



### Commissioning of CMMT-AS in Festo Automation Suite with CPX-E-CEC-M1-PN

This application note describes step by step how you configure a CMMT-AS-EC with CPX-E-CEC-M1-PN in Automation Suite and how you can use the SoftMotion libraries.

CMMT-AS-EC

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# 1 Components/Software/ IP address


Type/Name	Version Software/Firm-ware	IP address	Subnet mask
CMMT-AS	FW 014.0.7.121	192.168.0.20	255.255.255.0
CPX-E-CEC-M1-PN	FW 1.1.18	192.168.0.10	255.255.255.0
Laptop	--	192.168.0.200	255.255.255.0
Festo Automation Suite	V 1.2.1.16	--	--
CMMT-AS Plug-in	V 1.2.0.25	--	--
CPX Plug-in	V 1.2.0.74	--	--

Table 1.1: 1 Components/Software used

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

### A) 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)

### B) Festo Automation Plug-in

**Festo Automation Suite**  
 Parameterisation, programming and maintenance of electronic devices by Festo

1.2.1.16  
 06/06/2019

[→ Commissioning](#)  
[→ File and language versions](#)  
 ★★★★★ (3)

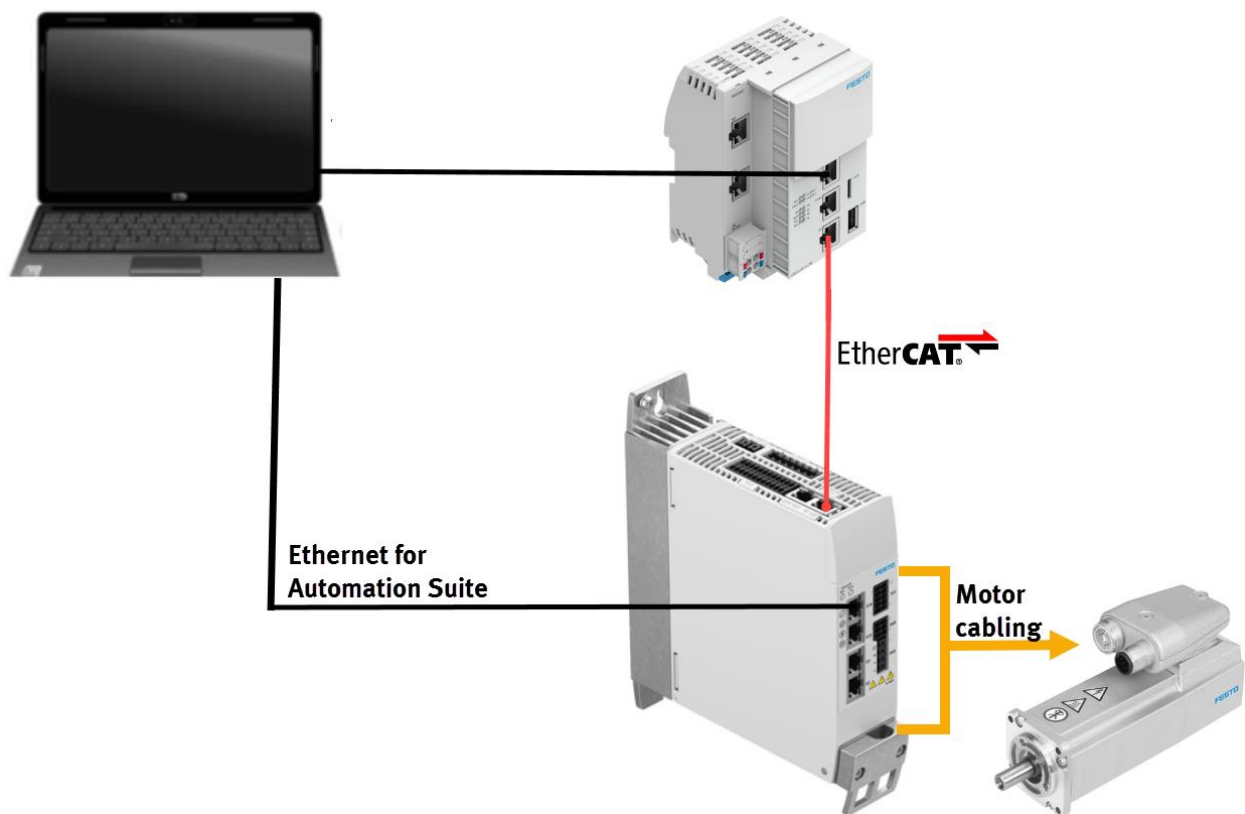
**New Features:**

- PositioningDrives data import

Source:

[https://www.festo.com/net/en-gb\\_gb/SupportPortal/default.aspx?q=5340819&tab=4&s=t#result](https://www.festo.com/net/en-gb_gb/SupportPortal/default.aspx?q=5340819&tab=4&s=t#result)

## 1.2 Network topology



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: Connecting cables

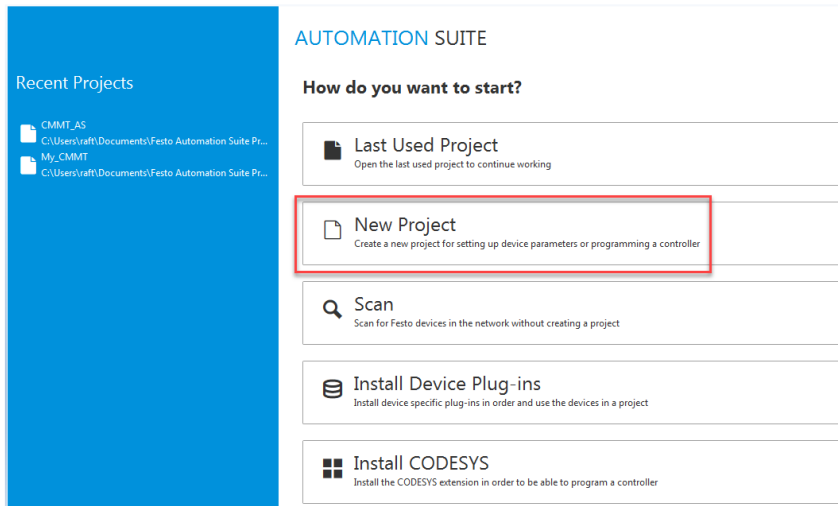
More information:

[https://www.festo.com/net/en-gb\\_gb/SupportPortal/default.aspx?q=8040446&tab=3](https://www.festo.com/net/en-gb_gb/SupportPortal/default.aspx?q=8040446&tab=3)

## 2 The first steps in Automation Suite

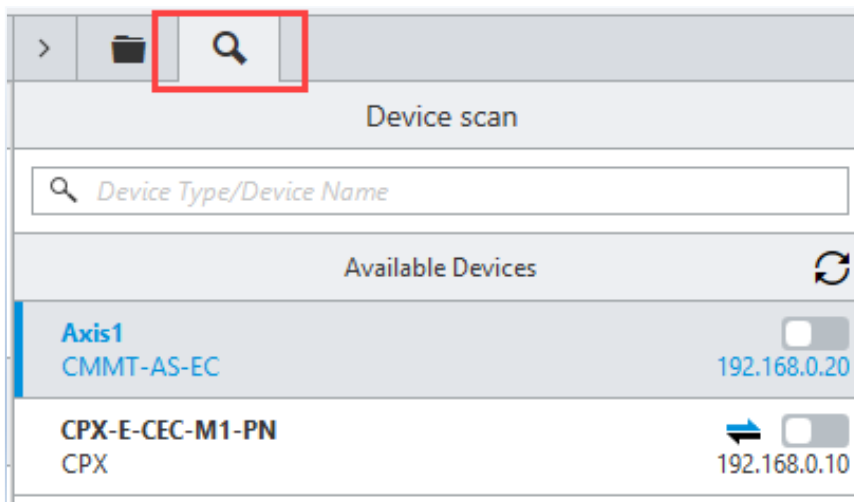
### 2.1 Creating a new project

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



### 2.2 Step by step commissioning of CMMT-AS

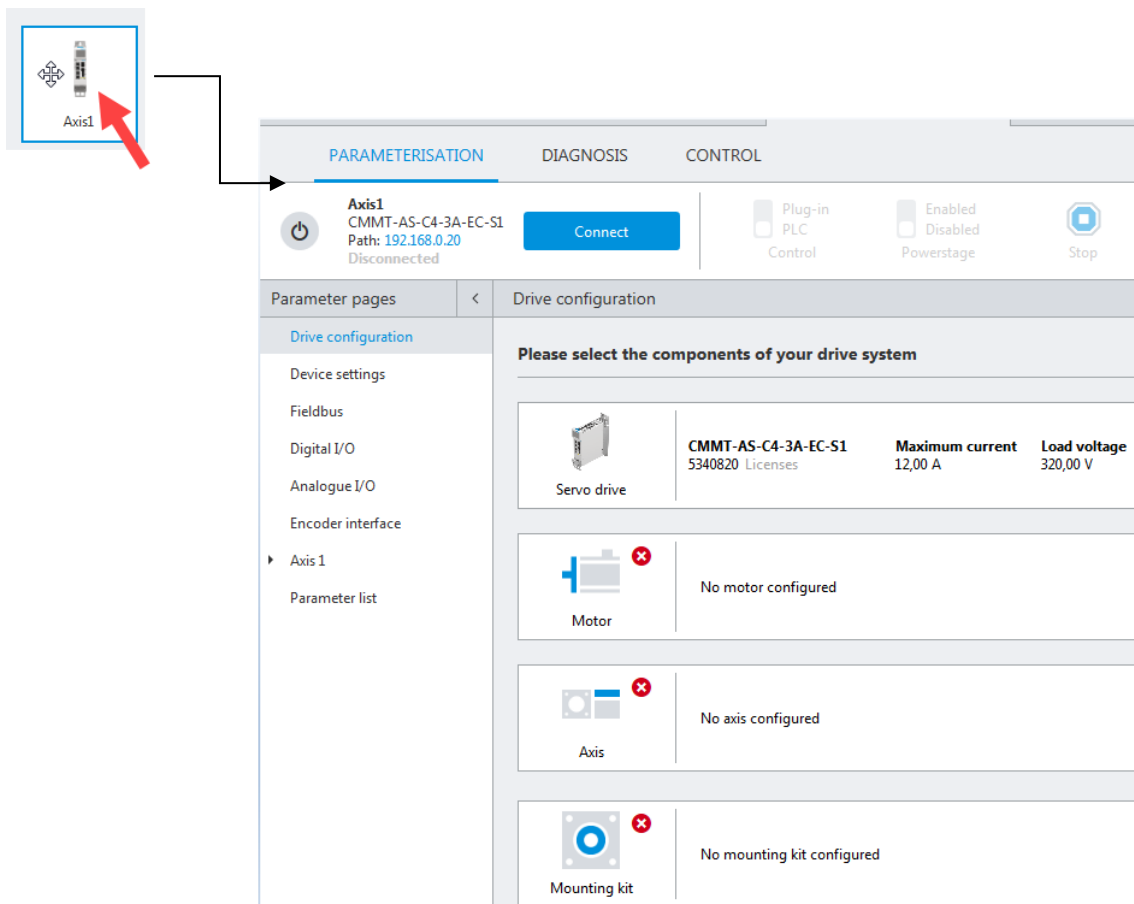
Step 2: Searching for the connected CMMT-AS via the **smaller** loupe, because then you can drag and drop the connected devices to your project directly



