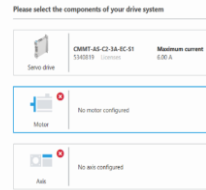


This document is a reference to understand and implement an FMCP (Festo Motion Control Platform) system, using Ethernet IP protocol



FMCP is based on Festo positioning basic library EVO3. In order to get further information refer to FMCP on Ethernet IP manual REV1.2

Open the FAS or FCT software depending of the drives available (CMMT-EC or CMMP)



The main parameters that needs to be set are:

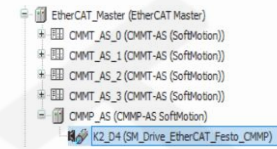
- The drive, motor, axis, mounting kit and gearbox if applied.

- Fieldbus option and supply voltage on device settings.
- Reference switches configuration.
- Homing Method.

Finally correct parameters and download to the device.

It is recommended to perform some movements to check if the configuration and load are correct. If the slave is a CMMP remember you will need the CAM-EC board on slot 2.

Once you download from the microsite the project archive <https://sites.google.com/view/fmcp/home> some values on the slave needs to be modified:



- Software Limits
- Dynamic Limits.
- Increments, motor turns, gear output turns if apply and units in application, these only for CMMP's.

In the case of CMMT these options does not need modifications. In both cases would work on ethercat.

NOTE:

If the elements of the base project change (PLC I/O boards, drives etc) addresses will change and de MAPPING section program will need to be modified.

On the project three User_GVLs/ GVL_CONFIG_K1....K3 depending on the kinematic available, you will need to set some important values:

- Available drives per kinematic - [arxAvailable]: a. FMCP: 1, 2, 3. (X,Y,Z) b. Virtual: 1, 2, 3, 4, 5 or 6.
- Type of drive for real axis - [areControllerType]: d. CMMP-ETC e. CMMT-ETC
- Motor orientation when H or T type selected - [areMotorOrientation].
- Address for real and virtual drive used - [arstRef].

```
FPosB.DRIVE_CONFIG := (
  arxAvailable
  areControllerType
  areMotorOrientation
  arstRef
  arlrFeedConstance
```

```
arxLimitAxes
arstLimitAxisDyn
```

- (Optional) - Axis dynamic limitation - [arxLimitAxes].
- (Optional) - Axis dynamic limitation - [arstLimitAxisDyn].
- (Optional) - Homing corner when H or T type selected - [eHomingCorner].
- (Optional) - Homing order [ariHomingOrder].
- (Optional) - Portal already homed - [xPortalAlreadyHomed].
- Kinematics type - [eKinematicType]: a. XY (2D, 3D), b. H and c. T.
- Software limits for each axis - [stKinematicSWLimit].

```
FPosB.HOMING_CONFIG := (
  xSetHomingCornerAsOrigin
  eHomingCorner
  stParkDynamic
  areHomingPosSingleAxis
  arlrUserHomingPos
  arxExcludeAxis
  ariHomingOrder
  areHomingMethodSingleAxis
  arxSaveHomingOffsetToEncoder
  xMoveToParkPos
  xPortalAlreadyHomed
  stParkPos
```

```
eKinematicType
stAddAxesConfig
```

```
eH_GantryBeltLock
//Software Limits
stKinematicSWLimit
```

The program without any changes works as eXY_Gantry The motor order is 1,2,3 (XYZ)

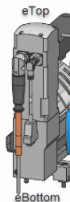
```
arxAvailable := [1,1,1,0,0,0]
arstRef := [ADR(K1_D1),ADR(K1_D2),ADR(K1_D3)]
```

In the case of eHGantry:

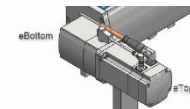
```
arxAvailable := [1,1,1,0,0,0]
arstRef := [ADR(K1_D1),ADR(K1_D2),ADR(K1_D3)]
```

In the case of eTGantry the first motor works as virtual:

```
arxAvailable := [0,1,1,0,0,0]
arstRef := [ADR(K1_V1),ADR(K1_D1),ADR(K1_D2)]
```

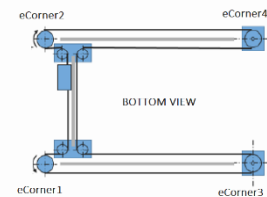


Orientation (areMotorOrientation) for a eXY an eH Kinematic

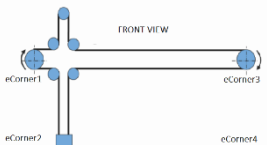


Orientation (areMotorOrientation) for a eT an eH Kinematic

Homing Corners:

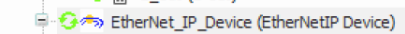


HKinematic



TKinematic

If dil switches are not going to be used and are set to 0, BootP commissioning tool must have been used to disable dhcp and assign an IP. Open the EtherNet_IP_Device by double clicking



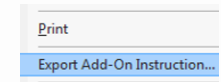
On the Parameters tab, Expand the "Network Settings" parameter heading. Configure the IP Address/Subnet/gateway and turn OFF the DHCP.

