

CMMT-AS-PN controlled by technology objects with SIMATIC S7-1500 in the TIA Portal

This document describes which control figures are implemented in CMMT-AS-PN drives and how to use it in programming environment of Siemens in TIA portal. Specifically focus on how to use Technology Objects (Interpolated motion) with PLC Open Function blocks.

CMMT-AS

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1 Components/Software used

Type/Name	Version Software/Firmware	Date of manufacture
CMMT-AS-C4-3A-PN-S1	19.0.3.69	
Automation Suite	2.1.0.519	
CMMT-AS Plug-in	2.1.0.464	
TIA Portal	V15 SP1	

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 Topology of the tested system

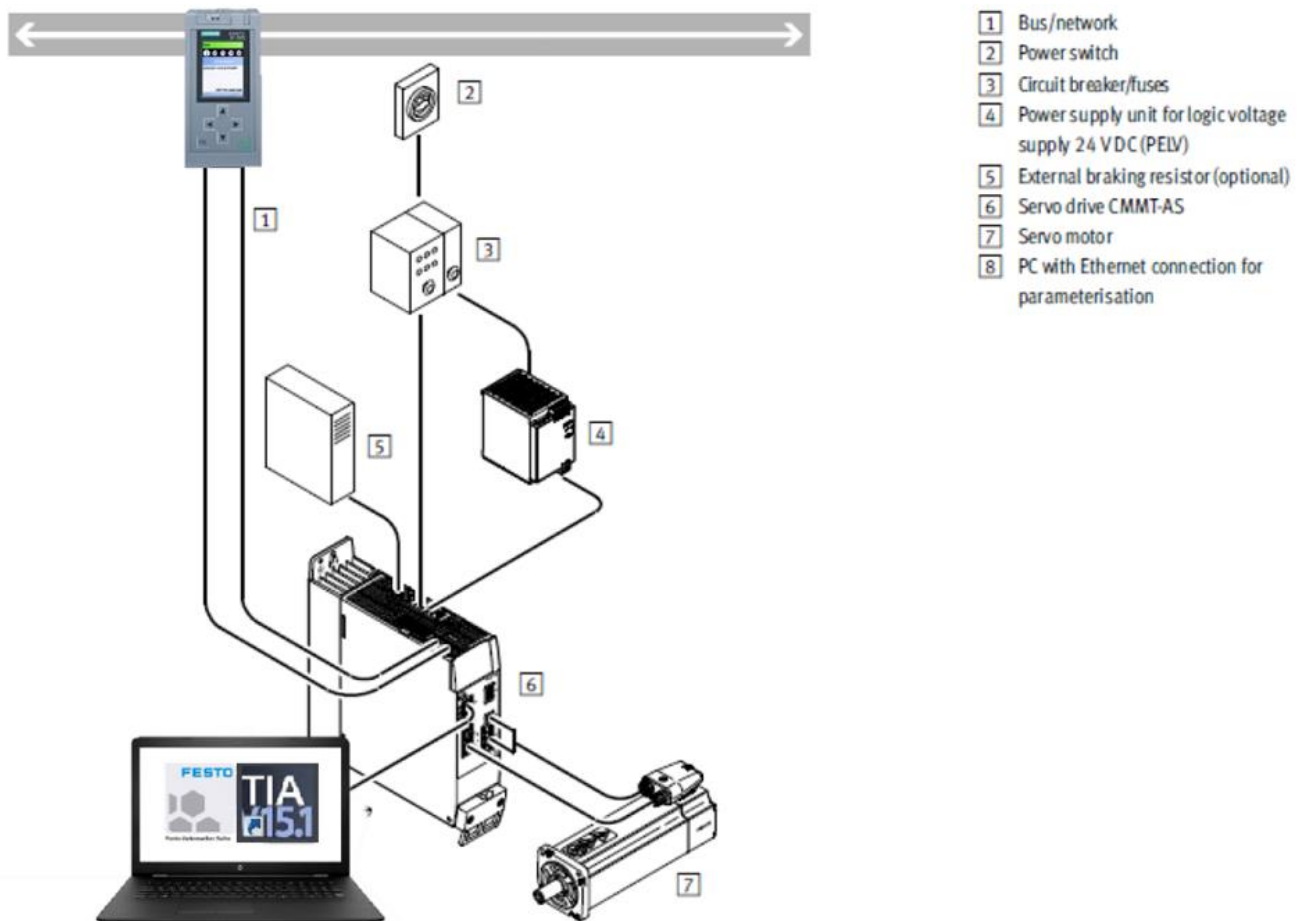


Figure 1.1 : overview of tested system

Please refer to the picture above and make sure all wires are correctly placed and connected

To configure and run the system for commissioning, it is necessary to install named software in the table 1.1 above on your laptop or other PC system which you will do commissioning with.

2 Application Description

This part of the documentation describes a connectivity and configuration of the motor drive CMMT-AS-...-PN within a PROFINET network controlled via Siemens S7-1500 PLC controller. The used bus protocol within this Application Note is an Application Class 4 and Telegram 105 which are specifically defined by Siemens for interpolated motion over PROFINET. It is targeted at people who are already familiar with this protocol, Festo Automation Suite and Siemens TIA Portal software.

3 Configuration of parameters in Automation Suite






3.1 Automation Suite related parameters

On the Device Configuration tab you can select the components of your drive system.

It is recommended to parametrize the present mechanic/axis of the system. This results in the best control loop parameters in the motor controller. The mechanical data such as the feed forward constant, gear ration must be also parametrized in the programming tool.

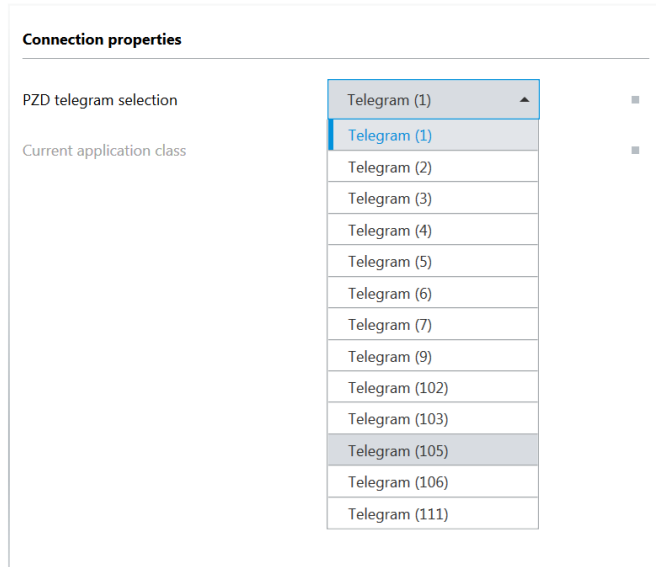
Drive configuration

Please select the components of your drive system

 Servo drive	CMMT-AS-C2-3A-PN-S1 5340814 Licenses	Maximum current 6,00 A	Intermediate circuit voltage 320,00 V			
 Motor	EMMT-AS-60-S-LS-RM 5242197	Type Servo motor (2)	Holding brake No	Encoder protocol EnDat 2.2 (5)	Encoder type Multi turn (2)	Voltage 325,00 V
 Axis	EGC-80-200-TB-KF-0H-GV 556814	Axis size 80	Feed constant 90,00 mm/r	Working stroke 200,00 mm		
 Mounting kit	EAMM-A-L48-60H 1456611	Type Axial				
 Gear	EMGA-60-P-G3-EAS-60 2297686	Gear ratio 3:1				

3.2 Telegram

On the Fieldbus tab you can find the parameters that are related to the communication with the host system. In order to achieve the best performance, select Telegram 105 under the PZD telegram selection.



Now you can connect to the device and transfer the parameters from the project to the device.

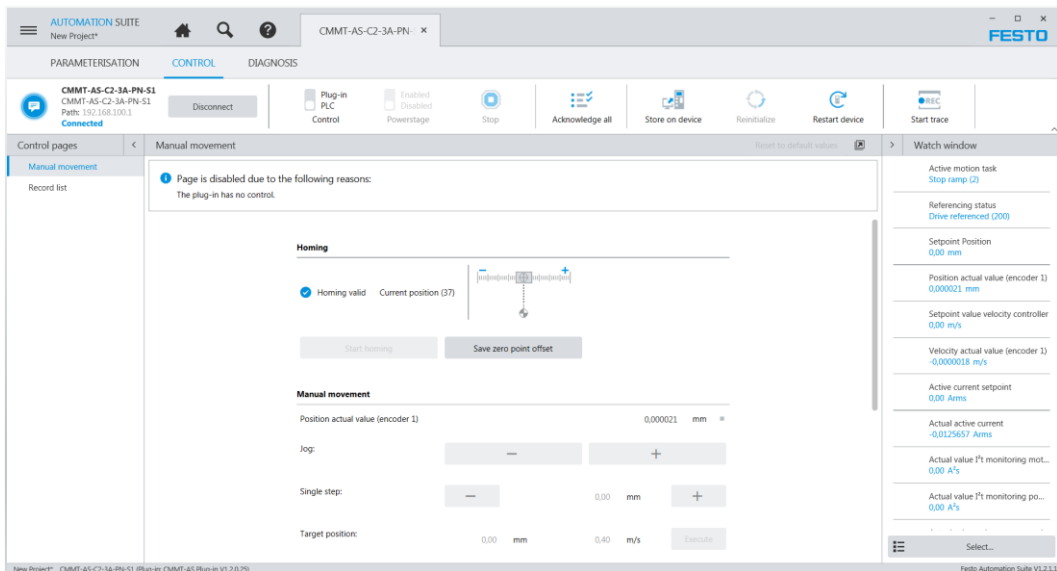
3.3 AC4 Parameters

After the download, stay on line a take note under the Fieldbus tab the reference values. The parameter below will be important during the configuration of the technology object in Tia Portal.



