

Commissioning of CMMT-AS in TwinCAT V3

This application notes describes step by step how you configure a CMMT-AS-EC in

- Automation Suite
- TwinCAT V3

And how you can use the PTP libraries.

CMMT-AS

TitleCommissioning CMMT_AS in TwinCAT V3
Version 1.10
Document no. 100185
Originalen
AuthorFesto

Last saved 18.10.2022

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1 Components/Software/ IP address

Type/Name	Version Software/Firm-ware	IP address	Subnet mask
CMMT-AS	FW 013.0.4	192.168.1.200	255.255.255.0
Beckhoff PLC CX5140-0135	V3.1 (Build 4020.14)	192.168.1.10	255.255.255.0
Laptop	--	192.168.1.100	255.255.255.0
TwinCAT System Manager	V3.1 (Build 4022)	--	--
Automation Suite	--	--	--

Table 1.1: 1 Components/Software used



Information

This AppNote describes the procedure with the CMMT-AS motor controller. The CMMT-AS servo drive controller and CMMT-ST servo drive controller for extra-low voltage are based on the same software platform. Therefore, the described settings can also be used as a reference for its parameterization. It is hereby expressly pointed out, that this has not been explicitly tested and therefore the function cannot be guaranteed!

1.1 Recommended manuals / XML / Plug-in / function blocks

- CMMT-AS Manual

Manual CMMT-AS-SW-EN
 Servoantriebsregler - CiA 402 - Function - EtherCAT - Software

[Manual](#)
[File and language versions](#)
 ★★★★★

Associated products

- servo drive CMMT-AS-C2-3A-EC-S1 (5340819)
- servo drive CMMT-AS-C4-3A-EC-S1 (5340820)

- Festo Automation Plug-in

Festo Automation Suite - Plug-in
 Plug-in for the configuration and parametrisation of the servo drive CMMT-AS

1.0.1.10
 19/07/2018

[Commissioning](#)
[File and language versions](#)
 ★★★★★

New Features:

- Online help now includes the device manual

- XML file

EtherCAT XML
 CMMT-AS ESI File

1.0
 22/06/2018

[Device Description Files](#)
[File and language versions](#)
 ★★★★★

[ESI-Files for CMMT-AS-...-EC](#)

- CMMT function blocks

Function blocks Beckhoff TwinCAT
 CMMT-AS Function blocks for Beckhoff TwinCAT

3.7.10.20
 17/07/2018

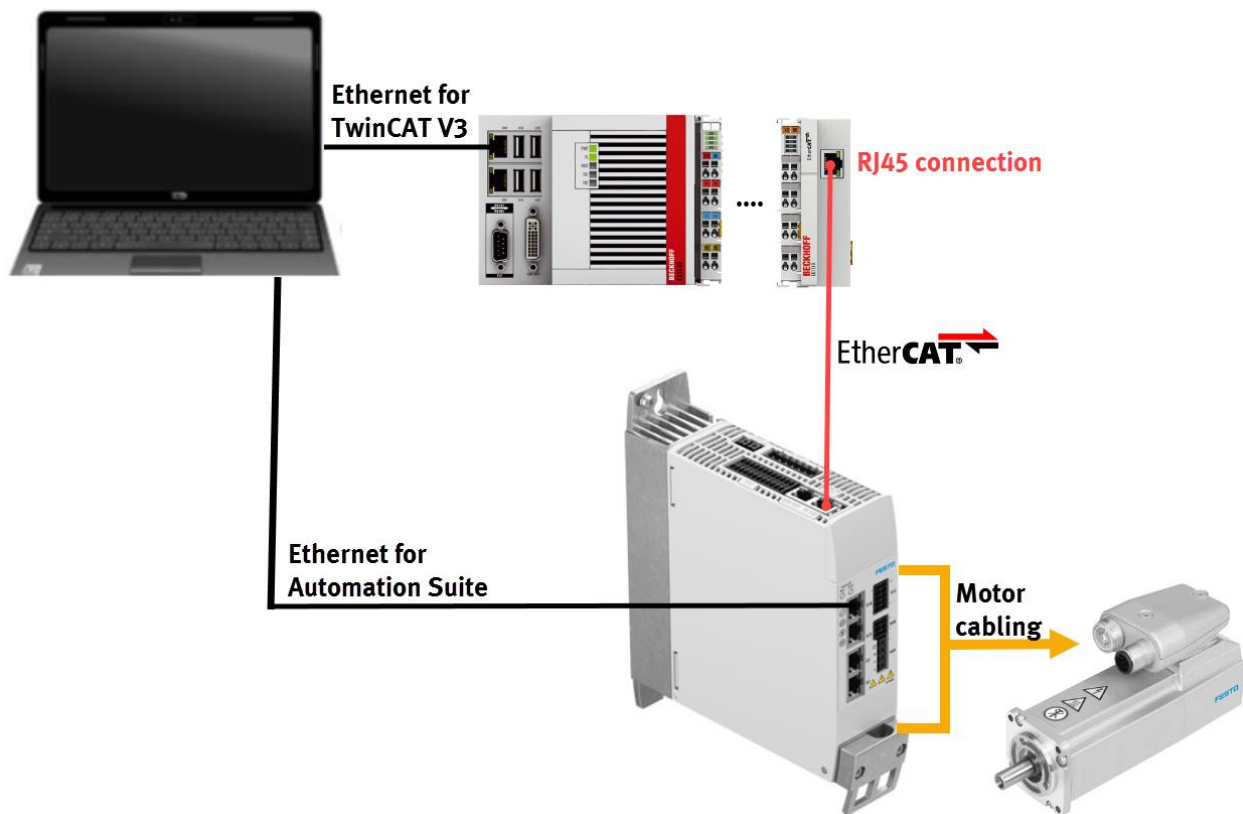
[Function blocks](#)
[File and language versions](#)
 ★★★★★

[CiA 402 library for motor controller CMMT-AS-...EC - TwinCAT V3](#)

Source:

https://www.festo.com/net/en-gb_gb/SupportPortal/default.aspx?q=5340819&tab=4&s=t#result

1.2 Network topology



Hint:

Festo offers M12-RJ45, RJ45-RJ45 and M12-M12 connecting cables for the Ethernet communication:

Type code	Part number	Description
NEBC-D12G4-ES-0.5-S-D12G4-ET	8040446	M12-M12 -> 0,5m
NEBC-D12G4-ES-1-S-D12G4-ET	8040447	M12-M12 -> 1m
NEBC-D12G4-ES-3-S-D12G4-ET	8040448	M12-M12 -> 3m
NEBC-D12G4-ES-5-S-D12G4-ET	8040449	M12-M12 -> 5m
NEBC-D12G4-ES-10-S-D12G4-ET	8045450	M12-M12 -> 10m
NEBC-D12G4-ES-1-S-R3G4-ET	8045451	M12-RJ45 -> 1m
NEBC-D12G4-ES-3-S-R3G4-ET	8045452	M12-RJ45 -> 3m
NEBC-D12G4-ES-5-S-R3G4-ET	8045453	M12-RJ45 -> 5m
NEBC-D12G4-ES-10-S-R3G4-ET	8040454	M12-RJ45 -> 10m
NEBC-R3G4-ES-1-S-R3G4-ET	8040455	RJ45-RJ45 -> 1m

Table 1.2: Table naming

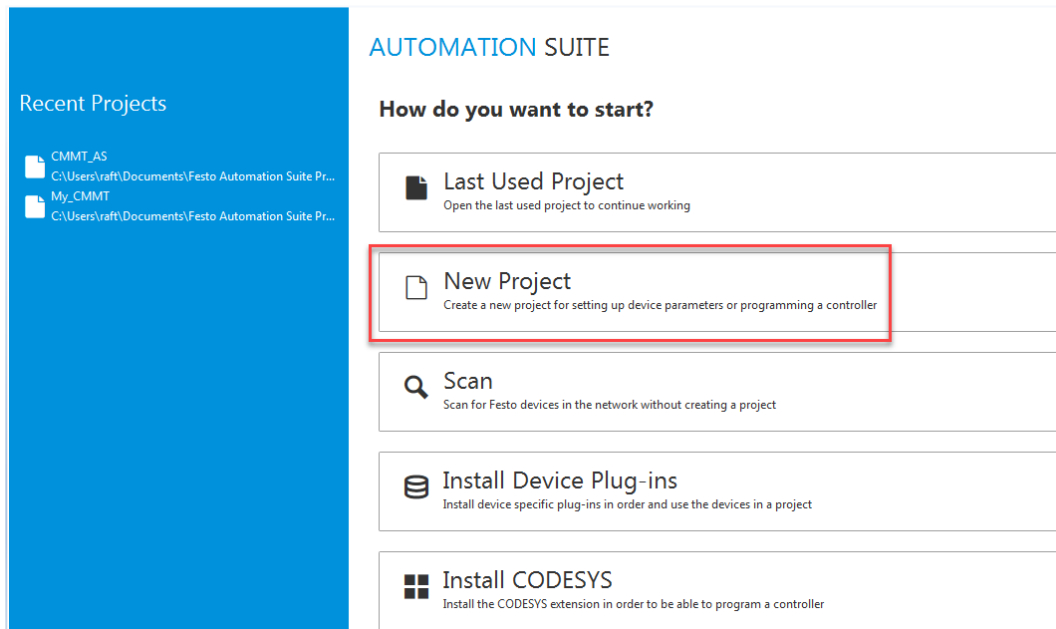
More information:

https://www.festo.com/net/en-gb_gb/SupportPortal/default.aspx?q=8040446&tab=3

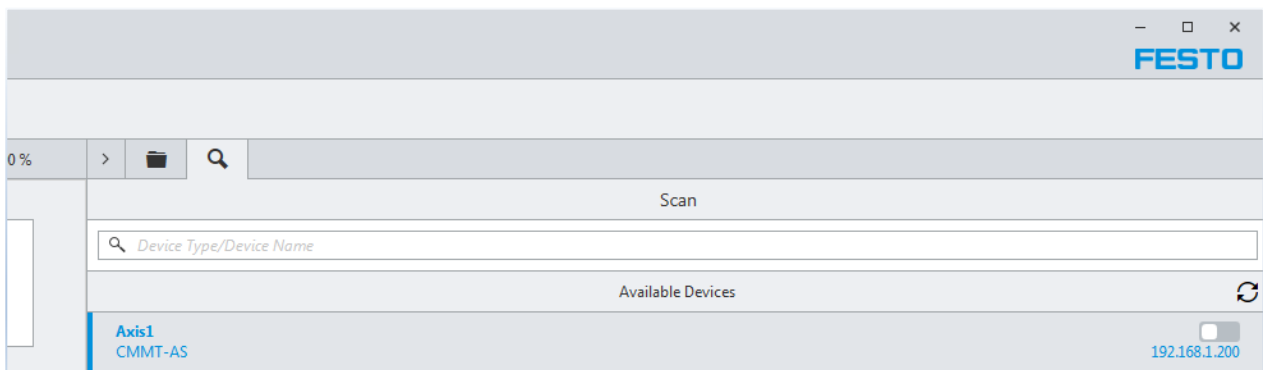
2 The first steps in Automation Suite

2.1 Creating a new project

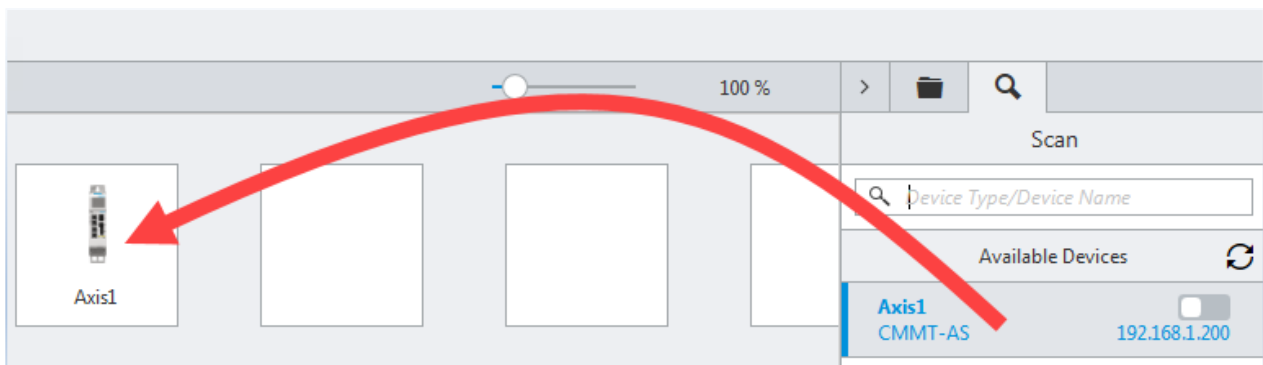
Step 1: After starting Automation Suite you have the possibility to open your recent projects or to create a new project:



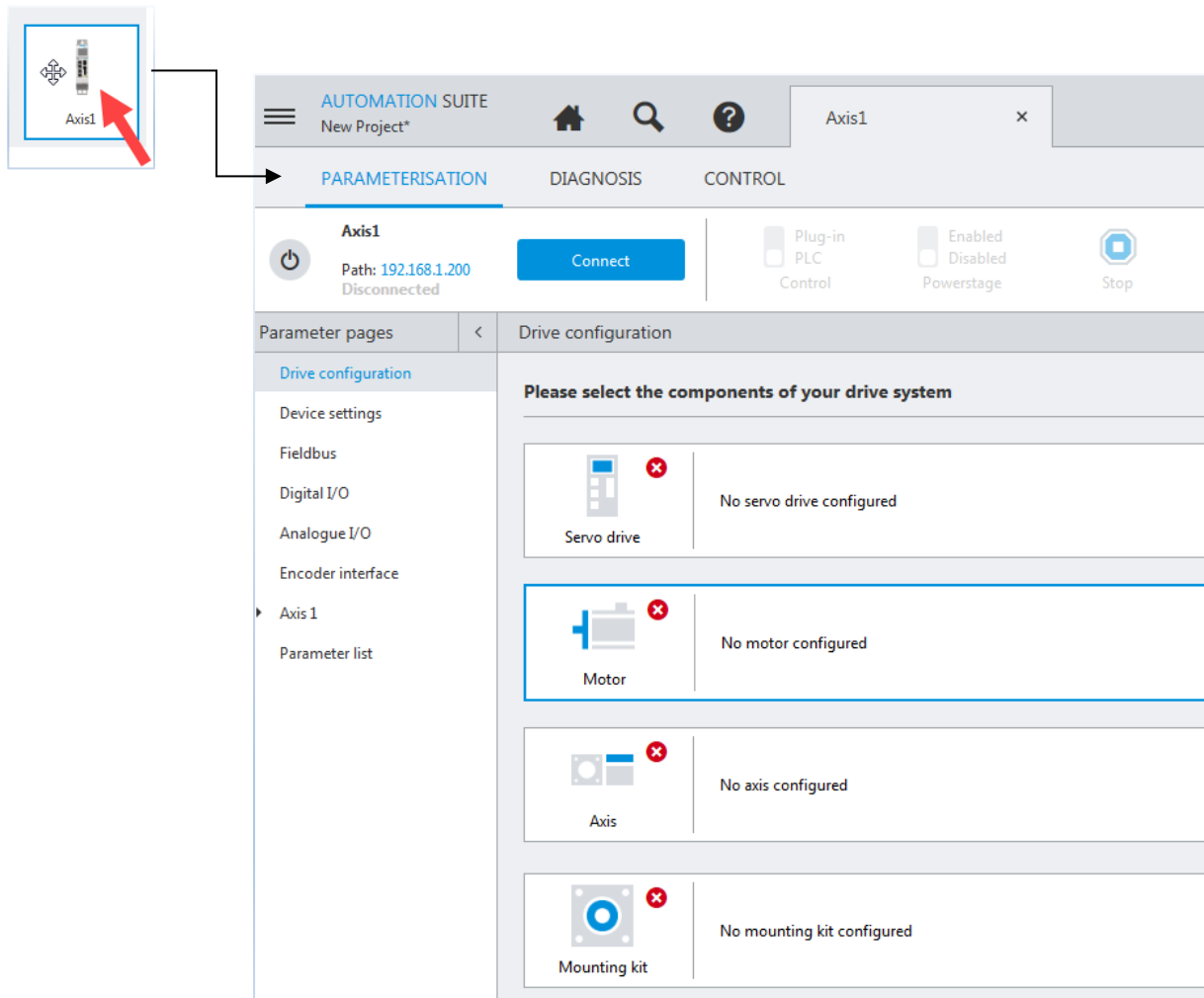
Step 2: Searching for the connected CMMT-AS via the **smaller** loupe, because then you can drag and drop the connected the devices to your project



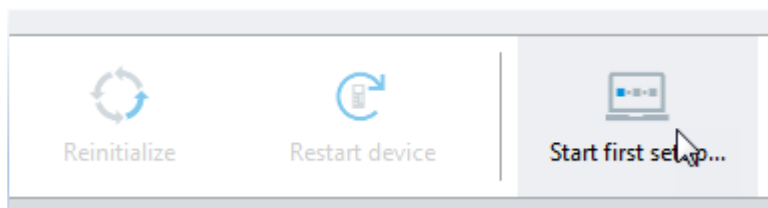
Step 3: Drag and Drop the CMMT-AS to your new project



Step 4: Open the CMMT-AS configuration view via double click on Axis1



Step 5: Use the Wizard for an easy and fast configuration



Step 6: Start the configuration step by step

- Choose the Servo drive

Please select the components of your drive system

Select servo drive

Please enter a search phrase and/or select a device from the list below.

Order code: CMMT-AS-C2-3A-M0
Part number: 548715Rev 04 A743

Search results:

CMMT-AS-C4-3A-EC-S1	5340820
---------------------	---------

Have a look on the label

- Choose the connected motor

Select Motor

Please enter a search phrase and/or select a device from the list below.

Order code: CMMT-AS-C2-3A-M0
Part number: 548715Rev 04 A743

Search results:

EMME-AS-40-S-LV-AS	2082428
EMME-AS-40-S-LV-ASB	2082430

- Define the axis (-> In this application we are working with an unlimited user define rotative axis)

Select axis

Please enter a search phrase and/or select a device from the list below.

Order code: CMMT-AS-C2-3A-M0
Part number: 548715Rev 04 A743

Search results:

User defined linear axis
User defined rotative axis

User defined rotative axis

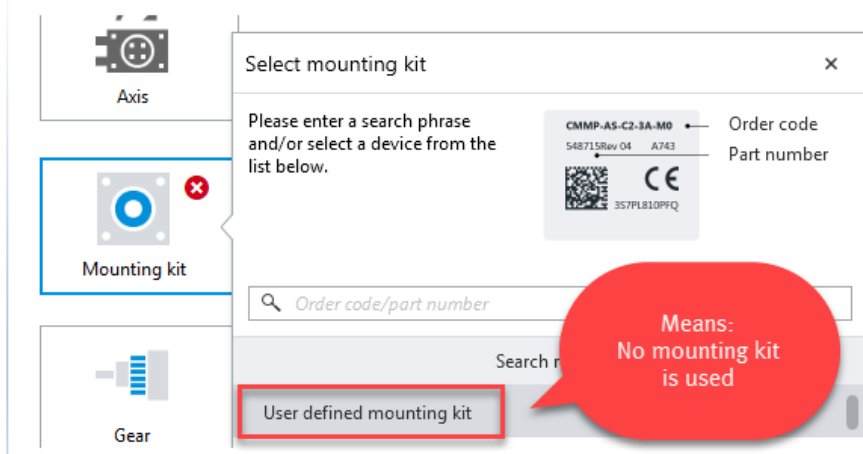
Current user unit: Rev [rev, rpm, ...] (3)

Motion: Rotative

Unlimited axis ☒ Active






Design axis: Single axis (0)

- Define the mounting kid (-> In this application we are using no mounting kit)



Step 7: After the basic configuration is finished the options for Application data, Hardware switches, Homing method and Software limits are available

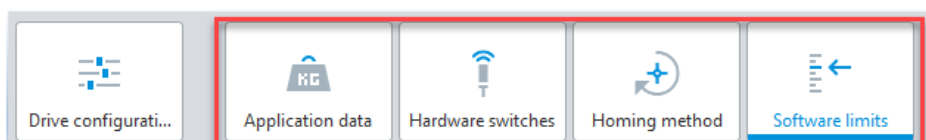
Please select the components of your drive system

 Servo drive	CMMT-AS-C4-3A-EC-S1 5340820 Licenses	Maximum current 12,00 A	Load voltage 320,00 V
 Motor	EMME-AS-40-S-LV-AS 2082428	Type EC motor (2)	Holding brake No
		Encoder protocol HiPerface (0)	Encoder type Single turn (1)
 Axis	User defined rotative axis	Position Range Unlimited	
 Mounting kit	User defined mounting kit	Type Axial kit	
 Gear	No gear configured		

You have access to this parameters via the “Next” button which appears on lower right corner



Or per direct click in the upper menu



Note: In this application we have used following settings:

Application data

Axis mass moment of inertia 0,00 kgcm²

Application moment of inertia 0,00 kgcm²

Total mass moment of inertia 0,00 kgcm²

Rotation polarity

Please select the mounting position of the motor (viewed from top):

☐ Invert rotation polarity

Hardware switches

Reference switch configuration Deactivated (0)

Limit Switches Configuration Not used (1)

Homing method

Method Method 37: Current position (37)

Nominal current limit percentage 0,20

Move to axis zero point after homing ☒ Active

Software limits

Axis zero point offset 0,00 r

Software limit positions active ☐ Active

☐ Negative software limit position -0,03 r

☐ Positive software limit position 0,97 r

Defined Homing method

Moveable offset

Step 8: Close the Wizard and download everything to the motor controller

AUTOMATION SUITE

New Project*

⌂

🔍

?

Axis1

×

←

First setup

PARAMETERISATION

DIAGNOSIS

CONTROL

⏻

Axis1

CMMT-AS-C4-3A-EC-S1

Path: 192.168.1.200

Disconnected

Connect

☐

Plug-in

☐Enabled

☐Disabled

PLC

Control

Powerstage

Parameter pages

<

Drive configuration

Parameter synchronisation

×

The following parameters mismatch. Please choose whether you want to transfer the parameters from the project to the device or vice versa.

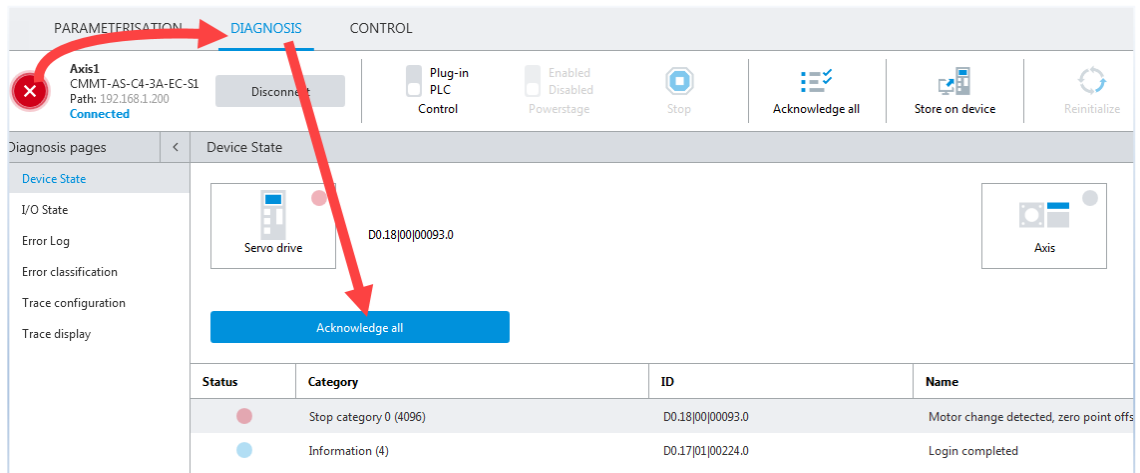
ID	Name	Value in project	Unit	Value on device	Unit
P0.494.0.0	Upper mains voltage val	530,00		265,00	
P0.3223.0.0	Zero point offset from u	0,00		-0,031795769	
P0.3226.0.0	Referencing in user cont	<input type="checkbox"/>		<input checked="" type="checkbox"/>	
P0.3239.0.0	Serial number motor ref			SC500410F	
P0.4811.0.0	Warning thresholds DC	790,00		390,00	
P0.4812.0.0	Switch-on threshold bra	760,00		370,00	
P0.4813.0.0	Upper limit value DC lin	800,00		400,00	
P0.9311.0.0	Upper limit value servo	80,00		85,00	
P0.9314.0.0	Upper limit value warnir	80,00		85,00	
P0.9315.0.0	Upper limit value power	90,00		95,00	
P1.2227.0.0	Total inertia	0,000003		0,00	
P1.2227.0.1	Total inertia	0,000003		0,00	
P1.2227.0.2	Total inertia	0,000003		0,00	
P1.7111.0.0	Motor inertia (user-defir	0,000003		0,000003	
P1.7144.0.0	Time constant I ² t (user-i	10,00		10000,00	
P1.8416.0.0	Axis zero point offset	0,00		0,03	

