Application Note

FESTO

SFAB-.-PNLK with Siemens PLC through Profinet using CPX-AP IO-Link

This Application Note explains how to integrate the SFAB IO Link Flow Sensor and the function block library for the Festo SFAB Flow Sensor through Profinet using the Festo CPX-AP IO Link with a Siemens PLC in the TIA Portal programming environment.

SFAB-10
SFAB-50
SFAB-200
SFAB-600
SFAB-1000

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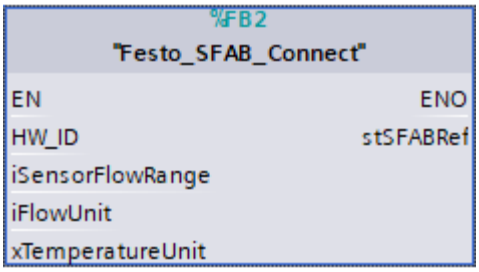
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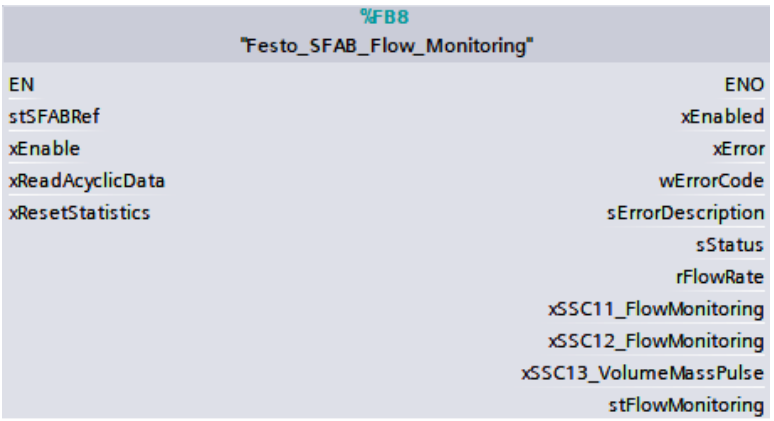
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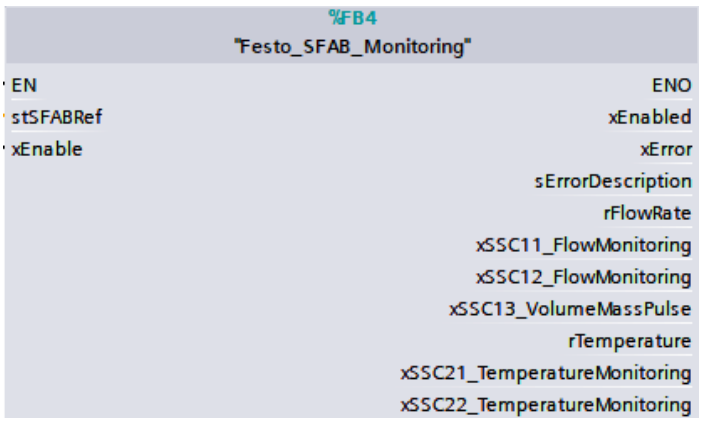
1 Introduction

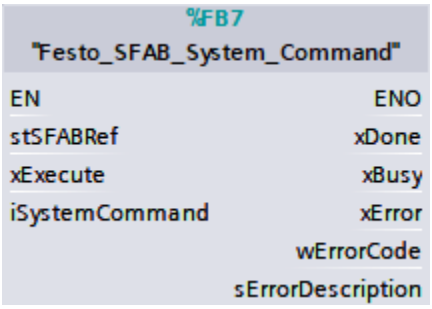
This application note demonstrates the integration of the Festo SFAB IO-Link Flow Sensor with Siemens PLC through PROFINET using CPX-AP IO-Link Master module.

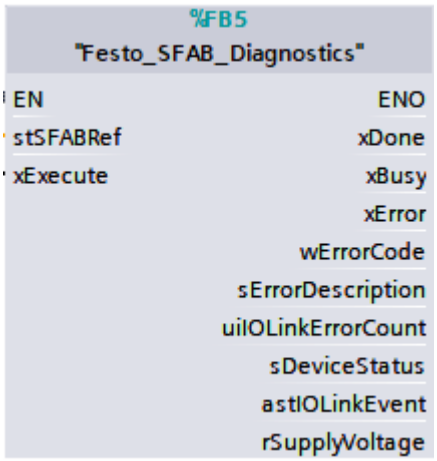
- **Festo_SFAB_Connect** maps the SFAB Flow Sensor reference structure and serves as the foundation for all other function blocks.
- **Festo_SFAB_Monitoring** reads and decodes the cyclic process data input of the SFAB Flow Sensor including flow rate temperature and SSC status.
- **Festo_SFAB_System_Command** Executes IO-Link acyclic system commands for the SFAB Flow Sensor including teach reset and recorder control commands.
- **Festo_SFAB_Diagnostics** reads diagnostic data from the SFAB Flow Sensor including device status IO-Link events and supply voltage.
- **Festo_SFAB_RecorderMode** controls and reads the volume recorder mode of the SFAB Flow Sensor including run pause reset and recorder data readout.
- **Festo_SFAB_Flow_Monitoring** reads acyclic flow monitoring data including minimum maximum and averaged flow rate values and resets MDC1 statistics.
- **Festo_SFAB_Flow_Parameters** reads and writes SSC1.1 SSC1.2 and SSC1.3 flow switching signal channel parameters including setpoints mode and logic.
- **Festo_SFAB_Device_Parameter** reads and writes device configuration parameters including measurement output display filter and access lock settings.

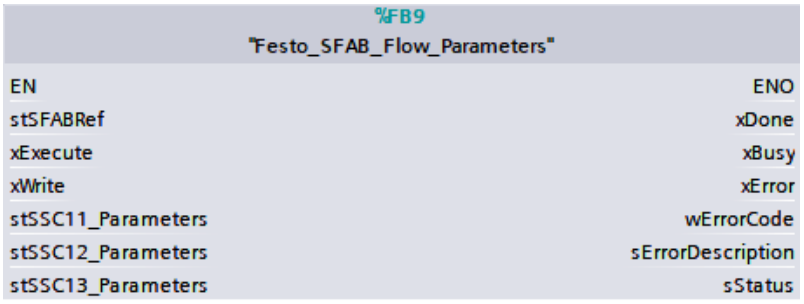


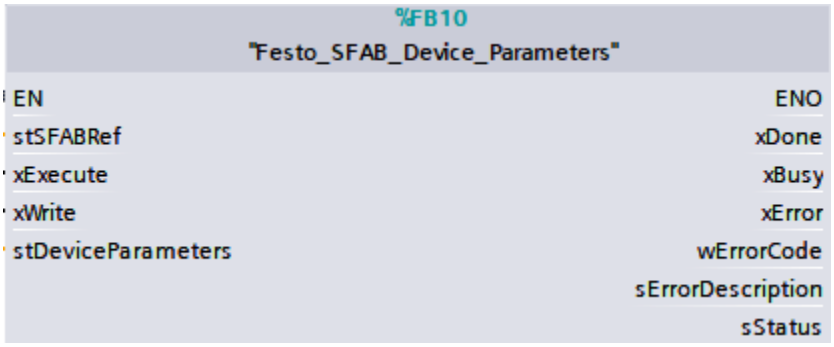


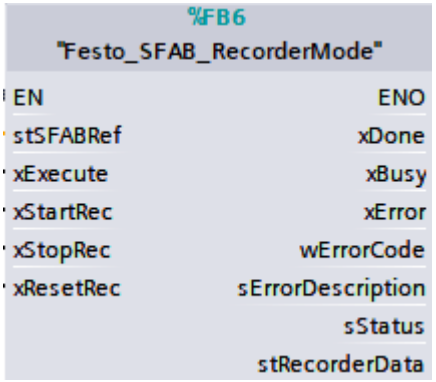





%FB5
"Festo_SFAB_Diagnostics"
EN
stSFABRef
xExecute
ENO
xDone
xBusy
xError
wErrorCode
sErrorDescription
uiIOLinkErrorCount
sDeviceStatus
astIOLinkEvent
rSupplyVoltage


%FB9
"Festo_SFAB_Flow_Parameters"
EN
stSFABRef
xExecute
xWrite
stSSC11_Parameters
stSSC12_Parameters
stSSC13_Parameters
ENO
xDone
xBusy
xError
wErrorCode
sErrorDescription
sStatus


%FB10
"Festo_SFAB_Device_Parameters"
EN
stSFABRef
xExecute
xWrite
stDeviceParameters
ENO
xDone
xBusy
xError
wErrorCode
sErrorDescription
sStatus


%FB6
"Festo_SFAB_RecorderMode"
EN
stSFABRef
xExecute
xStartRec
xStopRec
xResetRec
ENO
xDone
xBusy
xError
wErrorCode
sErrorDescription
sStatus
stRecorderData

1.1 Software Used

Software Name	Software Version
TIA Portal	V14.0
Festo Automation Suite	V2.12.0.436
CPX-AP Plug-in	V1.11.0.11
SFAB IODD File	V1.3.17
CPX-AP-.-PN GSDML	V20260810
Festo_SFAB_PN_IOLink Library	V1.0

Table 1.1: Software used

1.2 Hardware Used

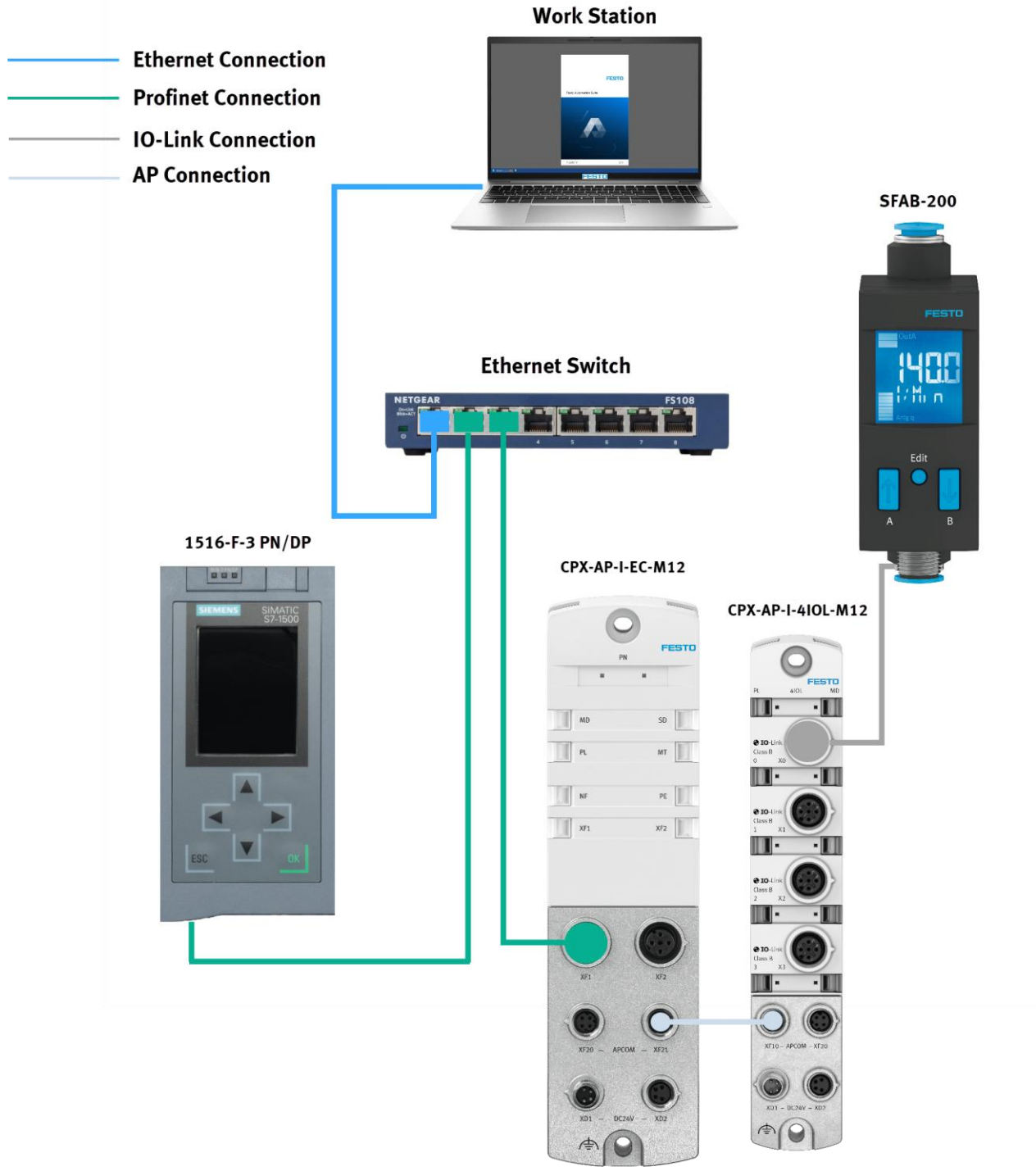
Device Name	Device Type	Version / Firmware
Siemens	S7-1500	Based on Version / Firmware
SFAB-.-PNLK Flow Sensor	SFAB-200	V8.8.29
CPX-AP Head Module	CPX-AP-I-PN-M12	V1.7.4
CPX-AP IO-Link Master	CPX-AP-I-4IOL-M12	V1.6.6
AP Communication Cable	NEBC-D8G4-ES-0.5-N-S-D8G4-ET	Version Free
M12 – RJ45 Ethernet Cable	NEBC-D12G4-ES-0.5-S-D12G4-ET	Version Free
Ethernet Cable	-	Version Free

Table 1.2: Hardware used

Note

- The hardware mentioned above is specific to this application note and may vary depending on user requirements.
- This Application note is applicable to both CPX-AP-A-PN and CPX-AP-I-PN and is therefore referred to collectively as CPX-AP-_-PN.
- For this Application note, CPX-AP-I-PN is used.

1.3 Topology Overview



2 Hardware Overview

2.1 SFAB -.- PNLK Product Overview

2.1.1 Product Desing

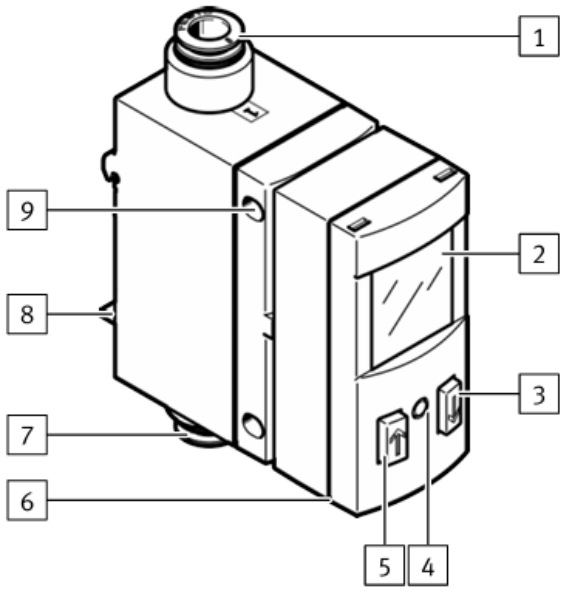


Fig. 1: Control elements and connection elements

1 Pneumatic port 1
2 Display
3 [B] key
4 [Edit] key
5 [A] key
6 Plug for M12 electrical connection
7 Pneumatic port 2
8 Mounting slide for DIN rail mounting and wall mounting, rear
9 Hole for panel mounting

2.1.2 Display Components

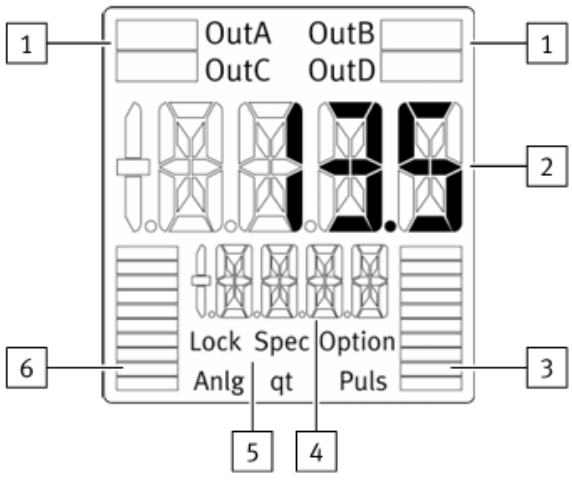


Fig. 2: LCD display

1 Output display
2 Main display, e. g. measured value
3 Volume bar graph
4 Sub-display, e.g. unit
5 Status indicator, e.g. analogue output
6 Flow rate bar display

2.1.3 Symbols on the display

Example for LCD display	Meaning
Output display	
‘ OutA’	Switching output OutA selected, flashes when IO-Link is active.
 ‘ OutA’	Switching output OutA set.
‘OutC’	Volume pulse OutC selected, flashes when IO-Link is active.
 ‘OutC’	Volume pulse OutC set.
‘OutB’	Switching output OutB selected.
‘OutB’ 	Switching output OutB set.
‘Pulse’	Volume pulse selected.
‘Anlg’	Analogue output selected.
Information/input display	
	Graphic display of flow measurement
	Graphic display of volume measurement
‘q’	Input signal flow rate selected.
‘t’	Input signal temperature selected.
‘Lock’	Security code activated.
‘Spec’	Special menu selected.
‘Option’	Illuminates when parameters having a special influence on the measured value indicator have been changed compared to the factory setting: reference condition (standard), gas.

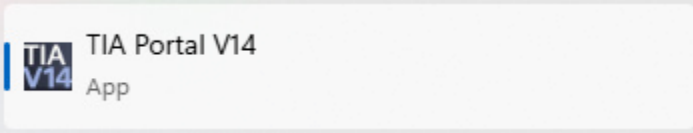
Tab. 2: Symbols on the display

3 Software Configuration

This chapter describes Siemens **TIA Portal** software configurations such as creating a new project and adding the controller to the project, installing **CPX-AP-.-PN** GSDML file, configuring CPX-AP devices, configuring the SFAB flow sensor and adding **Festo_SFAB_PN_IOLink** library to the project.

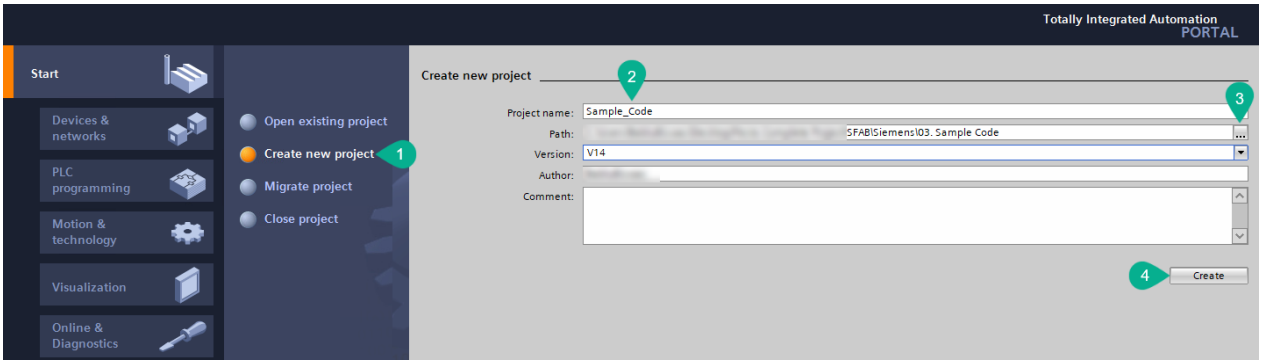
3.1 Creating a New Project and Adding the Controller in TIA Portal

Step 1



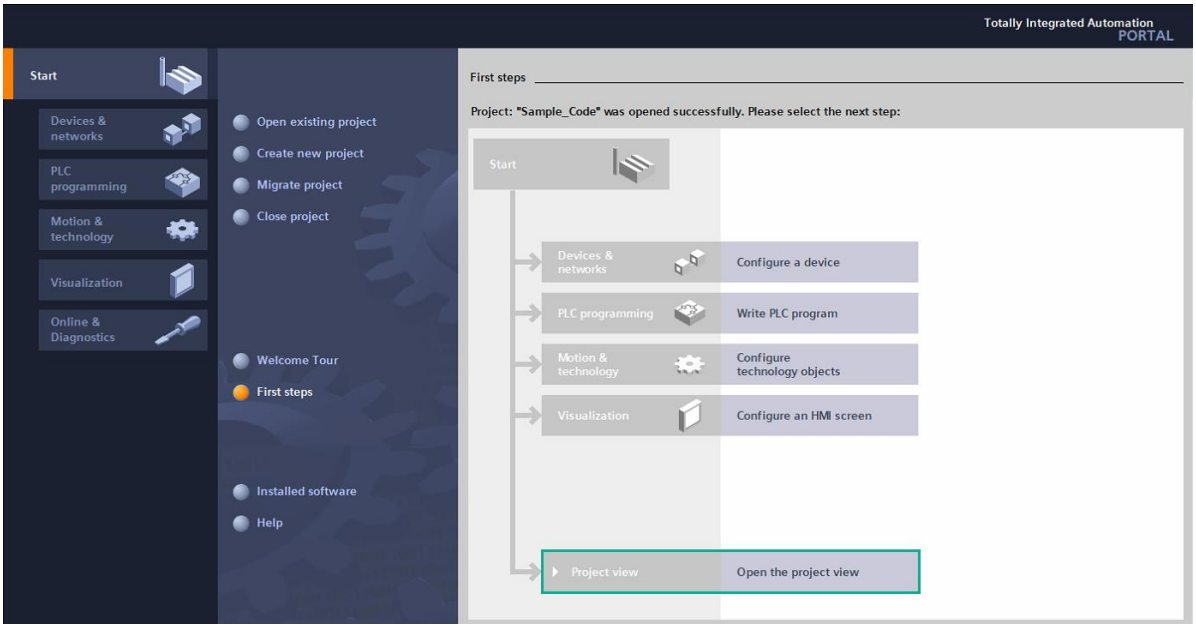
Open the **TIA Portal V14** software (**Windows Start >> Siemens Automation >> TIA Portal V14**).

Step 2



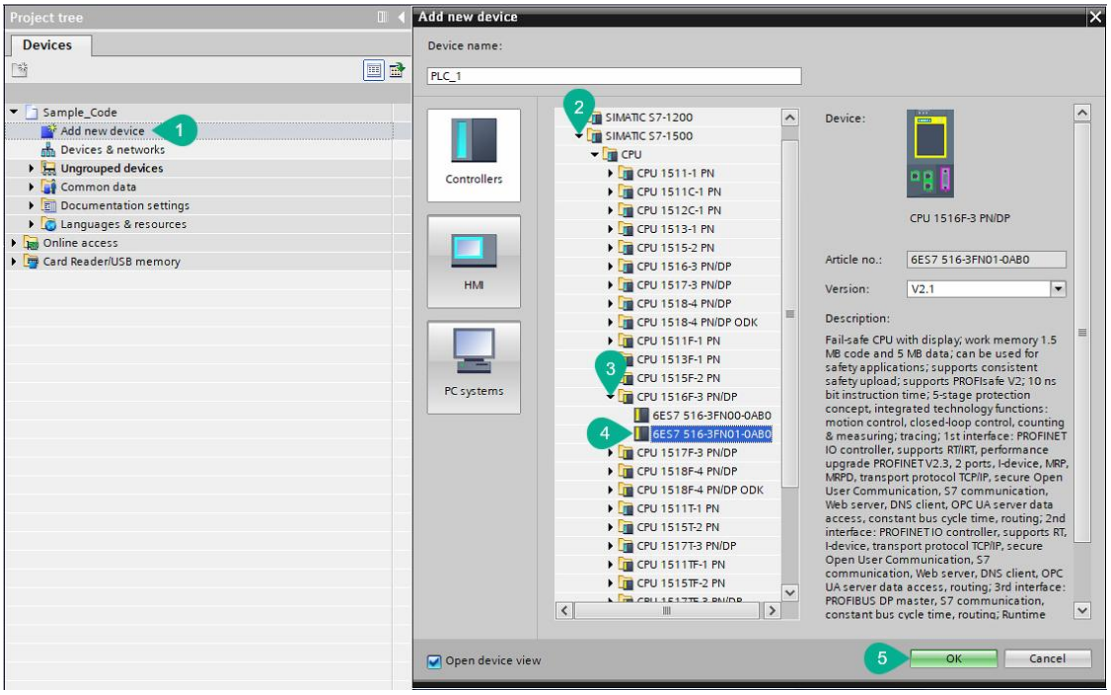
1. Click on **Create new project** option from **Start** page.
2. Enter the **Project Name** as per requirement on the **Project name** field.
3. Select the **Path** where the project has to be saved.
4. Click on **Create** button to create a new project.

