AP10S

Siemens S7-1200®
PROFINET® Interface Module
for TIA Portal® V14 SP1
via HMS Anybus® Communicator™

Software Description

V1.0.4

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1 General Notes

1.1 Trademarks

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1.3 Limitations

The library and its function were tested with SIMATIC® S7-1200 CPU 6ES7 212-1BD30-0XB0. The interface module was engineered in SCL using Siemens TIA Portal® V14 SP1 Update 1. There is also a library available for Siemens S7-1500 systems.
The method described in this document is the same for S7-1500 systems.

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

- AP10S firmware version >= 1.05
- Library “SIKO_SN5-PN_TIA_V13_SP1_Upd6_S71200_LIB_V501”
- Function block FB311 “SIKO_POS_AP10SvPN”
- 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

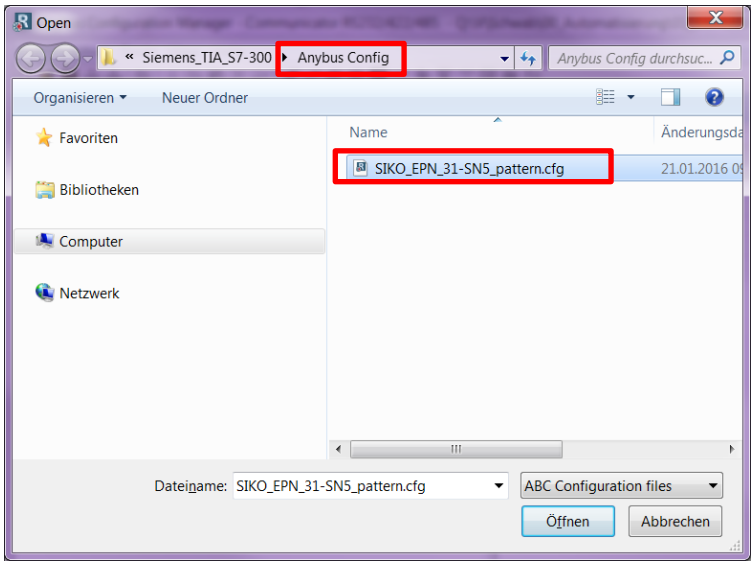
2 Hardware Configuration

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.

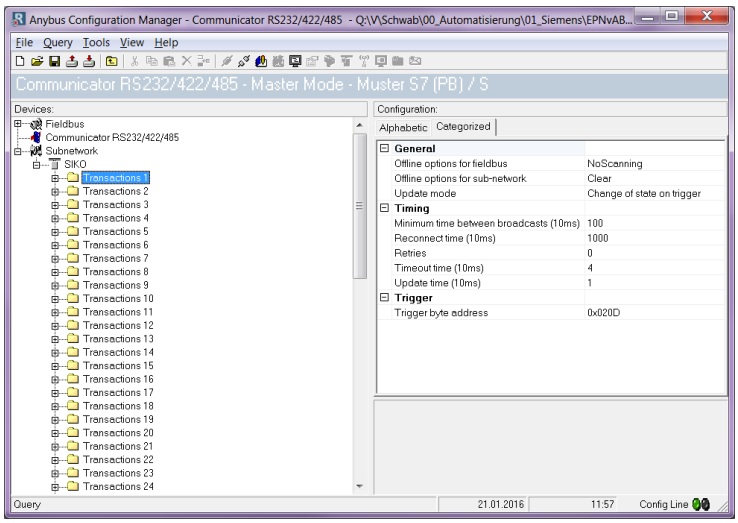
2.1.1 ABC Configuration File

Start ACM and select configuration file “SIKO_EPN_31-SN5_pattern.cfg” from the folder “Anybus Config”.



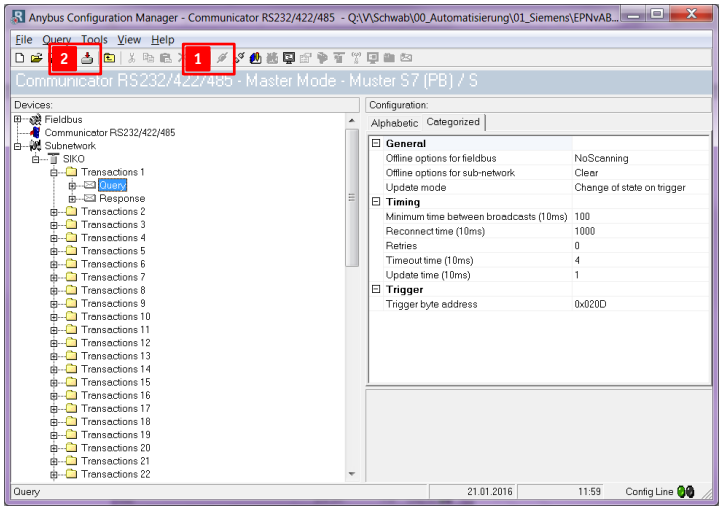
2.1.2 Transfer Configuration

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

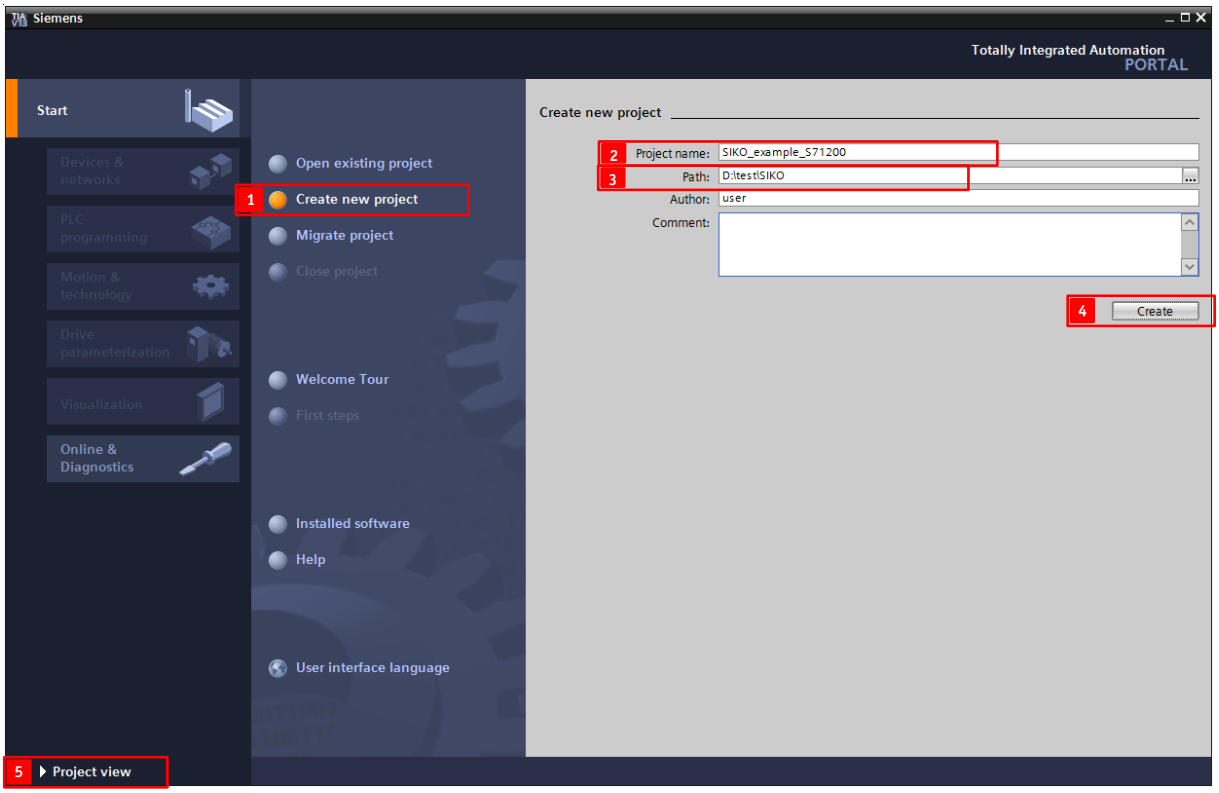
Each transaction consists of “Query” and “Response”. The minimum time for a used transaction is about >= 10 ms. Each Subnetwork cycle has an overhand of about >= 100 ms.