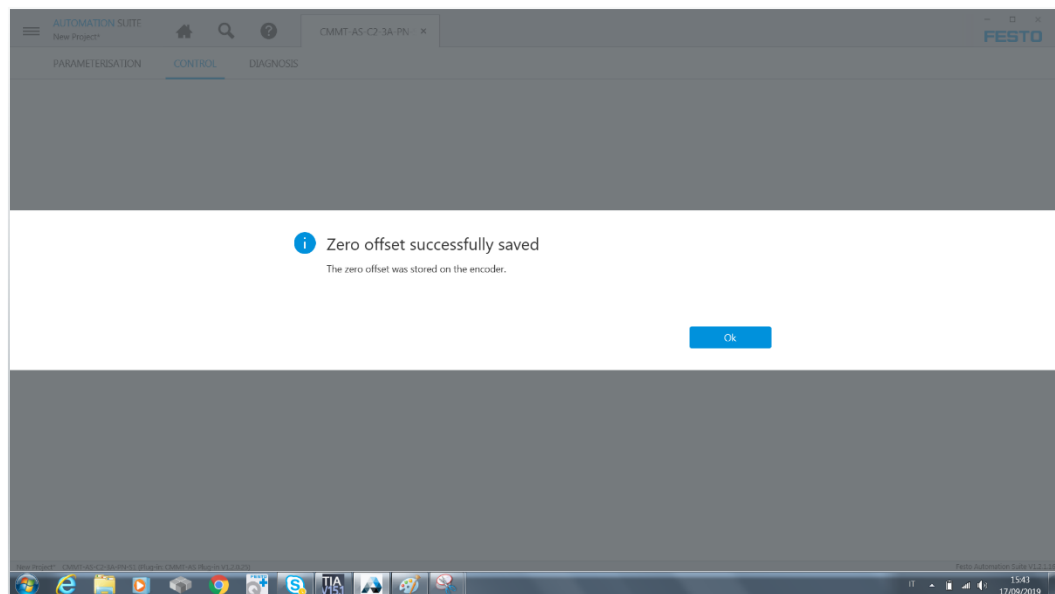
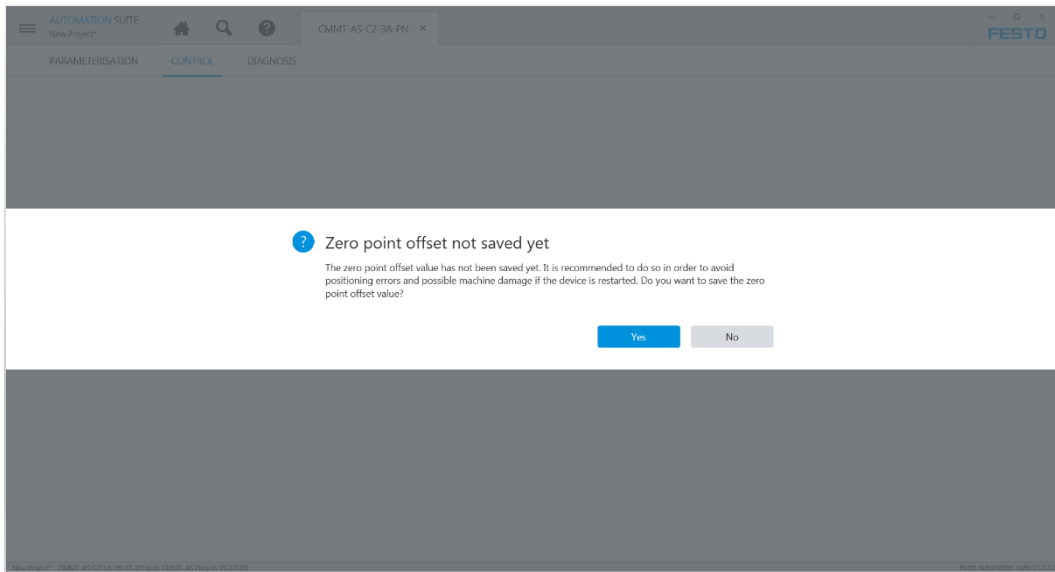
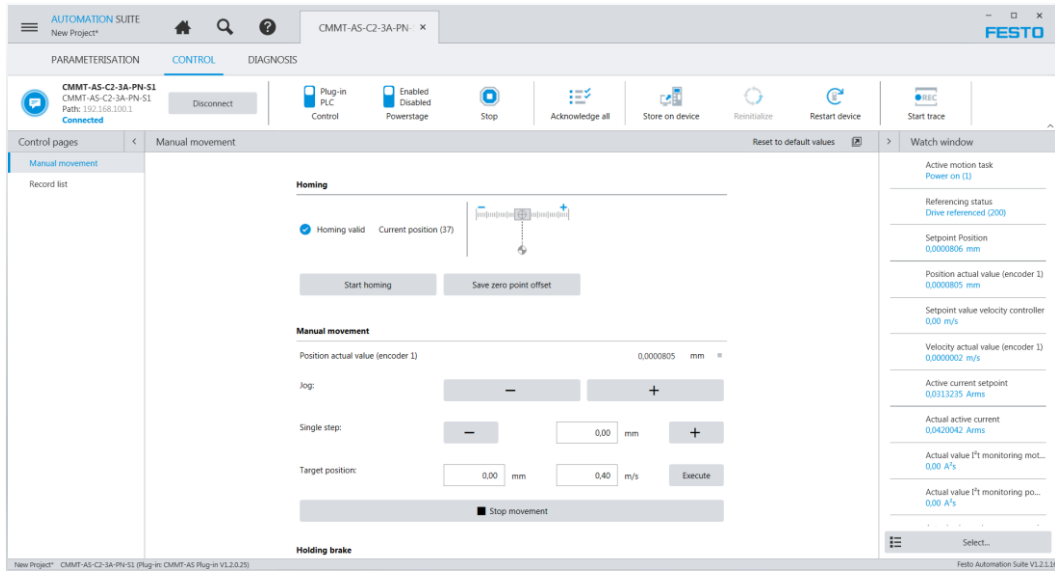
3.4 Commissioning the drive in Automation Suite

Switch On the Control Configuration tab. Now you can enable the plug-in to take the control of the drive, and after that you can power-on clicking on “Enable Powerstage” switch.



Configuration of parameters in Automation Suite

Now you can perform the homing of the drive and save the zero point offset.





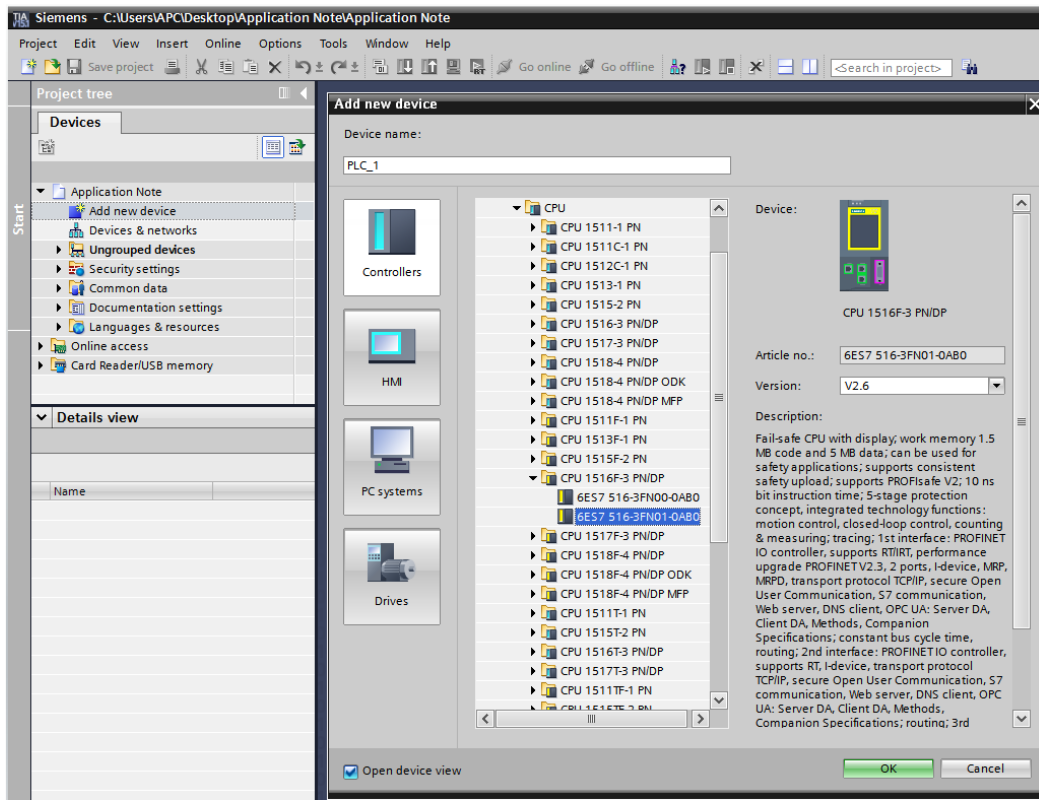
Warning

Before switching to the Tia Portal configuration, it is mandatory to perform an homing with the saving of the zero point offset.

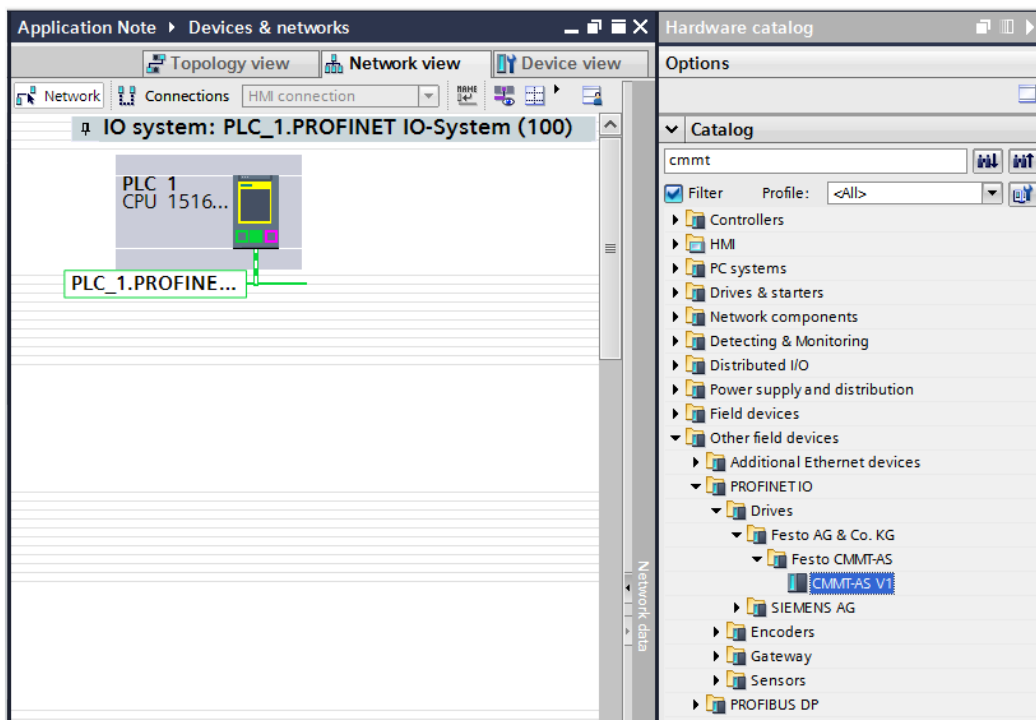
4 Setting up TIA Portal

4.1 Making the Hardware Configuration in TIA portal

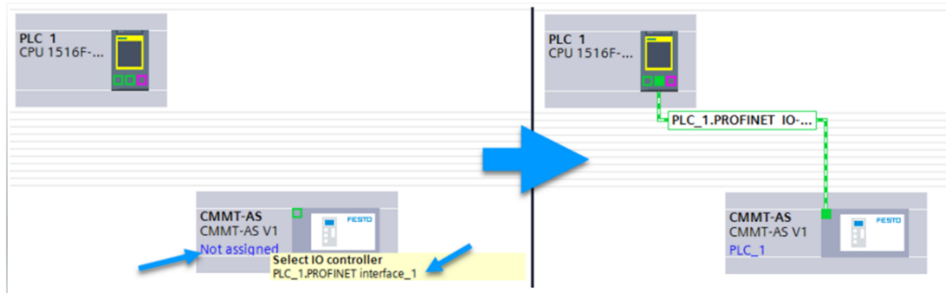
4.1.1 Create a new project and add your PLC:



