Application Note

FESTO

How to connect CMMT to a BECKHOFF IPC in TwinCAT V3 NC

Step by step description of how to start a project in TwincAT V3 and what needs to be done to integrate CMMT into the NC element

CMMT
TwinCAT V3

100201

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1 Components/Software used

Type/Name	Version Software/Firmware	Date of manufacture
CMMT-AS-C4-3A-EC-S1	--	--
CMMT Plug In	1.0.1.10	--
Festo Automation Suite	1.0.3.6	--
TwinCAT V3	Version 12.0.21005.1 REL	--
TwinCAT V3 - IPC	Build 4022.22	--

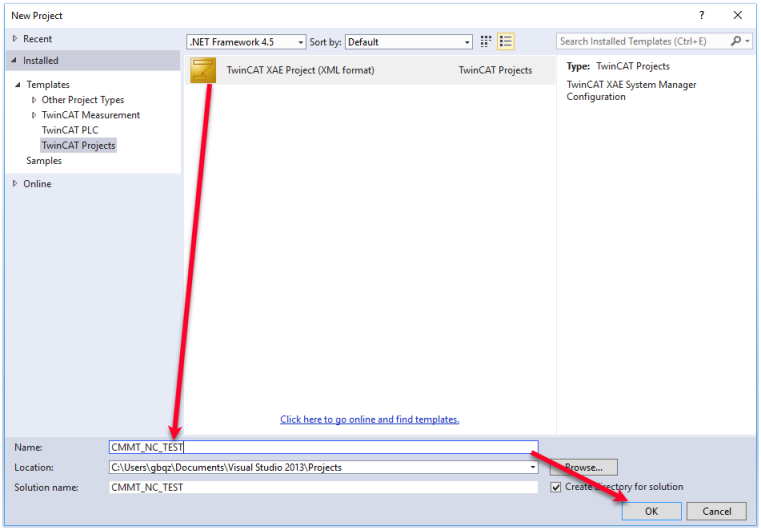
Table 1.1: 1 Components/Software used

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!

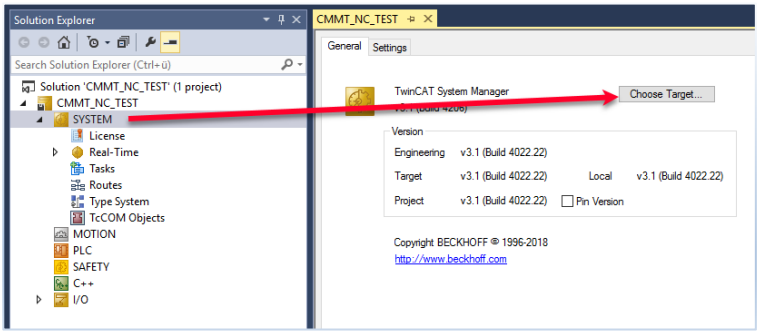
2 Starting with TwinCAT V3

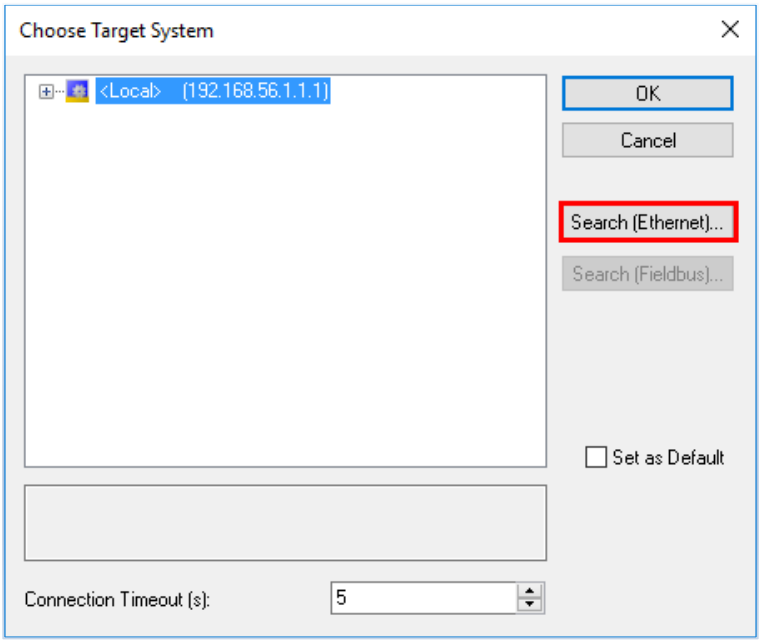
Start and name a new TwinCAT Project



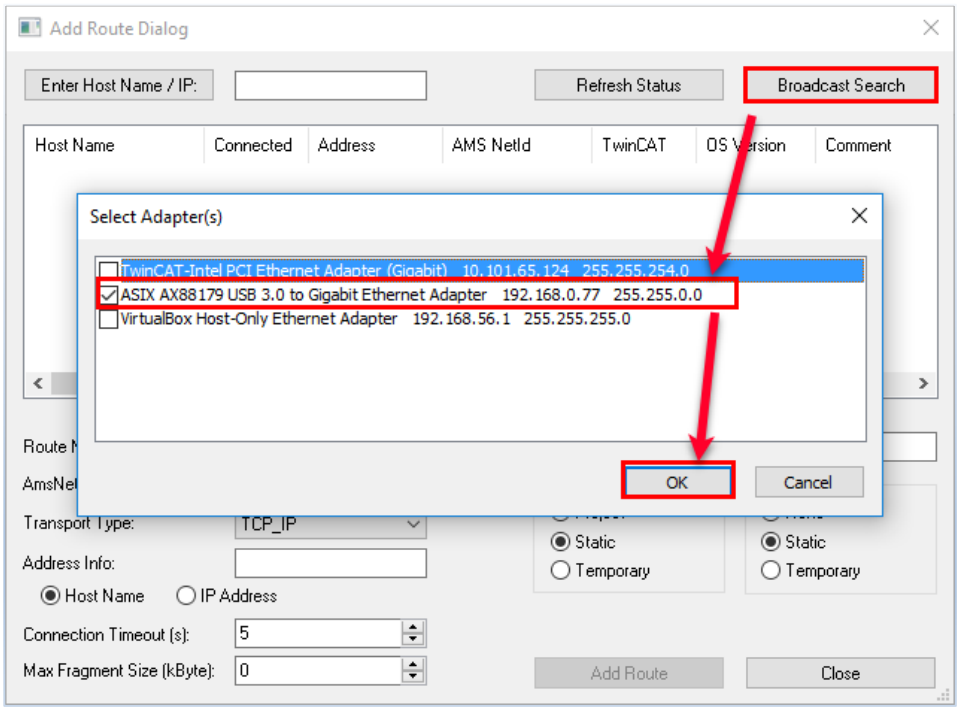
Make a connection to the IPC (Industrial PC) by double clicking on SYSTEM -› Choose Target... -› Search (Ethernet).

Note
Make sure that the laptop and the IPC are within the same network through the IP settings.



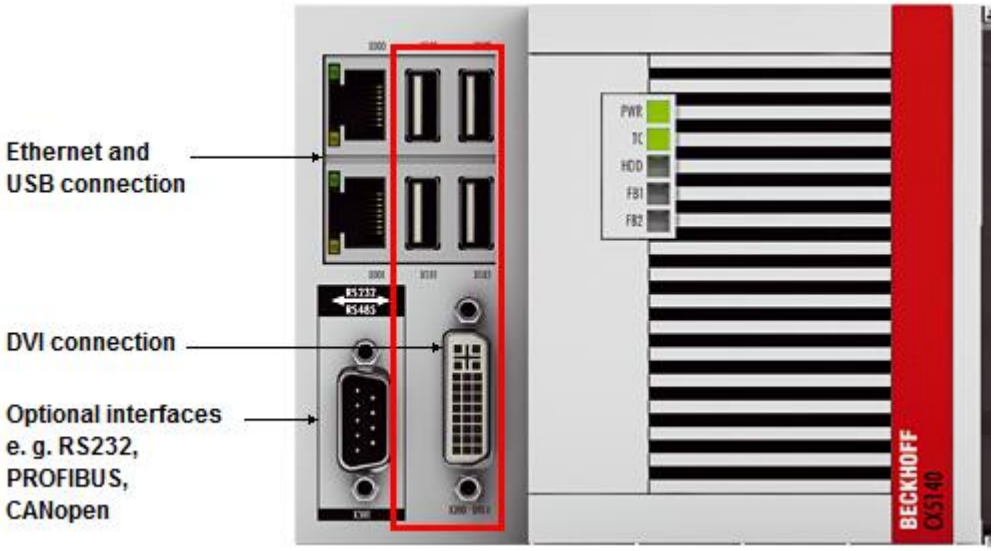


Execute a Broadcast Search and select the Laptop Ethernet Adapter where the IPC is connected to narrow down the search.



