

EHPS Gripper Control with Beckhoff PLC through IO-Link Master

This Application Note explains about controlling the EHPS Gripper Module through Festo IO-Link Master in Beckhoff PLC. User can able to change the gripper mode, Open & Close the Gripper by using enclosed sample code.

EHPS

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1 Introduction

This application note demonstrate the controlling of EHPS gripper module with Beckhoff TwinCat3 PLC. Using the sample code user can able to open & close position of the gripper. Also able to change the gripper operating mode, Latch data, Store data, Reset the direction, Teach the gripping position, Teach new end position & reset the errors.



Note

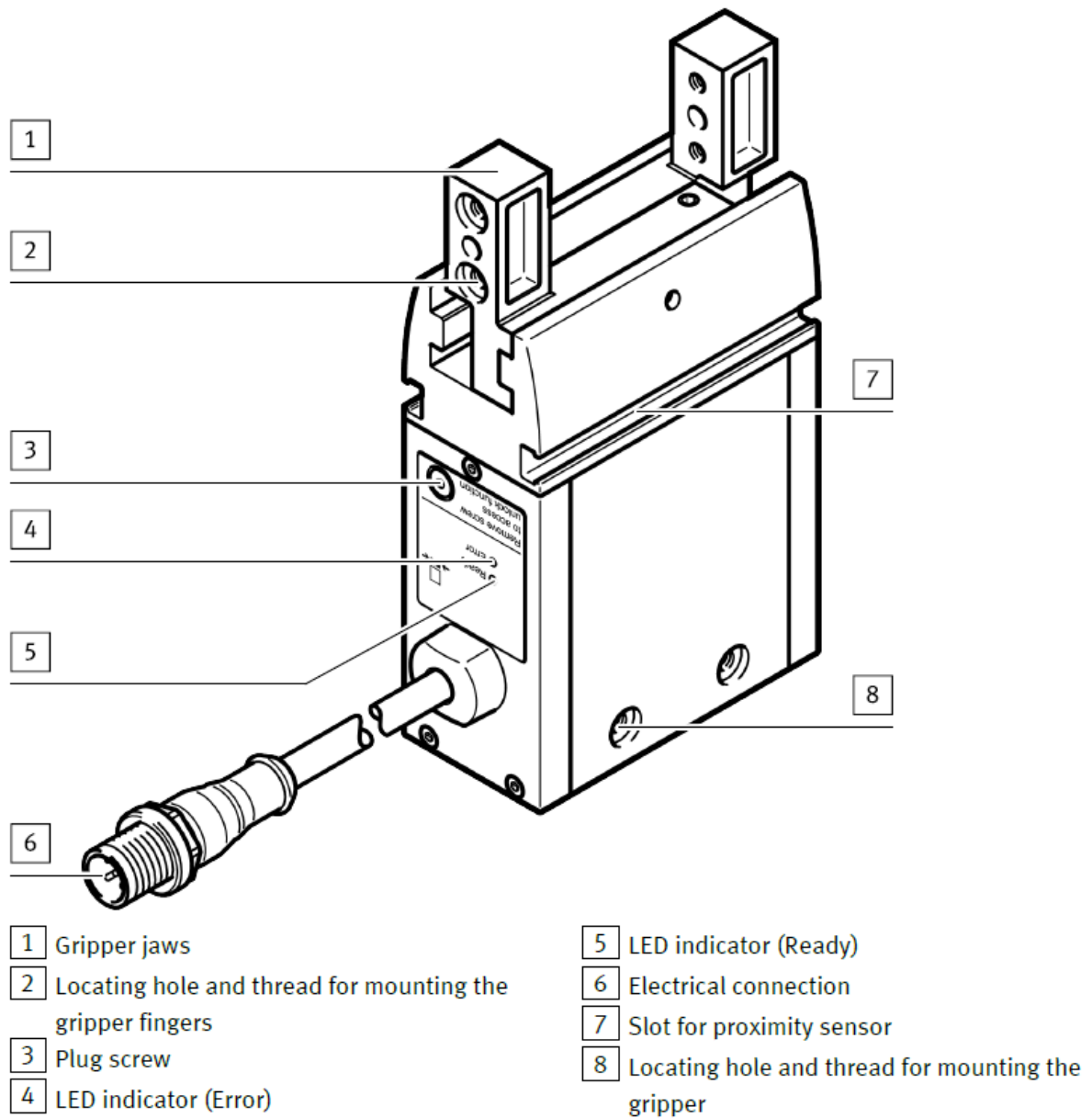
- For demonstration of this application note, here we have used Festo CPX-AP-I-4IOL-M12 as IO-Link Master.

1.1 Hardware & Software Requirements

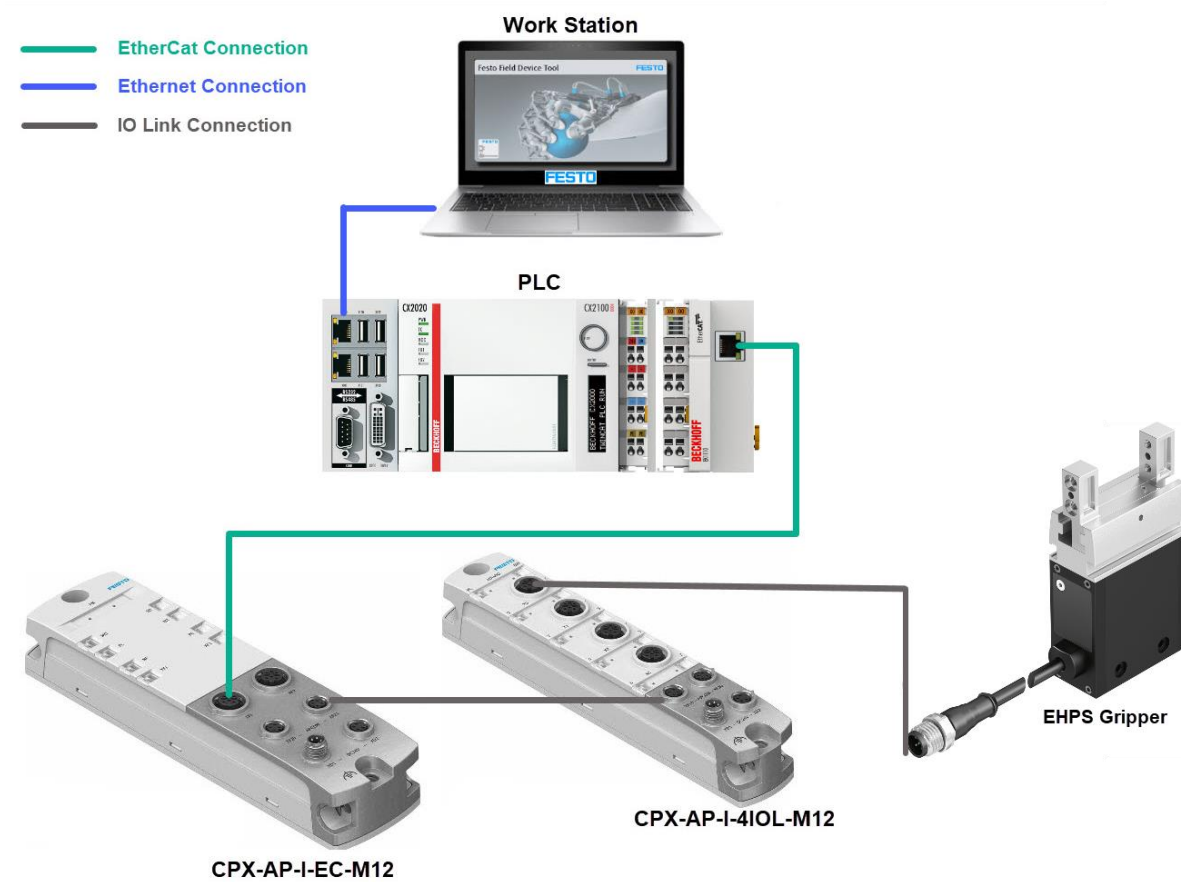
Device Name	Part Number	Version Software/Firmware	Device Type
Gripper – EHPS	EHPS-16-A-LK	Latest	Hardware
Festo IO-Link Master	CPX-AP-I-4IOL-M12	V1.1.3 & Above	Hardware
Festo CPX-AP-I Head Module	CPX-AP-I-EC-M12	V1.2.2 & Above	Hardware
CPX Module Connecting Cable	NEBC-D8G4-ES-0.3-N-S-D8G4-ET	-	Hardware
CPX Module Power Cable	NEBL-M8G4-E-5-N-LE4	-	Hardware
Beckhoff PLC CX2020	-	V3.1	Hardware
TwinCAT Xae Shell	-	V3	Software
Festo Field Device Tool	-	Latest	Software
Festo IO-Link Tool	-	V5.1.1 & Above	Software

Table 1.1: 1 Components/Software used

1.2 Hardware Overview



1.3 Communication Architecture



Note

- Communication Architecture may change depend on user CPX-AP-I expansion modules. The above structure shown for demonstration.

2 Beckhoff PLC Configuration in TwinCAT3

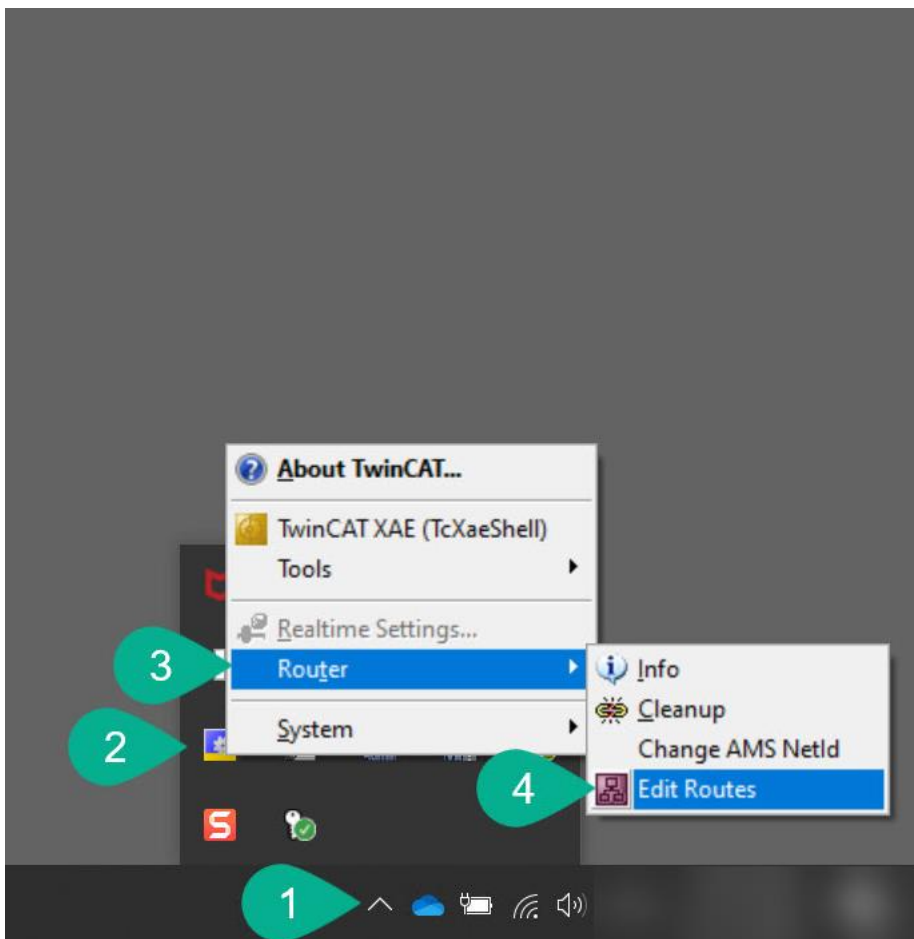
2.1 Connect Beckhoff Controller Using TwinCAT 3



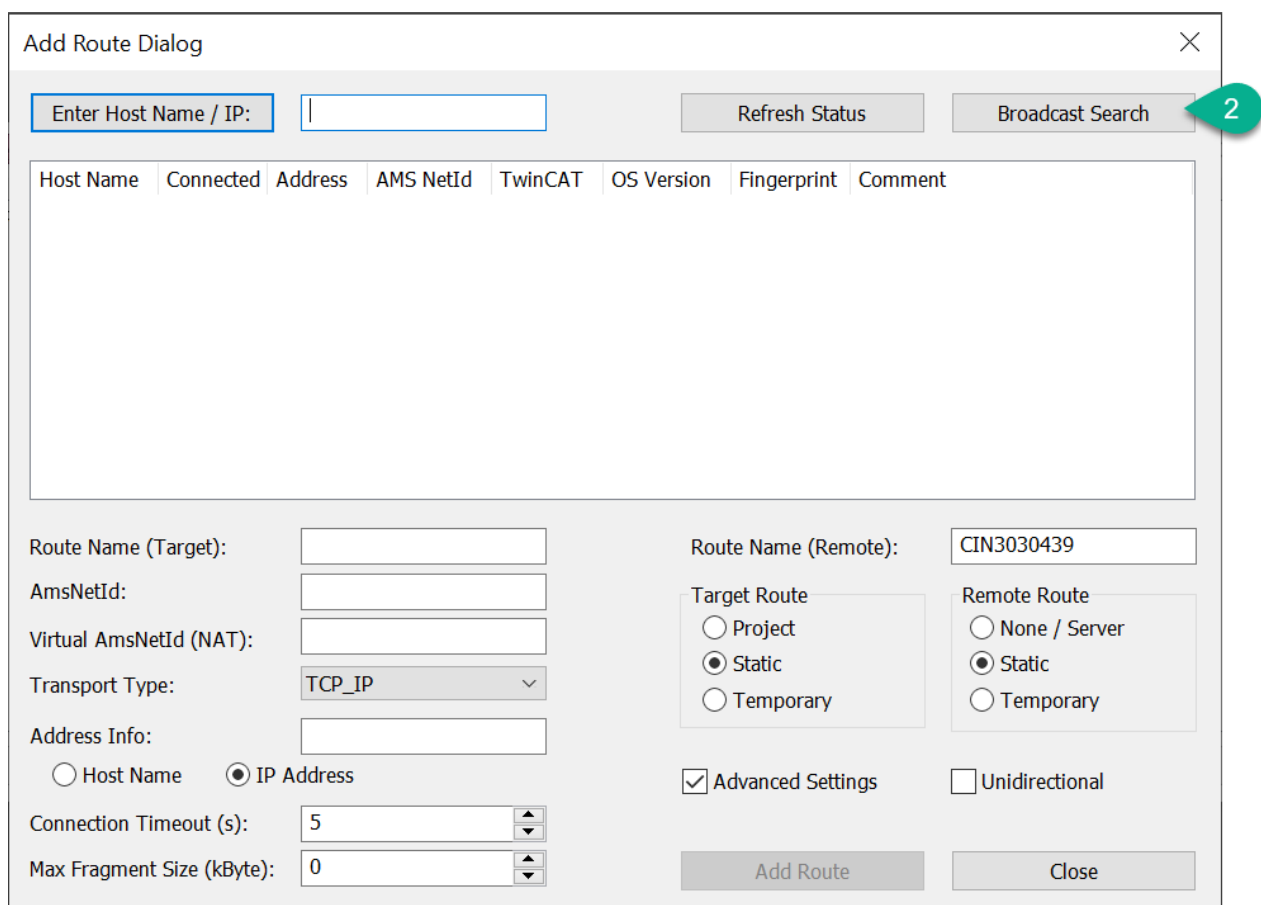
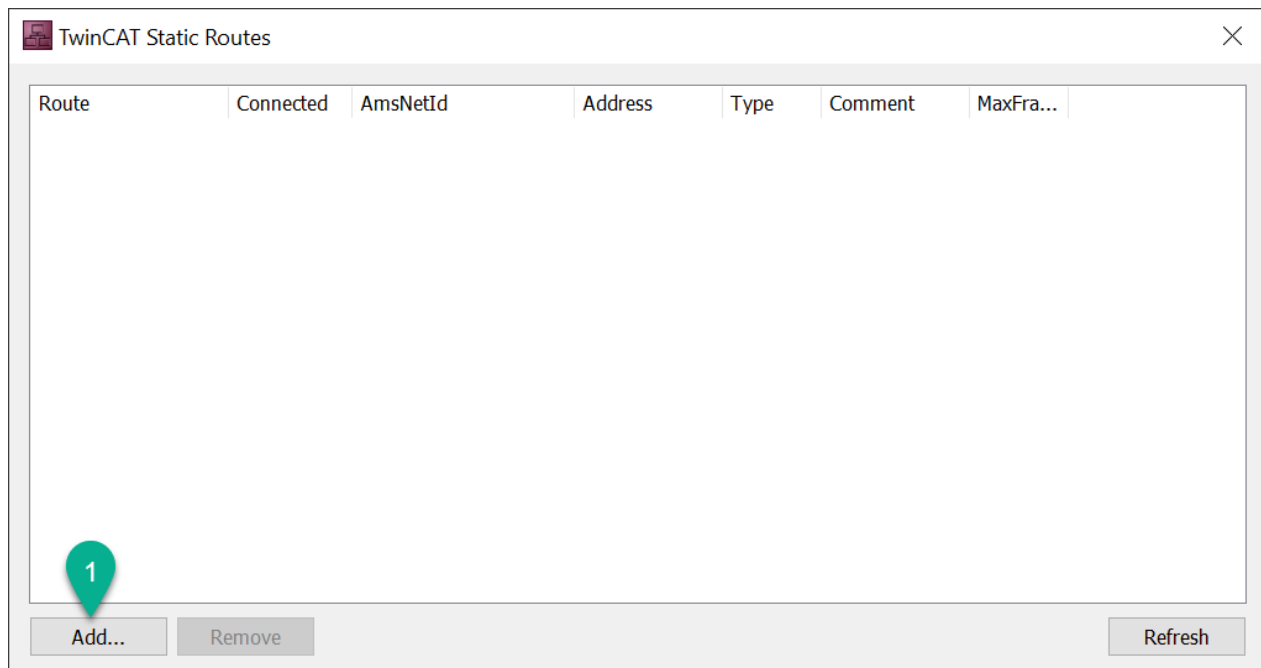
Note

- There is two method used for connect Beckhoff controller using TwinCAT 3
 - Dynamic Method (IP Address Set Automatically)
 - Static Method (Fixed IP Address)
- This example uses static method to connect Beckhoff controller using TwinCAT 3 (192.168.4.1 ---> IP Address of Controller).
- For using dynamic method, controller IP address configuration please watch following video on link
 - [BK04. How to Connect Beckhoff Controller using TwinCAT 3 \(2 Scenarios\)](#)

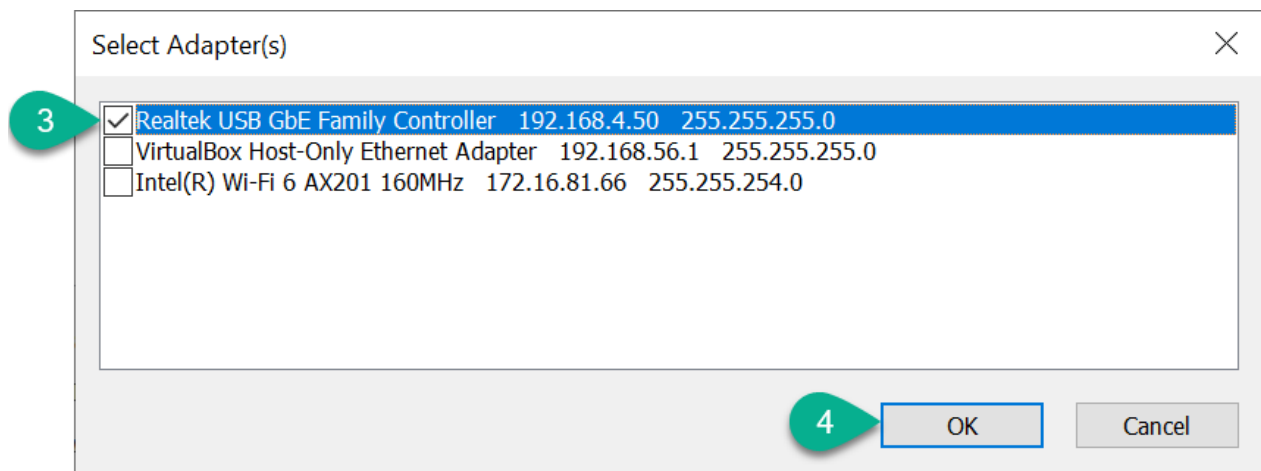
Step-1



1. Click on Taskbar hidden icon arrow from desktop window.
2. Click on **TwinCAT Config Mode** from taskbar hidden icon.
3. Click on **Router** from TwinCAT Config Mode popup window.
4. Click on **Edit Routes** to open the TwinCAT Static Routes Window.