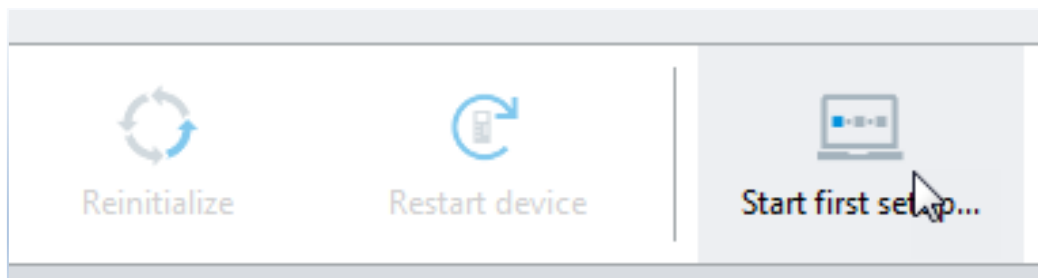
Step 3: Drag and Drop the CMMT-AS to your new project



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

- A) Choose the Servo drive (Optional step, if you didn't drag and drop the Online available device)

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, 548715Rev 04, A743  
Part number: 357PL810PFQ

Search results

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

Have a look on the label

- B) 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, 548715Rev 04, A743  
Part number: 357PL810PFQ

Search results

EMME-AS-40-S-LV-AS 2082428

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

Selected component

- C) Define the axis (-> In this application we are working with an unlimited user defined 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, 548715Rev 04, A743  
Part number: 357PL810PFQ

Search results

User defined linear axis

User defined rotative axis

User defined rotative axis

Search results

Selected component

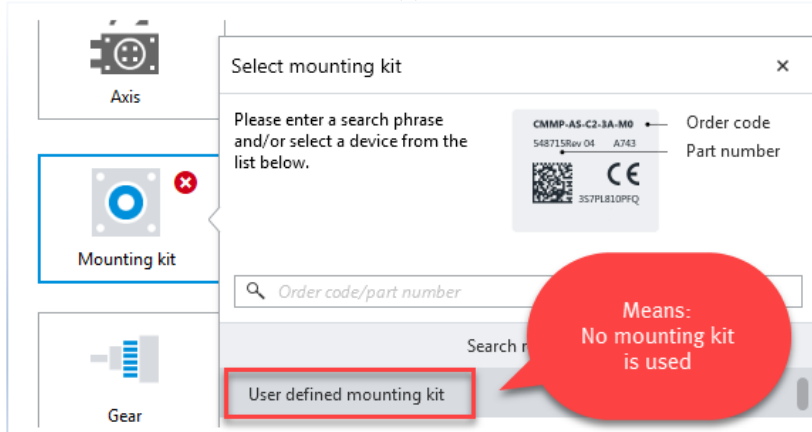
Current user unit: Rev [rev, rpm, ...] (3)

Motion: Rotative

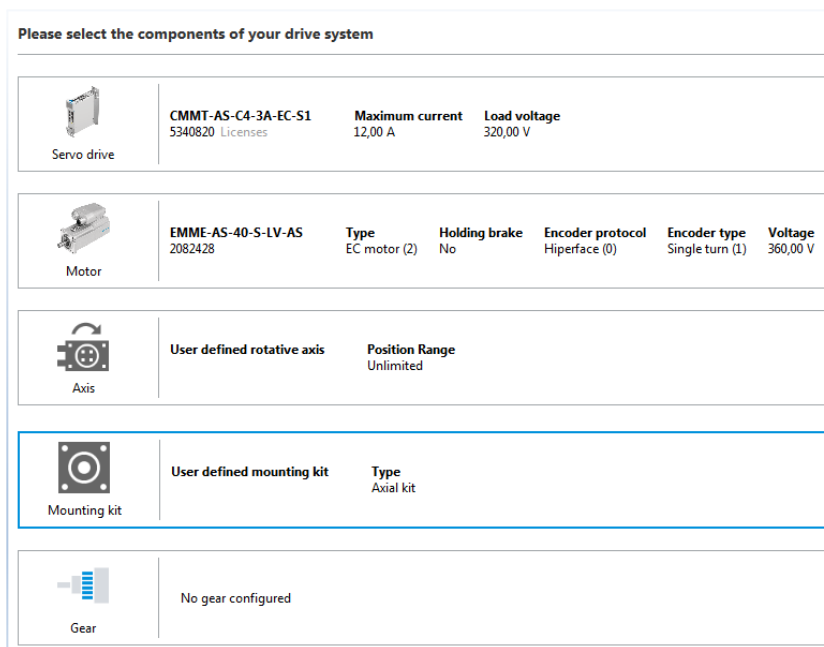
Unlimited axis ☒ Active

Design axis: Single axis (0)

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



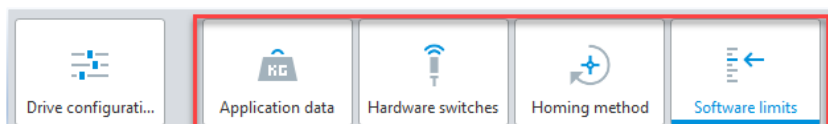
Step 7: After the basic configuration is finished the options for Application data, Hardware switches, Homing method and Software limits are available



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



Or per direct click in the upper menu



In this application we have used the following settings:

The image displays three screenshots of the Festo Automation Suite configuration interface, illustrating the settings used in the application. Arrows indicate the sequence of steps: from Application data to Hardware switches, then to Homing method, and finally to Software limits.

**Application data**

- Axis mass moment of inertia: 0,00 kgcm<sup>2</sup>
- Application moment of inertia: 0,00 kgcm<sup>2</sup>
- Total mass moment of inertia: 0,00 kgcm<sup>2</sup>

**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

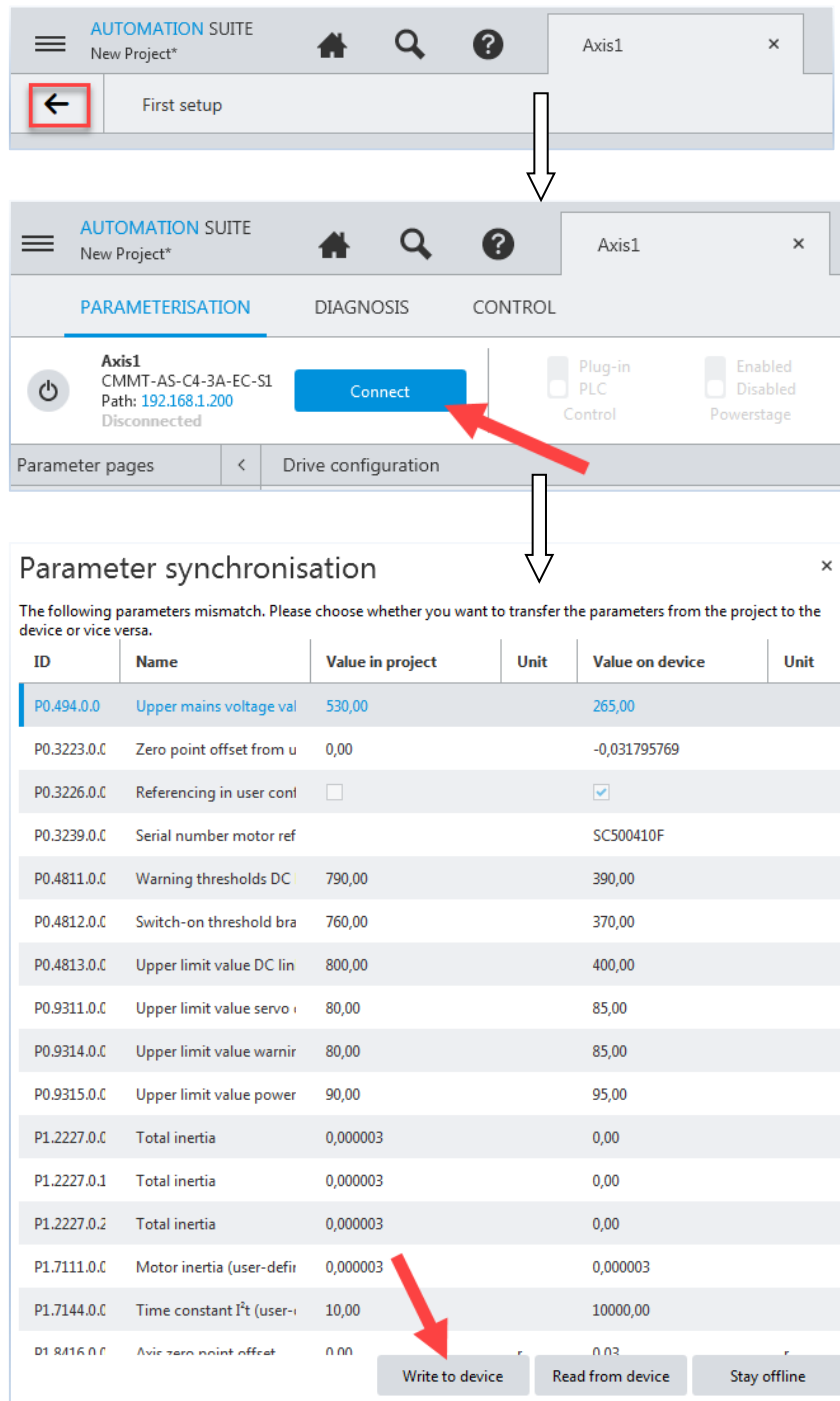
Move to axis zero point after homing: ☒ Active

**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

A red callout bubble labeled "Defined Homing method" points to the Homing method section. A red arrow labeled "Moveable offset" points to the Axis zero point offset field.

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



The screenshot shows the Automation Suite interface. The top bar includes the 'AUTOMATION SUITE' logo, a home icon, a search icon, a help icon, and a tab labeled 'Axis1'. Below the top bar, there is a 'First setup' button with a left arrow icon. A white arrow points from this button to the 'Connect' button in the 'PARAMETERISATION' tab. The 'Connect' button is blue and labeled 'Connect'. A red arrow points from the 'Connect' button to the 'Write to device' button in the 'Parameter synchronisation' dialog box.