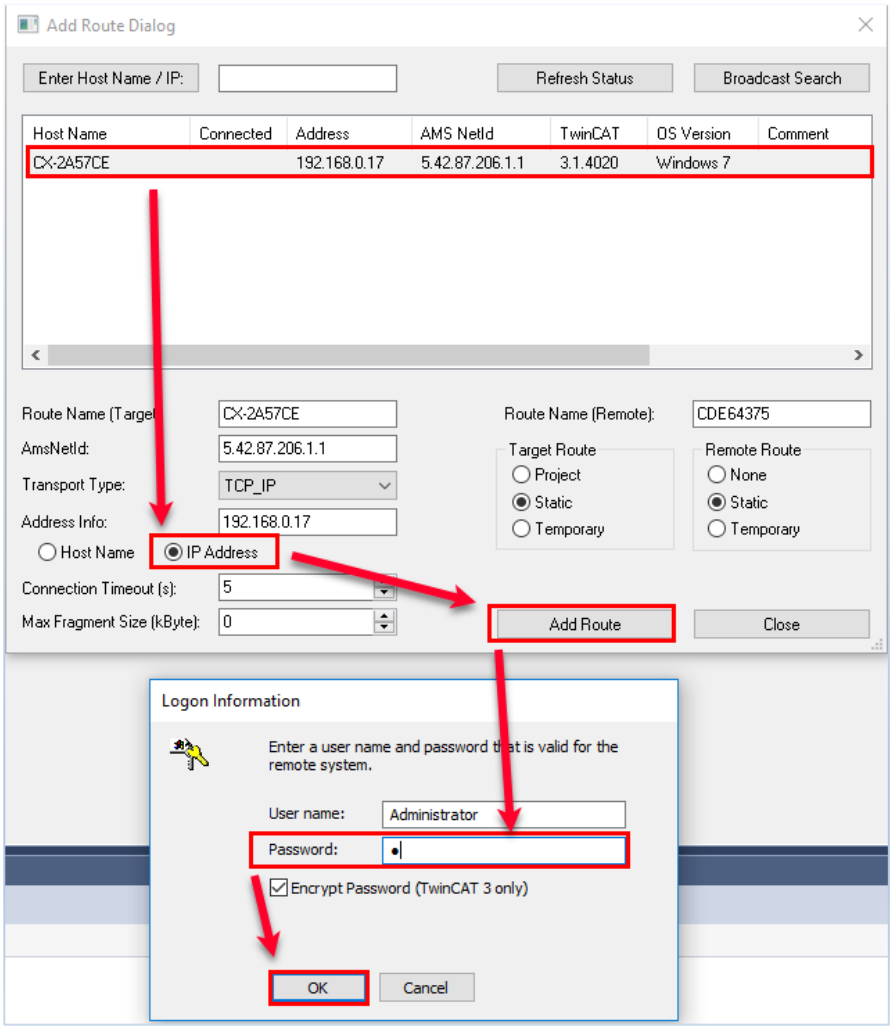
Note

If the IPC doesn't appear with the broadcast search, and the network settings have been forgotten, a monitor can be connected to it with the DVI connector, as well as a mouse and keyboard through USB. Running in the IPC is a Windows operating system will be visible in the monitor and the network settings of the IPC can be changed accordingly.

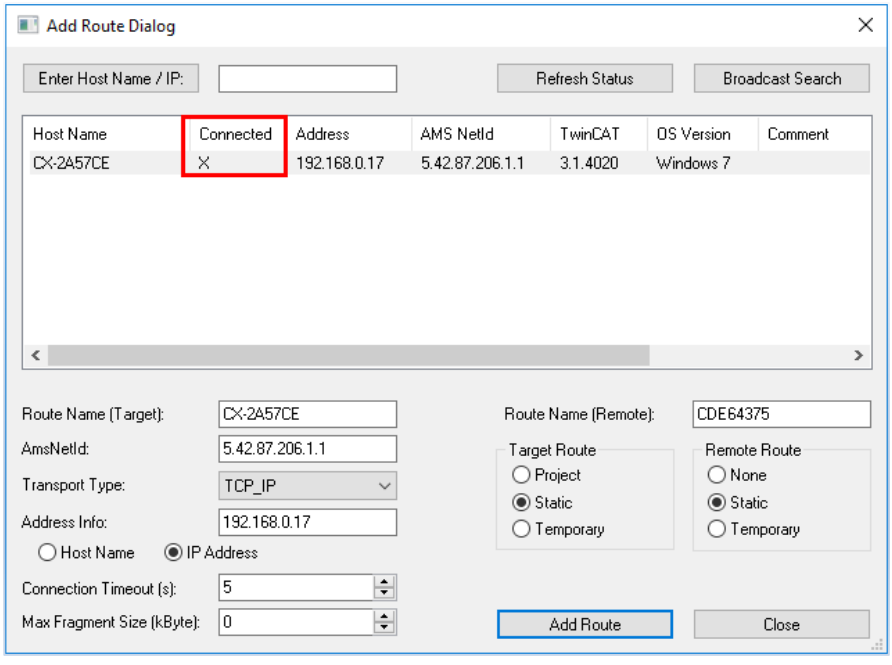


Click on the IPC, change the Address Info to IP Address -> Add Route.

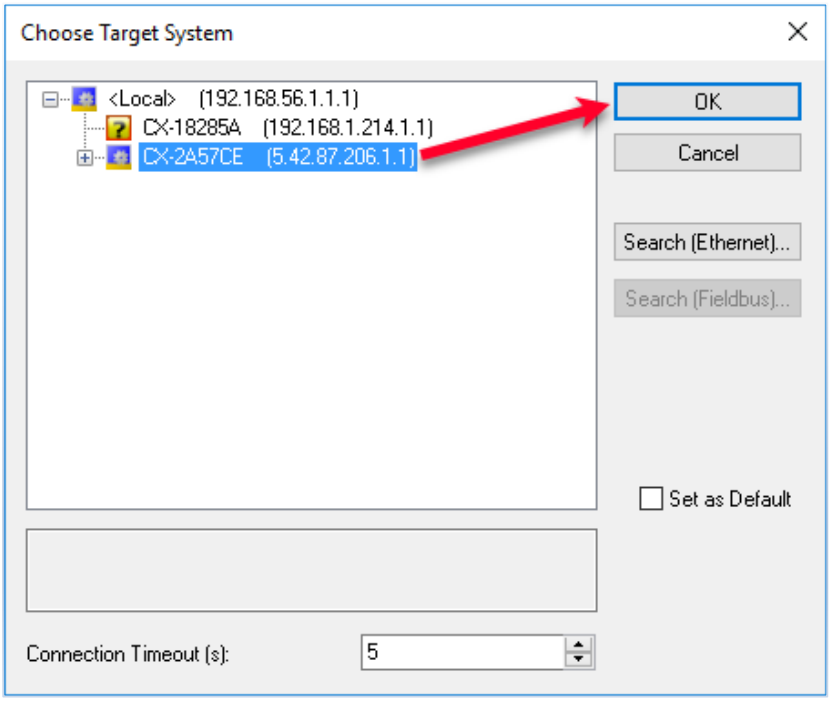
The default Password for any IPC is by default **1**.