Step 3



- Click on **Project view**, which is highlighted in green, to proceed to the detailed working environment.

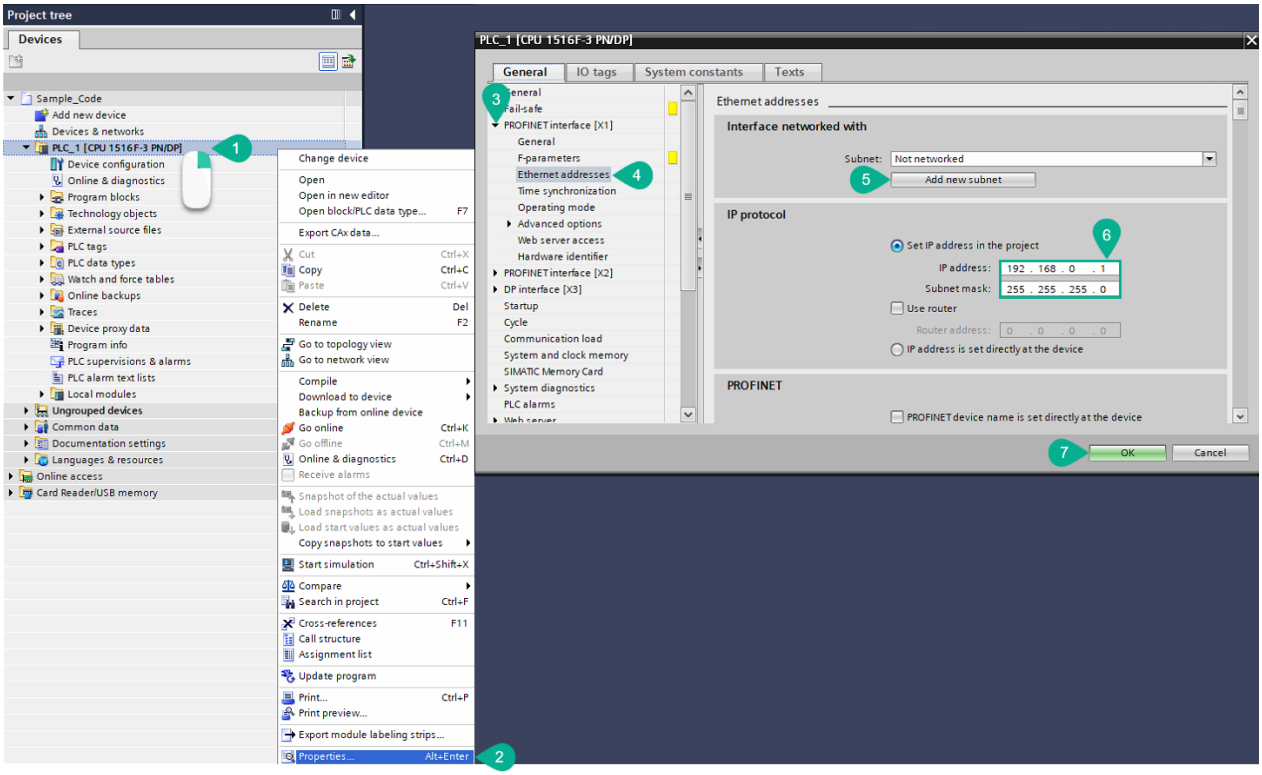
Step 4



1. In the **Project tree**, right-click on **Sample_Code** and select **Add new device**.
2. In the **Add new device** window, select **SIMATIC S7-1500** under **Controllers**.
3. Expand **SIMATIC S7-1500** and select **CPU 1516F-3 PN/DP**.
4. Select article number **6ES7 516-3FN01-0AB0**.
5. Click **OK** to add the device, with **Open device view** checkbox selected.

3.2 PLC Built-in Ethernet Port Configuration

Step 1



1. In the **Project tree**, right-click on **PLC_1 [CPU 1516F-3 PN/DP]**.
2. Select **Properties...** from the context menu.
3. In the **Properties** window, go to **PROFINET interface [X1]**.
4. Select **Ethernet addresses**.
5. Click **Add new subnet** to create a new subnet.
6. Enter the **IP address** as **192.168.0.1** and **Subnet mask** as **255.255.255.0**.
7. Click **OK** to apply the settings.

Note

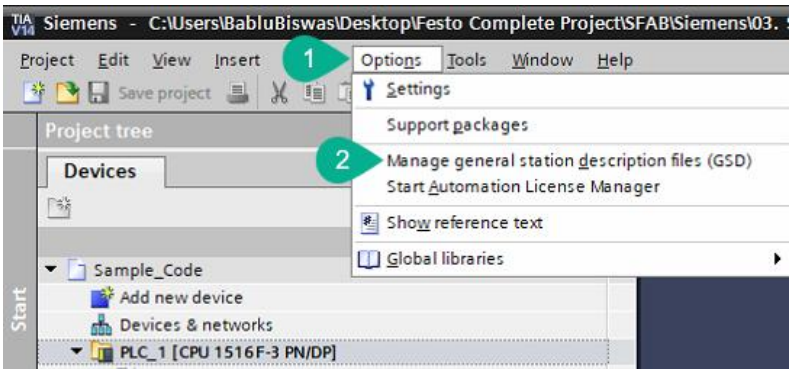
- The PROFINET Interface address of the PLC & PC must be in the same range.

3.3 Adding the CPX-AP-.-PN GSDML File to TIA Portal

Note

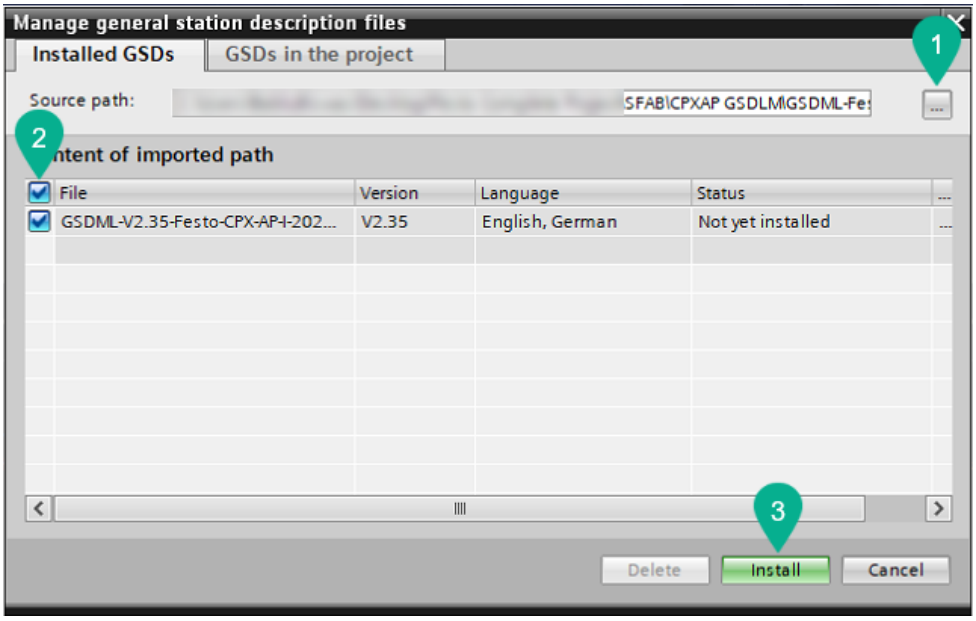
- Download the latest GSDML file from the Festo Support Portal.

Step 1



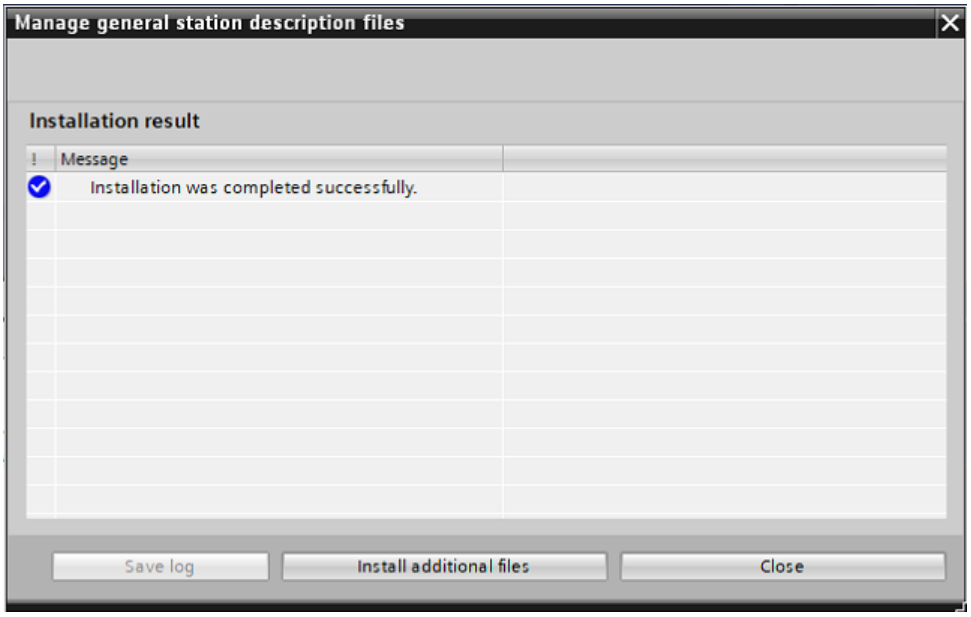
1. Click on **Options** in the menu bar.
2. Select **Manage General Station Description files (GSD)**.

Step 2



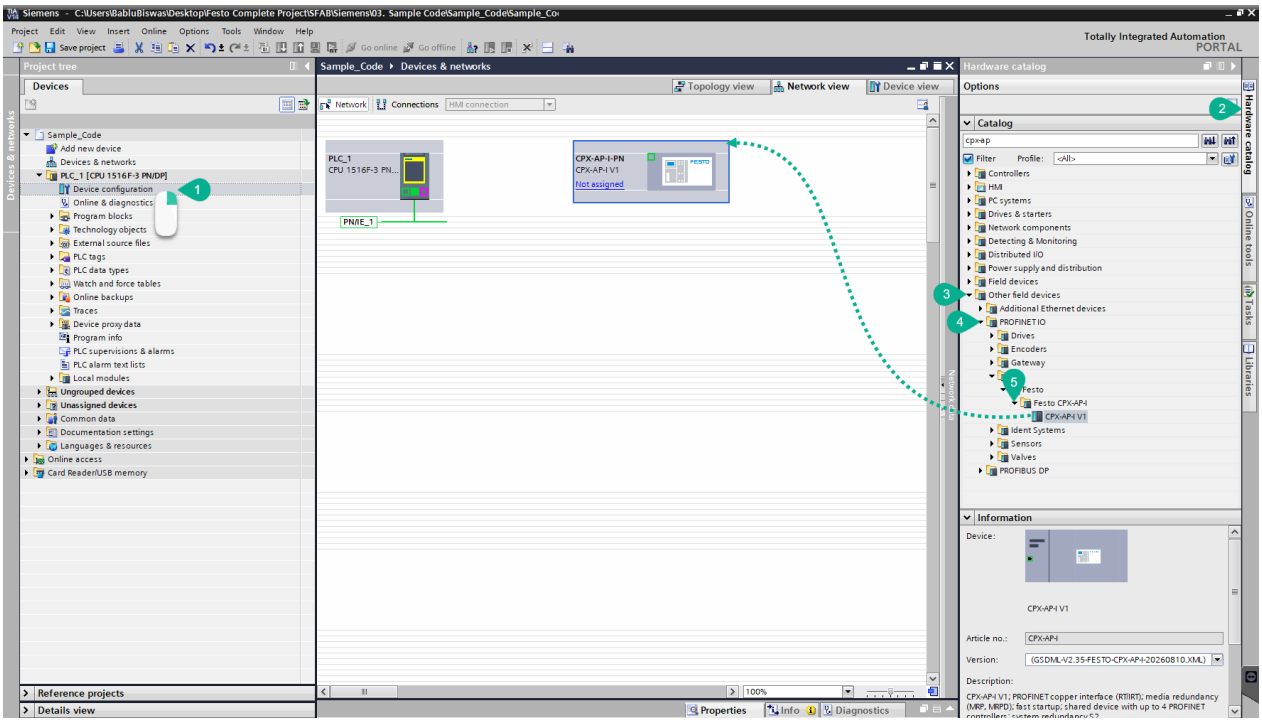
1. Click the **(...)** button next to **Source path** to browse and select the folder containing the GSD file (e.g., **SFAB\CPXAP GSDLM**).
2. Select the checkbox next to the file **GSDML-V2.35-Festo-CPX-AP-I-202...** under **Content of imported path**.
3. Click **Install** to install the selected GSD file.

Once the installation is completed, the installation wizard will be shown as below.



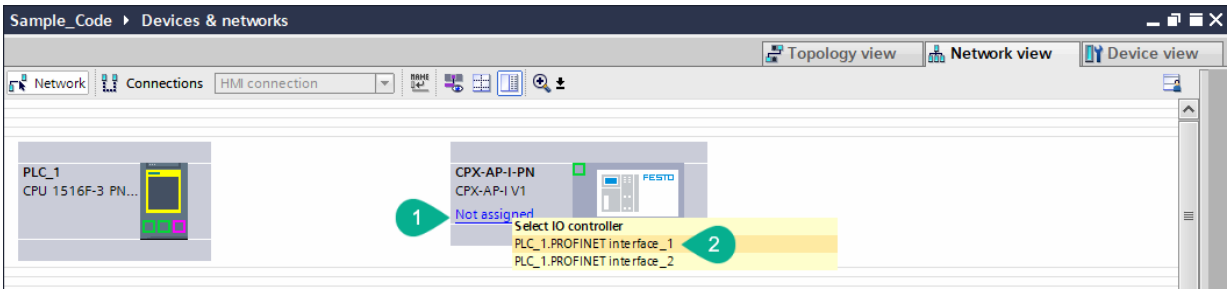
3.4 Adding the CPX-AP-.-PN Module to Network View

Step 1



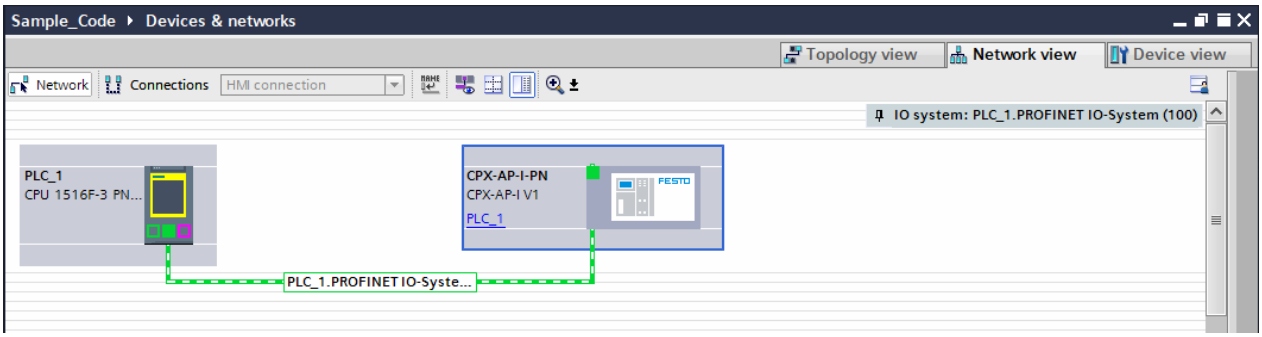
1. In the **Project tree**, click on **Device configuration** under **PLC_1 [CPU 1516F-3 PN/DP]**.
2. In the **Hardware catalog**.
3. Expand **Other field devices** in the catalog tree.
4. Expand **PROFINET IO**, then **Festo**, then **Festo CPX-AP-I**.
5. Expand **CPX-AP-I V1** and drag and drop the **CPX-AP-A V1** module into the **Network view**, as shown.

Step 2



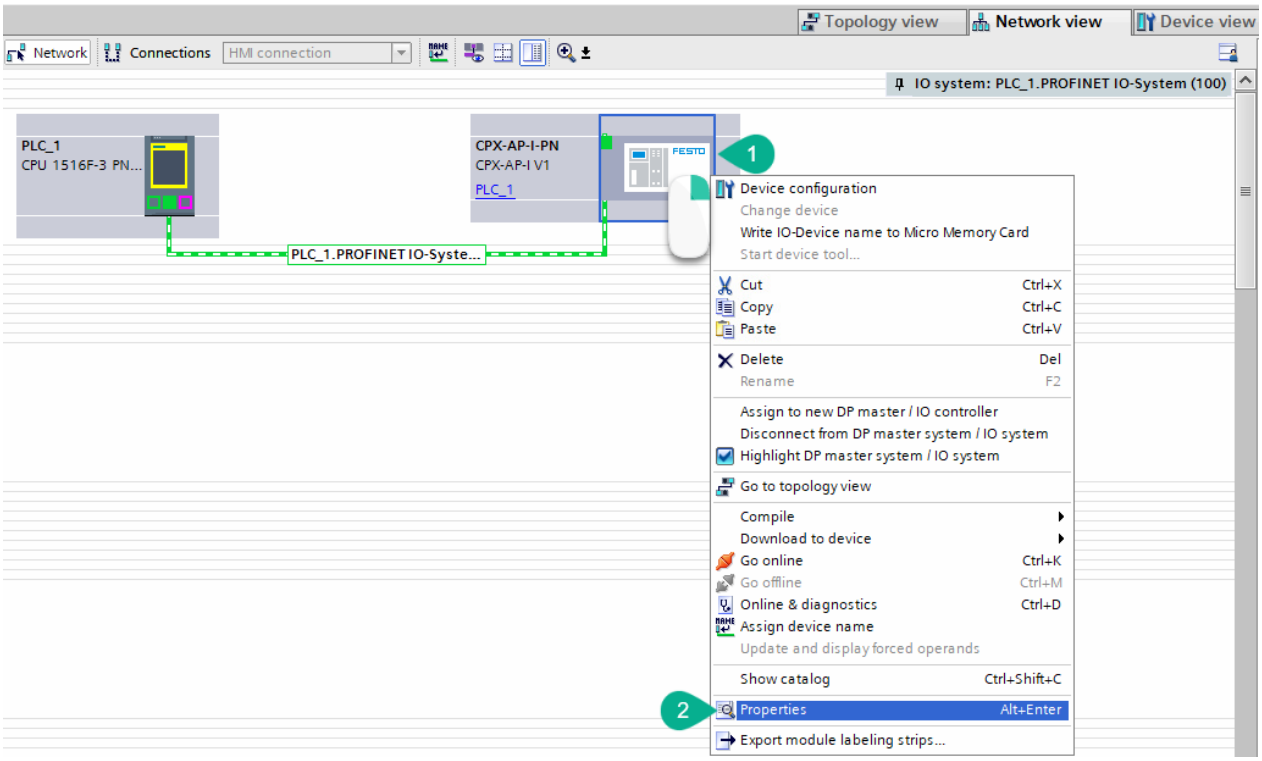
1. In the **Network view**, click on Not assigned below the CPX-AP-I-PN [CPX-AP-I V1] device.
2. From the drop-down list, select **PLC_1.PROFINET interface_1** to assign it as the IO controller.

Once the PLC is connected successfully to the device, it will look as shown below in the image:



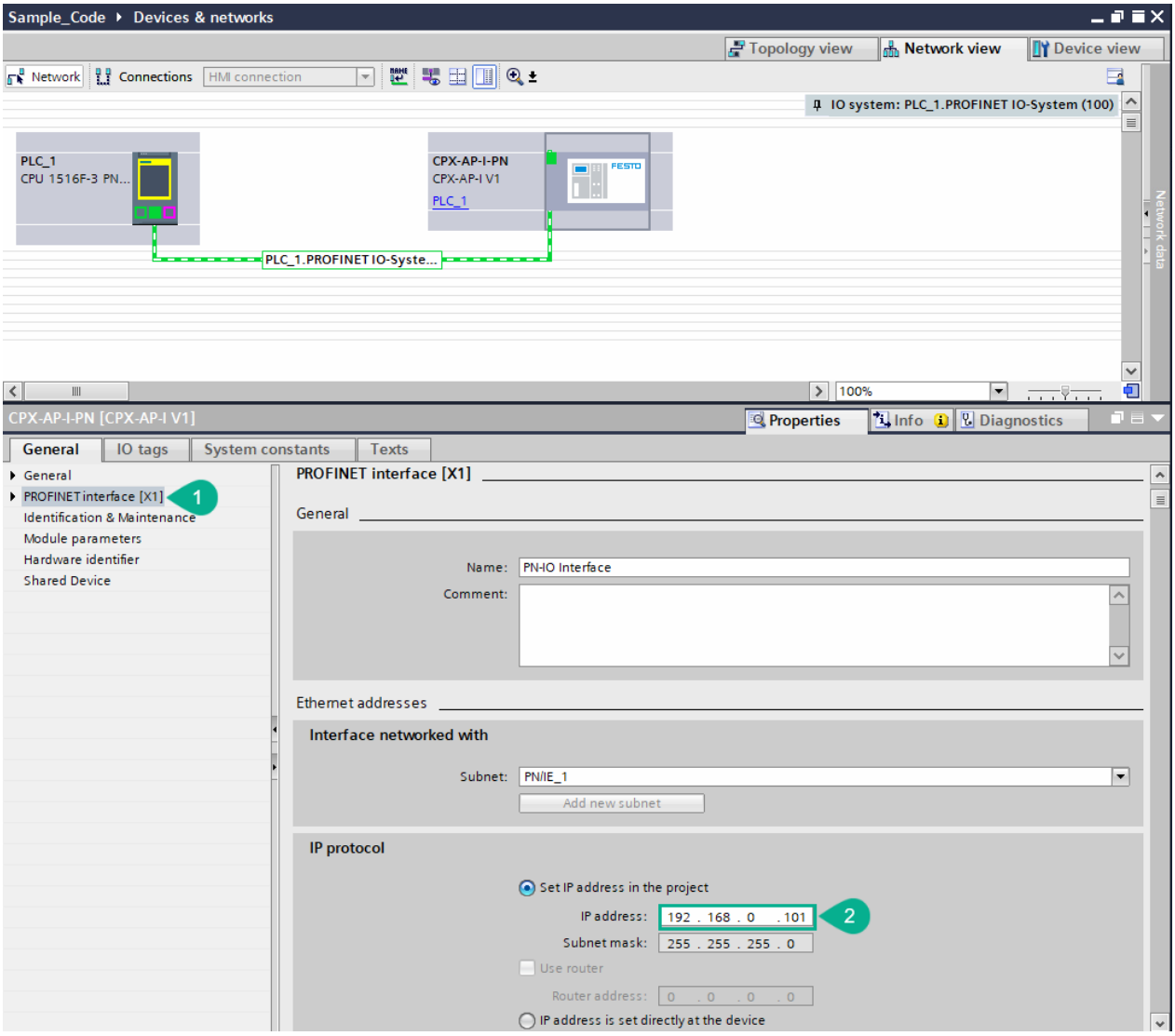
3.5 CPX-AP-I-PN IP Address Configuration

Step 1



1. Right-click on the **CPX-AP-I-PN [CPX-AP-I V1]** device in the **Network view**.
2. From the context menu, select **Properties...** to open the device configuration properties.