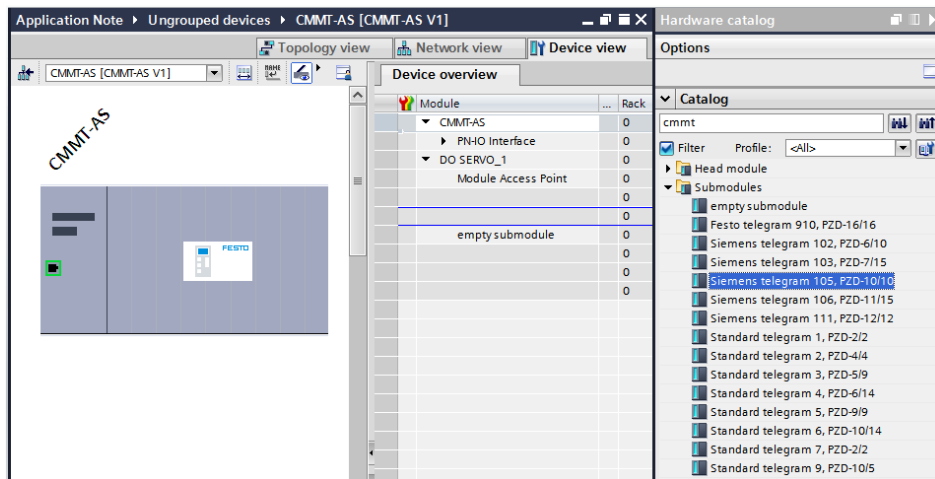
4.1.2 Go to the 'Device Configuration' tab, select 'Network View' and search for the CMMT in the Hardware Catalog. Drag and drop this to the middle screen:



- 4.1.3 To connect the CMMT with the PLC, click on 'Not Assigned' and select the PROFINET interface. After this, a green line will show the connection between the PLC and CMMT:

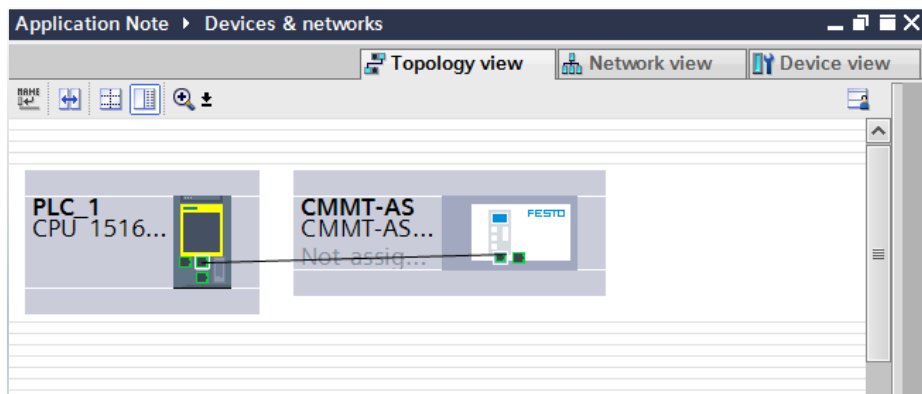


- 4.1.4 Double click on the CMMT to get into the 'Device View' tab. Here we can select the different Telegrams. To use the CMMT with technology object with the PLC Open Function Blocks we need to select: *Siemens telegram 105, PZD-10/10* (Drag and drop to the second empty slot)

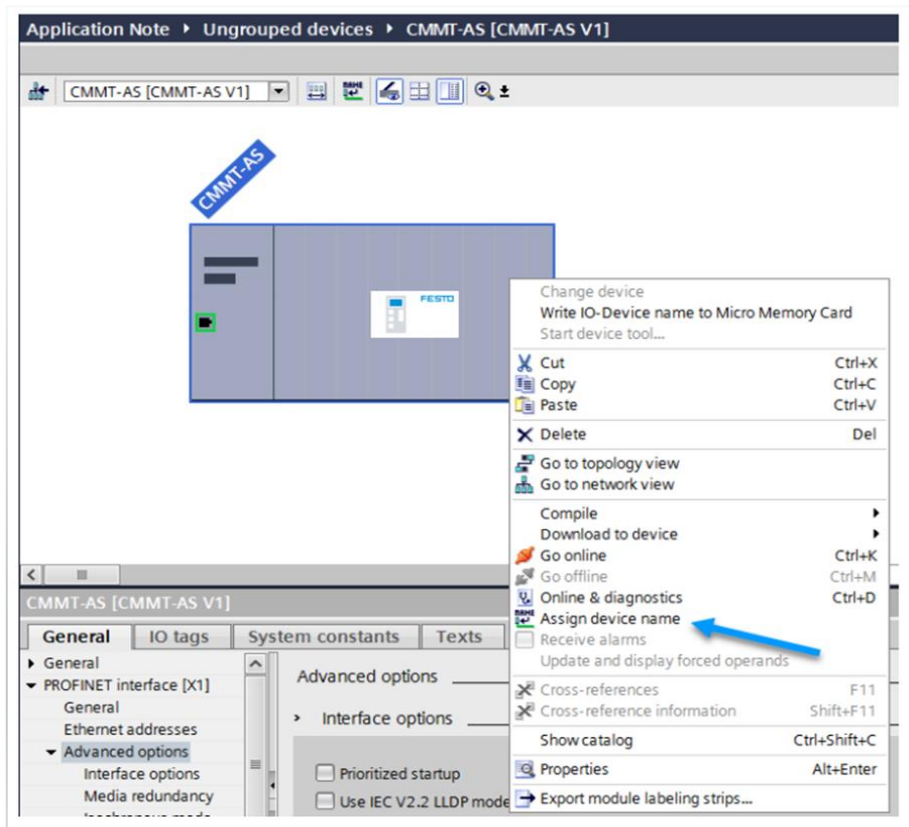


- 4.1.5 Go to the 'Device Configuration' tab, select 'Topology View' and configure the topology according to the real connection of the hardware structure by drag-and-drop.

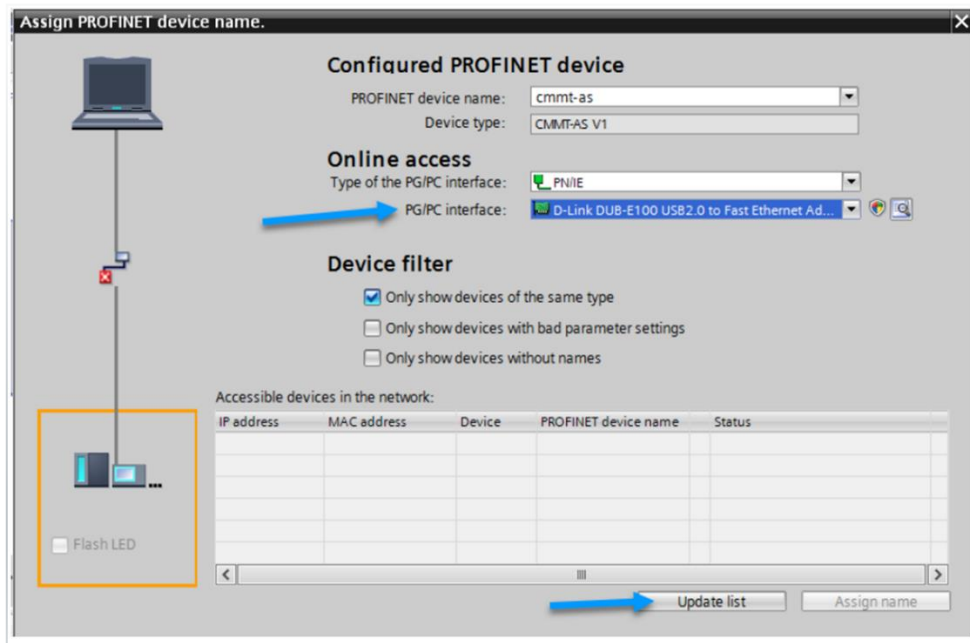
Note: Check that the PROFINET wiring present corresponds to the structure of this wiring. If the PROFINET wiring deviates from this, this must also be considered in the topology view.



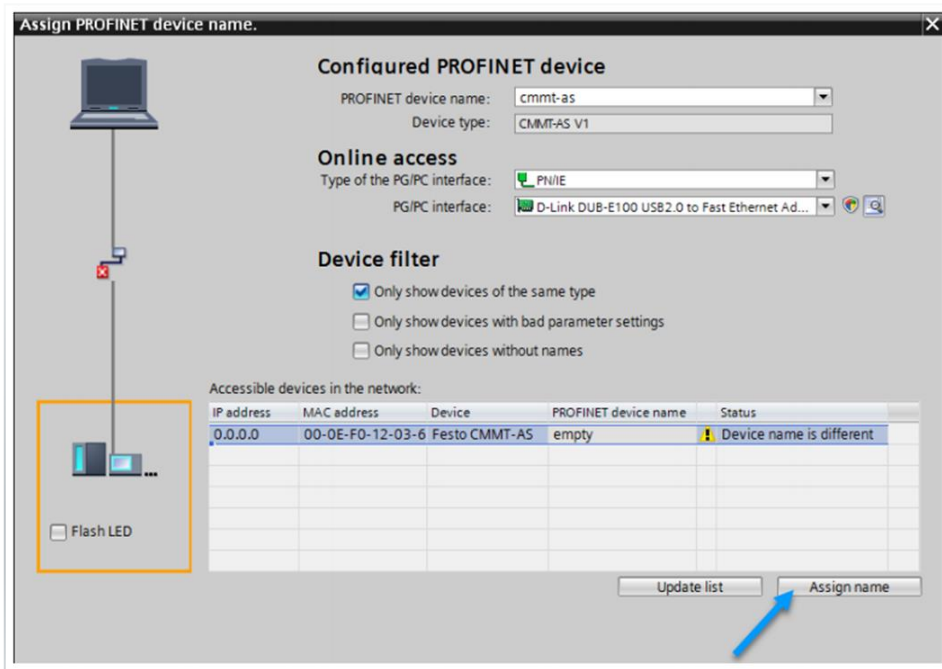
- 4.1.6 Right click on the CMMT and select **'Assign Device Name'**. For this you need to have access to either the whole PROFINET network or the X19 port on the CMMT.