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 >= 110 ms minimum. Please consider this for time critical applications!

2.2 Setup of PLC and PROFINET®

2.2.1 Create New TIA Portal® Project

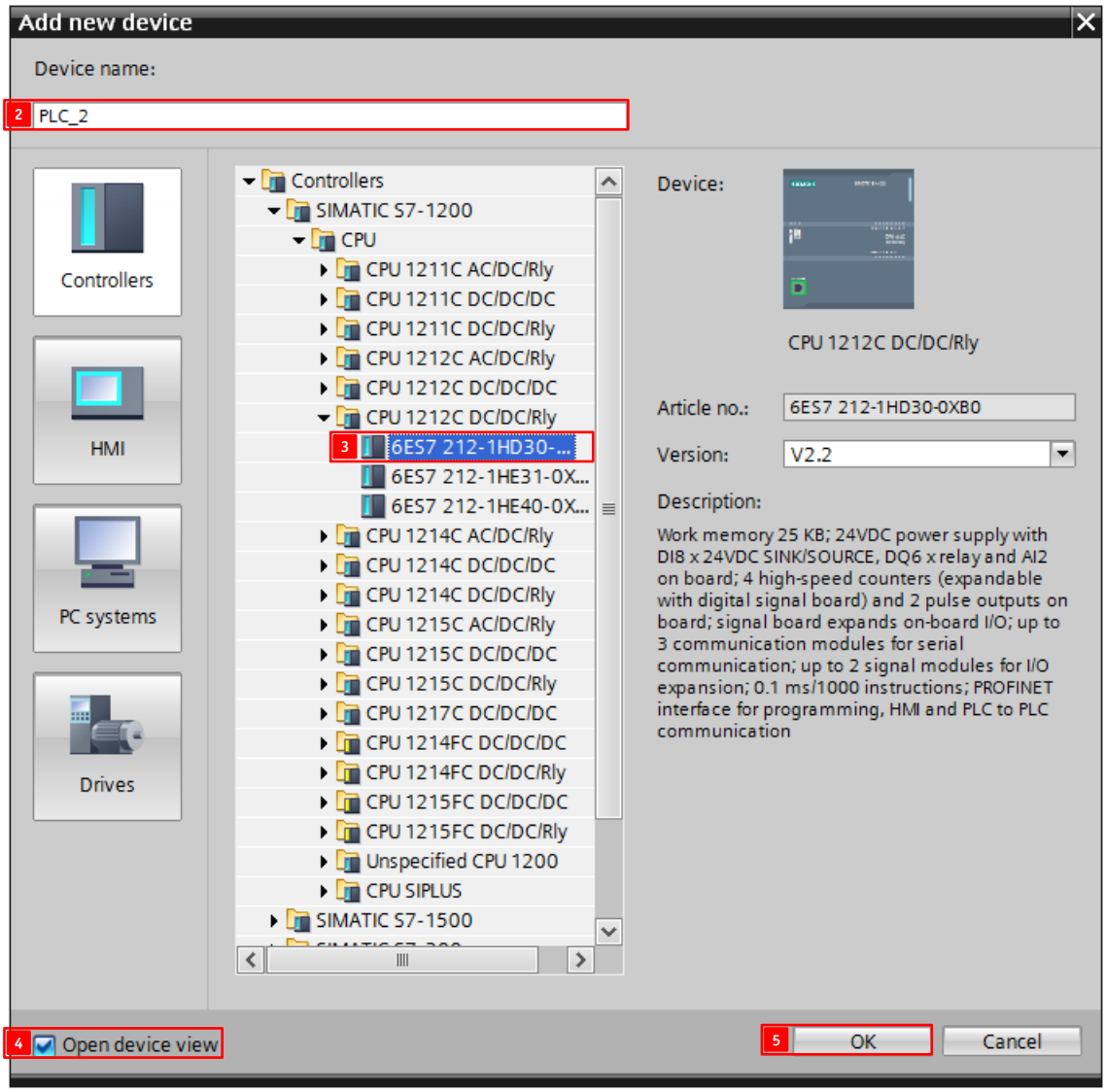
1. Execute the command “Create new project”.
2. Enter the project name “SIKO_example_S71200”.
3. Choose a project path.
4. Execute the command “Create”.
5. Change to “Project view”.



2.2.2 Add Your PLC to the Project

1. Navigate to the project tree in the project view and double-click on “Add new device”.

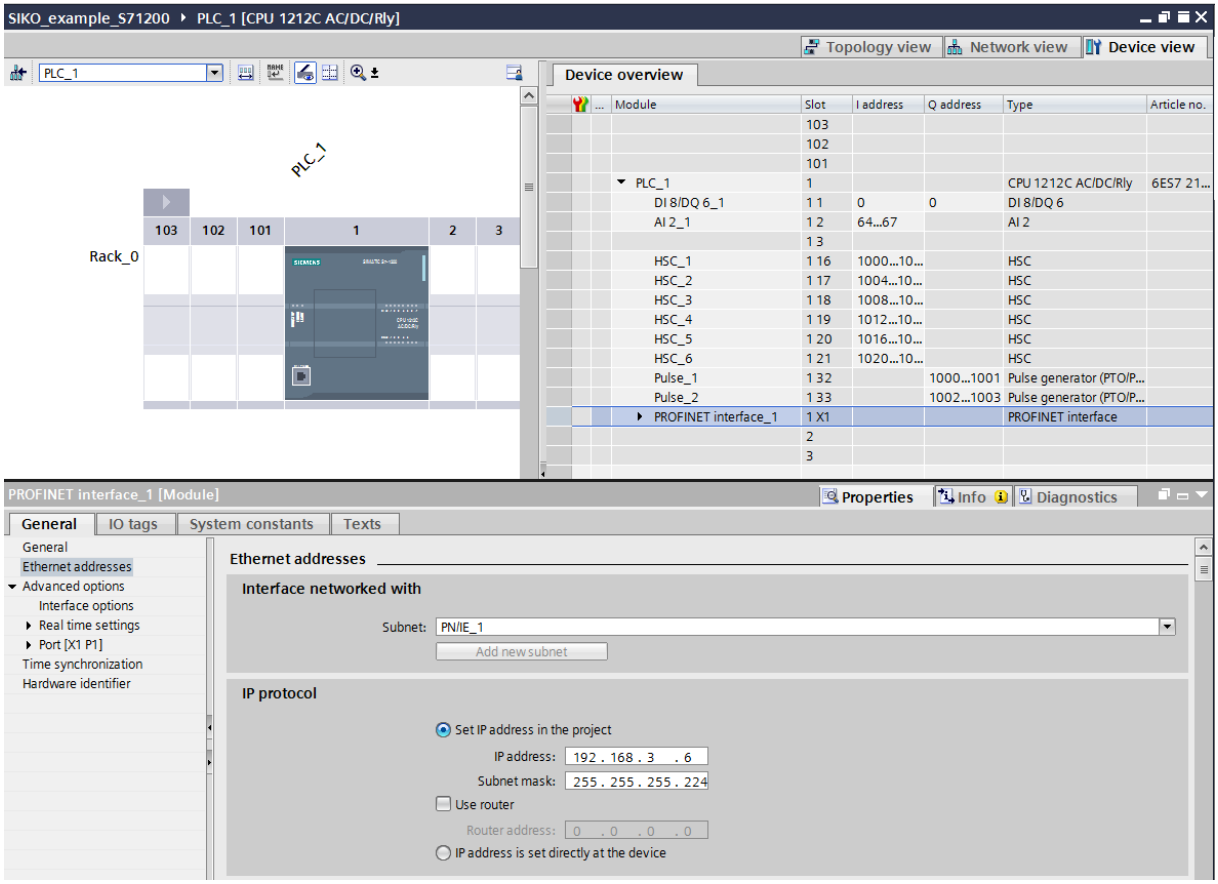
2. Assign a device name, for example “PLC_1”.
3. Select “Controllers” > “SIMATIC S7-1200” > “CPU” > “CPU 1212C AC/DC/Rly” > “6ES7 212-1BD30-0XB0”.
4. Select “Open device view”.
5. Confirm with “OK”.