To confirm a successful connection, an “X” will appear under the Connected column



Close the Add Route Dialog window, select the IPC and click OK



3 Install the CMMT ESI File

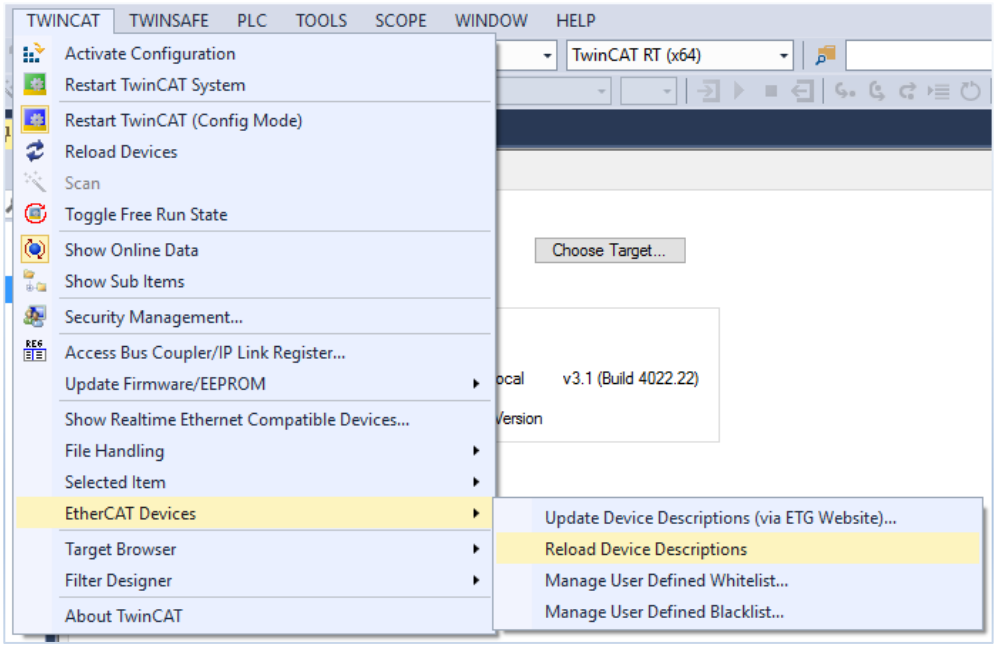
Download the EtherCAT ESI file from the support portal for CMMT.

„Install“ it in TwinCAT V3 by copying the file into the following folder

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

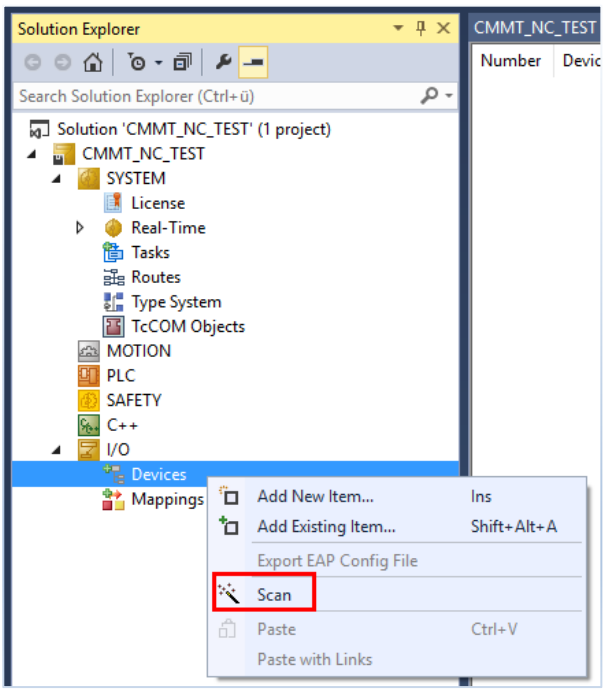
Note

This procedure is recommended before TwinCAT has been started, If TwinCAT is already running, the Device Repository can be refreshed/updated by clicking on TwinCAT -> EtherCAT Devices -> Reload Device Descriptions.

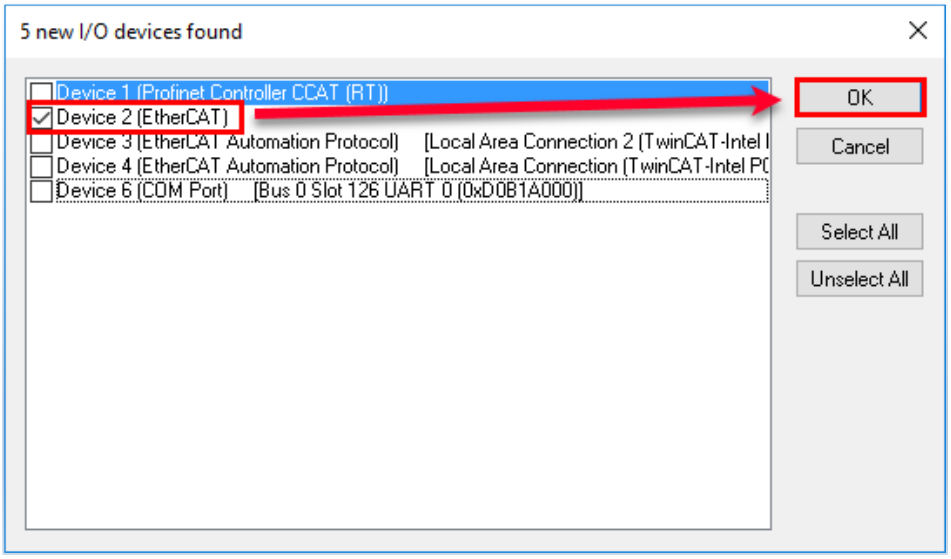


4 Scanning the EtherCAT Network

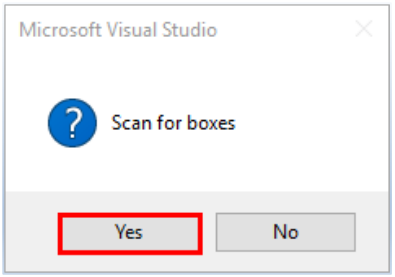
Once chapters 1 & 2 have been done, go to I/O, right click on Devices and execute a SCAN.



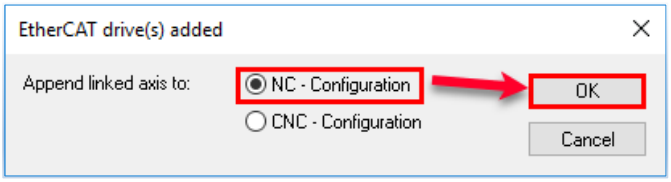
From the available interfaces, select the EtherCAT one and click on OK



Select Yes on Scan for Boxes.

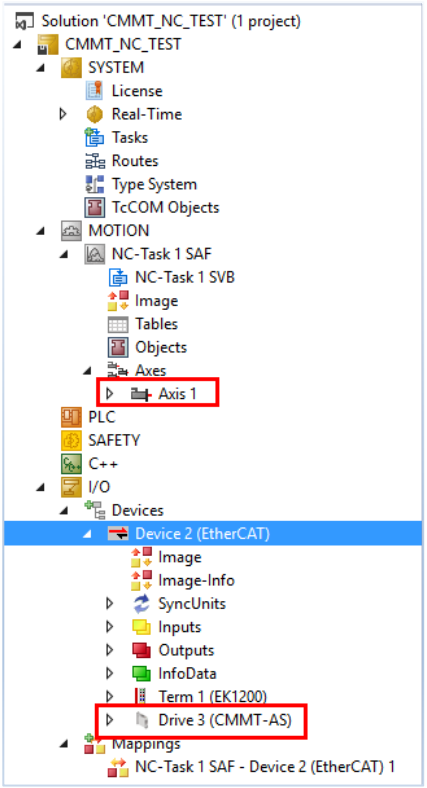


If CMMT is successfully detected, select to Append linked axis to: NC – Configuration -› OK