Step 2



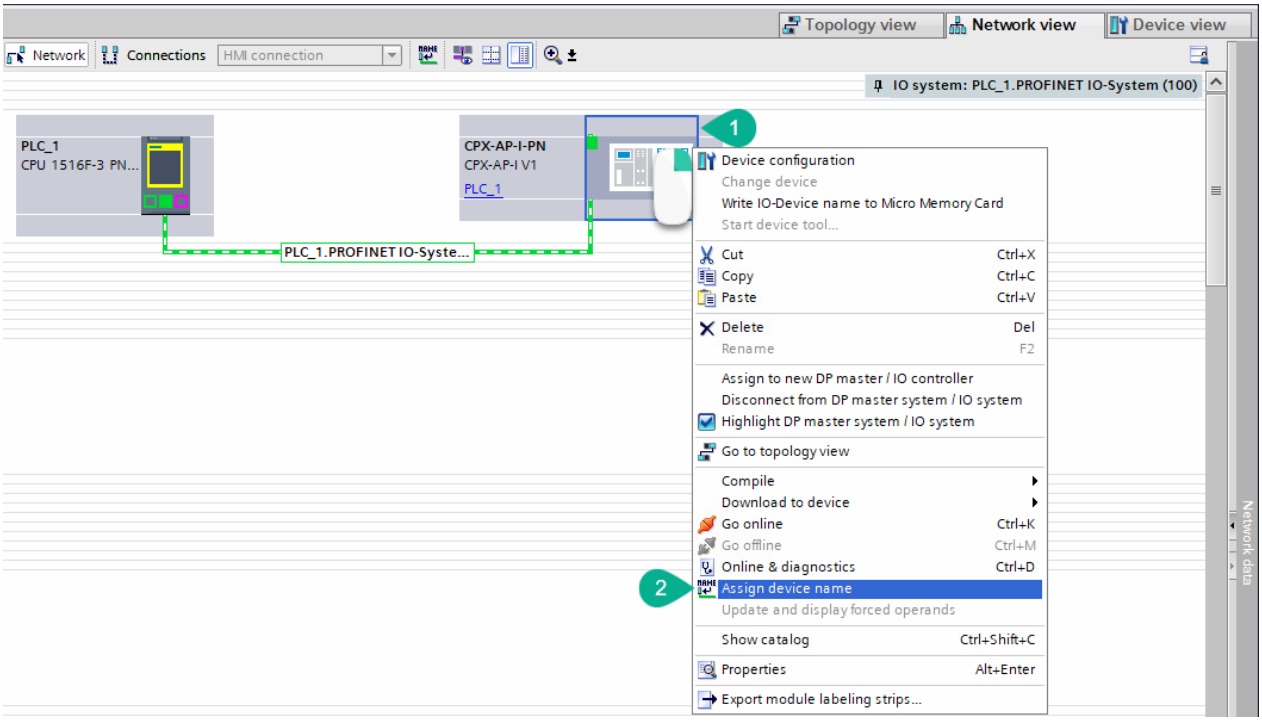
1. In the **Properties** window of **CPX-AP-I-PN**, select **PROFINET interface [X1]** under the **General** tab.
2. Under **IP protocol**, Enter the **IP address** as **192.168.0.101**, with **Subnet mask** as **255.255.255.0**.

Note

- The IP Address of the PROFINET interface of the CPX-AP-I-PN module, S7-1500 PLC must be in the same range.

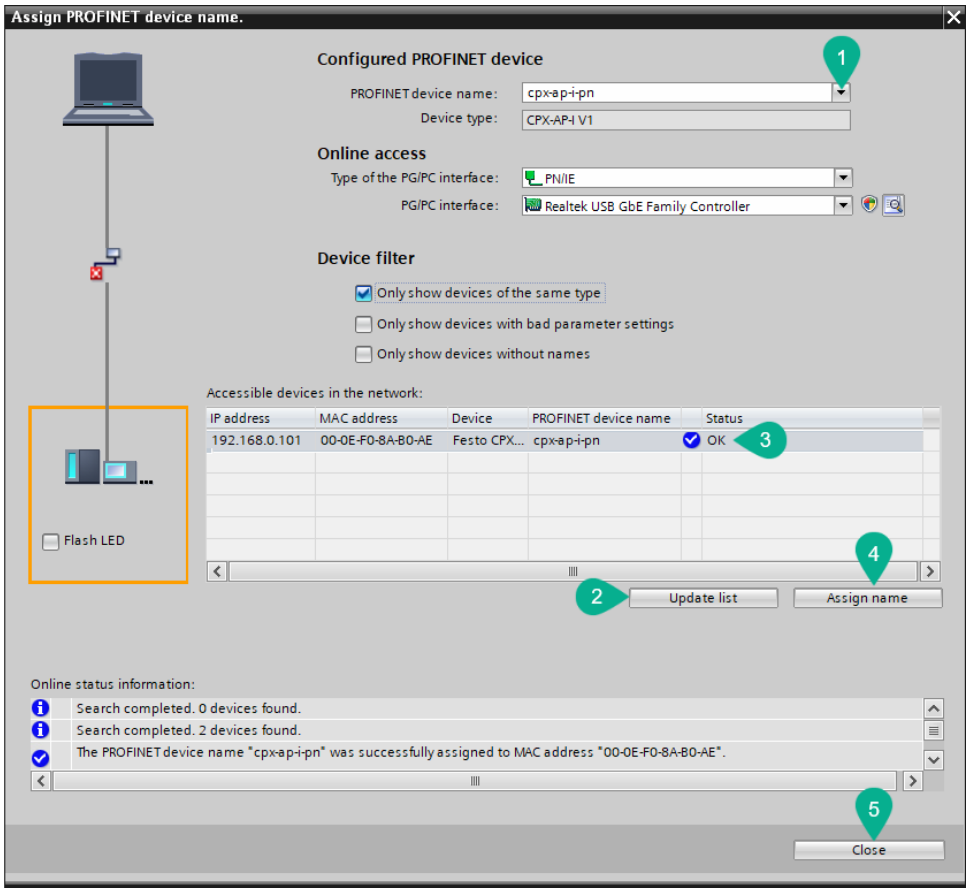
3.6 Assigning PROFINET Device Name to CPX-AP-.-PN Module

Step 1



1. Right-click on the **CPX-AP-I-PN** device in the **Network view**.
2. From the context menu, select **Assign device name**.

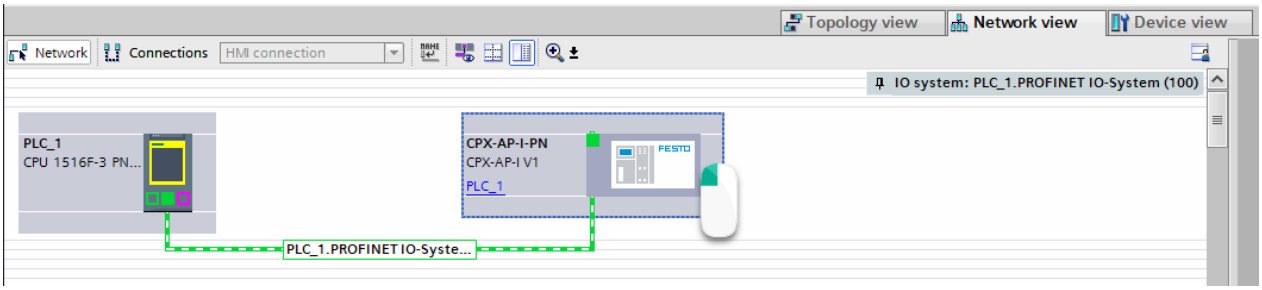
Step 2



1. Under **Configured PROFINET device**, confirm that **PROFINET device name** is set to **cpx-ap-i-pn**.
2. Click **Update list**, to refresh the list of accessible devices.
3. Once the scan is completed, the **CPX-AP-A-PN** module will appear, then select the **CPX-AP-I_PN**.
4. Click **Assign name** to assign the configured PROFINET device name to the selected device.
5. Click **Close** to close the **Assign PROFINET device name** window.

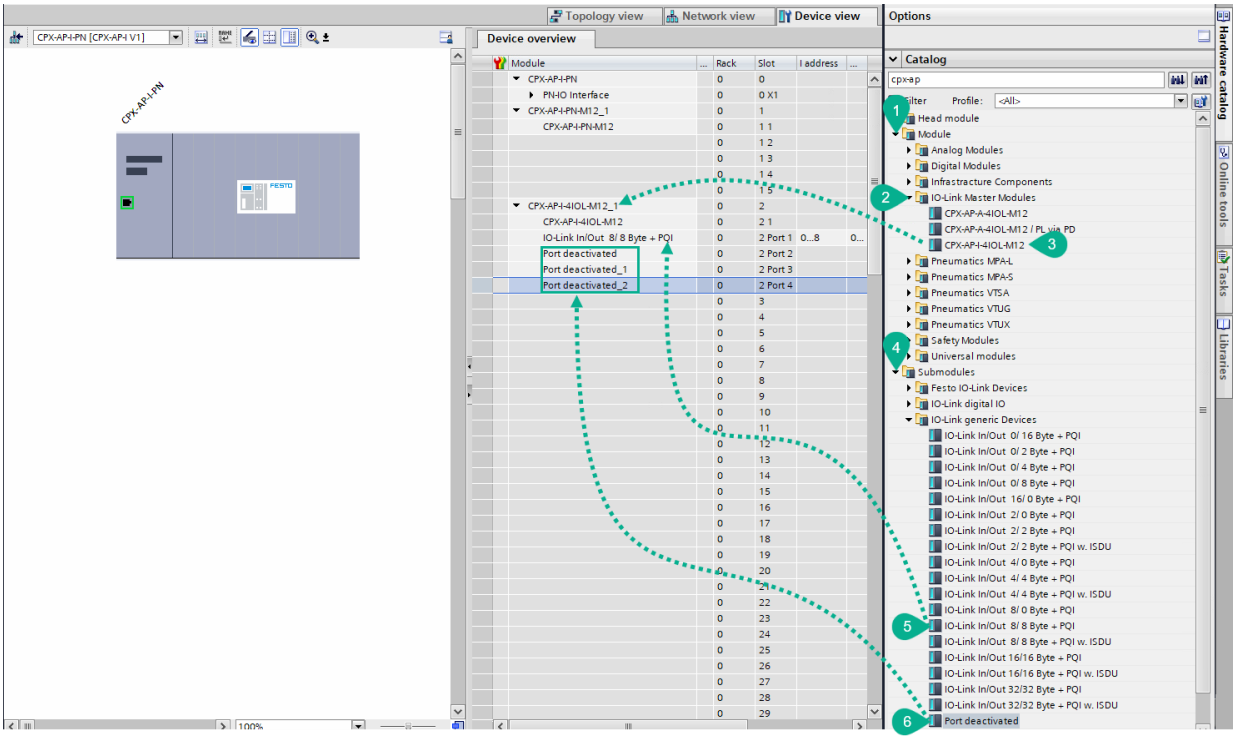
3.7 Configuring CPX-AP-A Devices in TIA Portal

Step 1



- In the **Network view**, double-click on the **CPX-AP-I-PN** device icon to open the **Device view**.

Step 2



1. In the **Hardware catalog**, expand the **Module** categories.
2. Expand **IO-Link Master Modules** in the catalog tree.
3. Select **CPX-AP-A-4IOL-M12** and drag it into the **Device overview**.
4. Expand **Submodules** in the catalog tree.
5. Expand **IO-Link generic Devices** and select **IO-Link In/Out 8/ 8 Byte + PQI**, then drag it into the **Device overview**.
6. For the remaining ports (**Port 2, Port 3, Port 4**), drag and drop **Port deactivated** from the catalog to deactivate unused ports, as shown.

Note

- The above configuration is based on Topology Overview shown on Chapter 1.3.
- Festo SFAB Flow Sensor is connected to CPX-AP-A-4IOL-M12 master module in Port 1.

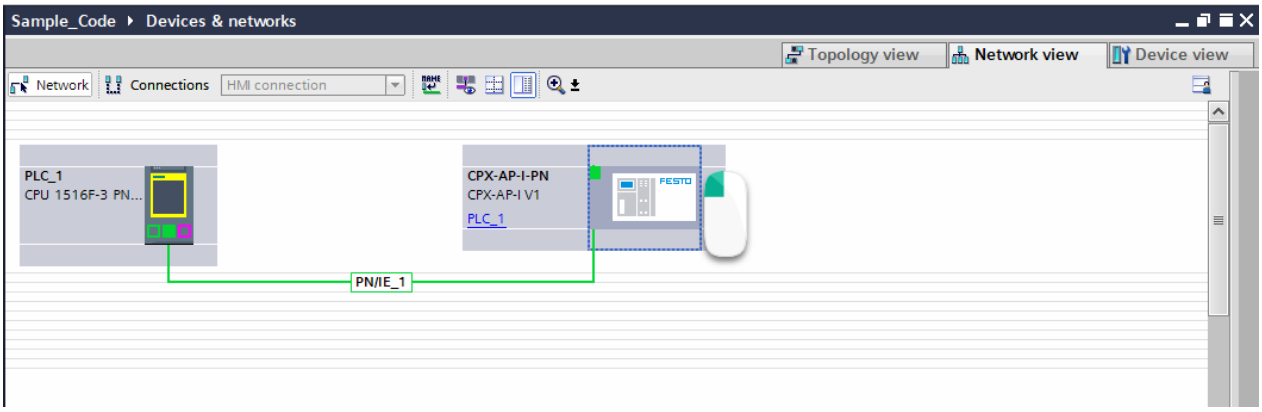
3.8 Variant Selection of CPX-AP IO-Link Master Module

The **Technical Data** of the **SFAB-.-PNLK Flow Sensor** is shown below. The **Process Data In** and **Process Data Out** sizes are highlighted in yellow color boxes, indicating **0 Bit Process Data Out** and **64 Bits (8 Byte) Process Data In**.

Characteristics	Specification
Protocol	IO-Link
Revision ID	V1.1
Device profiles	Smart Sensor - SSP 4.1.2 Firmware Update identification and diagnosis
	Function Measurement data, standard resolution Function Multiple switching signal Function Teach single value Function Extended identification Function Locator Function Product URI
Transmission rate	COM3
SIO-Mode support	Yes
Port type	class A
Process data output length	0 bit
Process data input length	64 bit
Process data content IN	Flow measurement value 16 bit MDC Flow monitoring 2 bit SSC Temperature measurement value 16 bit MDC Temperature monitoring 2 bit SSC Volume / mass pulse 1 bit SSC
Service data IN	Volume /mass measurement value 32 bit
Min. cycle time	1,2 ms
Data storage required	0,5 kByte

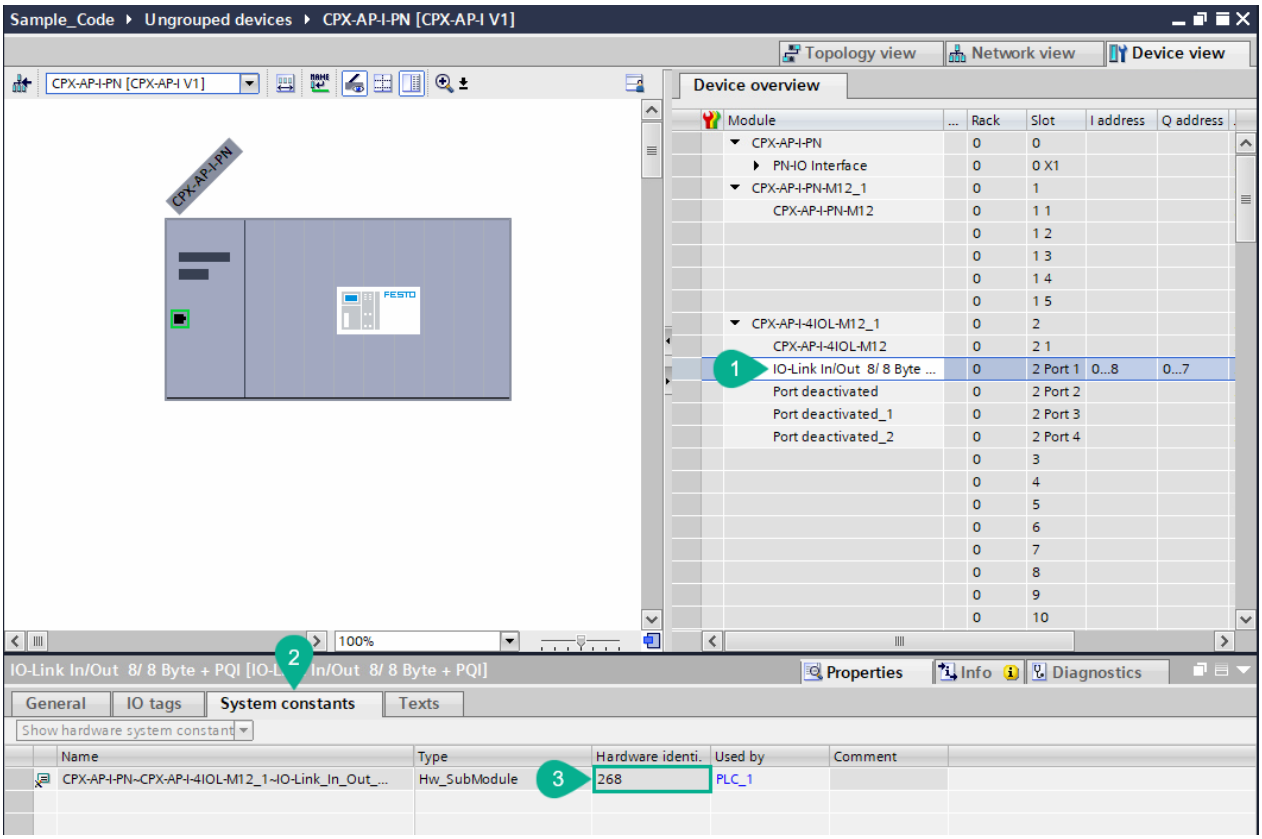
3.9 Finding Hardware ID of CPX-AP IO-Link Master Port

Step 1



- In the **Network view**, double-click on the **CPX-AP-I-PN** device icon to open the **Device view**.

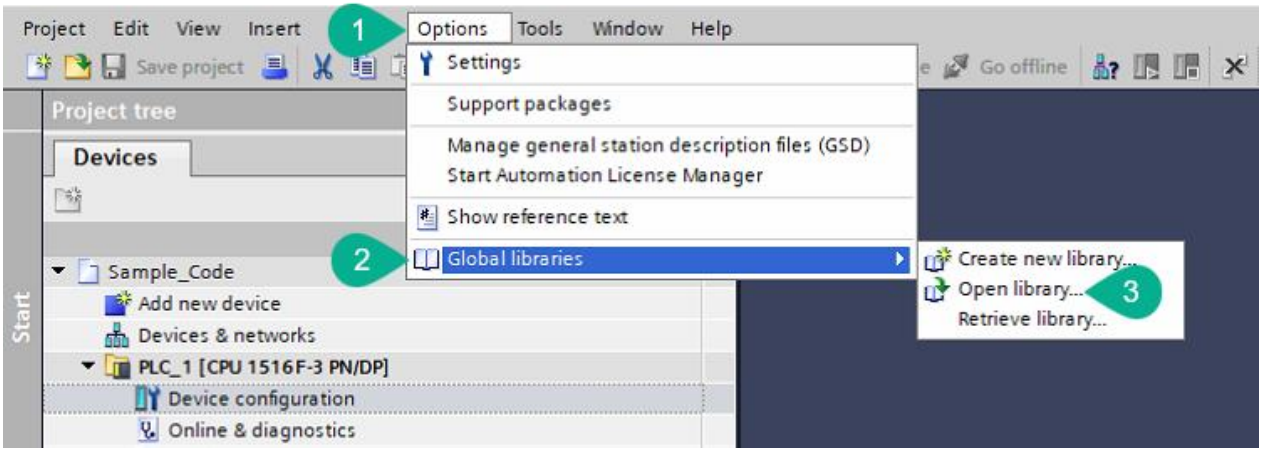
Step 2



1. In the **Device overview**, select the IO-Link In/Out 8/8 byte + PQI.
2. Click on the **System constants** tab in the lower properties window to view the hardware identifiers.
3. Note down the **Hardware ID** of the **CPX-AP IO-Link Master Port 1,** where the **SFAB Flow Sensor** is connected.