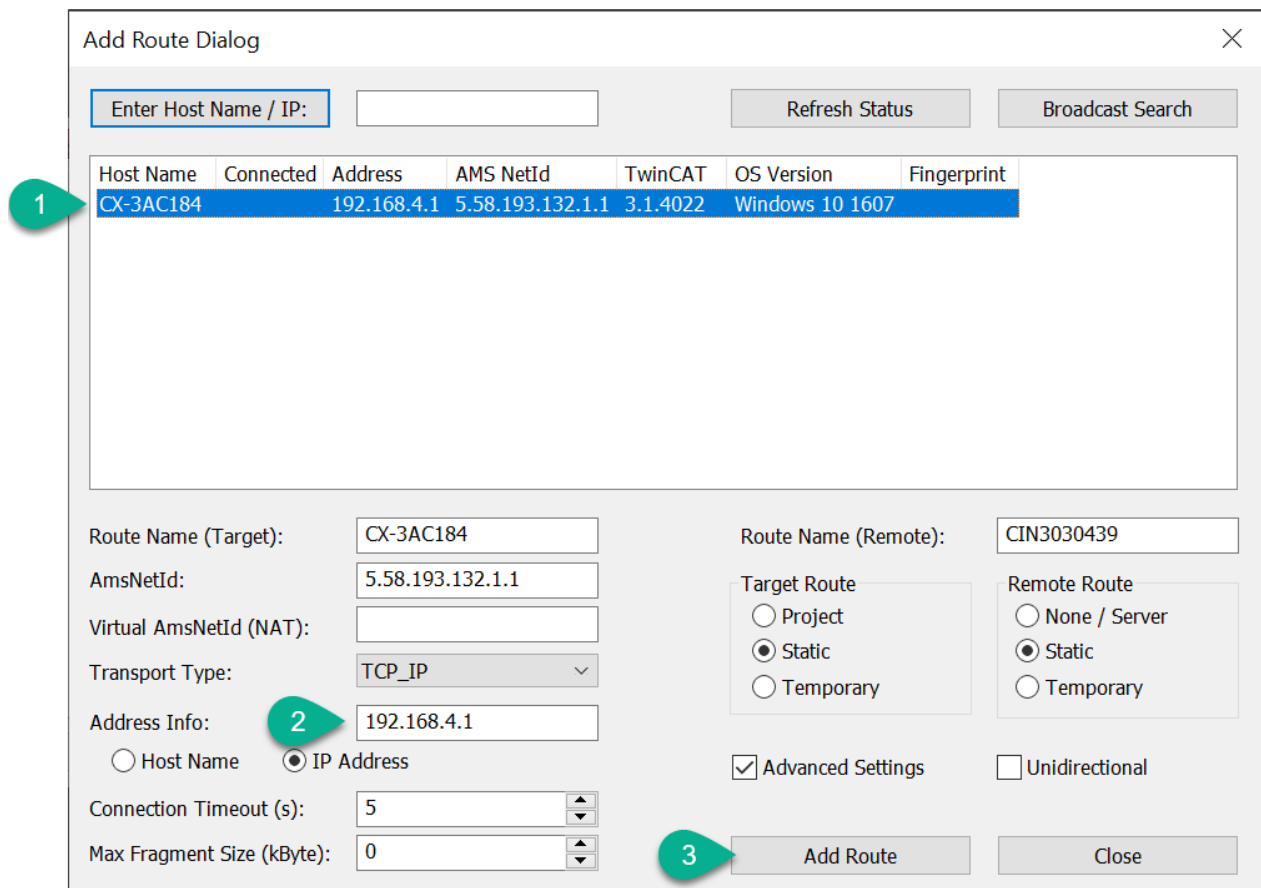
Step-2

1. Click on **Add** from TwinCAT Static Route window.
2. Click on **Broadcast Search** after confirm Route Settings from Add Route Dialog window.

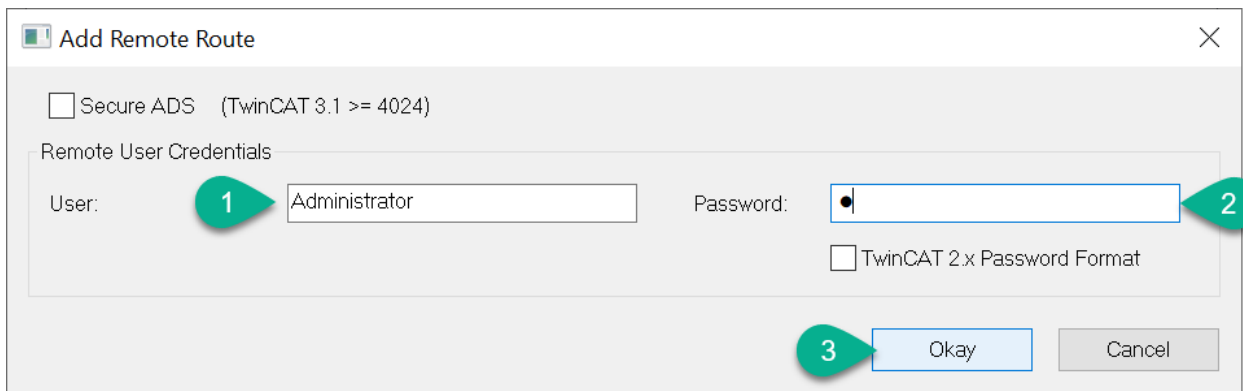


3. Select the correct adapter from the Adapter window.
4. Click **OK** to confirm the search in **Select Adapter(s)** window.

Step-3



1. Select the **PLC Route Connection** from Add Route Dialog window.
2. Check the **IP Address of controller** on Address Info field.
3. Click on **Add Route** from Add Route Dialog window.

Step-4


Add Remote Route

☐ Secure ADS (TwinCAT 3.1 >= 4024)

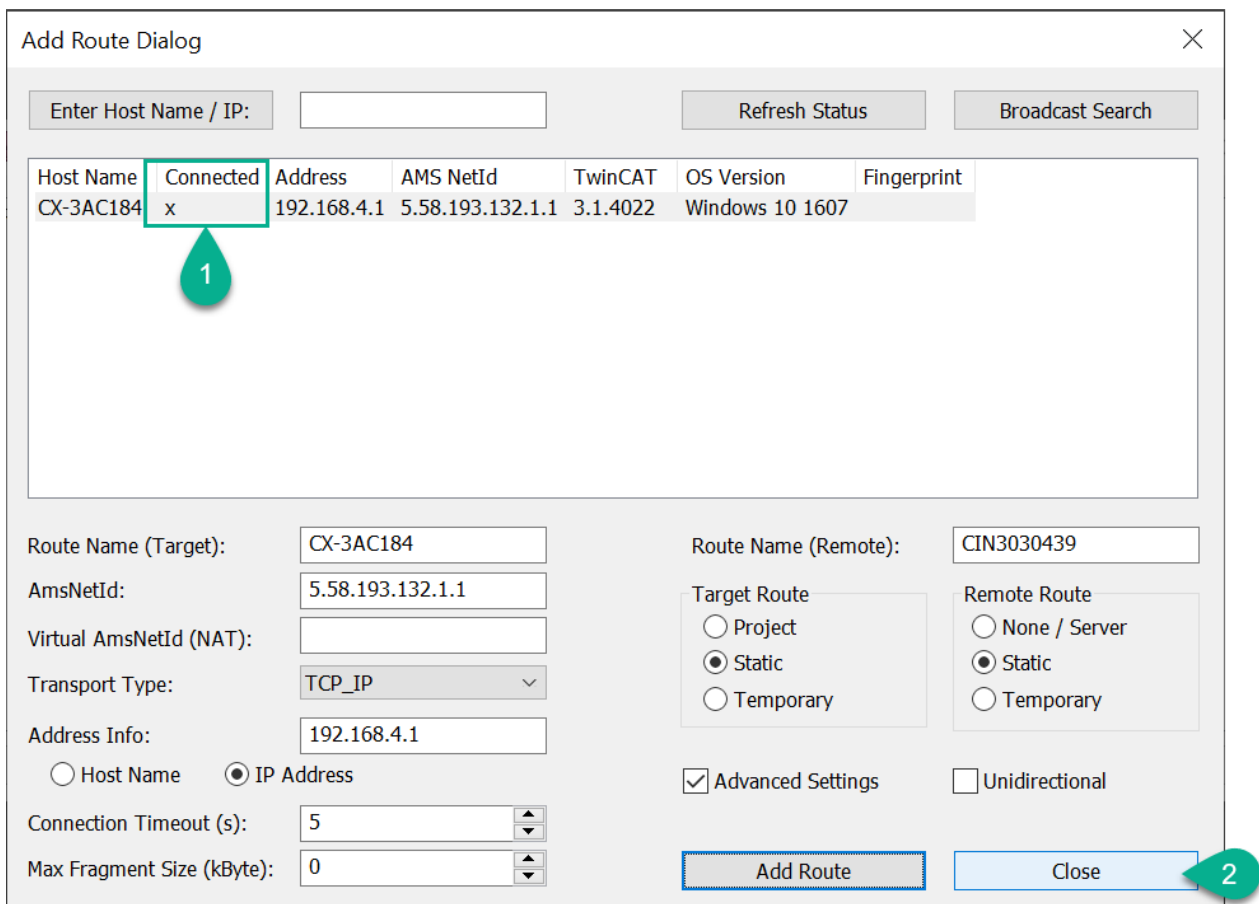
Remote User Credentials

User: Password:

☐ TwinCAT 2.x Password Format

Numbered callouts: 1 points to the User field, 2 points to the Password field, and 3 points to the Okay button.

1. Enter the **User** name in User field.
2. Enter the **Password** in Password field.
3. Click on **Okay** to add the Remote Route.

Step-5


Add Route Dialog

Enter Host Name / IP:

Host Name	Connected	Address	AMS NetId	TwinCAT	OS Version	Fingerprint
CX-3AC184	x	192.168.4.1	5.58.193.132.1.1	3.1.4022	Windows 10	1607

Numbered callout: 1 points to the 'x' in the Connected column.

Route Name (Target):

AmsNetId:

Virtual AmsNetId (NAT):

Transport Type:

Address Info:

☐ Host Name ☒ IP Address

Connection Timeout (s):

Max Fragment Size (kByte):

Route Name (Remote):

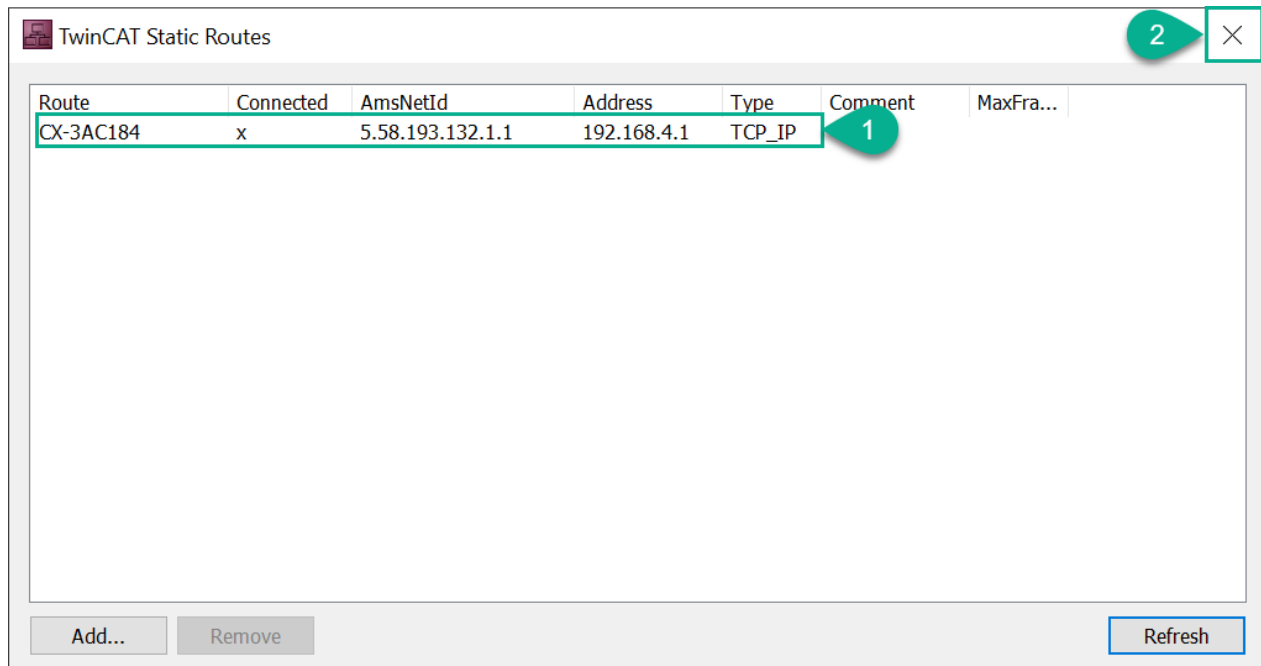
Target Route: ☐ Project ☒ Static ☐ Temporary

Remote Route: ☐ None / Server ☒ Static ☐ Temporary

☒ Advanced Settings ☐ Unidirectional

Numbered callout: 2 points to the Close button.

1. Check the Controller connect status (**x**) under Connected filed in Add Route Dialog window.
2. Click on **Close** from Add Route Dialog window.

Step-6

1. Verify the available Route from TwinCAT Static Routes window.
2. Click on **Close** from TwinCAT Static Routes window.

2.2 Creating a new project in TwinCAT3

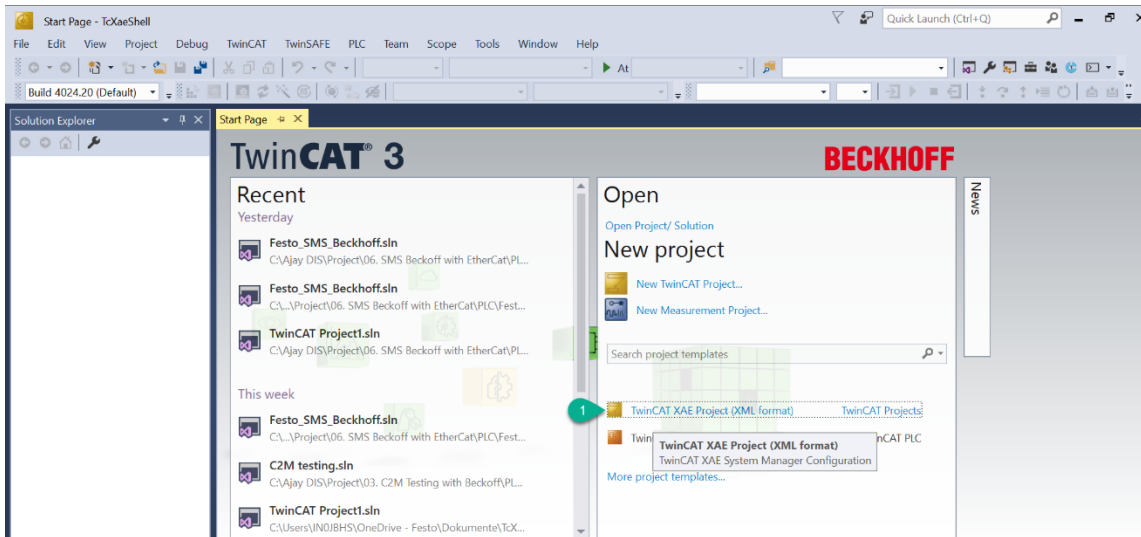


Note

- The Device Version **MUST BE 3.1 OR HIGHER**. An older controller will not be compatible with the Festo EtherCAT library.
- Skip this chapter if user when integrating on existing projects.

Step-1

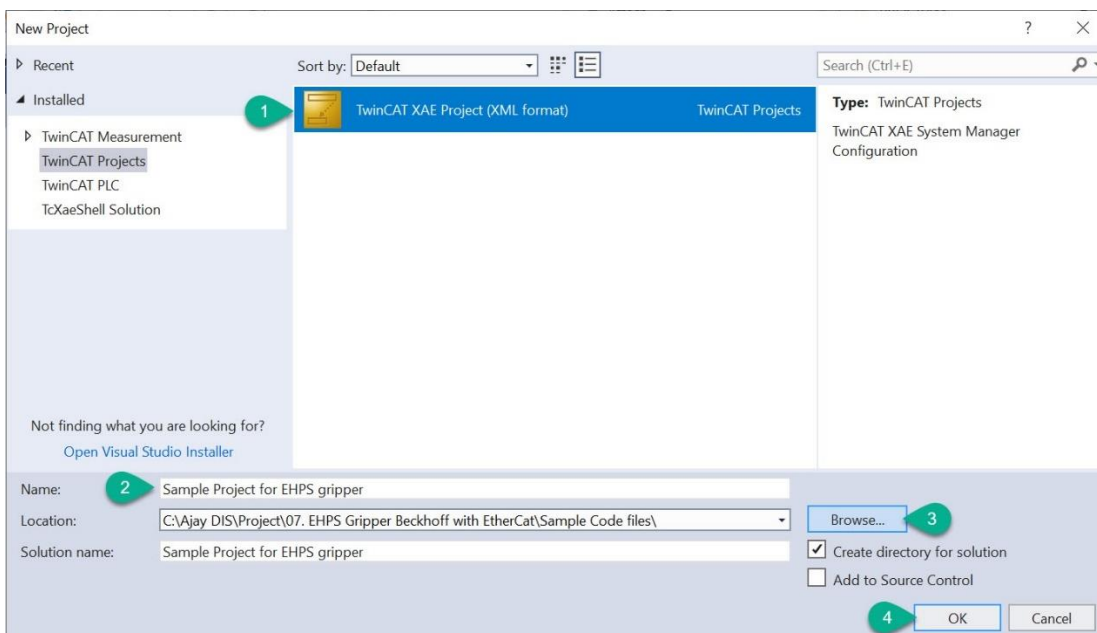
Start the **TwinCAT3 (TwinCAT XAE Shell)** software.