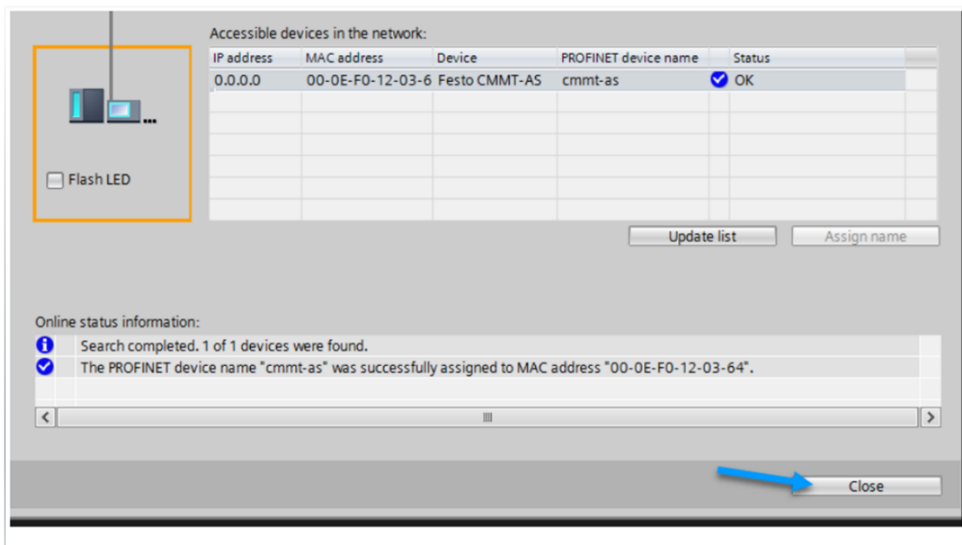
- 4.1.7 Select the correct interface and click on **'Update List'**:



- 4.1.8 The CMMT should appear with the status **'Device name is different'**. Select the CMMT and click on **'Assign name'**

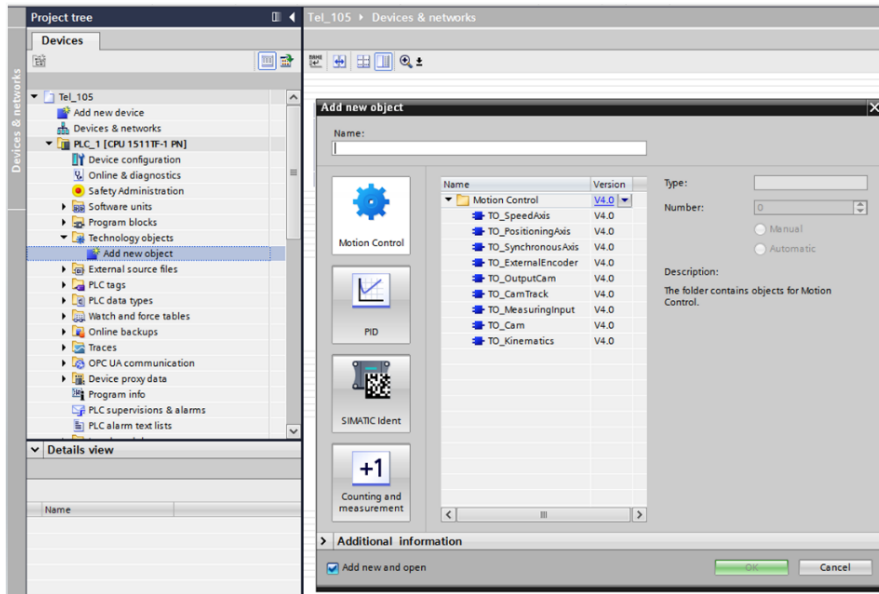


4.1.9 After the status switched to 'OK', close the dialog:

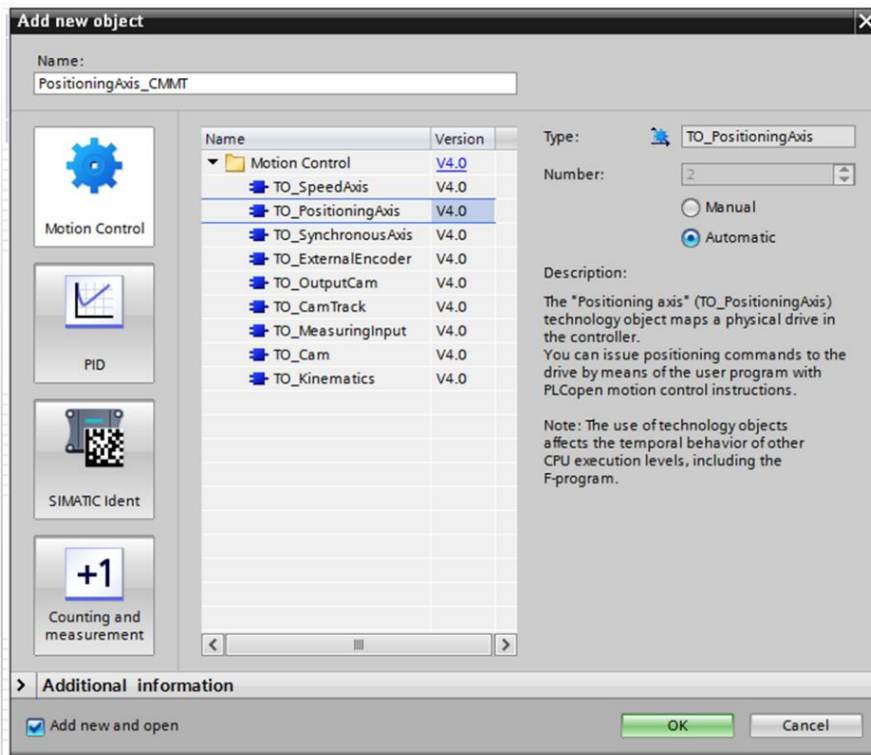


4.2 Making the Configuration of technological object

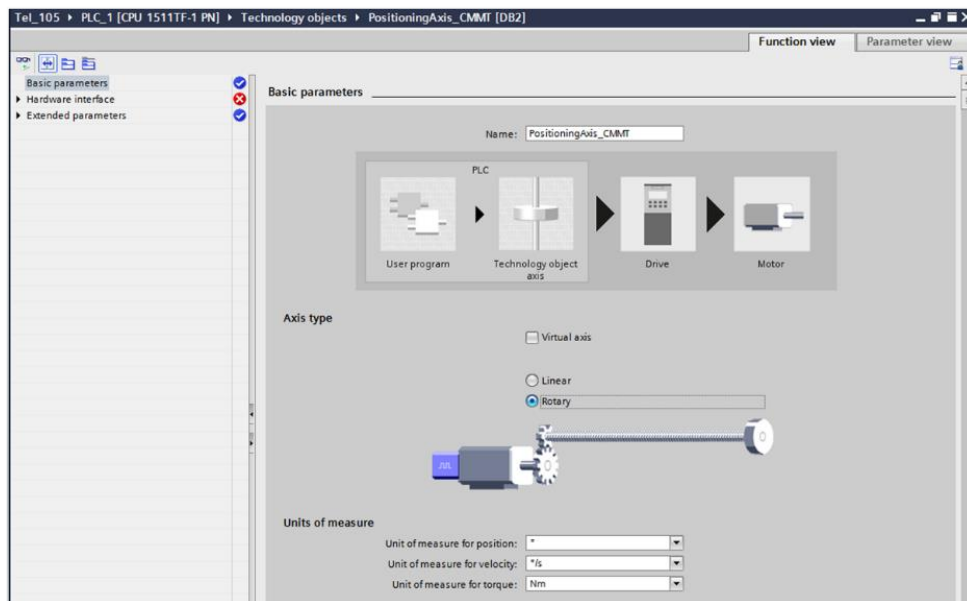
4.2.1 Create a new technological object:



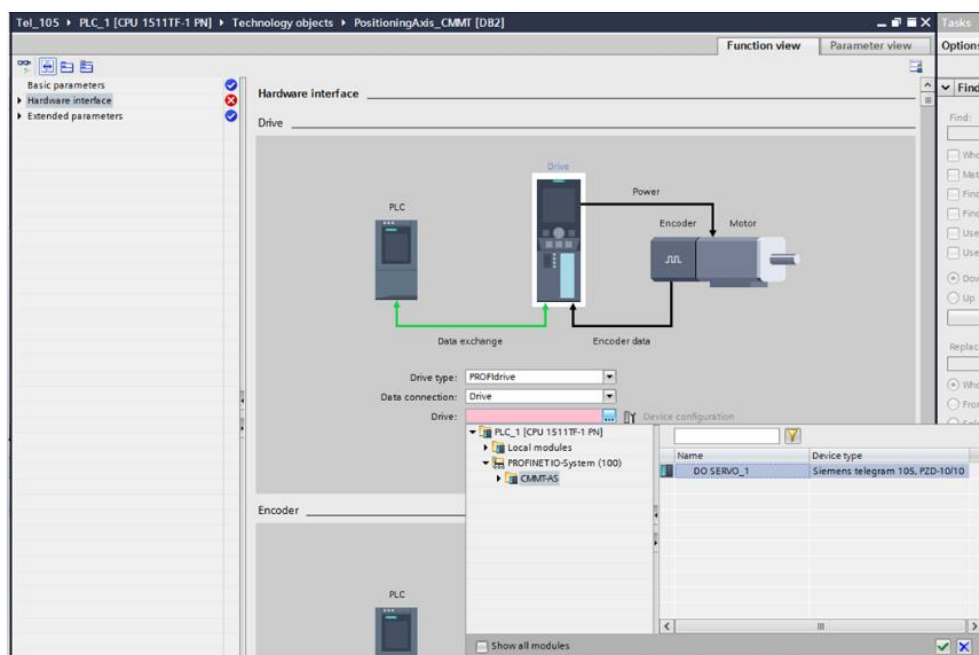
4.2.2 Select the entry "TO_PositioningAxis" in the "Motion Control" list and select the last version available:



4.2.3 Under "Hardware interface" for the axis, select Linear or Rotary axis:



4.2.4 Under "Hardware interface" for the axis, enter "PROFdrive" as "Drive type". Select the desired CMMT drive as "Drive":

