

# Robot Manipulators and Automation

## AUTO4507

### Lab Assignment 1+2 – *Group* – Industrial Automation Points: 10+10

#### Pre-Lab – Complete before the lab session

Before the first lab, answer pre-lab questions by reviewing the documentation in the Festo directory:

<https://roblab.org/courses/robman/labs/info-Festo/PrelabDocumentation/>

#### All stations:

1. What is the operating pressure of each station?
2. What is the operating voltage of each station?
3. A compressor can generate 28l/min of air for all 5 Festo modules, is this sufficient?
4. What is the comparative height difference between the red, silver, and black workpieces?

#### Through Beam Sensor Receiver: SOEG

1. What is the maximum range?
2. What is the measurement principle?

#### Sorting station – Sensors:

1. (Proximity-SIEN):
  - a. Operating Principle?
  - b. Max switching distance?
2. (Proximity-SME):
  - a. Operating Principle?
3. (Retro-Reflective-SOEG):
  - a. Operating Principle?
  - b. Coverage Range?
4. (Transmitter-SOEG):
  - a. Operating Principle?
  - b. Coverage Range?

#### Pick and Place station – Vacuum Generator:

1. A module supplies 1100kPa of pressure, can it be connected to this unit?
2. A workpiece requires -3 psi to be lifted, why can/can't this module be used?

## Lab 1 – Codesys

- Install and use CODESYS to determine, from the global variable lists, the PLC addresses (e.g., %IX1.0) corresponding to the variables listed in the tables below.
- Indicate whether the variable is an input (e.g., provides a reading from a sensor) or an output (e.g., provides a signal to trigger a motor)
- Provide a short description for the meaning of a high value corresponding to each variable (e.g., for an output variable: when high, conveyor moves forward; or, for an input variable: when high, workpiece is at sensor)

### Variable Matching: Distributing Station:

Variable	PLC Address	Input/ Output?	Meaning of high input/output
<b>FB_Mod_SM</b>			
xSlideRetracted			
xSlideExtended			
xMagEmpty			
xExtendSlide			
<b>FB_SeqNTransport_DI</b>			
xSensorStart			
xSensorMid			
xSensorEnd			
xConvForward			
xConvBackward			

**Measuring Station:**

<b>Variable</b>	<b>PLC Address</b>	<b>Input/Output?</b>	<b>Meaning of high input/output</b>
<b>FB_Mod_ME</b>			
xGripperOpened			
xGripperIsUp			
xSwivelDriveLeftPos			
xSwivelDriveRightPos			
xOpenGripper			
xGripperDown			
xSwivelDriveRotateClockwise			
<b>FB_SeqNTransport_ME</b>			
xSensorStart			
xSensorMid			
xSensorEnd			
xConvForward			
xConvBackward			
xExtendSeperator			
xRetractStopper			

**Pick and Place Station:**

<b>Variable</b>	<b>PLC Address</b>	<b>Input/ Output?</b>	<b>Meaning of high input/output</b>
<b>FB_Mod_PP</b>			
xSlideRetracted			
xSlideExtended			
xSuctionCupUp			
xWorkpiecePieckedUp			
xRetractSlide			
xExtendSlide			
xSuctionCupDownwards			
xVacuumOn			
<b>FB_SeqNTransport_PP</b>			
xSensorStart			
xSensorMid			
xSensorEnd			
xConvForward			
xConvBackward			
xExtendSeparator			

**Sorting Station:**

<b>Variable</b>	<b>PLC Address</b>	<b>Input/ Output?</b>	<b>Meaning of high input/output</b>
<b>FB_Mod_RE</b>			
xForkLightBarrier			
xReflexLightSensor			
xInductiveProximitySensor			
<b>FB_SeqNTransport_SO</b>			
xSensorStart			
xConvForward			
xSeparator1Exdented			
xSeparator2Exdented			
xSensorSlides			
xExtendSeparator1			
xExtendSeparator2			
xRetractStopper			

## Lab 2 – Run the Automation System

During the second lab each group will be assigned a module of the Festo production line.

### Tasks

- In the provided code for each station, several variables have been replaced with a variable called 'Dummy\_Var'. Replace all dummy variables with the correct variable (provided in the tables above) o Note: if a dummy variable corresponds to an action, the action type (S, R, N) may need to be changed too.
- As a group, demonstrate uploading the working program to the Festo station.