1. Click on **TwinCAT XAE Project (XML Format)** to create a new project.

The New Project tab will be displayed as shown below Step-2

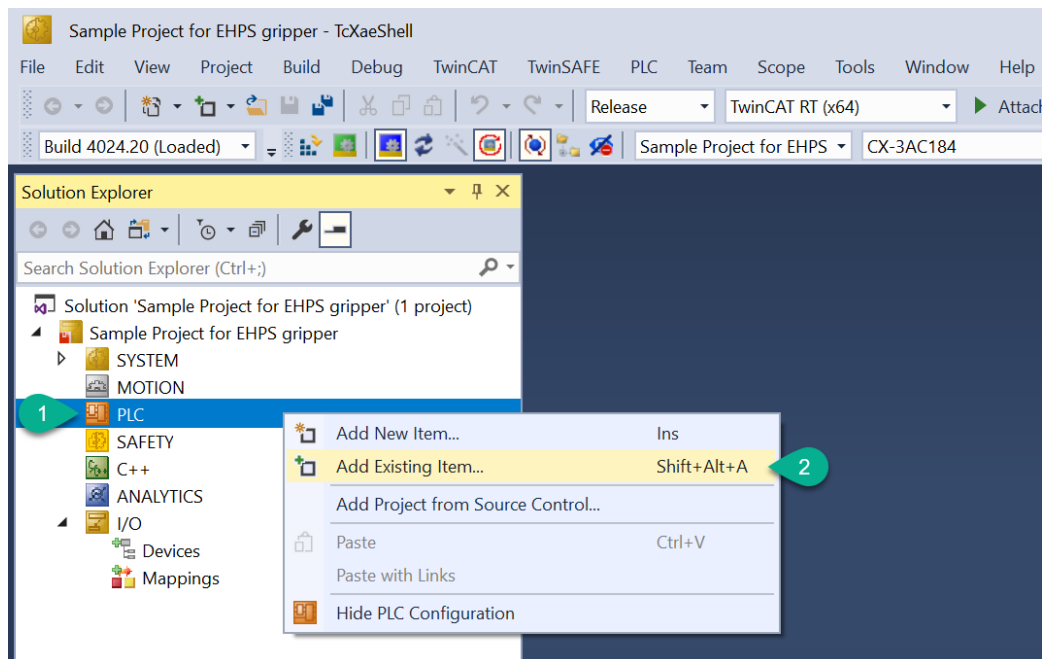
Step-2



1. Select **TwinCAT XAE Project (XML Format)** from New Project tab.
2. Type the **Project name** on the Name field.
3. Select the **Location** where the project has to be saved.
4. Click **OK** to create project.

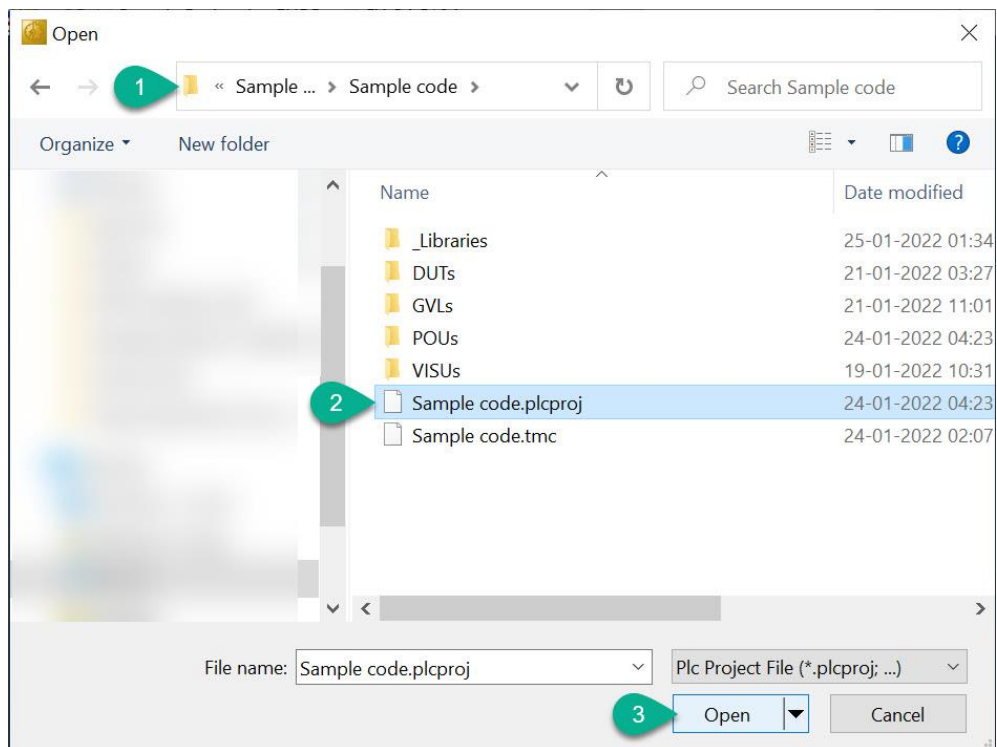
2.3 Import Sample Code into TwinCat3 PLC Project

Step-1

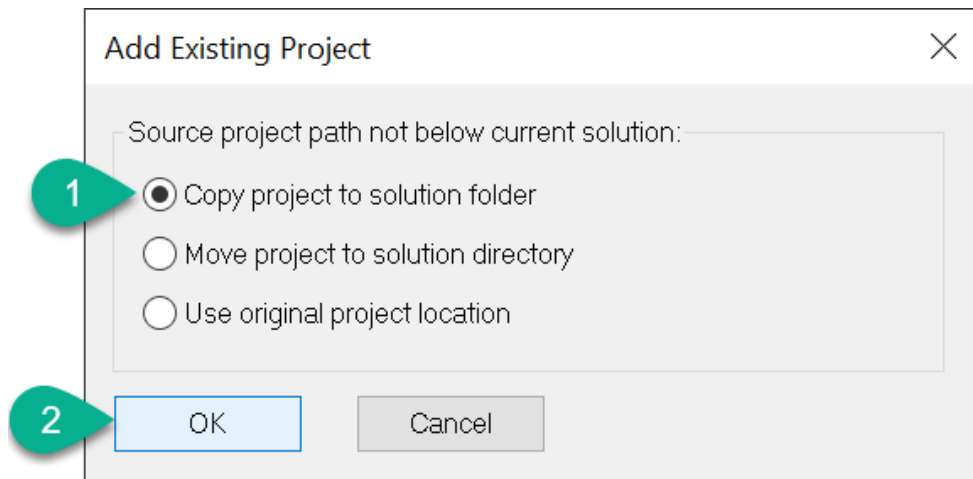


1. Right Click **PLC** from Solution Explorer.
2. Click on **Add Existing item** to add the sample code.

Step-2

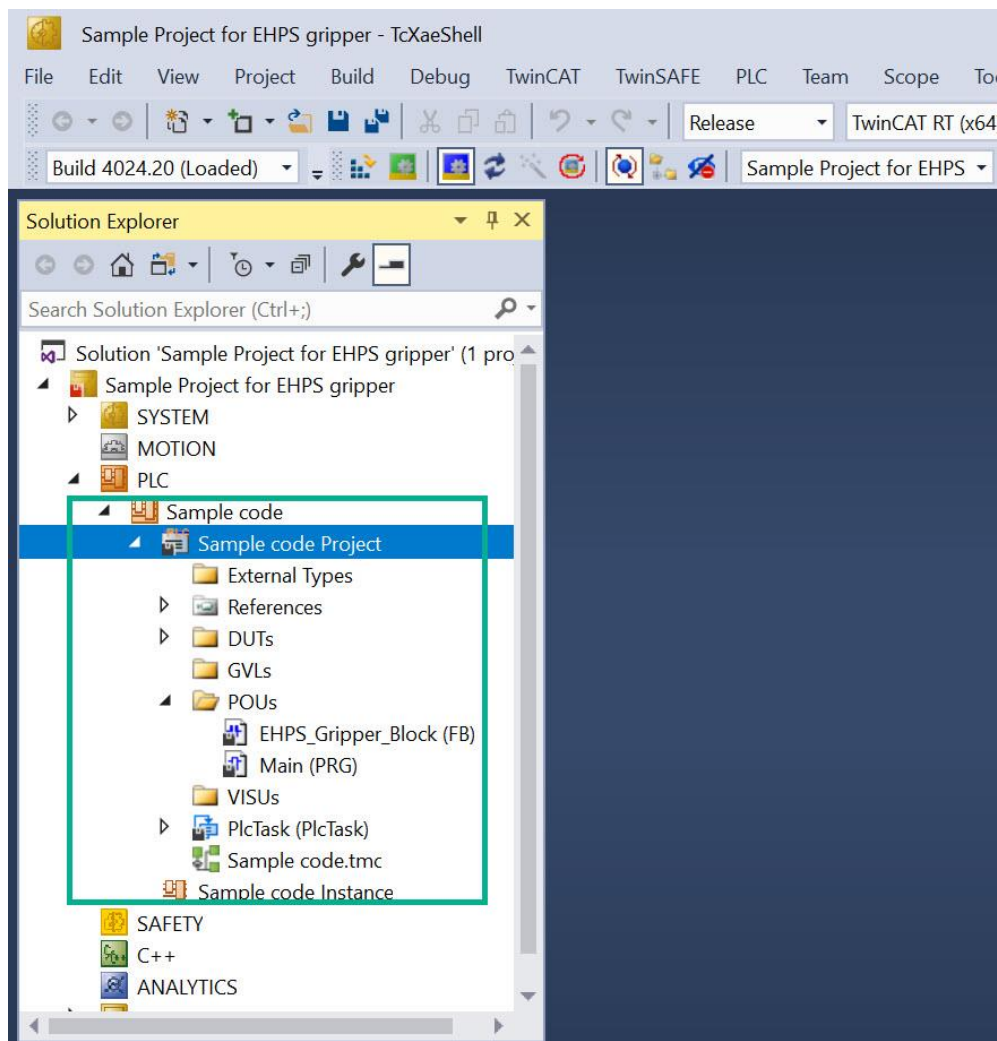


1. Choose the **path** where the Sample Code is saved in your system.
2. Select the **Sample Code** from Open window.
3. Click on **Open** to add the sample to PLC project .

Step-3

1. Select the **Copy Project** from the above options.
2. Click on **OK** to copy the sample code files to current project folder.

The Added Sample code project will be displayed as shown below Step-4.

Step-4

3 Configuring IO-Link module in TwinCAT3

3.1 Adding ESI File of CPX-API-I-EC

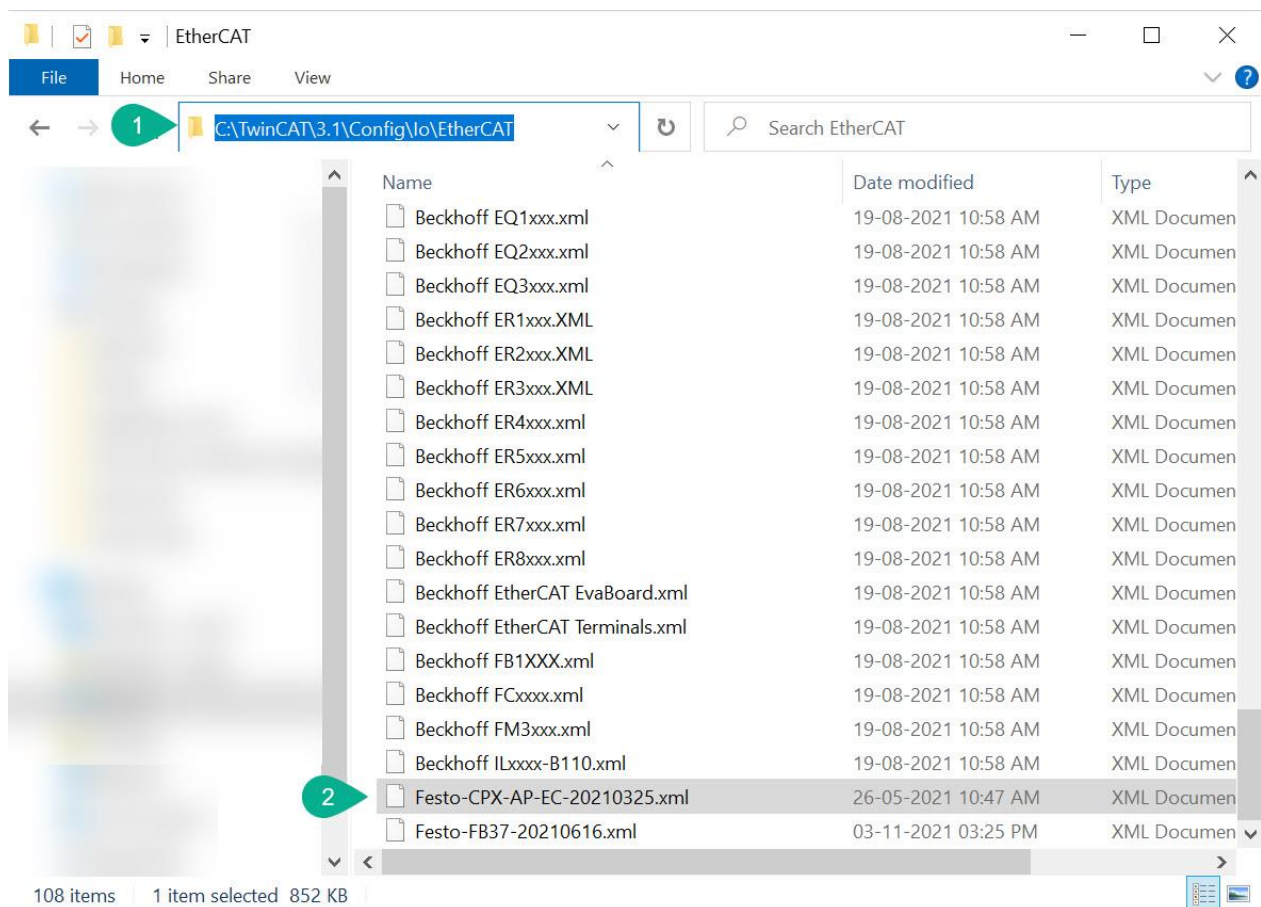
Step – 1

Download the Latest ESI File for **CPX-AP-I-EC** module from the Festo Support Portal.

Step – 2

Copy the ESI file in the following link in your system.

- **C:\TwinCAT\3.1\Config\Io\EtherCAT**

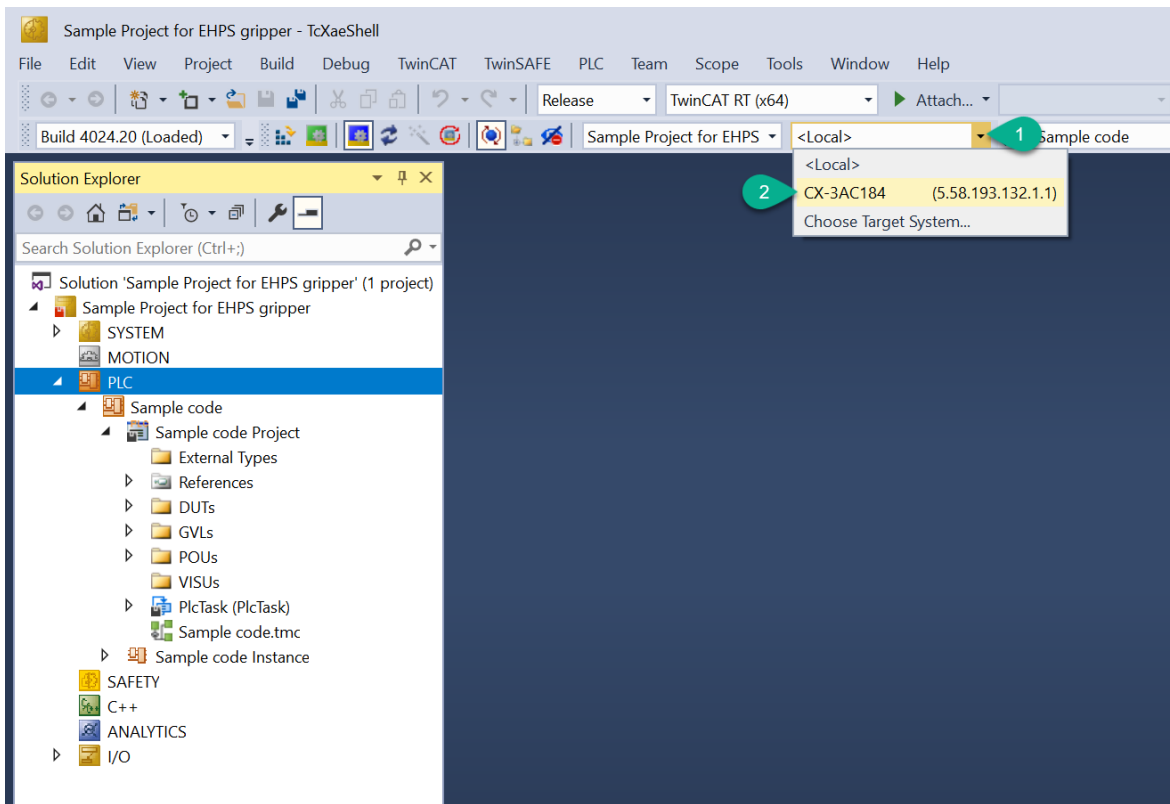


1. Copy the above EtherCAT ESI file path and paste in to path tab to open the TwinCAT3 ESI file location.
2. Copy the ESI file from Downloads and paste it to **C:\TwinCAT\3.1\Config\Io\EtherCAT** folder.

