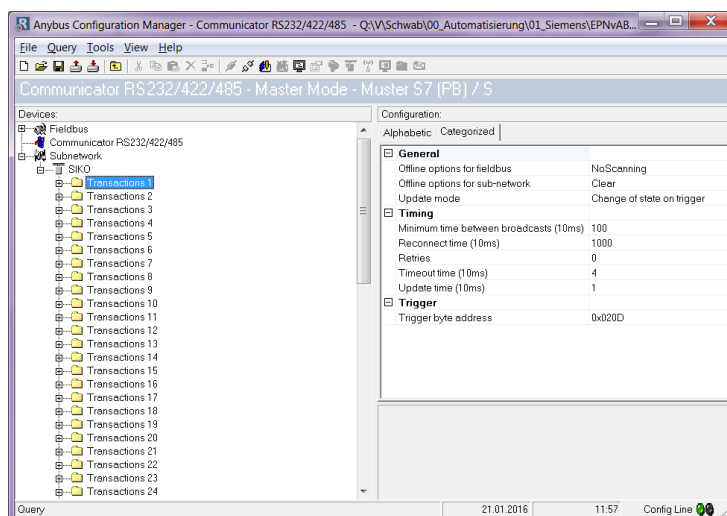
#### 2.1.1 ABC Configuration File

Start ACM and select configuration file “SIKO\_EPN\_31-SN5\_pattern.cfg” from the folder “Anybus Config”.



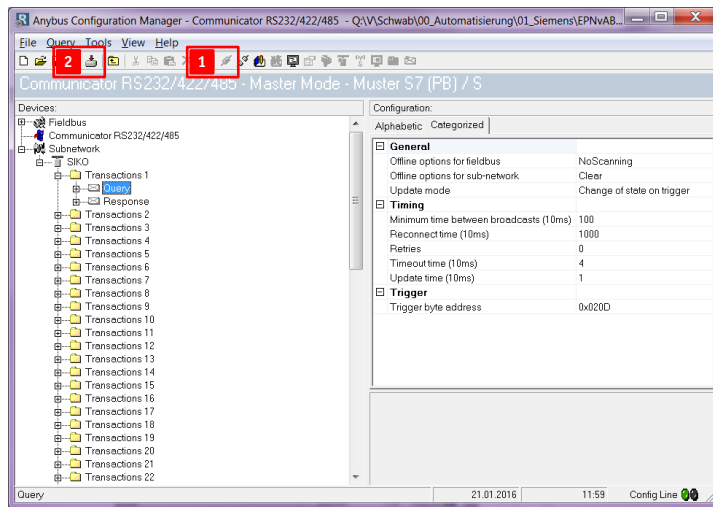
#### 2.1.2 Transfer Configuration

Connect ABC with PC via “RS232 configuration cable” of Anybus accessories.



1. Press "Connect" to go online with the ABC.
2. Press "download to the ABC".

You should have the following view:



### 2.1.3 ABC Cycle Time

Each transaction consists of "Query" and "Response". The minimum time for a used transaction is about  $\geq 10$  ms. Each Subnetwork cycle has an overhead of about  $\geq 100$  ms.

Since the plc cycle time is asynchronous with ABC cycle time the FB integrates a trigger instead of checksum to the SIKONETZ-5 structure. When a master telegram is completed by the FB the trigger will be incremented. The corresponding transaction will be updated by change of state on trigger and exchanges the trigger with checksum byte before the SIKONETZ-5 telegram is send into subnetwork.

The subnetwork reply is checked and checksum byte is exchanged with incremented trigger byte before the telegram is send to plc by ABC. The FB will wait until a valid slave telegram is responded before sending a new telegram. Due to it the minimum time between update cycle amounts to  $\geq 110$  ms minimum. Please consider this for time critical applications!

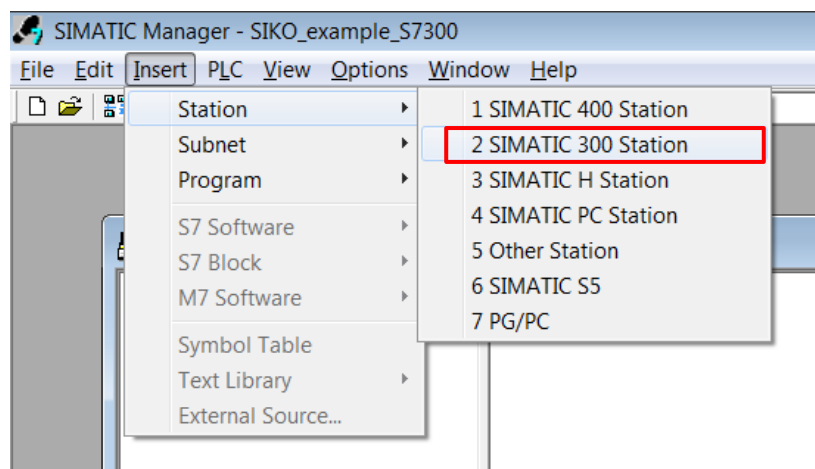
## 2.2 Setup of PLC, ABC and PROFINET®

### Create New SIMATIC® Manager Project

1. Start the SIMATIC® Manager and create a new project: "File" > "New".
2. Enter the project name "SIKO\_example\_S7300".
3. Choose a project path.
4. Execute the command "OK".

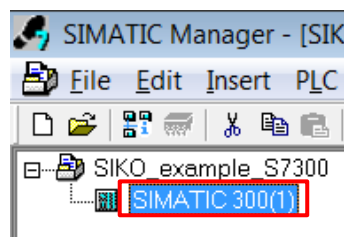
### 2.2.1 Add Your PLC to the Project

1. Insert a new S7-300 station by using the command "Insert" > "Station" > "SIMATIC 300 Station"



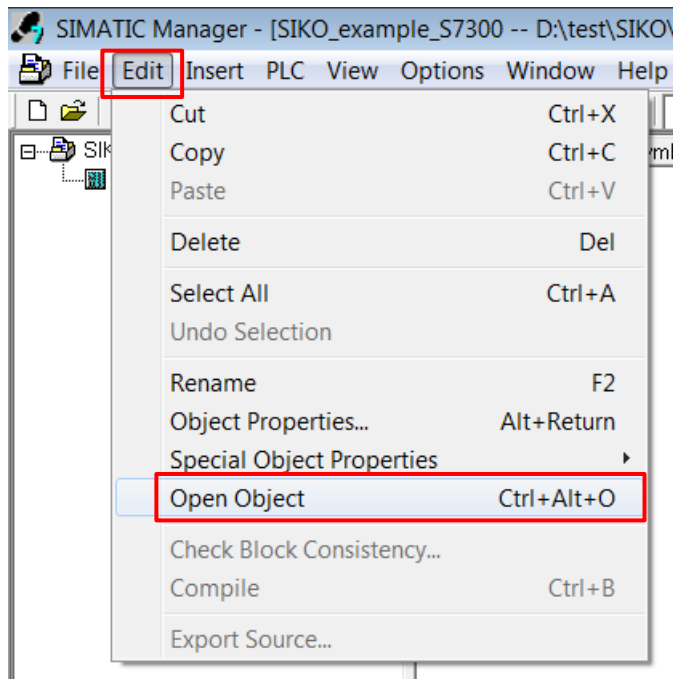
The new station appears below the project name.