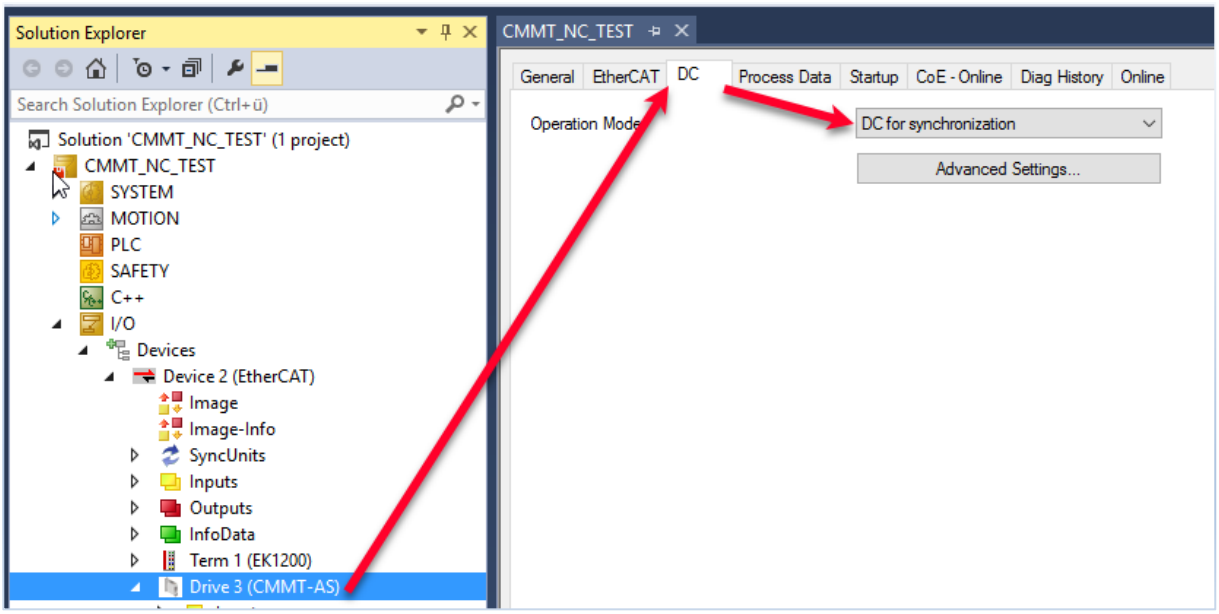


Note
Free Run can be activated to test communication between BECKHOFF IPC and CMMT.

After a successful SCAN of the network, CMMT should appear under the I/O'S EtherCAT Master and Axis 1 under the MOTION -› NC Task.



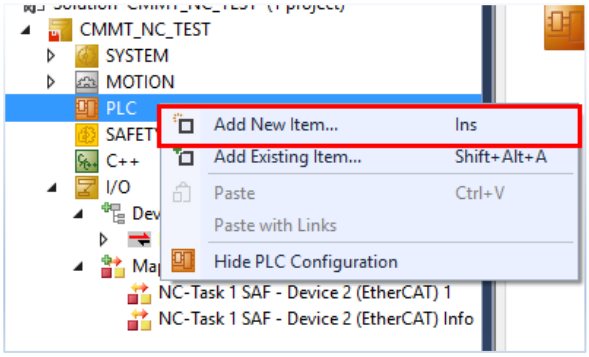
Click on the scanned CMMT Driver and enable DC for synchronization.



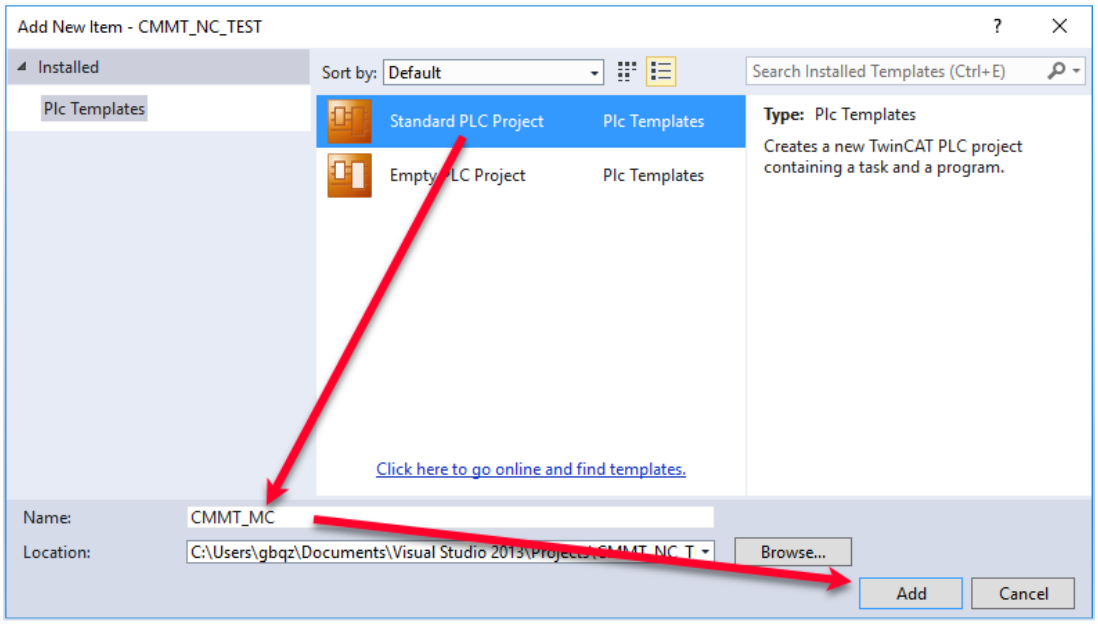
5 PLC Project setup

5.1 Adding the PLC Project

Right click on PLC and select Add New Item...

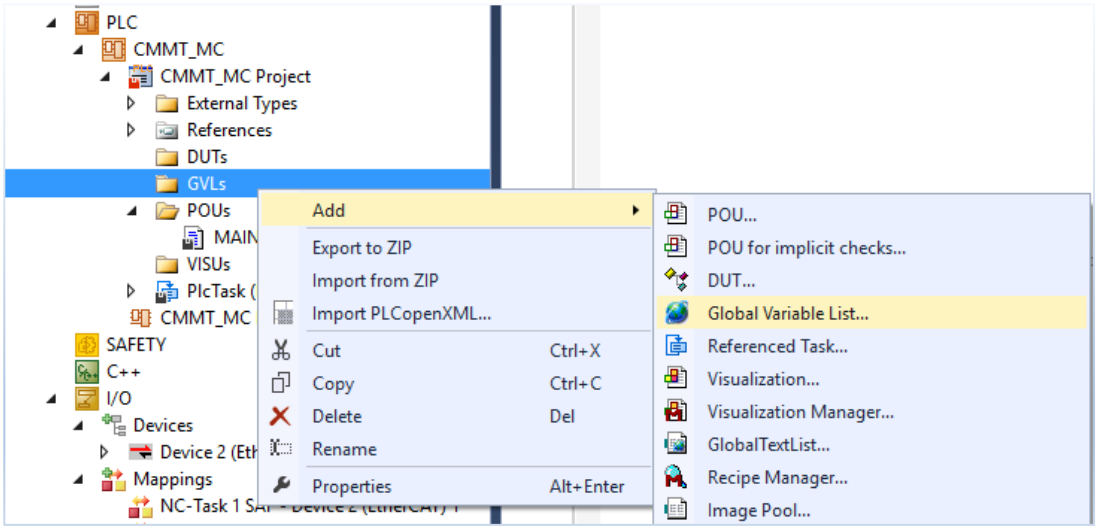


Choose the Standard PLC Project and select Add



5.2 Adding PLC I/O Variables

Add a Global Variable List (GVL) and declare 1 USINT Output with initial value 8 and 1 USINT Input.

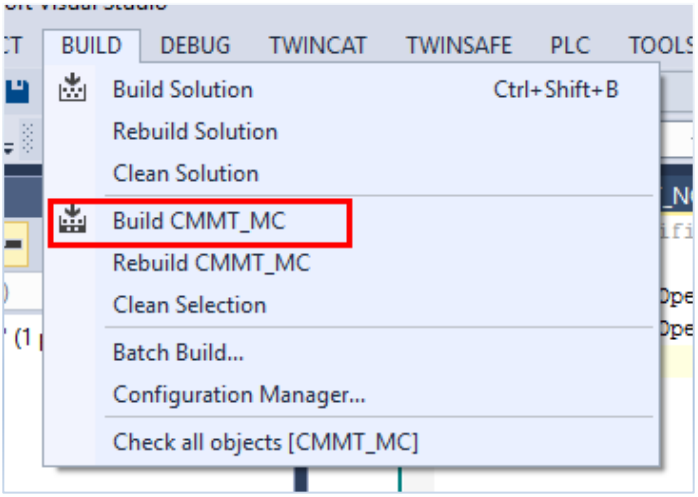


```
{attribute 'qualified_only'}
VAR_GLOBAL
    I_usiModesOfOperationDisplay    AT %I*  :USINT;
    Q_usiModesOfOperation           AT %Q*  :USINT := 8;
END_VAR
```