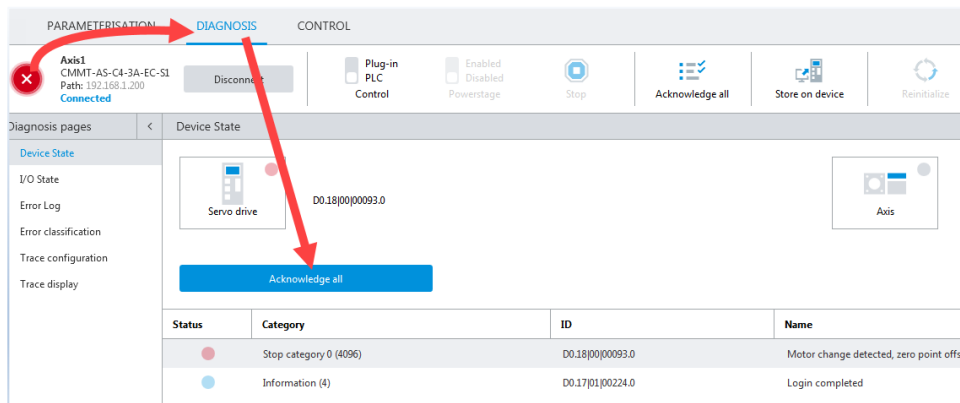
The 'PARAMETERISATION' tab is active, showing the 'Axis1' motor controller details: 'CMMT-AS-C4-3A-EC-S1', 'Path: 192.168.1.200', and 'Disconnected'. There are buttons for 'Plug-in PLC Control' and 'Enabled Disabled Powerstage'. Below this, there are 'Parameter pages' and 'Drive configuration' tabs.

The 'Parameter synchronisation' dialog box is open, displaying a table of parameters that mismatch between the project and the device. The table has columns: ID, Name, Value in project, Unit, Value on device, and Unit. The parameters listed are:

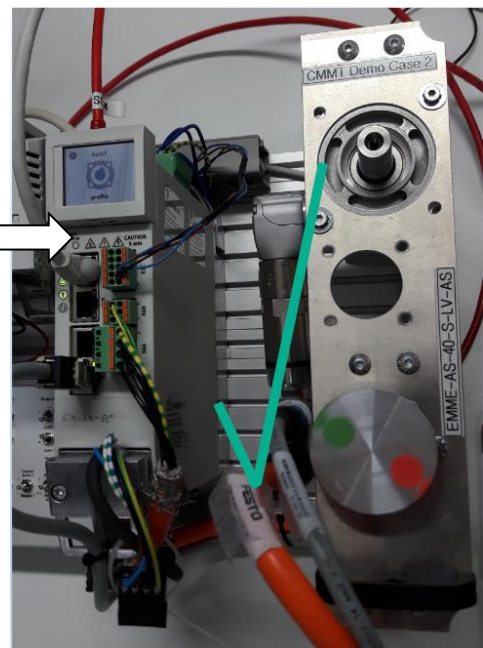
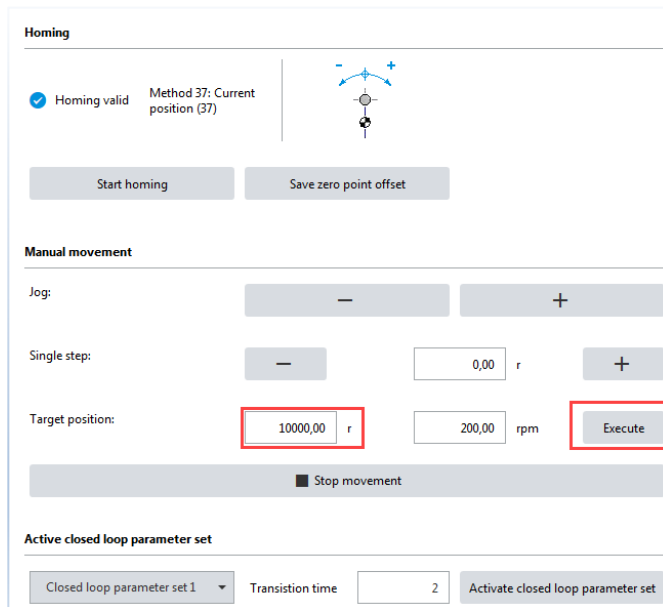
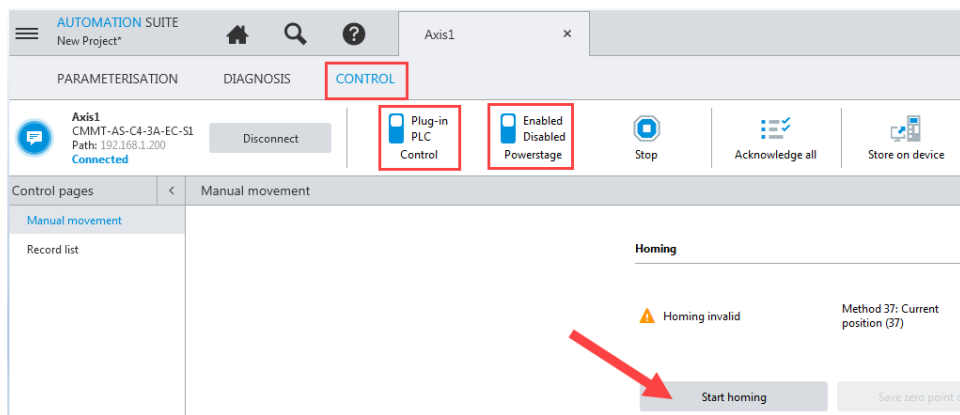
ID	Name	Value in project	Unit	Value on device	Unit
P0.494.0.0	Upper mains voltage val	530,00		265,00	
P0.3223.0.0	Zero point offset from u	0,00		-0,031795769	
P0.3226.0.0	Referencing in user cont	<input type="checkbox"/>		<input checked="" type="checkbox"/>	
P0.3239.0.0	Serial number motor ref			SC500410F	
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 <sup>2</sup> t (user-i	10,00		10000,00	
D1.8416.0.0	Axis zero point offset	0,00		0,03	

At the bottom of the dialog box, there are three buttons: 'Write to device', 'Read from device', and 'Stay offline'. A red arrow points from the 'Write to device' button to the 'Parameter synchronisation' dialog box.

Step 9: If the CMMT-AS was in use already then, because of the changes some diagnosis messages can occur. You can delete them here:

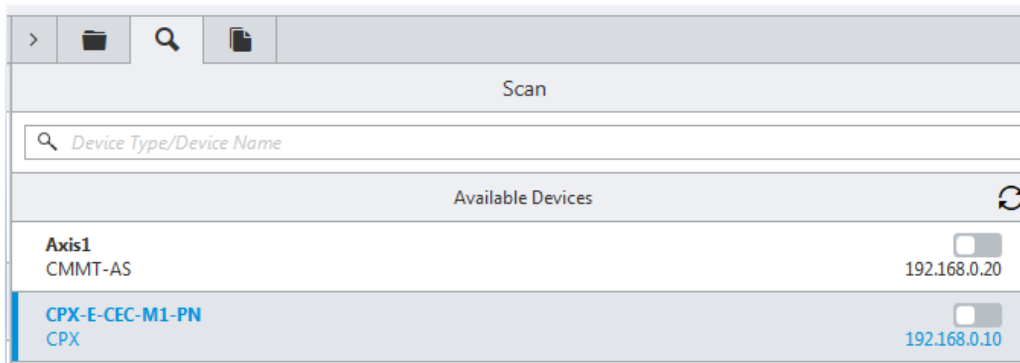


After that you can do for testing purpose a Homing and some movements

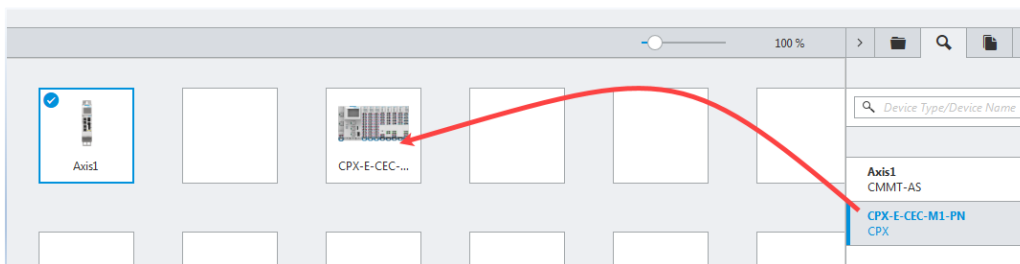


## 2.3 Step by Step commissioning of CPX-E-CEC-M1-PN

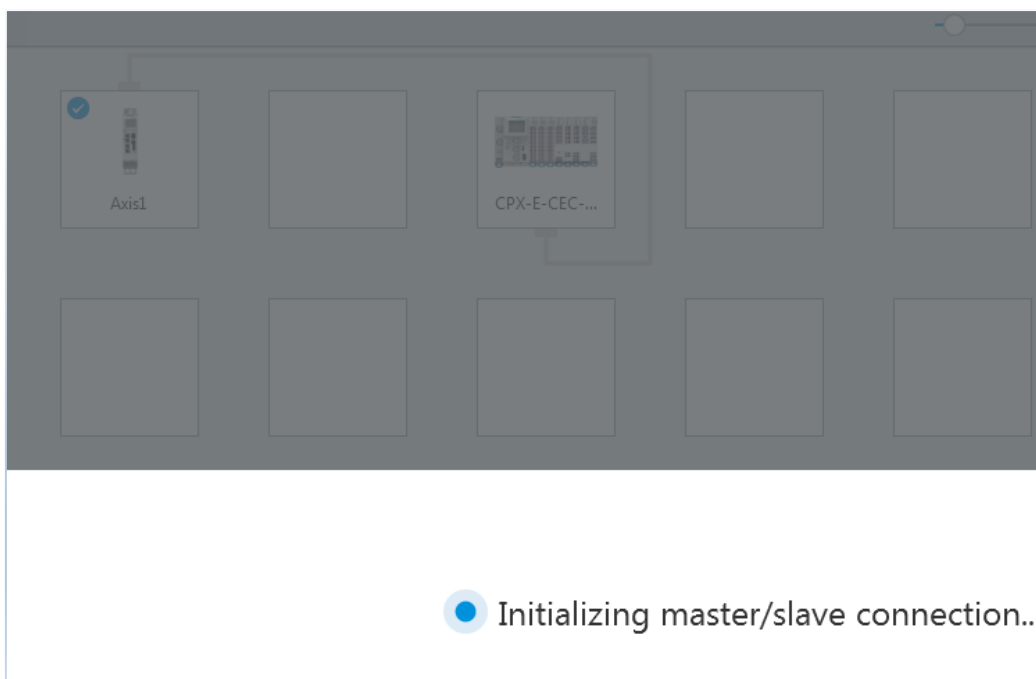
Step1: Searching for the connected CPX-E-CEC-M1-PN via the **smaller** loupe, because then you can drag and drop the connected the devices to your project



