

Robot Manipulators and Automation

AUTO4507

Lab Assignment 1 – <i>Group</i> – Industrial Automation Points: 5+5 = 10
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Pre-Lab – Complete before the lab session

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

<https://roblab.org/courses/robman/doc/festo/>

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?

Experiment 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:

1. Feeder Station:

Variable	PLC Address	Input/ Output?	Meaning of high input/output
FB_Mod_SM			
xSlideRetracted			
xSlideExtended			
xMagEmpty			
xExtendSlide			

FB_SeqNTransport_DI			
xSensorStart			
xSensorMid			
xSensorEnd			
xConvForward			
xConvBackward			

2. Measuring Station:

Variable	PLC Address	Input/ Output?	Meaning of high input/output
FB_Mod_ME			
xGripperOpened			
xGripperIsUp			
xSwivelDriveLeftPos			
xSwivelDriveRightPos			
xOpenGripper			
xGripperDown			
xSwivelDriveRotateClockwise			

FB_SeqNTransport_ME			
xSensorStart			
xSensorMid			
xSensorEnd			
xConvForward			
xConvBackward			
xExtendSeperator			
xRetractStopper			

3. Pick and Place Station:

Variable	PLC Address	Input/ Output?	Meaning of high input/output
FB_Mod_PP			
xSlideRetracted			
xSlideExtended			
xSuctionCupUp			
xWorkpiecePieckedUp			
xRetractSlide			
xExtendSlide			
xSuctionCupDownwards			
xVacuumOn			

FB_SeqNTransport_PP			
xSensorStart			
xSensorMid			
xSensorEnd			
xConvForward			
xConvBackward			
xExtendSeparator			

4. Pressure Station:

Variable	PLC Address	Input/ Output?	Meaning of high input/output
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5. Sorting Station:

Variable	PLC Address	Input/ Output?	Meaning of high input/output
FB_Mod_RE			
xForkLightBarrier			
xReflexLightSensor			
xInductiveProximitySensor			

FB_SeqNTransport_SO			
xSensorStart			
xConvForward			
xSeparator1Exdented			
xSeparator2Exdented			
xSensorSlides			
xExtendSeparator1			
xExtendSeparator2			
xRetractStopper			

Experiment 2 – Run the Automation System

During the 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 and running your program.