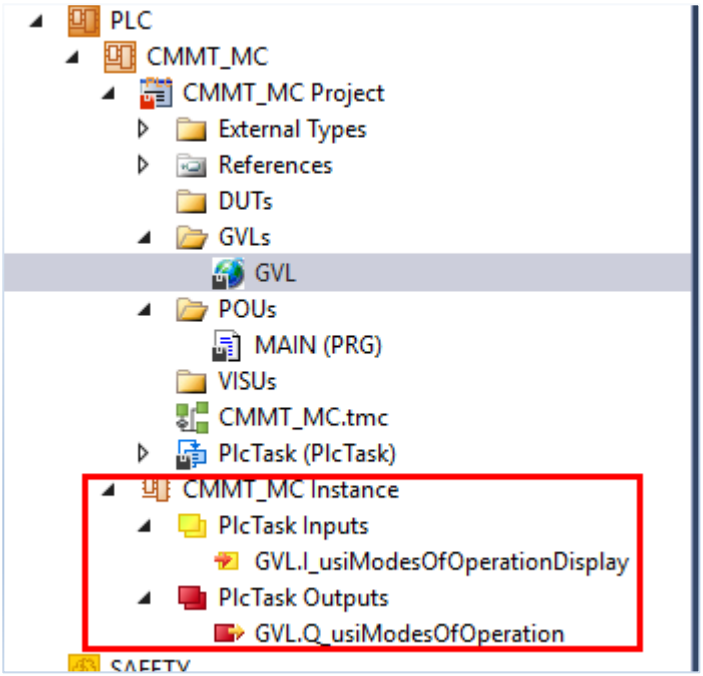
Note

Modes of Operation 8 means that the Axis will be in “Cyclic Synchronous Position” Mode. In this mode, the CMMT doesn’t control the movement to the Target Position by himself. The IPC’s NC element is responsible for defining and controlling the trajectory. This is done by sending the in-between positions of the Target Position to the CMMT.

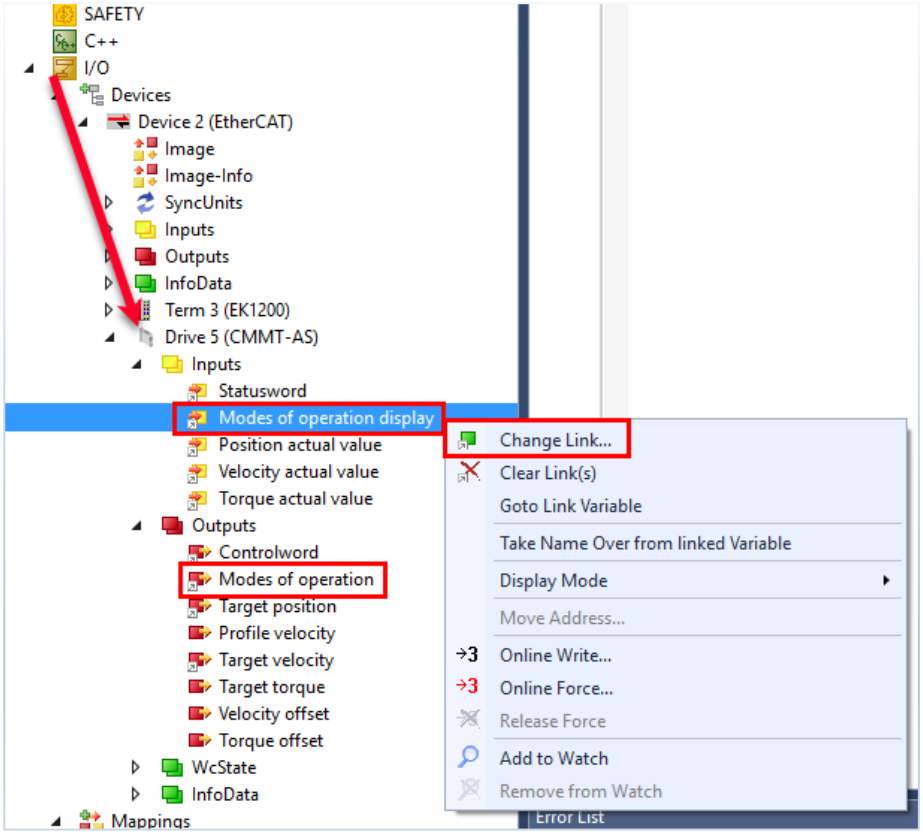
Build the PLC Project.

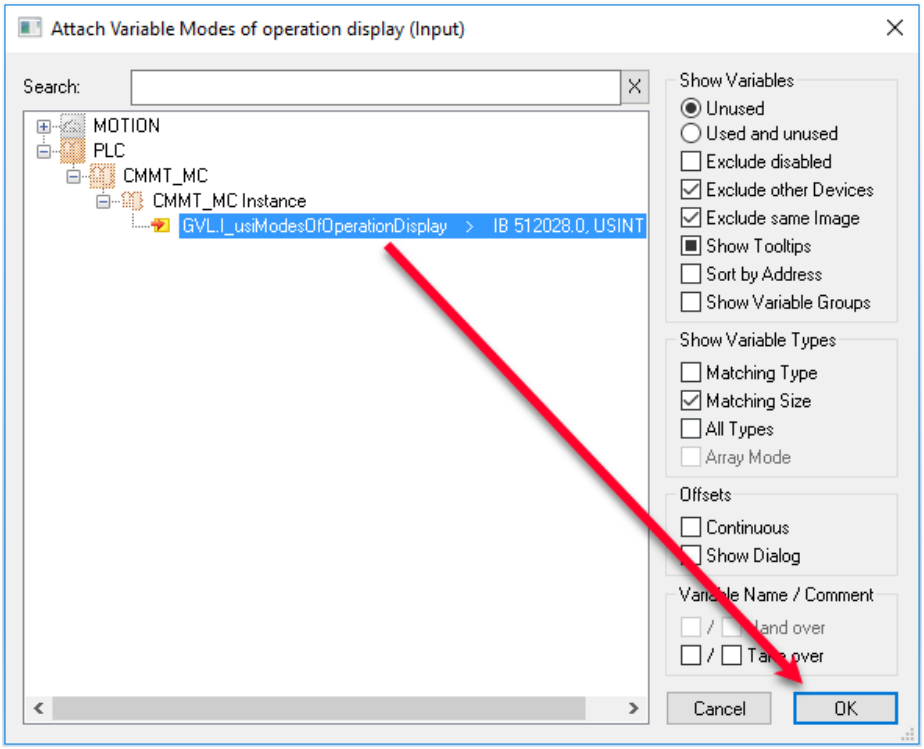


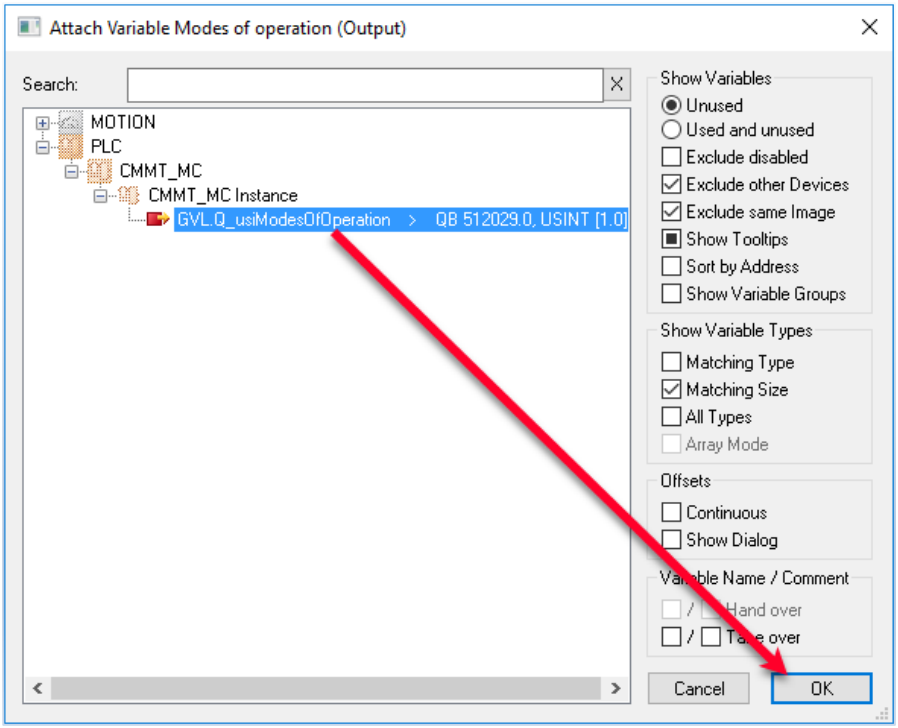
If the compilation has been done without any error, the variables should be visible at the very bottom of the PLC Project within the PLC Task Inputs/Outputs.