3.2 Adding CPX-API-I-EC module to I/O devices

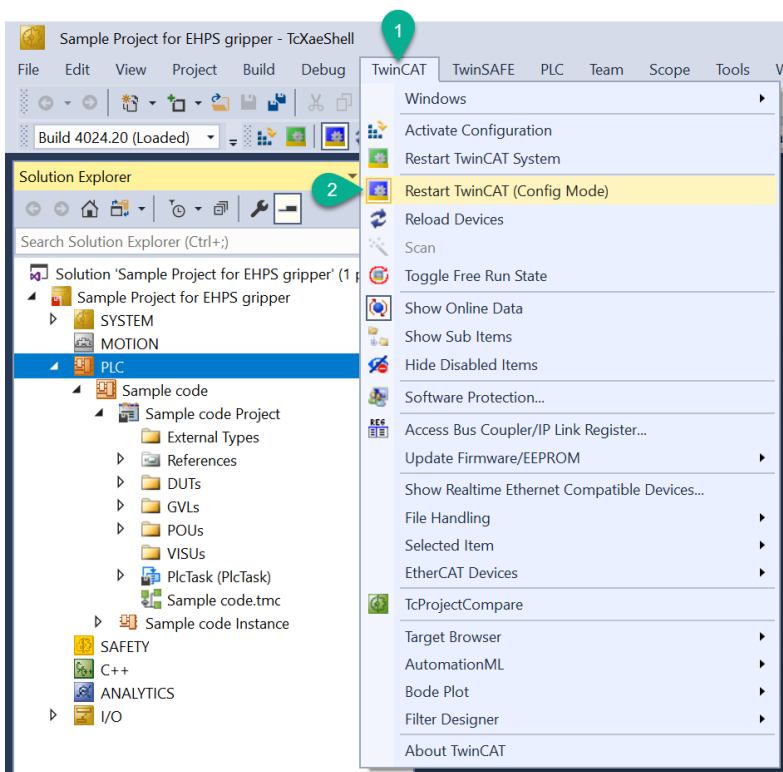
3.2.1 Choose Target System

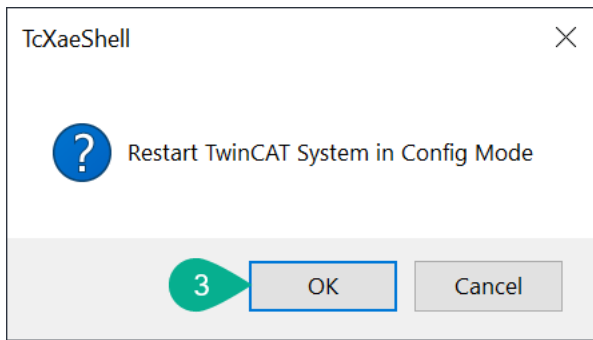
Step – 1



1. Click on drop down icon in Choose Target system field.
2. Choose **CX-3AC184 Route** from Choose Target system drop down.

Step – 2

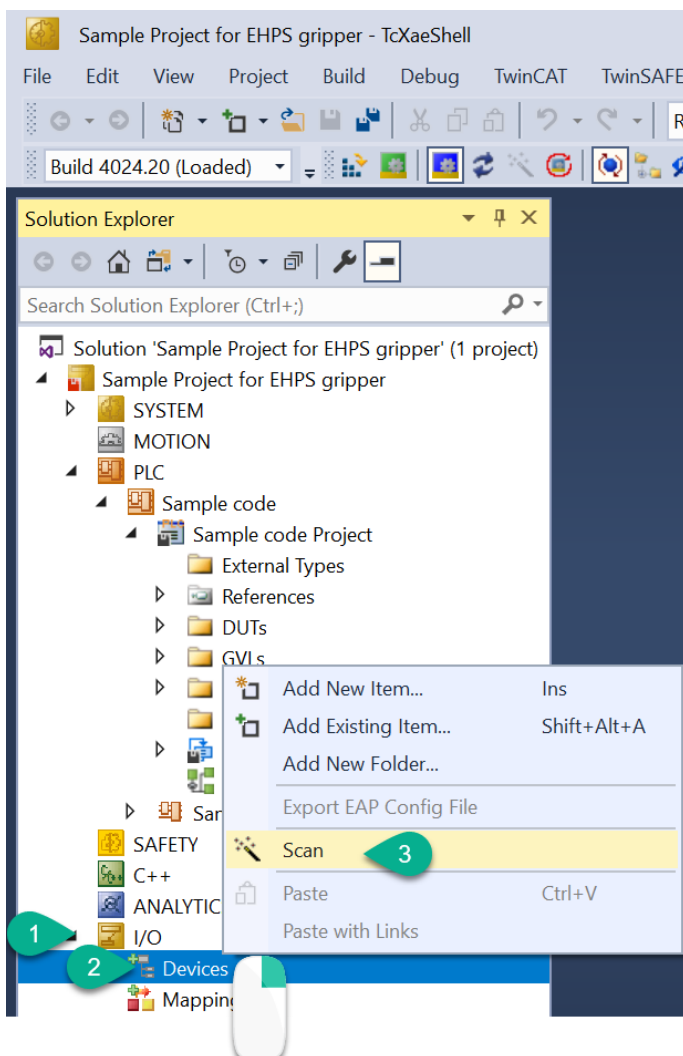




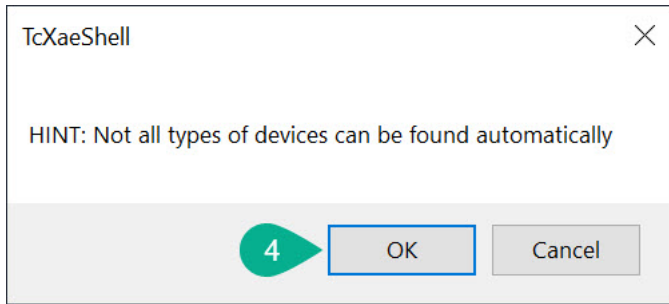
1. Click on **TwinCAT** menu from the top menu bar.
2. Click on **Restart TwinCAT (Config Mode)** from the TwinCAT menu.
3. Click on **OK** button to start the system in Config Mode.

3.2.2 Scanning I/O devices

Step – 1

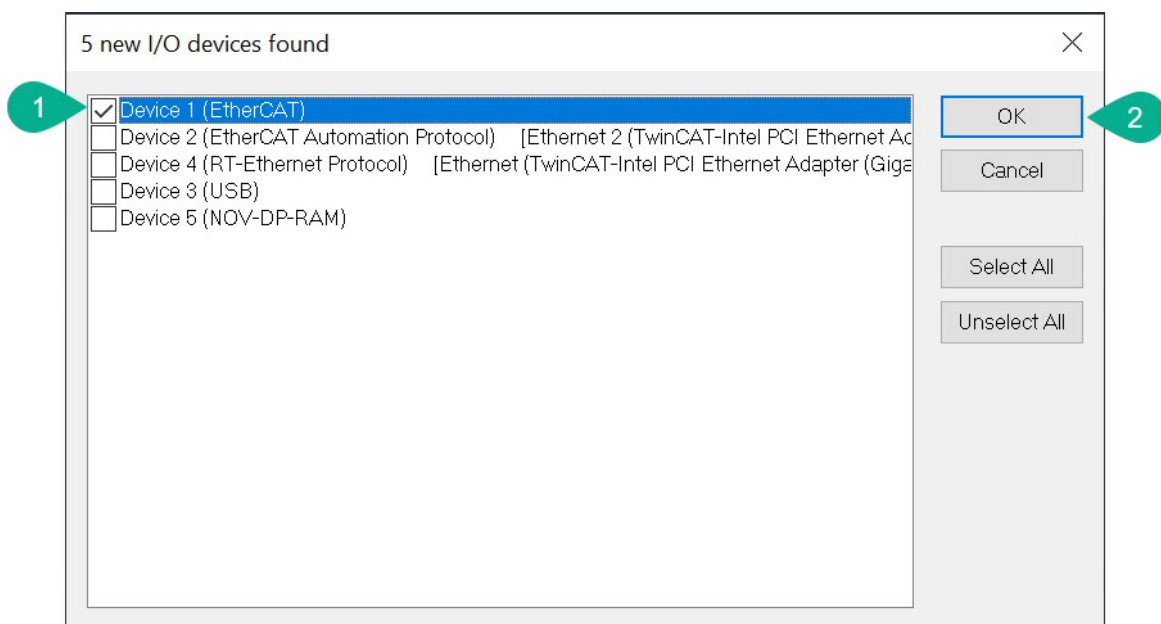


1. Expand the **I/O** from Solution Explorer.
2. Right click on **Devices** from I/O drop down menu.
3. Click on **Scan** to scan the I/O Devices.

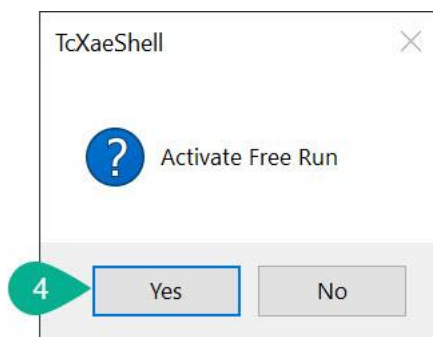
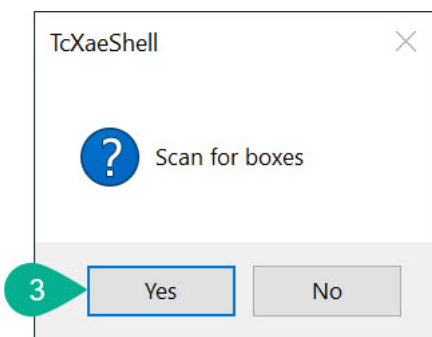


- Click **OK** button to start scanning for the I/O devices connected in the network.

Step – 2

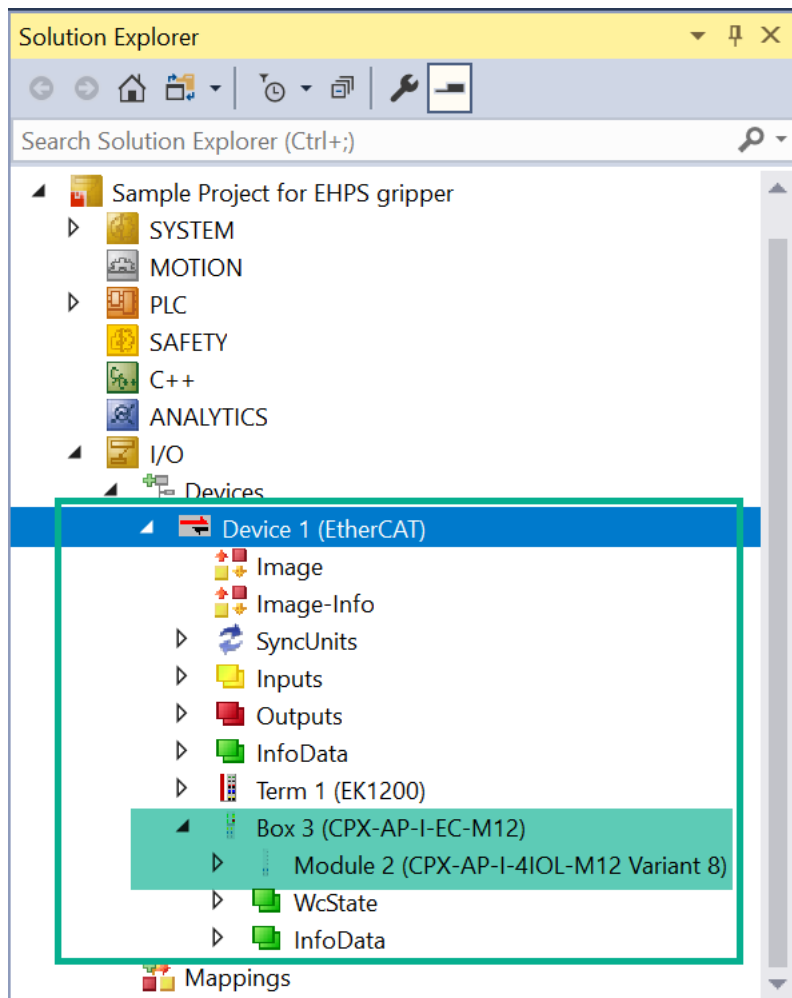


- Select the **Device 1 (EtherCAT)** from I/O devices found tab.
- Click **OK** to add the I/O devices to project in new I/O devices found window.



- Click **Yes** to Scan for Boxes which are connected to the EtherCAT Master.
- After the Boxes are scanned, click **Yes** to activate Free Run.

The devices connected in Network will be shown as below.



4 Configuring CPX-API-I-EC devices in TwinCAT3

4.1 CPX-AP-I-4IO-M12 IO-Link Master Port Configuration



Note

- User has to do the below configurations for the IO-Link port where EHPS Gripper is connect.

Step – 1

- Double click on **Box3 (CPX-AP-I-EC-M12)** to go to device overview.

The screenshot shows the TwinCAT3 interface. The top part is the 'Solution Explorer' window, which displays a project tree. Under the 'I/O' folder, 'Devices' is expanded, showing 'Device 1 (EtherCAT)' and 'Box 3 (CPX-AP-I-EC-M12)'. A red circle with the number '1' points to 'Box 3 (CPX-AP-I-EC-M12)'. Below this is the 'CoE - Online' tab, which shows a table of device parameters. A red circle with the number '2' points to the 'CoE - Online' tab. A red circle with the number '3' points to the '2001:0 CPX-AP-I-4IOL-M12 Variant 8 - Module Parameter' row. A red circle with the number '4' points to the '2... Port Mode - Port 0' row.

Index	Name	Flags	Value	Unit
2000:0	CPX-AP-I-EC-M12 - Module Parameter		> 1 <	
2001:0	CPX-AP-I-4IOL-M12 Variant 8 - Module Parameter		> 57 <	
2...	Setup monitoring load supply (PL) 24 V DC	RW	Load supply monitorin...	
2...	Nominal Cycle Time - Port 0	RW	as fast as possible (0)	
2...	Nominal Cycle Time - Port 1	RW	as fast as possible (0)	
2...	Nominal Cycle Time - Port 2	RW	as fast as possible (0)	
2...	Nominal Cycle Time - Port 3	RW	as fast as possible (0)	
2...	Enable diagnosis of IO-Link device lost - Port 0	RW	TRUE	
2...	Enable diagnosis of IO-Link device lost - Port 1	RW	TRUE	
2...	Enable diagnosis of IO-Link device lost - Port 2	RW	TRUE	
2...	Enable diagnosis of IO-Link device lost - Port 3	RW	TRUE	
2...	Port Mode - Port 0	RW	DEACTIVATED (0)	
2...	Port Mode - Port 1	RW	DEACTIVATED (0)	
2...	Port Mode - Port 2	RW	DEACTIVATED (0)	
2...	Port Mode - Port 3	RW	DEACTIVATED (0)	
2...	Validation & Backup - Port 0	RW	No Device check (0)	
2...	Validation & Backup - Port 1	RW	No Device check (0)	
2...	Validation & Backup - Port 2	RW	No Device check (0)	
2...	Validation & Backup - Port 3	RW	No Device check (0)	
2...	Nominal Vendor ID - Port 0	RW	0x014D (333)	

- Click on **CoE – Online** to view the device parameters.
- Expand the **CPX-AP-I-4IOL-M12 Variant 8 – Module Parameter** to view the module parameter.
- Double click on **Port Mode – Port 0** to change the port configuration.

The Port Configuration tab will be displayed as shown below Step-2.

Step – 2

The 'Set Value Dialog' box is shown with the following fields and annotations:

- Dec:** 0
- Hex:** 0x00
- Enum:** A dropdown menu is open, showing options: DEACTIVATED, IOL_MANUAL, **IOL_AUTOSTART** (highlighted with a green circle 2), DI_CQ, and PREOPERATE. A green circle 1 points to the dropdown arrow.
- Bool:** (empty)
- Binary:** 00
- Bit Size:** Radio buttons for 1, 8 (selected), 16, 32, 64, and ?.
- Buttons:** OK (highlighted with a green circle 3), Cancel, and Edit...

1. Click on **Enum** field to view the port enable options.
2. Select **IOL_AUTOSTART** from the port enable options.
3. Click on **OK** button to enable the port.

Step – 3

- Follow the above step1 and step2 to change the other parameters.
- Assign the parameter as like below green highlighted to activate an IO-Link port.

The TwinCAT3 parameter configuration window is shown with the 'Startup' tab selected. The 'Online Data' button is highlighted. The 'Module OD (AoE Port):' is set to 0.

Index	Name	Flags	Value
2000:0	CPX-API-I-EC-M12 - Module Parameter		> 1 <
2001:0	CPX-API-I-4IOL-M12 Variant 8 - Module Parameter		> 57 <
2...	Setup monitoring load supply (PL) 24 V DC	RW	Load supply monitoring active, diagnosis suppressed in cas...
2...	Nominal Cycle Time - Port 0	RW	as fast as possible (0)
2...	Nominal Cycle Time - Port 1	RW	as fast as possible (0)
2...	Nominal Cycle Time - Port 2	RW	as fast as possible (0)
2...	Nominal Cycle Time - Port 3	RW	as fast as possible (0)
2...	Enable diagnosis of IO-Link device lost - Port 0	RW	TRUE
2...	Enable diagnosis of IO-Link device lost - Port 1	RW	TRUE
2...	Enable diagnosis of IO-Link device lost - Port 2	RW	TRUE
2...	Enable diagnosis of IO-Link device lost - Port 3	RW	TRUE
2...	Port Mode - Port 0	RW	IOL_AUTOSTART (2)
2...	Port Mode - Port 1	RW	DEACTIVATED (0)
2...	Port Mode - Port 2	RW	DEACTIVATED (0)
2...	Port Mode - Port 3	RW	DEACTIVATED (0)
2...	Validation & Backup - Port 0	RW	Type compatible Device V1.1, Backup + Restore (3)
2...	Validation & Backup - Port 1	RW	No Device check (0)
2...	Validation & Backup - Port 2	RW	No Device check (0)
2...	Validation & Backup - Port 3	RW	No Device check (0)
2...	Nominal Vendor ID - Port 0	RW	0x0000 (0)

**Note**

- Festo EHPS Gripper unit is connected to CPX-API-I-4IOL-M12 Master Module in Port-0.

