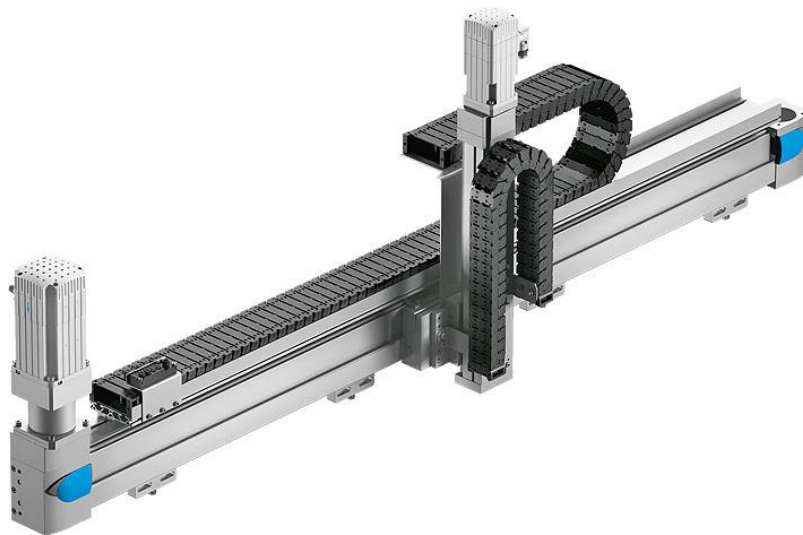




Festo_HomingLibrary

Description

Library for using drive-controlled homing with motor controller from Festo. The library is developed for using in TwinCAT environment with CiA402 drive profile.



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1 Important instructions

1.1 Version overview

Author	Date	Version	Comments
chmm	09.03.2018	3.1.20.0	• Library created
chmm	03.12.2018	3.1.20.1	• Bugfix for CMMT-AS • CMMT-ST added
chmm	07.05.2018	3.1.20.2	• Function block "Festo_MC_ReadAxisError" for CMMT-AS and CMMT-ST released
chmm	24.06.2021	3.1.24.0	• Function block "Festo_MC_Home" changed (no manual link of "ModesOfOperation" neccessary) • Function block "Festo_MC_ReadAxisError" for EMCA-EC released • Error list for CMMT-AS and CMMT-ST updated • CMMP-AS motor controller is no longer supported with this library
chmm	16.11.2021	3.1.24.1	• Bugfix in switching operation modes
fxlt	21.07.2026	3.1.24.9	• CMMT-AS-S3 Device supported • Updated Error List • Bugfix CMMT-AS/ST

1.2 Copyright Notice

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1.4 Target group

This manual is intended exclusively for technicians trained in control and automation technology, who have experience in installation, commissioning, programming and diagnostics of positioning systems and the relevant fieldbus. They must have a good knowledge of TwinCAT and their NC-axis programming.

1.5 Service

If you have a technical problem, please contact your local Festo service partner or use the respective contact form at the following website.

www.festo.com/contact

1.6 Safety instructions

When commissioning and programming positioning systems, you must observe the safety regulations in the manuals and operating instructions for the components used. The user must ensure that nobody has access to the sphere of influence of the connected actuators. Access to the potential danger area must be prevented by suitable measures such as barriers and warning signs. If additional commercially available components such as sensors and actuators are connected, the specified limits for pressures, temperatures, electrical data, torques, etc. must not be exceeded.

2 Introduction

2.1 Intended use

This library based on PLCopen is for using drive-controlled homing with motor controller from Festo in CiA402 drive profile. Drive-controlled homing is carried out automatically by the drive. It is only started by the control system. In addition, the current drive error text can be read out with this library. It's designed in TwinCAT 2 and TwinCAT 3 environment from Beckhoff.

The function blocks are called cyclically using a separate instance for each motor controller (each axis) integrated into the user program. Simultaneous use of other function blocks for controlling the same device is not permitted. The library described is used for following motor controllers:

- Servo drives CMMT-AS
- Servo drives CMMT-ST
- Integrated drive EMCA-EC

2.2 Characteristic of homing run

To run an electrical drive system, the system must be referenced. This can be done in several ways

- Via Festo Configuration Tool (FCT) or via Festo Automation Suite (FAS)
- Via fieldbus NC-controlled homing
- Via fieldbus drive-controlled homing (more complex because it is necessary to switch the operating modes)

In a running system, it is only possible to use the last two afore mentioned methods.