Link the created variables to the **Modes of Operation Display** Input and **Modes of Operation** Output of the CMMT.







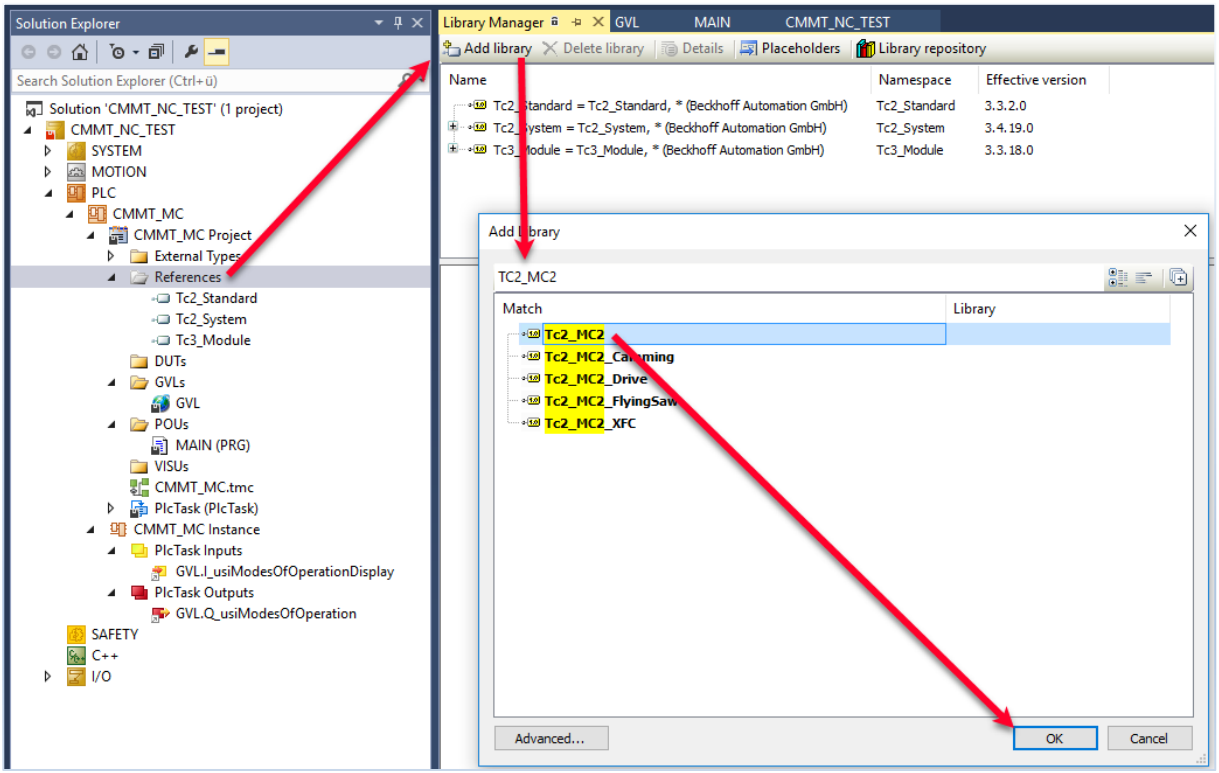
Note

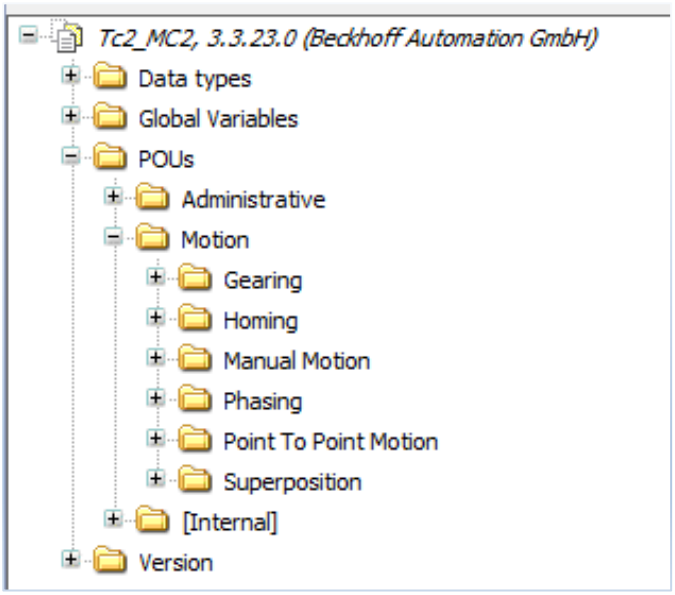
If the variables are not visible in the Variable List, it could be that the PLC project compilation has not been done or there is an error on the PLC program.

5.3 Adding the PLC Open Library

Go to PLC -› References (Double Click) -› Add Library -› Tc2_MC2

Here are the PLC Open FBs

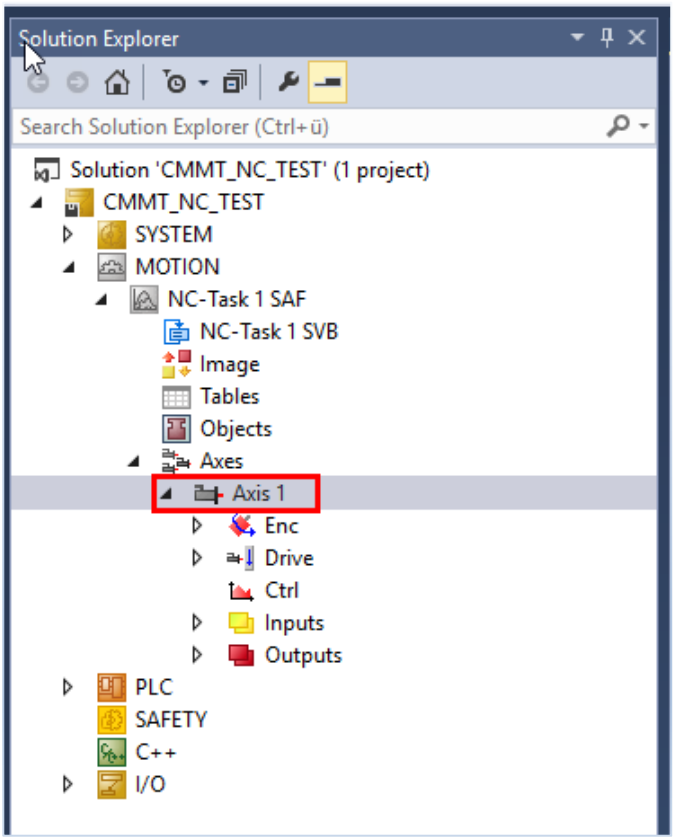




Create in the GVL a variable of Type AXIS_REF, which will be linked to the NC Axis element.

```
1  {attribute 'qualified_only'}
2  VAR_GLOBAL
3      I_usiModesOfOperationDisplay    AT %I*  :USINT;
4      Q_usiModesOfOperation           AT %Q*  :USINT := 8;
5      CMMT_Axis1_Ref  : AXIS_REF;
6  END_VAR
```