2. Select the new station on the left side.



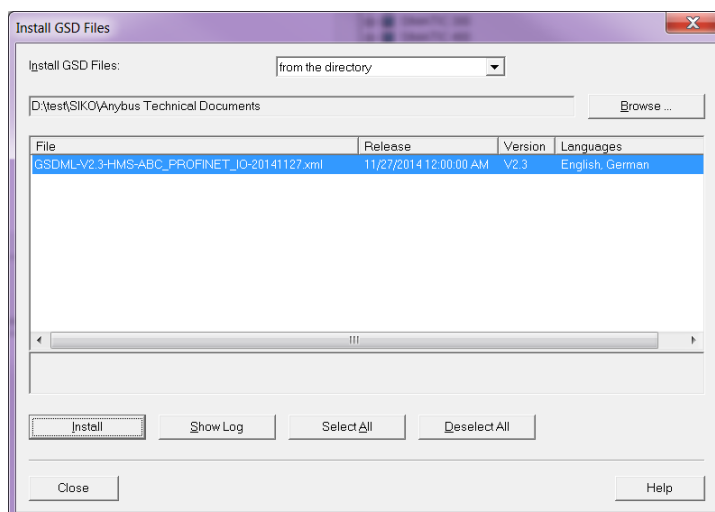
### 2.2.2 Register the GSDML Device Description File for ABC

1. Open the hardware configuration tool with command "Edit" > "Open Object".



Now an empty hardware configuration window is opened.

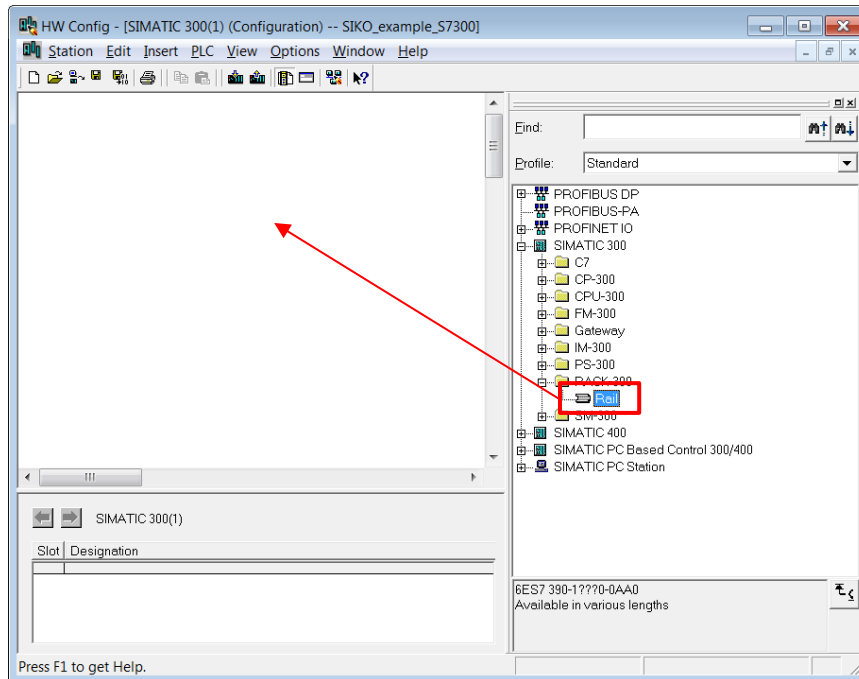
2. Install GSD for ABC via command "Options" > "Install GSD File..."
3. Browse to the storage location of the GSD file and choose the actual version.
4. Install the selected file.



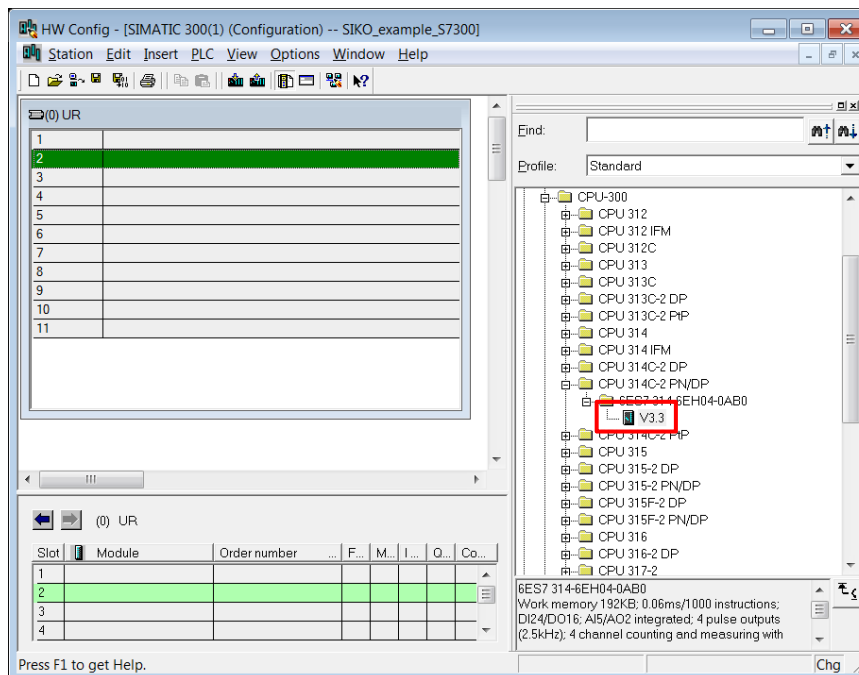
After installation the ABC is available in the hardware catalog.

### 2.2.3 Configure the PLC and the PROFINET®

1. Choose "Rail" from the folder "RACK-300" of the hardware catalog on the right side. Use drag and drop to move the "Rail" to the hardware configuration.



2. Choose the CPU from the hardware catalog and plug it into slot 2 of the rail.



Now the "Properties - Ethernet interface" window appears.

**NOTICE**

The IP settings in this example can cause serious network problems under certain circumstances. If you are in doubt about the correct IP settings for your network, ask your system administrator for assistance.

3. Enter a valid IP address, "192.168.3.5" for example.
4. Enter a valid subnet mask, "255.255.255.224" for example.
5. Create a new Subnet "New..."

Properties - Ethernet interface PN-IO (R0/S2.2)

General Parameters

If a subnet is selected, the next available addresses are suggested.

IP address: 192.168.3.5  
Subnet mask: 255.255.255.224

☐ Use different method to obtain IP address

Gateway  
☒ Do not use router  
☐ Use router  
 Address:

Subnet  
 --- not networked ---  
 New...  
 Properties...  
 Delete

OK Cancel Help

Properties - New subnet Industrial Ethernet

General

Name: Ethernet(1)

Subnet ID: 005F - 0004

Project path:

Storage location of the project: D:\test\SIKO\SIKO\_exa

Author:

Date created: 02/08/2016 04:59:28 PM  
 Last modified: 02/08/2016 04:59:28 PM

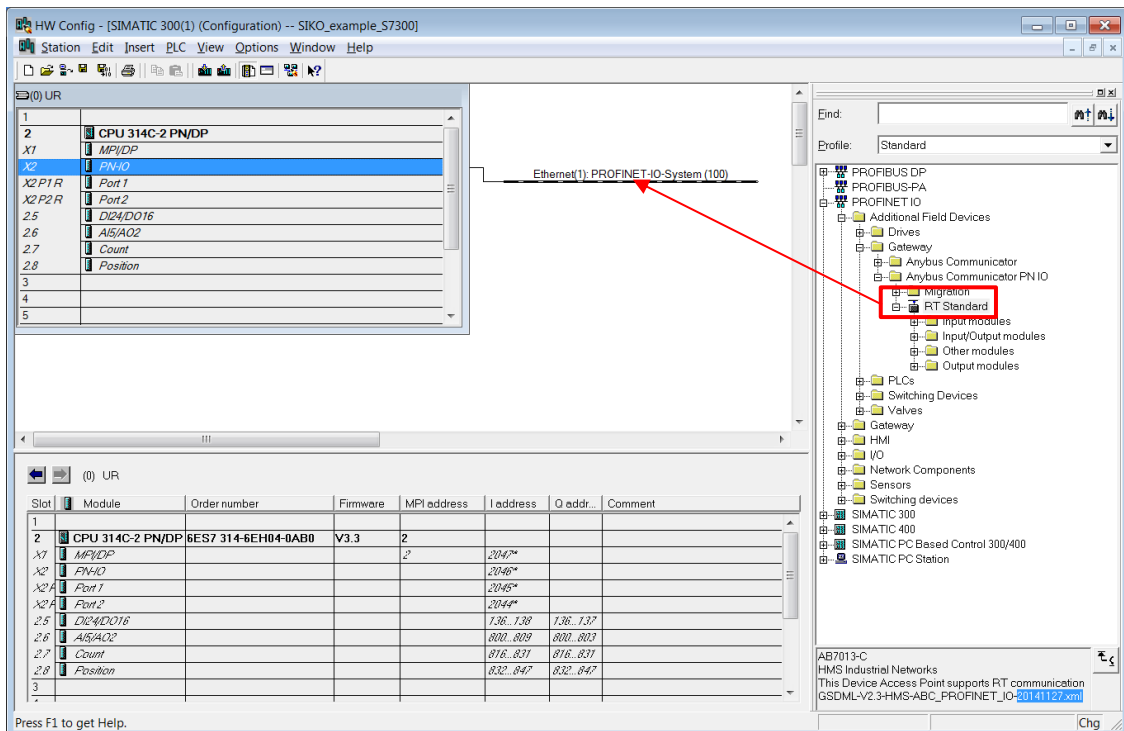
Comment:

OK Cancel Help

6. Confirm the settings with "OK".
7. Close the "Properties - Ethernet interface" window.

## 2.2.4 Add New Module to Your Hardware Configuration

1. Choose "RT Standard" within the folder "Anybus Communicator PN IO" from the hardware catalog and attach it to the PROFINET subnet using drag and drop. Please check corresponding GSDML version!

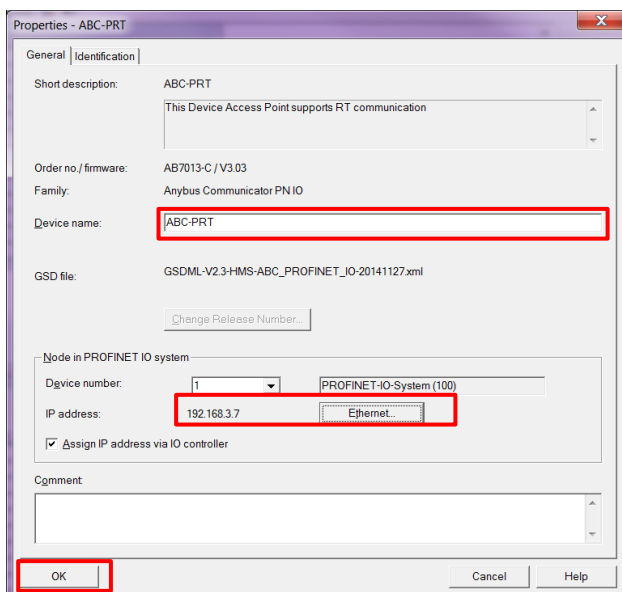


Open the properties window of the ABC by double clicking on the Communicator symbol.

### NOTICE

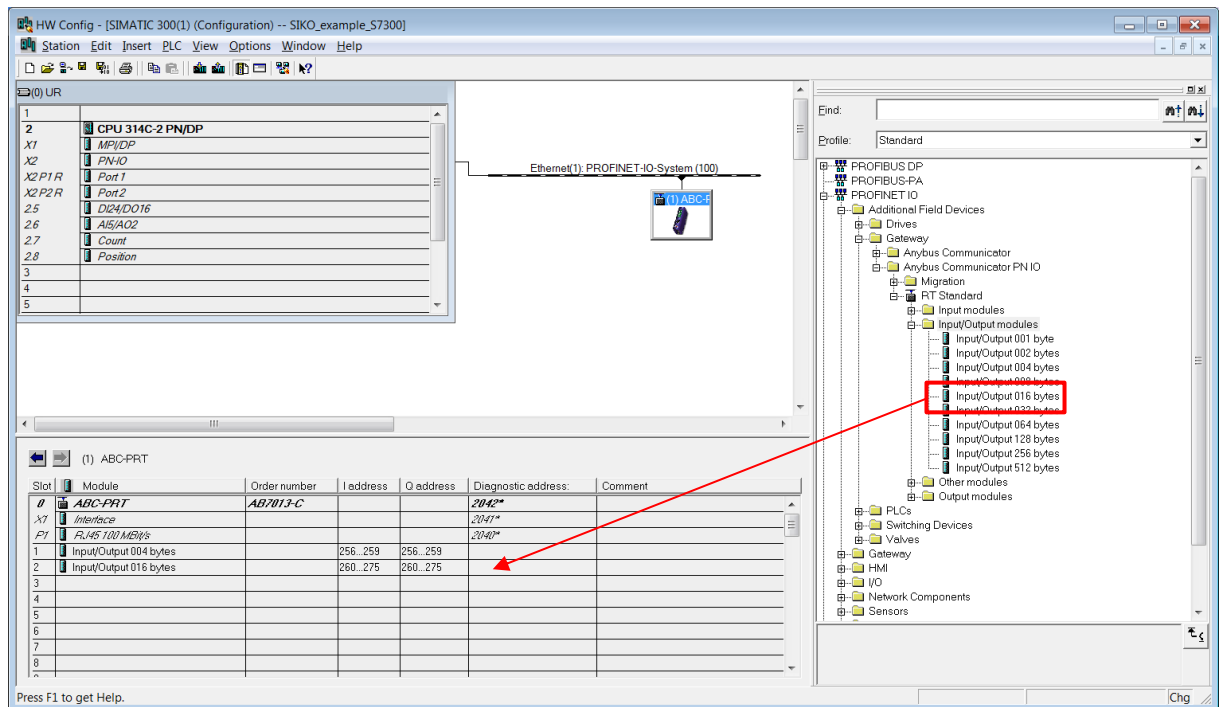
The IP settings in this example can cause serious network problems under certain circumstances. If you are in doubt about the correct IP settings for your network, ask your system administrator for assistance.

2. Enter a valid PROFINET® device name, "ABC-PRT" for example.
3. Enter a valid IP address, "192.168.3.7" for example
4. Confirm the settings with "OK".



## 2.2.5 Configure the Data Input / Output of ABC

1. Add "Input/Output 004 bytes" from device "Anybus Ccommunicator PN IO > Module" of the hardware catalog to the "Devices overview".
2. For each Sikonet-5 device, add "Input/Output 016 bytes" from device "Anybus Ccommunicator PN IO > Module" of the hardware catalog to the "Devices overview".



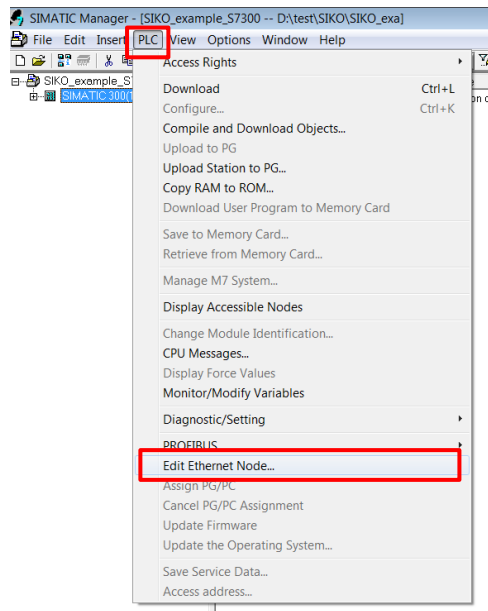
3. Save and compile the hardware configuration.
  4. Close "HW Config".
- The hardware configuration of the project is now complete.