Step2: Drag and drop the CPX-E-CEC-M1-PN to your project



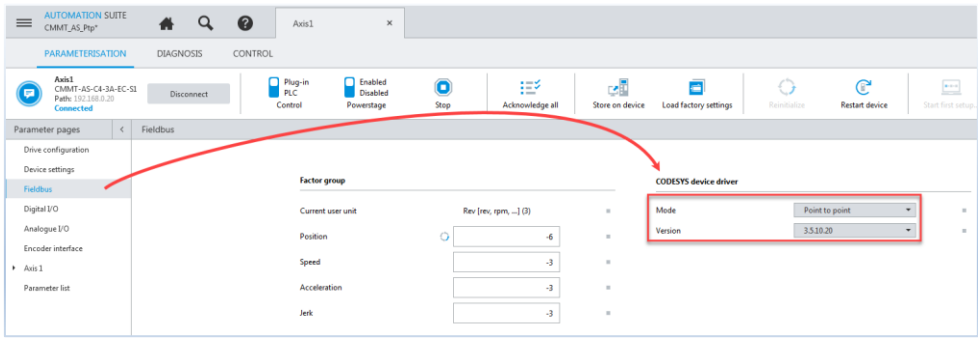
Step3: To establish a EtherCAT communication path you must draw a line between master and slave



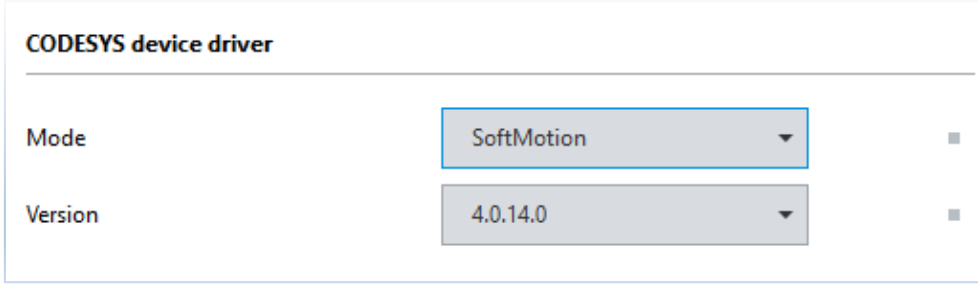
The result could look like this:



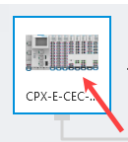
**Important**  
After you have established an EtherCAT communication following new option appears at CMMT-AS -> **Fieldbus**



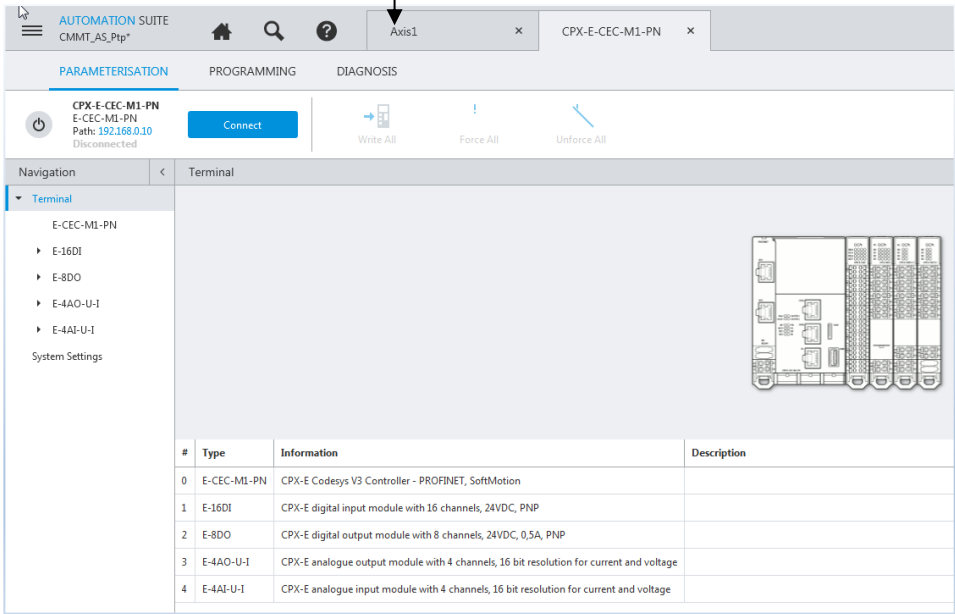
You can change the mode depending on your needs (In this document we are using just **SoftMotion**):



Step4: Open the CPX-E-CEC-M1-PN Codesys view via double click

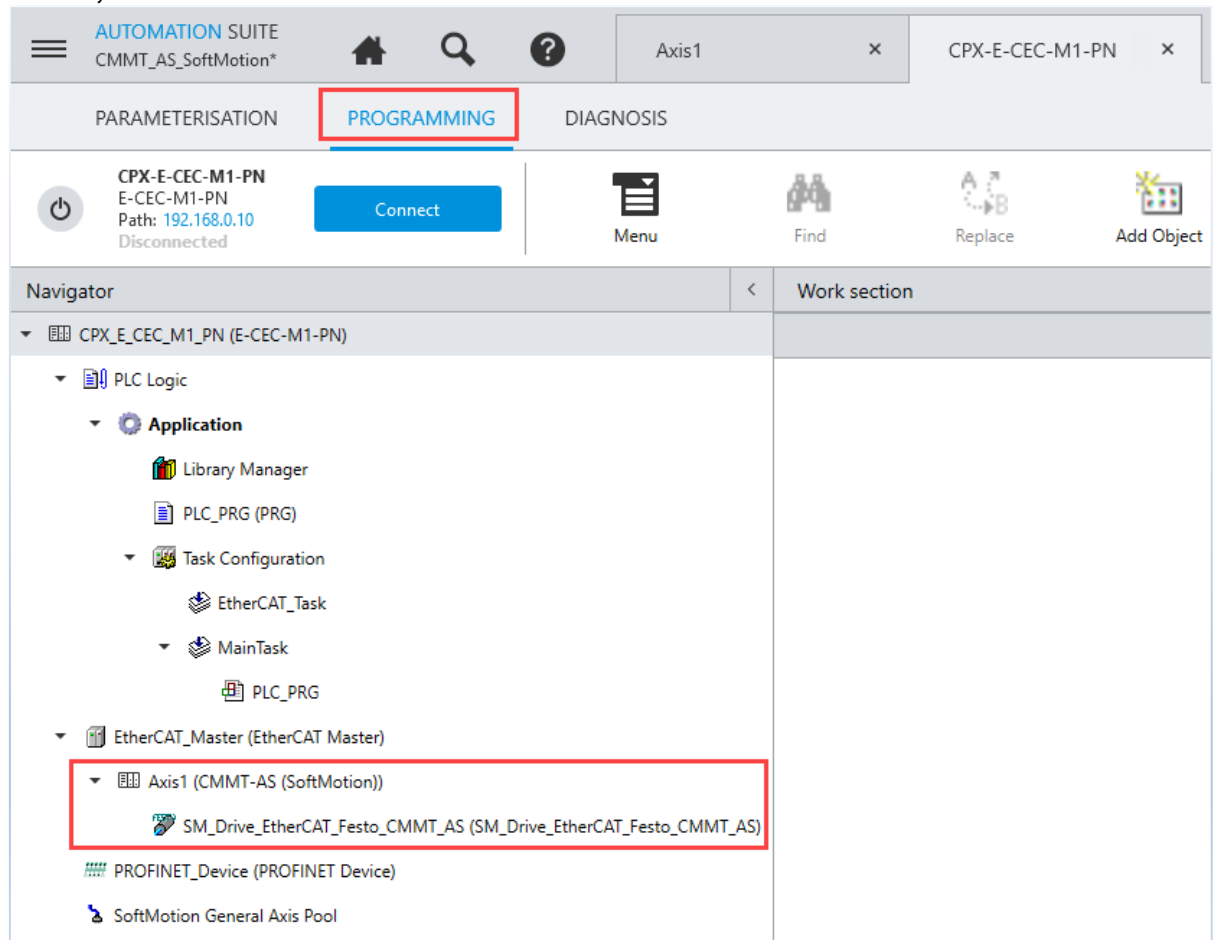


The Parameterization window appears with the actual configuration (This happens only if you have chosen the available device before (Step 1))

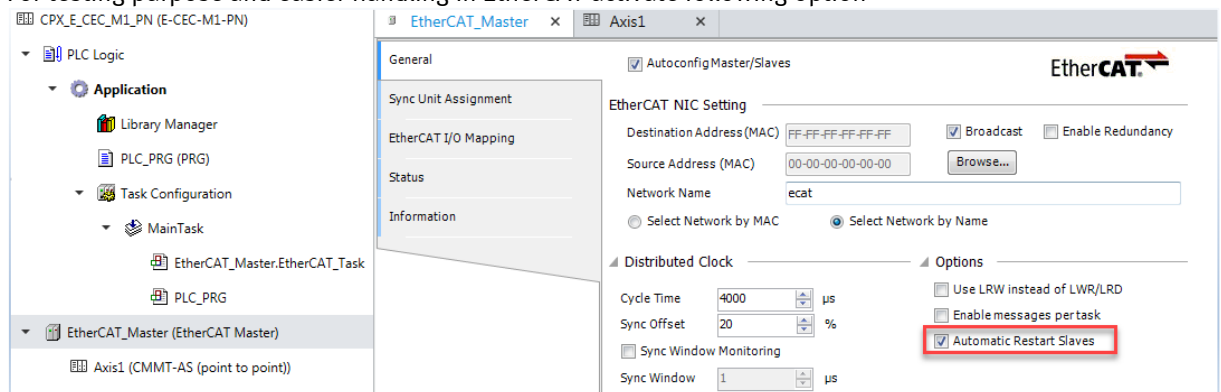


Step5: Open the Programming tab

If you have established the EtherCAT communication, then the system recognizes the CMMT-AS automatically



Step6: For testing purpose and easier handling in EtherCAT activate following option

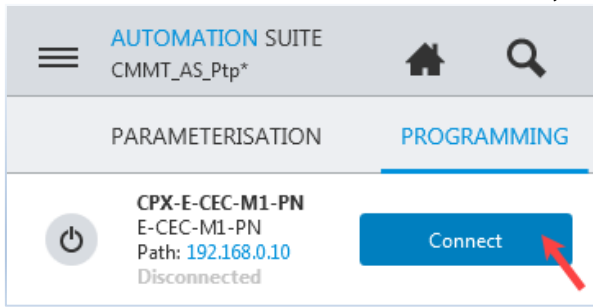


Automatic Restart Slaves means that in the event of communication breakdown the master tries to re-start the slaves cyclically till everything is running again.