Build/Compile the PLC project without errors



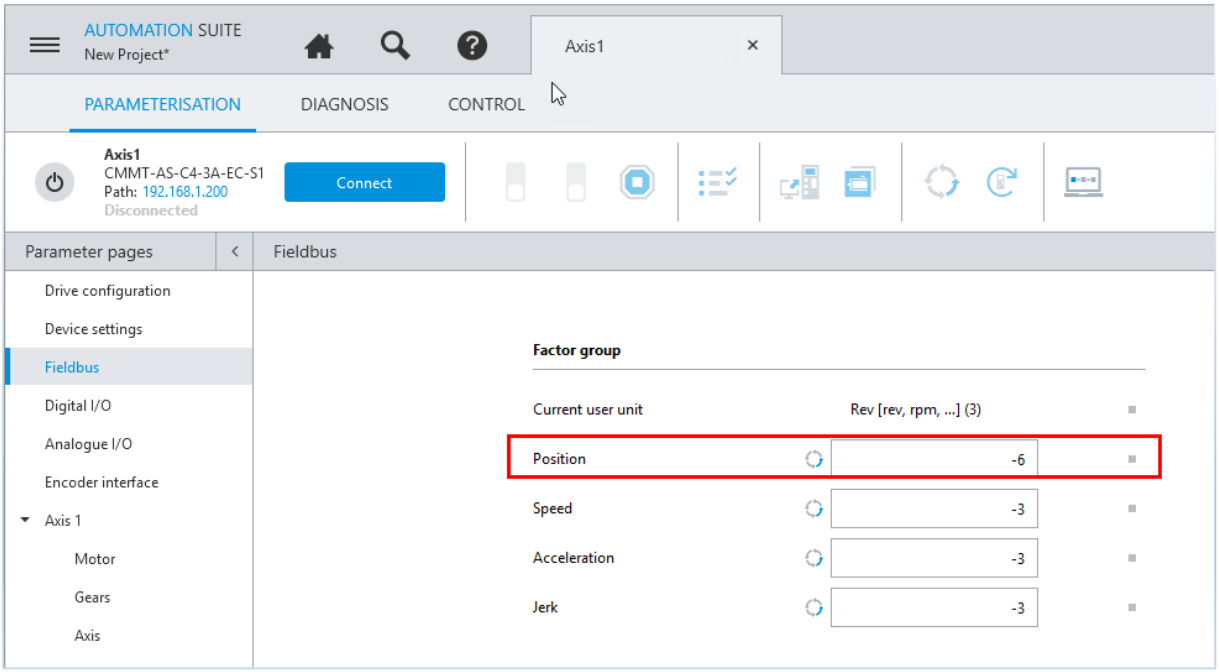
6 MOTION NC Axis configuration

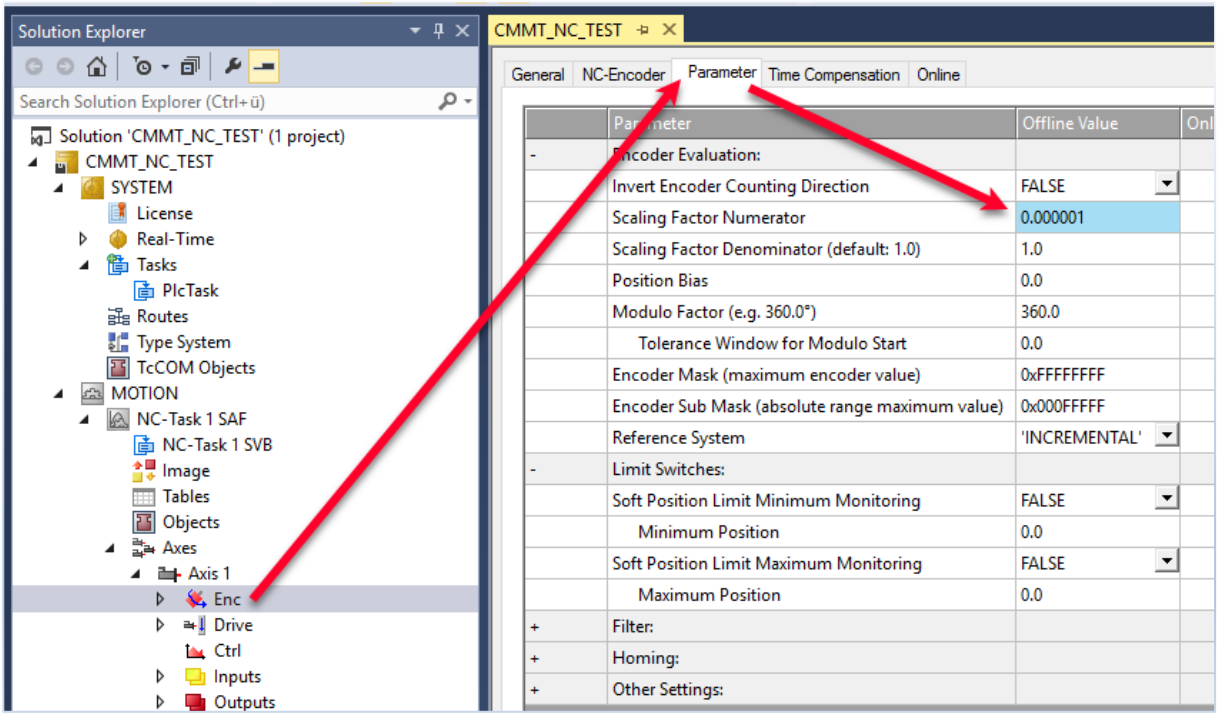
Open the Axis 1 encoder settings by opening the following path:

MOTION -› NC Task -1 1 SVB -› Axes -› Axes 1 -› Enc

Modify the **Scaling Factor Numerator** according to the Fieldbus Settings in the CMMT.

$$10^{-6} = 0.000001$$

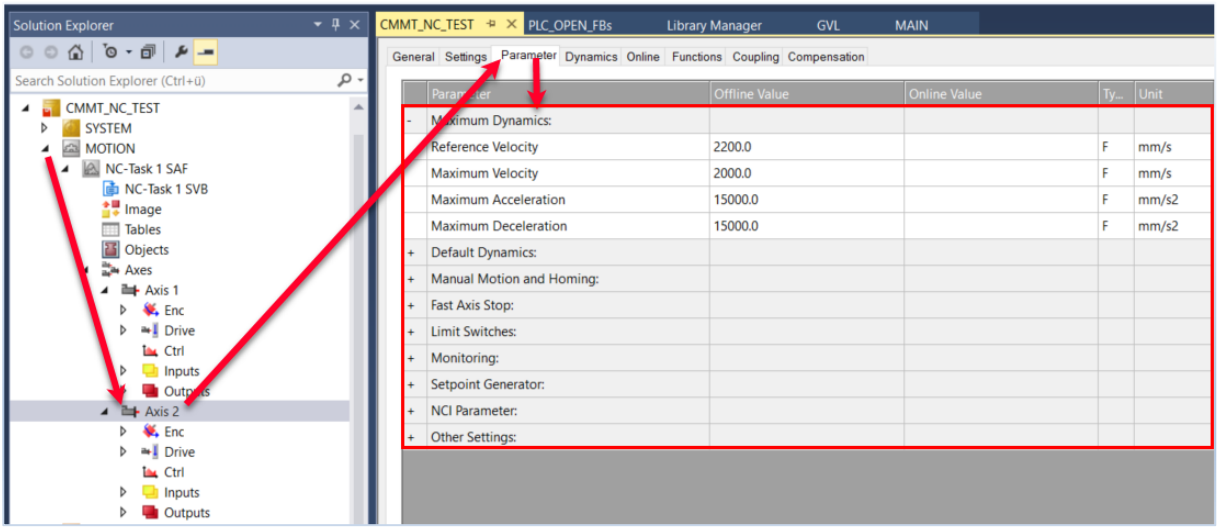




The Axis settings, CMMT, Motor and Actuator, must also be checked for compatibility between the Festo Automation Suite Settings and the NC Axis settings.