Write to device

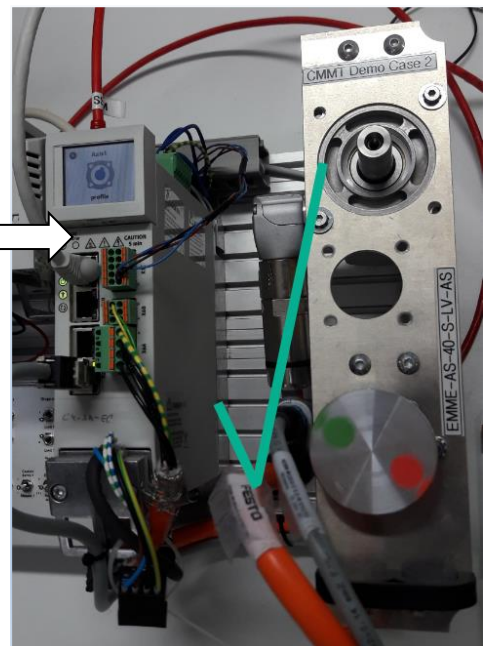
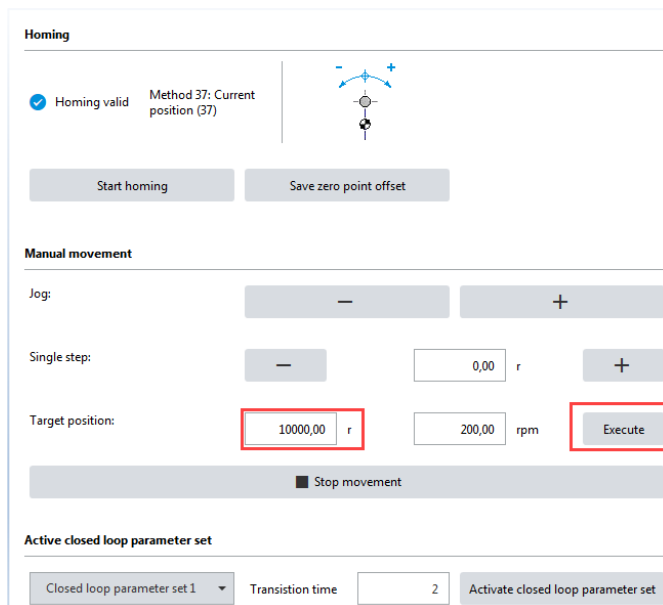
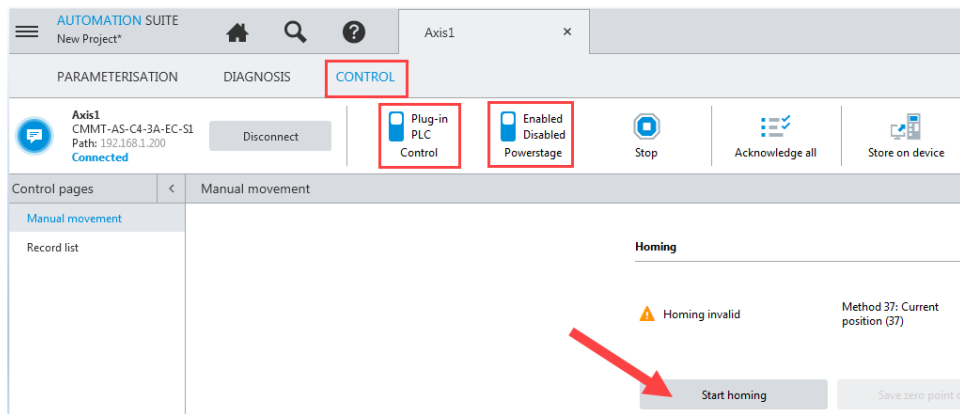
Read from device

Stay offline

Step 9: If the CMMT-AS was in use already then, a change can occur some diagnosis messages.
You can delete them:



After that you can do for testing purpose a Homing and some movements



3 Step by Step commissioning in TwinCAT V3

3.1 Pre- conditions

- 1) You have download and integrated the **CMMT-AS XML file already**

If not then do following:

- Download the file from the Festo Support Portal and unzip it:

Support Portal

Please select a category on the left or use the search.

Search

FESTO
 DNC-125-100-PPV-A
 183501 R408
 pmax: 12 bar
 Part number Series Order code

→ Contact
 → Product conformity
 → Terms and conditions of use for electronic documentation

servo drive CMMT-AS-C4-3A-EC-S1
 5340820

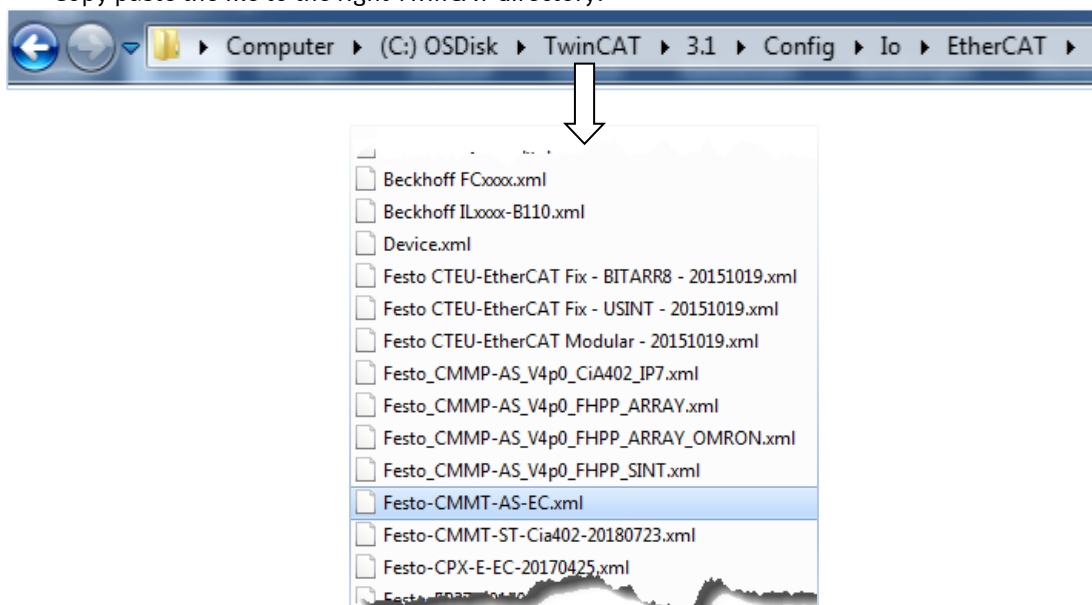
→ Display in the catalogue
 → CAD / EPLAN
 → Spare parts catalogue
 → Technical data
 → Create download package

Top 3 Product information [1] Technical documentation [5] Certificates [2] **Software [5]** Expert knowledge [0] Training [0]

Description	Version	Filter result
Firmware Firmware CMMT-AS-...-EC (EtherCAT) <input type="checkbox"/> Firmware for motor controller CMMT-AS-...-EC (EtherCAT)	V013.0.4 22/06/2018	→ Firmware → File and language versions ★★★★★
EtherCAT XML CMMT-AS ESI File <input type="checkbox"/> ESI-Files for CMMT-AS-...-EC	1.0 22/06/2018	→ Device Description Files → File and language versions ★★★★★

Supported systems:

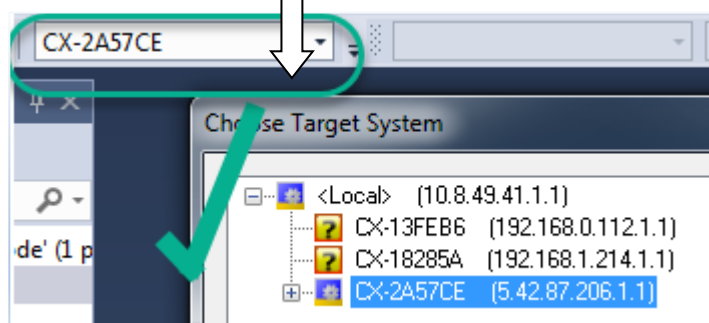
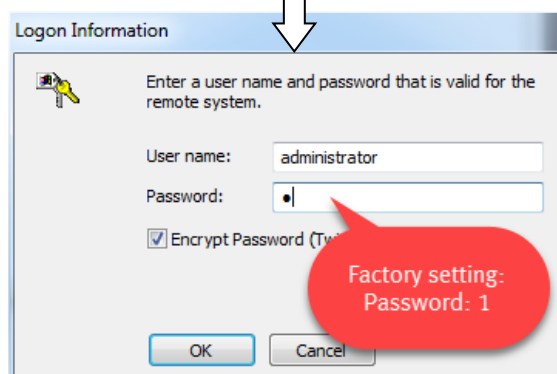
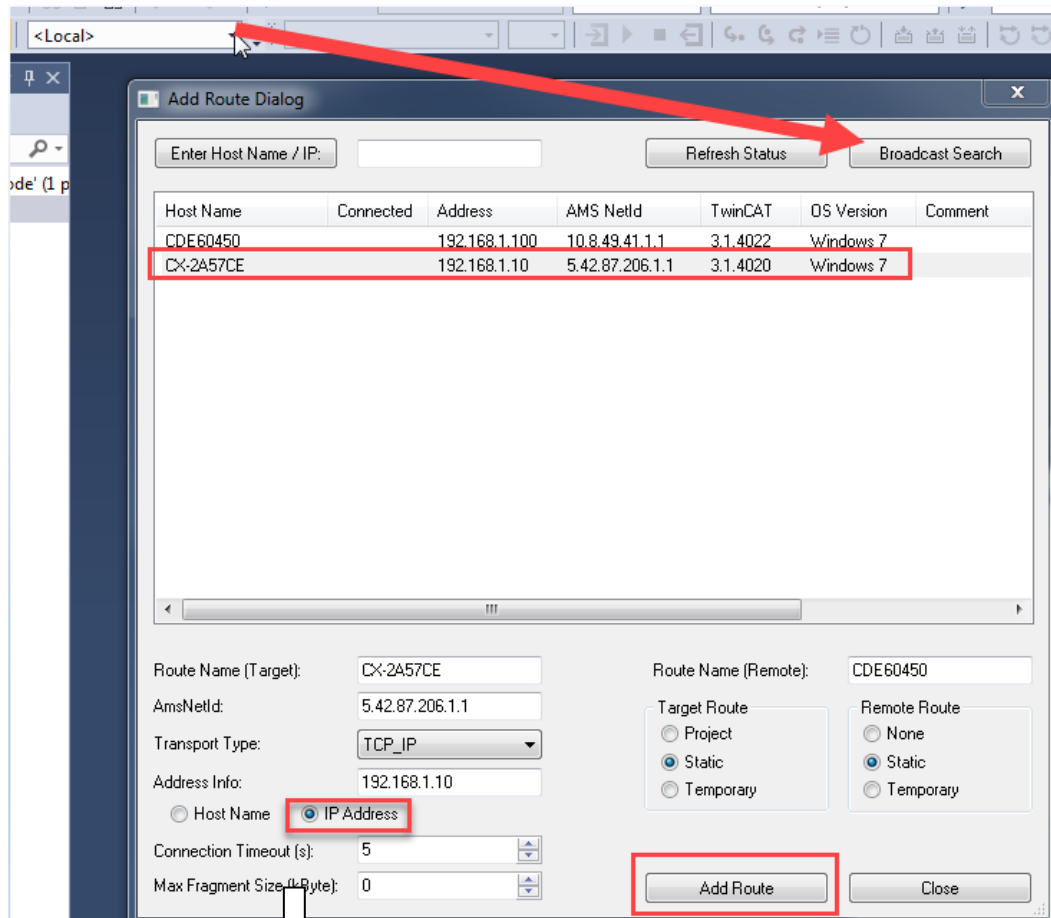
- Copy paste the file to the right TwinCAT directory:



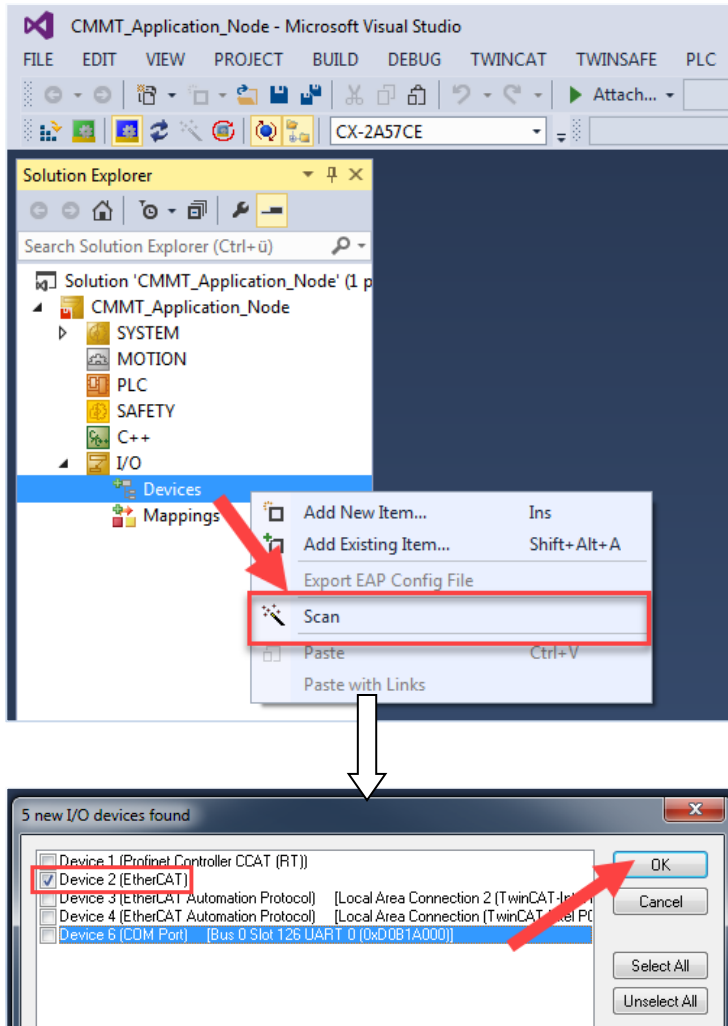
2) Your Laptop has a connection to the Beckhoff PLC

If not then do following.

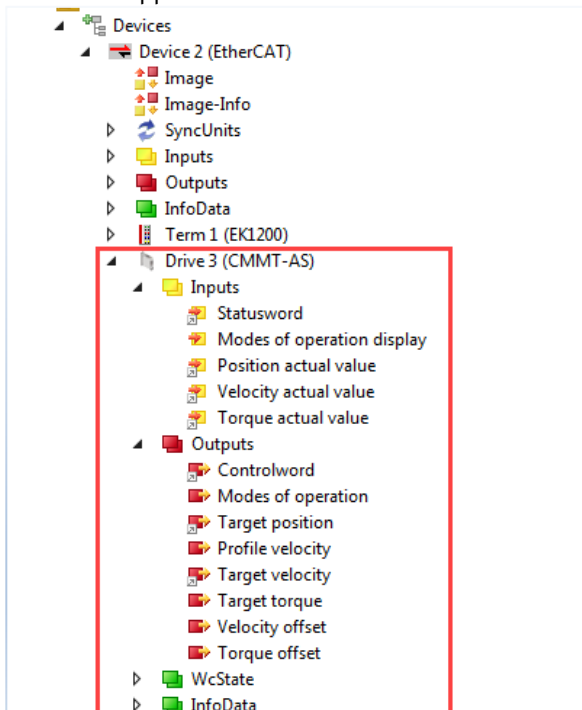
- Search for the communication and Add the route:



3.2 Scan for EtherCAT devices

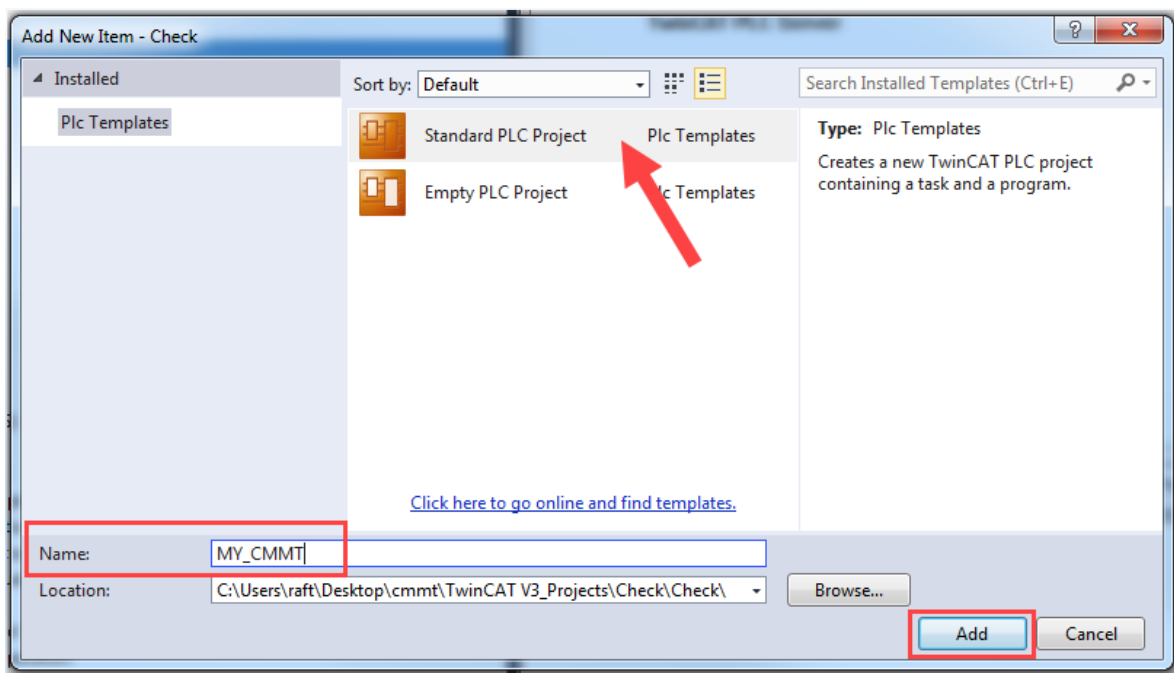
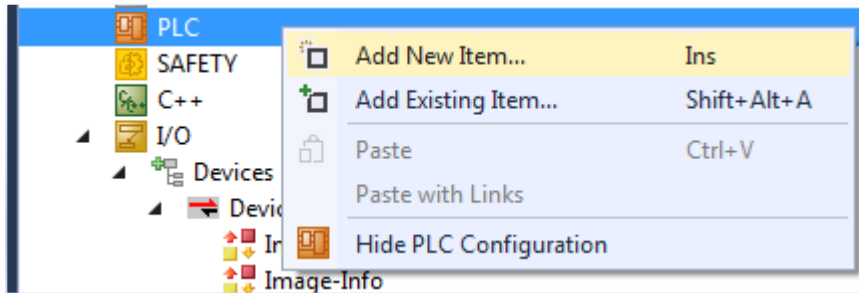


If the XML file is located in the right TwinCAT directory, our drive is powered and the EtherCAT cable is connected then it will appear in the device tree:

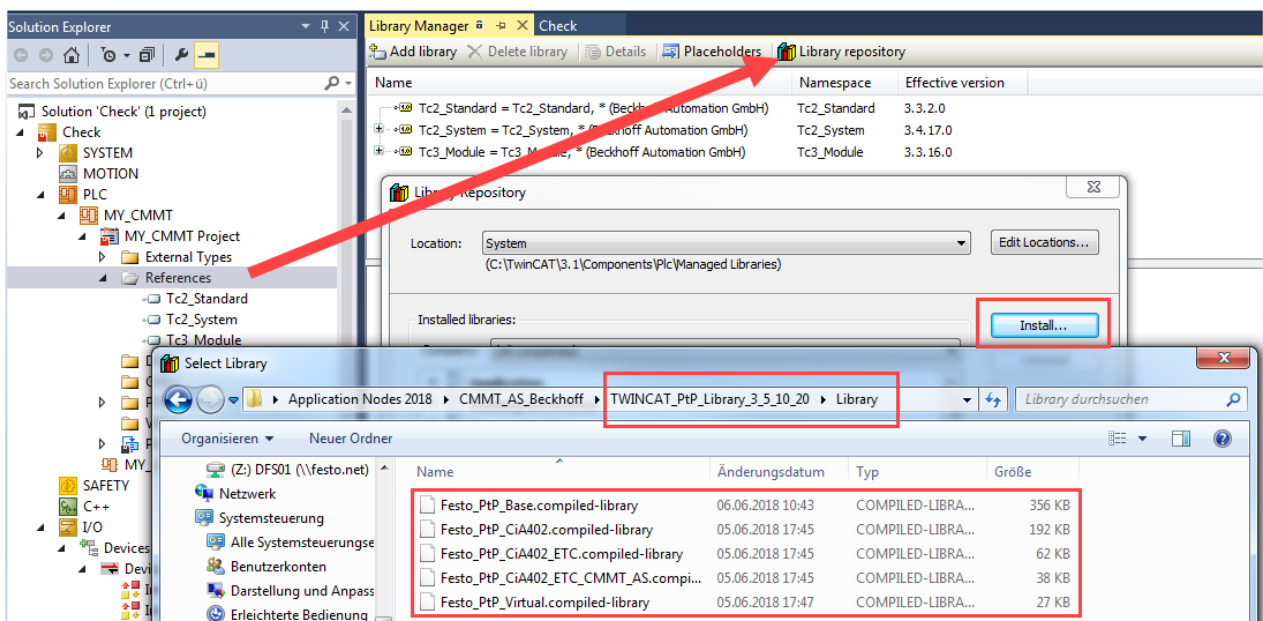


3.3 Creating PLC project and link the variables

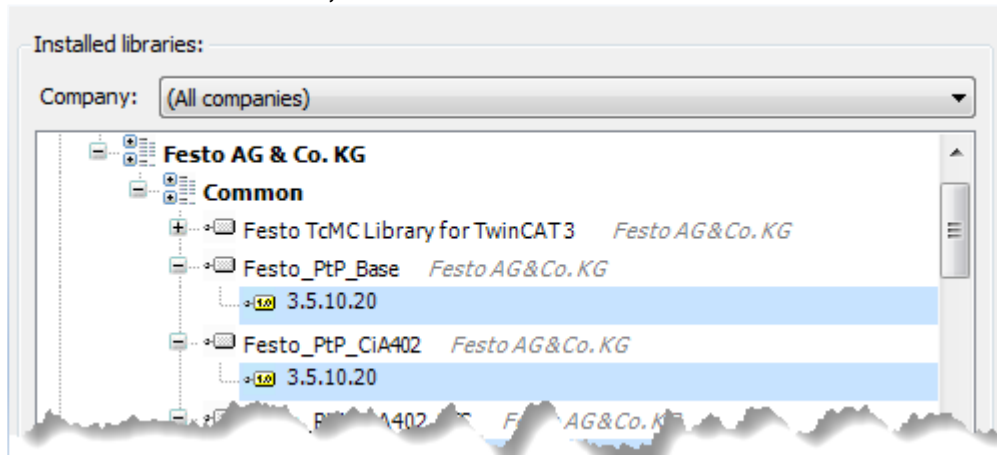
3.3.1 Step 1: Create a new PLC program



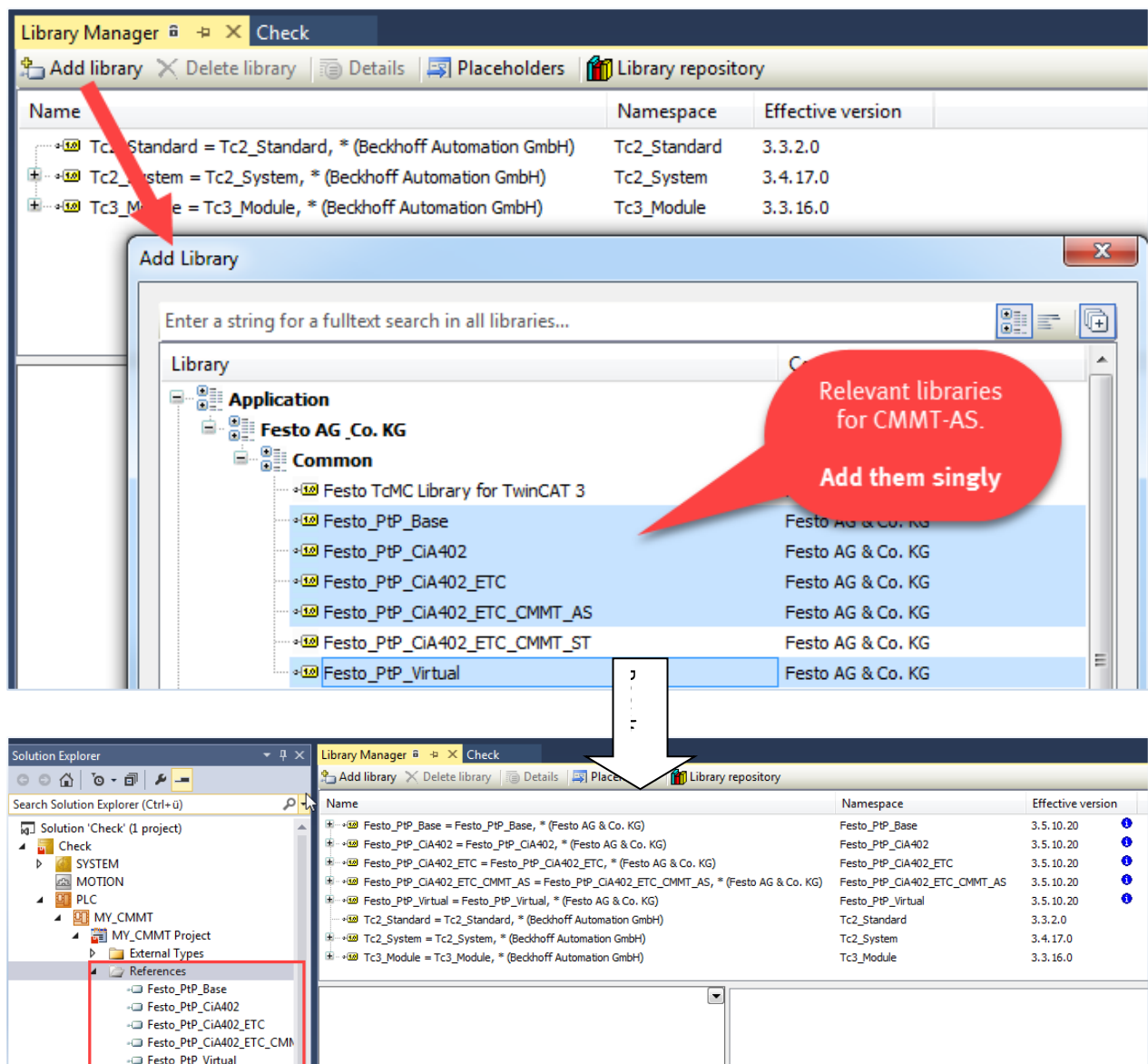
3.3.2 Step 2: Add the Festo PTP libraries, which you have download from the Festo Support Portal



After a successful installation you find the libraries listed in the Festo folder:



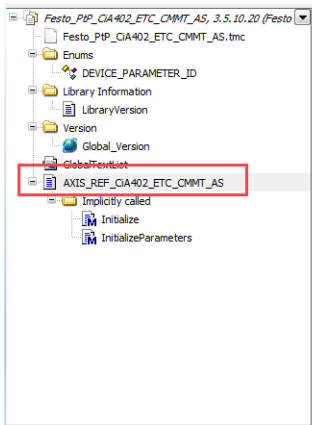
3.3.3 Step 3: Add all the Festo PTP libraries for CMMT-AS



Note:

The libraries have internal relations that's the reason why you need them all!

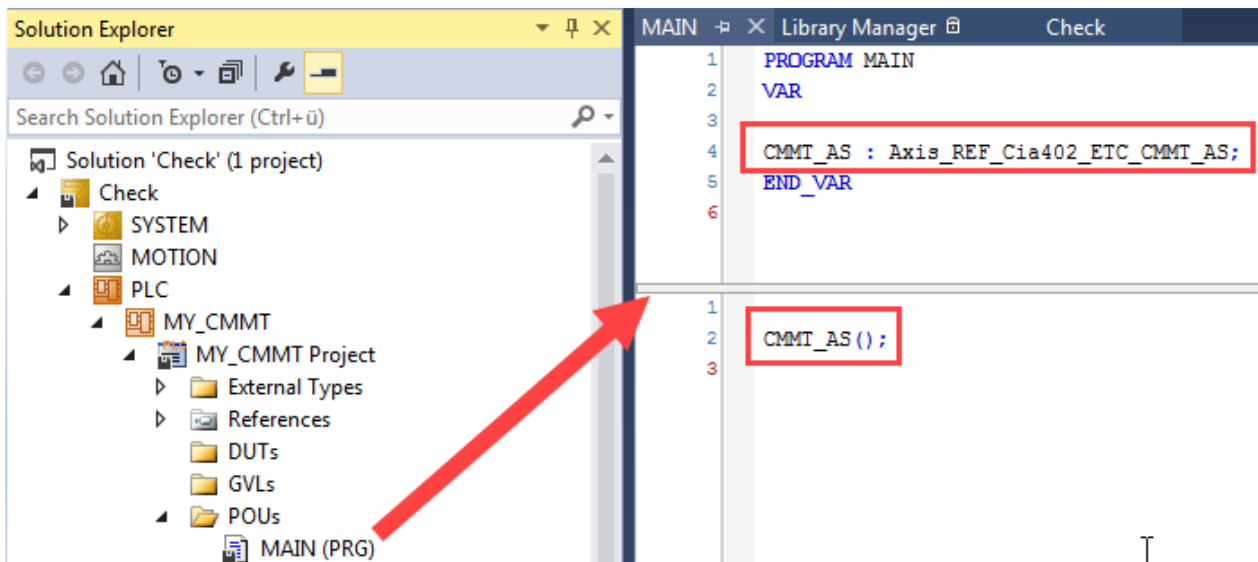
As reference have closer look on the function block self:



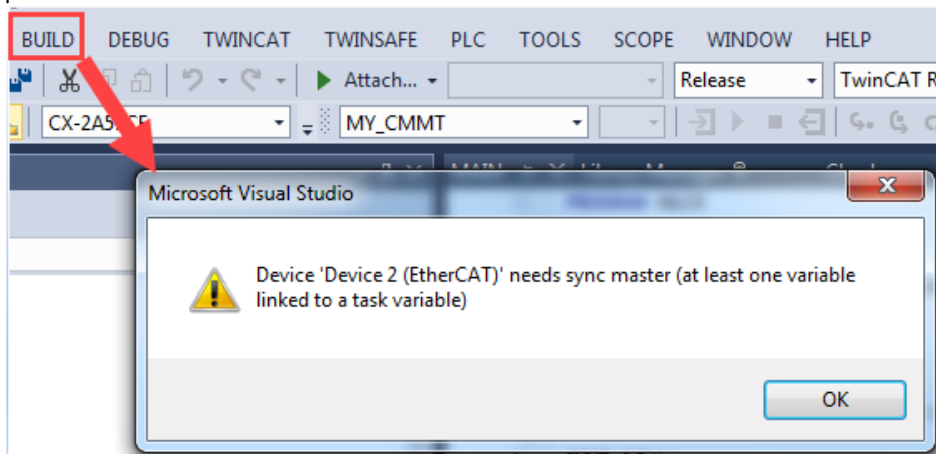
Scope	Name	Type	Address	Initial	Comment	Inherited from
Output	InitErrorInfo	INIT_ERROR		init_NoError	information about initialization error of the library	AXIS_REF_FESTO
	AxisState	AXIS_STATE		Disabled	axis state according to PLCopen specification	AXIS_REF_FESTO
	ActiveMoveFB	I_MotionCallback			interface to the currently active motion FB (for aborting a motion)	AXIS_REF_FESTO
	ActiveParameterFB	I_ParameterCallback			interface to the currently active parameter FB	AXIS_REF_FESTO
Input	AdsAddr_In	AmsAddr	%I*			AXIS_REF_FESTO_Cia402
	Statusword_In	UINT	%I*			AXIS_REF_FESTO_Cia402
	ModesOfOperationDisplay_In	SINT	%I*			AXIS_REF_FESTO_Cia402
	PositionActualValue_In	DINT	%I*			AXIS_REF_FESTO_Cia402
	VelocityActualValue_In	DINT	%I*			AXIS_REF_FESTO_Cia402
	TorqueActualValue_In	INT	%I*			AXIS_REF_FESTO_Cia402
Output	Controlword_Out	UINT	%Q*			AXIS_REF_FESTO_Cia402
	ModesOfOperation_Out	SINT	%Q*			AXIS_REF_FESTO_Cia402
	TargetPosition_Out	DINT	%Q*			AXIS_REF_FESTO_Cia402
	ProfileVelocity_Out	UDINT	%Q*			AXIS_REF_FESTO_Cia402
	TargetVelocity_Out	DINT	%Q*			AXIS_REF_FESTO_Cia402
	TargetTorque_Out	INT	%Q*			AXIS_REF_FESTO_Cia402

3.3.4 Step 4: Call the PTP function block cyclically

- Create e.g. following program in the MAIN (PRG)

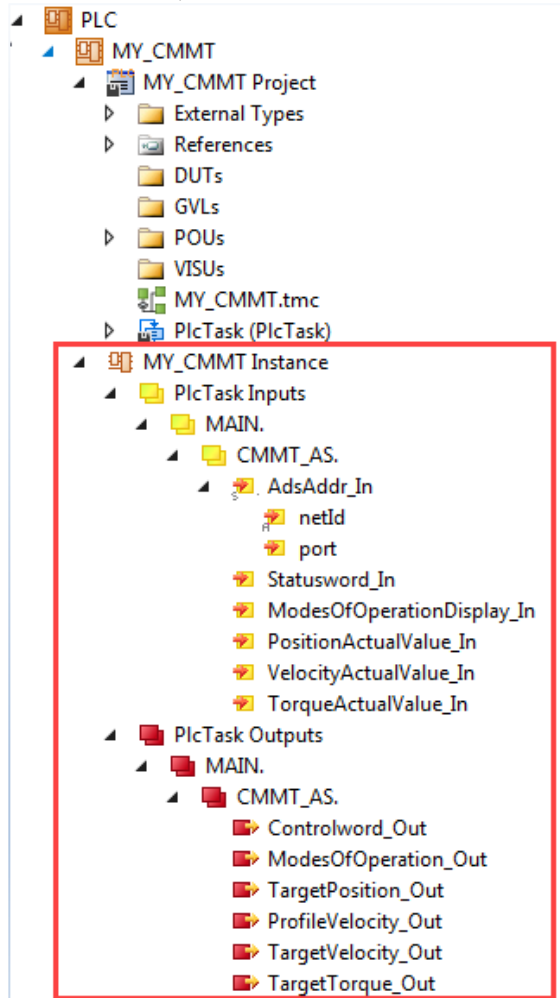


- Build All
Following message will appear, but that's not critical due the fact that we have not linked the real process data of CMMT-AS