2.2.1 NC-controlled homing

By using the NC driven homing run, you should use the MC_Home function block from Beckhoff.

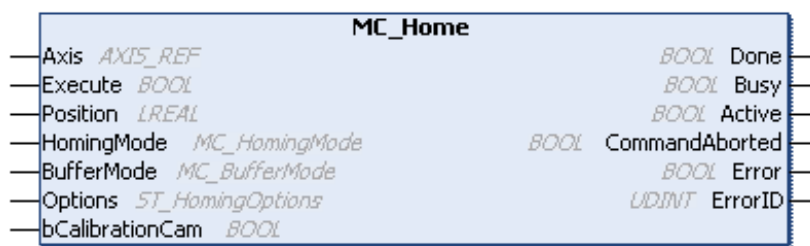


Figure 1: MC_Home function block (source: Beckhoff)



The limit switches must be connected to the PLC.



The observation of the axis limits must be done by the NC.
The controller internal SW limits must be deactivated by the start-up parameters.



We recommend the NC driven homing run! This is Beckhoff standard. Please refer to the Beckhoff documentation for how to use the MC_Home function block.

2.2.2 Drive-controlled homing

By using the drive-controlled homing, the home run is carried out automatically by the drive. It is only started by the control system.



Figure 2 : Festo_MC_Home function block



Homing Method of the motor controller must be configured with FCT (Festo Configuration Tool) or the FAS (Festo Automation Suite).

3 Content of the Festo_HomingLibrary

3.1 Overview

The “Festo_HomingLibrary” consists of two function blocks that extend the PLCOpen function blocks of the TwinCAT NC-axis by the drive-controlled homing run and the reading of the axis error:

- **Festo_MC_Home** --> starting the drive-controlled home run
- **Festo_MC_ReadAxisError** --> reading the most recent error number of the device

3.2 Referenced libraries

The “Festo_HomingLibrary” uses the following libraries from TwinCAT internally:

- Tc2_EtherCAT
- Tc2_MC2
- Tc2_Standard
- Tc2_System

3.3 Festo_MC_Home

Function block to start the drive-controlled homing run. This FB will control the “modes of operation” of the drive additionally. With a rising edge at “Execute” the following homing procedure of the Festo motor controller will start:

1. Identification of connected drive and fieldbus interface
2. Disable "lag distance monitoring position" by NC-axis (if monitoring is active)
3. Reset referenced bit of NC-axis
4. Write "modes of operation" of connected drive to mode 6 (homing mode)
5. Start homing run
6. Wait until drive-controlled homing run is finished
7. Set position of NC-axis
8. Enable "lag distance monitoring position" by NC-axis (if monitoring was active before homing run)
9. Set referenced bit of NC-axis
10. Set "modes of operation" back to commanded mode (input at function block)



During drive-controlled homing, the MC_Power function block temporarily loses control authority, which may result in an MC_Power error being reported.



CMMP-AS motor controller is no longer supported with this library.
(use version 3.1.20.2 or lower)



Figure 3: Festo_MC_Home function block

i Homing Method of the motor controller must be configured with FCT (Festo Configuration Tool) or the FAS (Festo Automation Suite).

Var_Input_Output

Variable	Type	Description
Axis	Axis_Ref	Reference to the axis

Var_Input

Variable	Type	Description
Execute	BOOL	Starts homing procedure with rising edge
TimeoutTimeHomingRun	TIME	Time for timeout supervision during homing run (default = 60 sec)

Var_Ouput

Variable	Type	Description
Done	BOOL	Homing run finished successfully
Busy	BOOL	Homing procedure is active
Error	BOOL	Signals that an error has occurred within the function block
ErrorID	WORD	Error identification
ErrorString	STRING	String with detailed error information

3.4 Festo_MC_ReadAxisError

Function block for reading the most recent axis error of the motor controller.



Figure 4: Festo_MC_ReadAxisError

Var_Input_Output

Variable	Type	Description
Axis	Axis_Ref	Reference to the axis

Var_Input

Variable	Type	Description
Enable	Bool	As long as "Enable" is true, axis error will be read

Var_Ouput

Variable	Type	Description
Valid	BOOL	If true, a valid set of outputs is available at FB
Busy	BOOL	Reading of axis error is active
AxisErrorID	UDINT	Value of the actual axis error
AxisErrorString	STRING	String with axis error information
Error	BOOL	Signals that an error has occurred within the function block
ErrorId	WORD	Error identification
ErrorString	STRING	String with detailed error information

4 Commissioning

Before starting the TwinCAT 3 environment copy the latest xml-file of the drive to the following folder:
C:\TwinCAT\3.1\Config\Io\EtherCAT.