2.2.3 Configure the IP Address of the PLC in the Project

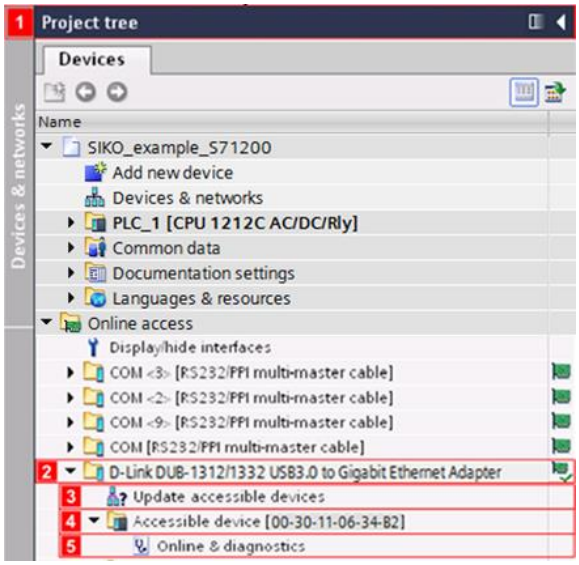
NOTICE	The IP settings in this example can cause serious network problems under certain circumstances. If you are in doubt about the correct IP settings for your network, ask your system administrator for assistance.

1. Navigate to the tab “Device view”.
2. Choose “PLC_1”.
3. Double-click on Profinet-Port.
4. Left-click on “Ethernet addresses” from folder “General”.
5. Select “Set IP address in the project”.
6. Enter a valid IP address.
7. Enter a valid subnet mask.



2.2.4 Open the Window “Online & diagnostics” of the ABC

1. Navigate to the project tree in the project view.
2. Choose your network interface.
3. Double-click on “Update accessible devices”.
4. Identify the HMS ABC by its MAC-ID.
5. Double-click on “Online & diagnostics”.



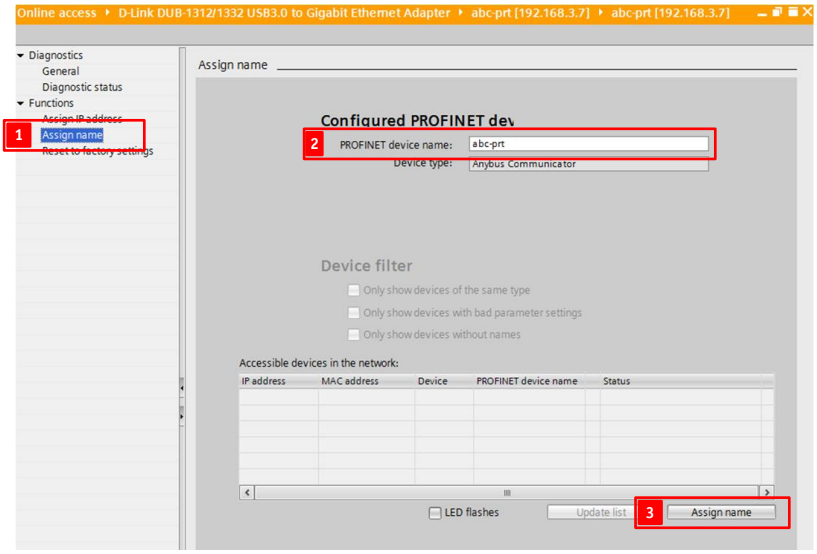
2.2.5 Enter the IP Address of the ABC

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.

1. Navigate to folder “Assign IP address” in the “Online & diagnostics” window.
2. Enter a valid IP address, “192.168.3.7” for example.
3. Enter a valid subnet mask, “255.255.255.224” for example.
4. Execute the command “Assign IP address”.

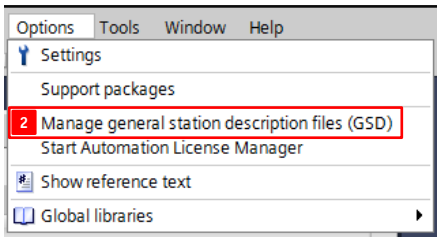
2.2.6 Enter the PROFINET® Device Name of the ABC

1. Navigate to the folder “Assign name” in the “Online & diagnostics” window.
2. Enter a valid PROFINET® device name, “abc-prt” for example.
3. Execute the command “Assign name”.

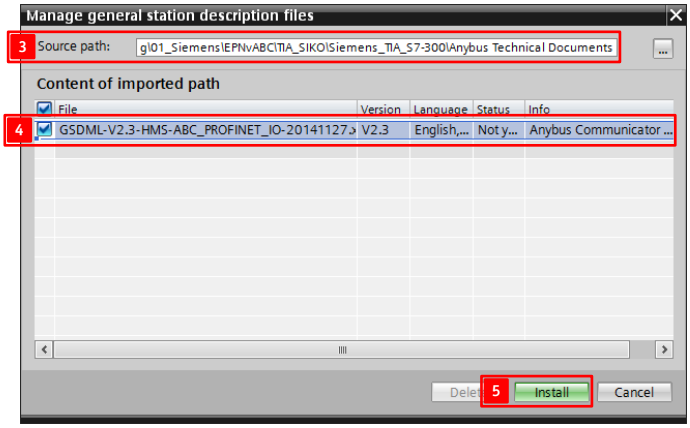


2.2.7 Register the GSDML Device Description File for ABC

1. Go to the TIA Portal® “Project view”.
2. Execute the command: “Options” > “Manage general station description files (GSD)”.



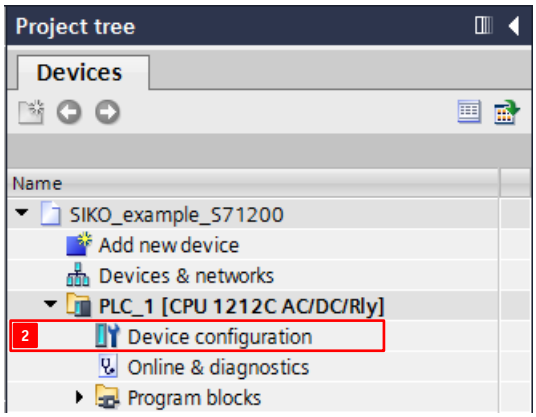
3. Browse to the storage location of the GSDML file.
4. Select the GSDML file for Anybus Communicator.
5. Execute the command “Install”.