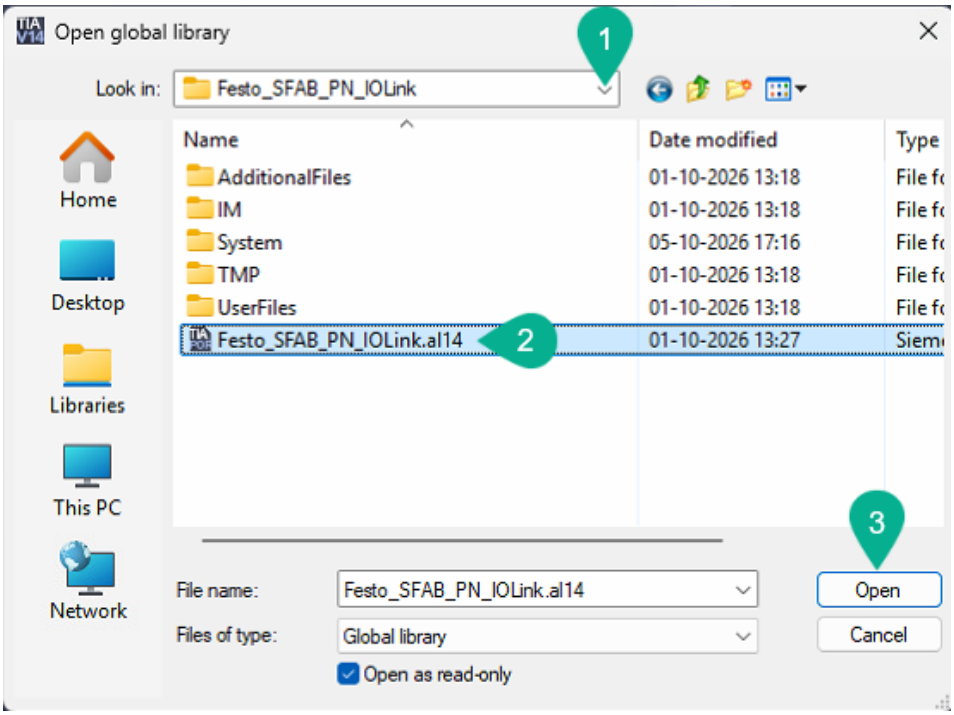
3.10 Installing the Festo_SFAB_PN_IOLink Library in TIA Portal

Step 1



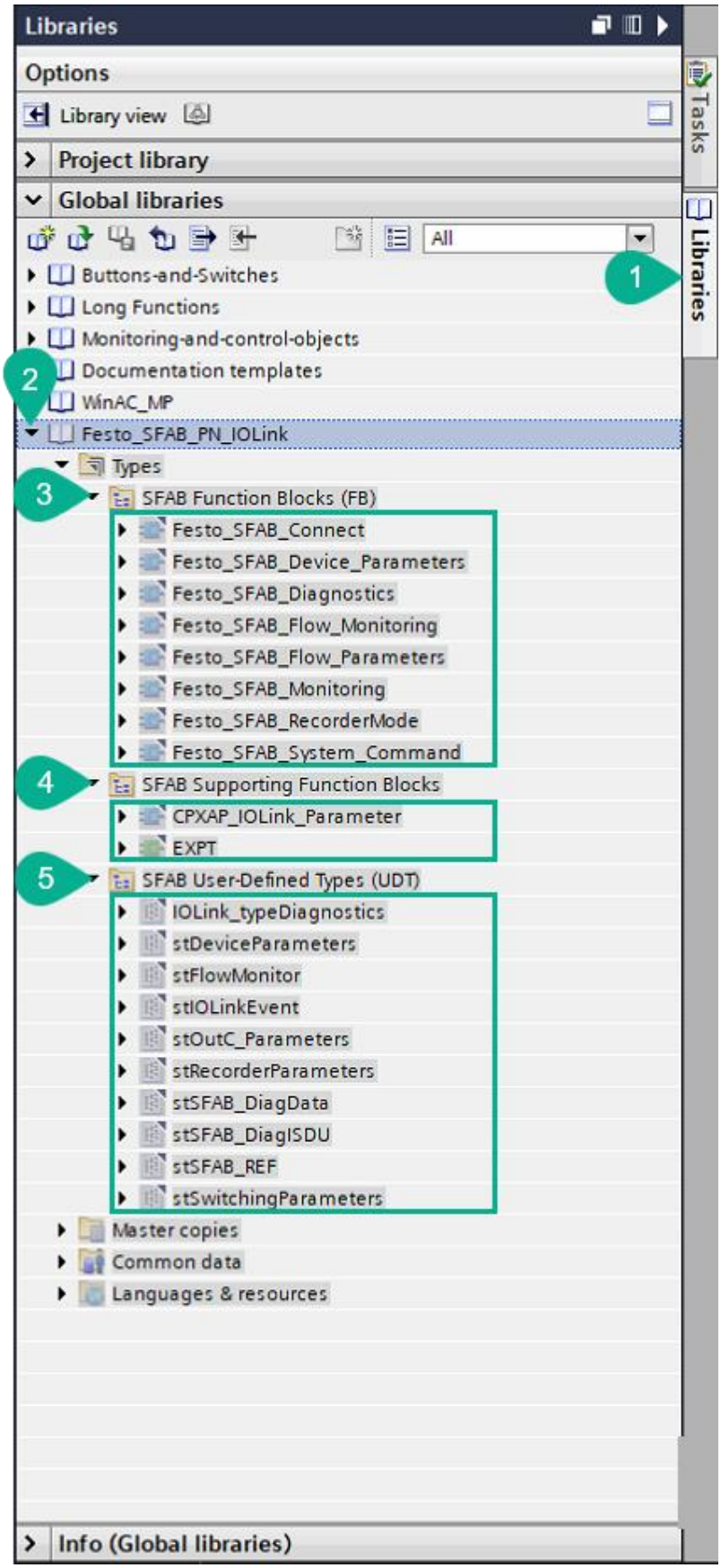
1. Click on **Options** in the menu bar.
2. Select **Global libraries** to expand the submenu.
3. Select **Open library...** to open an existing global library.

Step 2



1. In the **Open global library** window, under **Look in**, confirm the folder is set to **Festo_SFAB_PN_IOLink**.
2. Select the file **Festo_SFAB_PN_IOLink.al14** from the file list.
3. Click **Open** to open the selected global library.

Step 3



1. Click on the **Libraries** tab on the right-side panel to open the **Libraries** window.
2. Under **Global libraries**, expand **Festo_SFAB_PN_IOLink**.
3. Expand **Types**, then **SFAB Function Blocks (FB)**to view the available function blocks:

- **Festo_SFAB_Connect**
- **Festo_SFAB_Device_Parameters**
- **Festo_SFAB_Diagnostics**
- **Festo_SFAB_Flow_Monitoring**
- **Festo_SFAB_Flow_Parameters**
- **Festo_SFAB_Monitoring**
- **Festo_SFAB_RecorderMode**
- **Festo_SFAB_System_Command**

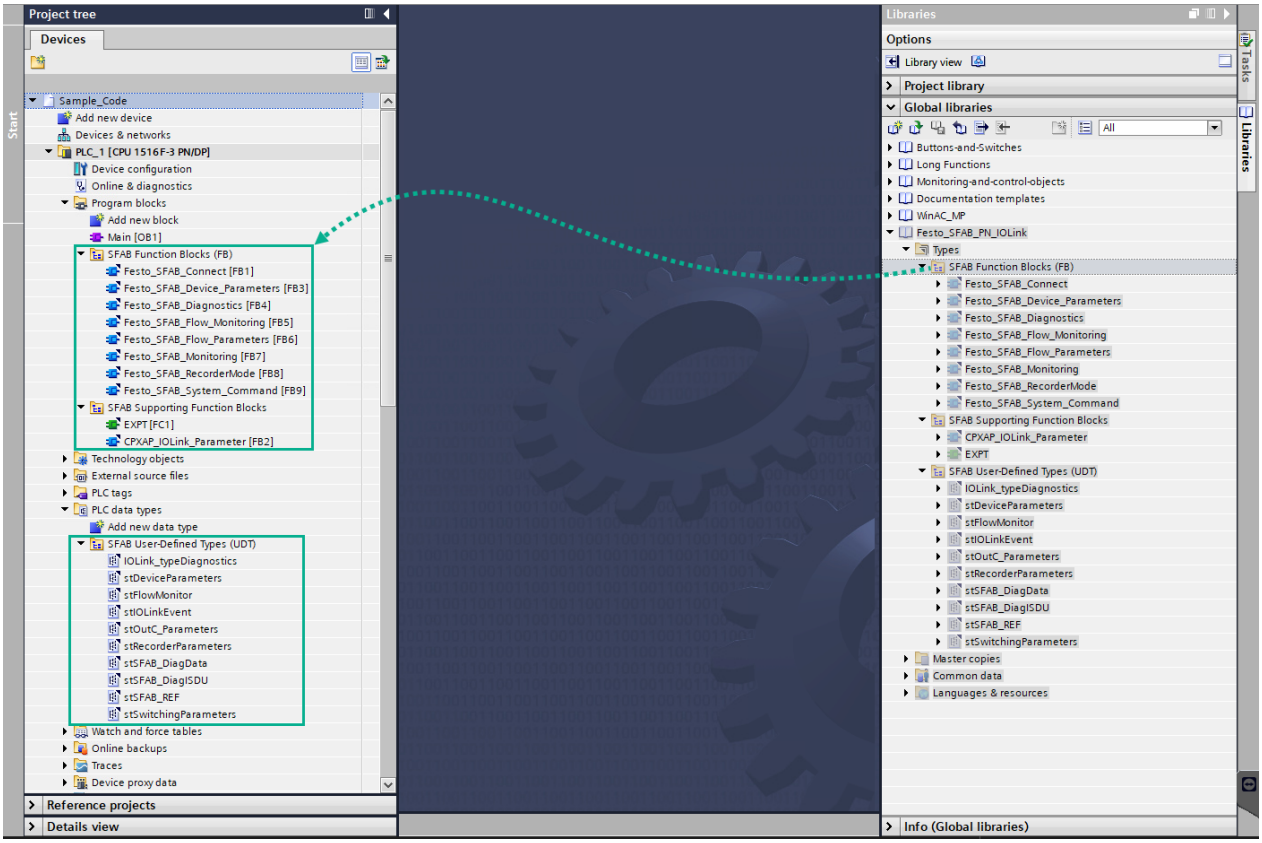
4. Additionally, note the **SFAB Supporting Function Blocks**:
   - **CPXAP_IOLink_Parameter**
   - **EXPT**
5. Under UDTs, the following user-defined types are available:
   - **IOLink_typeDiagnostics**
   - **stDeviceParameters**
   - **stFlowMonitor**
   - **stIOLinkEvent**
   - **stOutC_Parameters**
   - **stRecorderParameters**
   - **stSFAB_DiagData**
   - **stSFAB_DiagISDU**
   - **stSFAB_REF**
   - **stSwitchingParameters**

The above supporting functions & supporting files are user data type files which are used in **CPXAP_IOLink_Parameter** block and **SFAB** blocks.

➔ **Note**

- User has to execute one function block at a time in program, except **Festo_SFAM_Connect** & **Festo_SFAM_Monitoring** block.

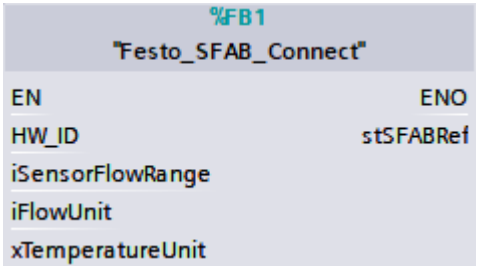
3.11 Adding Function blocks and Supporting files to the Program



Drag and drop the Folder **SFAB Function Blocks (FB)** from the library to the folder **Program Blocks** in the project.

4 Festo SFAB PN IOLink Library Function Blocks Description

4.1 Festo SFAB Connect



4.1.1 Festo_SFAB_Connect Block Input Variables

Input Variables	Data Type	Description
HW_ID	HW_ANY	Hardware ID of the CPX-AP IO-Link Master Module
iSensorFlowRange	INT	Connected SFAB Sensor Flow Range Variant Selection: **0** = SFAB_10, **1** = SFAB_50, **2** = SFAB_200, **3** = SFAB_600, **4** = SFAB_1000
iFlowUnit	INT	Flow Rate Unit Type Selection: **0** = L_Min, **2** = M3_Hour, **3** = Scfm, **4** = G_Min
xTemperatureUnit	BOOL	Temperature Unit | **TRUE**: °F Fahrenheit | **FALSE**: °C Celsius

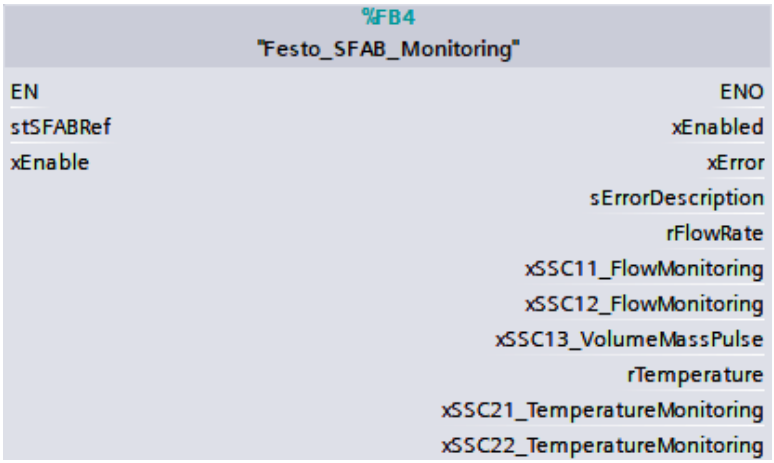
Table 4.1: Festo_SFAB_Connect Block Input Variables descriptions

4.1.2 Festo_SFAB_Connect Block Output Variables

Output Variables	Data Type	Description
stSFABRef	STRUCT of the type (stSFAB_REF)	SFAB Sensor Reference Structure (Refer Chapter 4.9.1)

Table 4.2: Festo_SFAB_Connect Block Output Variables description

4.2 Festo SFAB Monitoring



4.2.1 Festo_SFAB_Monitoring Block Input Variables

Input Variables	Data Type	Description
stSFABRef	STRUCT of the type (stSFAB_REF)	SFAB Sensor Reference Structure (Refer Chapter 4.9.1)
xEnable	BOOL	TRUE: Enable Function Block

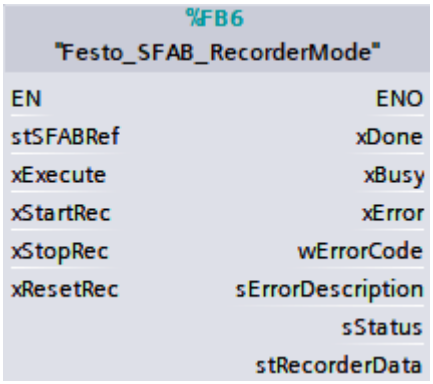
Table 4.3: Festo_SFAB_Monitoring Block Input Variables descriptions

4.2.2 Festo_SFAB_Monitoring Block Output Variables

Output Variables	Data Type	Description
xEnabled	BOOL	TRUE: Function Block is Enabled and Running
xError	BOOL	TRUE: Error while Reading Process Data
sErrorDescription	STRING	Function Block Error Code (Refer Chapter 4.11)
rFlowRate	REAL	MDC1 Flow Measurement Value | Unit: As per user selection
xSSC11_FlowMonitoring	BOOL	SSC1.1 Flow Rate Monitoring OutA | TRUE: On | FALSE: Off
xSSC12_FlowMonitoring	BOOL	SSC1.2 Flow Rate Monitoring OutB | TRUE: On | FALSE: Off
xSSC13_VolumeMassPulse	BOOL	SSC1.3 Volume / Mass Pulse OutC | TRUE: On | FALSE: Off
rTemperature	REAL	MDC2 Temperature Measurement Value | Unit: As per user selection
xSSC21_TemperatureMonitoring	BOOL	SSC2.1 Temperature Monitoring | TRUE - On | FALSE - Off
xSSC22_TemperatureMonitoring	BOOL	SSC2.2 Temperature Monitoring | TRUE - On | FALSE - Off

Table 4.4: Festo_SFAB_Monitoring Block Output Variables descriptions

4.3 Festo SFAB RecorderMode



4.3.1 Festo_SFAB_RecorderMode Block Input Variables

Input Variables	Data Type	Description
stSFABRef	STRUCT of the type (stSFAB_REF)	SFAB Sensor Reference Structure (Refer Chapter 4.9.1)
xExecute	BOOL	Rising Edge - Read Recorder Mode Data
xStartRec	BOOL	Rising Edge - Run / Resume Recorder
xStopRec	BOOL	Rising Edge - Pause Recorder
xResetRec	BOOL	Rising Edge - Reset Recorder Statistics

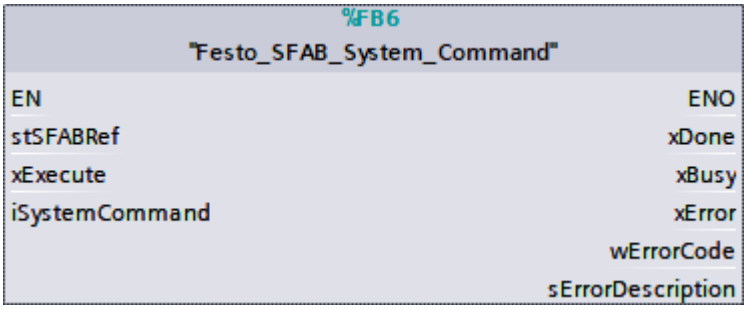
Table 4.5: Festo_SFAB_RecorderMode Block Input Variables descriptions

4.3.2 Festo_SFAB_RecorderMode Block Output Variables

Output Variables	Data Type	Description
xDone	BOOL	TRUE = Operation Executed Successfully
xBusy	BOOL	TRUE = Operation is Executing
xError	BOOL	TRUE = Error while Executing
wErrorCode	WORD	Function Block Error Code
sErrorDescription	STRING	Function Block Error Code (Refer Chapter 4.11)
sStatus	STRING	Recorder Mode Status
stRecorderData	STRUCT of the type (stRecorderParameters)	Recorder Mode Data Structure (Refer Chapter 4.9.2)

Table 4.6: Festo_SFAB_RecorderMode Block Output Variables descriptions

4.4 Festo SFAB System Command



4.4.1 Festo_SFAB_System_Command Block Input Variables

Input Variables	Data Type	Description
stSFABRef	STRUCT of the type (stSFAB_REF)	SFAB Sensor Reference Structure (Refer Chapter 4.9.1)
xExecute	BOOL	Rising Edge: Execute IO-Link System Command
iSystemCommand	INT	SFAB IO-Link System Commands (Refer Chapter 4.4.3)

Table 4.7: Festo_SFAB_System_Command Block Input Variables descriptions

4.4.2 Festo_SFAB_System_Command Block Output Variables

Output Variables	Data Type	Description
xDone	BOOL	TRUE - Command Executed Successfully
xBusy	BOOL	TRUE - Command is Executing
xError	BOOL	TRUE - Error while executing System Command
wErrorCode	WORD	Function Block Error Code
sErrorDescription	STRING	Enumeration of Function Block Error Code (Refer Chapter 4.11)

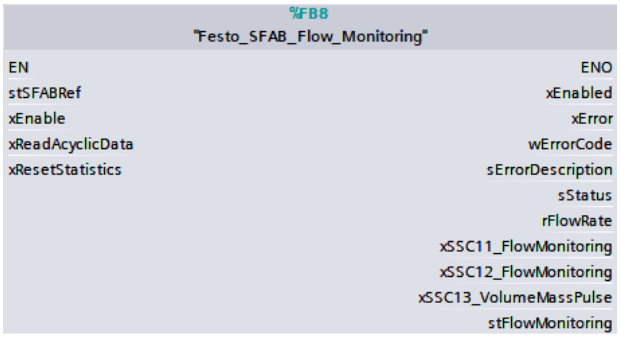
Table 4.8: Festo_SFAB_System_Command Block Output Variables descriptions

4.4.3 iSystemCommand

Command Value [Dec]	System Command	Description
65	SP1 Single Value Teach	Determine the teach point for switching point SP1.
66	SP2 Single Value Teach	Determine the teach point for switching point SP2.
75	Specific Teach	Run 2-point teach-in according to the teach flag.
76	Teach Cancel	Cancel teach-in sequence.
126	Locator Start	Start double flashing of the display for localization.
127	Locator Stop	Stop double flashing of the display for localization.
128	Device Reset	Warm start of the device.
129	Application Reset	Reset technology-specific application.
130	Restore Factory Settings	Reset applicable settings to factory settings.
131	Back To Box	Reset all parameters to the original delivery values.
160	Reset Minimum MDC1	Reset minimum measured value for the flow rate.
161	Reset Maximum MDC1	Reset maximum measured value for the flow rate.
166	Reset Minimum MDC2	Reset minimum measured value for the temperature.
167	Reset Maximum MDC2	Reset maximum measured value for the temperature.
168	Adjust Flow Zero Point	Run user-defined adjustment of the Flow zero point.
176	Reset Recorder	Reset the volume value / mass value / energy value of the recorder to zero.
177	Run or Resume Recorder	Start or resume recording on the recorder.
178	Pause Recorder	Pause the recorder

Table 4.9: iSystemCommand descriptions

4.5 Festo SFAB Flow Monitoring



4.5.1 Festo_SFAB_Flow_Monitoring Block Input Variables

Input Variables	Data Type	Description
stSFABRef	STRUCT of the type (stSFAB_REF)	SFAB Sensor Reference Structure (Refer Chapter 4.9.1)
xEnable	BOOL	TRUE = Enable Function Block
xReadAcyclicData	BOOL	Rising Edge = Update Flow Rate Monitoring Parameters
xResetStatistics	BOOL	Rising Edge = Reset Min Max Flow Rate Statistics

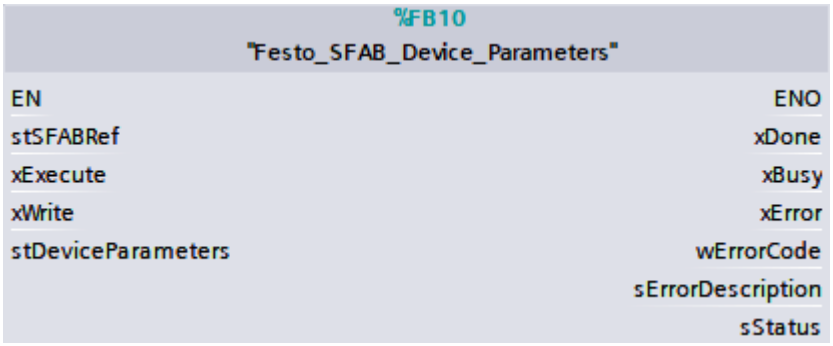
Table 4.10: Festo_SFAB_Flow_Monitoring Block Input Variables descriptions

4.5.2 Festo_SFAB_Flow_Monitoring Block Output Variables

Output Variables	Data Type	Description
xEnabled	BOOL	TRUE = Function Block is Enabled and Running
xError	BOOL	TRUE = Error while Monitoring Flow Rate Parameters
wErrorCode	WORD	Function Block Error Code
sErrorDescription	STRING	Function Block Error Code (Refer Chapter 4.11)
sStatus	STRING	Flow Rate Monitoring Status
rFlowRate	REAL	MDC1 Flow Measurement Value | Unit as per user selection
xSSC11_FlowMonitoring	BOOL	SSC1.1 Flow Rate Monitoring OutA | TRUE=On | FALSE=Off
xSSC12_FlowMonitoring	BOOL	SSC1.2 Flow Rate Monitoring OutB | TRUE=On | FALSE=Off
xSSC13_VolumeMassPulse	BOOL	SSC1.3 Volume/Mass Pulse OutC | TRUE=On | FALSE=Off
stFlowMonitoring	STRUCT of the type (stFlowMonitor)	Flow Rate Monitoring Parameters Structure (Refer Chapter 4.9.6)

Table 4.11: Festo_SFAB_Flow_Monitoring Block Output Variables descriptions

4.6 Festo SFAB Device Parameters



4.6.1 Festo_SFAB_Device_Parameters Block In-Out Variables

In-Out Variables	Data Type	Description
stDeviceParameters	STRUCT of the type (stDeviceParameters)	SFAB Device Configuration Parameters Structure (Refer Chapter 4.9.7)

Table 4.12: Festo_SFAB_Device_Parameters Block In-Out Variables description

4.6.2 Festo_SFAB_Device_Parameters Block Input Variables

Input Variables	Data Type	Description
stSFABRef	STRUCT of the type (stSFAB_REF)	SFAB Sensor Reference Structure (Refer Chapter 4.9.1)
xExecute	BOOL	Rising Edge: Read All Device Parameters
xWrite	BOOL	Rising Edge: Write All Device Parameters **TRUE =** Parameter Write, **FALSE =** Parameter Read

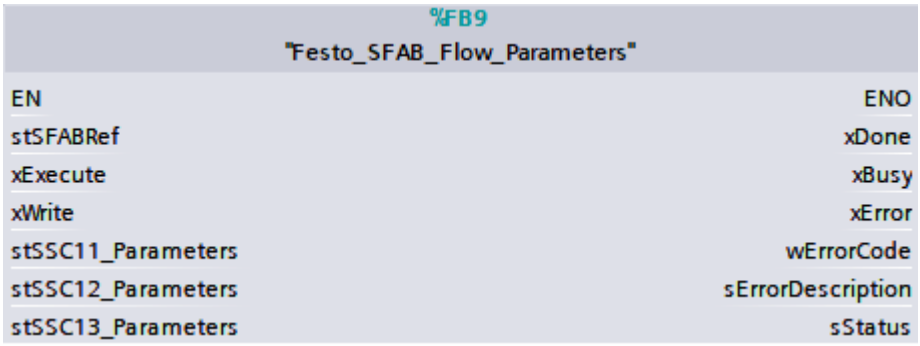
Table 4.13: Festo_SFAB_Device_Parameters Block Input Variables descriptions

