

54029 system is used to demonstrate the integration of mechatronics system with robot for a weighing and inspection process. The containers are placed on a conveyor system. Upon detection of containers, the belt conveyor moves forward. A sensor checks the material type (metal or plastic). According to the program, the container is sorted or rejected using the rejection chute. The containers that are accepted are transferred using Rotary Pick & Place Manipulator to the Weighing Module. The weighing module calculates the weight of each container. According to the weight tolerances configured, the containers are stored in the pallet using the SCARA ROBOT.

Learning Objectives:

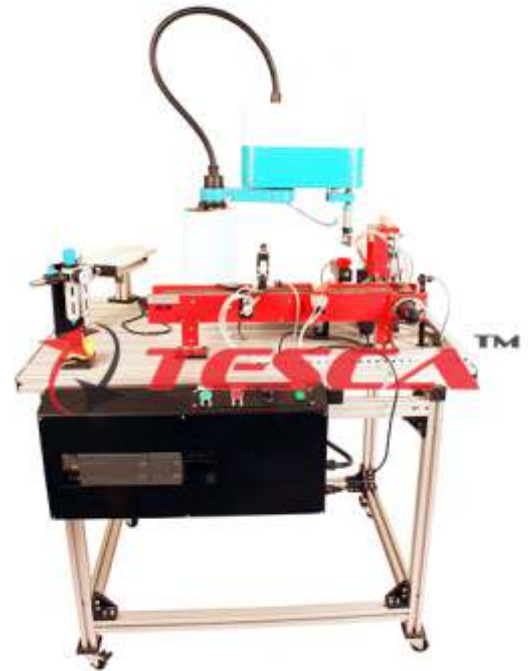
Having successfully completed this lab, the student will demonstrate knowledge in

In Robot Technology

- Study of Classification of robots
- Study of kinematics of robot
- Programming techniques
- Application of robot
- control aspects of various Driving system (Stepper & RC servo)
- Understanding of robot inter-joints, kinematics and control methodology.
- Demonstrate knowledge in the control system of robot
- Demonstrate knowledge in the operating industrial robots.
- Learn about the maintenance of these systems

In Automation Technology

- Basic concepts in automation.
- Basic applications of automation in industries
- Advanced applications of Sensors, Pneumatics in automation.
- Learn Robotics & Automation technology.
- Study the actual control system used in industries
- In-depth training in fault detection & correction
- Learn about the maintenance & servicing of these systems



TECHNICAL SPECIFICATIONS - INTEGRATION OF SCARA ROBOT WITH AUTOMATION

- **Key Advantages of Tesca Mechatronics systems:**
- The industry is looking for students who have skills and knowledge of **integrated engineering technologies and problems solving skillsets**. Tesca’s Adv Mfg & Automation training solutions are designed to deliver the same through our **Industry 4.0 Smart Factory, and Smart Mechatronics products**. We have already delivered over **50+ systems globally** to highly reputed educational institutions.
- The Tesca product portfolio is ready for Industry 4.0 integration and IIOT Training
- Our training solutions are developed with focus on delivering skills and transferrable knowledge that students can carry from their classroom/ labs to the industry
- Our hardware is accompanied with world-class online training courses (SKILLON365)
- **IOT Ready:** Equipment is Internet of Things ready and can be interfaced with IoT platform. This is an option.
- **Digital Twin:** Digital twin is available for all mechatronics system as an option.
- Approach to the design, construction, training and future ready concepts aligned with European and American educational system
- **Train on Automation in Circuit:** Understand how automation works - from simple to complex circuits
- **Train on Automation in Application:** Understand how automation works in industries - from simple to complex applications, programming & control
- Train on Automation in Maintenance: Understand how to identify faults and troubleshoot in automation -variety of exercises to train in this area
- **SKILLON365:** Online courseware that gives the users flexibility of selecting courses from a variety of technologies and changeable each year.
- Tesca modules are built for durability, robustness and performance, high quality and aesthetic finish
- **Highly reliable components:** Pneumatics from Festo, PLC from Siemens, Sensors for reputed international manufacturers, Mechanical components from reputed international industrial suppliers

Note: Specifications are subject to change.

Tesca Technologies Pvt. Ltd.