2.2.8 Add New Module to Your Hardware Configuration

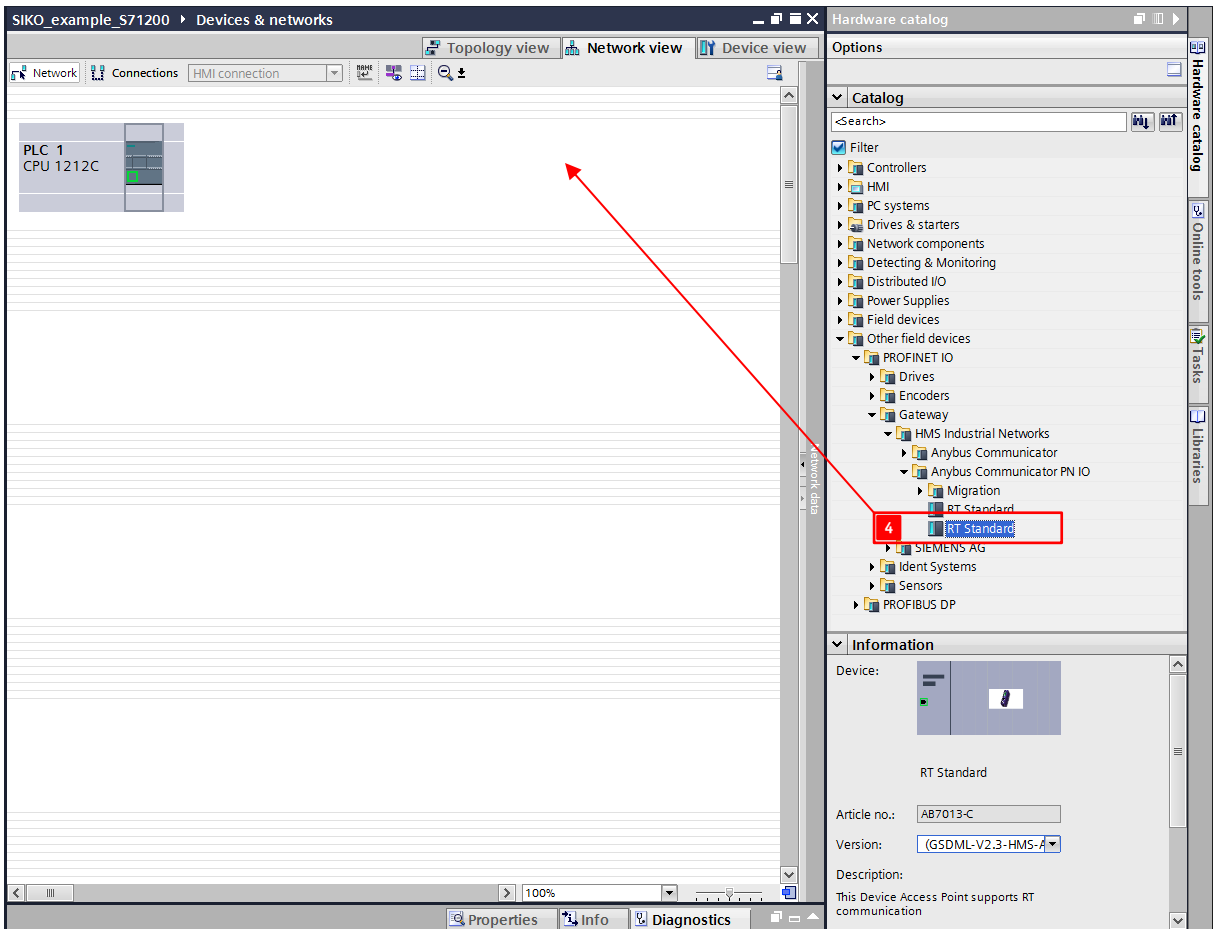
1. Go to the TIA Portal® “Project view”.

2. Double-click on “Device configuration” of your PLC.



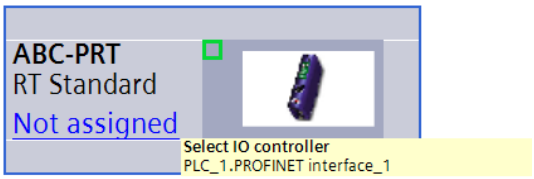
3. Navigate to the tab “Network view”.

4. Add “RT Standard” from device “Anybus Cmunicator PN IO > Headmodules” of the hardware catalog to the “Devices & networks window”. Please check corresponding GSDML version!



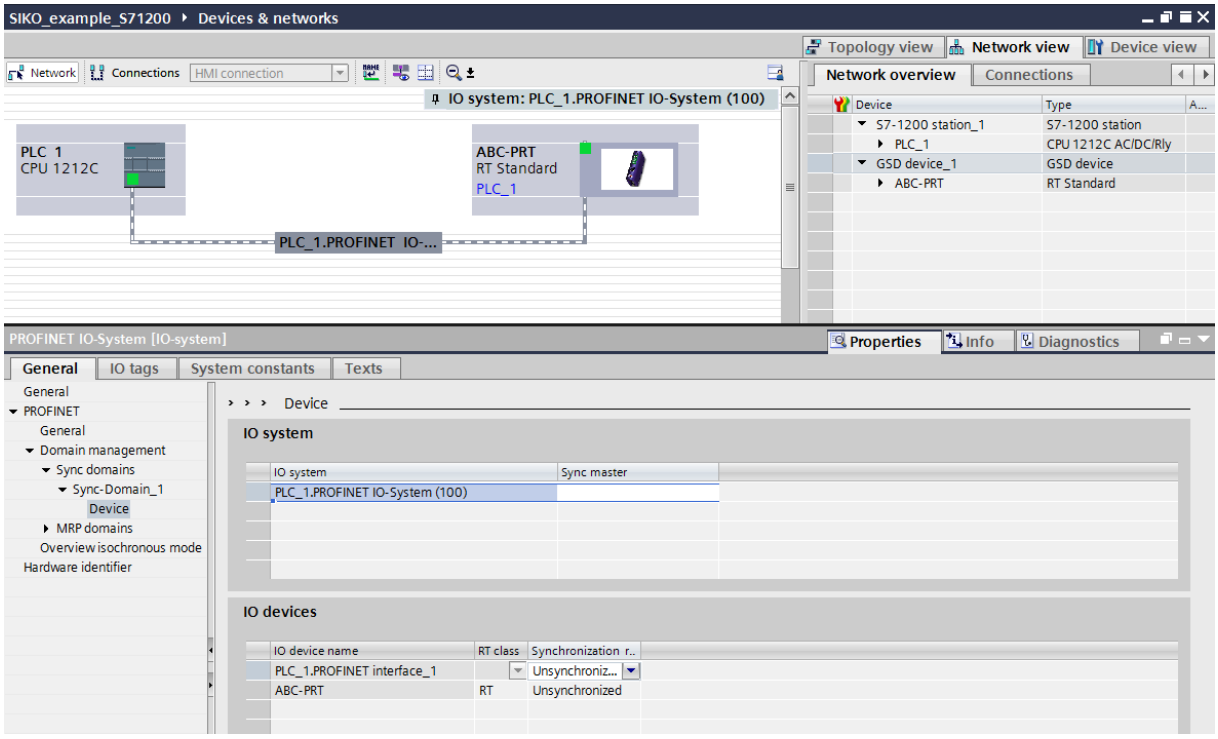
2.2.9 Select the PROFINET® IO Controller

1. Left-click “Not assigned” inside the ABC symbol.
2. Select IO Controller.



2.2.10 Configure the Sync Domain

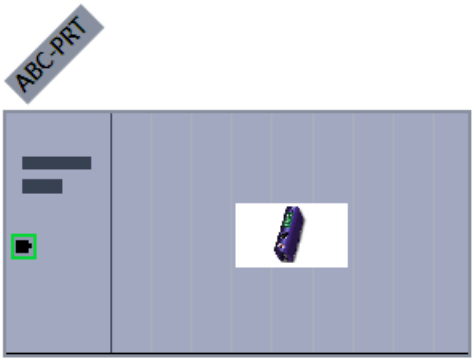
1. Double-click on the PROFINET® IO-System.
2. Make the settings.



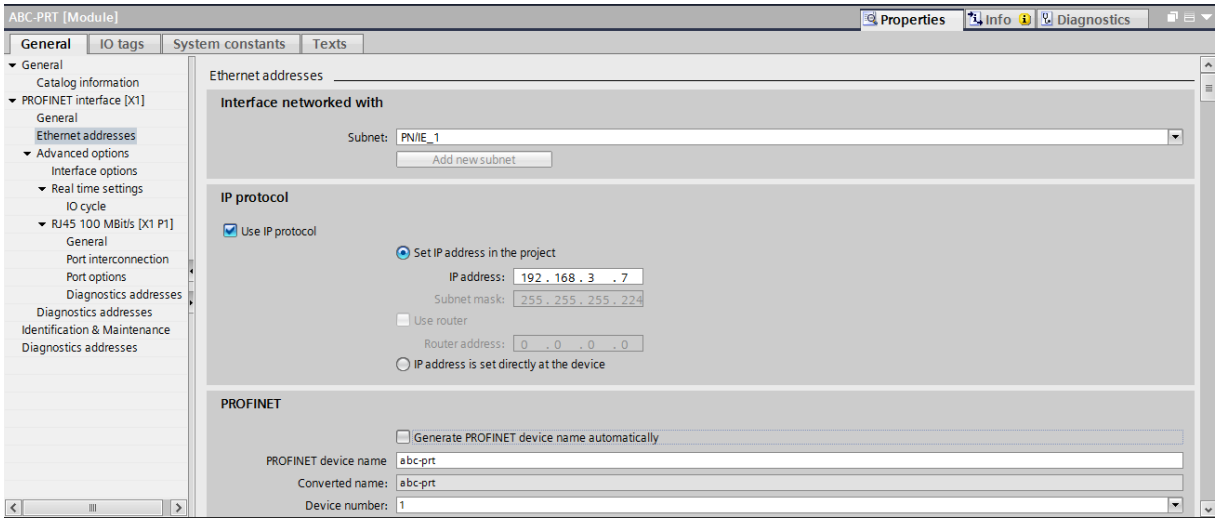
2.2.11 Configure the IP Address of the ABC in the Project

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.