4.2 I/O Address Configuration and Linking to Module I/O's in TwinCAT3

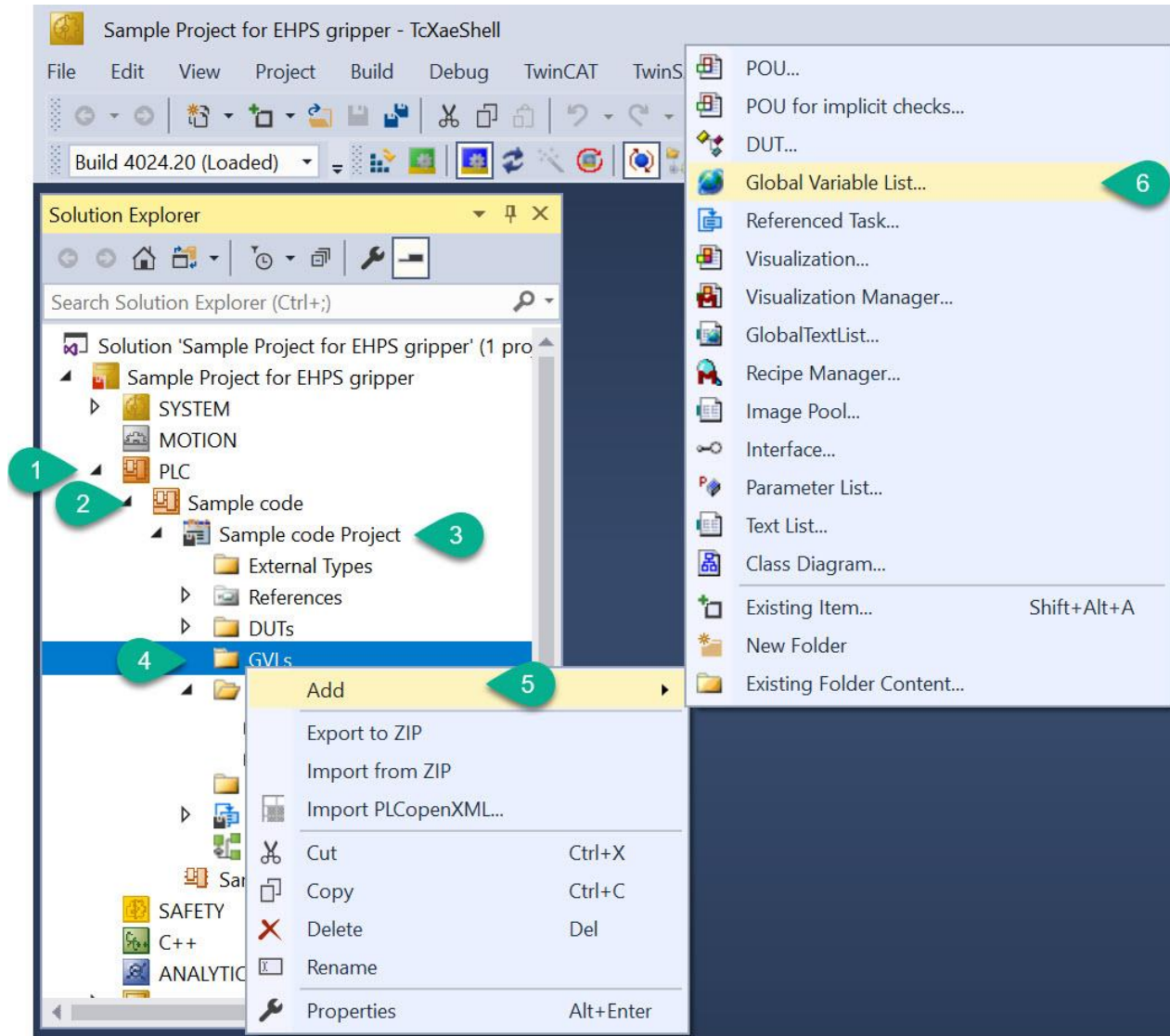


Note

- User has to do the below I/O Address Linking from Global variable I/O's to Module I/O's to perform the I/O related operations.

4.2.1 PLC Variable Creation in TwinCat3

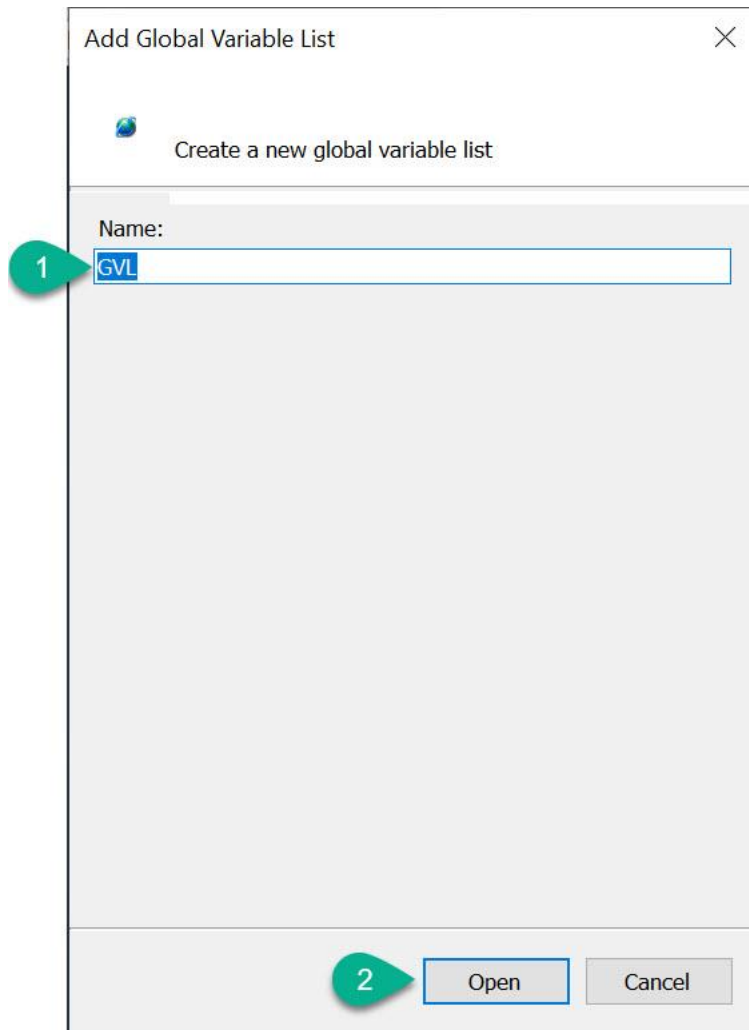
Step – 1



1. Expand the **PLC** from Solution Explorer.
2. Expand the **Sample code** from PLC menu.
3. Expand the **Sample code Project** to view the PLC objects.
4. Right click on **GVLs** to view the Global variable options.
5. Click on **Add** from global variable options.
6. Click on **Global Variable List** from the Add option.

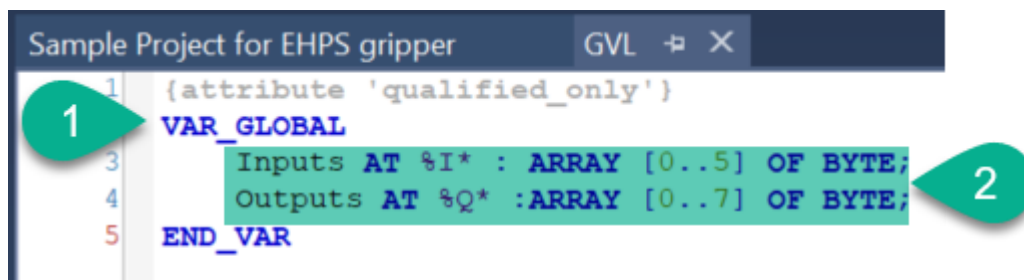
The Add Global Variable List tab will be displayed as shown below Step-2.

Step – 2



1. Enter the **Global Variable List** Name on Name field.
2. Click on **Open** to view the created Global Variable list.

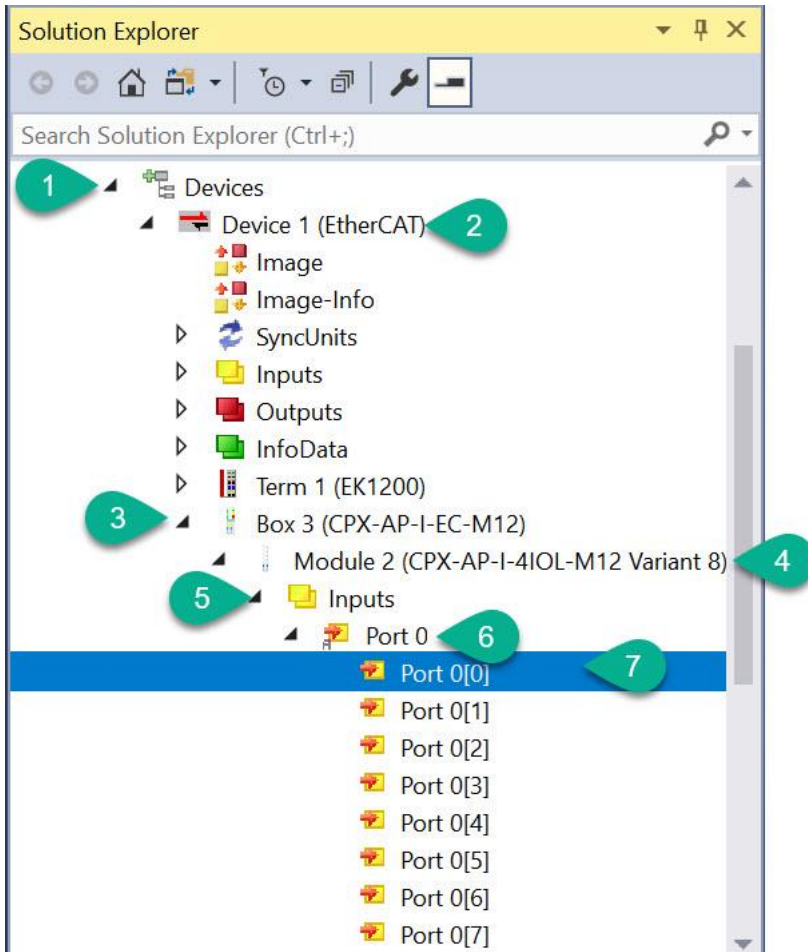
Step – 3



1. Create the Required Variables under the **VAR_GLOBAL**.
2. The Created Global Variables are shown above image.

4.2.2 Input Address Linking

Step – 1



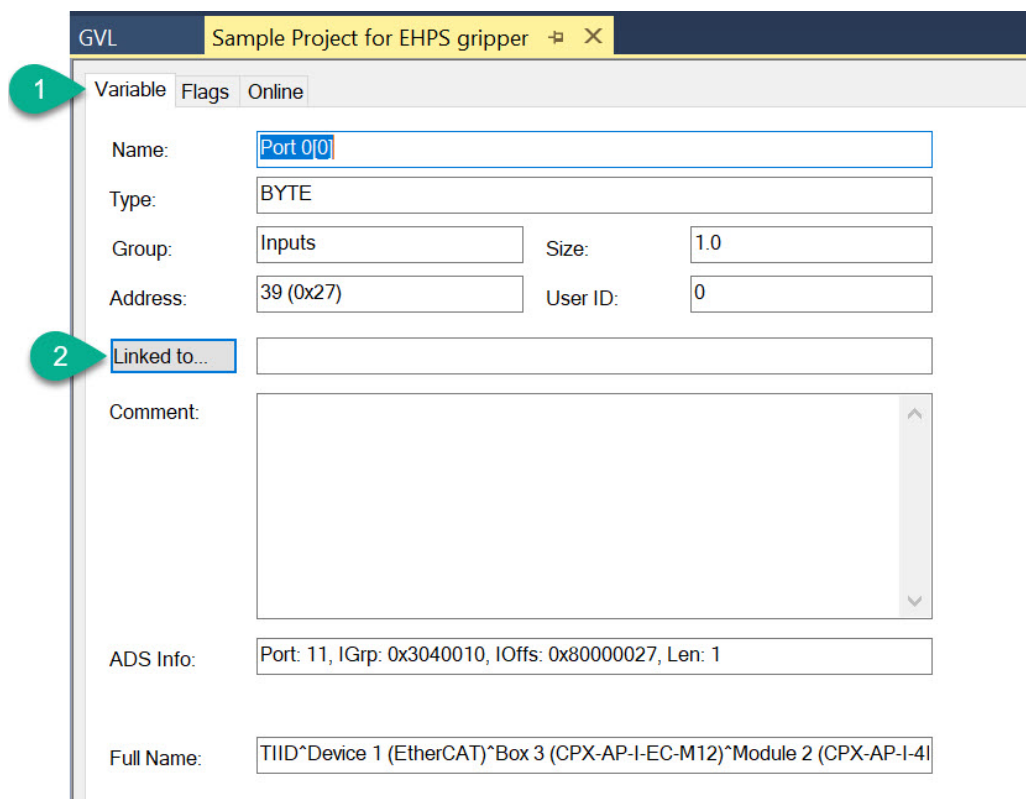
1. Expand the **Devices** from Solution Explorer.
2. Expand the **Device 1 (EtherCAT)** from Device list.
3. Expand the **Box3 (CPX-AP-I-EC-M12)** to view the Modules.
4. Expand the **CPX-AP-I-4IOL-M12** Module to view the Inputs and Outputs.
5. Expand the **Inputs** to view the Port.
6. Expand the **Port 0** to view the variables
7. Double click on **Port 0[0]** to open the Variable properties.

The Variable Properties tab will be displayed as shown below Step-2.

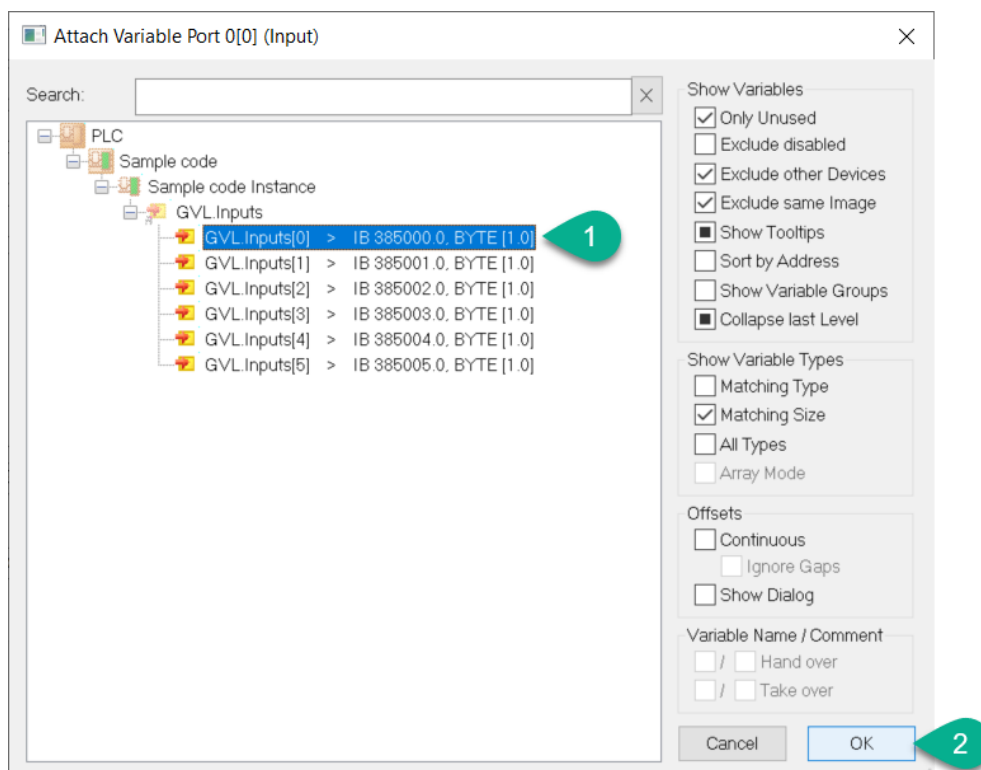


Note

- User has to link the PLC variable to Inputs Port, where the EHPS Gripper device is connected.
- Here the variables are linked to Inputs Port0, because the EHPS Gripper is connected in Port-0.

Step – 2

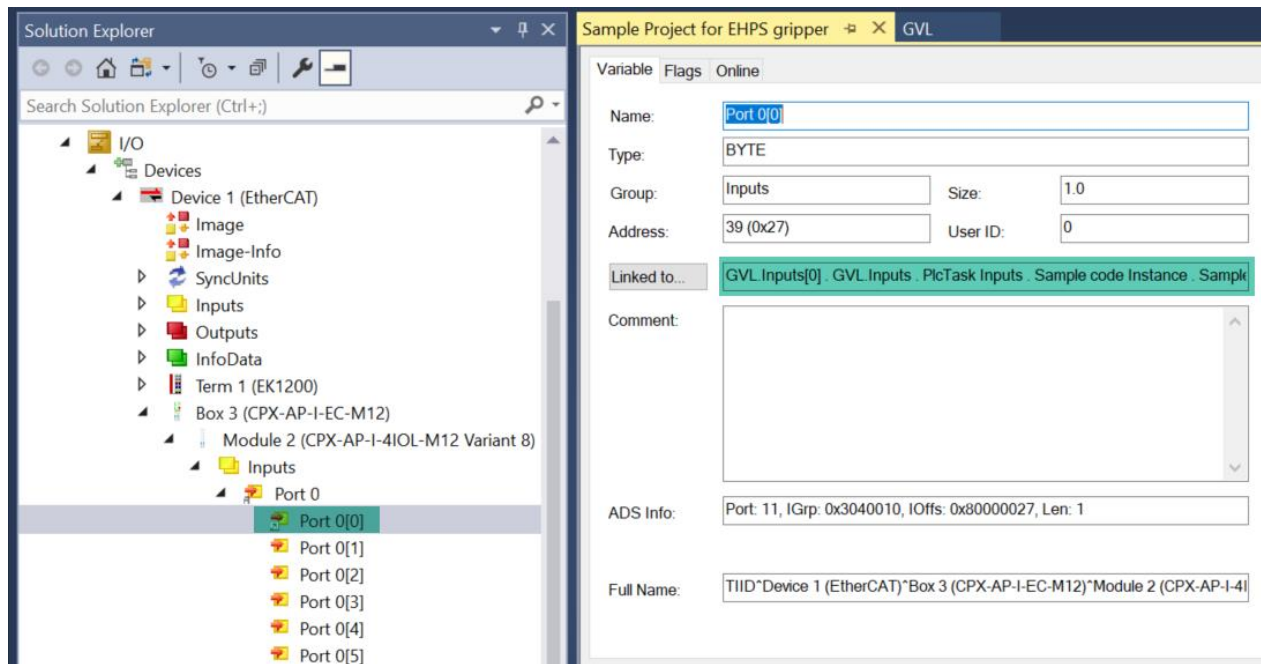
1. Click on **Variable** tab from variable properties.
2. Click on **Linked to...** button to view and link the PLC variables.