## 2.3 Communication settings

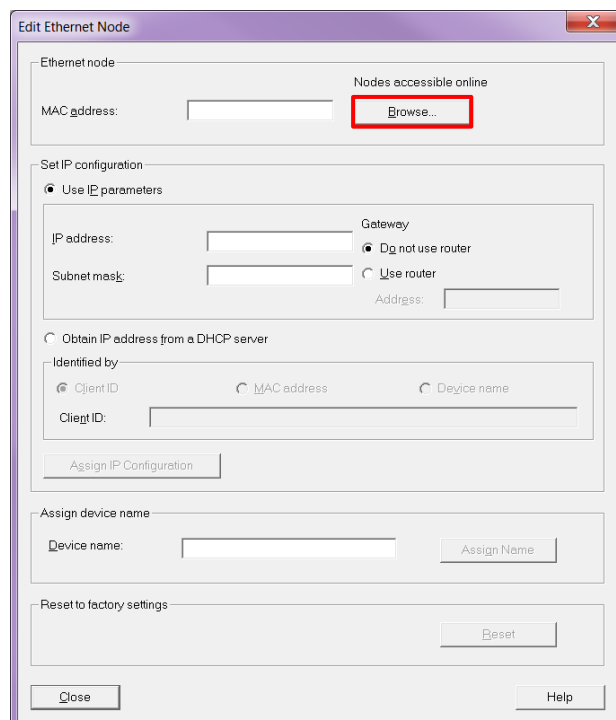
After setup of the project, the hardware must be configured.

### 2.3.1 Display accessible nodes

1. Execute the command "PLC" > "Edit Ethernet Node..."



2. Use the "Browse" button to find accessible nodes.



3. Choose device type "Anybus Communicator" from the list.
4. Confirm with "OK"

### 2.3.2 Set up of the communication settings of the device

1. Enter IP address from chapter 2.2.4.3.
2. Enter Subnet mask from chapter 2.2.3.4.
3. Execute command "Assign IP Configuration".
4. Enter Device name from chapter 2.2.4.2.
5. Execute command "Assign Name".
6. "Close" the Edit Ethernet Node window.

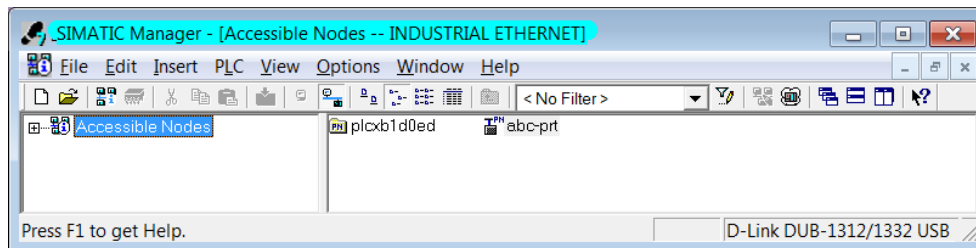
The screenshot shows the 'Edit Ethernet Node' window with the following fields and buttons:

- Ethernet node**
  - MAC address: 00-30-11-06-34-B2 (with a 'Browse...' button)
- Set IP configuration**
  - ☒ Use IP parameters
    - IP address: 192.168.3.7
    - Subnet mask: 255.255.255.224
    - Gateway
      - ☒ Do not use router
      - ☐ Use router (with Address: 192.168.3.7)
  - ☐ Obtain IP address from a DHCP server
- Identified by**
  - ☒ Client ID (with Client ID: field)
  - ☐ MAC address
  - ☐ Device name
- Assign IP Configuration** (button)

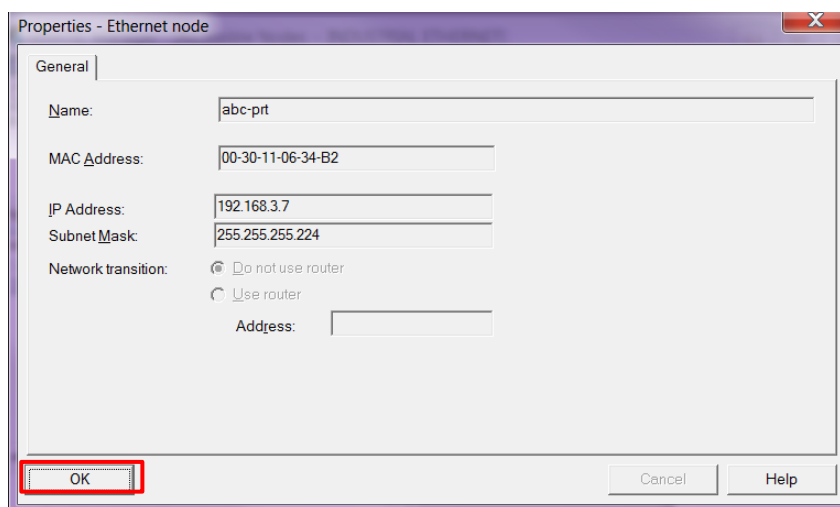
- Assign device name**
- Device name: abc-prt (with **Assign Name** button)
- Reset to factory settings**
- Reset** (button)
- Close** (button) and **Help** (button) at the bottom.

### 2.3.3 Check settings

1. Check the settings via command "PLC" > "Display Accessible Nodes".



2. Select node "abc-prt"
3. Execute command "Edit" > "Object Properties...".
4. Now the actual settings are shown.

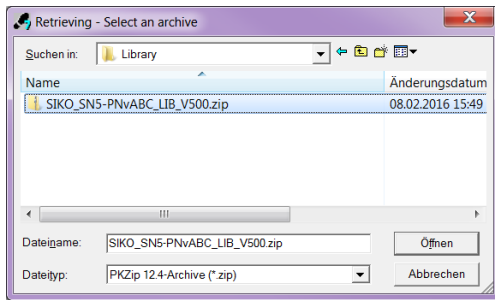


5. Confirm "OK".
6. Close the Accessible Nodes window.

### 3 Software Configuration

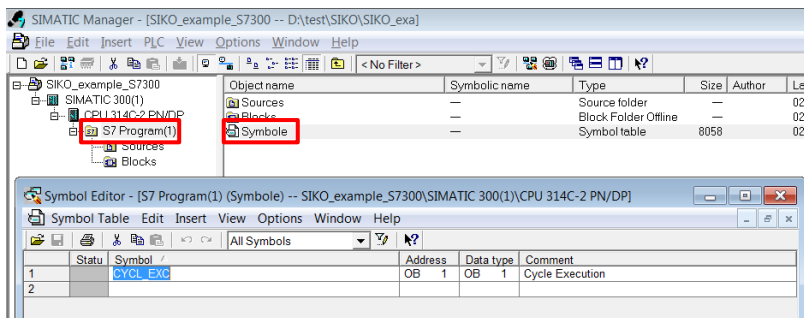
#### 3.1 Import the SIKO-library

1. Execute command "File" > "Retrieve".
2. Browse to the storage location of the SIKO-library.
3. Select the archive SIKO\_SN5-PNvABC\_LIB\_V500.zip.
4. Execute the command "Open".