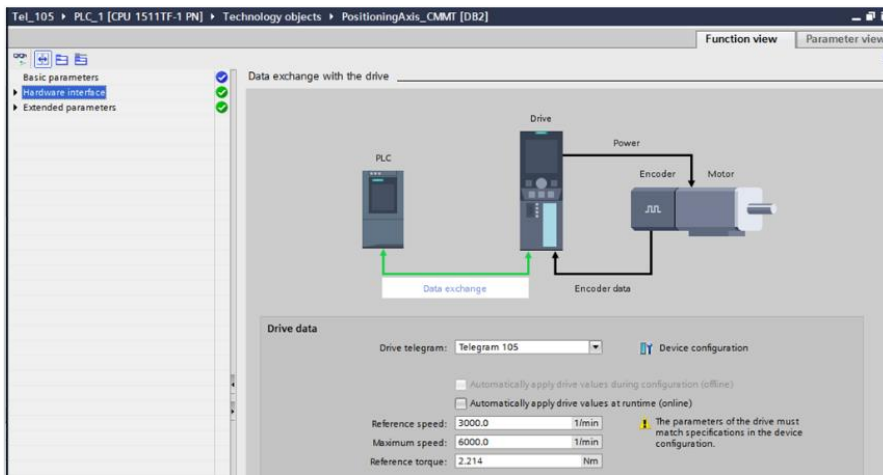


4.2.5 Insert the base value speed from the FAS fieldbus tab. For example:

Base value speed (controller) rpm

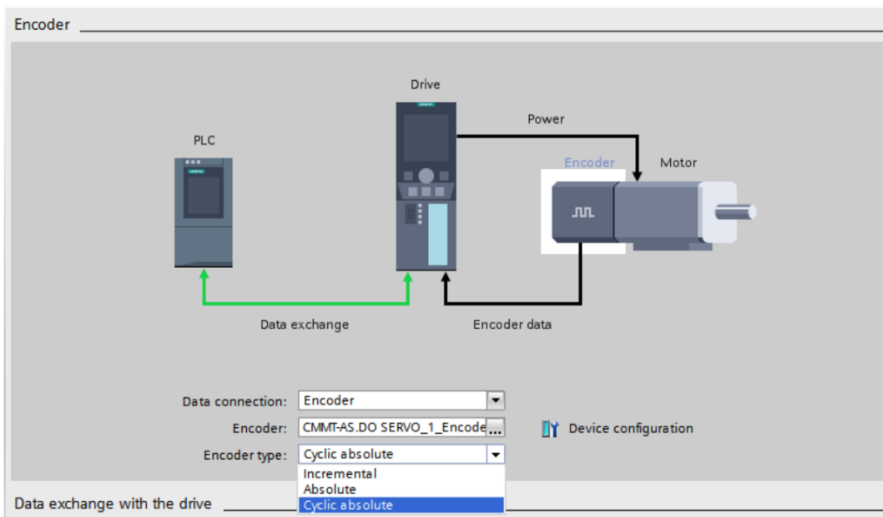
The maximum speed in the technology object is: “base value speed (controller)” * 2

The reference torque depends on the torque settings in the technology object. Please see chapter 4.2.9 for further information.

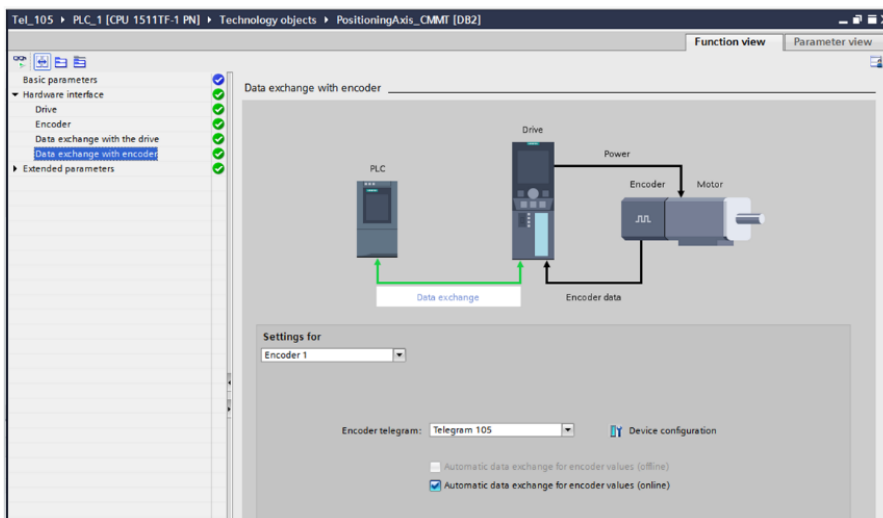


4.2.6 Select the appropriate Encoder Type:

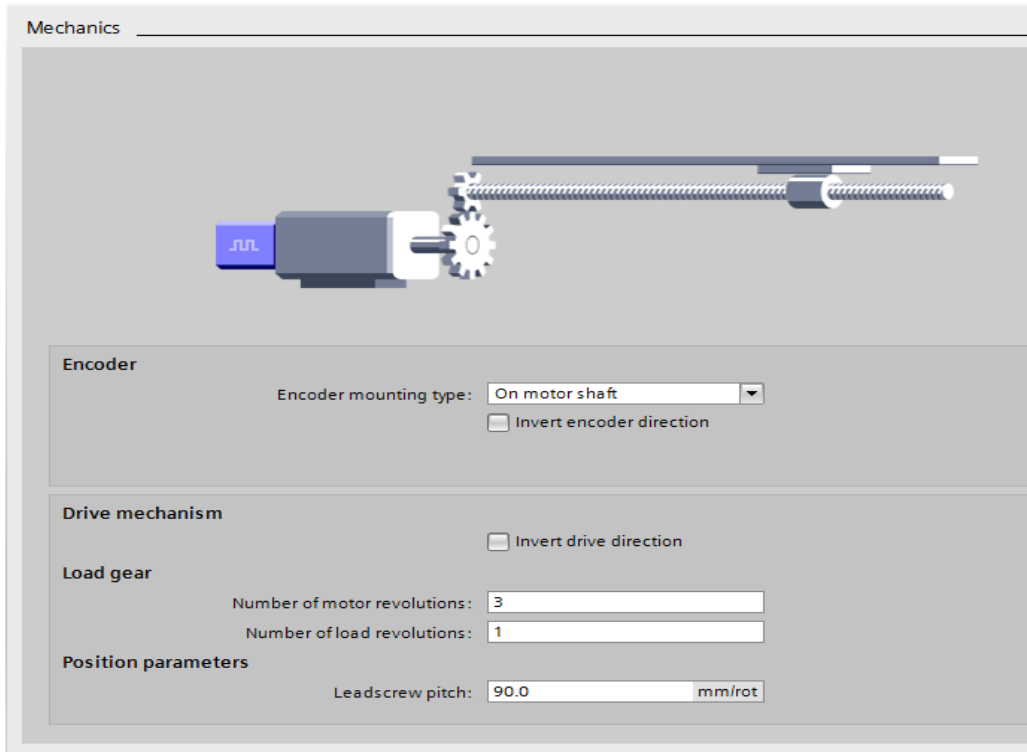
- Incremental for Motor with Incremental Encoder (es. EMMB-AS-x-x-S30S)
- Cyclic Absolute for Motor with Absolute Single Turn Encoder (es. EMMT-AS- x -x-xx-xSx)
- Cyclic Absolute for Motor with Absolute Multi Turn Encoder (es. EMMT-AS- x -x-xx-xMx)



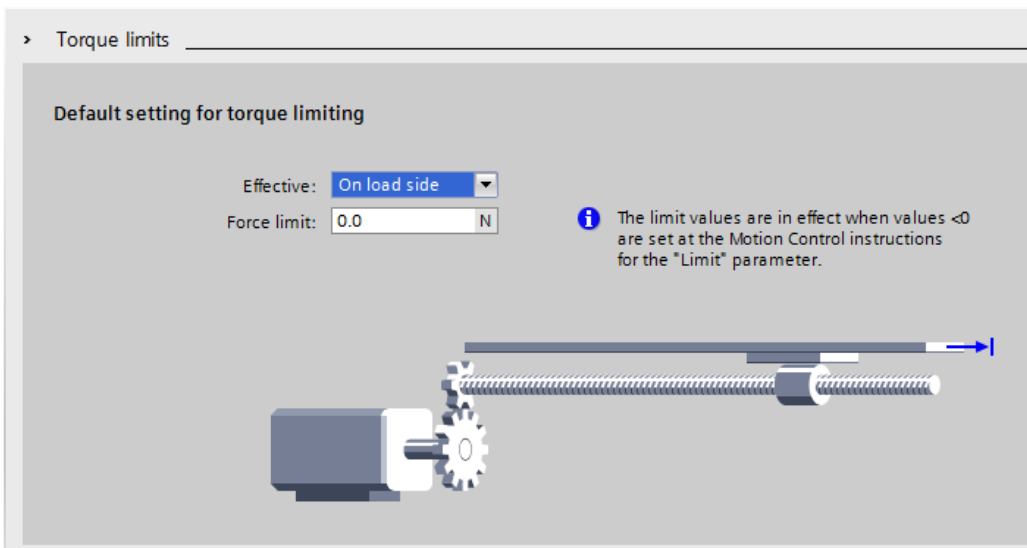
4.2.7 The encoder data are automatically transferred to the technology object after connecting with the drive. Flag on “Automatic data exchange for encoder values (online)”.



4.2.8 Set the correct mechanical data in the Mechanics tab.



4.2.9 Set the correct torque/force limits depending on your system in the technology object.



We recommend setting

- “On load side” for linear systems
- “On motor side” for rotative systems

Depending on this configuration mask the reference torque in chapter 4.2.5 must be adapted.

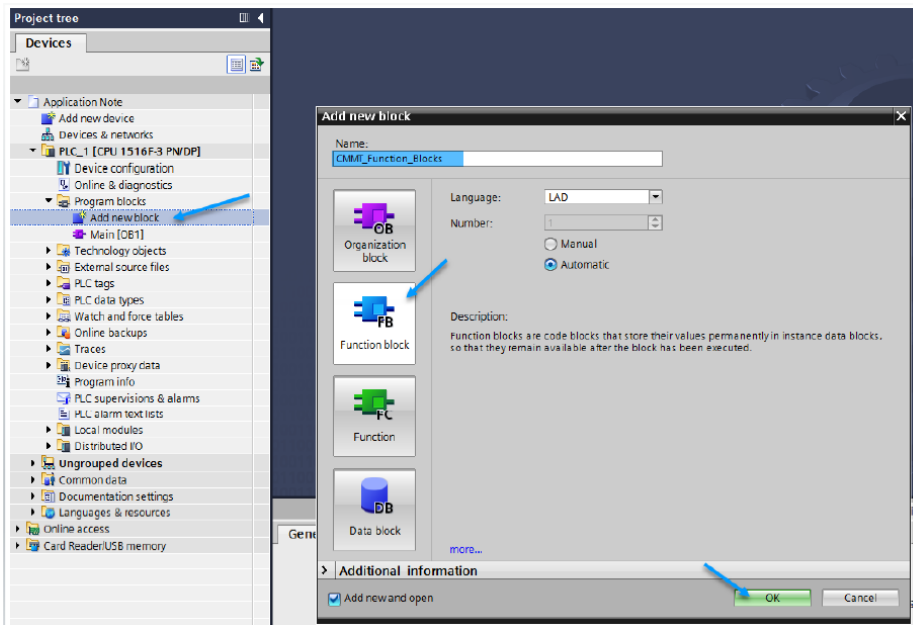
If you have chosen “On load side” then you have to set the “resulting maximum torque” from the motor in the reference torque field. The value can be found in parameter P1.7142.0.0.

If you have chosen “On motor side” then you have to set the “maximum motor or servo drive torque” from the motor controller in the reference torque field. The value can be found in parameter P1.381.0.0.