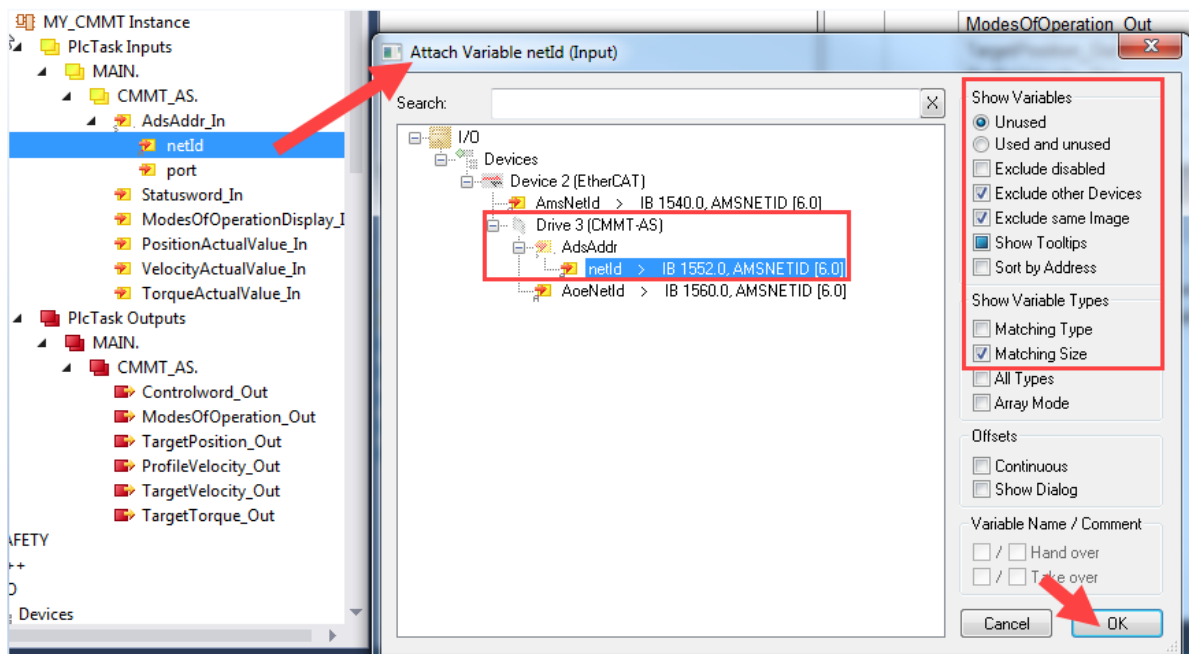
Note:

In the Instance you will find following variable structure too:

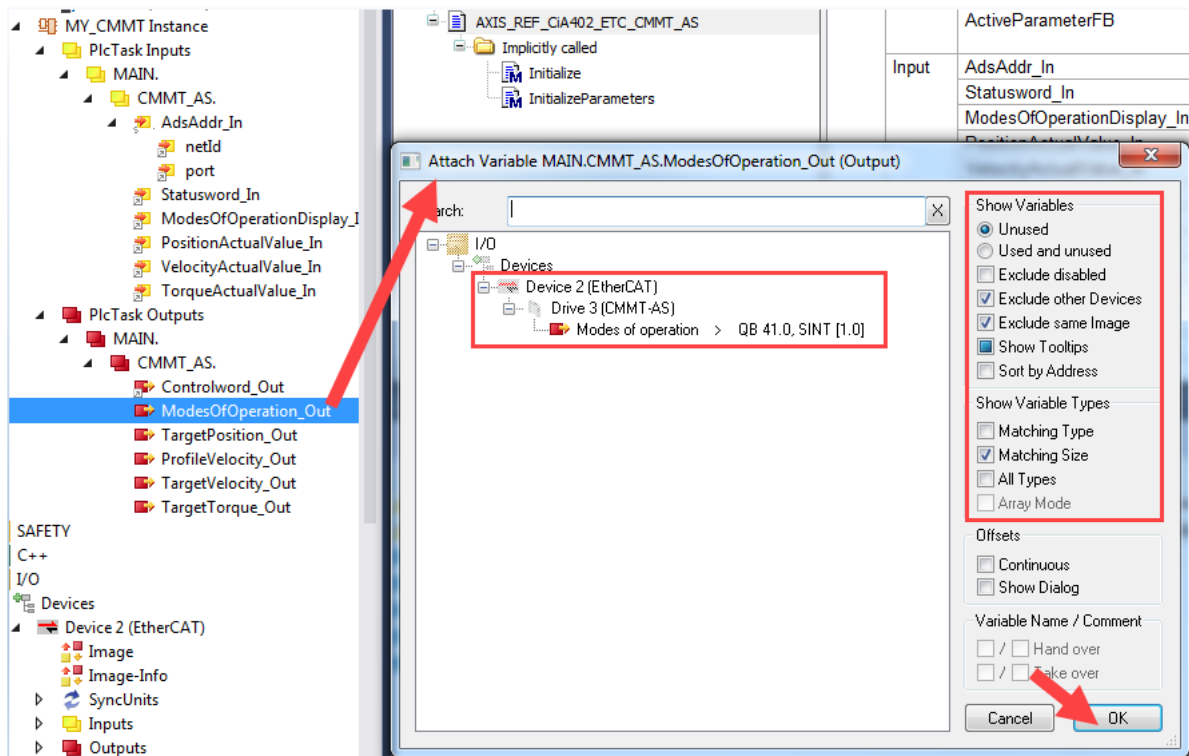


3.3.5 Step 5: Link the function block variables with the real CMMT-AS process I/O data

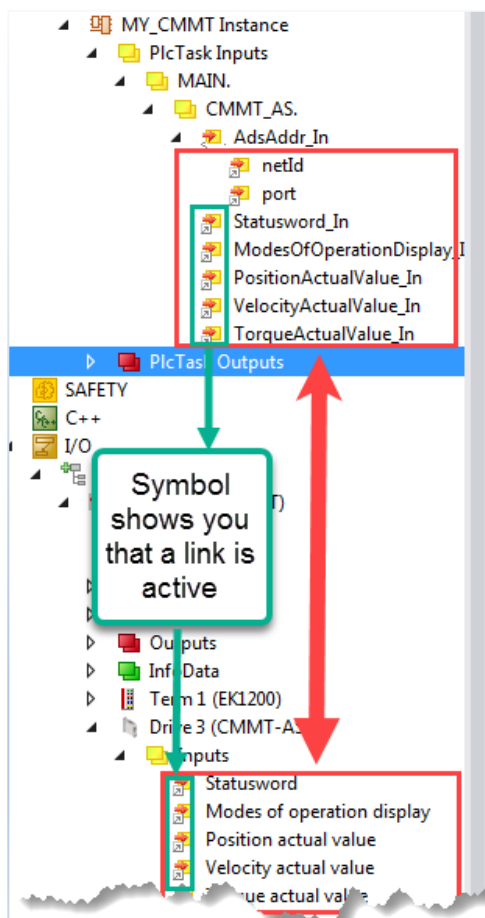
Example for the Input:



Example for the output:



Result if you are finished:

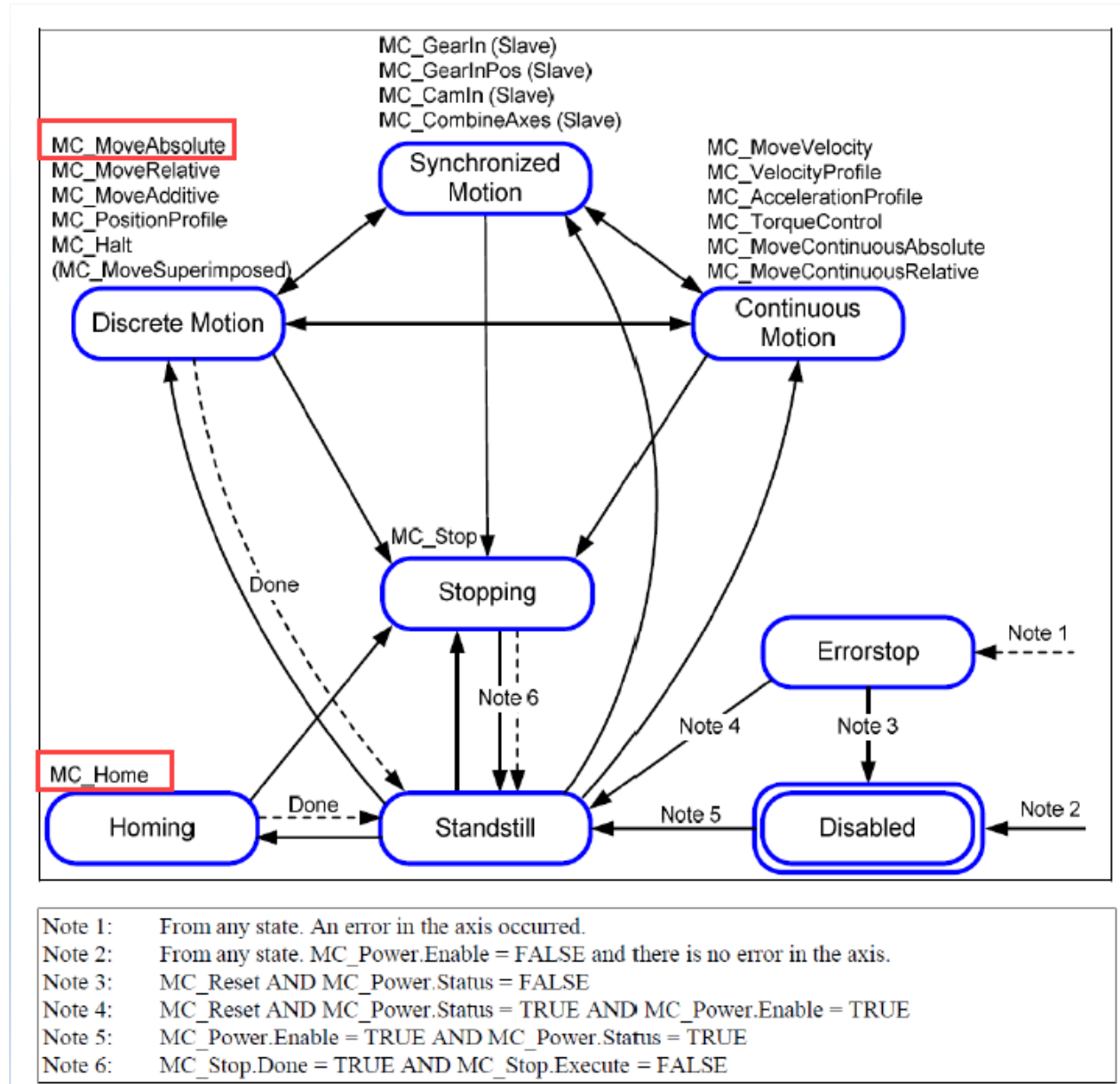


3.4 Creating PLC program

The example PLC program contains a simple routine where you move the rotative axis absolutely-