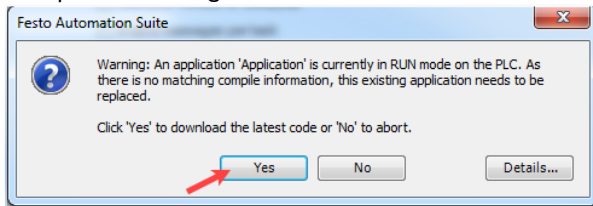


Step7: Download the project to the PLC and check if the EtherCAT communication is running

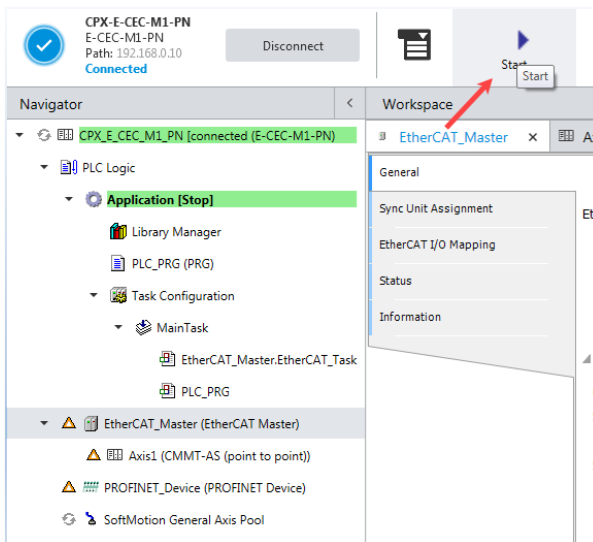
A) Connect to device to start download automatically



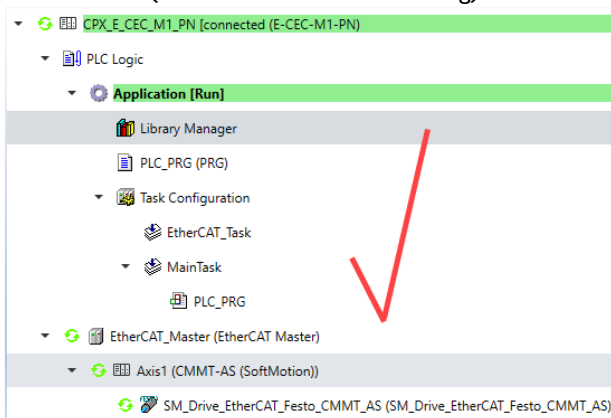
B) Accept the Warning



C) Switch PLC to Run Mode

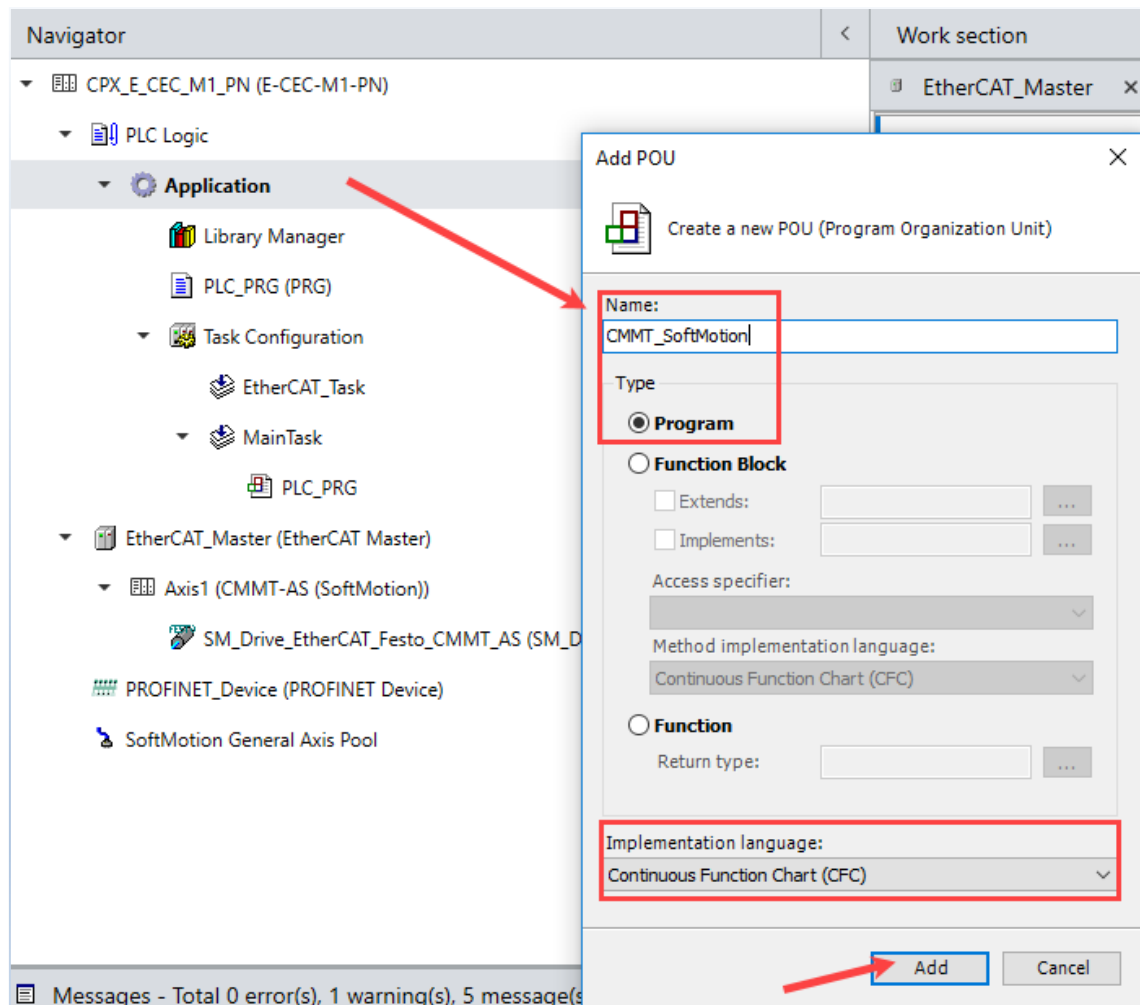


D) Check result (Green = EtherCAT is running)

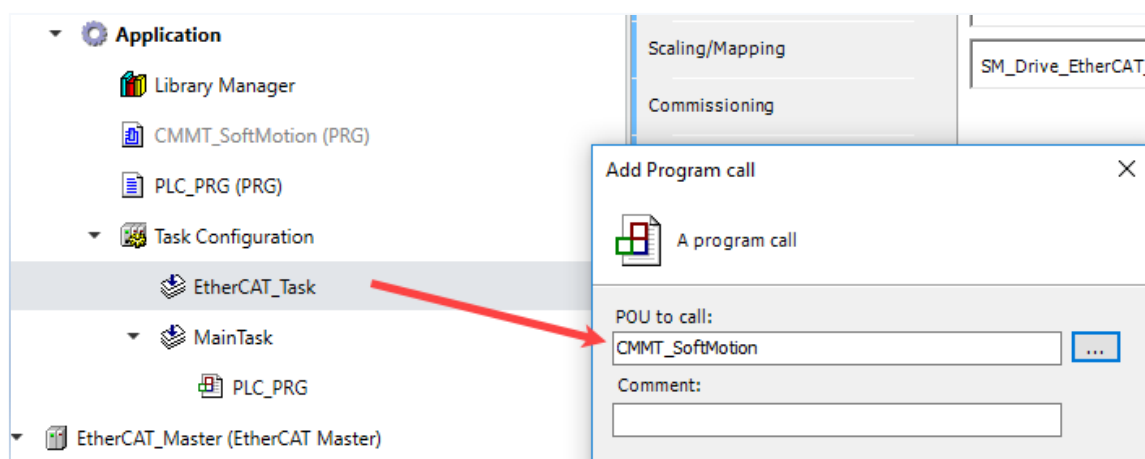


## 2.4 Using the SoftMotion function blocks

Step1: Add e.g. a CFC program



Step2: Call the CFC (PRG) in the EtherCAT Task



### Note

PLCopen FB's must be called in the EtherCAT Task to work synchronously. If the PLCopen FB's are not called within this task they will simply not work correctly

## Step3: Integrate the Festo SoftMotion function blocks in your CFC (PRG)

**Note**

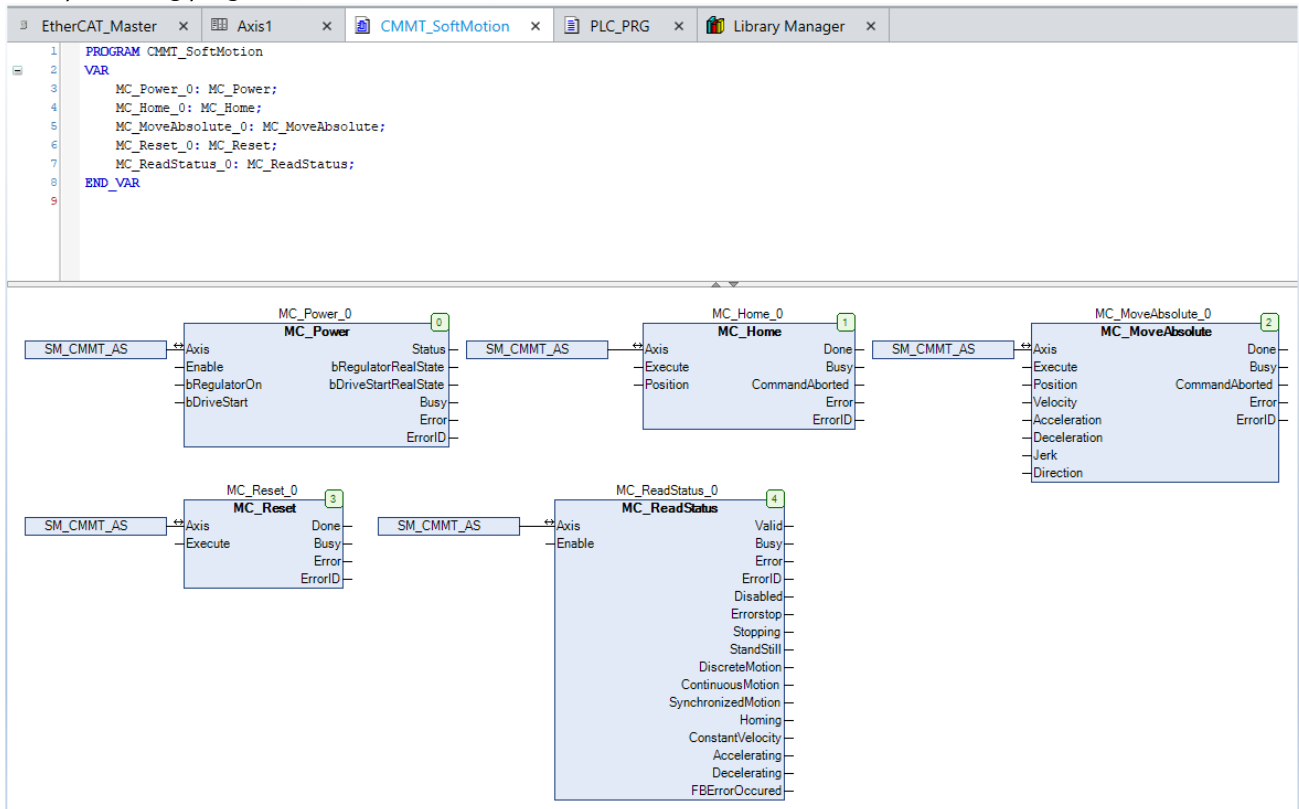
You can find available FB's in the Library Manager. They are included in the CPX-E-CEC-M1-PN package