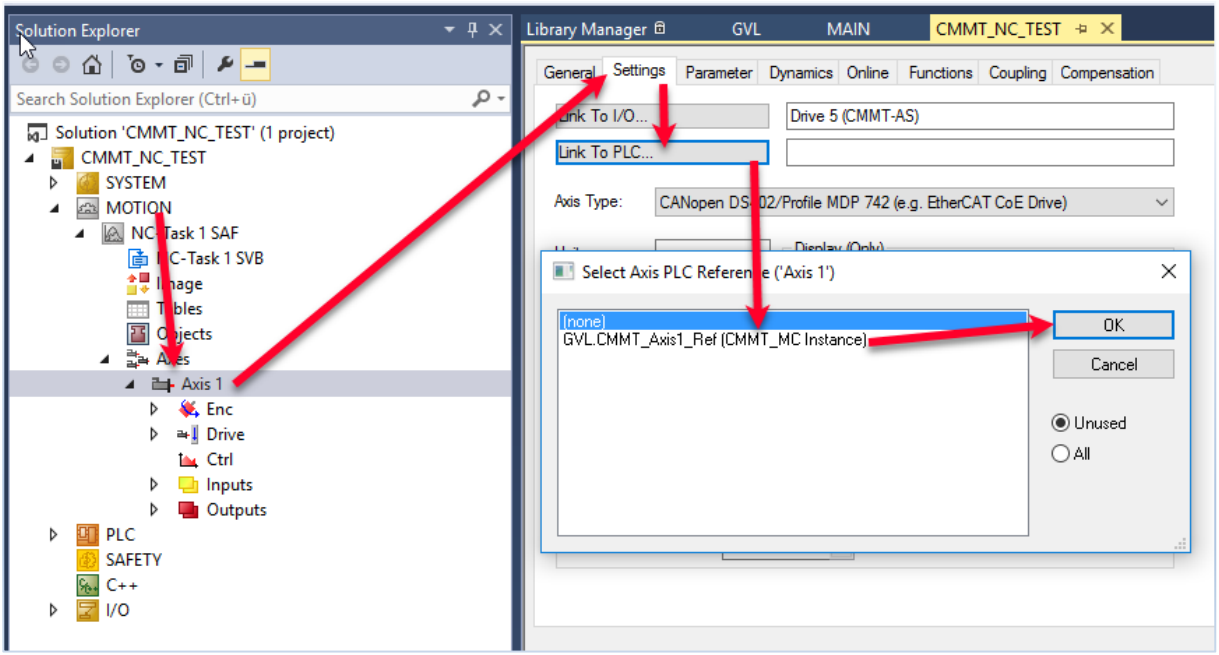
For example: Velocity, Acceleration, Quick stop ramp, maximum velocity, etc.

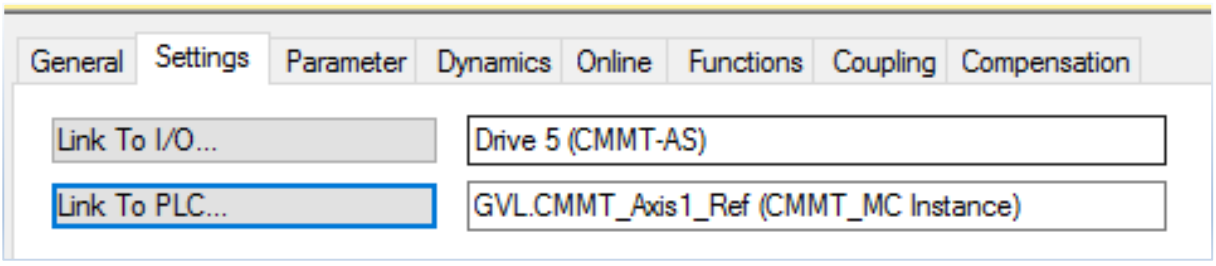
These settings are located under the MOTION -› NC -› Axes -› Axis 1 -› Parameters



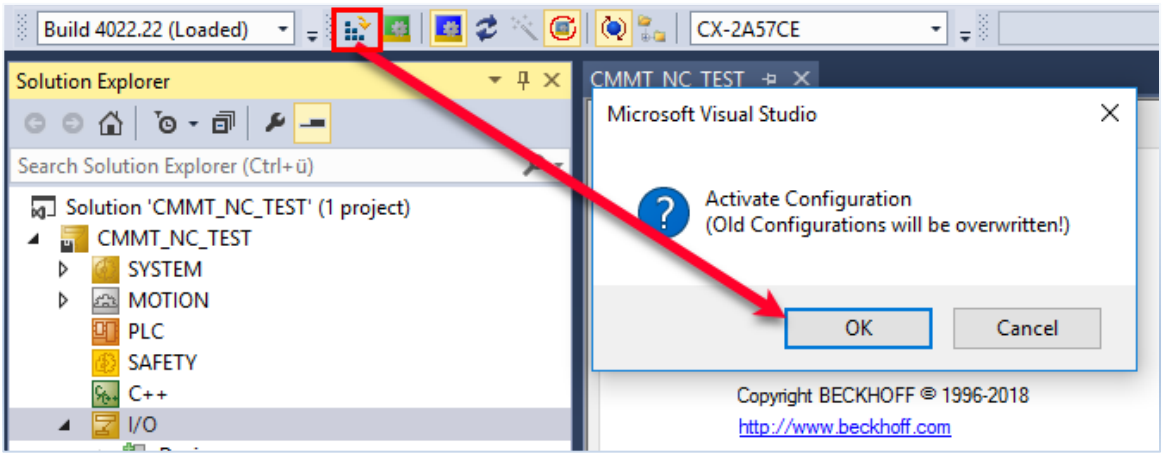
Double click on Axis one and link the AXIS_REF object by following this path:

Axis 1 -› Settings -› Link To PLC... -› ‹Select FML_REF variable› -› OK



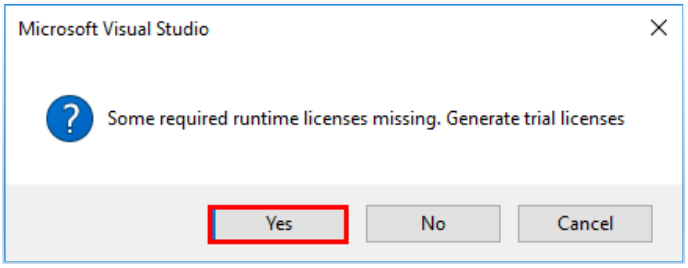


Click on **Activate Configuration** to download the scanned network + Settings to the IPC.

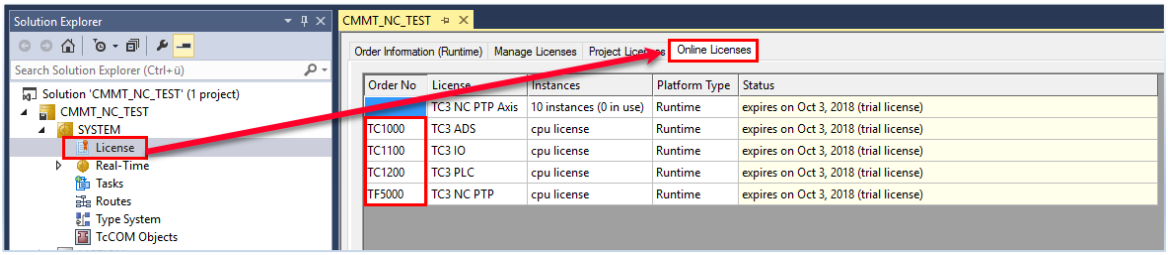


Note

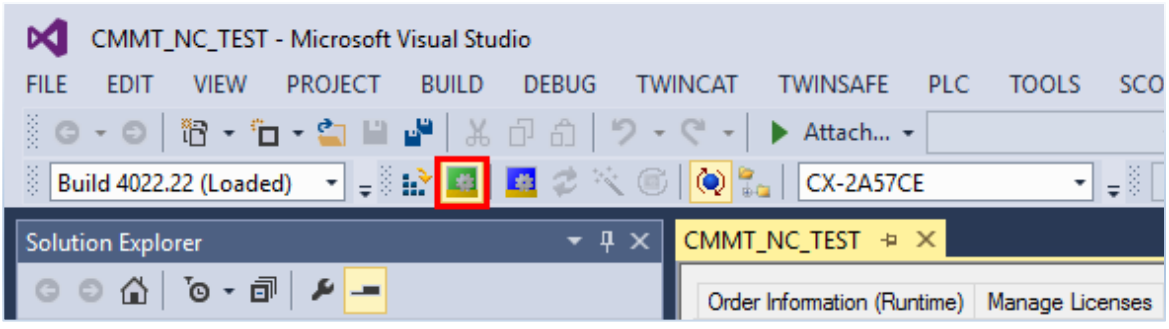
If the IPC is missing some licenses required for the NC application, a window will pop up, mentioning that the licenses are missing. For testing purposes, TwinCAT V3 allows to generate Trial Licenses, which will expire after a certain period. The license can be bought from BECKHOFF at any time once the tests have been successful.



License codes can be viewed at the SYSTEM -› License -› Online Licenses Tab.



After the configuration has been done, click on the RUN Mode symbol to bring the IPC into Run Mode.



Note

HW changes or Network changes must be done with the system in Configuration mode, which is triggered by clicking on the Blue Icon. Once configurations have been done, the PLC code can only be downloaded once the IPC is in RUN Mode.

7 PLC Programming

Now the that the complete configuration has been done, the PLC Open Function Blocks for Softmotion can be integrated as done in CODESYS.

They must be linked to the AXIS_REF element that we have created for the Axis.