1. Navigate to the tab “Network view”.
2. Double-click on the ABC-PRT symbol.
3. Double-click on module.



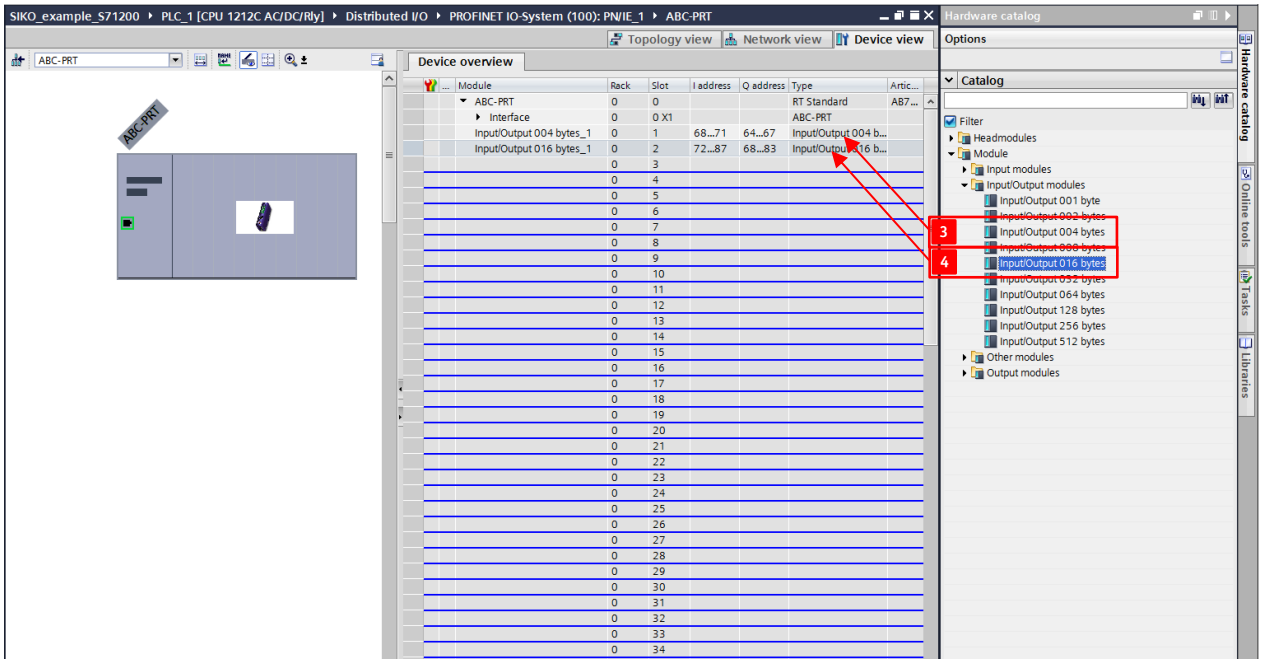
1. Navigate to the “Ethernet addresses” folder.



2. Choose “Set IP address in the project”.
3. Enter the IP address used in chapter 2.2.5: “192.168.3.7”.
4. Enter the PROFINET® device name used in chapter 2.2.6: “abc-prt”.

2.2.12 Configure the Data Input / Output of ABC

1. Navigate to the tab “Device view”.
2. Choose “ABC-PRT”
3. Add "Input/Output 004 bytes" from device “Anybus Cmunicator PN IO > Module” of the hardware catalog to the “Devices overview”.
4. For each Sikonet-5 device, add "Input/Output 016 bytes" from device “Anybus Cmunicator PN IO > Module” of the hardware catalog to the “Devices overview”.

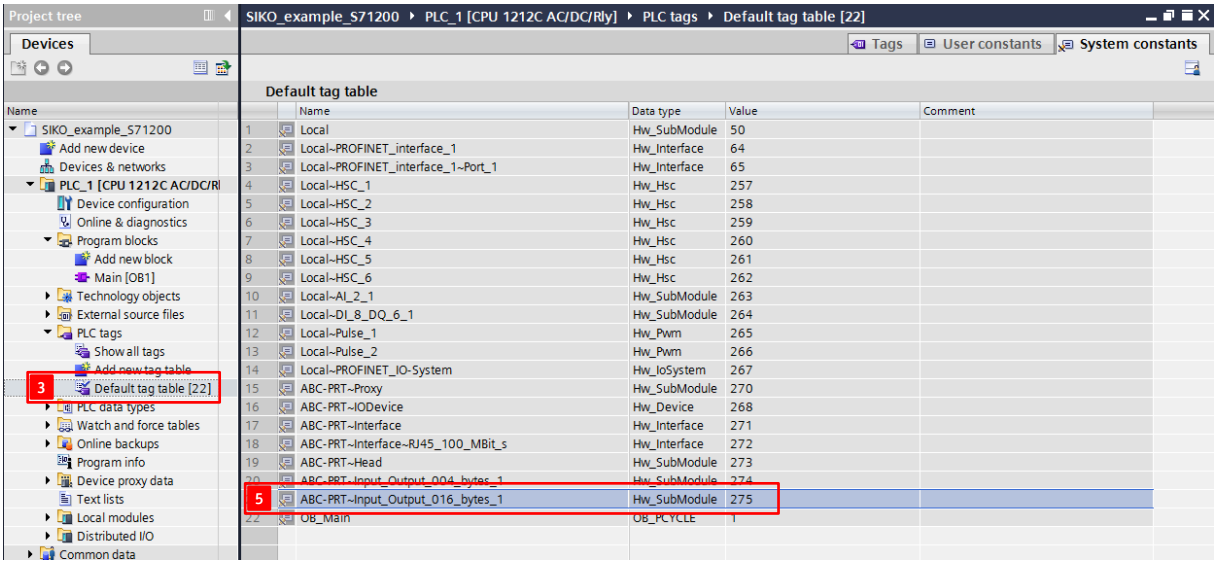


5. Close "Device Configuration" window. The hardware configuration of the project is now complete.

3 Software Configuration

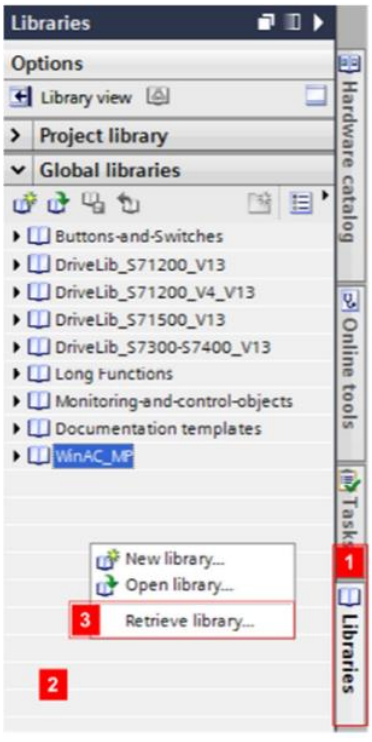
3.1 Determine the “System constants” of ABC In- and Output for the SIKO Function Block

1. Navigate to the project tree.
2. Go to the “PLC tags”.
3. Double-click on “Default tag table [22]”.
4. Select “System constants”.
5. Read out the “ABC-PRT~Input_Output_016_bytes_1” and remember the value