4.6.3 Festo_SFAB_Device_Parameters Block Output Variables

Output Variables	Data Type	Description
xDone	BOOL	TRUE: Read or Write Operation Completed Successfully
xBusy	BOOL	TRUE: Read or Write Operation in Progress
xError	BOOL	TRUE: Error during Read / Write
wErrorCode	WORD	Function Block Error Code
sErrorDescription	STRING	Function Block Error Code (Refer Chapter 4.11)
sStatus	STRING	Device Parameters Read / Write Status

Table 4.14: Festo_SFAB_Device_Parameters Block Output Variables descriptions

4.7 Festo SFAB Flow Parameters



4.7.1 Festo_SFAB_Flow_Parameters Block In-Out Variables

In-Out Variables	Data Type	Description
stSSC11_Parameters	STRUCT of the type (stSwitchingParameters)	SSC1.1 OutA - Flow Rate Monitoring Parameters (Refer Chapter 4.9.5)
stSSC12_Parameters	STRUCT of the type (stSwitchingParameters)	SSC1.2 OutB - Flow Rate Monitoring Parameters (Refer Chapter 4.9.5)
stSSC13_Parameters	STRUCT of the type (stOutC_Parameters)	SSC1.3 OutC - Volume/Mass Pulse Parameters (Refer Chapter 4.9.3)

Table 4.15: Festo_SFAB_Flow_Parameters Block In-Out Variables descriptions

4.7.2 Festo_SFAB_Flow_Parameters Block Input Variables

Input Variables	Data Type	Description
stSFABRef	STRUCT of the type (stSFAB_REF)	SFAB Sensor Reference Structure from Festo_SFAB_Connect (Refer Chapter 4.9.1)
xExecute	BOOL	Rising Edge - Read All Flow Rate Parameters
xWrite	BOOL	Rising Edge - Write All Flow Rate Parameters **TRUE =** Parameter Write **FALSE =** Parameter Read

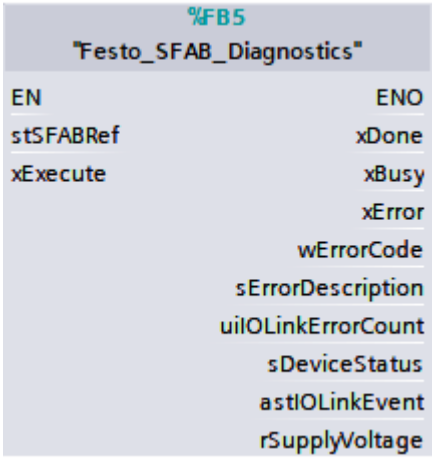
Table 4.16: Festo_SFAB_Flow_Parameters Block Input Variables descriptions

4.7.3 Festo_SFAB_Flow_Parameters Block Output Variables

Output Variables	Data Type	Description
xDone	BOOL	TRUE: Read or Write Operation Completed Successfully
xBusy	BOOL	TRUE: Read or Write Operation in Progress
xError	BOOL	TRUE: Error during Read / Write
wErrorCode	WORD	Function Block Error Code
sErrorDescription	STRING	Enumeration of Function Block Error Code (Refer Chapter 4.11)
sStatus	STRING	Flow Parameters Read / Write Status

Table 4.17: Festo_SFAB_Flow_Parameters Block Output Variables descriptions

4.8 Festo SFAB Diagnostics



4.8.1 Festo_SFAB_Diagnostics Block Input Variables

Input Variables	Data Type	Description
stSFABRef	STRUCT of the type (stSFAB_REF)	SFAB Sensor Reference Structure (Refer Chapter 4.9.1)
xExecute	BOOL	Rising Edge: Trigger Diagnostic Read

Table 4.18: Festo_SFAB_Diagnostics Block Input Variables descriptions

4.8.2 Festo_SFAB_Diagnostics Block Output Variables

Output Variables	Data Type	Description
xDone	BOOL	TRUE: Diagnostic Data Read Completely
xBusy	BOOL	TRUE: Function Block Executing Diagnostic
xError	BOOL	TRUE: Error while Reading Diagnostic Data
wErrorCode	WORD	Function Block Error Code
sErrorDescription	STRING	Function Block Error Code (Refer Chapter 4.11)
uiIOLinkErrorCount	UINT	Total Active Error Count
sDeviceStatus	STRING	Current Sensor Condition and Diagnosis State: **0 =** Device Operating Properly **2 =** Out of Specification **4 =** Failure
astIOLinkEvent	ARRAY [1..8] OF stIOLinkEvent	IO-Link Event Array - Max 8 Events (Refer Chapter 4.9.4)
rSupplyVoltage	REAL	Supply Voltage of the Sensor in Volt

Table 4.19: Festo_SFAB_Diagnostics Block Output Variables descriptions

4.9 Structure Data Type

4.9.1 stSFAB_Ref

Structure Variables	Data Type	Description
abySFAB_DataIn	ARRAY [0..7] OF BYTE	Raw Process Data Input from SFAB Sensor
byDeviceAvailable	BYTE	Port Qualifier Information (PQI) from Sensor.
byPQI	BYTE	Process Quality Indicator byte
HW_ID	HW_ANY	Hardware ID of the CPX-AP IO-Link Master Module
iSensorFlowRange	INT	Connected SFAB Sensor Flow Range Selection: **0** = SFAB_10 **1** = SFAB_50 **2** = SFAB_200 **3** = SFAB_600 **4** = SFAB_1000
siFlowUnit	SINT	Flow Rate Unit: **0**=l/min | **2**=m³/h | **3**=scfm | **4**=g/min
xTemperatureUnit	BOOL	Temperature Unit | **FALSE** = Celsius | **TRUE** = Fahrenheit
iErrorCode	INT	Error code from DPRD_DAT

Table 4.20: stSFAB_Ref descriptions

4.9.2 stRecorderParameters

Structure Variables	Data Type	Description
rRecorderVolume	REAL	Scaled volume/mass value
udRecorderTime_s	UDINT	Recorder time in seconds
udRecorderErrorTime_s	UDINT	Recorder error time in seconds
siVolumeUnit	SINT	Current volume/mass unit: **0**=L | **2**=m³ | **2**=SCFt | **3**=g
xRecorderRunning	BOOL	TRUE = Recorder is running
xRecorderPaused	BOOL	TRUE = Recorder is paused
xRecorderReset	BOOL	TRUE = Recorder was just reset

Table 4.21: stRecorderParameters descriptions

4.9.3 stOutC_Parameters

Structure Variables	Data Type	Description
udPulseThreshold	UDINT	Volume/mass pulse threshold (PULS, SP): Range: **0..52428800**
xSwitchPointLogic	BOOL	Pulse output logic NO/NC: **0**=NO High-active | **1**=NC Low-active
uiPulseLength_ms	UINT	Volume/mass pulse length in ms: Range: **20..995 ms**

Table 4.22: stOutC_Parameters descriptions

4.9.4 stIOLinkEvent

Structure Variables	Data Type	Description
sEventType	STRING	Event Type of the SFAB Sensor: **0 =** No Event **1 =** Notification **2 =** Warning **3 =** Error
iEventCode	INT	Event Code of the SFAB Sensor
sEventDescription	STRING	Event Code Description Refer Chapter 4.10

Table 4.23: stIOLinkEvent descriptions

4.9.5 stSwitchingParameters

Structure Variables	Data Type	Description
iSetPoint_SP1	REAL	Setpoint SP1 (SP, SP.Lo, SP.Hi) Range **0..24000**
iSetPoint_SP2	REAL	Setpoint SP2 (SP, SP.Lo, SP.Hi) Range **0..24000**
xSwitchPointLogic	BOOL	Switching point logic, NO/NC: **0**: High-active (Normally Open NO) **1**: Low-active (Normally Close NC)
iSwitchPointMode	INT	Switching point mode: **0**: Deactivated **1**: Single point mode **2**: Window mode **3**: Two-point mode
rHysteresis	REAL	Hysteresis at switchpoint Range **0..21600**
iBacklightColour	INT	Display backlight colour: **0**: Always blue (bLUE) **1**: Red if Out = 0 (R.OFF) **2**: Red if Out = 1 (R. ON)

Table 4.24: stSwitchingParameters descriptions

4.9.6 stFlowMonitor

Structure Variables	Data Type	Description
rMinFlowRate	REAL	Minimum flow rate value | Unit as per user selection
rMaxFlowRate	REAL	Maximum flow rate value | Unit as per user selection
rAvgFlowRate	REAL	Averaged flow rate value | Unit as per user selection

Table 4.25: stFlowMonitor descriptions

4.9.7 stDeviceParameters

Structure Variables	Data Type	Description
siFlowUnit	SINT	Flow unit selection: **0**: Liters per Minute [l/min] **2**: Cubic Meters per Hour [m³/h] **3**: Standard Cubic Feet per Minute [scfm] **4**: Grams per Minute [g/min]
xTemperatureUnit	BOOL	Temperature unit °C / °F: **0**: °C **1**: °F
siReferenceCondition	SINT	Reference condition 0°C/15°C/20°C: **0**: DIN 1343 (0°C) **1**: ISO 2533 (15°C) **2**: ISO 6358 (20°C)
siGasType	SINT	Gas type Air/N2/Ar/CO2: **0**: Air **1**: N2 **2**: Ar **3**: CO2
uiFlowMeasurementFilter	UINT	Flow measurement filter 0..2048ms: **0**: Filter disabled **1**: 2 ms **2**: 4 ms **3**: 8 ms **4**: 16 ms **5**: 32 ms **6**: 64 ms **7**: 128 ms **8**: 256 ms **9**: 512 ms **10**: 1024 ms **11**: 2048 ms
iFlowDisplayFilter	INT	Flow display filter 256/512/1024ms: **8**: 256 ms **9**: 512 ms **10**: 1024 ms

Structure Variables	Data Type	Description
siPin2_OutputSignal	SINT	Output signal Pin2: **0**: SSC1.2 OutB Flow monitoring **2**: Flow measurement value MDC1 analog **4**: Temperature measurement value MDC2 analog
xPin4_OutputSignal	BOOL	Output signal Pin4: **0**: SSC1.1 OutA Flow monitoring **1**: SSC1.3 OutC Volume/mass pulse
siHardwareMode	SINT	NPN / PNP selection: **0**: NPN **1**: PNP
siAnalogOutputType	SINT	0-10V / 1-5V / 4-20mA: **0**: 0..10 V voltage output **1**: 1..5 V voltage output **2**: 4..20 mA current output
iAnalogStartValue	INT	Analog start value % | Range **-100..90**
iAnalogEndValue	INT	Analog end value % | Range **-90..100**
uiBacklightDuration	UINT	Backlight duration always on/5..640s: **0**: Always On **1**: 5 seconds **2**: 10 seconds **3**: 20 seconds **4**: 40 seconds **5**: 80 seconds **6**: 160 seconds **7**: 320 seconds **8**: 640 seconds
siSubDisplayMode	SINT	Sub-display mode selection: **0**: Units **1**: Gas type **2**: Flow measurement value **3**: Volume / mass measurement value **5**: Temperature measurement value **6**: SP1 **7**: SP2
xLocalSSCDisplay	BOOL	Show only active or all SSCs: **0**: Only active SSCs **1**: All local SSCs

Structure Variables	Data Type	Description
siMeasuredValueDisplay	SINT	Flow/Volume/Temperature display: **0**: Flow **1**: Volume / mass pulse **2**: Temperature
uiLockCode	UINT	Local parameter lock code 0=Off; **0…9999**
xParameterizationLock	BOOL	**FALSE**: Unlocked | **TRUE**: Locked
xUserInterfaceLock	BOOL	**FALSE**: Unlocked | **TRUE**: Locked
xUserZeroAdjustment	BOOL	User zero adjustment On/Off: 0: Off 1: On

Table 4.26: stDeviceParameters descriptions

4.10 sEventDescription

Event Code	Event Description
0	Device Ok
16#1000	Device Error
16#1808	Moisture or Dirt in the Compressed Air
16#1815	Overload or Short Circuit at Switching Output OutA.Puls
16#1816	Overload or Short Circuit at Switching Output OutB
16#181F	Volume Recording / Mass Recording Overflow
16#4000	Temperature Error in IO-Link Driver
16#5111	Power Supply Too Low

Table 4.27: sEventDescription descriptions

4.11 sErrorDescription

Error Code	Error Description
1000	No Error
1001	Hardware ID Not Configured
1002	Invalid Sensor Flow Range
1003	Invalid Flow Unit Selection
1004	DPRD Error - Process Data Read Failed
1005	PQI Error
1006	Invalid Flow Display Filter Selection
1007	Invalid Measured Value Display Selection
1008	Invalid Backlight on Duration Selection
1009	Invalid Sub-Display Mode Selection
1010	Invalid Flow Measurement Filter Selection
1012	Invalid Gas Type Selection
1013	Invalid Reference Condition Selection
1014	Invalid Lock Code
1015	Invalid Pin 2 Output Signal Selection
1016	Invalid Pin 4 Output Signal Selection
1017	Invalid OutA SSC1.1 Set Point 1 Value
1018	Invalid OutA SSC1.1 Set Point 2 Value
1019	Invalid OutA SSC1.1 Switch Point Mode Selection
1020	Invalid OutA SSC1.1 Hysteresis Value
1021	Invalid OutA SSC1.1 Backlight Color Selection
1022	Invalid OutB SSC1.2 Set Point 1 Value
1023	Invalid OutB SSC1.2 Set Point 2 Value
1024	Invalid OutB SSC1.2 Switch Point Mode Selection
1025	Invalid OutB SSC1.2 Hysteresis Value
1026	Invalid OutB SSC1.2 Backlight Color Selection
1027	Invalid OutC udPulseThreshold Value
1028	Invalid OutC uiPulseLength_ms Value
1029	IO-Link Master Reported Error
1030	Parameter Read Function Error
1031	Parameter Write Function Error
1116	Analog Start Value Below Minimum -100
1117	Analog Start Value Above Maximum 90
1118	Analog End Value Below Minimum -90
1119	Analog End Value Above Maximum 100

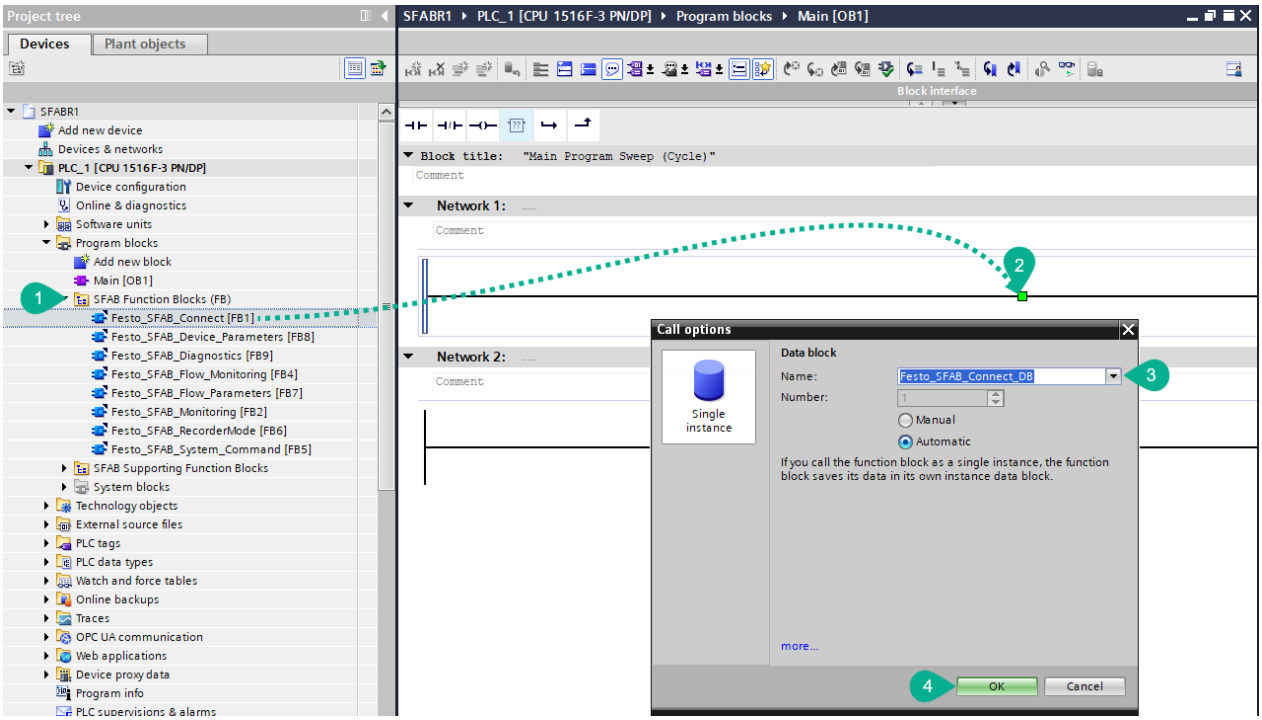
Table 4.28: sErrorDescription descriptions

5 Configuration of Festo SFAB PN IOlink Function Blocks in TIA Portal

This chapter describes adding **Festo_SFAB_PN_IOLink** library function blocks in program & assigning input, output tags.

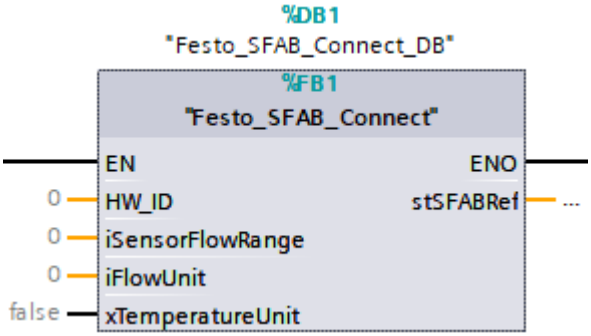
5.1 Configuration the Festo SFAB PN IOLink Library Function Blocks

Step 1

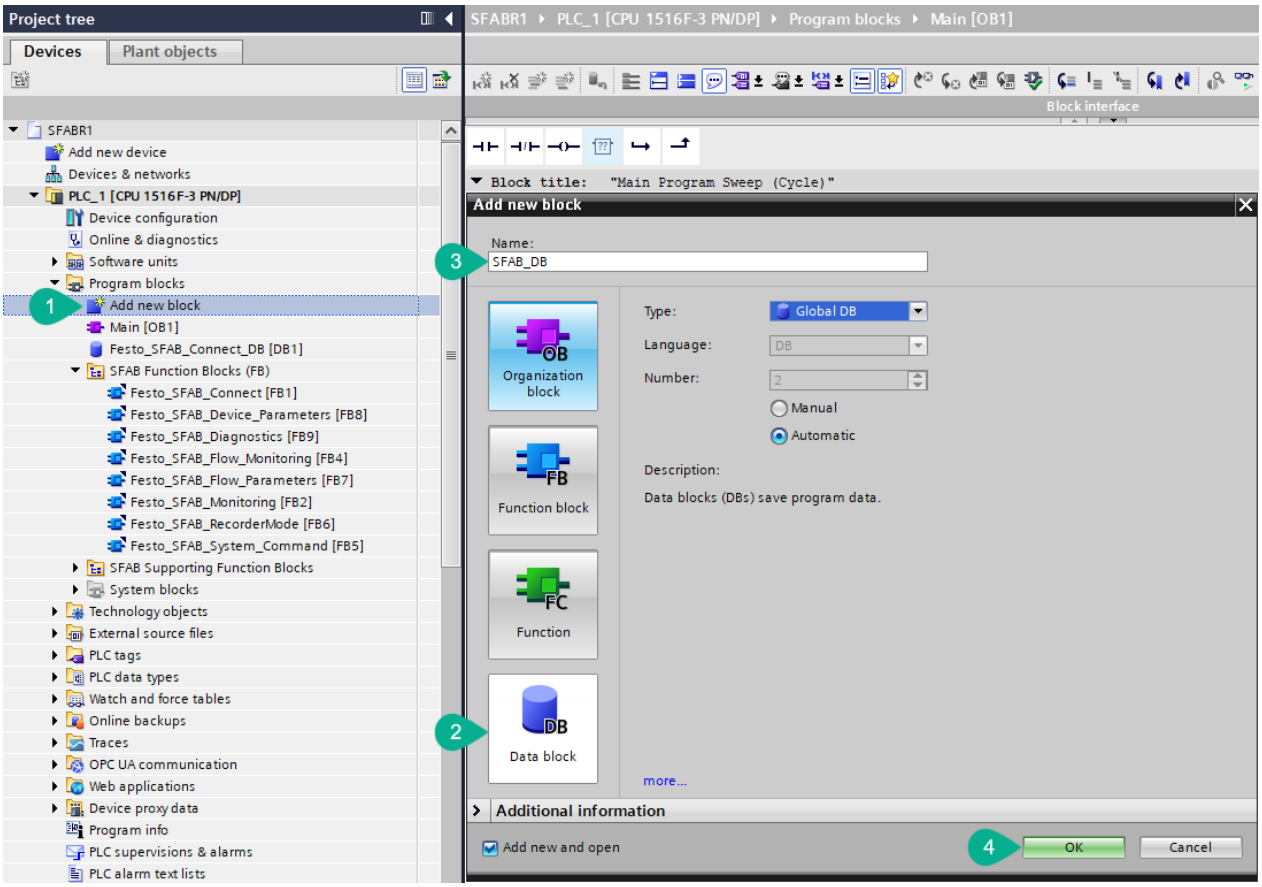


1. Expand the **SFAB Function Blocks (FB)** Function Blocks folders to find all the available function blocks.
2. Drag and drop the **Festo_SFAB_Connect** block into the Main Program OB; the Call Options window will appear.
3. In the **Call options** window, under **Data block**, confirm **Single instance** is selected and the **Name** field shows **Festo_SFAB_Connect_DB**.
4. Click **OK** to confirm the name and close the Call Options tab.

The called function block is shown below.