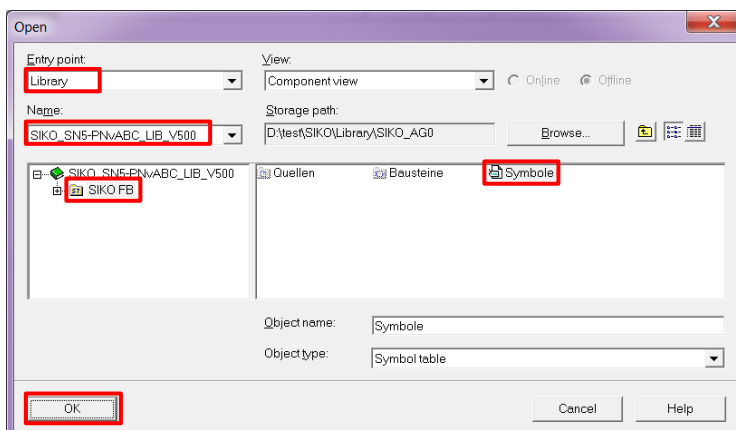


##### 3.1.1 Integrate the Symbole from the Library to Project

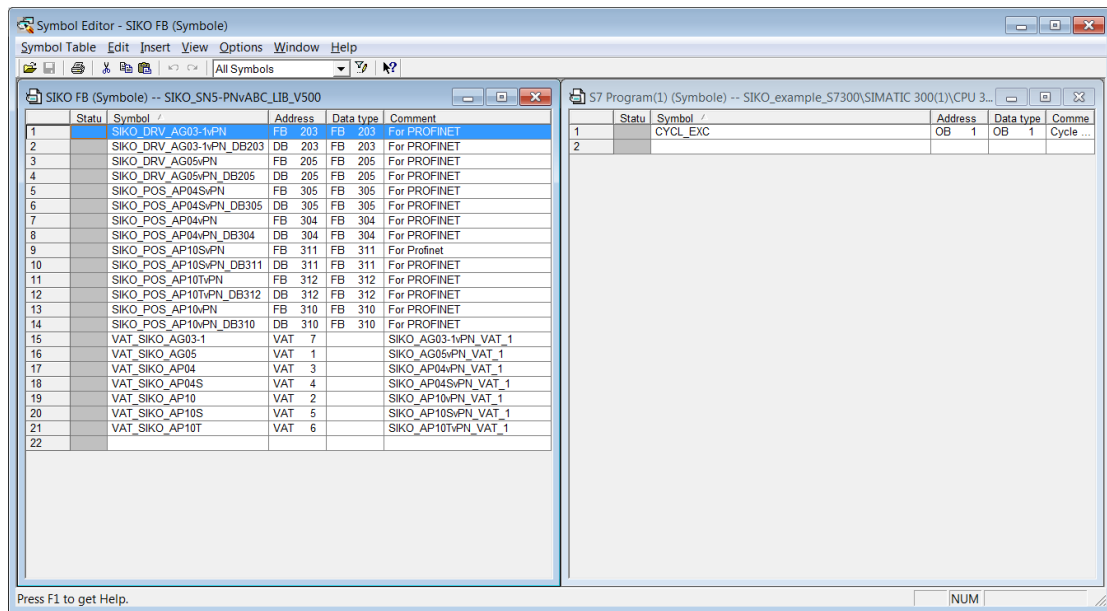
1. Navigate to the tab "S7 Program(1)" in the project tree
2. Double-click on the object "Symbole" in the right window



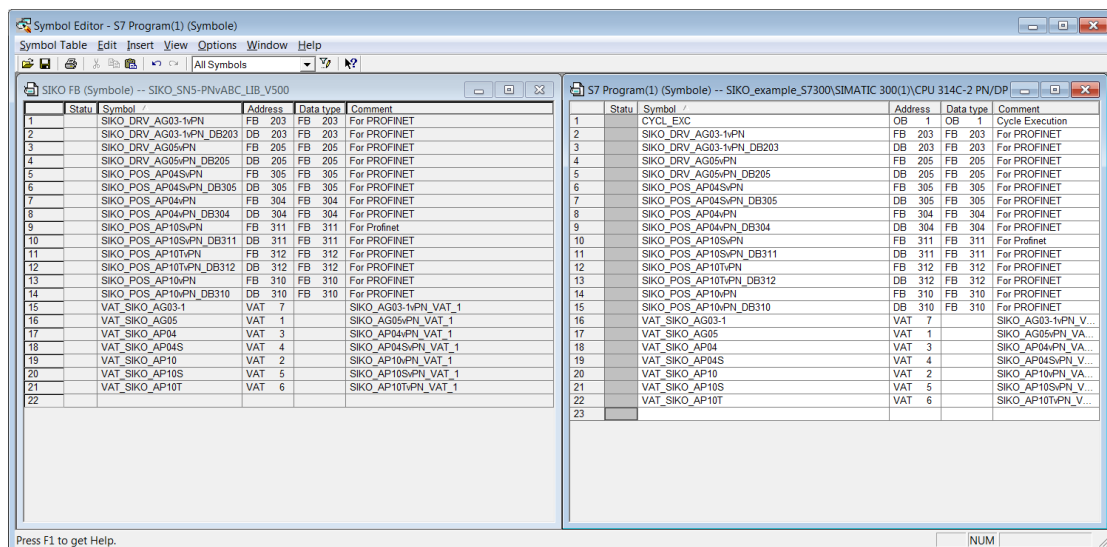
3. In the Symbole Editor execute command "Symbole" > "open".
4. Select the library SIKO\_SN5-PNvABC\_LIB\_V500 and "SIKO\_FB".
5. Choose "Symbole" and confirm your selection with "OK".



## 6. Execute command "Window" &gt; "Arrange" &gt; "Vertically".



7. Select ALL by the keystroke combination [Ctrl] + [A].
8. Copying it into the clipboard with the keystroke combination [Ctrl] + [C].
9. Click into line 2 (empty one) of your project symbol table and enter with the keystroke combination [Ctrl] + [V].
10. Delete the the red marked line.

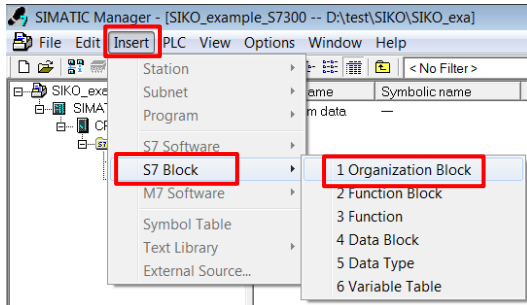


11. Close symbol table "SIKO\_FB".
12. Save and close your project symbol table.

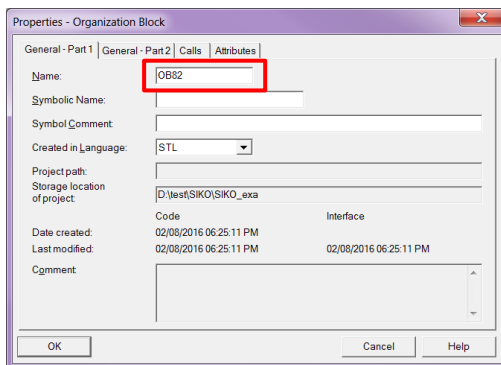
### 3.2 Add required function blocks

Add OB82, OB86 and OB122 to the folder "Blocks".