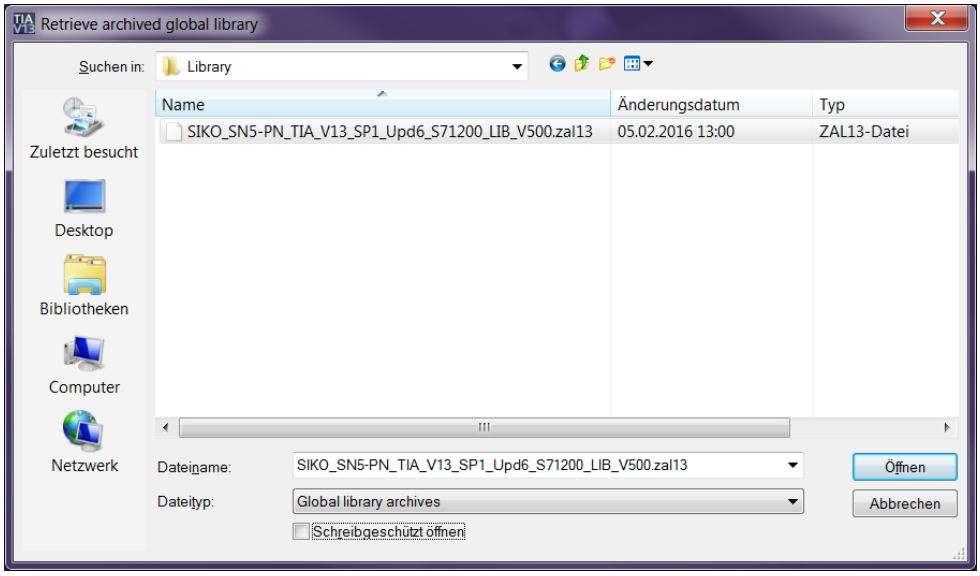


3.2 Import the SIKO-library

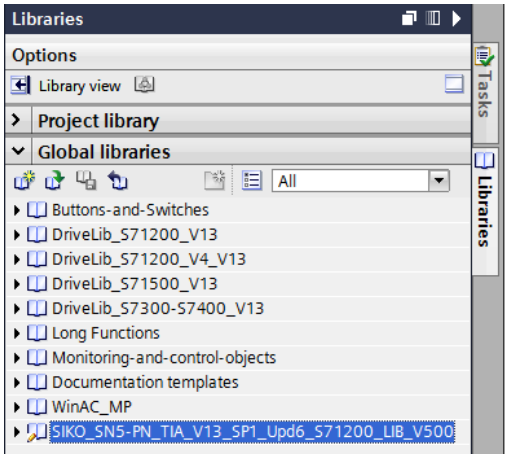
1. Navigate to the tab “Device view”.
2. Right-click in emty space inside the tab “Libraries”.
3. Execute the command “Retrieve library...”.



4. Browse to the storage location of the SIKO-library.
5. Select the archive SIKO_SN5-PN_TIA_V13_SP1_Upd6_S71200_LIB_V501.zal13.
6. Execute the command “Open”.

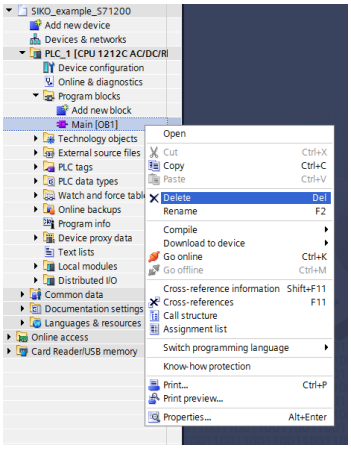


7. Choose a target directory to store the library.
8. The library appears in the “Global libraries” window.



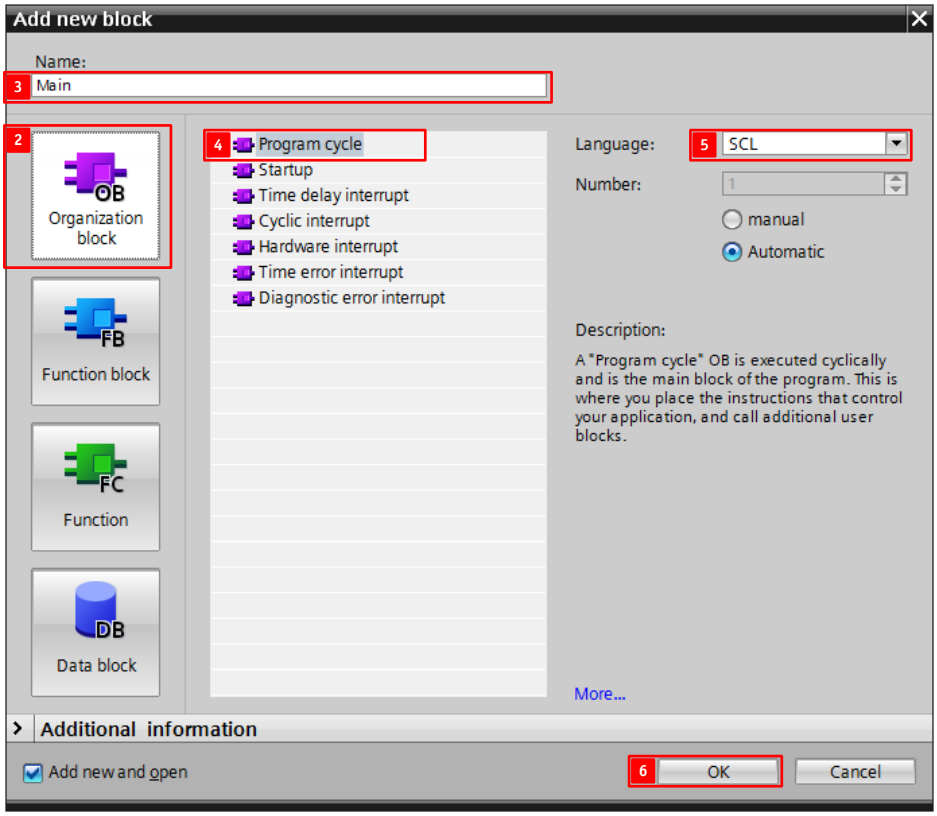
3.3 Delete OB1

1. Navigate to the project tree.
2. Go to the Program blocks folder.
3. Right-click on “Main [OB1]”.
4. Delete OB1.

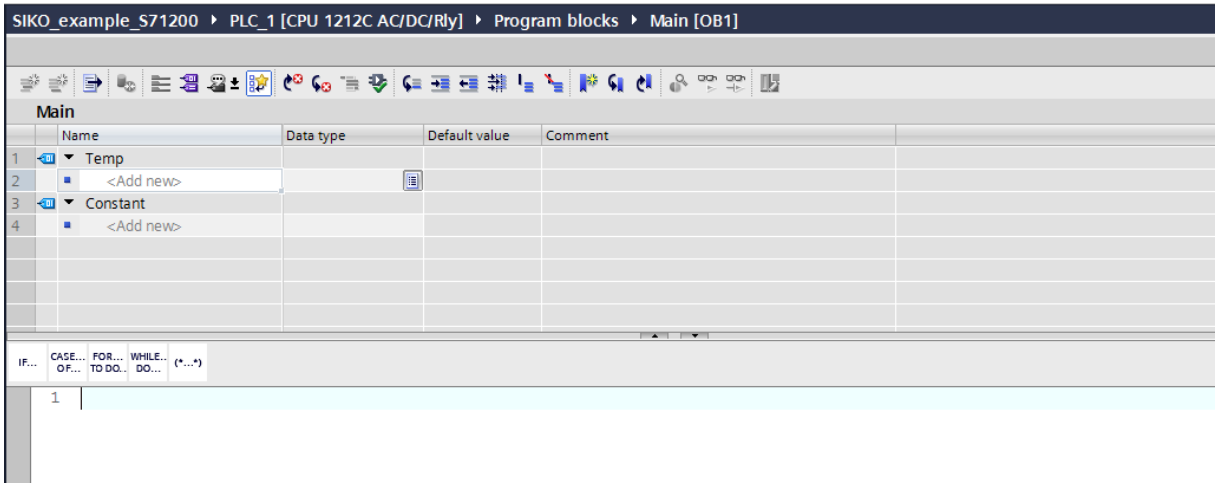


3.4 Create New OB1 in Language SCL

1. Create a new OB1 via the command “Program block” > “Add new block”.
2. Choose “Organization block”.
3. Enter “Main” as name.
4. Choose “Program cycle”.
5. Choose language “SCL”.
6. Confirm the settings with “OK”.