IT-2013, Ramchandrapura Industrial Area, Sitapura Extension,
 Near Bombay Hospital, Vidhani Circle, Jaipur-302022, Rajasthan, India,
 Tel: +91-141-2771791 / 2771792; Email: info@tesca.in, tesca.technologies@gmail.com
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- **Serviceability:** We support our product globally through our reselling partners and through "Going Digital with Tesca" platform, where you can connect with our service specialists through asynchronous communications or synchronous communication means

MAPS 1 -Weighing & Palletizing System Consists off the following

- Complete Workstation Mounted on a aluminium Profile Plate with Operating Console - **1No.**
- Belt Conveyor - **1No.**
- Rotary Pick & Place Manipulator - **1No.**
- Weighing Module - **1No.**
- Pallet - **1No.**
- Rejection Chute - **1No.**
- PLC - **1No.**
- Main Supply : 110VAC/230V AC, 50/60 HZ, 100 VA With Power Supply Unit, Interconnections - **1No.**
- Quest SCARA -4 Axis Assembly Robotic ARM with Pallet, & Robot Controller Software as detailed below - **1No.**

1. Common configuration of 54029 Stations

Each station is mounted an aluminum profile plated that is placed on a mobile trolley and fitted with PLC as required by the station. Aluminum Profile Plate for mounting all pneumatic & other components to the modules. All electrical and electronic items shall be housed in the cabinet of the trolley below the platform."

- Operating console with Push button for start, stop, two way selector switch, power switch, emergency stop button - **1No.**
- Dimensions 620(W) x 400(D) x 980(H) mm
- Power Supply Unit with - **1No.**
 Input Voltage: 110V & 48A, 50/60 Hz, Single Phase
 Output Voltage: 24V DC
 Output Current: 4.5A
 with short circuit protection
 Fully wired & Programmed PLC Unit is provided with
- a) Siemens PLC S7-1200 CPU - **1No.**
 24 Digital input,16 Digital output & 2 Analog input
- b) Communication cable - **1No.**
- c) PLC Programming Software - TIA Portal Basic (v13 sp1):Programming - **1No.**
 Language: Comply IEEE programming language capability."1Siemens
- Service Unit: FRL Unit with pressure regulator, pressure gauge with maximum pressure 10 bar. Shut off value will be provided with FRL. Switch Knob will be provided in all stations. - **1No.**
- Work pieces - **1Set.**
- Electrical Cabinet: - **1No.**
- Accessible electrical connection terminal box with power input and coded I/O.
- Industrial communication with others station via standard communication protocol.
- Communication interface: Ethernet port.
- Include hard wired and PLC program (manual and auto mode operation)"
- Communication interface: Ethernet port.
- All wiring cables are properly identified and labelled at both ends.
- All pneumatic cables and tubing are properly identified and labelled at both ends.



2. Belt Conveyor Module

The conveyor module conveys the part from one end to another.

Specification:

- Motor : 12 V DC power motor
- Length : 420mm
- Height : 60mm
- Width : 40mm
- Belt : Nylon fabric belt
- 4 gates provided for fixing sensors and part ejection.
- Knob screw (1 no) and T-nuts of diameter M6 are provided for quick fixing of the module on profile plate.



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3. The Rotary Pick And Place (RPP) Module

The rotary pick and place (RPP) module picks the work piece from one position, horizontally rotates by 90° and then places the work piece to another position.

The part shall be moved to next location for processing, in a rotary manner. The module is a stand alone functional unit with readiness to connect electrically and pneumatically through external valve module and PLC and I/Os to actuate the function. The module is completely ready to mount with quick mounting knob screw and T-nut on 8mm T-slotted n tube.

Specification:

Double acting pneumatic cylinders	:	3
5/2 Single acting solenoid valve	:	1
5/2 Double acting solenoid valve	:	2
Reed switches	:	4
Rotation angle	:	90°
Vertical stroke	:	20mm
Mounting	:	Knob screw (1no)
Scope of supply		
Quick mounting knob screw and T-nut – 1		
Pneumatic module		
Air supply module		



4. Weighing Module

The weighing Module weight the material using a load cell and shows the value in the PLC

Specification:

Type : Electrical System
 Required Work piece : Cylindrical Work piece
 Load cell for weighing module : 1 no.
 Amplifier unit with relay output



5. Air Supply Module (FRL Unit)

This consists of the air filter, pressure regulator and lubricator unit, and supplies compressed air to control the movement of the pneumatic cylinders.

Pressure regulator – The pressure regulator maintains a constant output pressure independent of pressure fluctuations and air consumption. The output pressure can be reduced by means of a secondary venting without compressed air consumers.

Air filter – The air filter removes contamination, pipe sinter, rust and condensate from compressed air.