1. Select folder "Blocks".
2. Execute command "Insert" > "S7 Block" > "1 Organization Block".



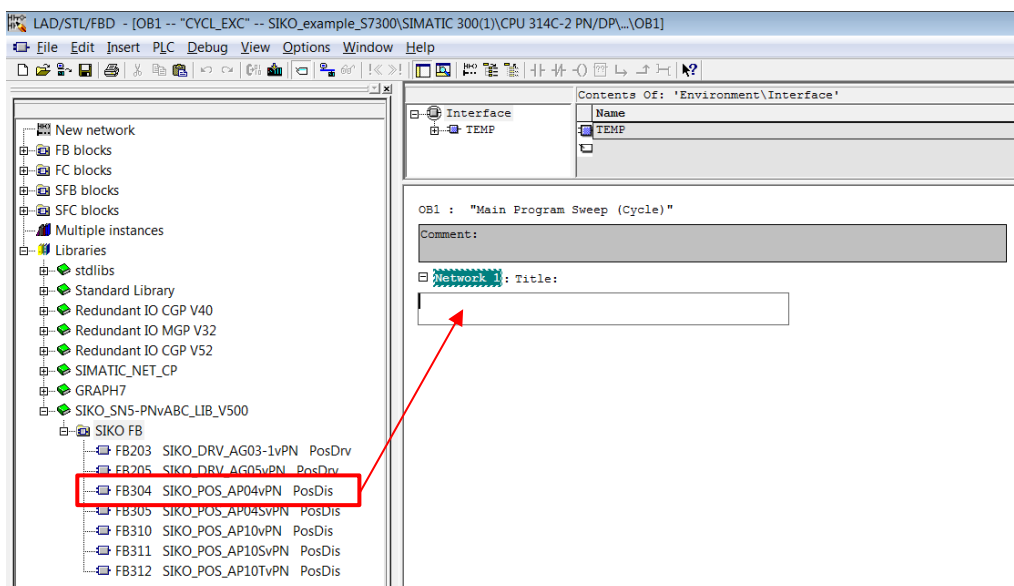
3. Enter organization block name "OB82".



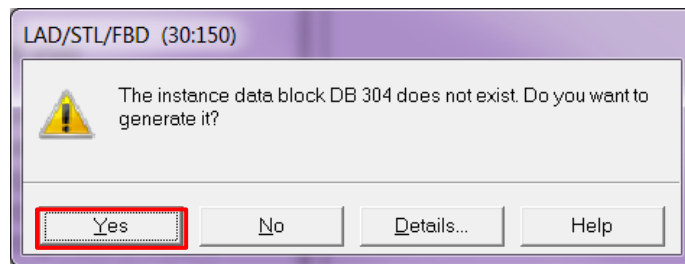
4. Repeat steps 2 and 3 with block name "OB86" and "OB122".

### 3.3 Call SIKO function block cyclically

1. Double click on "OB1".
2. Add function block FB304 from library to main program.

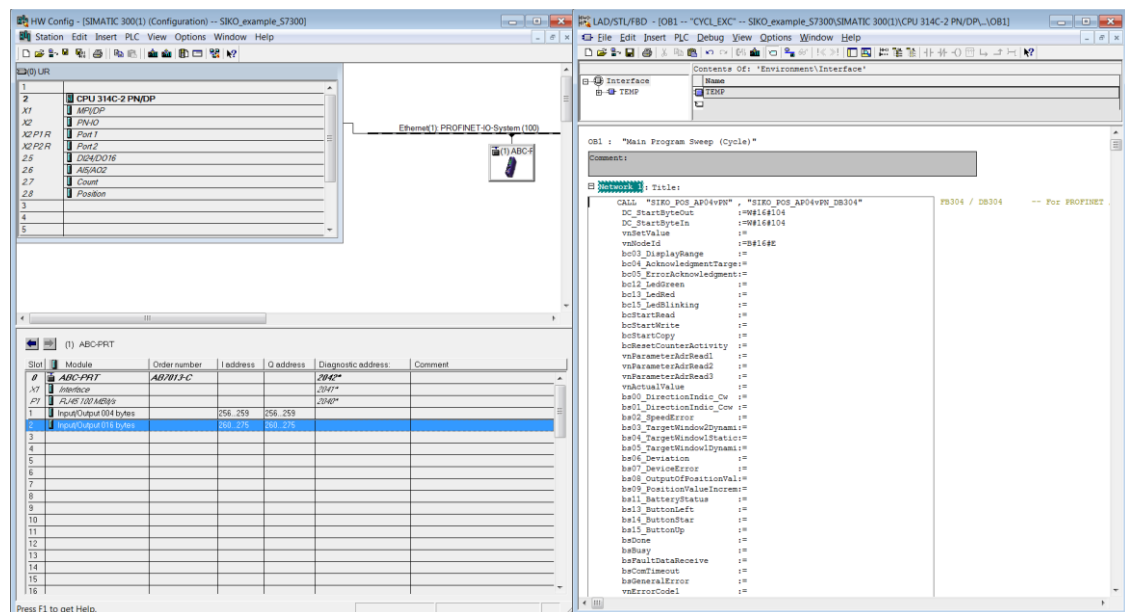


3. Enter the name "DB304" for instance data block.
4. Confirm the message window with "Yes".



### 3.3.1 Setup the input and output addresses of the SIKO function block

To setup the input and output addresses of the function block the decimal address values from the hardware configuration have to be converted to hexadecimal values.



In this example the conversion table looks like this:

Slot 2 – Q address	260...275dec	DC_StartByteOut	W#16#104
Slot 2 – I address	260...275dec	DC_StartByteIn	W#16#104

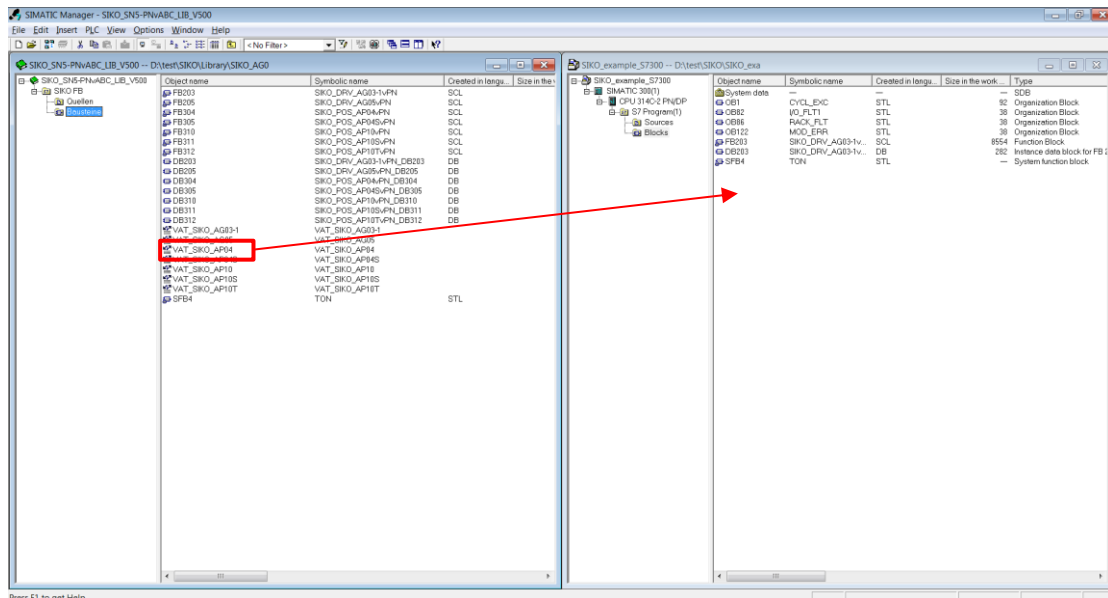
The input "nNodeId" of the function block must be connected with the set note address of the Sikonet-5 device.

In this example the address B#16#E (14dec) is used.

After set up of the addresses save the settings and close the editor window and confirm "OK".