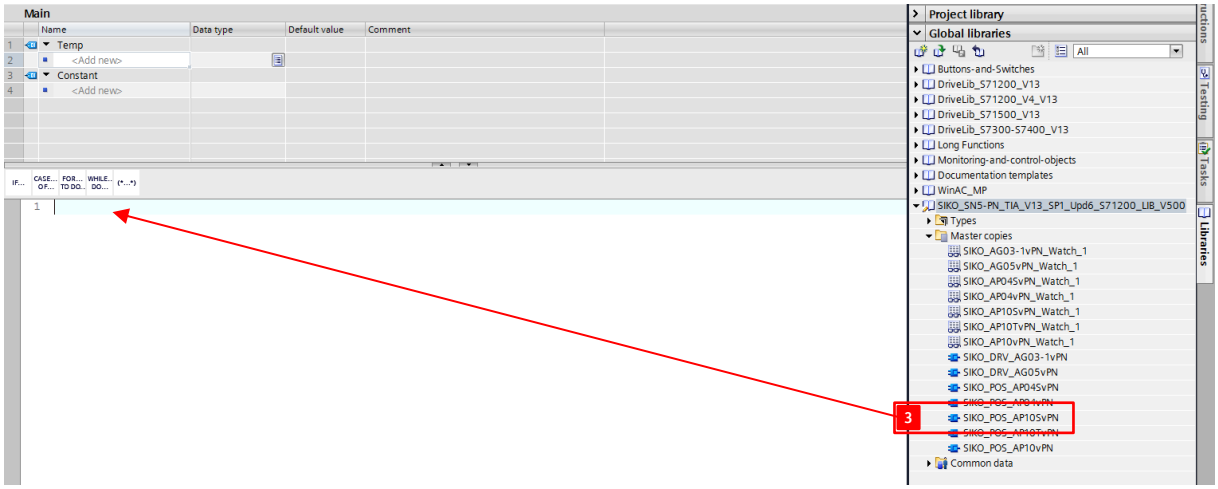


7. The SCL editor window is opened.

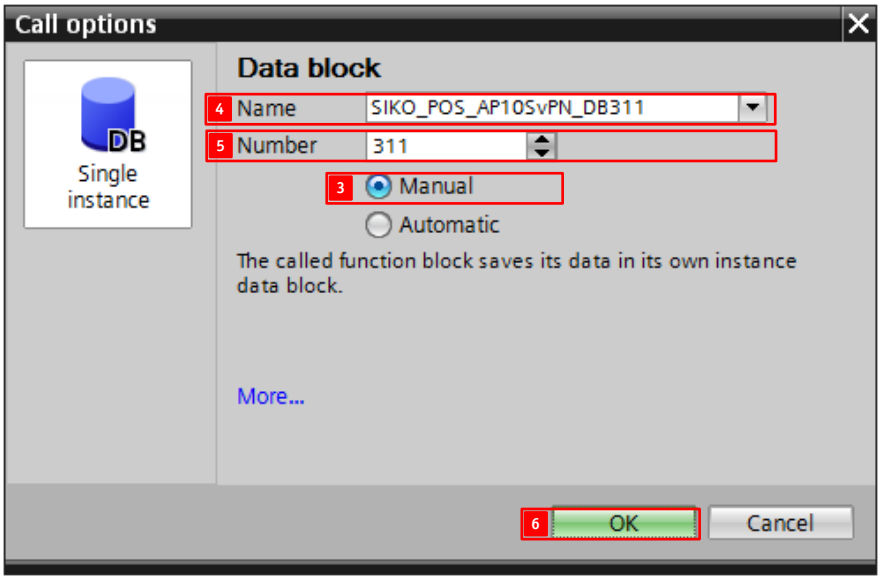


3.5 Function Block Call

1. Use drag and drop to move the function block “SIKO_POS_AP10SvPN” from the library SIKO_SN5-PN_TIA_V13_SP1_Upd6_S71200_LIB_V501 to the OB1 SCL editor window.



2. Now the window “Call options” appears.
3. Select “Manual”.
4. Enter “SIKO_POS_AP10SvPN_DB311” as name for the instance data block.
5. Enter Number “311”.
6. Confirm with “OK”.



3.5.1 Setup the Input and Output Addresses of the SIKO Function Block

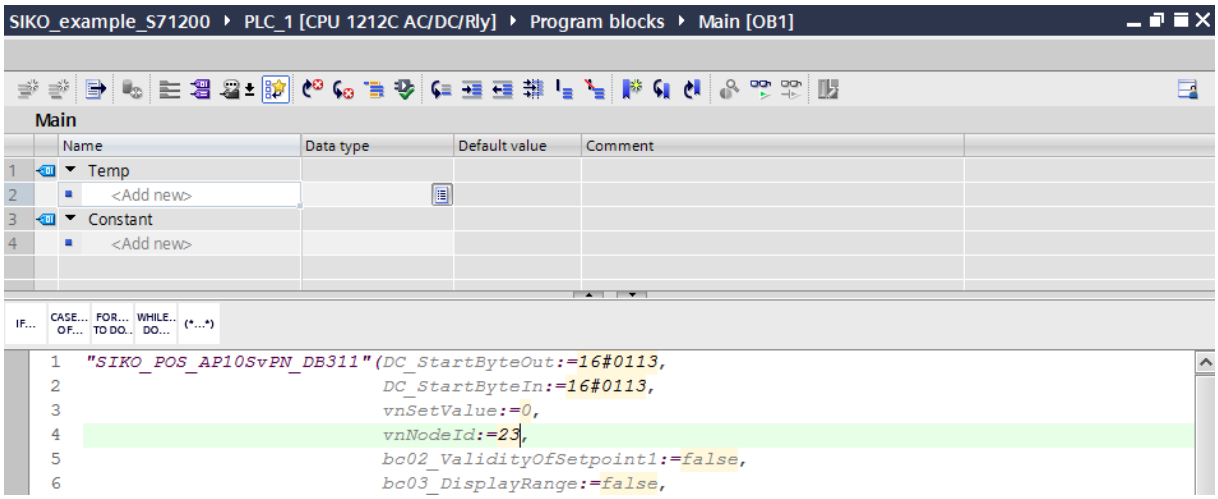
To setup the input and output addresses of the function block the decimal address value from Hw_SubModule have to be converted to hexadecimal values.

In this example the conversion table looks like this:

Hw_SubModule	275dec	DC_StartByteOut	W#16#113
		DC_StartByteIn	W#16#113

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

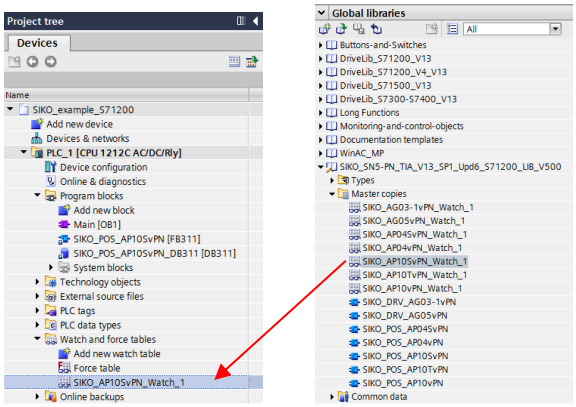
In this example the address 23 (dec) is used.



After set up of the addresses save the settings and close the editior window.