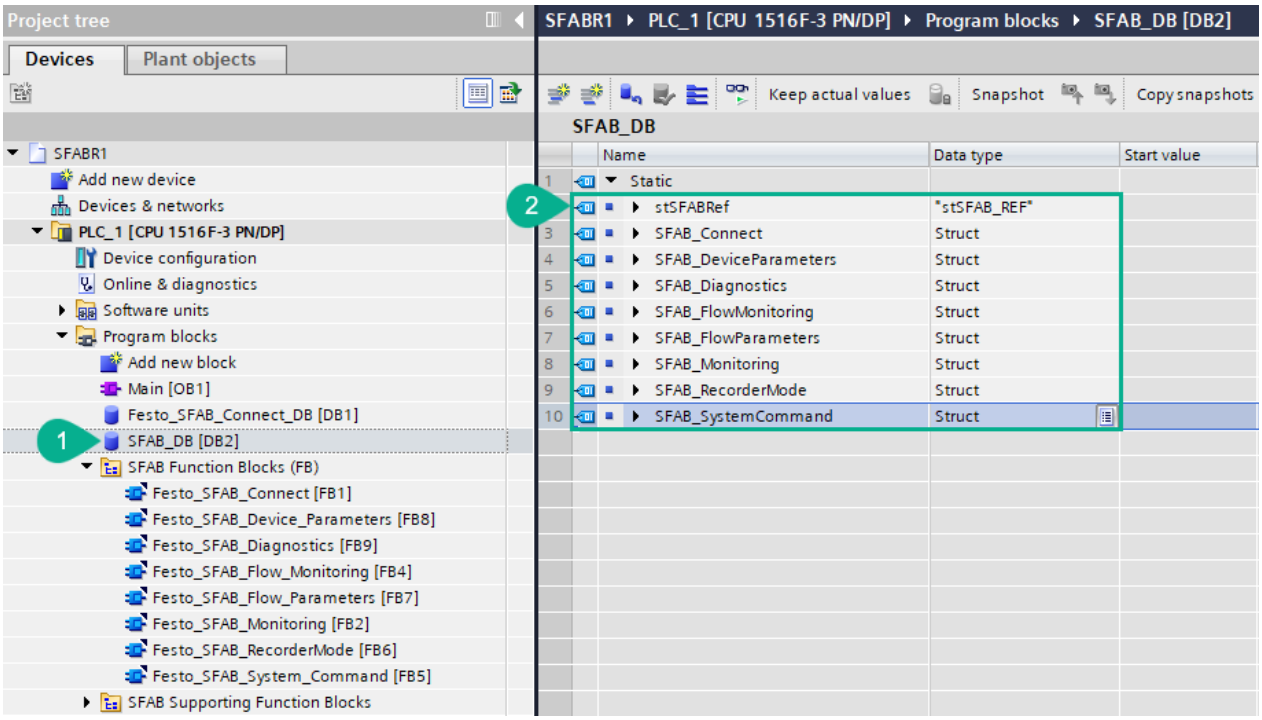


Step 2



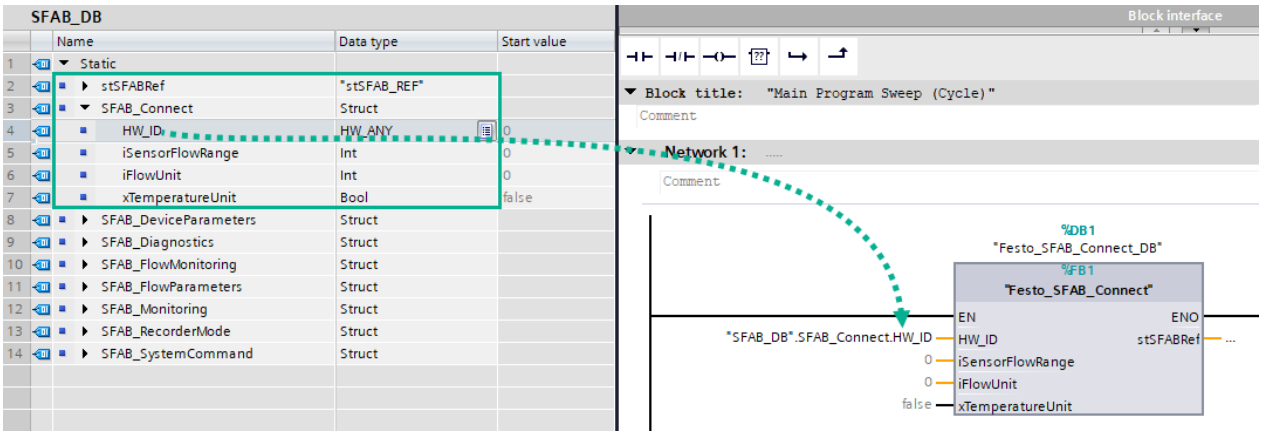
1. In the **Project tree**, under **Program blocks**, double-click **Add new block**.
2. Select **Data Block** Type: Choose the option to create a Global Data (DB).
3. Enter the required name for the data block in Name field.
4. Click **OK** to create and open the new global data block.

Step 3



1. In the **Project tree**, double-click on **SFAB_DB [DB2]** under **Program blocks** to create all the required tags.
2. In the **SFAB_DB** editor, create all required tags and define the following variables with their respective **Data type** for each block.

Step 4

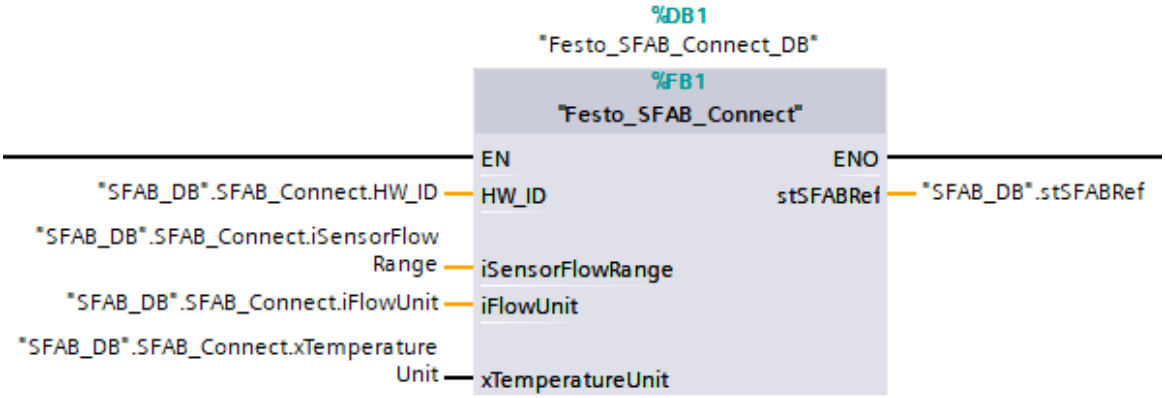


In **SFAB_DB**, under the **SFAB_Connect** struct, confirm the following members and their **Data types**, then drag and drop the **SFAB_Connect** members from **SFAB_DB** to the corresponding inputs of the **Festo_SFAB_Connect** block in **Main [OB1]**.

Note

- Repeat **Step 4** to create and assign the different input and output tags in the function block.

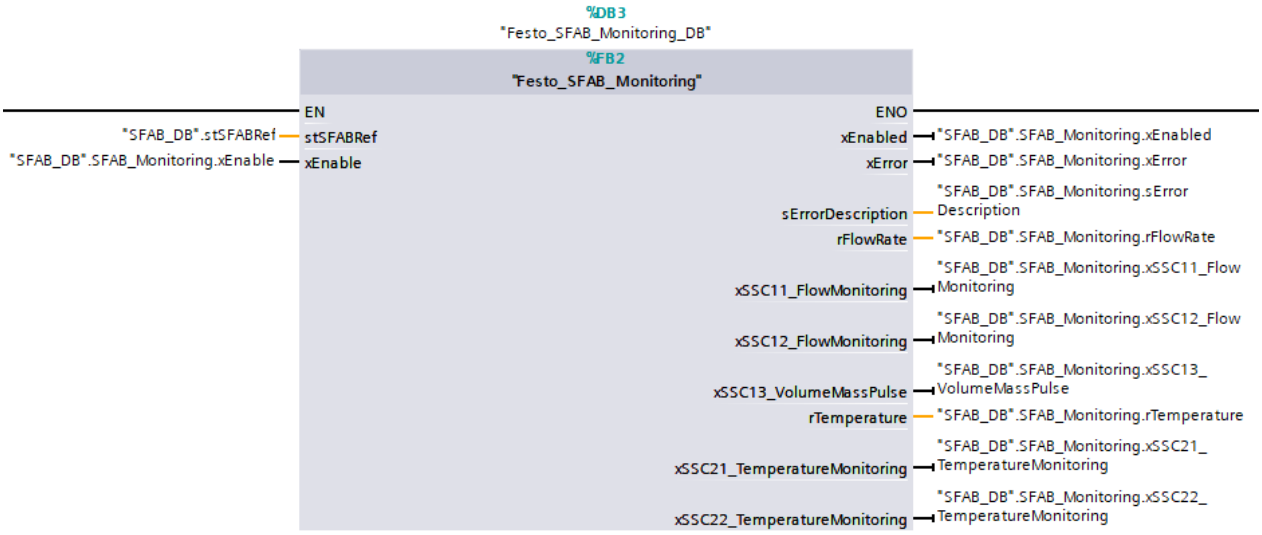
Once all tags have been assigned successfully, the **Festo_SFAB_Connect** Function Block will look like the one below.



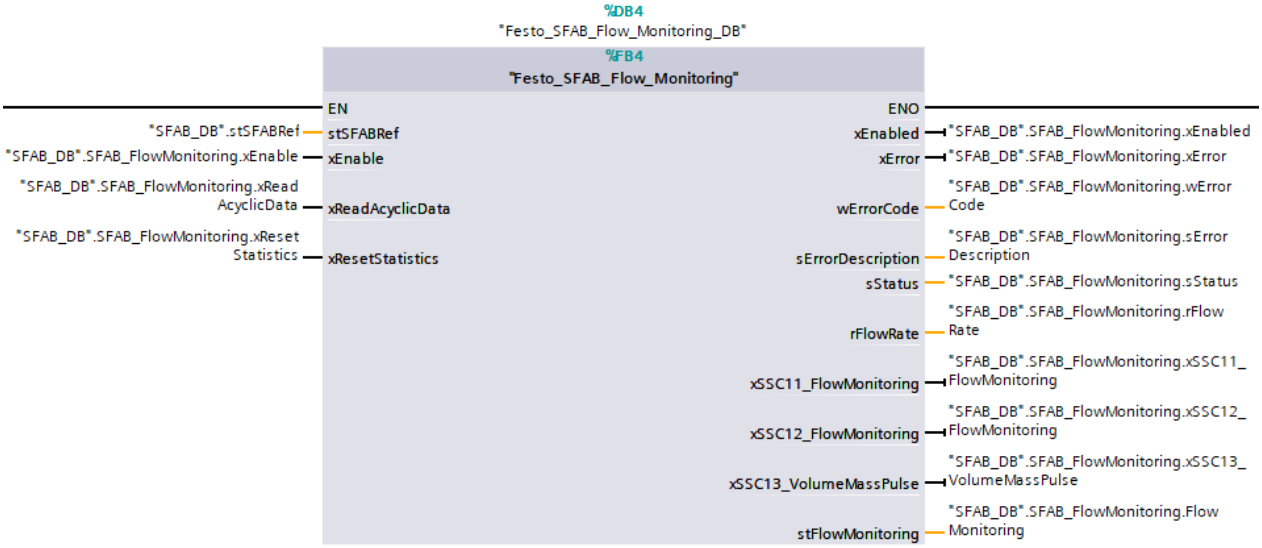
Note

- Repeat the same procedure to complete assigning the remaining inputs and outputs of the other Festo SFAB function blocks (**Festo_SFAB_Device_Parameters**, **Festo_SFAB_Diagnostics**, **Festo_SFAB_Flow_Monitoring**, **Festo_SFAB_Flow_Parameters**, **Festo_SFAB_Monitoring**, **Festo_SFAB_RecorderMode,** and **Festo_SFAB_System_Command**), as applicable to the connected SFAB sensor configuration.

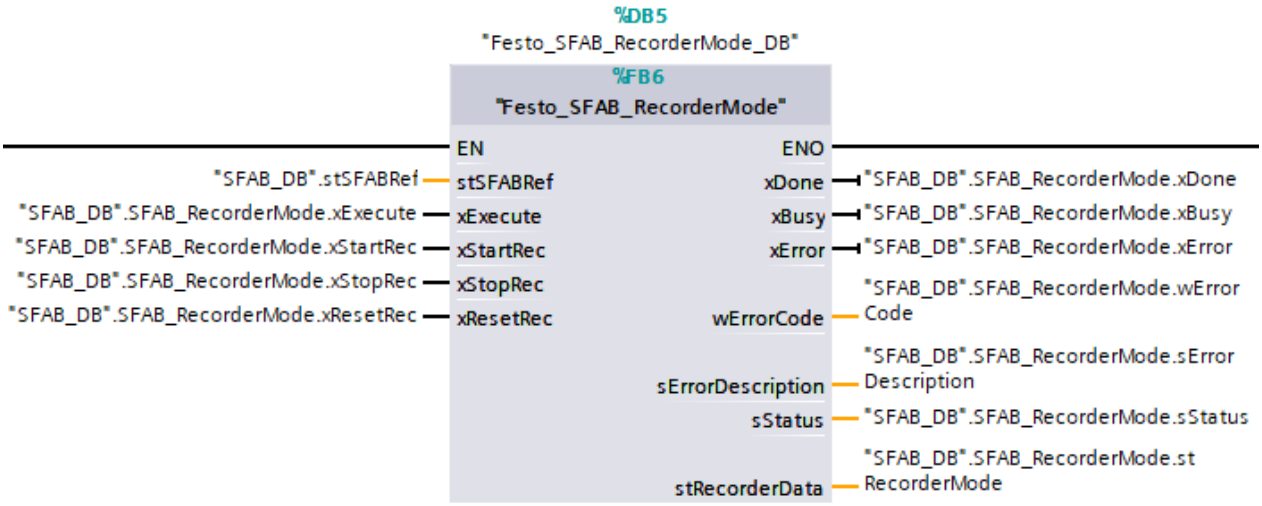
Once all tags have been assigned successfully, the **Festo_SFAB_Monitoring** Function Block will look like the one below.



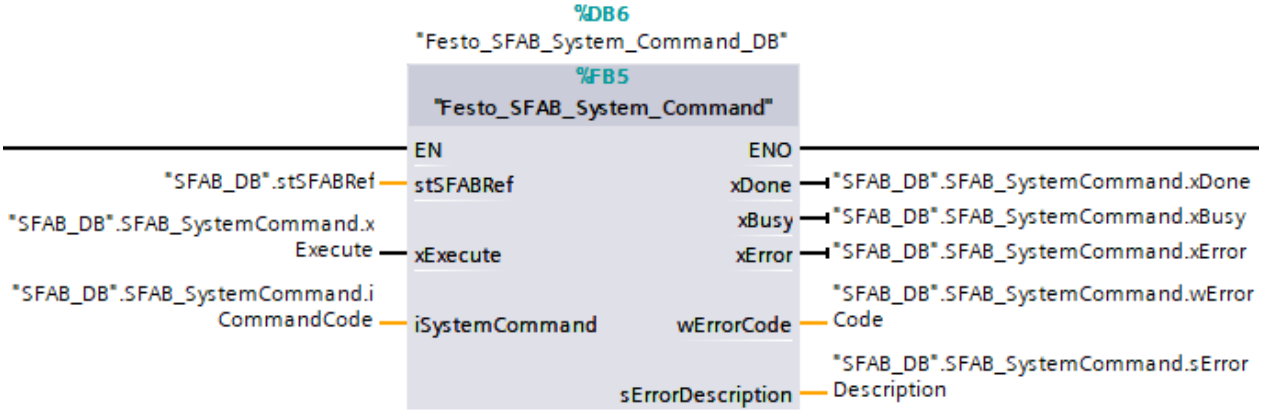
Once all tags have been assigned successfully, the **Festo_SFAB_Flow_Monitoring** Function Block will look like the one below.



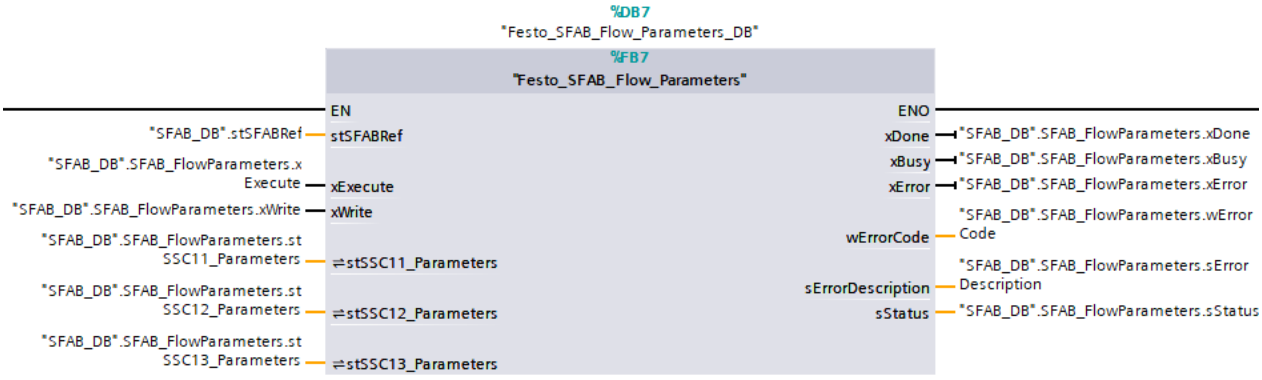
Once all tags have been assigned successfully, the **Festo_SFAB_RecorderMode** Function Block will look like the one below.



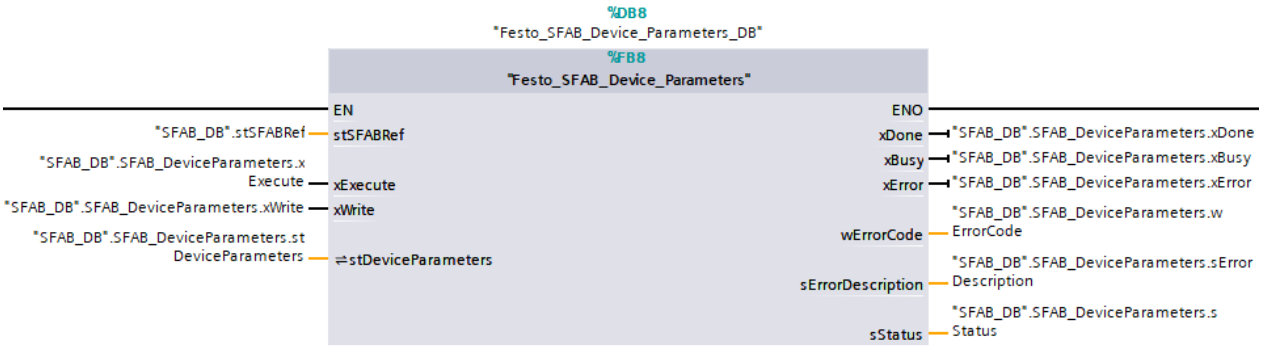
Once all tags have been assigned successfully, the **Festo_SFAB_System_Command** Function Block will look like the one below.



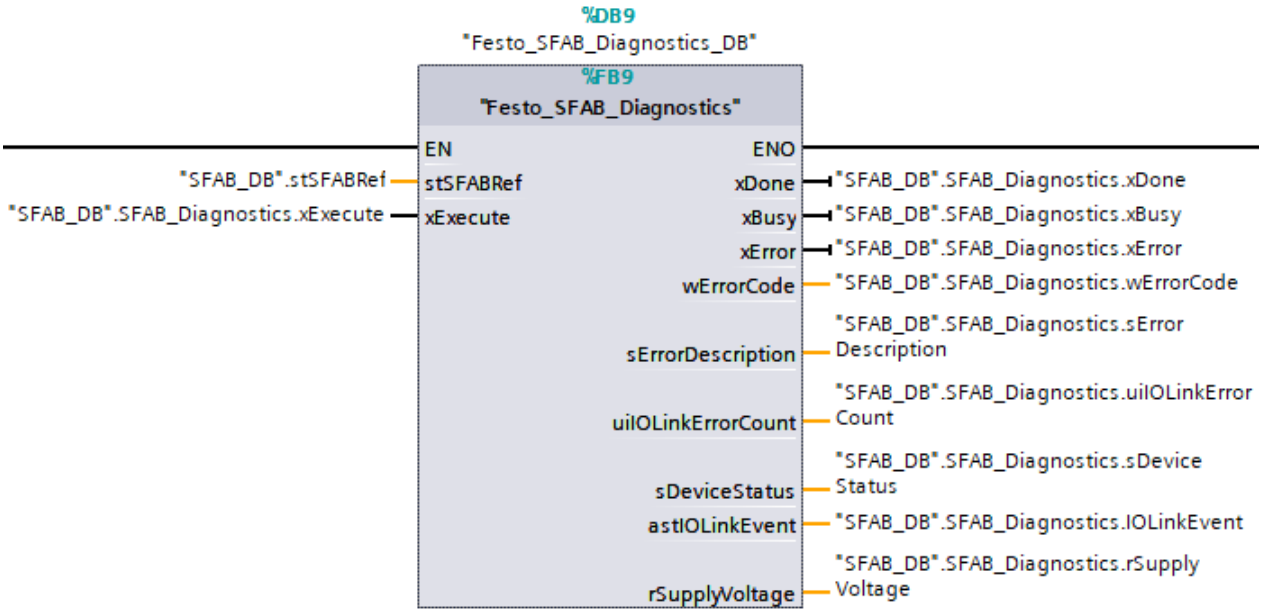
Once all tags have been assigned successfully, the **Festo_SFAB_Flow_Parameters** Function Block will look like the one below.



Once all tags have been assigned successfully, the **Festo_SFAB_Device_Parameters** Function Block will look like the one below.

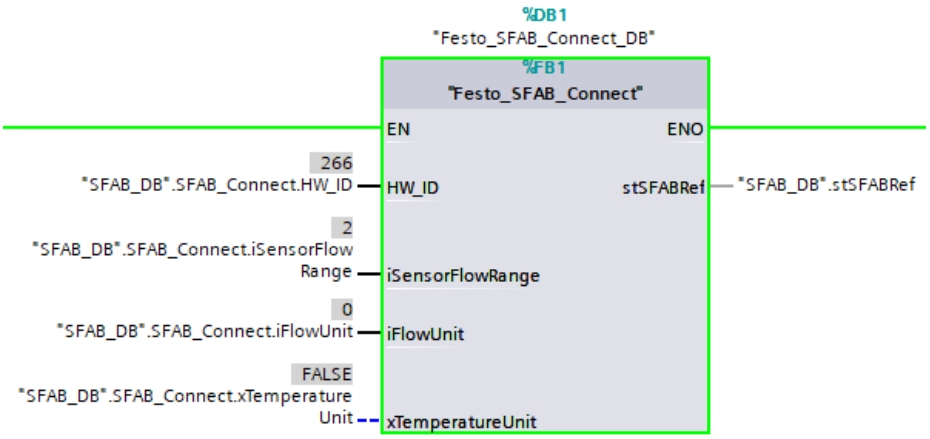


Once all tags have been assigned successfully, the **Festo_SFAB_Diagnostics** Function Block will look like the one below.