Step – 3

1. Select the Input variable from PLC variable list.
2. Click on **OK** button to Link the PLC variable to Module input.

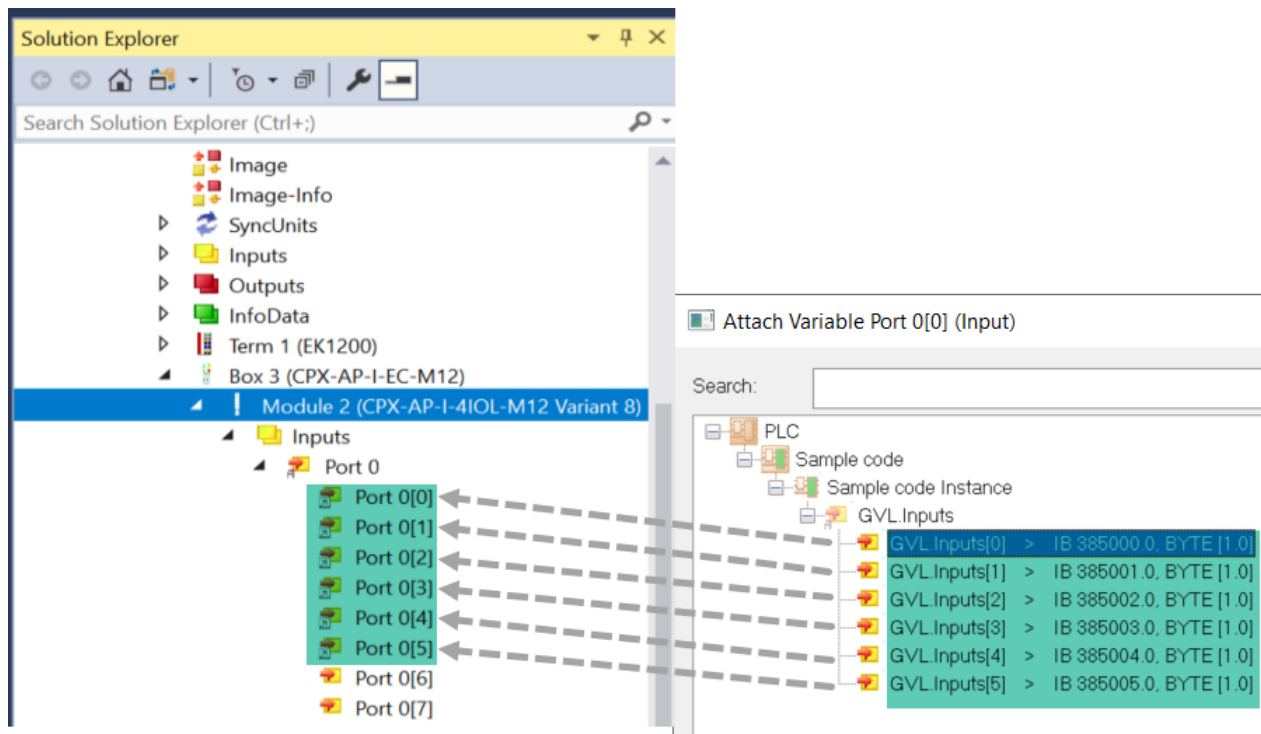
The linked Input variable will be displayed as shown below step-4.

Step – 4



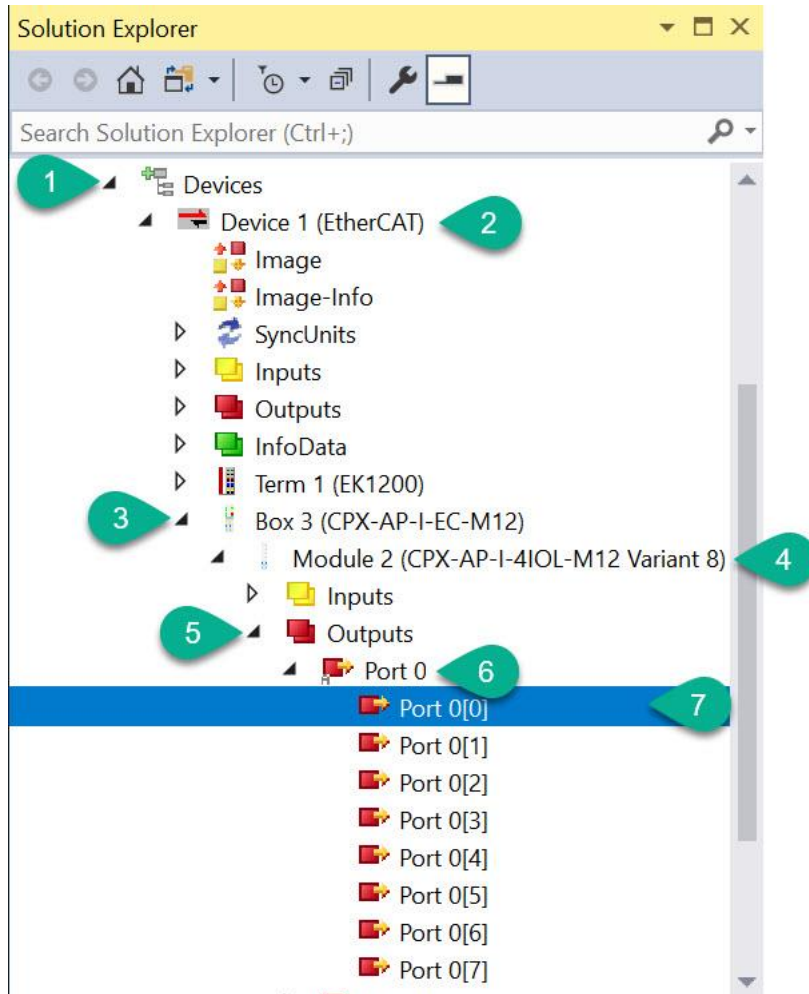
Step – 5

- Follow the above step1 to step3 to link the PLC variable to other module inputs.
- The linked Input variable will be displayed as shown below.



4.2.3 Output Address Linking

Step – 1



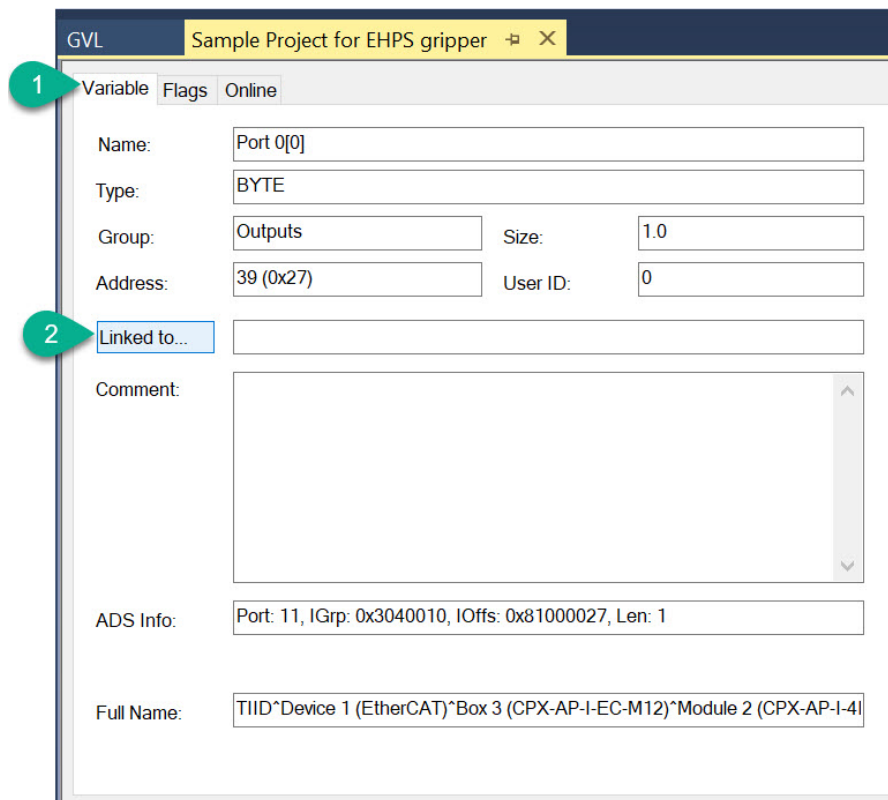
1. Expand the **Devices** from Solution Explorer.
2. Expand the **Device 1 (EtherCAT)** from Device list.
3. Expand the **Box3 (CPX-AP-I-EC-M12)** to view the Modules.
4. Expand the **CPX-AP-I-4IOL-M12** Module to view the Inputs and Outputs.
5. Expand the **Outputs** to view the Port.
6. Expand the **Port 0** to view the variables
7. Double click on **Port 0[0]** to open the Variable properties.

The Variable Properties tab will be displayed as shown below Step-2.

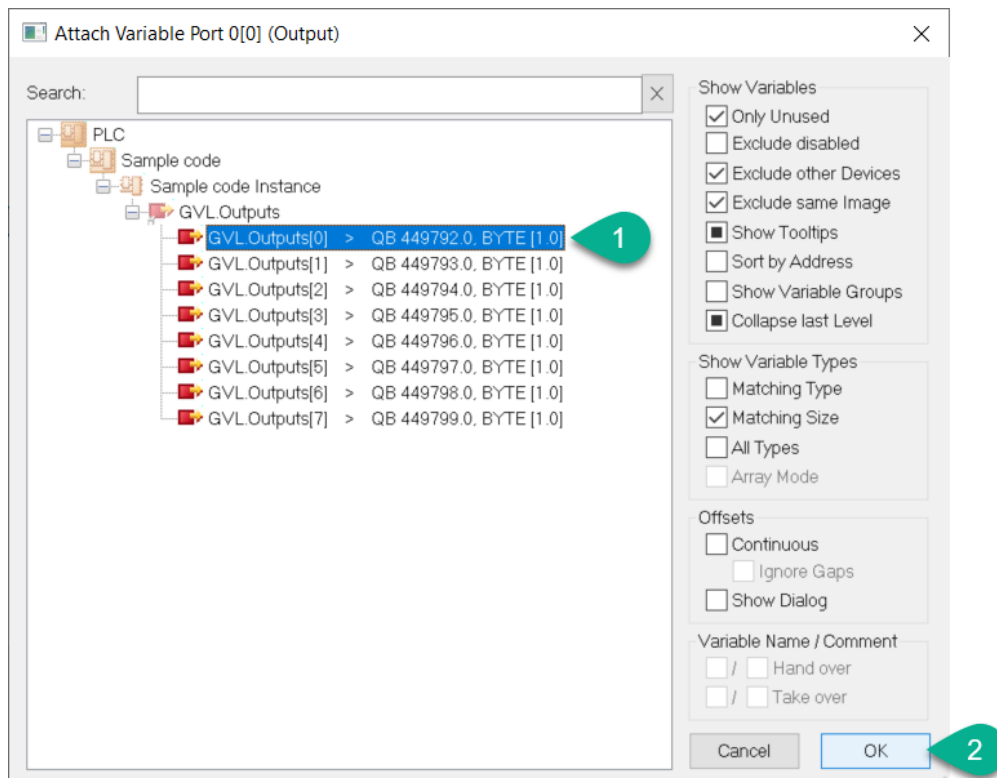


Note

- User has to link the PLC variable to Outputs Port, where the EHPS Gripper device is connected.
- Here the variables are linked to Outputs Port0, because the EHPS Gripper is connected in Port-0.

Step – 2

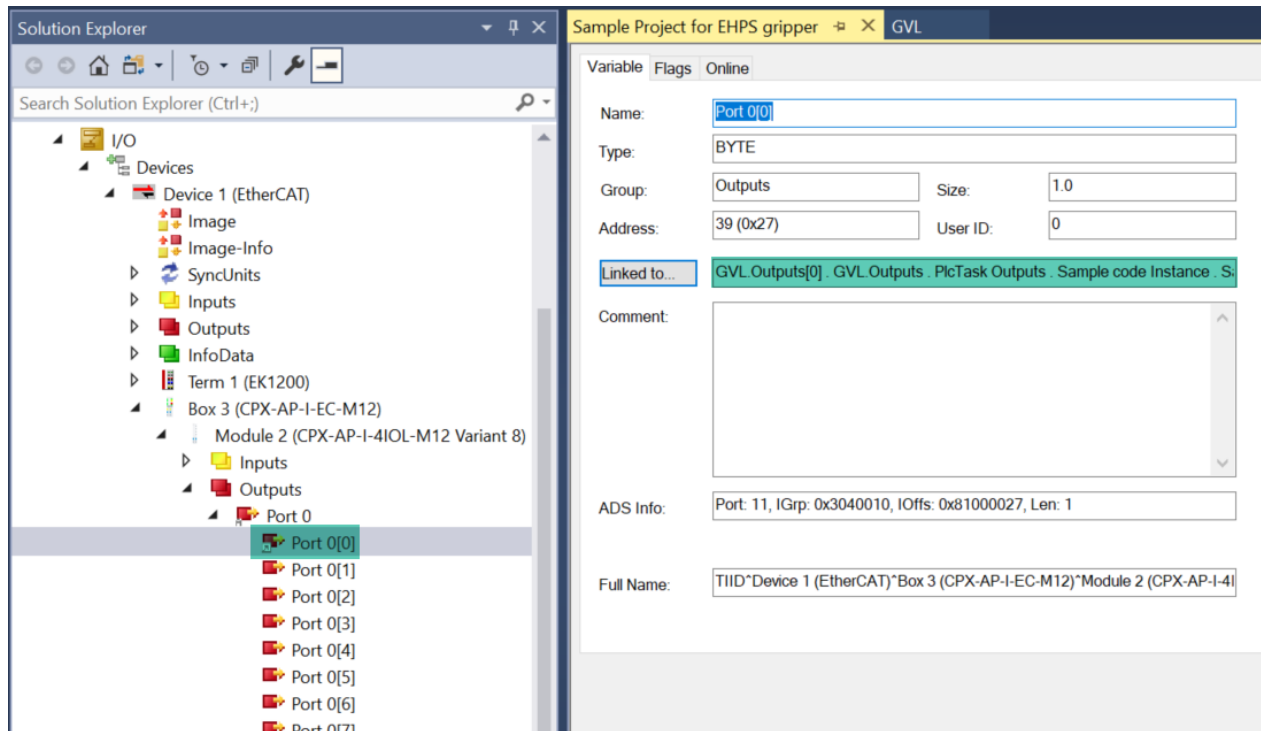
1. Click on **Variable** tab from variable properties.
2. Click on **Linked to...** button to view and link the PLC variables.

Step – 3

1. Select the Output variable from PLC variable list.
2. Click on **OK** button to Link the PLC variable to Module Output.

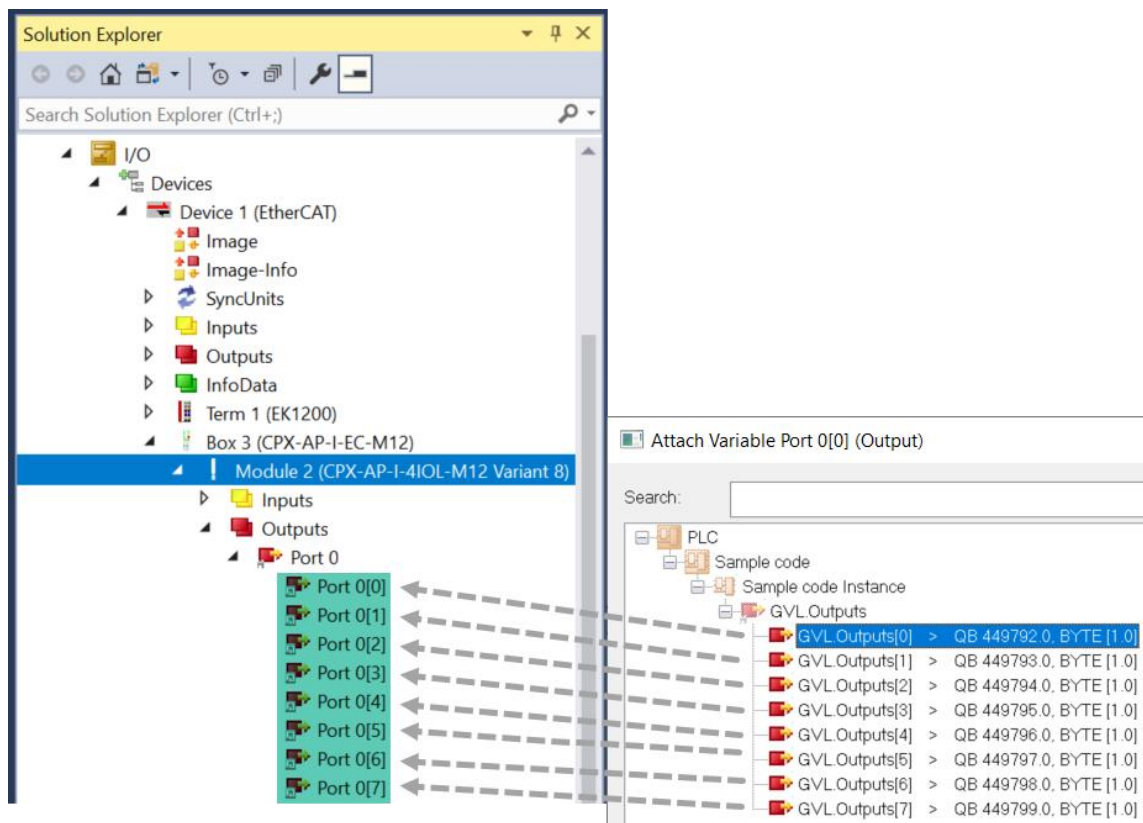
The linked Input variable will be displayed as shown below step-4.

Step – 4



Step – 5

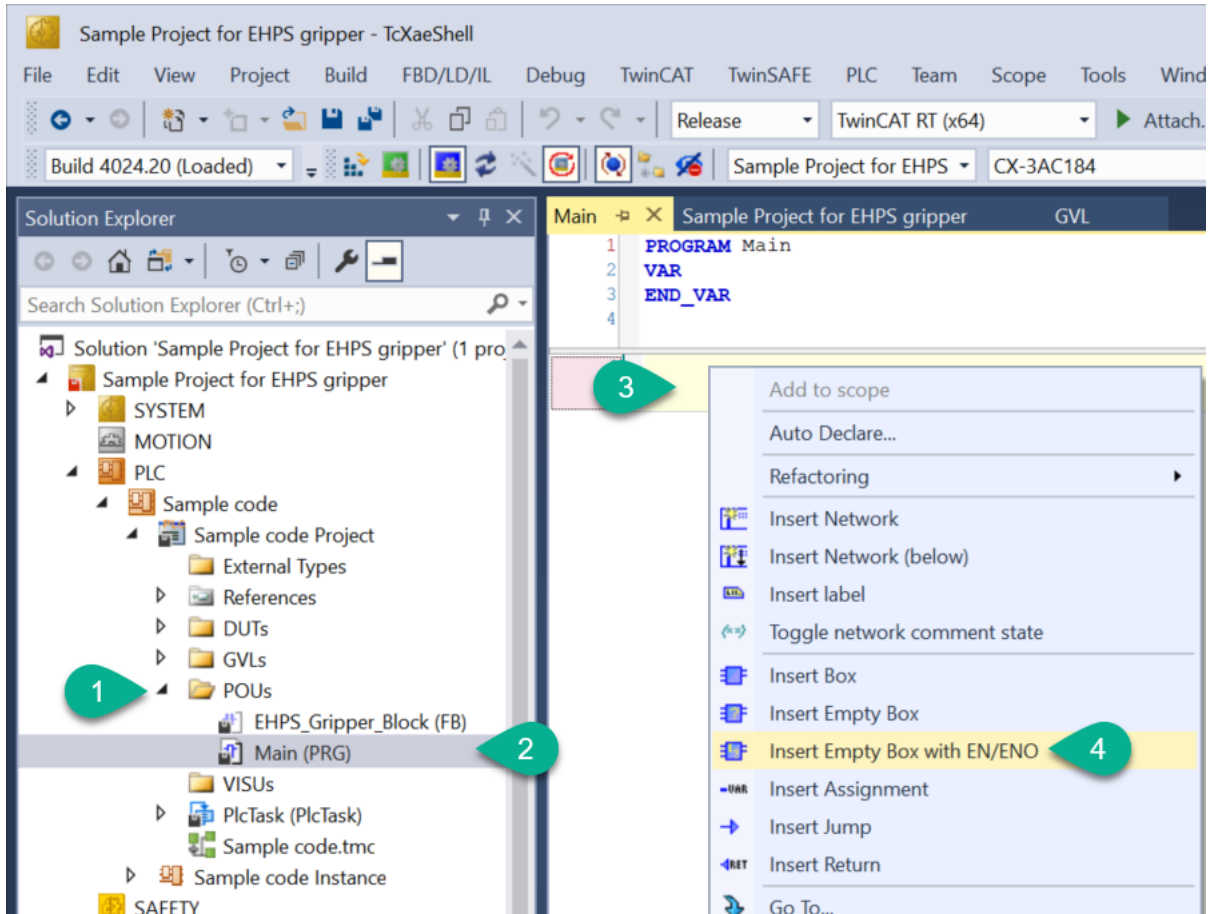
- Follow the above step1 to step3 to link the PLC variable to other module outputs.
- The linked Output variable will be displayed as shown below.