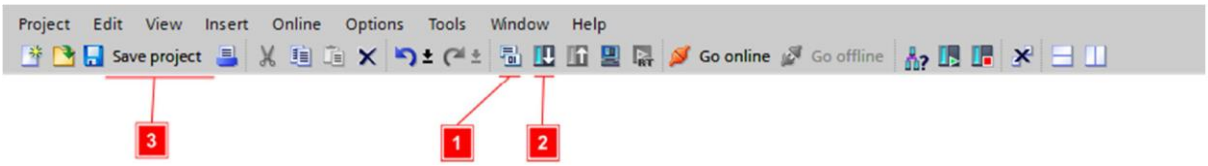
3.6 Add the Watch Table “SIKO_AP10SvPN_Watch_1” from the SIKO-library

1. Use drag and drop to move the watch table of the library to the project folder “Watch and force tables”.



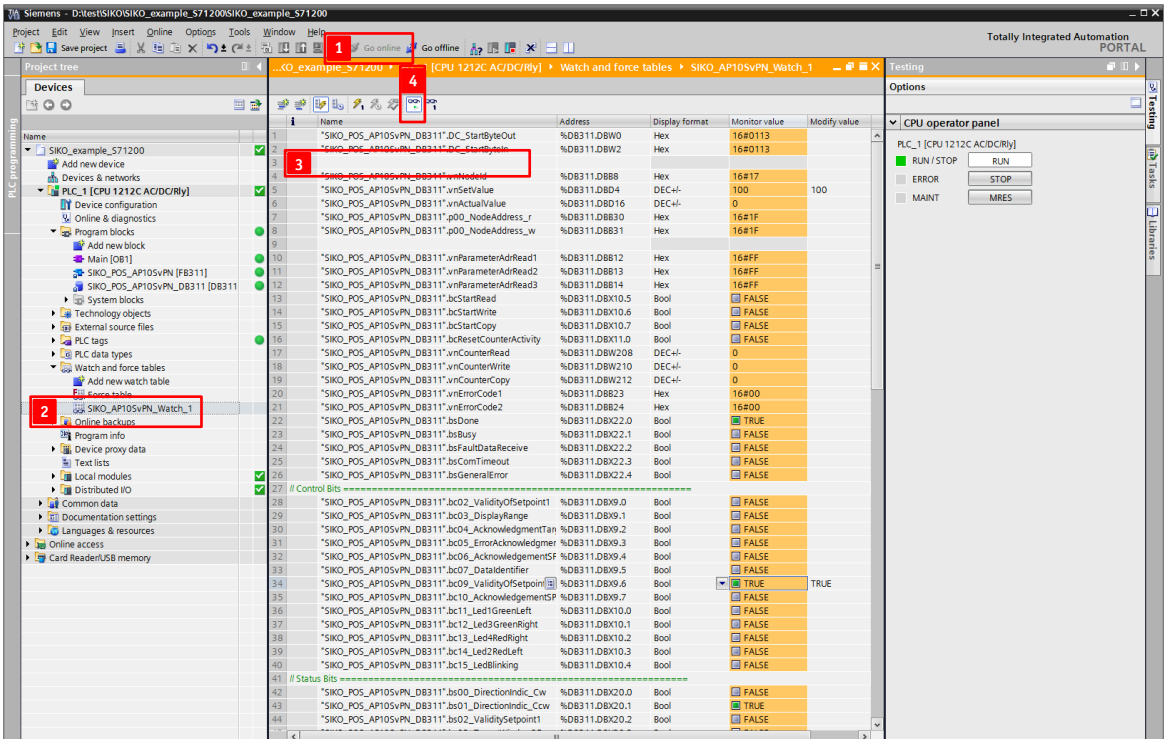
3.7 Complete the Project

1. Execute the command “Compile”.
2. Execute the command “Download to device”.
3. Execute the command “Save project”.



3.8 Work with the Project

1. Go online with your PLC.
2. Double-click on “SIKO_AP10SvPN_Watch_1”.
3. Left-click inside the watch table window.
4. Enable the “Monitor all” option in the watch table window.
5. Now you can control the SIKO-AP10S by setting the control bits.



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 inclution 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 responsing 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 AP10S.

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	0x38 Sensor type	0 ... 1	0
2	3	0x00 Note address	0 ... 31	31
3	4	0x01 Baud rate	0 ... 2	1
4	5	0x02 Bus Timeout	0 ... 20	20
5	6	0x03 Response parameter to a setpoint write access	0 ... 2	0
6	7	0x04 Keys enable time: Configuration start delay	1 ... 60	5
7	8	0x05 Key function enable1: Calibration enable	0 ... 1	1
8	9	0x06 LED flashing	0 ... 1	0
9	10	0x07 LED3 (green right)	0 ... 1	1
10	11	0x08 LED2 (red left)	0 ... 1	1
11	12	0x09 LED1 (green left)	0 ... 1	1
12	13	0x0A Decimal places	0 ... 4	0
13	14	0x0B Display divisor (ADI)	0 ... 3	0
14	15	0x0C Direction indicators (CW, CCW)	0 ... 2	0
15	16	0x0D Display orientation	0 ... 1	0
16	17	0x0E Configuration programming mode	0 ... 1	0
17	18	0x1B Counting direction	0 ... 1	0
18	19	0x1C Resolution	MS500H: 310 ... 2114064575 GS04: 1 ... 65535	10000
19	20	0x1E Offset value	-9999 ... 9999	0
20	21	0x1F Calibration value	-999999 ... 999999	0
21	22	0x20 Target window1 (near field)	0 ... 9999	5
22	23	0x21 Positioning type (loop type)	0 ... 2	0
23	24	0x22 Loop length	0 ... 9999	0
24	25	0x28 Operating mode	0 ... 3	0
25	26	0x30 Display in the 2nd row	0 ... 1	0
26	27	0x31 Target window2 (extended)	0 ... 9999	0
27	28	0x32 Target window2 visualization	0 ... 1	0
28	29	0x33 Application of the display divisor (ADI application)	0 ... 1	0
29	30	0x34 Formation of the differential value	0 ... 1	0

Count read value	Count write value	Name	Value range (dec)	Default
30	31	0x35 Key function enable2: Incremental measurement enable	0 ... 1	1
31	32	0x39 LED4 (red right)	0 ... 1	1
32	33	0x3A LCD backlight flashing	0 ... 1	0
33	34	0x3B LCD backlight white	0 ... 1	1
34	35	0x3C LCD backlight red	0 ... 1	1
35	36	0x3D Key function enable3: Configuration enable via keyboard	0 ... 1	1
36	37	0x3E Acknowledgement settings	0 or 2	0
37	38	0x3F Indication factor	0 ... 8	0
38		0x63 Battery voltage		0
39		0x65 Device identification		0
40		0x67 Software version		0
41		0x80 Number of errors		0
42		0x81 Error 01		0
43		0x82 Error 02		0
44		0x83 Error 03		0
45		0x84 Error 04		0
46		0x85 Error 05		0
47		0x86 Error 06		0
48		0x87 Error 07		0
49		0x88 Error 08		0
50		0x89 Error 09		0
51		0x8A Error 10		0
52		0x96_00 Input Errors		0
53		0x96_01 Input Errors Index 1		0
54		0x96_02 Input Errors Index 2		0
55		0x96_03 Input Errors Index 3		0
56		0x96_04 Input Errors Index 4		0
57		0x96_05 Input Errors Index 5		0
58		0x96_06 Input Errors Index 6		0
59		0x96_07 Input Errors Index 7		0
60		0x96_08 Input Errors Index 8		0
61		0x96_09 Input Errors Index 9		0
62		0x96_10 Input Errors Index 10		0
	39	0xA7 Execute Calibration	0 ... 1	0
	40	0xAA FreezeAV	0 ... 1	0
	41	0xC3 Start sensor alignment	0 ... 1	0
63		0xC5 ADC values of the sensor		0
64		0xCF Period counter		0

Count read value	Count write value	Name	Value range (dec)	Default
65	42	0xD0 Response delay	0 ... 10	0
	43	0xD2 Auto Id Assignment	1 ... 31	0
66		0xFA System Status word		0
67	44	0xFB Setpoint1	–2.147.483.648 ... 2.147.483.647	0
68		0xFC Differential value		0
69		0xFE Position value		0
70		0xFF Setpoint2		0
	45	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 AP10S manual (keyword: error codes) for a complete description of these error codes.