6 Sample Code for Festo SFAB PN IOLink Library Function Blocks

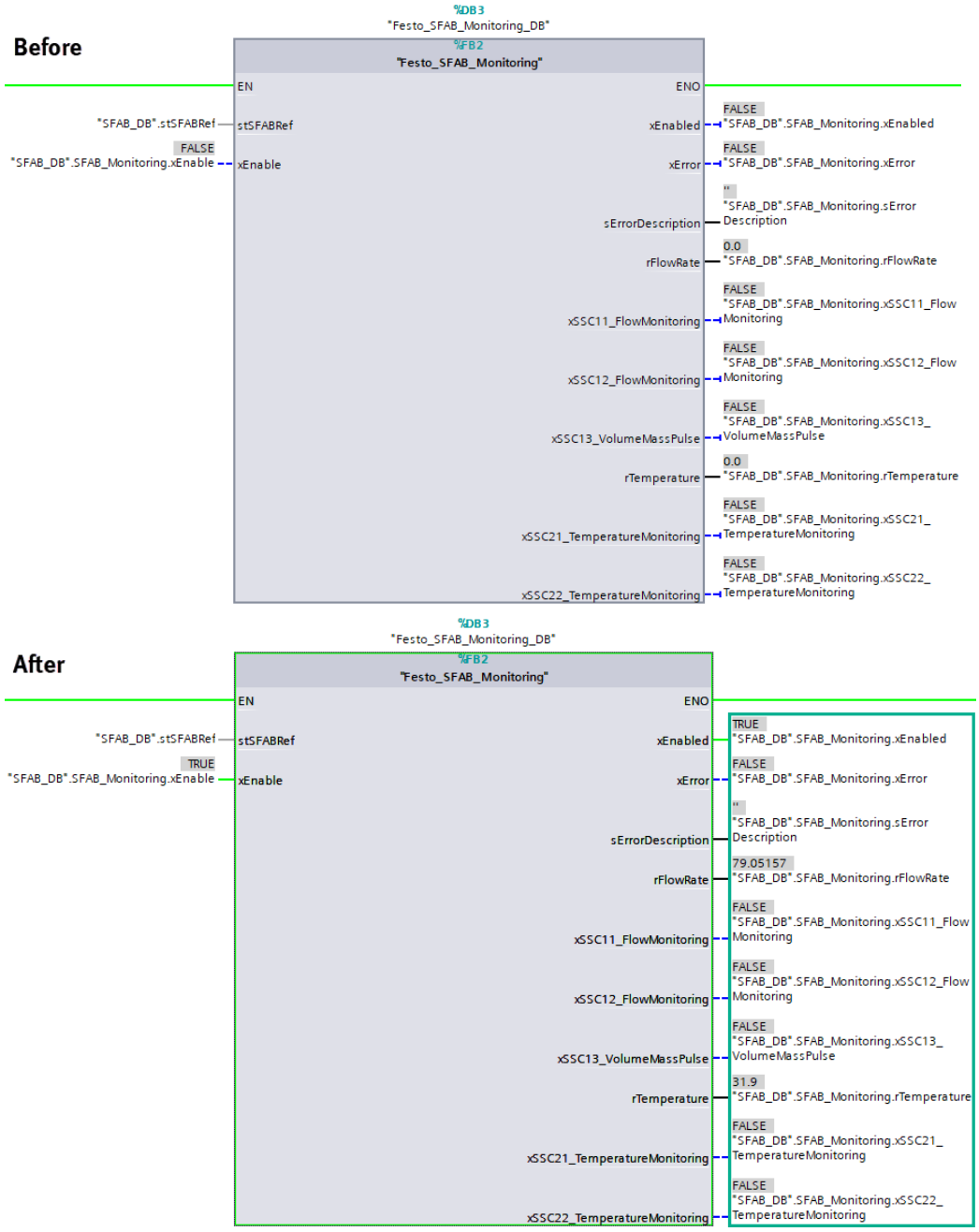
6.1 Festo SFAB Connect Block



1. Enter the **HW_ID**, set to value **266** (See Chapter 3.9), representing the Hardware ID of the IO-Link Port on the CPX-AP-...-4IOL-M12 module.
2. Enter the **iSensorFlowRange**, set to value **2**, representing the connected SFAB Sensor Flow Range selection (e.g., SFAB 200).
3. Enter **iFlowUnit**, set to value **0**, representing the selected Flow Rate Unit.
4. Enter **xTemperatureUnit**, set to value **FALSE**, representing the selected Temperature Unit °F Fahrenheit.

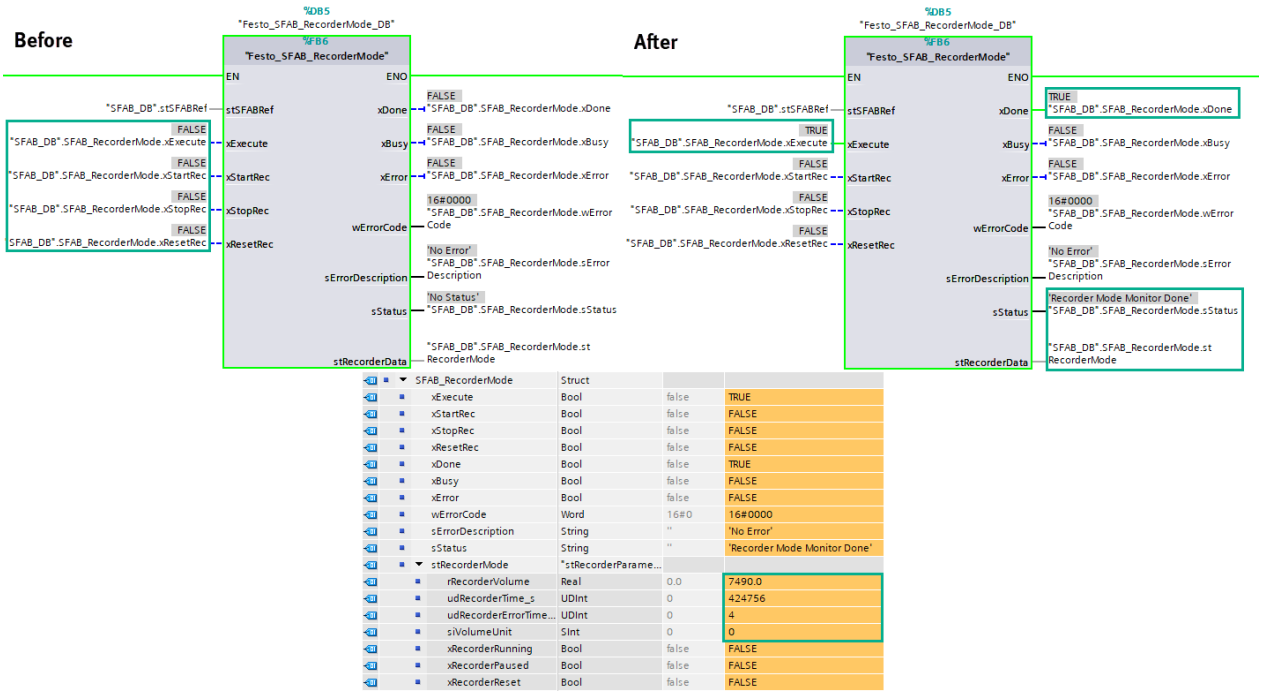
The function block returns the output **stSFABRef**, assigned to the variable **"SFAB_DB".stSFABRef**, of type **stSFAB_REF**, which serves as the SFAB Sensor Reference Structure used as input for the other Festo_SFAB function blocks.

6.2 Festo SFAB Monitoring Block



1. Set the input **xEnable** to **TRUE**, then the **xEnabled** output changes to **TRUE**, confirming the block is active.
2. **xError** remains **FALSE**, with **sErrorDescription** showing an empty string, indicating no error.
3. **rFlowRate** updates to **79.05157**, reflecting the live flow rate measured by the SFAB sensor.
4. **rTemperature** updates to **31.9**, reflecting the live temperature measured by the sensor.
5. **xSSC11_FlowMonitoring**, **xSSC12_FlowMonitoring**, **xSSC13_VolumeMassPulse**, **xSSC21_TemperatureMonitoring**, and **xSSC22_TemperatureMonitoring** all remain **FALSE**, indicating that none of the corresponding switching signal channel thresholds have been triggered based on the current process values.

6.3 Festo SFAB RecorderMode Block

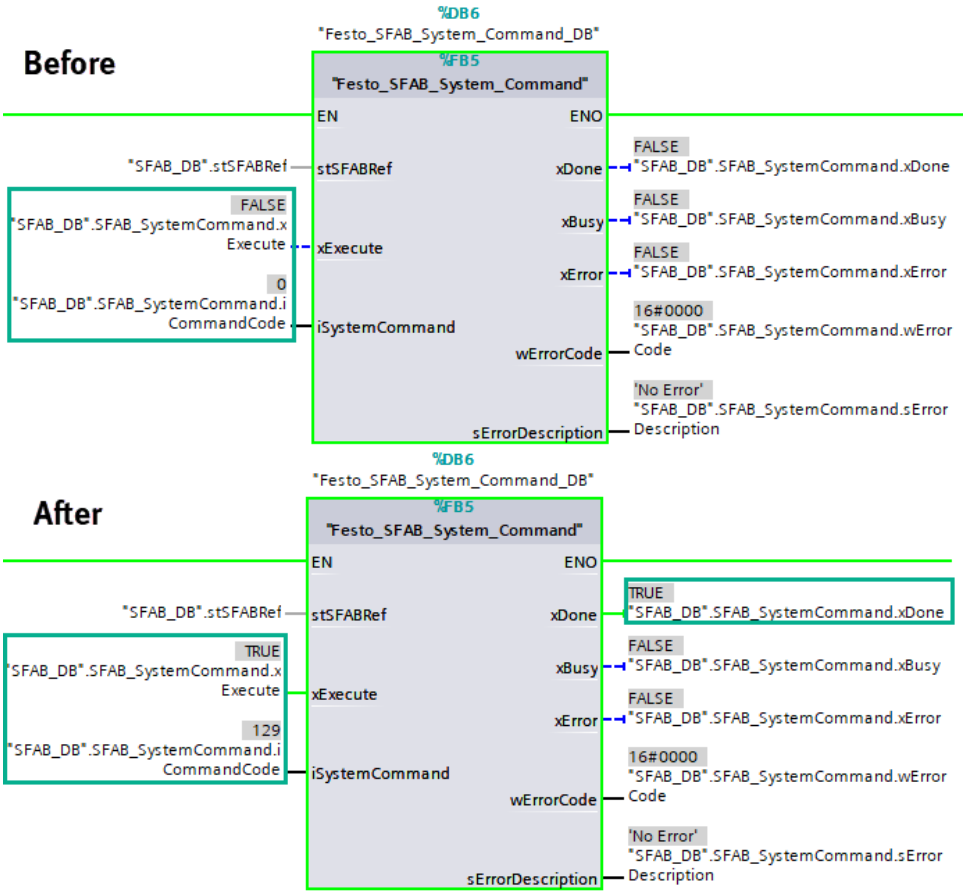


1. Set the input **xExecute** from **FALSE** to **TRUE**, which will start reading all the relevant parameters.
2. Make sure **xStartRec**, **xStopRec**, and **xResetRec** are set to **FALSE**.
3. **xBusy** will turn to **TRUE** while reading; once the reading is done, it will turn to **FALSE**.
4. **xDone** changes to **TRUE**, indicating that the function block read has completed successfully.
5. While reading, if there is any error, then **xError** will turn **TRUE**, along with **wErrorCode** and **sErrorDescription**.
6. **sStatus** shows the current status of the function block; once the reading is done, it will show **'Recorder Mode Monitor Done'**, indicating the current recorder mode status of the sensor.
7. **stRecorderMode** structure, the following read values will be shown.

Note

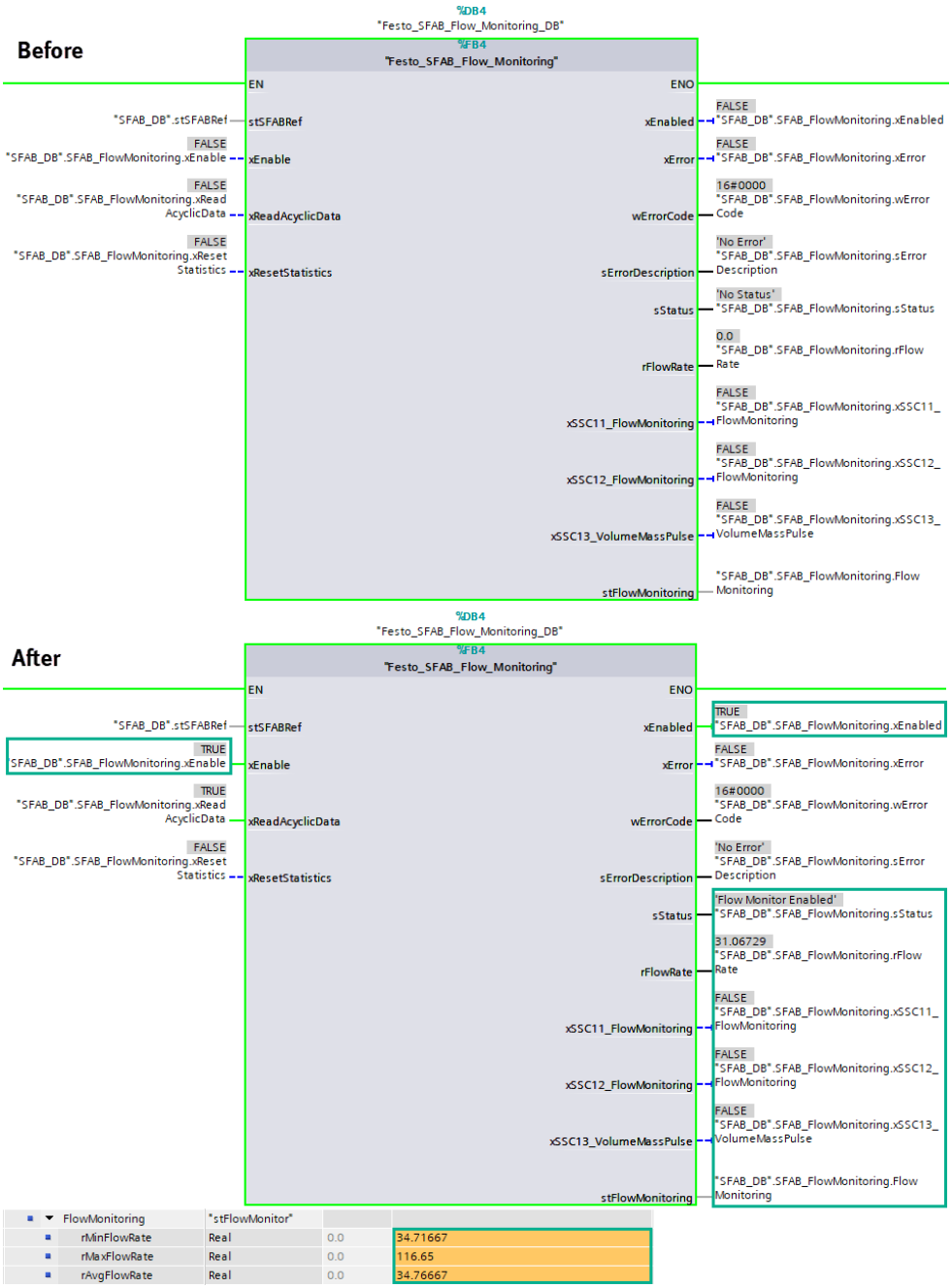
- To start, stop, or reset the recording, the user must trigger only one input at a time. If multiple inputs (**xStartRec**, **xStopRec**, **xResetRec**) are set to **TRUE** simultaneously, this may result in an error.
- It is recommended to activate the required input as per the application need, setting it to **TRUE** individually while keeping the remaining inputs set to **FALSE**.

6.4 Festo SFAB System Command Block



1. Set the input **xExecute** from **FALSE** to **TRUE**, and set **iSystemCommand** to **129**, representing the **ApplicationReset** system command, which will trigger the execution of the selected system command (Refer Chapter 4.4.3).
2. **xBusy** will turn to **TRUE** while the command is being executed; once the execution is complete, it will turn to **FALSE**.
3. **xDone** changes to **TRUE**, indicating that the system command has been executed successfully.
4. If there is any error during execution, then **xError** will turn **TRUE**, along with **wErrorCode** and **sErrorDescription** showing the relevant error details.
5. In this case, **xError** remains **FALSE**, with **wErrorCode** showing **16#0000**, and **sErrorDescription** showing **'No Error'**, confirming that the **ApplicationReset** system command was executed successfully on the connected SFAB Flow Sensor.

6.5 Festo SFAB Flow Monitoring



1. Set the input **xEnable** from **FALSE** to **TRUE**, starts monitoring the process data and it will read the acyclic data.
2. Keep **xReadAcyclicData** andn**xResetStatistics** set to **FALSE**.
3. **xEnabled** changes to **TRUE**, confirming that the function block is enabled and running.
4. **xError** remains **FALSE**, with **wErrorCode** showing **16#0000**, and **sErrorDescription** showing **No Error**.
5. **sStatus** changes to **Flow Monitor Enabled**, and **rFlowRate** updates to **0.016667**, reflecting the live flow rate measured by the sensor.
6. **xSSC11_FlowMonitoring**, **xSSC12_FlowMonitoring**, and **xSSC13_VolumeMassPulse** remain **FALSE**, as their respective SSC threshold conditions have not been triggered.
7. **stFlowMonitoring** provides the following flow rate statistics.

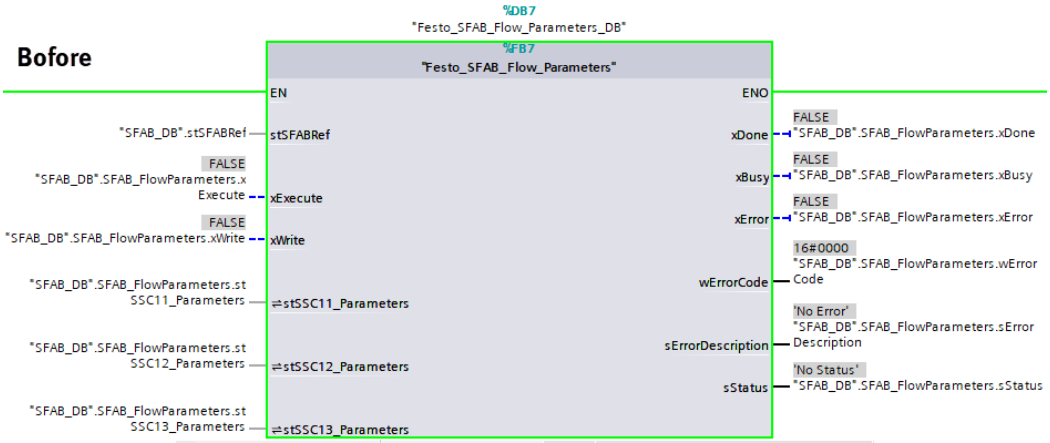
Note

- To read the acyclic data, make sure the function block is enabled (**xEnable = TRUE**) first. Once enabled, the user can read the acyclic data by setting **xReadAcyclicData** from **FALSE** to **TRUE**, which triggers a single read of the acyclic data.
- To read the acyclic data again, repeat the same procedure by toggling **xReadAcyclicData** from **FALSE** to **TRUE** on each occasion.

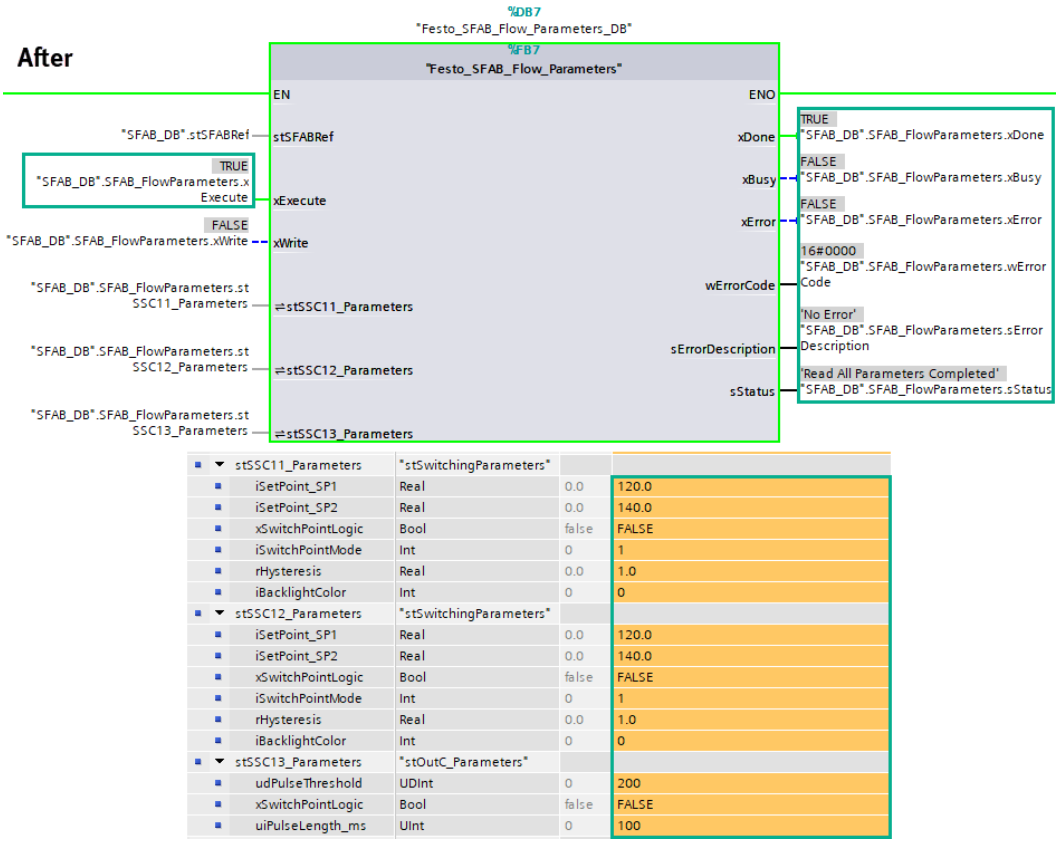
6.6 Festo SFAB Flow Parameters

The **Festo_SFAB_Flow_Parameters** function block is used to read and write the Flow Rate Monitoring (**SSC11, SSC12**) and Volume/Mass Pulse (**SSC13**) parameters of the connected SFAB Flow Sensor.