4.1 Adding of new EtherCAT drive

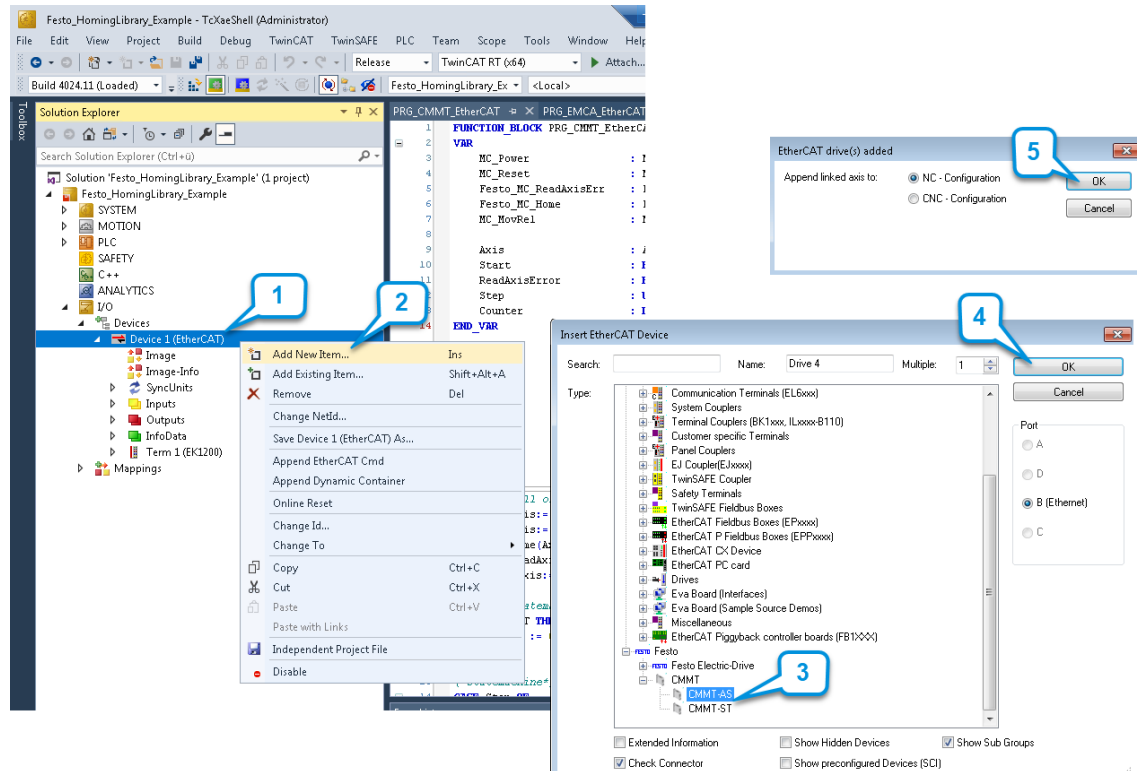


Figure 5: Adding of new EtherCAT drive

4.2 Adding of “Festo_HomingLibrary” and “TC2_MC2” library

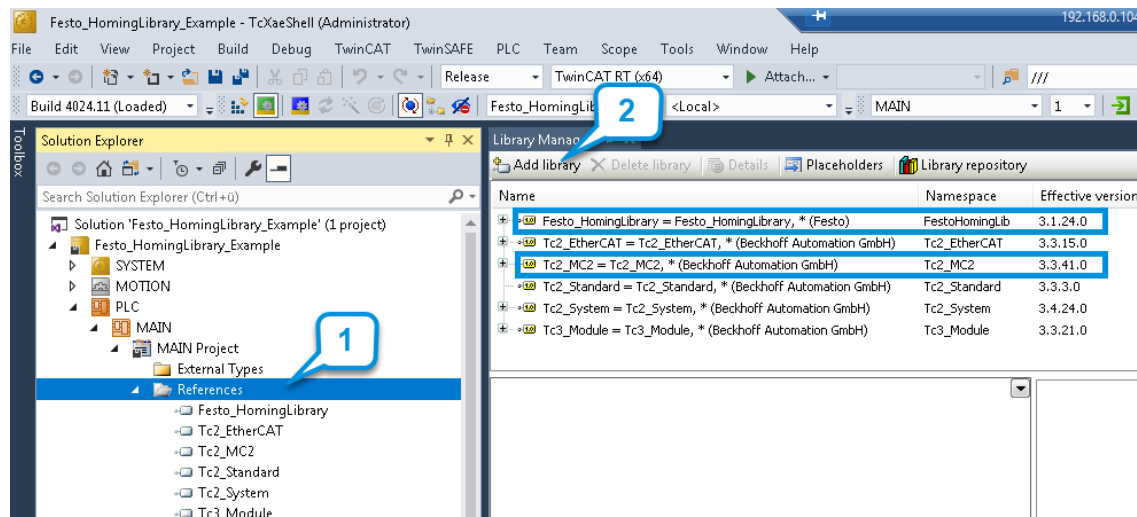


Figure 6: Adding of “Festo_HomingLibrary” and “TC2_MC2” library

4.3 Declaration of axis reference structure

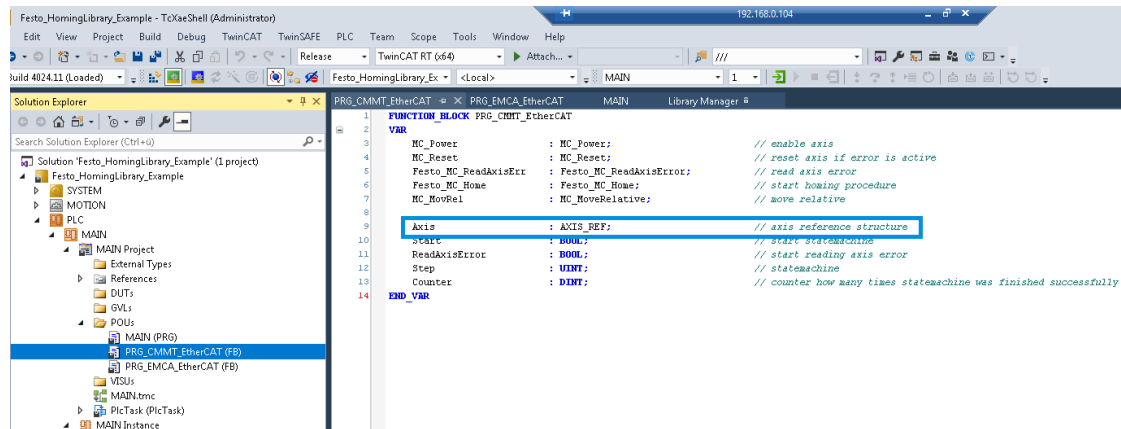


Figure 7: Declaration of axis reference structure

4.4 Linking of NC-Axis with the PLC-program and the drive

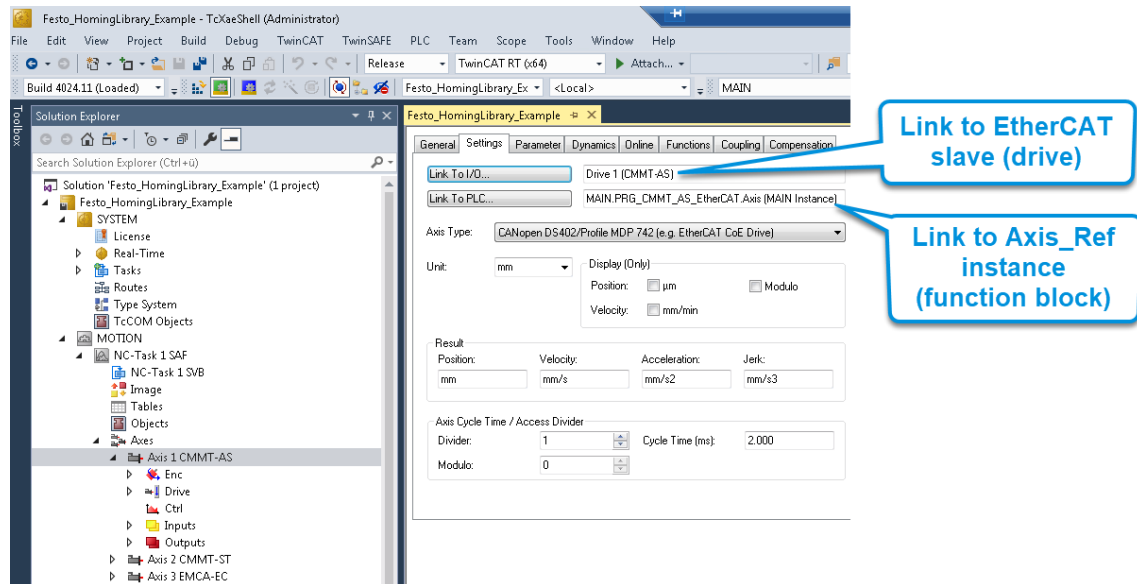