Lubricator – The proportional lubricator adds precision adjustable quantity of oil to the compressed air. The oil droplets are atomized just downstream from proportional valve in the air duct. The oil mist component is proportional to the compressed air flow rate.



Scope of supply

Quick mounting knob screw and T-nut – 1
 shut-off valve and 5m tube of diameter 8mm

6. SCARA Robot

Industrial SCARA Robot – SR4 - 300

Tesca's high performance industrial SCARA robot is made based on International standards. This compact industrial robot is offered with total reach of 300mm and maximum payload capacity of 5kg. The robot guarantees high accuracy and easy calibration. Specially designed light weight arms offers maximum acceleration and higher bending resistance. The robot's minimum space requirement and easy installation help it adapt to any automation system.



4 AXIS HIGH PERFORMANCE INDUSTRIAL SCARA ROBOT

Specification

Number of Axis	:	4
Axis Arm Length		
X Axis (mm)	:	100

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Y Axis	:	200
Z Axis - route (mm)	:	150
Total Reach		
Robot (mm)	:	300
X Axis Deg +/-	:	127
Axis Rotation Angle	:	
Y Axis Deg +/-	:	142
R Axis Deg +/-	:	360
Repeat Positioning Accuracy		
X, Y Axis mm +/-	:	0.01
Z Axis mm +/-	:	0.01
R Axis Deg +/-	:	0.005
Maximum Speed		
X Axis Deg/Sec	:	600
Y Axis Deg/Sec	:	600
X, Y Axis Synthesis m/Sec	:	5.2
Z Axis m / Sec	:	1.3
R Axis Deg/Sec	:	1667
Maximum Payload	:	5Kg
Related Payload	:	2Kg
Limit Protection	:	All Axes Software & Mechanical Limit (x, Y, Z Axis)
Weight	:	14Kg
Robot Cable Length	:	5M
Controller	:	Teach pendant
Power Supply	:	230 V AC, 50/60 Hz
Dimensions And Weight		
L x W x H	:	1050 x 900 x 1800 mm
Weight	:	140Kgs (approx.). Robot not included in weight (+15 kg)

Experiments

Experiments for Robotic Technology

- Program the robot for assembling operation using joint control method.
- Programming for a pick & place operation using PTP / joint commands using any suitable methods.
- Program the robot using arithmetic and looping commands for simple application using joint control.
- Program a robot with loop programming with various speeds control techniques.
- Simple Programming of robot for simultaneous movement
- Write down a flow control & conditional program for the robot for any suitable applications.
- Program the robot to communicate with external devices using built-in output commands
- Study on the pros and con's using various programming methods and logic.

Experiments for Integration of Robotics with Automation

Basic Exercises:

- To move the Robot come down pick the bottle and move up and open the gripper.
- To make the Robot to come down pick the bottle and places it in the weighing module.
- Program to Start and stop the Belt Conveyor using single button at any locations.
- To run the Belt Conveyor continuously when the start switch is pressed, until the stop button is pressed.
- To run the Belt Conveyor when start button is pressed and automatically stop it after a time delay 10 sec.
- To move the unloading arm when the start is pressed and moves it back to home position after 10 sec.
- Transfer the job from Belt Conveyor end to Weighing module position.

Advanced Exercises:

- Programming of Robot with memory array for the bottle's processed.
- Programming and control of unloading module and integrating of weighing module to form a closed loop system.
- Programming of Robot with station control.
- Program to check for inspection and place the bottle in the weighing module
- Program to sensor trigger/manual triggered and to make the Robot to come down pick the bottle and places it in the next module
- Full complete system – sequence.

REQUIRED EQUIPMENT AT SITE AND UTILITIES TO BE PROVIDED BY THE BUYER DURING

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COMMISSIONING, DEMONSTRATION & TRAINING

For

- Compressor - 100 Litre tank Capacity, 6 to 8 Bar (100 – psi) - 1No
- Desktop computer required with specification below
- Operating System : Windows 7 Professional or higher
- Processor Required At least 2.4 GHz or equivalent, RAM : at least 4 GB
- Graphic Card : at least 1 GB or equivalent

Set Of Spares

Photoelectric sensor	:	1 Nos.
Capacitive sensor	:	1 Nos.
Fuse	:	10 Nos.
Relay	:	2 Nos.
Bottles	:	4 Nos.
Filling material	:	1 pckt
Pneumatic hose	:	2 mtr

Note: As part of continuous improvement, Tesca reserves the right to alter machine design and specification without prior notice.

Ordering Details

SN.	Order Code	Details
1.	54029A	Export Packing

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