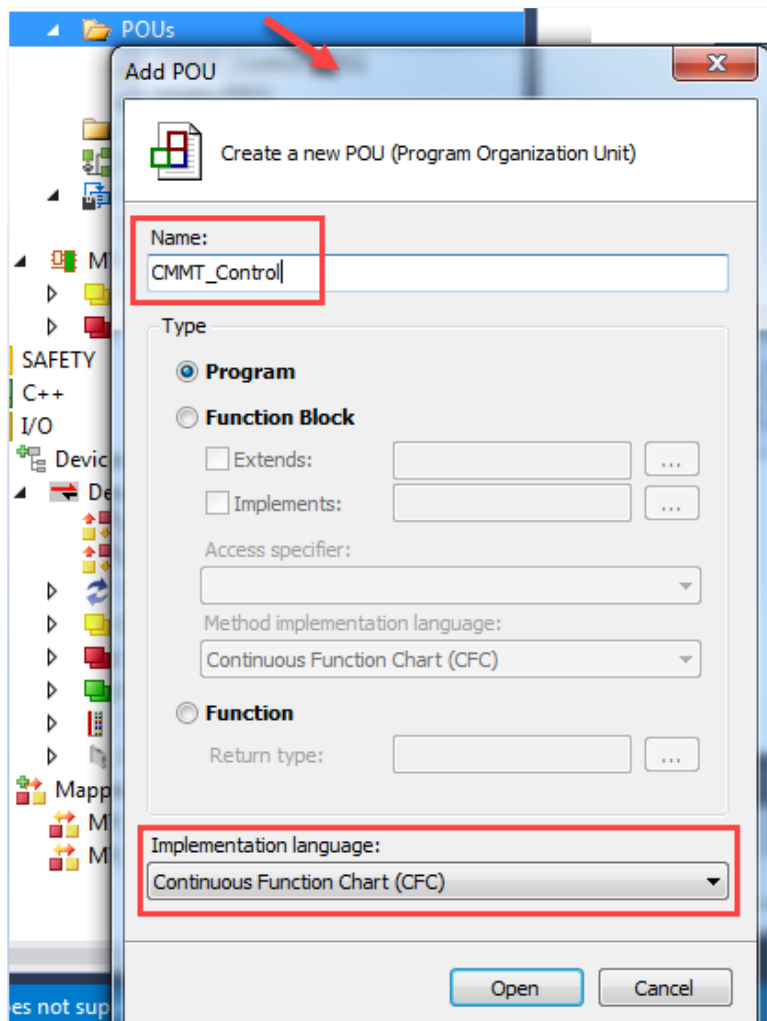
3.4.1 PLC Open state machine

As reference have a closer look on the PLCopen state machine and for more details check the corresponding specification which you can get from www.plcopen.org

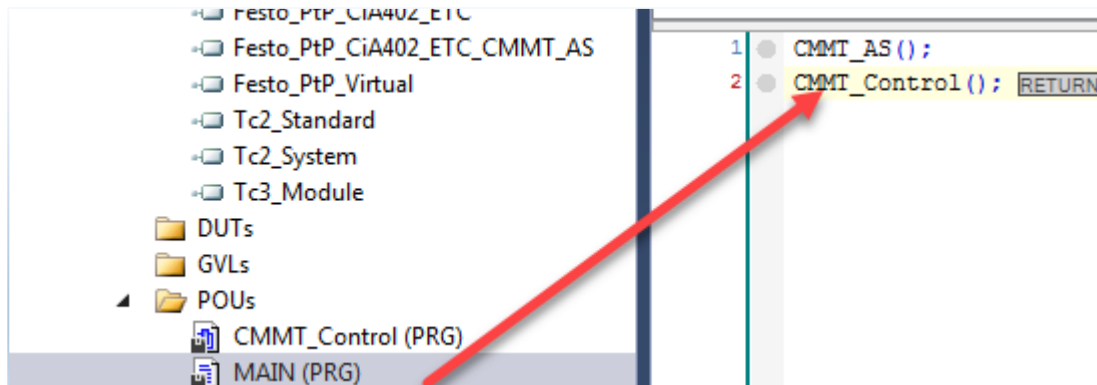


3.4.2 Creating a CFC program for Move Absolute

Step1: Add CFC program

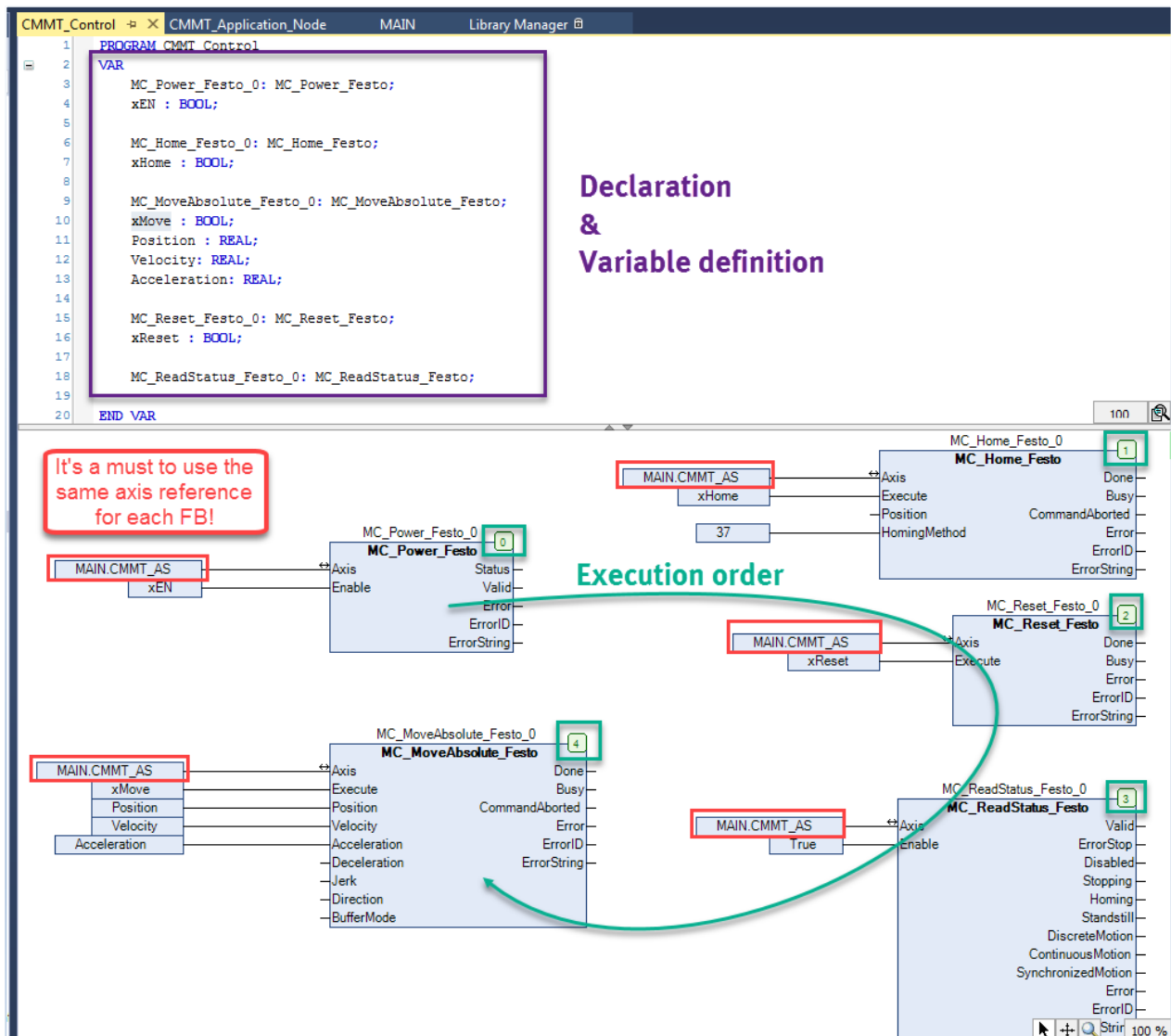


Step2: Call "CMMT_Control" in "Main" cyclically



Step3: Write a CFC Logic with the PLCopen FB's for "Move Absolute"

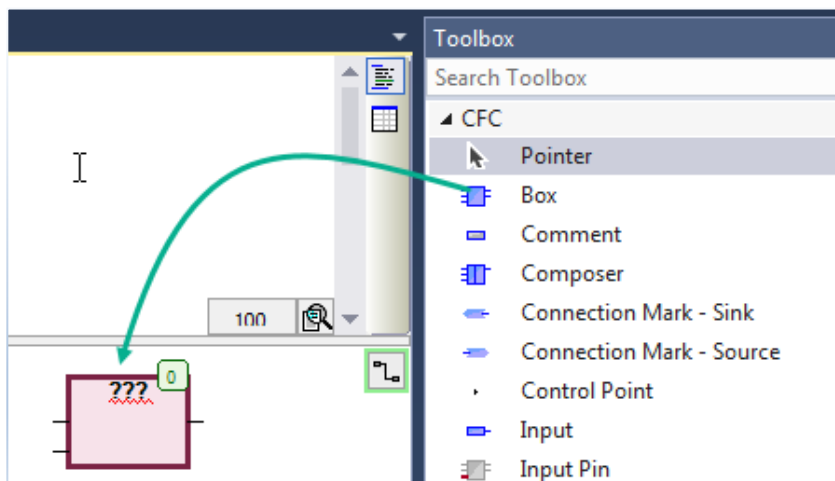
Example:



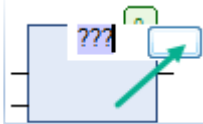
Note:

If you have added the PtP libraries then you can choose the right FB's via following procedure easily:

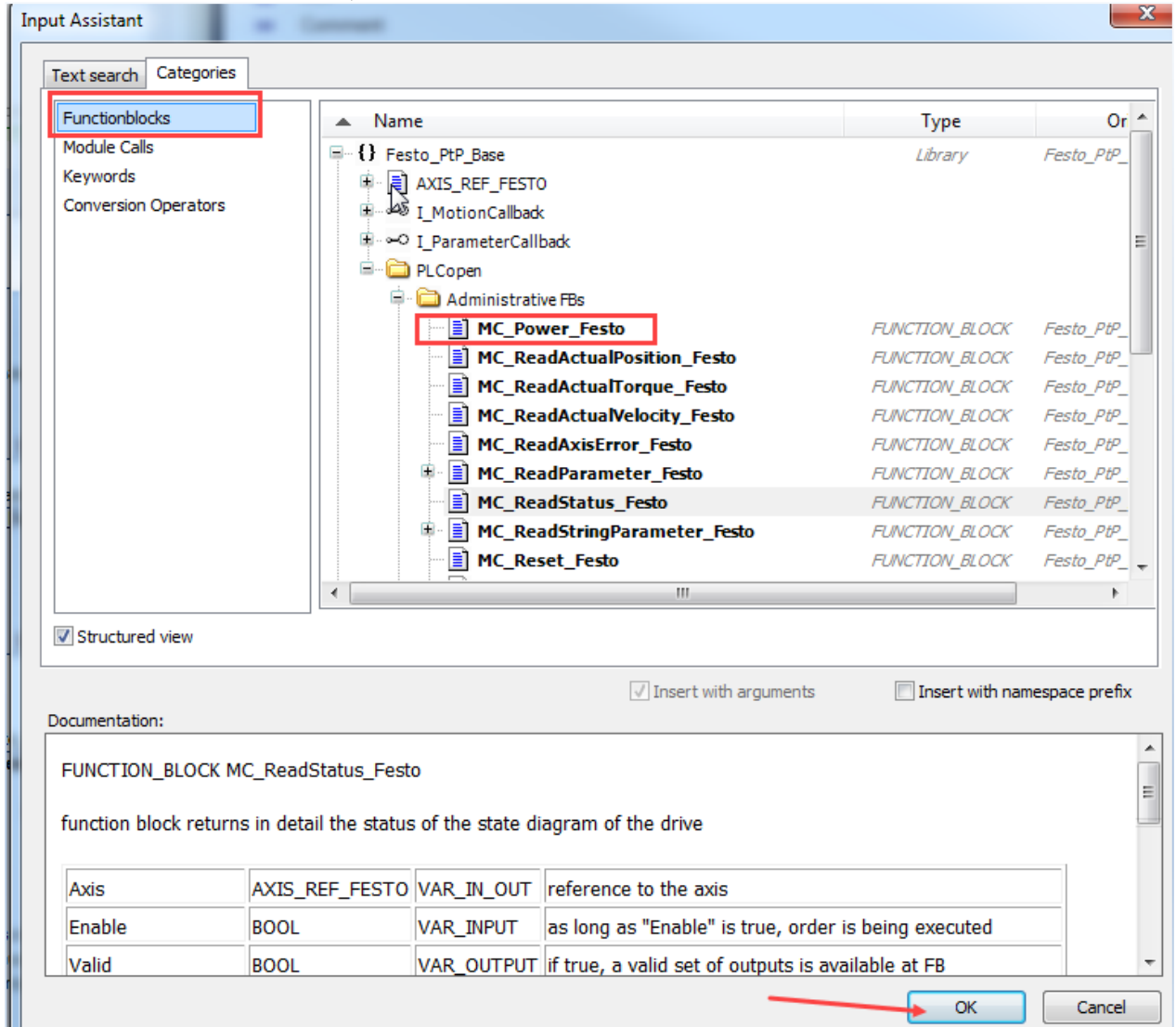
- Drag and Drop a box



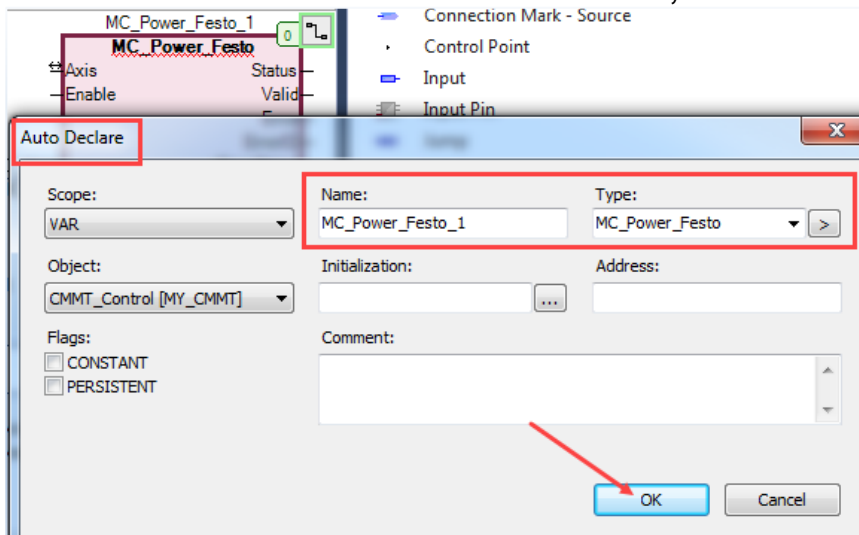
- Open Input Assistant



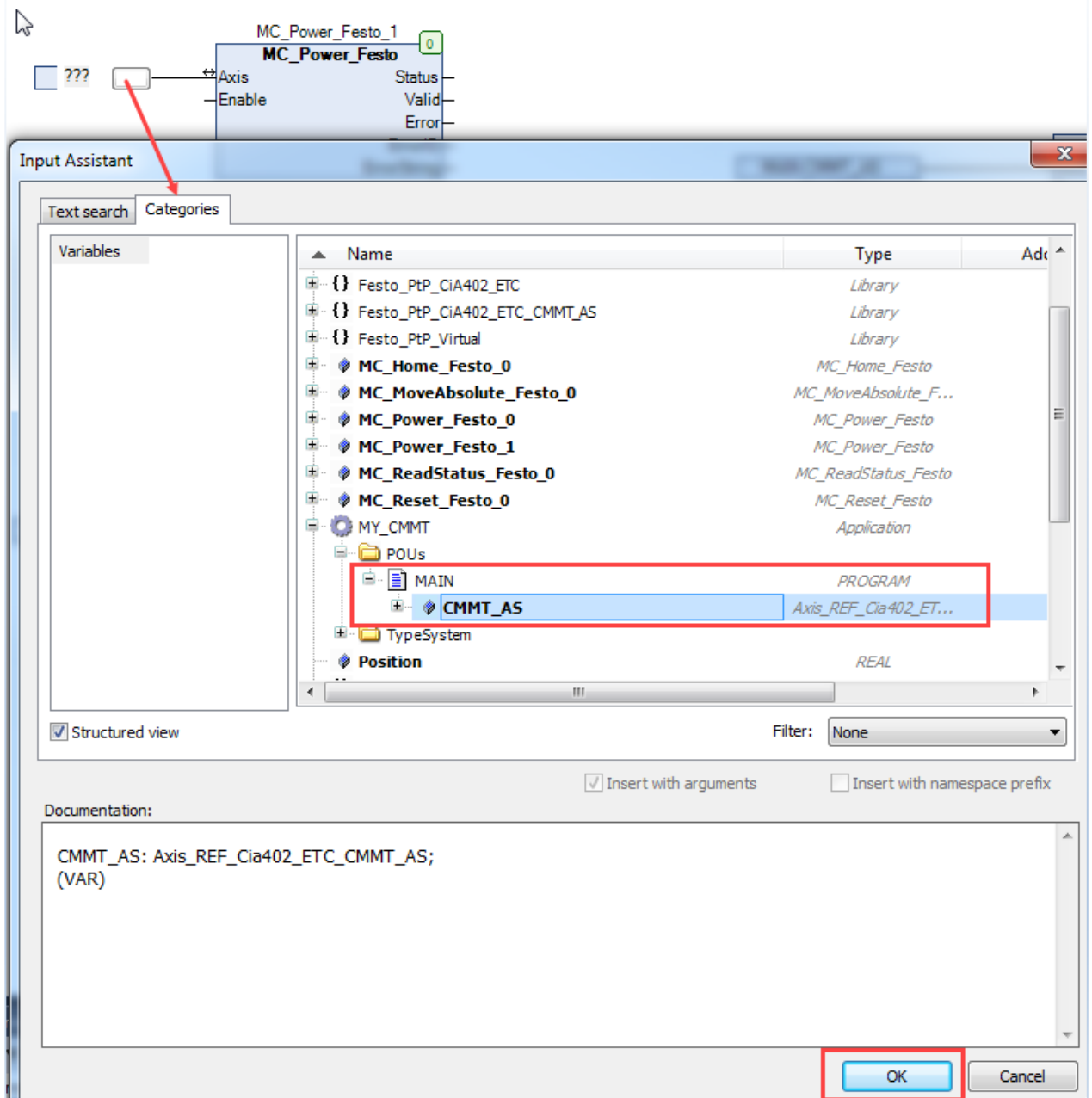
- Choose the Function block which you want to use



- Press 2x the enter button to define an instance automatically and to start the Auto Declare assistant



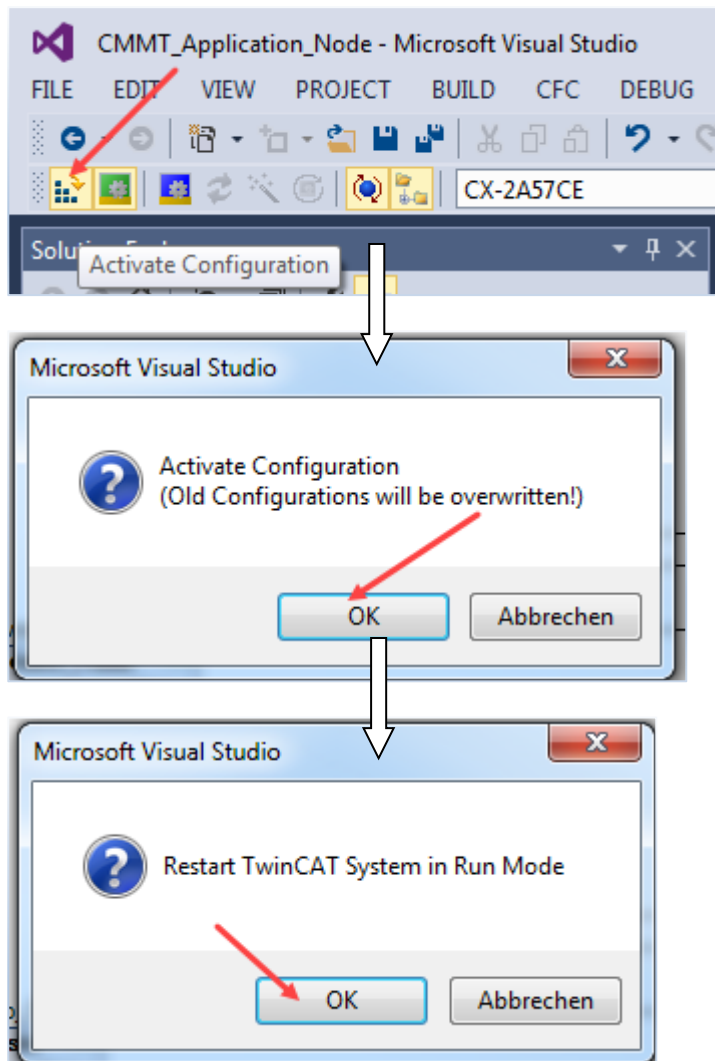
- Define the axis reference for the function block



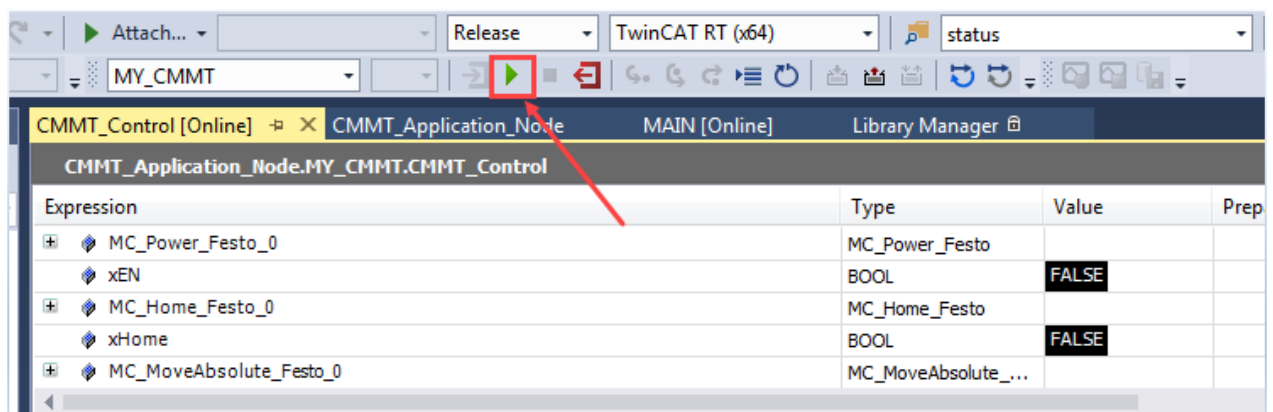
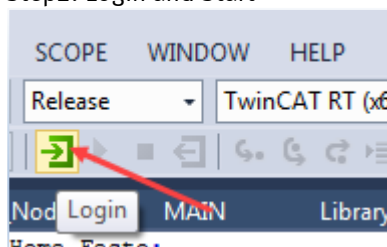
➔ You can use this procedure to create further PLCopen function blocks in your CFC program.

3.4.3 Download and Testing the program

Step1: Activate configuration



Step2: Login and Start



Step3: Test the logic manually

Expression	Type	Value	Prepared value	Address	Comment
MC_Power_Festo_0	MC_Power_Festo				
xEN	BOOL	TRUE			
MC_Home_Festo_0	MC_Home_Festo				
xHome	BOOL	FALSE			
MC_MoveAbsolute_Festo_0	MC_MoveAbsolute ...				
xMove	BOOL	TRUE			
Position	REAL	200			
Velocity	REAL	2000			
Acceleration	REAL	1000			

The ladder logic diagram shows several function blocks: MC_Power_Festo_0, MC_Home_Festo_0, MC_Reset_Festo_0, MC_MoveAbsolute_Festo_0, and MC_ReadStatus_Festo_0. Each block has various inputs and outputs, including status, error, and motion parameters. The MC_MoveAbsolute_Festo_0 block is highlighted with a red box, showing its inputs: xMove (TRUE), Position (200), Velocity (2000), and Acceleration (1000).

And compare it e.g. with the information of Automation Suite in Online mode:

The Automation Suite interface shows the drive configuration for the CMMT-AS-C4-3A-EC-S1 drive. The watch window displays the following data:

Variable	Value
Position servo control	200,00 r
Position actual value (encoder 1)	200,000030518 r
Velocity servo control	0,00 r

A red arrow points from the 'Position servo control' variable in the watch window to the 'Position' input of the MC_MoveAbsolute_Festo_0 block in the TwinCAT V3 interface. A green checkmark is placed next to the 'Position actual value (encoder 1)' variable.