### 3.4 Insert variable table for testing

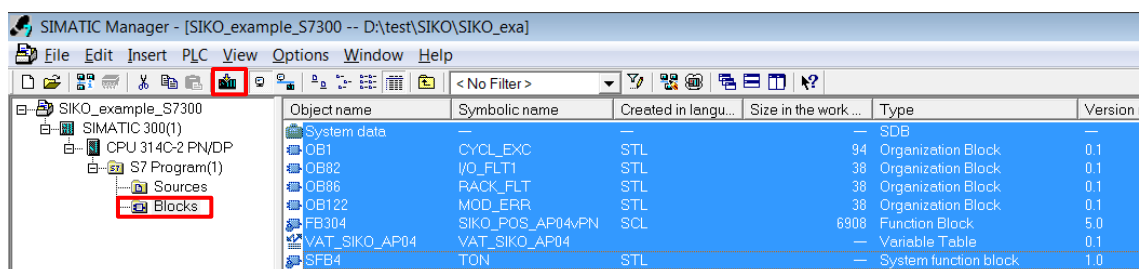
1. While your project is still open execute command "File" > "open"
2. Select the library SIKO\_SN5-PNvABC\_LIB\_V500
3. Execute command "Window" > "Arrange" > "Vertically".
4. Choose "VAT\_SIKO\_AP04" and copy it into your project using drag and drop.



5. Close library "SIKO\_SN5-PNvABC\_LIB\_V500".

### 3.5 Complete the Project

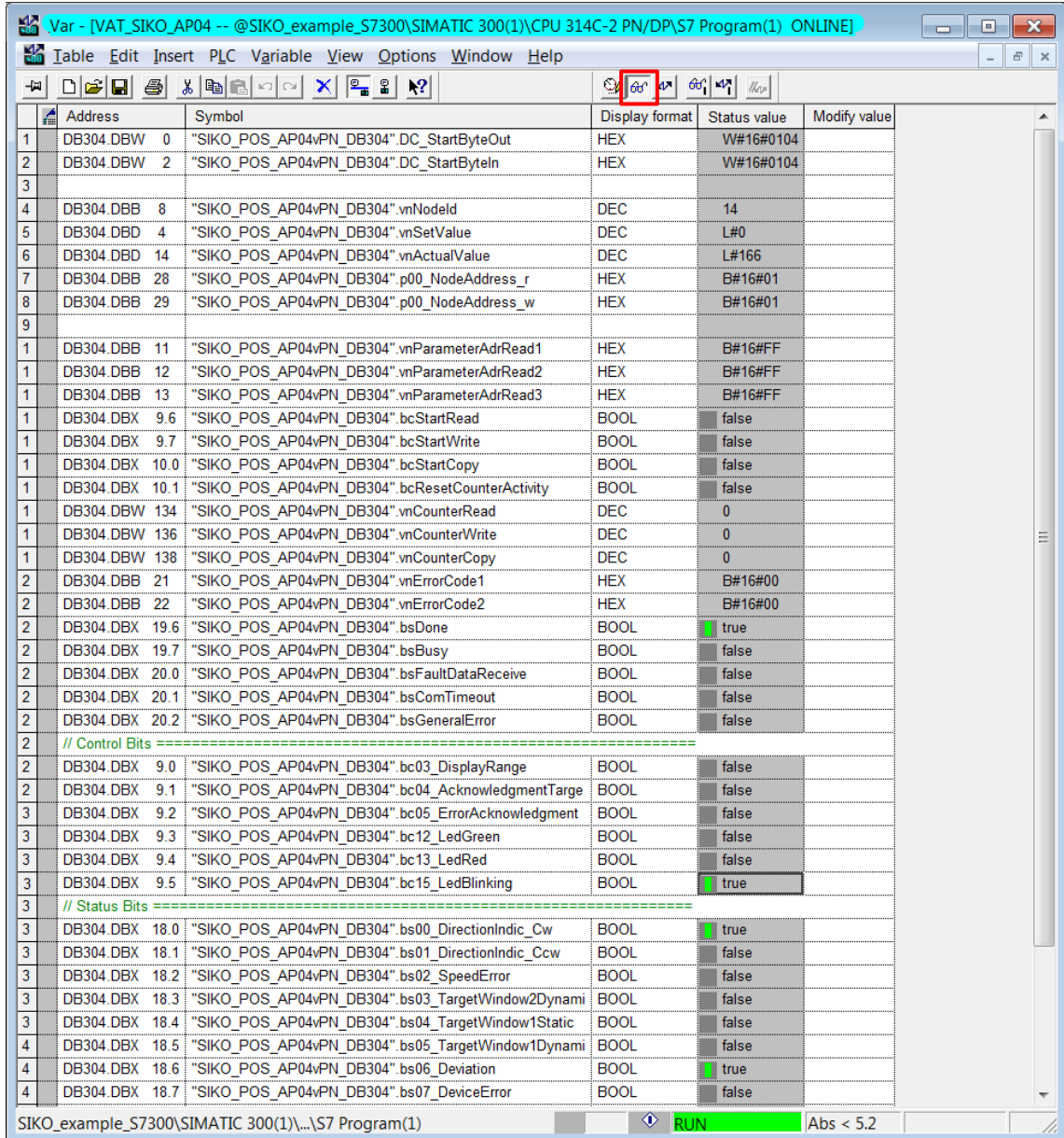
1. Select folder "Blocks".
2. Click into the right window and select ALL by the keystroke combination [Ctrl] + [A].
3. Execute the command "Download".



4. Confirm the following message boxes with "Yes" or "OK" respectively.

### 3.6 Work with the Project

1. Double-click on "VAT\_SIKO\_AP04".
2. Enable the "Monitor" option in the VAT window.
3. Now you can control the SIKO-AP04 by setting the control bits.