6.6.1 Read Parameters



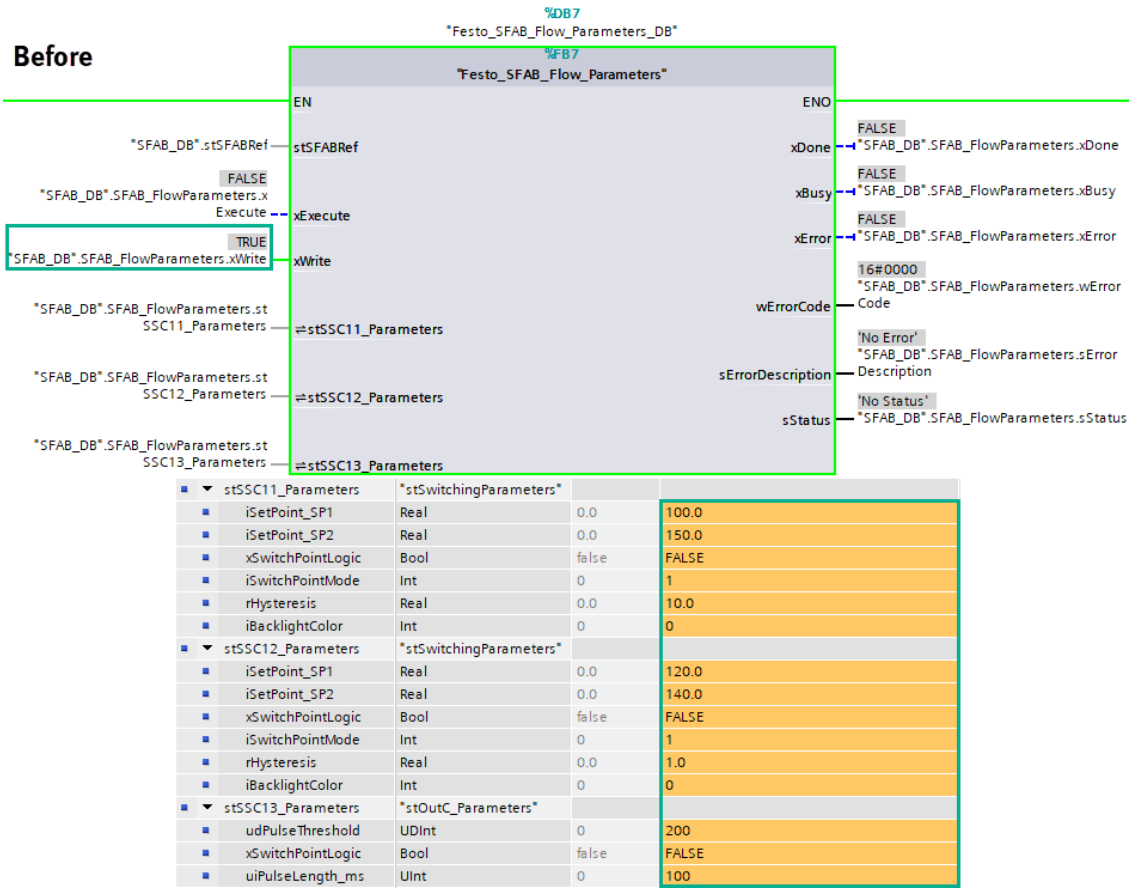
stSSC11_Parameters	"stSwitchingParameters"		
iSetPoint_SP1	Real	0.0	0.0
iSetPoint_SP2	Real	0.0	0.0
xSwitchPointLogic	Bool	false	FALSE
iSwitchPointMode	Int	0	0
rHysteresis	Real	0.0	0.0
iBacklightColor	Int	0	0
stSSC12_Parameters	"stSwitchingParameters"		
iSetPoint_SP1	Real	0.0	0.0
iSetPoint_SP2	Real	0.0	0.0
xSwitchPointLogic	Bool	false	FALSE
iSwitchPointMode	Int	0	0
rHysteresis	Real	0.0	0.0
iBacklightColor	Int	0	0
stSSC13_Parameters	"stOutC_Parameters"		
udPulseThreshold	UDInt	0	0
xSwitchPointLogic	Bool	false	FALSE
uiPulseLength_ms	UInt	0	0



stSSC11_Parameters	"stSwitchingParameters"		
iSetPoint_SP1	Real	0.0	120.0
iSetPoint_SP2	Real	0.0	140.0
xSwitchPointLogic	Bool	false	FALSE
iSwitchPointMode	Int	0	1
rHysteresis	Real	0.0	1.0
iBacklightColor	Int	0	0
stSSC12_Parameters	"stSwitchingParameters"		
iSetPoint_SP1	Real	0.0	120.0
iSetPoint_SP2	Real	0.0	140.0
xSwitchPointLogic	Bool	false	FALSE
iSwitchPointMode	Int	0	1
rHysteresis	Real	0.0	1.0
iBacklightColor	Int	0	0
stSSC13_Parameters	"stOutC_Parameters"		
udPulseThreshold	UDInt	0	200
xSwitchPointLogic	Bool	false	FALSE
uiPulseLength_ms	UInt	0	100

1. Set the input **xExecute** from **FALSE** to **TRUE**, which triggers a rising edge to read all the Flow Rate Parameters, while keeping **xWrite** set to **FALSE**.
2. **xBusy** will turn to **TRUE** while reading; once the reading is complete, it will turn back to **FALSE**.
3. **xDone** changes to **TRUE**, indicating that the read operation has completed successfully.
4. **xError** remains **FALSE**, with **wErrorCode** showing **16#0000**, and **sErrorDescription** showing **'No Error'**.
5. **sStatus** changes to **'Read All Parameters Completed'**, confirming that all Flow Parameters have been successfully read.
6. Structures **stSSC11_Parameters**, **stSSC12_Parameters**, and **stSSC13_Parameters** are updated with the following read values as shown above:

6.6.2 Write Parameters

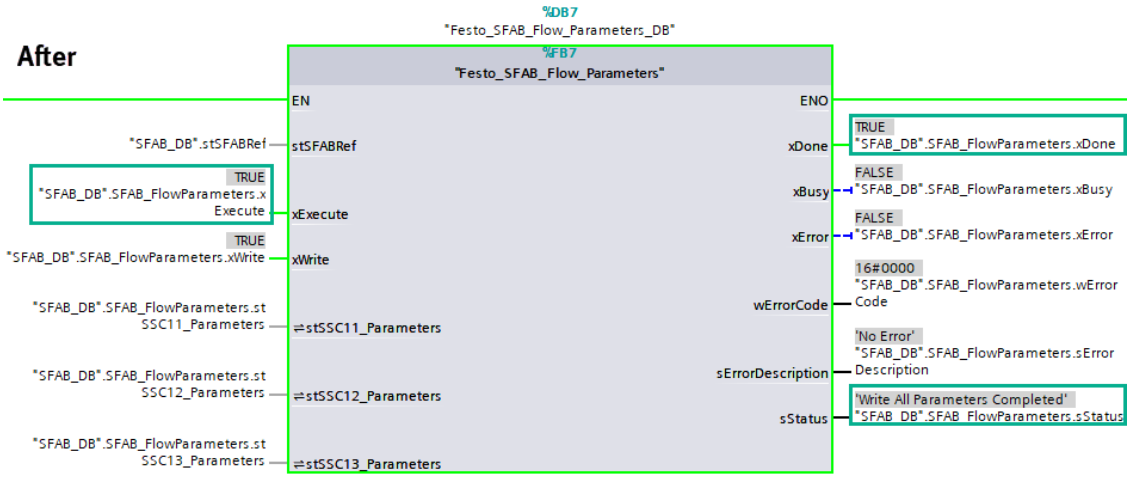


stSSC11_Parameters	"stSwitchingParameters"		
iSetPoint_SP1	Real	0.0	100.0
iSetPoint_SP2	Real	0.0	150.0
xSwitchPointLogic	Bool	false	FALSE
iSwitchPointMode	Int	0	1
rHysteresis	Real	0.0	10.0
iBacklightColor	Int	0	0
stSSC12_Parameters	"stSwitchingParameters"		
iSetPoint_SP1	Real	0.0	120.0
iSetPoint_SP2	Real	0.0	140.0
xSwitchPointLogic	Bool	false	FALSE
iSwitchPointMode	Int	0	1
rHysteresis	Real	0.0	1.0
iBacklightColor	Int	0	0
stSSC13_Parameters	"stOutC_Parameters"		
udPulseThreshold	UDInt	0	200
xSwitchPointLogic	Bool	false	FALSE
uiPulseLength_ms	UInt	0	100

1. **xWrite** is set to **TRUE**, in preparation for a write operation, while **xExecute** remains **FALSE**.
2. In **stSSC11_Parameters**, the values are updated to the desired new setting:
   - **iSetPoint_SP1** = **100**
   - **iSetPoint_SP2** = **150**
   - **xSwitchPointLogic** = **False**
   - **iSwitchPointMode** = **1** (SinglePoint_Mode)
   - **rHysteresis** = **10**
   - **iBacklightColor** = **0** (AlwaysBlue)

➔ **Note**

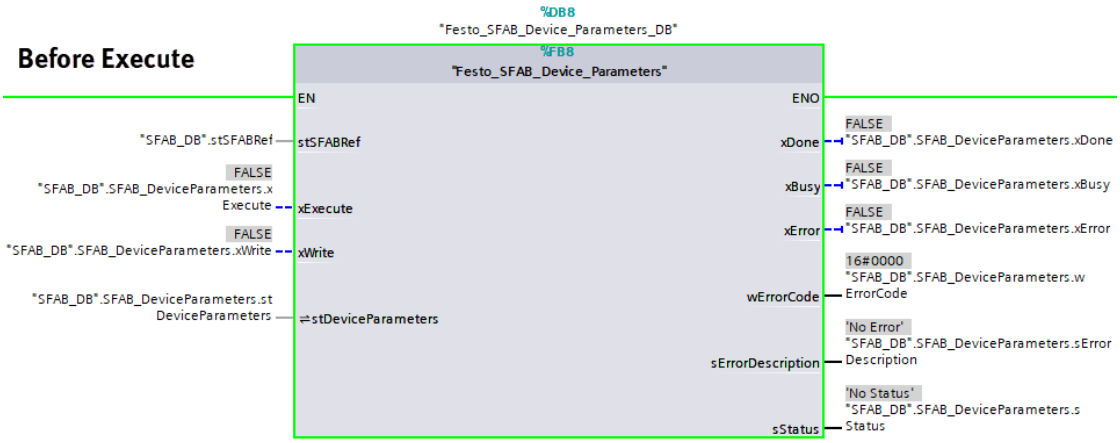
- The user can enter values in **stSSC12_Parameters** and **stSSC13_Parameters** to configure the desired write data for the device before executing the function block.



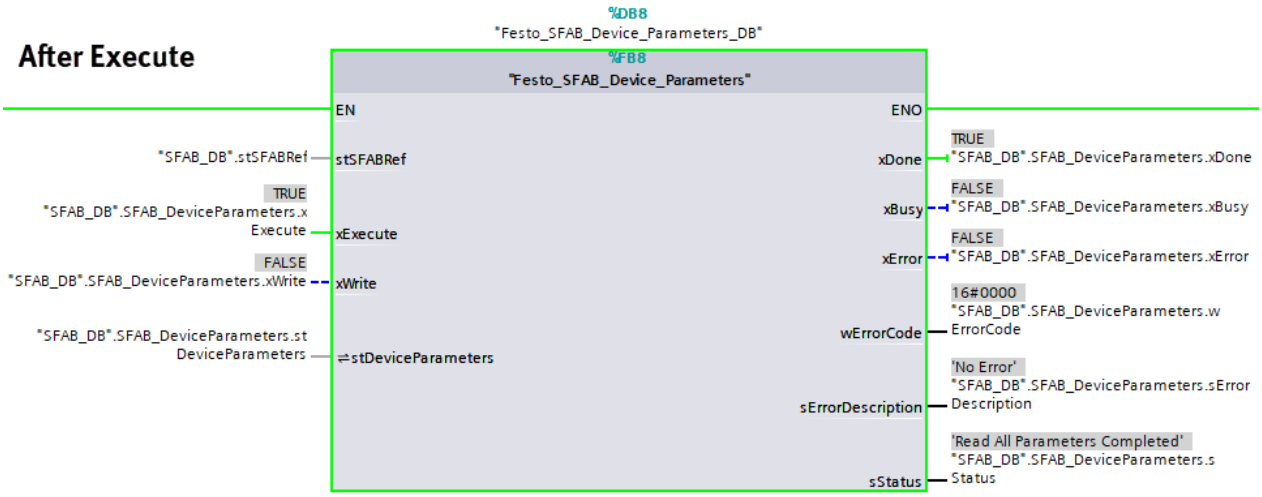
1. Set **xExecute** from **FALSE** to **TRUE**, triggering a rising edge to write the updated **stSSC11_Parameters** values to the SFAB Flow Sensor.
2. **xDone** changes to **TRUE,** indicating that the write operation has completed successfully.
3. **xBusy** remains **FALSE**, confirming the operation is no longer in progress.
4. **xError** remains **FALSE**, with **wErrorCode** showing **16#0000**, and **sErrorDescription** showing **'No Error'**.
5. **sStatus** changes to **'Write All Parameters Completed'**, confirming that the updated Flow Parameters have been successfully written to the SFAB Flow Sensor.

6.7 Festo SFAB Device Parameters

6.7.1 Reading Device Parameters



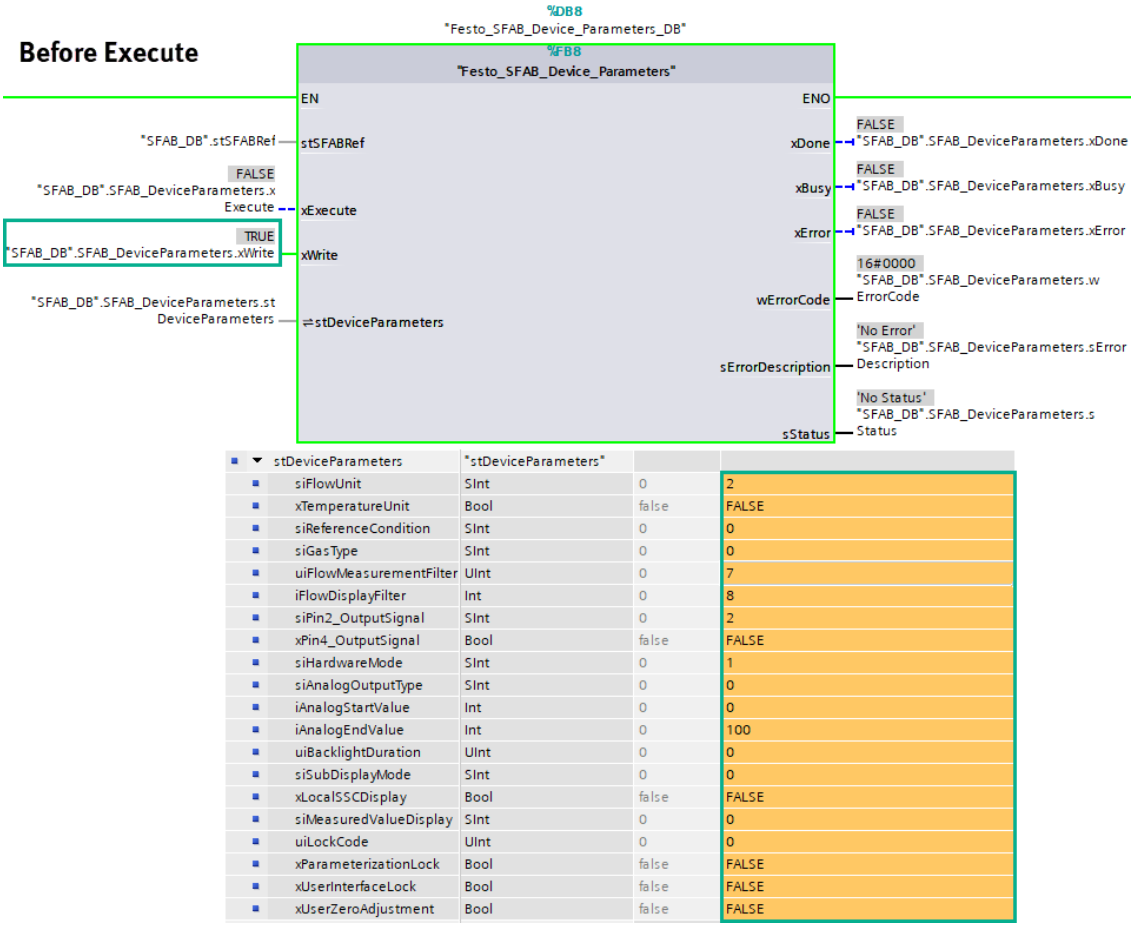
stDeviceParameters	"stDeviceParameters"		
siFlowUnit	SInt	0	0
xTemperatureUnit	Bool	false	FALSE
siReferenceCondition	SInt	0	0
siGasType	SInt	0	0
uiFlowMeasurementFilter	UInt	0	0
iFlowDisplayFilter	Int	0	0
siPin2_OutputSignal	SInt	0	0
xPin4_OutputSignal	Bool	false	FALSE
siHardwareMode	SInt	0	0
siAnalogOutputType	SInt	0	0
iAnalogStartValue	Int	0	0
iAnalogEndValue	Int	0	0
uiBacklightDuration	UInt	0	0
siSubDisplayMode	SInt	0	0
xLocalSSCDisplay	Bool	false	FALSE
siMeasuredValueDisplay	SInt	0	0
uiLockCode	UInt	0	0
xParameterizationLock	Bool	false	FALSE
xUserInterfaceLock	Bool	false	FALSE
xUserZeroAdjustment	Bool	false	FALSE



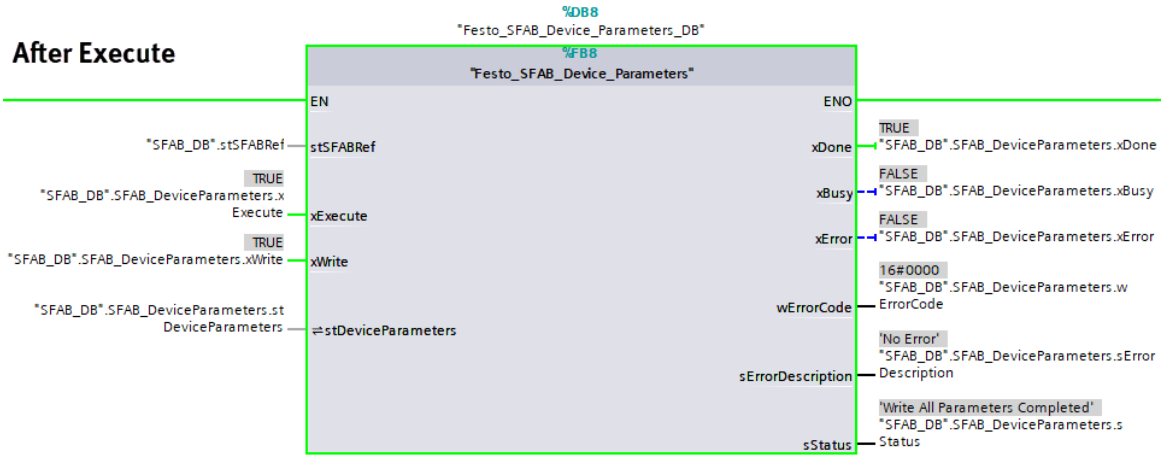
stDeviceParameters	"stDeviceParameters"		
siFlowUnit	SInt	0	0
xTemperatureUnit	Bool	false	FALSE
siReferenceCondition	SInt	0	0
siGasType	SInt	0	0
uiFlowMeasurementFilter	UInt	0	6
iFlowDisplayFilter	Int	0	8
siPin2_OutputSignal	SInt	0	2
xPin4_OutputSignal	Bool	false	FALSE
siHardwareMode	SInt	0	1
siAnalogOutputType	SInt	0	0
iAnalogStartValue	Int	0	0
iAnalogEndValue	Int	0	100
uiBacklightDuration	UInt	0	0
siSubDisplayMode	SInt	0	0
xLocalSSCDisplay	Bool	false	FALSE
siMeasuredValueDisplay	SInt	0	0
uiLockCode	UInt	0	0
xParameterizationLock	Bool	false	FALSE
xUserInterfaceLock	Bool	false	FALSE
xUserZeroAdjustment	Bool	false	FALSE

1. Turn **OFF** the **xWrite** input.
2. Turn **ON** the **xExecute** input (**TRUE** – Reads All Device Parameters).
3. **xBusy** turns **ON** while reading parameters, and turns **OFF** (**FALSE**) once reading is completed.
4. **xDone** turns **ON** (**TRUE**) once the parameter read is completed.
5. **xError** remains **FALSE**, with **wErrorCode** showing **16#0000**, and **sErrorDescription** showing **'No Error'**.
6. **sStatus** will be updated with **'Read All Parameters Completed'**.
7. **stDeviceParameters** will be updated with the read data from the sensor (Refer Chapter 4.9.7), showing the following values

6.7.2 Writing Device Parameters

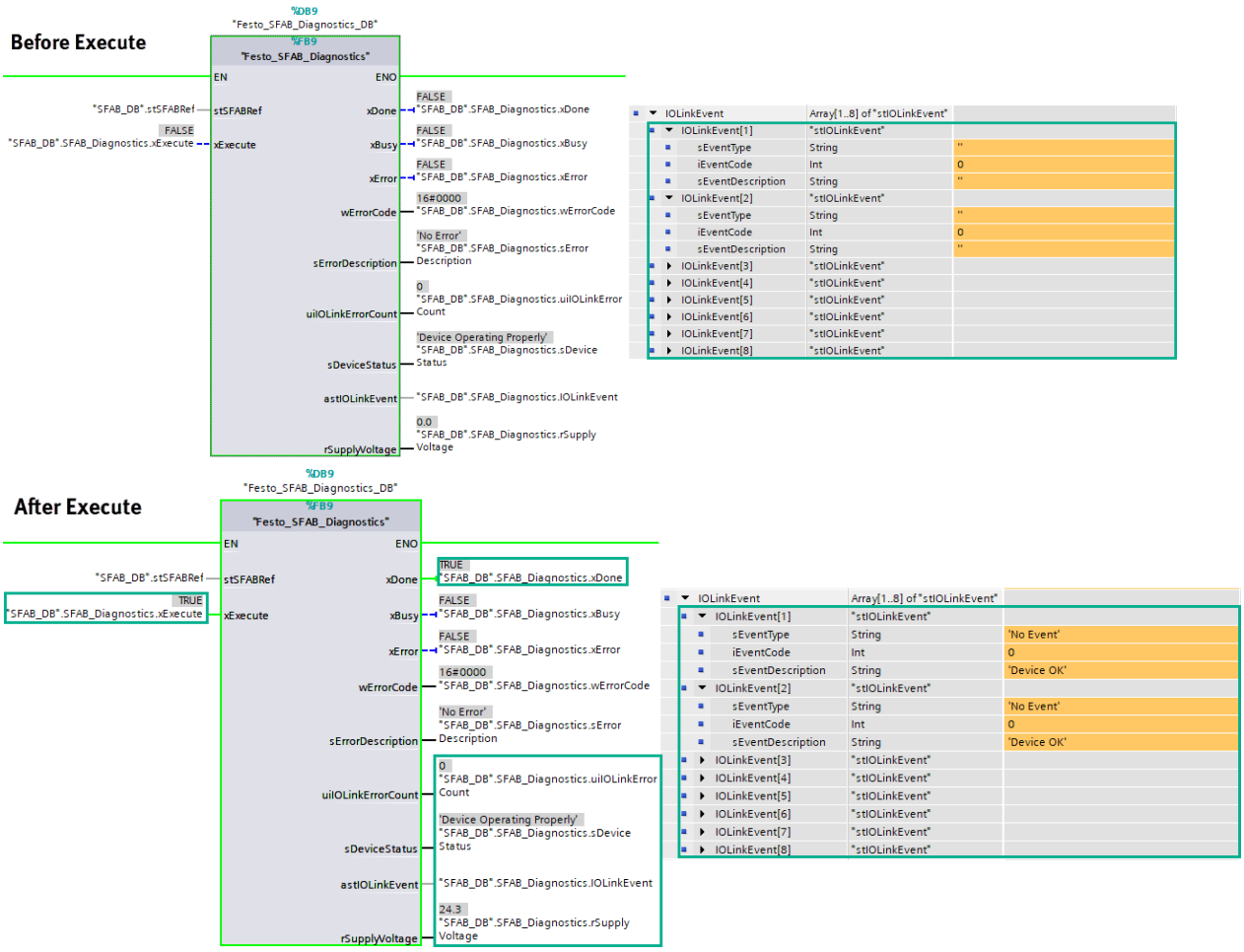


1. Turn ON **xWrite** Input (**TRUE** - Enables Write Mode).
2. Configure the required parameters within the **stDeviceParameters** structure as per user preference (Refer Chapter 4.9.7).



1. Turn ON **xExecute** Input (**TRUE** - Triggers the Write Operation).
2. **xBusy** turns **ON** while writing parameters to the device.
3. **sStatus** will be updated with the current parameter writing state.
4. **xDone** turns **ON** once the parameter write is completed.
5. **sStatus** will be updated with **Write_All_Parameters_Completed**.

6.8 Festo SFAB Diagnostics



1. Turn ON **xExecute** Input (**TRUE** - Reads Device Diagnostics).
2. **xBusy** turns **True** while reading diagnostic data.
3. **xDone** turns **True** once the diagnostic read is completed.
4. **sDeviceStatus** will be updated with the current device health status (e.g., **Device Operating Properly**).
5. **rSupplyVoltage** will be updated with the current voltage reading from the sensor.
6. **uiIOLinkErrorCount** will be updated with the current error count from the IO-Link connection.
7. **astIOLinkEvent** array will be updated with the latest event logs (if any events are present) Refer Chapter 4.9.4.