Library Manager		
Name	Namespace	Effective version
Festo_Robotics_Trafo_3 = Festo_Robotics_Trafo_3, 3.5.9.10 (Festo AG & Co. KG)	FESTO_ROBOTICS_TRAFO	3.5.9.10
IODrvEtherCAT = IODrvEtherCAT, 3.5.12.40 (3S - Smart Software Solutions GmbH)	IoDrvEthercatLib	3.5.12.40
IoStandard = IoStandard, 3.5.10.0 (System)	IoStandard	3.5.10.0
SM3_Basic = SM3_Basic, 4.4.0.1 (3S - Smart Software Solutions GmbH)	SM3_Basic	4.4.0.1
3SLicense = 3SLicense, 3.5.12.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.12.0
Base Interfaces, * (System)	IBaseLibrary	3.5.2.0
CAA Callback = CAA Callback Extern, 3.5.11.0 (CAA Technical Workgroup)	CB	3.5.11.0
CAA Device Diagnosis = CAA Device Diagnosis, 3.5.10.0 (CAA Technical Workgroup)	DED	3.5.10.0
CAA Types = CAA Types Extern, 3.5.10.0 (CAA Technical Workgroup)	CAA	3.5.10.0
CmpApp = CmpApp, 3.5.12.20 (System)	CmpApp	3.5.12.20
CmpErrors2 Interfaces, * (System)	CmpErrors	3.5.12.0
CmpEventManager = CmpEventManager, 3.5.12.0 (System)	CmpEventManager	3.5.12.0
CmpIecTask = CmpIecTask, 3.5.12.0 (System)	CmpIecTask	3.5.12.0
CmpLog = CmpLog, 3.5.5.0 (System)	CmpLog	3.5.5.0

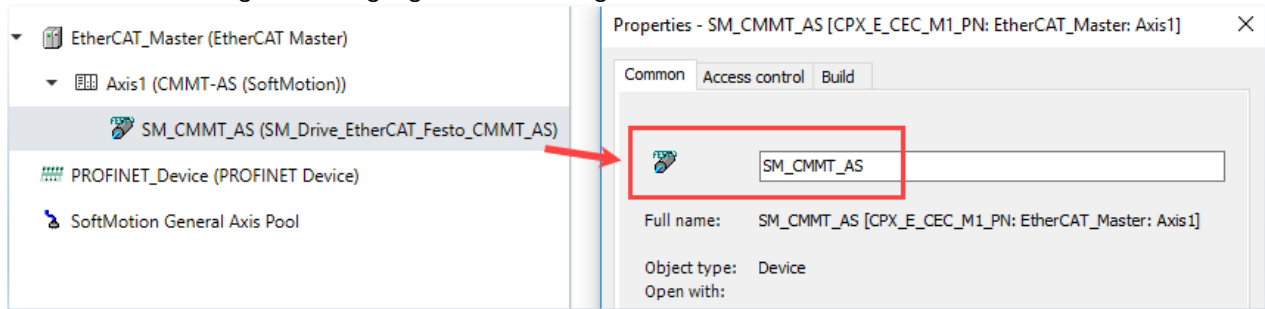
  

MC_MoveAbsolute
MC_MoveAdditive
MC_MoveRelative
MC_MoveSuperImposed
MC_MoveVelocity
MC_PositionProfile
MC_Stop

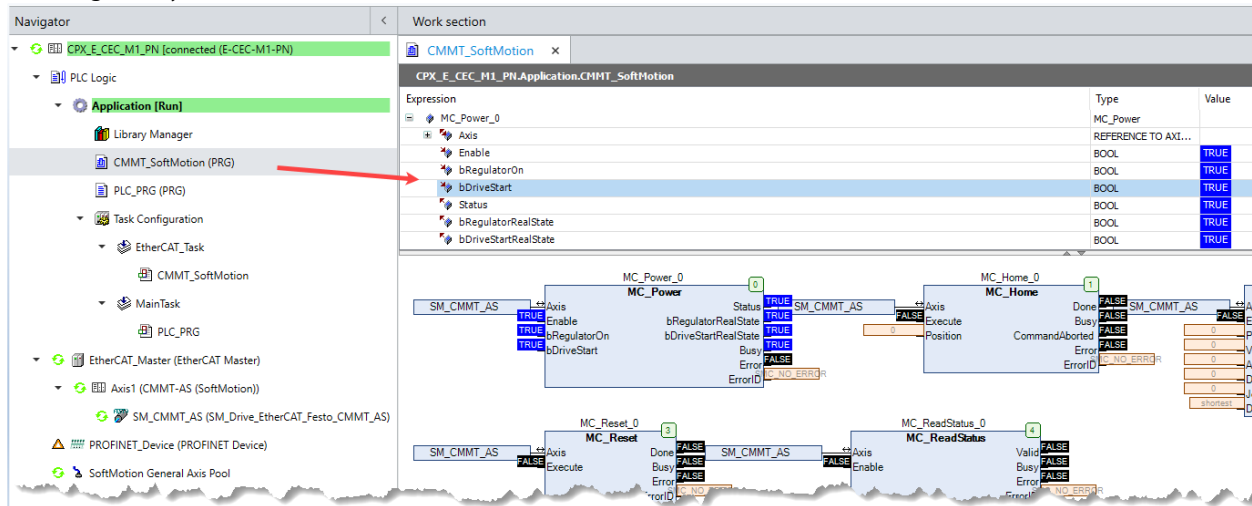
A simple testing program (without variables) could look like this:



For an easier handling in CFC language we have changed the name of the SM drive:

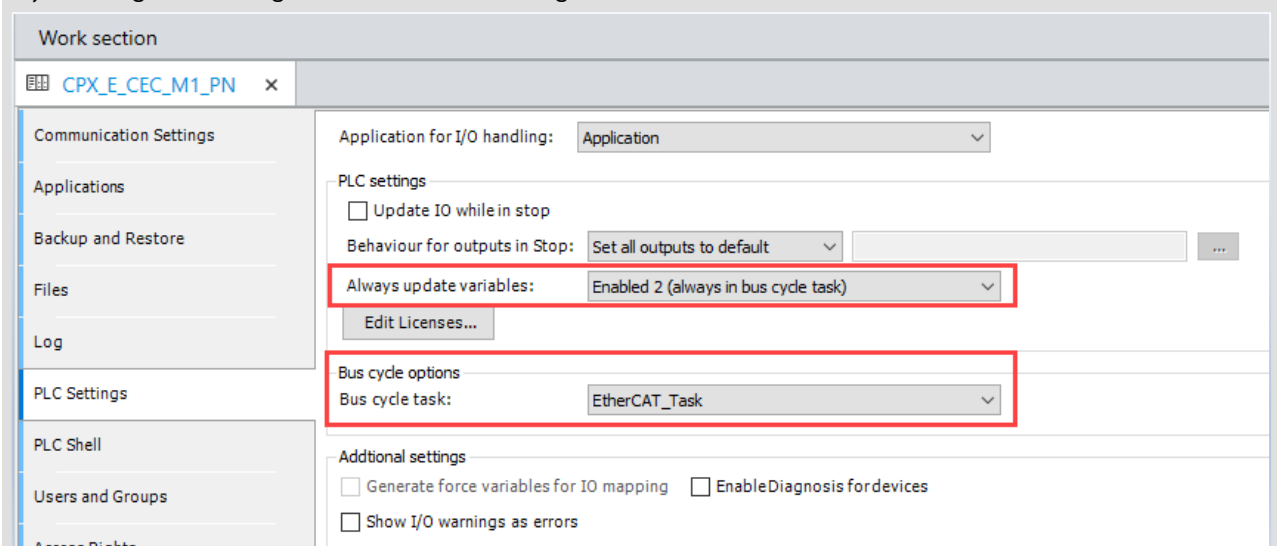


After download you could use for testing the internal FB variables in Online Mode, but be aware that the handling is very uncomfortable:



## Note

If you change the settings in the PLC like following:

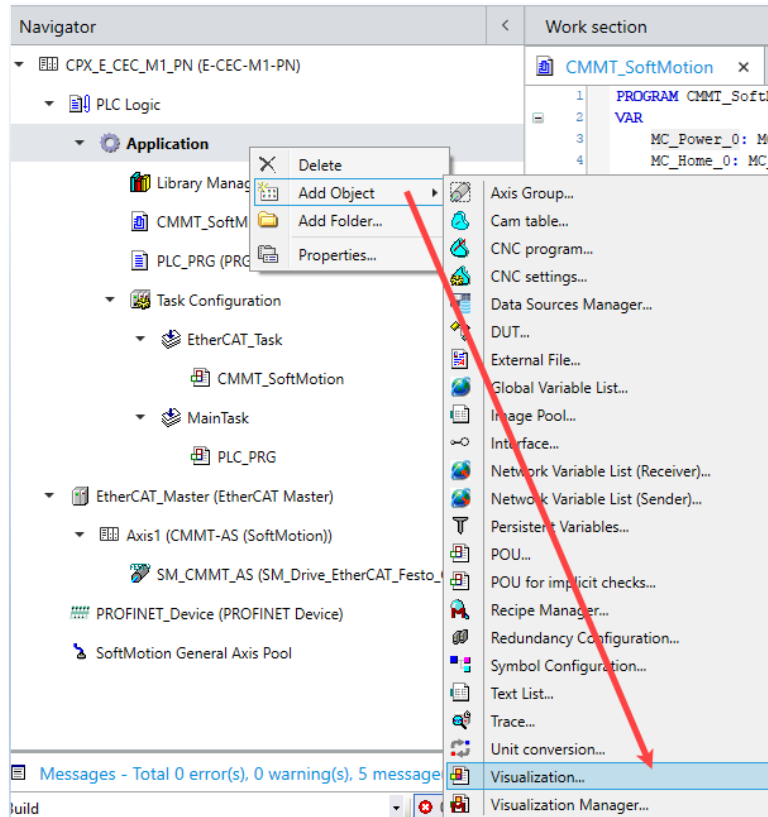


then you ensure that unused I/O variables (which are not used in a programming code) are updated too and that the Bus cycle task is using always the EtherCAT Task. To avoid problems during testing such options are recommended.