5 Configuration of EHPS Gripper Function block in TwinCAT3.

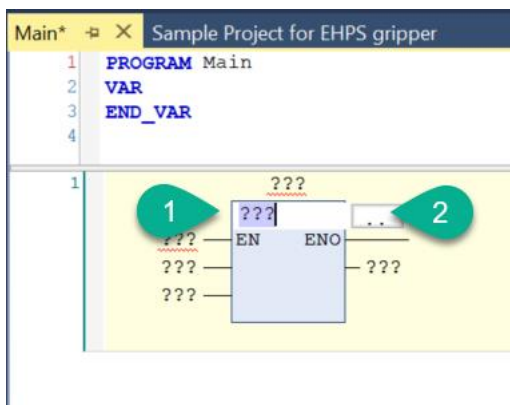
5.1 Configuring the EHPS_Gripper_Block Input & Output Interface Tags

Step – 1



1. Expand the **POUs** from PLC objects.
2. Double click on **Main** from POU list.
3. Right click on the **Network** from Main window.
4. Click on **Insert Empty Box with EN/ENO** to insert the empty block.

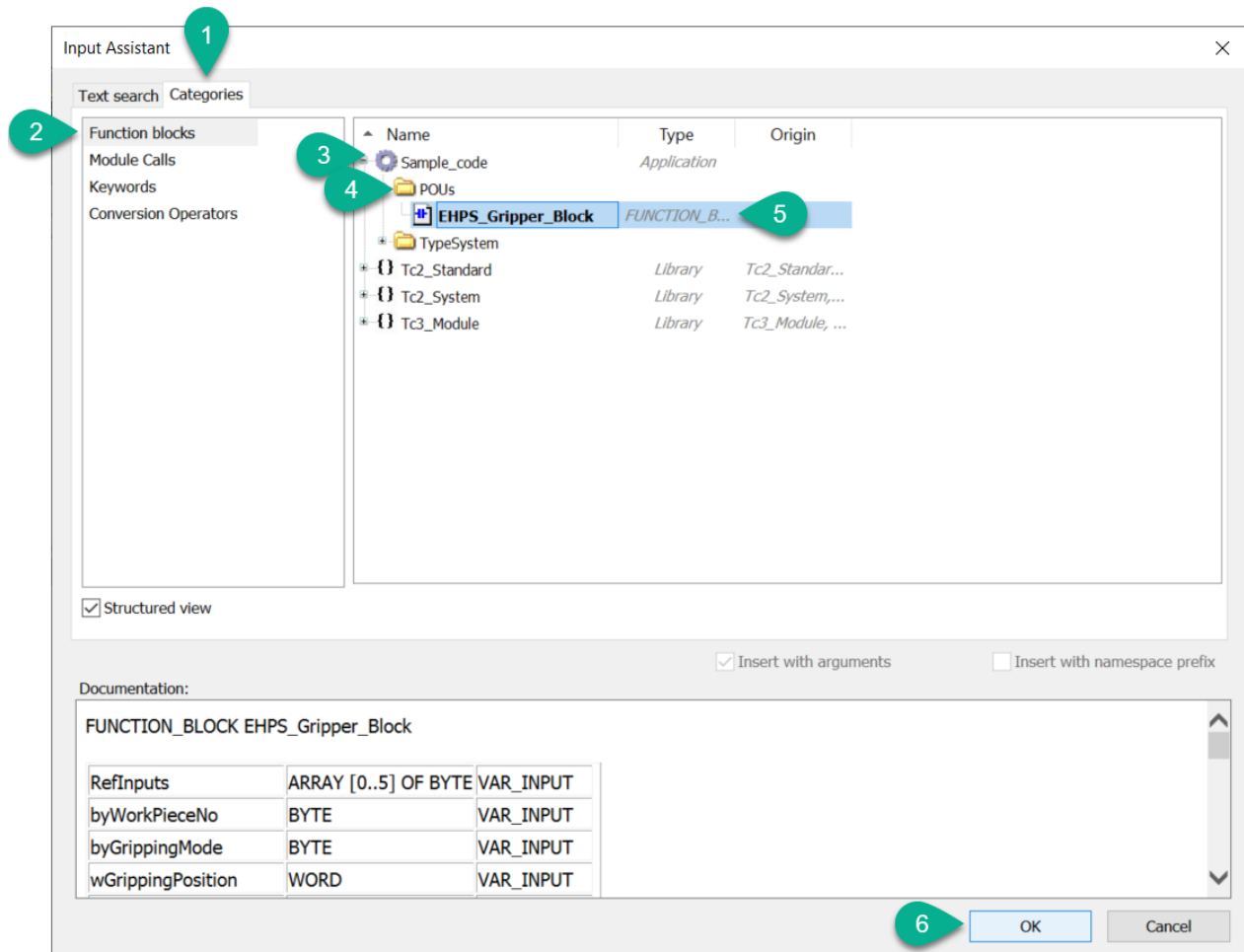
Step – 2



1. Click on the inserted block to view the browse button.
2. Click on **Browse** button to open the Input assistant window.

The opened Input Assistant window will be displayed as show below step-3.

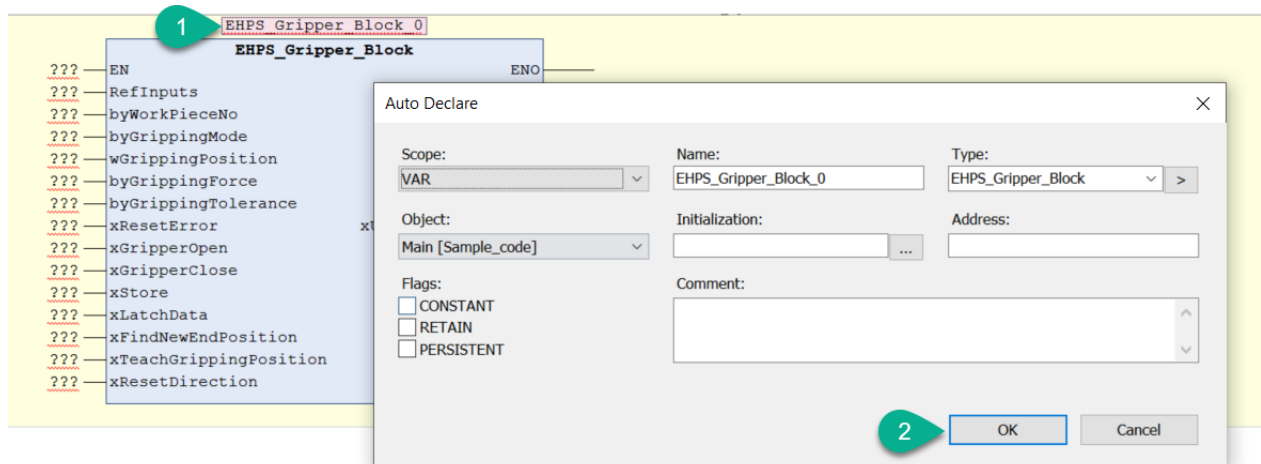
Step – 3



1. Click on **Categories** tab from Input Assistant window.
2. Click on **Function blocks** from Categories tab.
3. Expand the **Sample code** to view the POU's.
4. Expand the **POUs** to view the Function blocks.
5. Select **EHPS_Gripper_Block** from the POU's.
6. Click on **OK** button to call the function block.

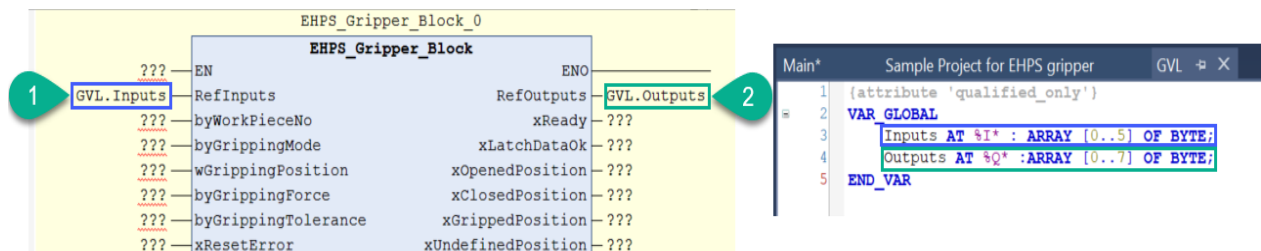
The called function block shown in below Step-4

Step – 4



1. Enter the name of the FB instance & press enter key for Auto declare the tag name.
2. Click “OK” button from the auto declare window.

Step – 5



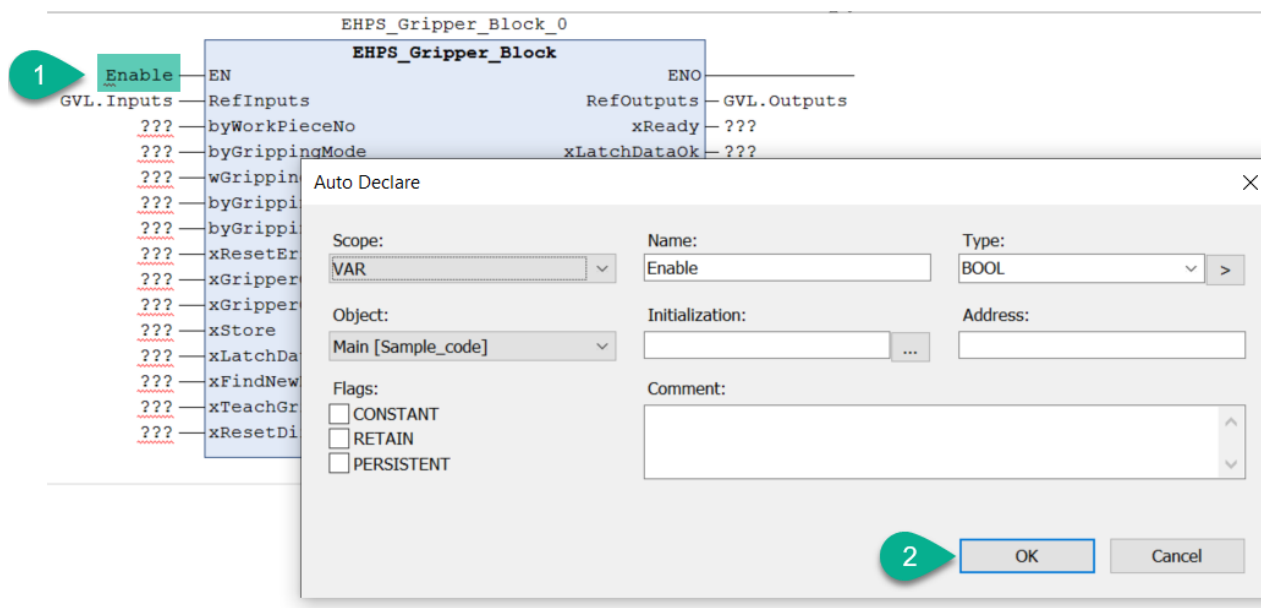
1. Enter GVL.Inputs in RefInputs to assign the global variable input tag.
2. Enter GVL.Outputs in RefOutputs to assign the global variable output tag.



Note

- User must be taken the input and output tags from Global variable list, Which is linked to Module I/Os.

Step – 6



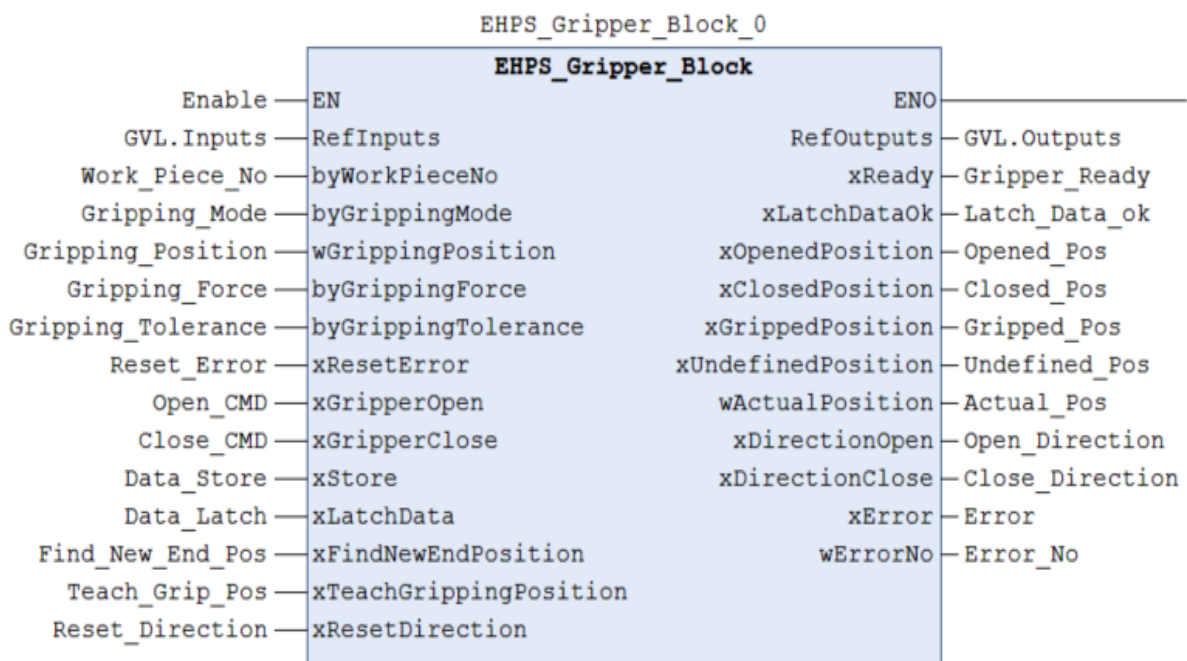
1. Enter the tag name for “EN” input tag & press enter to open Auto Declare window.
2. Click “OK” to confirm the entered tag name.



Note

- Repeat Step – 5 for different input & output tags in function block.

Once all steps completed successfully the **EHPS_Gripper_Block** Function block will be look like below.



6 EHPS_Gripper_Block Interface Tag Details

6.1 IO_Interface Tag Details

Tag Name	Data Type	Function Description
RefInputs	ARRAY[0..5] OF BYTE	Feedback data from actuator unit. (Data Read from actuator unit to Controller)
RefOutputs	ARRAY[0..7] OF BYTE	Command data to actuator unit. (Data Write from Controller to actuator unit)

6.2 EHPS Control Tag Details

Tag Name	Data Type	Description
byWorkPieceNo	SINT	Work Number
byGrippingMode	SINT	Gripper mode 000 – Invalid 100 – Universal mode 060 – External Gripping 070 – Internal Gripping
wGrippingPosition	INT	Gripping Position
byGrippingForce	SINT	Gripper force
byGrippingTolerance	SINT	Gripper tolerance
xResetError	BOOL	True – Reset the error in device.
xGripper Open	BOOL	True – Gripper open command.
xGripper Close	BOOL	True – Gripper close command.
xStore	BOOL	True – Store the written parameters in device.
xLatchData	BOOL	True – Write the modified parameters in device.
xFindNewEndPosition	BOOL	True – Find the new end position.
xTeachGrippingPosition	BOOL	True – Teach the gripping position.
xResetDirection	BOOL	True – Reset the direction flag.

6.3 EHPS Status Tag Details

Tag Name	Data Type	Description
xReady	BOOL	True – Module is in ready to operate state
xLatchDataOK	BOOL	True – Acknowledgement of modified parameters wrote successfully
xOpenedPosition	BOOL	True – Gripper is in open position
xClosedPosition	BOOL	True – Gripper is in closed position
xGrippedPosition	BOOL	True – Gripper is in gripping position
xUndefinedPosition	BOOL	True – Unified position state
wActualPosition	INT	Actual position of the gripper.
xDirectionOpen	BOOL	True – Gripper movement completed with open direction
xDirectionClose	BOOL	True – Gripper movement completed with close direction
xError	BOOL	True – Device in error state.
wError_No	INT	Diagnostic error code. Refer below table for error code details.