Figure 8: Linking of NC-Axis with the PLC-program and the drive

4.5 Changing the settings of the NC-axis

The “Scaling Factor Numerator” must be the same as in the Festo Automation Suite. In case of the CMMT-AS and CMMT-ST servo drives, the factory setting for the “Scaling Factor Numerator” value is 0,001 (if you use user unit “Metric”). For the user unit “Revision” or “Degree” set the “Command pulse count per motor rotation” to value is 0,000 001. If this factory setting has been changed in Festo Automation Suite under “Fieldbus”- “FactorGroup”, the scaling factor in the NC axis must also be adjusted.

For EMCA-EC the settings must be also the same as in the Festo Configuration Tool. In case of the EMCA-EC motor unit, the factory setting for the “Scaling Factor Numerator” value is 0,000 01

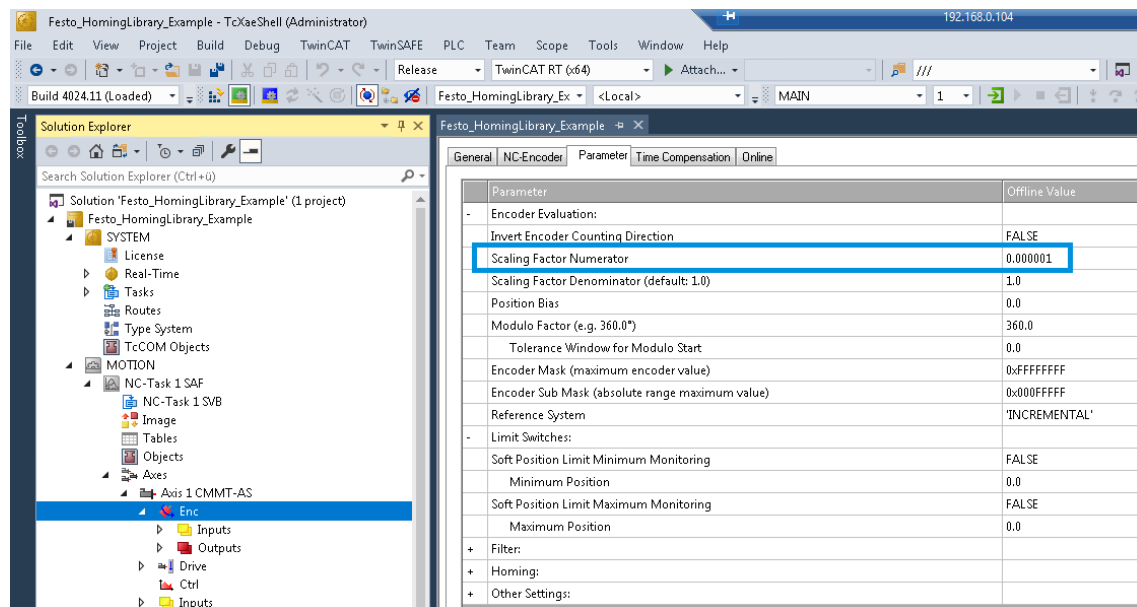


Figure 9: Changing the settings of factor group (scaling factor)

Festo recommends setting the “Following Error Calculation” to “Extern”. This means that the drive monitors the following error distance.