	Address	Symbol	Display format	Status value	Modify value
1	DB304.DBW 0	"SIKO_POS_AP04vPN_DB304".DC_StartByteOut	HEX	W#16#0104	
2	DB304.DBW 2	"SIKO_POS_AP04vPN_DB304".DC_StartByteIn	HEX	W#16#0104	
4	DB304.DBB 8	"SIKO_POS_AP04vPN_DB304".vnNodeId	DEC	14	
5	DB304.DBD 4	"SIKO_POS_AP04vPN_DB304".vnSetValue	DEC	L#0	
6	DB304.DBD 14	"SIKO_POS_AP04vPN_DB304".vnActualValue	DEC	L#166	
7	DB304.DBB 28	"SIKO_POS_AP04vPN_DB304".p00_NodeAddress_r	HEX	B#16#01	
8	DB304.DBB 29	"SIKO_POS_AP04vPN_DB304".p00_NodeAddress_w	HEX	B#16#01	
1	DB304.DBB 11	"SIKO_POS_AP04vPN_DB304".vnParameterAdrRead1	HEX	B#16#FF	
1	DB304.DBB 12	"SIKO_POS_AP04vPN_DB304".vnParameterAdrRead2	HEX	B#16#FF	
1	DB304.DBB 13	"SIKO_POS_AP04vPN_DB304".vnParameterAdrRead3	HEX	B#16#FF	
1	DB304.DBX 9.6	"SIKO_POS_AP04vPN_DB304".bcStartRead	BOOL	false	
1	DB304.DBX 9.7	"SIKO_POS_AP04vPN_DB304".bcStartWrite	BOOL	false	
1	DB304.DBX 10.0	"SIKO_POS_AP04vPN_DB304".bcStartCopy	BOOL	false	
1	DB304.DBX 10.1	"SIKO_POS_AP04vPN_DB304".bcResetCounterActivity	BOOL	false	
1	DB304.DBW 134	"SIKO_POS_AP04vPN_DB304".vnCounterRead	DEC	0	
1	DB304.DBW 136	"SIKO_POS_AP04vPN_DB304".vnCounterWrite	DEC	0	
1	DB304.DBW 138	"SIKO_POS_AP04vPN_DB304".vnCounterCopy	DEC	0	
2	DB304.DBB 21	"SIKO_POS_AP04vPN_DB304".vnErrorCode1	HEX	B#16#00	
2	DB304.DBB 22	"SIKO_POS_AP04vPN_DB304".vnErrorCode2	HEX	B#16#00	
2	DB304.DBX 19.6	"SIKO_POS_AP04vPN_DB304".bsDone	BOOL	true	
2	DB304.DBX 19.7	"SIKO_POS_AP04vPN_DB304".bsBusy	BOOL	false	
2	DB304.DBX 20.0	"SIKO_POS_AP04vPN_DB304".bsFaultDataReceive	BOOL	false	
2	DB304.DBX 20.1	"SIKO_POS_AP04vPN_DB304".bsComTimeout	BOOL	false	
2	DB304.DBX 20.2	"SIKO_POS_AP04vPN_DB304".bsGeneralError	BOOL	false	
2	// Control Bits =====				
2	DB304.DBX 9.0	"SIKO_POS_AP04vPN_DB304".bc03_DisplayRange	BOOL	false	
2	DB304.DBX 9.1	"SIKO_POS_AP04vPN_DB304".bc04_AcknowledgmentTarget	BOOL	false	
3	DB304.DBX 9.2	"SIKO_POS_AP04vPN_DB304".bc05_ErrorAcknowledgment	BOOL	false	
3	DB304.DBX 9.3	"SIKO_POS_AP04vPN_DB304".bc12_LedGreen	BOOL	false	
3	DB304.DBX 9.4	"SIKO_POS_AP04vPN_DB304".bc13_LedRed	BOOL	false	
3	DB304.DBX 9.5	"SIKO_POS_AP04vPN_DB304".bc15_LedBlinking	BOOL	true	
3	// Status Bits =====				
3	DB304.DBX 18.0	"SIKO_POS_AP04vPN_DB304".bs00_DirectionIndic_Cw	BOOL	true	
3	DB304.DBX 18.1	"SIKO_POS_AP04vPN_DB304".bs01_DirectionIndic_Ccw	BOOL	false	
3	DB304.DBX 18.2	"SIKO_POS_AP04vPN_DB304".bs02_SpeedError	BOOL	false	
3	DB304.DBX 18.3	"SIKO_POS_AP04vPN_DB304".bs03_TargetWindow2Dynam	BOOL	false	
3	DB304.DBX 18.4	"SIKO_POS_AP04vPN_DB304".bs04_TargetWindow1Static	BOOL	false	
4	DB304.DBX 18.5	"SIKO_POS_AP04vPN_DB304".bs05_TargetWindow1Dynam	BOOL	false	
4	DB304.DBX 18.6	"SIKO_POS_AP04vPN_DB304".bs06_Deviation	BOOL	true	
4	DB304.DBX 18.7	"SIKO_POS_AP04vPN_DB304".bs07_DeviceError	BOOL	false	

SIKO\_example\_S7300\SIMATIC 300(1)\...S7 Program(1) RUN Abs < 5.2

## 4 Communication settings

### 4.1 Data Exchange

The FB is designed to send or receive in alternation the "nSetValue" (Write, Parameter: 0xFF "Set Point ") or the "nActualValue" (Read, Parameter: 0xFE "Actual Position") respectively, while no specific parameter access is active.

With the "nParameterAdrRead1", "nParameterAdrRead2" and "nParameterAdrRead3" further parameter can be included in the data read cycle. With default value 0xFE the inclusion is disabled.

NOTE: If "bsFaultDataReceive" is indicated the complete data exchange is stopped, while Control and Status Word are still updated! A missing or not responding subnetwork participant is indicated by "bsComTimeout" (0,5sec. + time set in parameter 0x02 Bus Timeout).

### 4.2 Parameter Access

The present module contains the parameter data in addition to the process data (CW/SW). Parameters that can be changed (read/write) exist in programming as actual value (\_r) and as target value (\_w) as well. Furthermore, it is differentiated between pure read parameters (only indicated as actual value) and pure write parameters (only indicated as target value).

A rising edge must be applied either to the "bcStartRead" or to the "bcStartWrite" input on the module described here in order to enable a read or write process of one of the variables.

#### 4.2.1 Read Parameters

If a rising edge is applied to the "bcStartRead" input, then all parameters will be read and can be used for further programming. If counter read value is not reset to "0" the read cycle was interrupted by read failure. This indicates to a communication failure.

#### 4.2.2 Write Parameters

If a rising edge is applied to the "bcStartWrite" input of the module, then all parameters will be transferred to the module. If counter write value is not reset to "0" the write cycle was interrupted by a write failure. This indicates to a communication failure or parameter value is beyond range of value accepted by AP04.

#### 4.2.3 Copy Parameters from Read to Write

If a rising edge is applied to the "bcStartCopy" input of the module, then all actual values (\_r) are copied to their corresponding target values (\_w).

### 4.3 S-Commands

After executing a S-Command a read cycle is been triggered to refresh all actual values (\_r).

#### 4.4 Counter Value

Count read value	Count write value	Name	Value range (dec)	Default
	1	0xA8 Programming Mode On/Off	0 ... 1	0
1	2	0x00 Note address	0 ... 31	1
2	3	0x01 Baud rate	0 ... 2	1
3	4	0x02 Bus Timeout	0 ... 20	0
4	5	0x03 Response parameter to a setpoint write access	0 ... 2	0
5	6	0x04 Keys enable time: Configuration start delay	1 ... 60	15
6	7	0x05 Key function enable1: Calibration enable	0 ... 1	1
7	8	0x06 LED flashing	0 ... 1	1
8	9	0x08 LED2 (red)	0 ... 1	1
9	10	0x09 LED1 (green)	0 ... 1	1
10	11	0x0A Decimal places	0 ... 4	0
11	12	0x0B Display divisor (ADI)	0 ... 3	0
12	13	0x0C Direction indicators	0 ... 2	0
13	14	0x0D Display orientation	0 ... 1	0
14	15	0x0E Configuration programming mode	0 ... 1	0
15	16	0x1B Counting direction	0 ... 1	0
16	17	0x1C Resolution per revolution	1 ... 59999	720
17	18	0x1E Offset value	-9999 ... 9999	0
18	19	0x1F Calibration value	-9999 ... 9999	0
19	20	0x20 Target window1 (near field)	0 ... 9999	5
20	21	0x21 Positioning type (loop type)	0 ... 2	0
21	22	0x22 Loop length	0 ... 9999	0
22	23	0x28 Operating mode	0 ... 2	0
23	24	0x30 Display in the 2nd row	0 ... 1	0
24	25	0x31 Target window2 (extended)	0 ... 9999	0
25	26	0x32 Target window2 visualization	0 ... 1	0
26	27	0x33 Application of the display divisor (ADI application)	0 ... 1	0
27	28	0x34 Formation of the differential value	0 ... 1	0
28	29	0x35 Key function enable2: Incremental measurement enable	0 ... 1	1
29		0x63 Battery voltage		0
30		0x65 Device identification		0
31		0x67 Software version		0
	30	0xAA FreezeAV	0 ... 1	0

Count read value	Count write value	Name	Value range (dec)	Default
32	31	0xD0 Response delay	0 ... 10	0
33		0xFA System Status word		0
34		0xFE Position value		0
35		0xFF Setpoint2		0
	32	0xA0 System Command	1, 2, 5, 7 or 9	0

#### 4.4.1 Error Codes

If a communication error occurs, there is an error code present at the outputs "nErrorCode1" and "nErrorCode2". Please refer to the AP04 manual (keyword: error codes) for a complete description of these error codes.