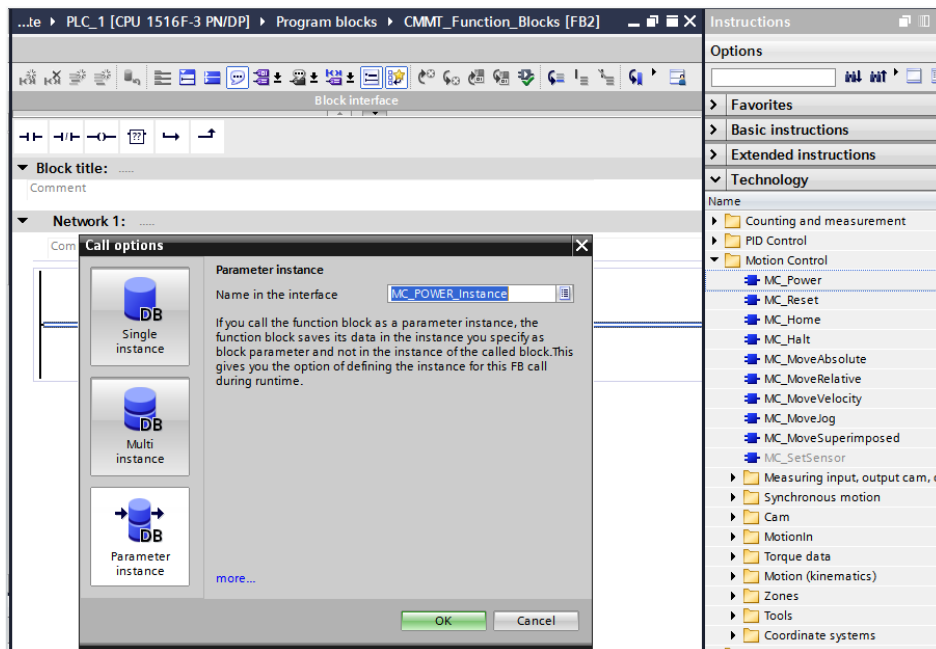
4.2.10 Save the project.

4.3 Creating the S7 program

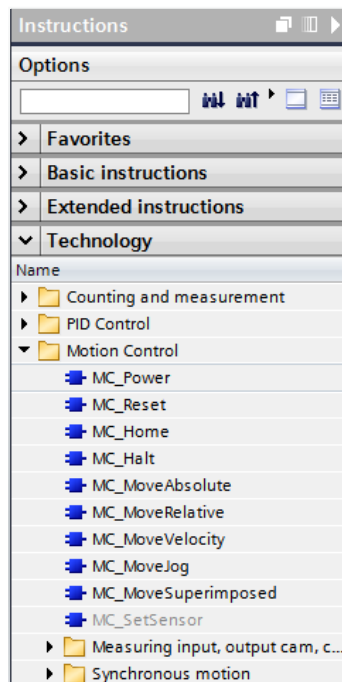
4.3.1 Programming the positioning axis. From the Project Tree select **'Add new block'** and create a Function Block. Fill in the name (e.g. CMMT_Function_Blocks), select **'Function block'** and click **'OK'**.



4.3.2 In the InOut area of the block interface add a variable "Axis" of data type "TO_PositioningAxis":



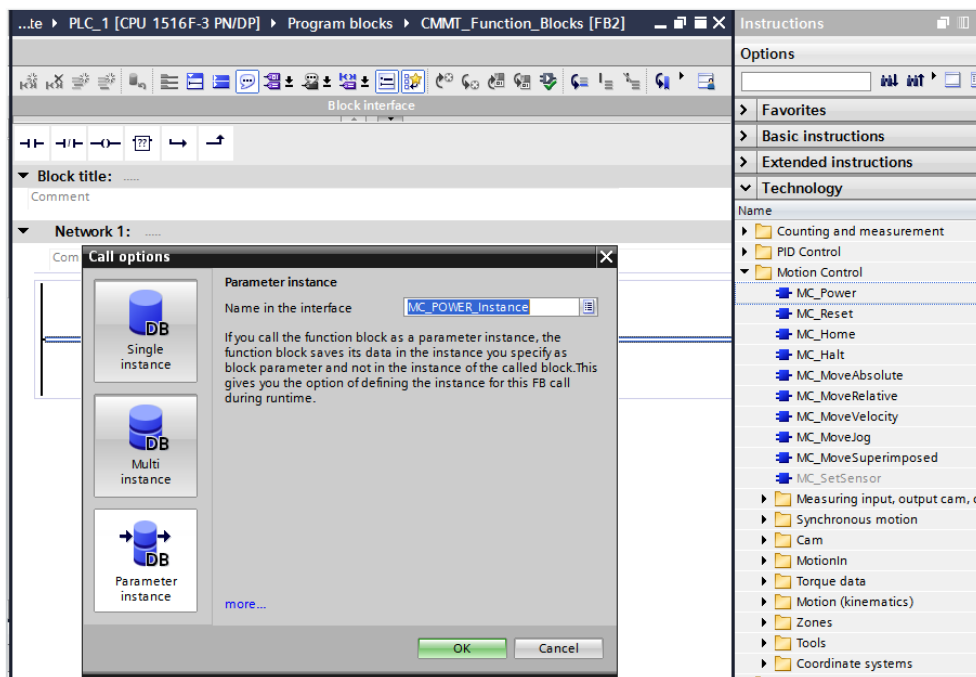
4.3.3 Go to the "Technology" palette in the "Instructions" task card and open the "Motion Control" folder:



4.3.4 Select Use multi-instances to add the required instructions to the function Block.

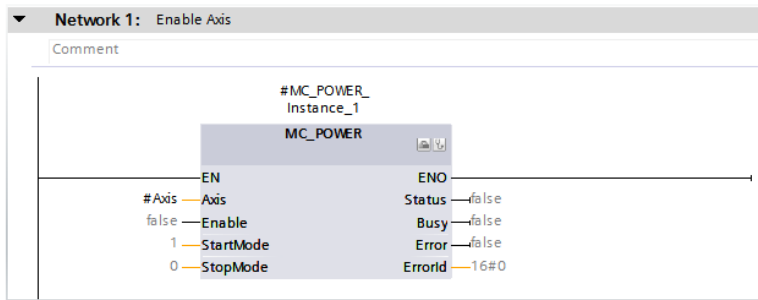
Note: In this example, the following instructions are used:

- MC_Power
- MC_MoveRelative
- MC_MoveJog
- MC_Halt
- MC_Reset

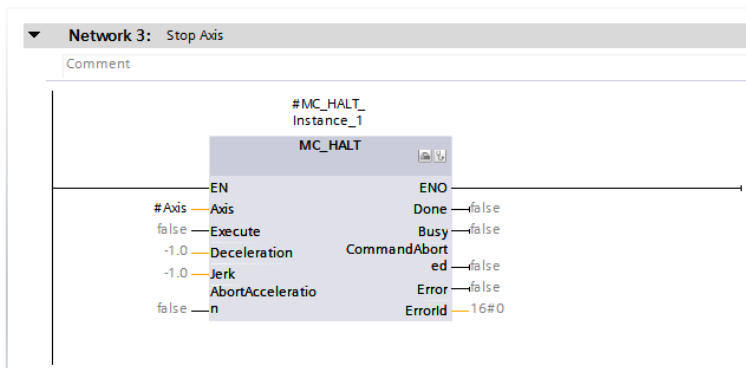


4.3.5 Program all blocks as follows:

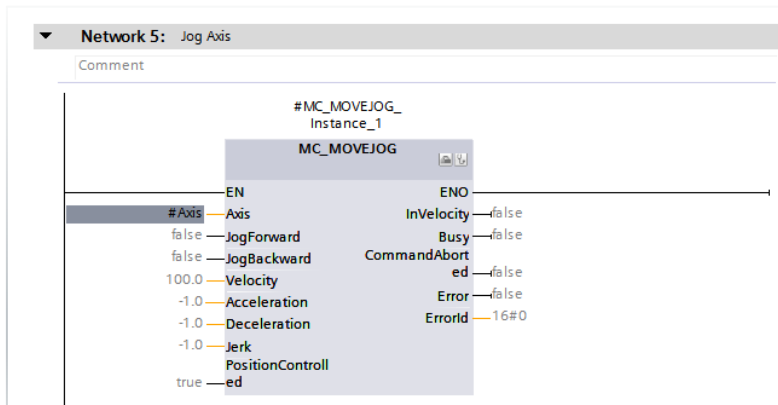
- MC_Power



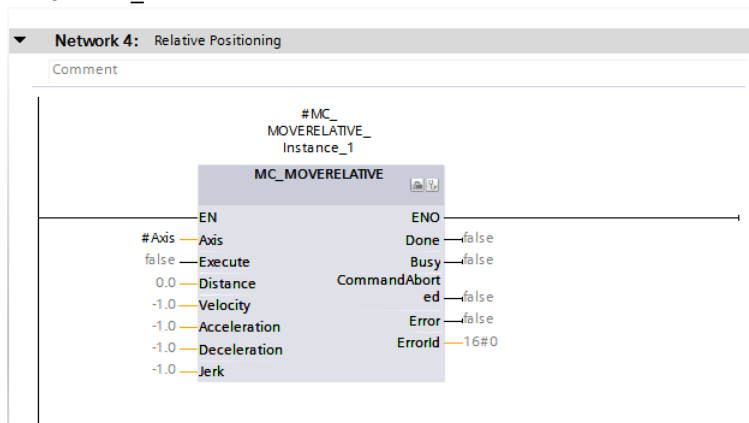
- MC_Halt



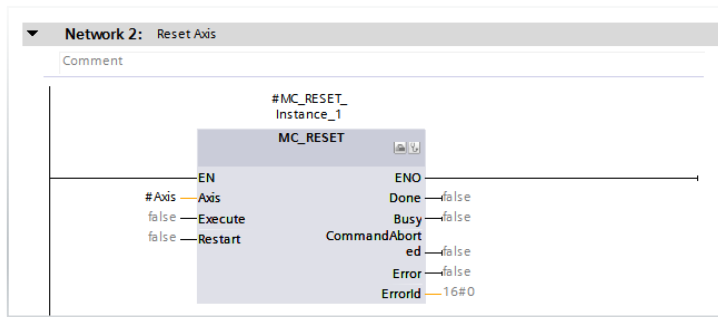
- MC_MoveJog



- MC_MoveRelative



o MC_Reset



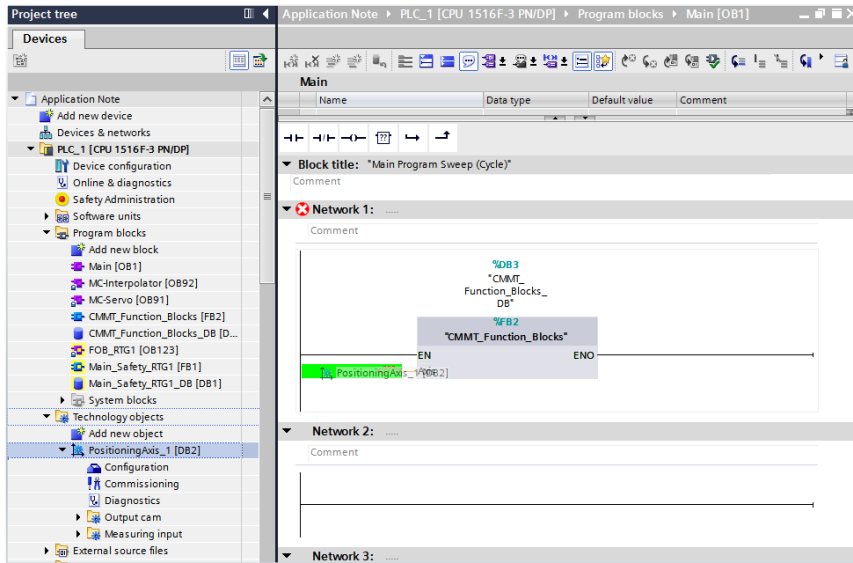
4.3.6 Open the cyclic OB "Main [OB1]". Add the blocks " CMMT_Function_Blocks " via drag & drop into the cyclic OB:

The screenshot displays the TIA Portal interface. On the left, the "Project tree" shows the hierarchy: Application Note > PLC_1 [CPU 1516F-3 PN/DP] > Program blocks > Main [OB1]. The "CMMT_Function_Blocks [FB2]" block is highlighted. The main editor shows the "Main" cyclic OB with a network containing the "CMMT_Function_Blocks [FB2]" block. Below the editor, the "Call options" dialog is open, showing the configuration for the data block:

- Data block:** Single instance
- Name:** CMMT_Function_Blocks_DB
- Number:** 3
- Mode:** Automatic (selected)

The dialog also includes an explanatory note: "If you call the function block as a single instance, the function block saves its data in its own instance data block." and "more..." link. The "OK" and "Cancel" buttons are at the bottom.

4.3.7 Connect the technology object to the input parameters of the block:

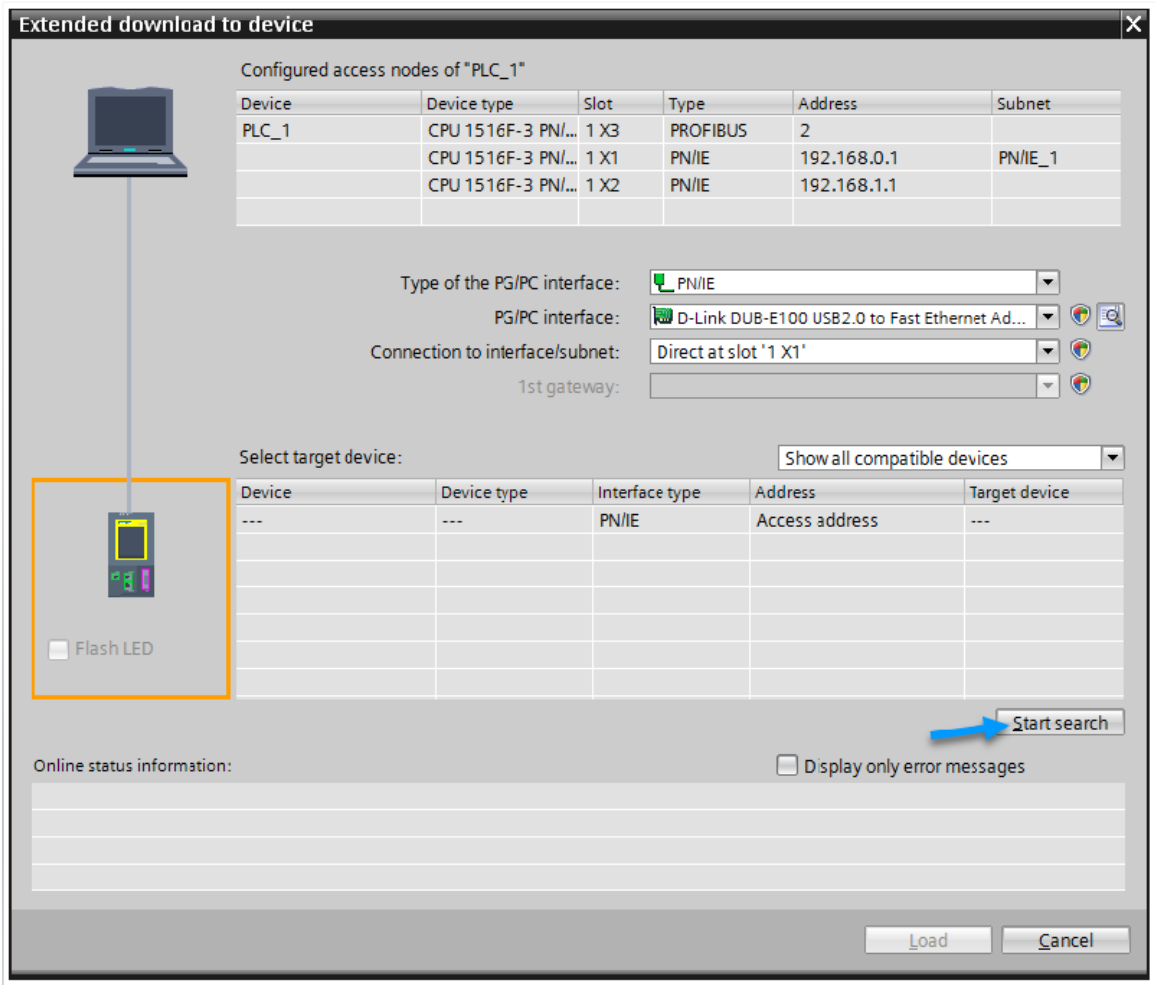


4.3.8 Save the project.

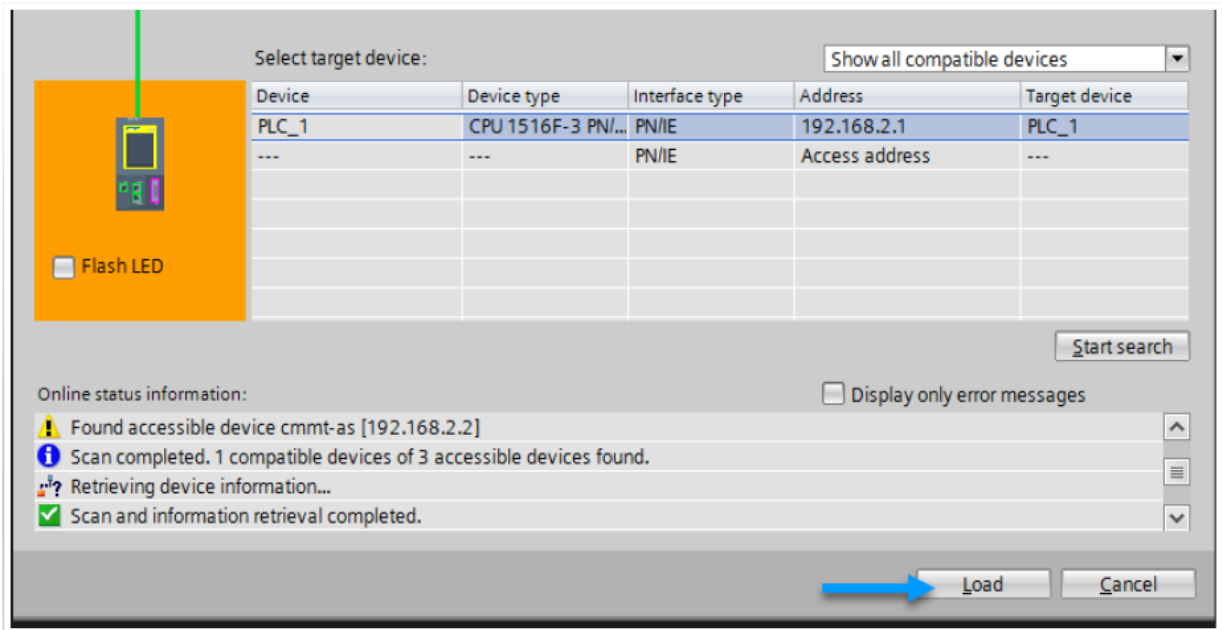
4.4 Compile and Download the program

4.4.1 Right click on the PLC_1 and select 'Download' -> 'Hardware and software (only changes)':

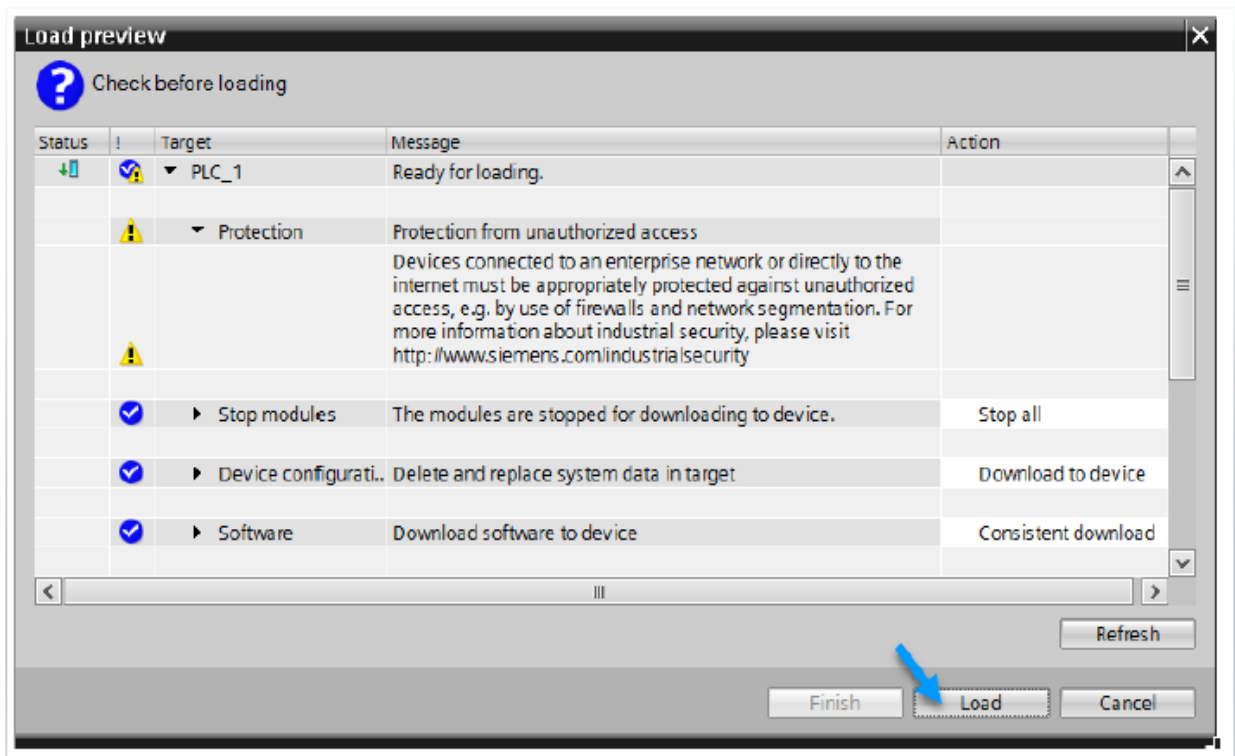
4.4.2 Start searching for the PLC:



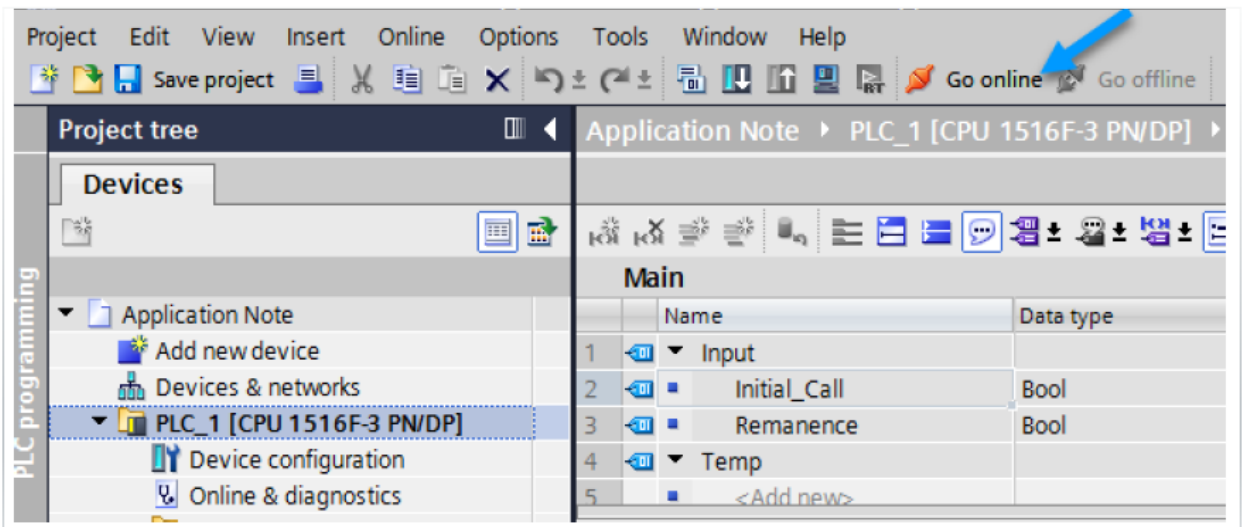
4.4.3 Select the PLC and load the project:



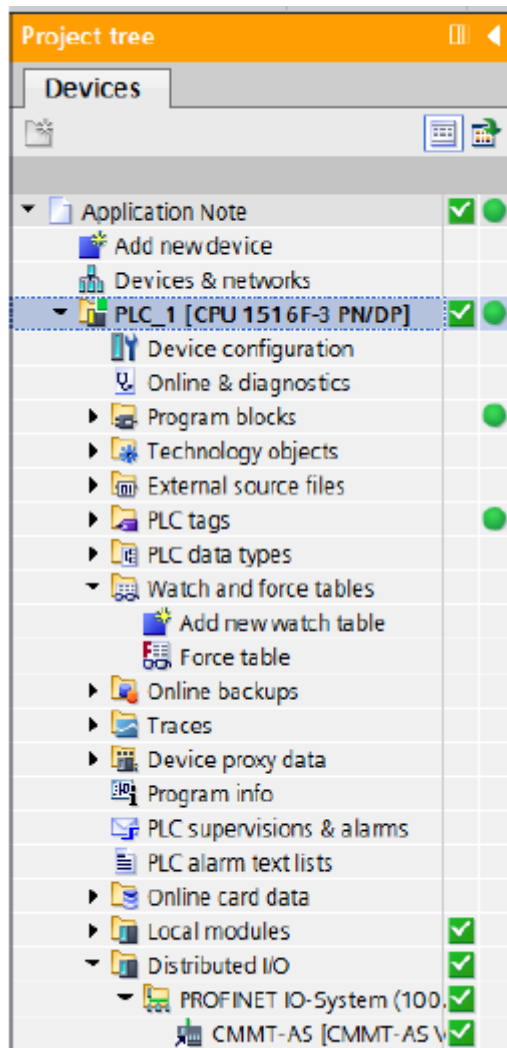
4.4.4 Select 'Load' on the Load preview and 'Finish' on the dialog that comes after.



4.4.5 While still selecting PLC_1 in the Project tree, go online:

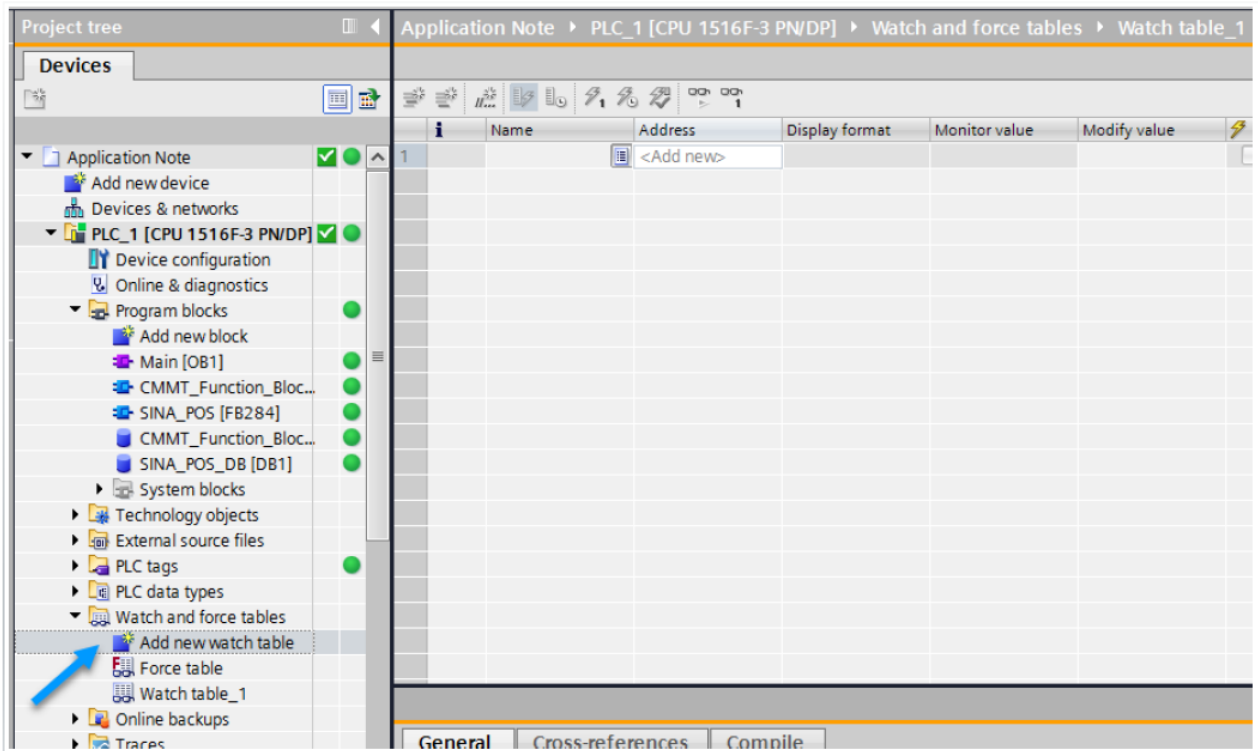


4.4.6 Make sure the PROFINET Network is up and running by checking if all is green and with checkmarks:



4.5 Use the blocks with a 'Watch Table'

4.5.1 Double click on 'Add new watch table':



4.5.2 Start typing the name 'CMMT_Function_Blocks_DB' and select it by pressing the 'Tab'-key. Type 'MC_POWER_Instance.enable' and press the 'Enter'-key. Do the same for each variable, you would like to watch.

The screenshot shows the 'Watch table' for 'CMMT_Operation'. The table contains the following entries:

	Name	Address	Display format	Monitor value	Modify...
1	// MC_Power				
2	*CMMT_Function_Blocks_DB*.MC_POWER_Instance_1.Enable		Bool		
3	*CMMT_Function_Blocks_DB*.MC_POWER_Instance_1.Status		Bool		
4	*CMMT_Function_Blocks_DB*.MC_POWER_Instance_1.Busy		Bool		
5	*CMMT_Function_Blocks_DB*.MC_POWER_Instance_1.Error		Bool		
6					
7	// MC_Reset				
8	*CMMT_Function_Blocks_DB*.MC_RESET_Instance_1.Execute		Bool		
9	*CMMT_Function_Blocks_DB*.MC_RESET_Instance_1.Done		Bool		
10	*CMMT_Function_Blocks_DB*.MC_RESET_Instance_1.Busy		Bool		
11	*CMMT_Function_Blocks_DB*.MC_RESET_Instance_1.Error		Bool		
12					
13	// MC_Move_Jog				
14	*CMMT_Function_Blocks_DB*.MC_MOVEJOG_Instance_1.JogForward		Bool		
15	*CMMT_Function_Blocks_DB*.MC_MOVEJOG_Instance_1.JogBackward		Bool		
16	*CMMT_Function_Blocks_DB*.MC_MOVEJOG_Instance_1.Velocity		Floating-point nu...		
17	*CMMT_Function_Blocks_DB*.MC_MOVEJOG_Instance_1.Acceleration		Floating-point nu...		
18	*CMMT_Function_Blocks_DB*.MC_MOVEJOG_Instance_1.Deceleration		Floating-point nu...		
19	*CMMT_Function_Blocks_DB*.MC_MOVEJOG_Instance_1.Jerk		Floating-point nu...		
20	*CMMT_Function_Blocks_DB*.MC_MOVEJOG_Instance_1.PositionControlled		Bool		
21	*CMMT_Function_Blocks_DB*.MC_MOVEJOG_Instance_1.InVelocity		Bool		
22	*CMMT_Function_Blocks_DB*.MC_MOVEJOG_Instance_1.Busy		Bool		
23	*CMMT_Function_Blocks_DB*.MC_MOVEJOG_Instance_1.Error		Bool		
24					
25	// MC_Halt				
26	*CMMT_Function_Blocks_DB*.MC_HALT_Instance_1.Execute		Bool		
27	*CMMT_Function_Blocks_DB*.MC_HALT_Instance_1.Deceleration		Floating-point nu...		
28	*CMMT_Function_Blocks_DB*.MC_HALT_Instance_1.Jerk		Floating-point nu...		
29	*CMMT_Function_Blocks_DB*.MC_HALT_Instance_1.Done		Bool		



Warning

In case of Absolute Encoder or Cyclic Absolute Encoder, the Technology Object must be homed before performing any positioning command.

In this case it is recommended to execute an MC_Home with Mode=7.

If the Technology object is not Referenced, this message will appear in diagnostics:

Job rejected: A job cannot be executed. You cannot execute a Motion Control instruction because necessary requirements are not fulfilled (technology object not homed).

(<TO>.ErrorWord.X3 (CommandNotAccepted))