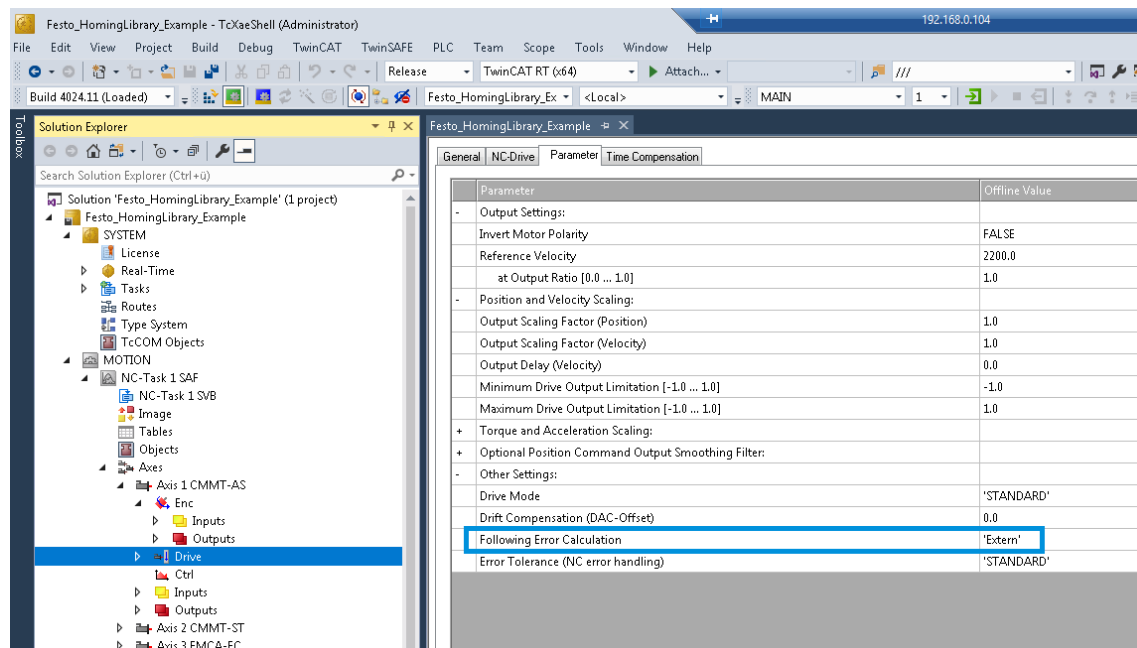


Figure 10: Changing following error calculation to extern

Make sure that "DC for synchronization" is activated.

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5 Coding example

```

1  (*cyclic call of function blocks*)
2  MC_Power(Axis:= Axis);
3  MC_Reset(Axis:= Axis);
4  Festo_MC_Home(Axis:= Axis);
5  Festo_MC_ReadAxisErr(Axis:= Axis, Enable:=ReadAxisError);
6  MC_MovRel(Axis:= Axis, Distance:= 25, Velocity:= 15, Acceleration:= 100, Deceleration:= 100, Jerk:= 300);
7
8  // reset statemachine if start is FALSE
9  IF NOT START THEN
10     Step      := 0;
11 END_IF
12
13 (*Statemachine*)
14 CASE Step OF
15     0: // init
16         MC_Power.Enable           := FALSE;
17         MC_Reset.Execute          := FALSE;
18         Festo_MC_Home.Execute     := FALSE;
19         MC_MovRel.Execute         := FALSE;
20
21         IF Start THEN
22             Step                  := 1;
23         END_IF
24
25     1: // enable
26         MC_Power.Enable           := TRUE;
27         MC_Power.Enable_Positive  := TRUE;
28         MC_Power.Enable_Negative  := TRUE;
29
30         IF MC_Power.Status THEN
31             Step                  := 20;
32         ELSIF MC_Power.Error THEN
33             Step                  := 10;
34         END_IF
35
36     10: // reset
37         MC_Reset.Execute          := TRUE;
38
39         IF MC_Reset.Done THEN
40             MC_Reset.Execute      := FALSE;
41             Step                  := 0;
42         END_IF
43
44     20: // start homing
45         Festo_MC_Home.Execute     := TRUE;
46
47         IF Festo_MC_Home.Done AND Axis.McToPlc.ActPos > -1.5 AND Axis.McToPlc.ActPos < 1.5 THEN
48             Festo_MC_Home.Execute := FALSE;
49             Step                  := 30;
50         END_IF
51
52     30: // move rel no. 1
53         MC_MovRel.Execute         := TRUE;
54
55         IF MC_MovRel.Done THEN
56             MC_MovRel.Execute     := FALSE;
57             Step                  := 40;
58         END_IF
59
60     40: // move rel no. 2
61         MC_MovRel.Execute         := TRUE;
62
63         IF MC_MovRel.Done THEN
64             MC_MovRel.Execute     := FALSE;
65             Counter               := Counter + 1;
66             Step                  := 20;
67         END_IF
68 END CASE

```

Figure 11: Implementation example