6.3.1 Error Code Details

Diagnostic message Hex (Dec)	Device status	Error	Possible cause	Remedy	'Error-Count' ¹⁾
0x0 (0)		'Status ok, device is ready'			No
0x100 (256)	Outside the specification	'Power supply error'	– Actuator supply not connected – Cable break – Actuator supply not sufficient	Testing the actuator supply voltage	Yes
0x101 (257)	Outside of specification (drive can no longer be moved)	'Temperature too high'	– Ambient temperature too high – Gripper has overload	Ensure adequate pressurisation/cooling/connection	Yes
0x102 (258)	Outside of specification (drive can no longer be moved)	'Temperature too low'	Ambient temperature too low	Ensure sufficient operating temperature	Yes

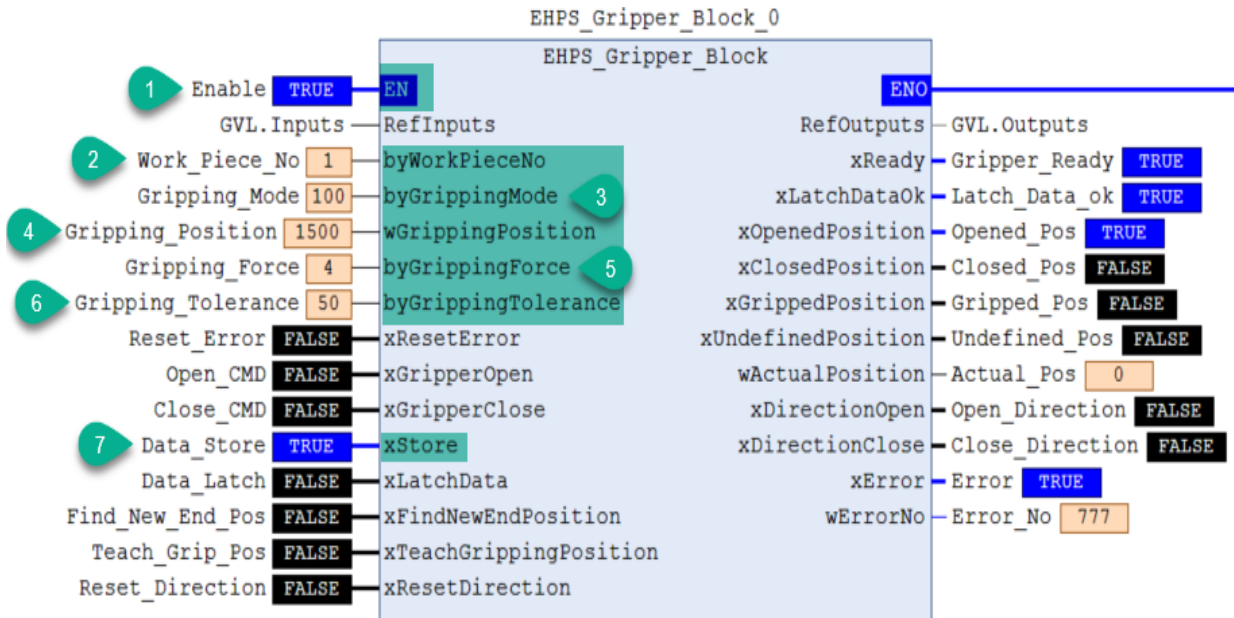
Diagnostic message Hex (Dec)	Device status	Error	Possible cause	Remedy	'Error-Count' ¹⁾
0x010A (266) ¹⁾	Outside the specification	'Actuator under voltage during movement'	– Actuator supply unstable – Line resistance increased (faulty supply cable) – Power supply not sufficiently designed for peak loads, faulty supply cables	– Check gripping force, check power supply and peak load – Manual acknowledgement of error message necessary	No
0x300 (768)	Outside the specification	'ControlWord not plausible'	Incorrect value in 'Control-Word'	Checking the value in the 'ControlWord'	No
0x301 (769)	Outside the specification	'GrippingPosition not plausible'	Incorrect value in parameter 'GrippingPosition'	Check the parameter 'GrippingPosition'	No
0x302 (770)	Outside the specification	'GrippingForce not plausible'	Incorrect value in parameter 'GrippingForce'	Check the parameter 'GrippingForce'	No
0x304 (772)	Outside the specification	'GrippingTolerance not plausible'	Incorrect value in parameter 'GrippingTolerance'	Check the parameter 'GrippingTolerance'	No
0x305 (773) ²⁾	Failure	'Reference position error'	Gripper has no reference position	Service Festo SE & Co. KG	Yes
0x306 (774)	Outside the specification	'GrippingMode not plausible'	Incorrect value in parameter 'Gripping-Mode'	Check the parameter 'Gripping-Mode'	No
0x307 (775)	Motion task cannot be executed	'Drive command cannot be executed'	Multiple travel commands in the same direction	Reset 'Reset-DirectionFlag' direction flag or send movement command in the other direction	No
0x308 (776)	Outside the specification	'WorkpieceNo not plausible'	Incorrect value in parameter 'WorkpieceNo'	Check the parameter 'WorkpieceNo'	No

Diagnostic message Hex (Dec)	Device status	Error	Possible cause	Remedy	'Error-Count'¹⁾
0x309 (777)	Outside the specification	'GrippingPosition not latched'	Process data sent by the master have been changed	Transfer of the changed parameters by 'LatchData.'	No
0x30D (781)	Outside the specification	'GrippingForce not latched'	Process data sent by the master have been changed	Transfer of the changed parameters by 'LatchData.'	No
0x30F (783)	Outside the specification	'GrippingTolerance not latched'	Process data sent by the master have been changed	Transfer of the changed parameters by 'LatchData.'	No
0x310 (784)	Outside the specification	'GrippingMode not latched'	Process data sent by the master have been changed	Transfer of the changed parameters by 'LatchData.'	No
0x311 (785)	Outside the specification	'WorkpieceNo not latched'	Process data sent by the master have been changed	Transfer of the changed parameters by 'LatchData.'	No
0x312 (786)	Outside the specification	'Initial handshake missing'	After a cold start, a single data migration by 'LatchData' ('ControlWord' = 1) is required.	Transfer of the changed parameters by 'LatchData.'	No
0x400 (1024) ³⁾	Failure	'Gripper blocked'	– Gripper is difficult to move – The travel path of the grab is impaired	– Restore the free movement of the gripper – Service Festo SE & Co. KG	Yes
0x406 (1030)	Failure	'System error / internal error'	Internal system error	Service Festo SE & Co. KG	Yes

7 Sample Code Program Example Functions

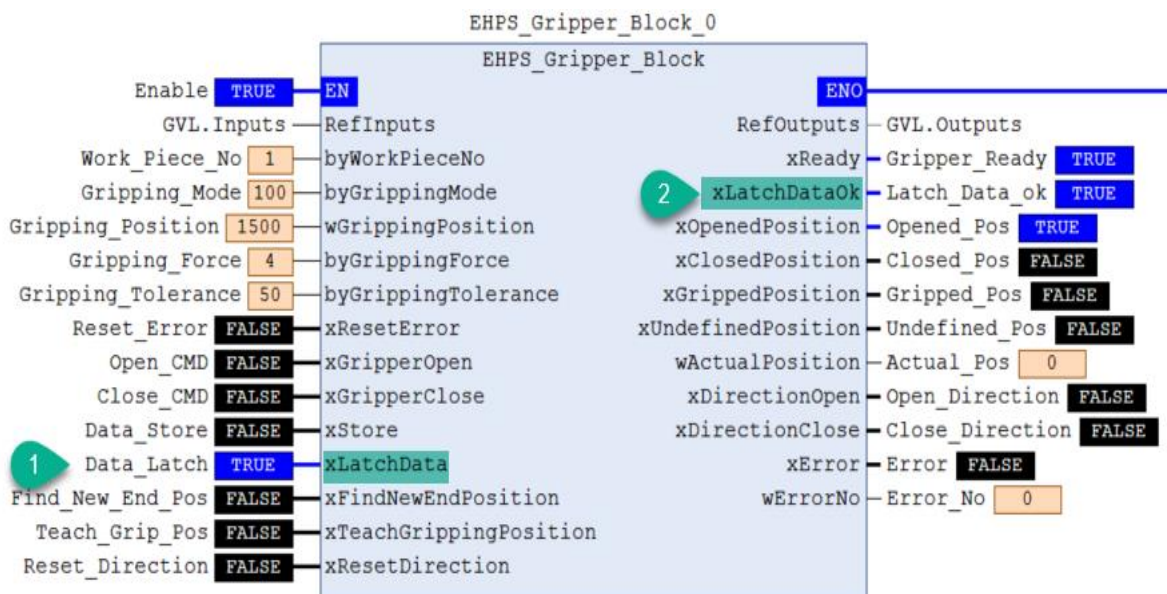
7.1 Gripper Parameter Store and Latch Function.

Step – 1



1. Execute the **Enable** Tag to enable the block.
2. Enter the required Tolerance value in **Gripping_Tolerance** tag.
3. Enter the required Force value in **Gripping_Force** tag.
4. Enter the required Gripping Position value in **Gripping_Position** tag.
5. Enter the Work piece number in **WorkPiece_No** tag.
6. Enter the Gripping Mode value in **Gripping_Mode** tag.
7. Execute the **Store** command to save the above parameter in under the selected Work piece Number.

Step – 2



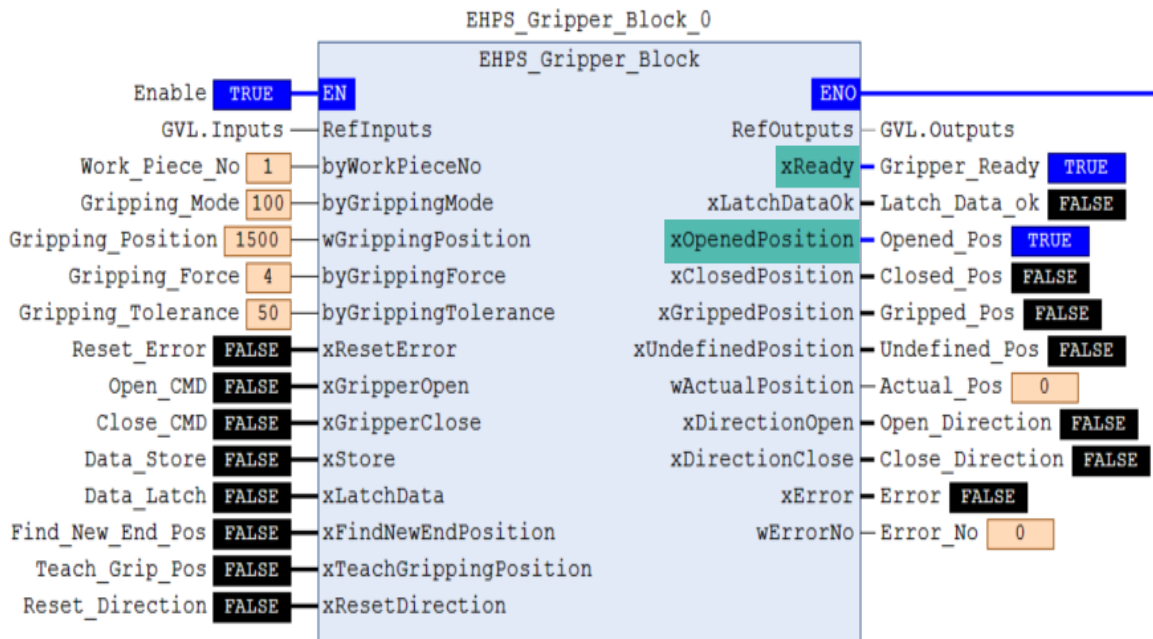
1. Execute the **Latch_Data** command to retrieve the saved parameter from selected Work piece Number to process parameter.

- Once the Latch_Data command Executed, user gets the feedback for Parameter saved from input tag **Latch_Data_OK**.

7.2 Gripper Close Function

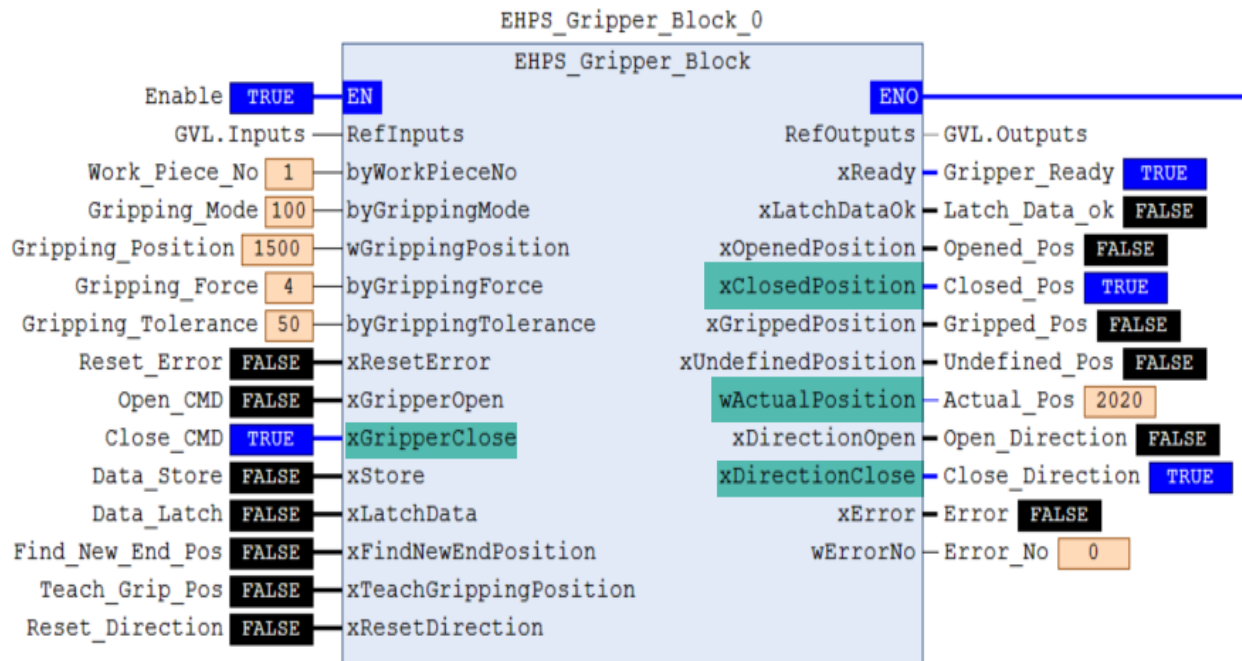
Step – 1

- Check the input status before execute the gripper close command.

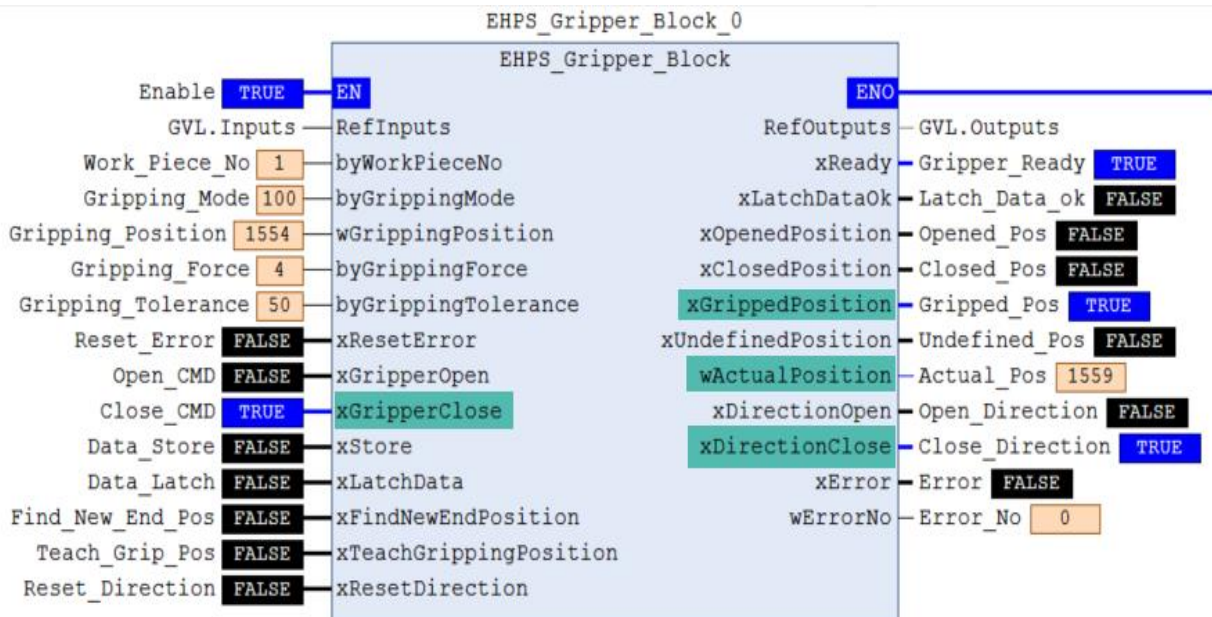


Step – 2

- Execute the Gripper close command to close the gripper.
- Once the Gripper Close command Executed, user gets the feedback for gripper close from input tags and Position feedback from **Gripper_Actual_Position** tag.
- The Gripper close without work object feedback will be displayed as shown below.



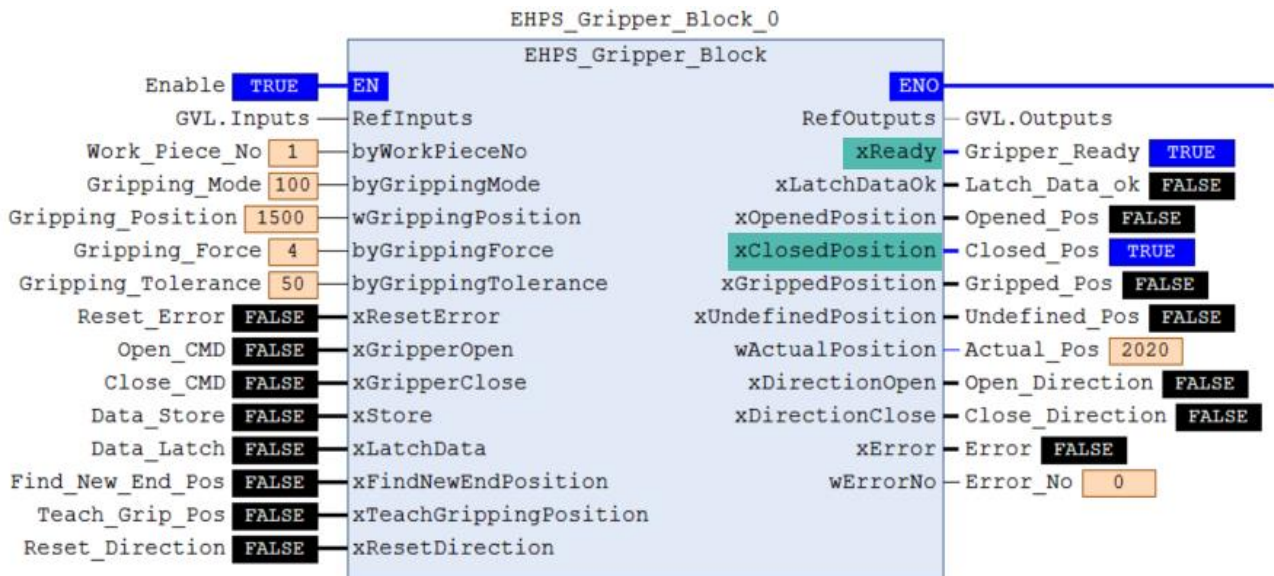
The Gripper close with work object feedback will be displayed as shown below.



7.3 Gripper Open Function

Step – 1

- Check the input status before execute the gripper open command.



Step – 2

- Execute the Gripper open command to open the gripper.
- Once the Gripper Open command Executed, user gets the feedback for gripper open from input tags and Position feedback from **Gripper_Actual_Position** tag.
- The Gripper open feedback will be displayed as shown below.