Network Settings		
IP-Address	STRING(255)	'192.168.0.2'
SubnetMask	STRING(255)	'255.255.255.0'
Gateway	STRING(255)	'0.0.0.0'
DHCP	Enumeration of BYTE	OFF

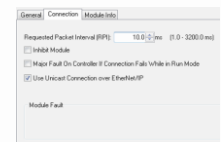
5

EHTERNET MODULE AND ADD ON

Once the Version 6 .ACD file has been downloaded from the microsite (FMCP Allen Bradley function block). You must open the file.



Generic ethernet module



6.3

POINT TO POINT SEQUENCE

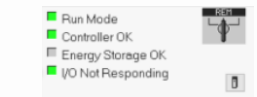
Point to point sequence: On this example the program is on PTP operation mode and complete one point to point movement.

ACTION	TRANSITION
bModeSelector := 5 (Point to Point)	bModeSelected == 5
rNominalVel_CNCConstantVel := Target speed mm/sec	bMoveDn == 1
rMoveAcceleration	
rMoveDeceleration := Target Decel mm/sec^2	
rXAxisMove_CNCOffset := Target Destination	
rYAxisMove_CNCOffset := Target Destination	
rZAxisMove_CNCOffset := Target Destination	
bMove :=1	
bMove :=0	bMoveDn == 0

5.1

EHTERNET MODULE AND ADD ON

Include the Add on, reference to the generic ethernet module:



Compile and download to Rockwell plc. You can verify the communication on codesys as well:



6.4

SAFE MOVE WITH NO Z OFFSET

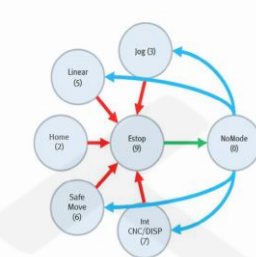
Safe move: On this example the program is on Safe move operation mode and complete one interpolated movement.

ACTION	TRANSITION
bModeSelector := 6 (Safe Move)	bModeSelected == 6
rNominalVel_CNCConstantVel := Target speed mm/sec	bMoveDn == 1
rMoveAcceleration rMoveDeceleration := Target Decel mm/sec^2	
rXAxisMove_CNCOffset := Target Destination	
rYAxisMove_CNCOffset := Target Destination	
rZAxisMove_CNCOffset := Target Destination	
zAxisUpMoveK1:= Target Distance Z AxisUp	
rSmoothRadMove_CNCRotateK1:= Target smooth radius	
bMove :=1	
bMove :=0	bMoveDn == 0

6

OPERATION MODES

The FMCP has the following operation modes:



- 0.-No mode: On this state the system will clear faults, And will enter on config mode if has not been done and later will return to no mode.
- 9.-Estop: This step unable any movement, restart any mode and clean errors.
- 2.-Home: homing routine of the system.
- 3.-Jog: The axis can be jogged (one at the time).
- 5.-Linear: Point to point movements.
- 6.-Safe Move: Interpolated pick and place movements saving height in every motion to protect eoat.
- 7.-Dedicated function for dispensing at constant speed, incudes H and M functions for external signals and pauses.

7

WEB VISUALIZATION

The web visualization can be used for configuring, monitoring and troubleshooting the system



While orders are being executed on the code user can monitor changes and values on the visualization.

System can be operated as well.

Changing Settings:

If you need to change a configuration value click on the visualization on “Config Mode” Password: “Festo” then modify and click on “SAVE” button.

in order to auto load the modify parameter after a power cycle set to TRUE on GLV_CONFIG_K1 “xAutoLoadParameter”

xAutoLoadParameter := TRUE,

6.1

HOMMING SEQUENCE

Only a brief of the OP modes will be described on these manual, and the required I/O. As a rule, the system can’t change of OP Mode if they Move” bit or a motion routine remained active.

On this example the program change from STOP to HOMING operation mode, then complete home:

ACTION	TRANSITION
bModeSelector := 9 EStop	bModeSelected == 9
bModeSelector := 0 (Error verification)	bModeSelected == 0
bModeSelector := 2 (Homing)	bModeSelected == 2
bMove := 1	bHomed == 0
bMove := 0	bHomed == 1

8

TROUBLESHOOTING

If an error appears during operation, a description can be get and a possible reaction to solve the problem can be found on these visualization section.

Message System							v 3.14.13.5		eXY_Gantry		
<div>Hex View</div>		MSG ID	MSG Table	(Text/Hex) Add01	(Hex) Add02	Dev	Sub System	Reaction	Cat	Timestamp	
Ack		ERR_PositoningError	1	SMC_AXIS_NOT_READY_FOR_MOVE		3	0	1000	3	07#2020-05-03-04:54:35	

The MSG Table column display with additional table including more detailed information (1-> SMC_ERROR; 2-> CANOPEN_KERNEL_ERROR; 3-> SDO_ERROR)

If error in a drive occurred, it is possible to get the error description.

ERR_DriveError	1	SMC_DL_HWLIMITS_EXCEEDED
----------------	---	--------------------------

Get Drive Error

In order to get the drive error, the “Get Drive Error” button is available.