### 2.4.1 Creating a visualisation

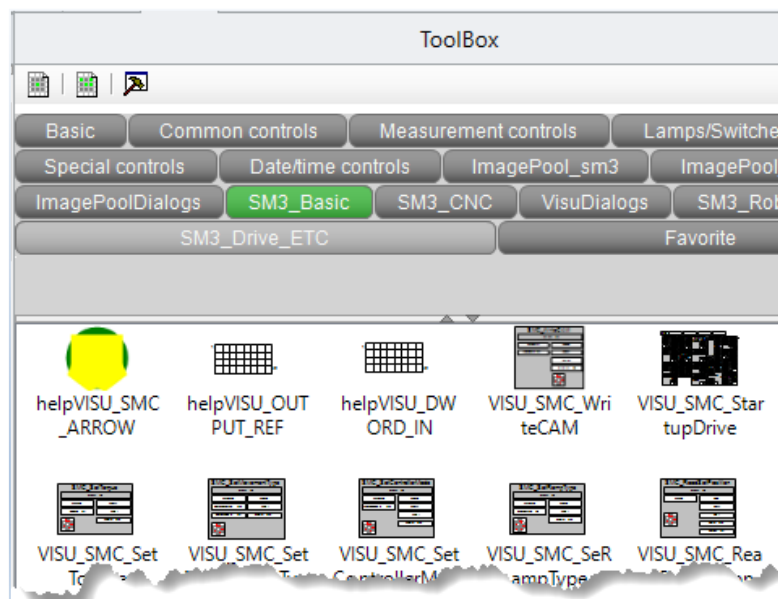
To make the testing easier you can use the available FB visualisation elements.

Step1: Add visualization

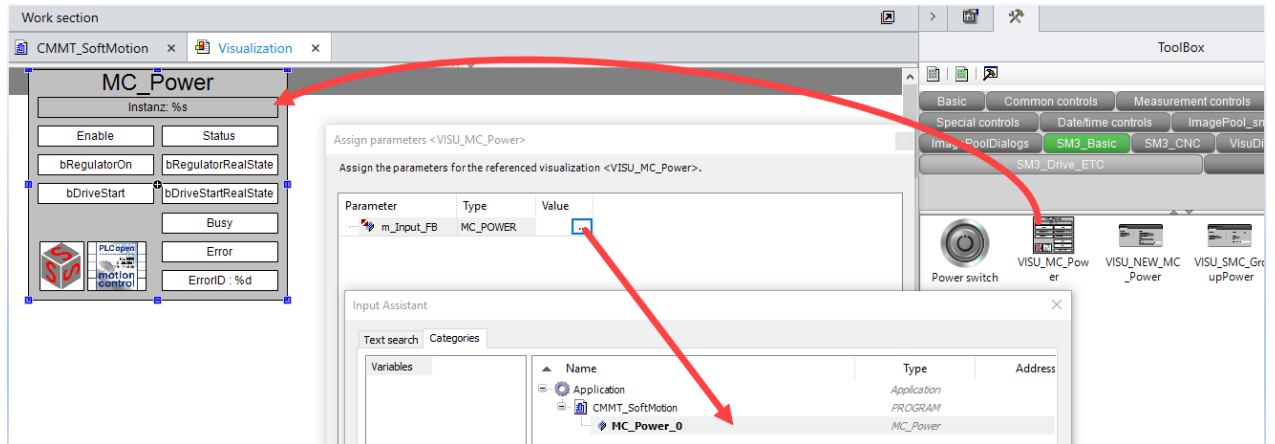


Step2: Drag and drop the Visualisation element which you want to use from the SoftMotion library **and** link the Visu elements to the corresponding function blocks

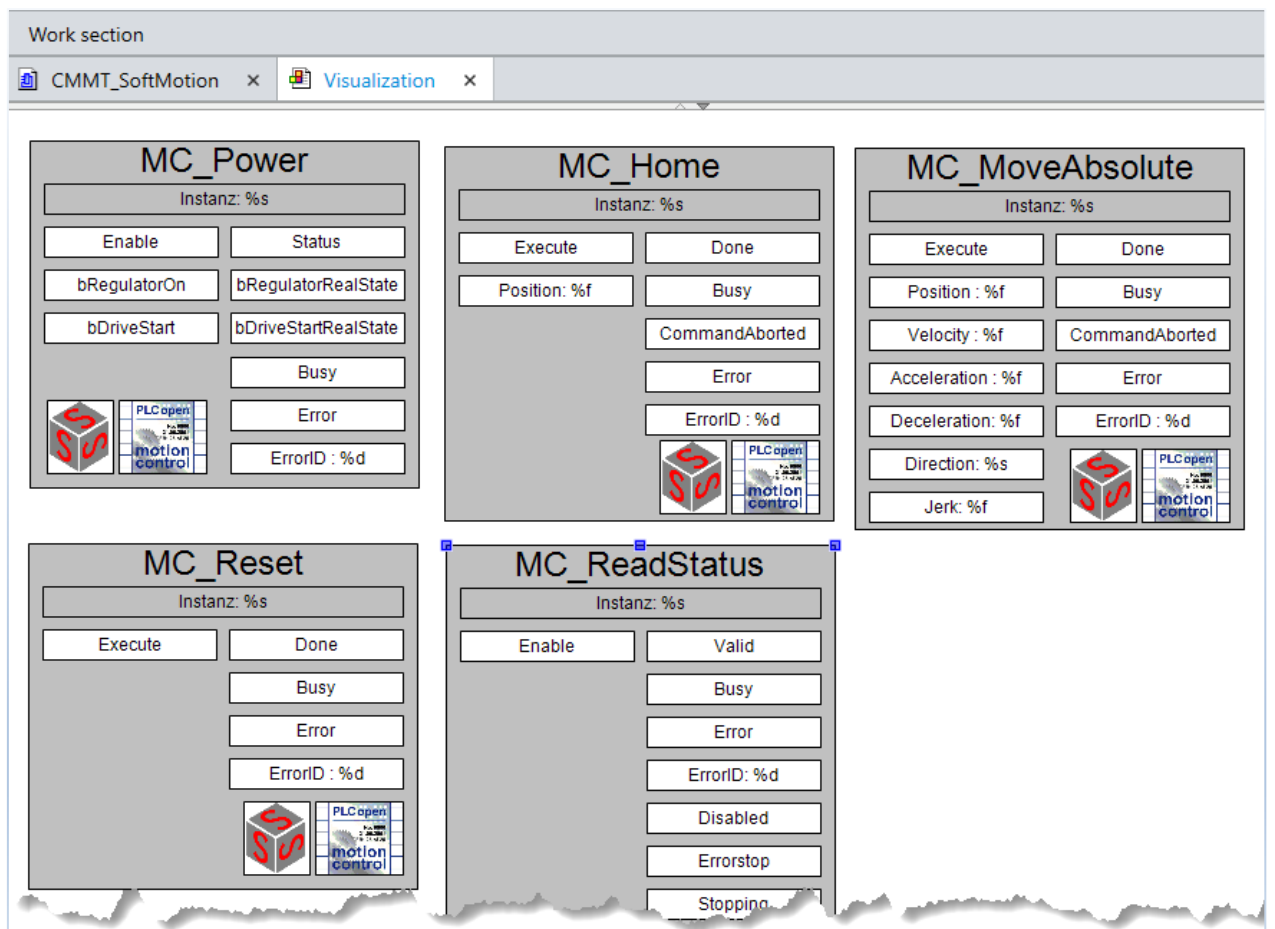
You will find all Visu SM elements in the ToolBox:



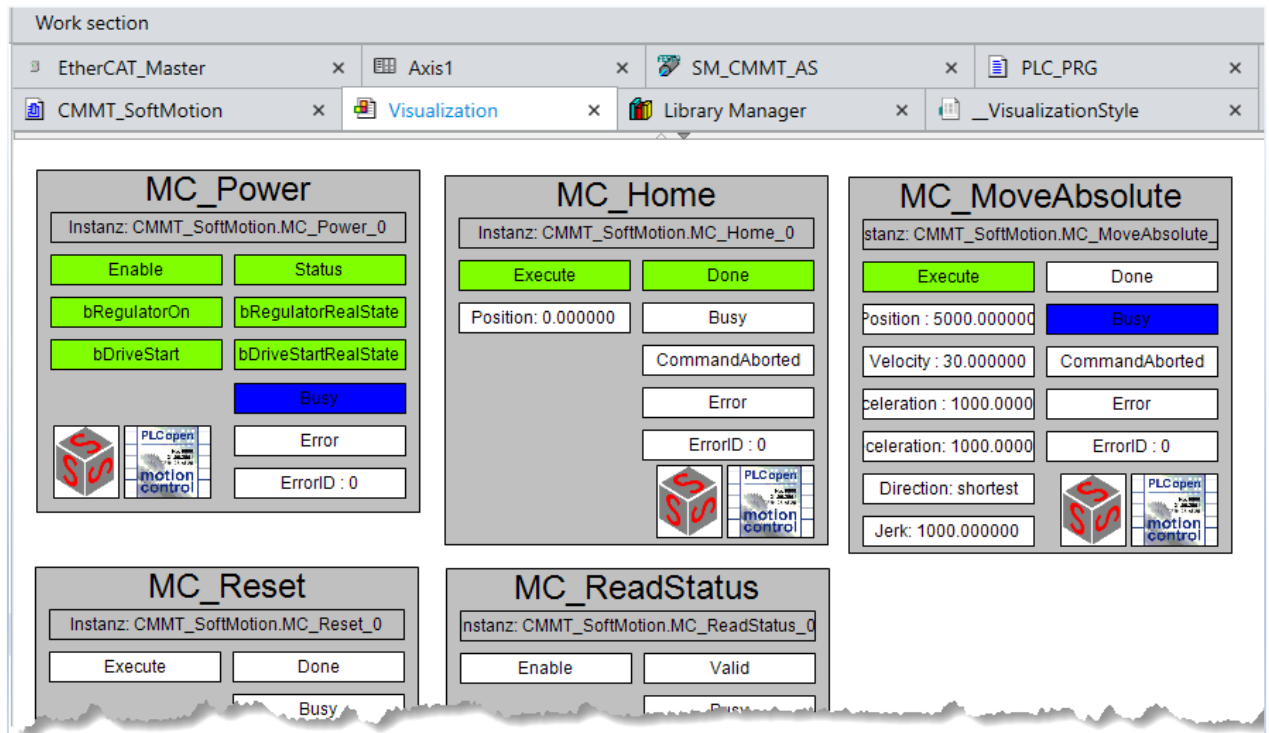
The linking process looks like this:



An easy visualization could look like this:



Step 3: Test your visualization in Online Mode:






## 2.5 Excuse Scaling

If you are using SoftMotion per default the factor group has following values:

Factor group		CODESYS device driver	
Current user unit	Rev [rev, rpm, ...] (3)	Mode	SoftMotion
Position	<input type="text" value="-6"/>	Version	4.0.14.0
Velocity	<input type="text" value="-3"/>		
Acceleration	<input type="text" value="-3"/>		
Jerk	<input type="text" value="-3"/>		

As default we are using following mode:

Parameter list			   <input type="text" value="x csp"/>
ID	Name	Value	
▼ /Axis1/CiA402 motion group[0] (41)			
P1.11412.0.0	Interpolation mode CSP	CSP (1)	<div>CSP (1)</div> <div>CSP (1)</div> <div>CSP-V (4)</div> <div>CSP-T (5)</div> <div>CSP-VT (6)</div>
▼ /Axis1/Configuration movement monitoring group[0] (13)			
P1.11280026.0.0	Valid movement monitoring CSP		

CSP (1) = Cyclic synchronized positioning mode = operating mode 8

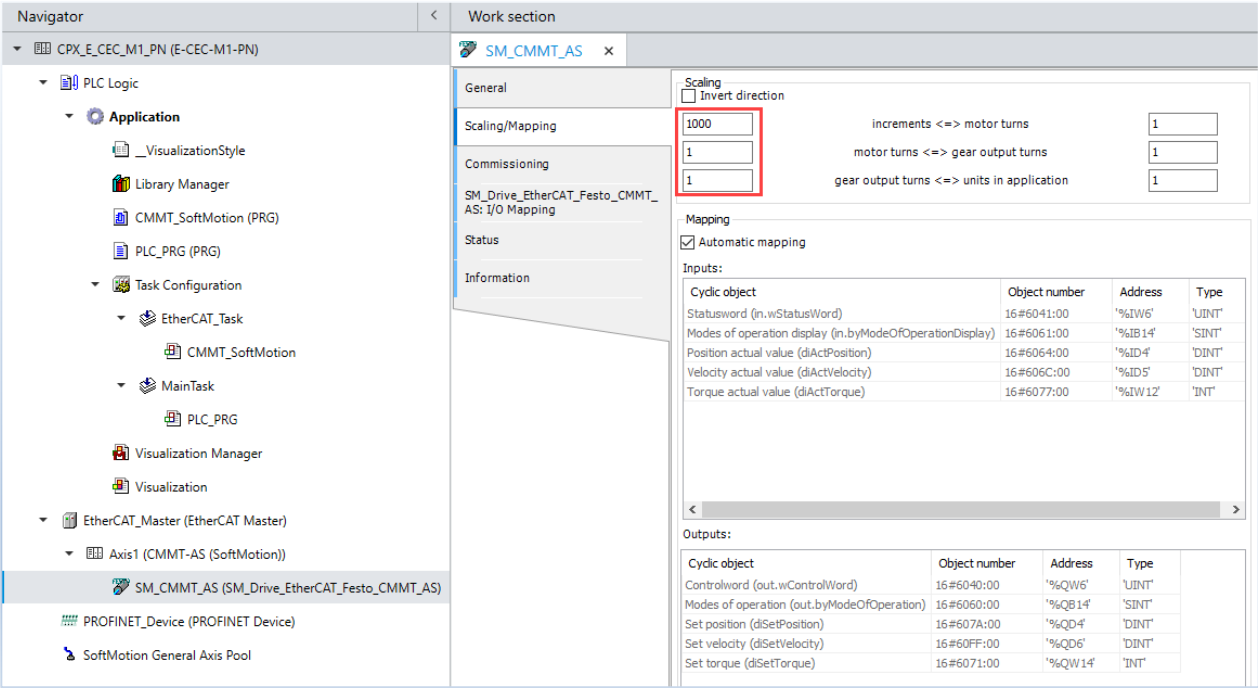
For operating mode 8 we only need the factor group value of the position. The user unit in FAS is 'meter' for linear movements. A typical value for the resolution is  $10^{-6}$ . It is recommended to work with this value. Depending on the system configuration this value could be different. You can also change this value manually, but be aware if you make this value 'coarser' then the drive will also deteriorate in his running behavior.

If you use the factor group of FAS then you have the advantage that you no longer have to be worry about the feed constants and any used gears.

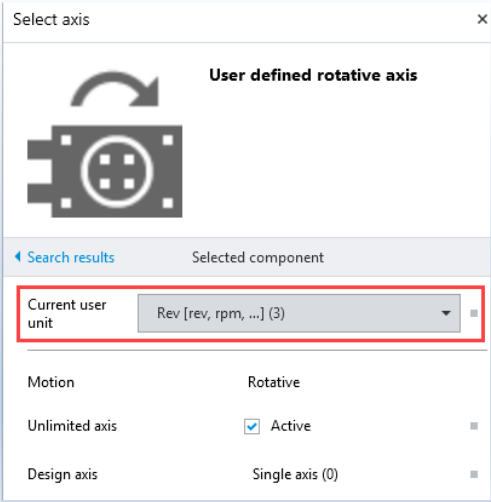
The derived parameters of speed, acceleration and jerk have no influence in operating mode 8. The basis for these values is the Factor group of the position



In a Codesys SoftMotion project per default the scaling is done like following:



In this application note project we have used following unit

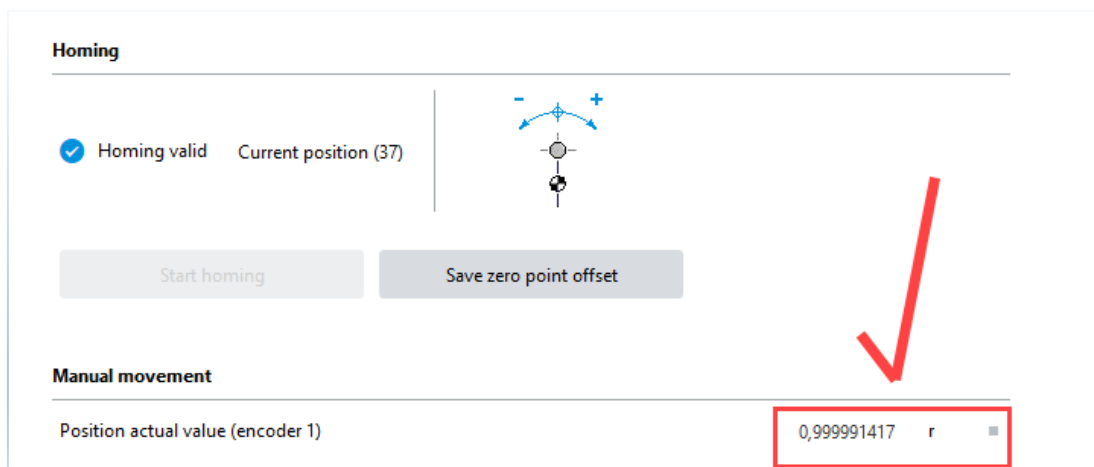
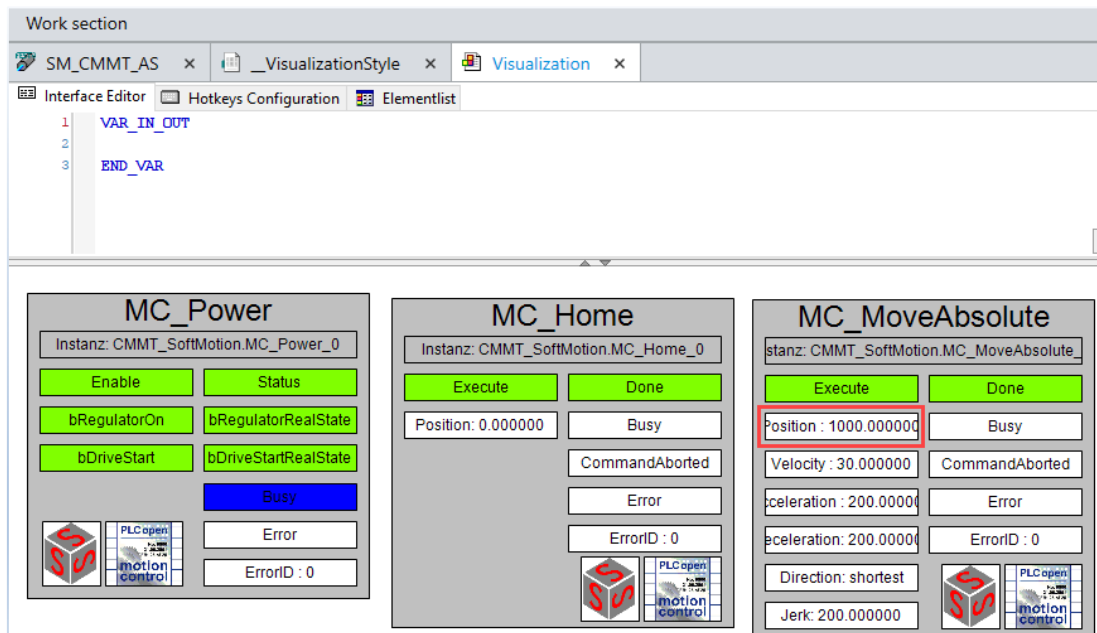


- A) That means 1 revolution (360°) in Codesys has a Position value of 1000

The reference remains with the factor group 'Position' in FAS and the principle is unit/s

➔ In our case **resolution/s**:

$$0,000001 \text{ (Factor CMMT)} * 1000 \text{ (Scaling Codesys)} = 0,001 * 1000 = 1 \text{ revolution}$$



- B) The velocity in operating mode 8 is using the same factor group like the position. That means if you enter e.g. a value of 3000 in Codesys then the velocity has a value of around 180 rpm

$$\text{In our case that means: } 0,000001 * 1000 * 3000 = 3/s = 180 \text{ rpm}$$

