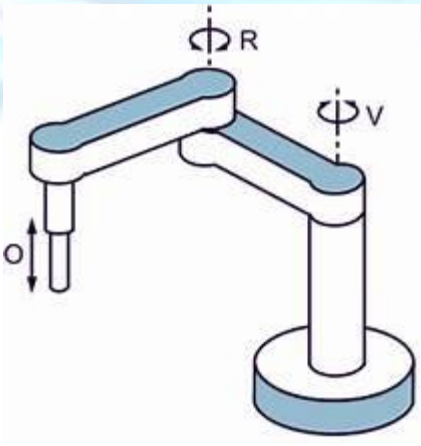
1.5 ROBOTCLASSIFICATION:

THE PNEUMATIC ROBOT:

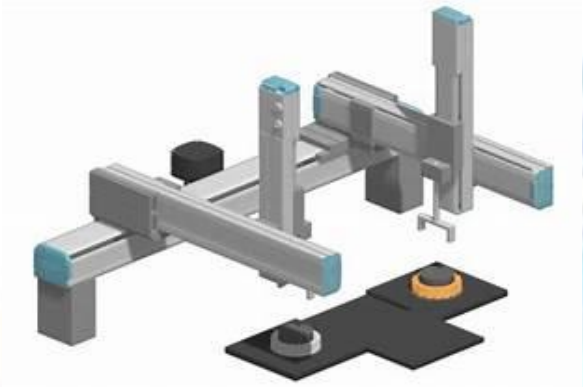
Pneumatic powered, it has no servo motors driving the axes, but an air cylinder instead. This device takes air from the room and compresses it. By pressurizing the air, the compressor can power different movements and tasks. If the air wasn't pressurized, the arm wouldn't be able to move very much, if at all. A popular application is to pick and place small components into an assembly, Pick and Place units are fast, accurate and very cost effective.

THE SCARA ROBOTS:

Scara means Selective, Compliant, Robot arm. SCARA robots are essentially robotic arms with several joints that give them the flexibility to perform various tasks. A



typical SCARA configuration includes a controller, a power supply, an end-effector (like a gripper or special tool), and specialized software. SCARA robots stand out from other industrial robots due to their unique range of motion, particularly in the X-Y plane. This means it can move horizontally in any direction within its workspace. It can also move vertically, although with some limitations, as the vertical axis remains fixed.



THE GANTRY ROBOT:

This type of robot is generally mounted direct to the shop floor and usually has a large work envelope. It can be used for material handling applications. They can be pneumatic powered the cost of servo drives for industrial robotics is getting so competitive that today the air powered types are few and far between.

CARTESIAN ROBOTS:

These machines are usually mounted on a table and are similar in concept to the gantry robot but on a smaller scale. A Cartesian robot is a type of industrial robot

that moves along the three main axes of a Cartesian coordinate system: X, Y, and Z. It is often used in assembly and handling applications because it offers precision and control in each of its movements. Pick and place, Assembly, Material handling,3D printing

THE 6-AXES INDUSTRIAL ROBOT ARM:

Maybe the most recognized industrial robot. It is available in a wide range of sizes and payloads; they can be small enough to mount on a table. The robot arm can be found in all types of uses, from assembly to welding to painting and material handling.

THE PAINTING ROBOT:

Painting robots are specialized robotic systems designed to automate the painting process in manufacturing environments. They utilize advanced technology to apply coatings, paints, and finishes to a variety of surfaces with remarkable accuracy and consistency. These are typically equipped with various tools and technologies that enable them to perform complex robot's tasks that would be challenging or impossible for human workers. The integration of robotics into the painting process not only enhances productivity but also significantly reduces the risk of human error.

THE WELDING ROBOT:

Robot welding is the use of mechanized programmable tools (robots), which completely automate a welding process by both performing the weld and handling the part. Processes like gas metal arc welding, while often automated, are not necessarily equivalent to robot welding, since a human operator sometimes prepares the materials to be welded.

1.6 TECHNICAL SPECIFICATION IN ROBOTICS

ACCURACY: The robot's program instructs the robot to move to a specified point; it does not actually perform as per specified. The accuracy measures such variance. That is, the distance between the specified position that a robot is trying to achieve (programming point), and the actual X, Y and Z resultant position of the robot end effector.

REPEATABILITY: The ability of a robot returns repeatedly to a given position. It is the ability of a robotic system or mechanism to repeat the same motion or achieve the same position. Repeatability is a measure of the error or variability when

repeatedly reaching for a single position. Repeatability is often smaller than accuracy.

DEGREE OF FREEDOM (DOF): Each joint or axis on the robot introduces a degree of freedom. Each DOF can be a slider, rotary, or other type of actuator. The number of DOF that a manipulator possesses thus is the number of independent ways in which a robot arm can move. Industrial robots typically have 5 or 6 degrees of freedom.

Three of the degrees of freedom allow positioning in 3D space (X, Y, Z), while the other 2 or 3 are used for orientation of the end effector (yaw, pitch and roll). 6 degrees of freedom are enough to allow the robot to reach all positions and orientations in 3D space. 5 DOF requires a restriction to 2D space, or else it limits orientations. 5 DOF robots are commonly used for handling tools such as arc welders.

RESOLUTION: The smallest increment of motion can be detected or controlled by the robotic control system. It is a function of encoder pulses per revolution and drive (e.g. reduction gear) ratio. And it is dependent on the distance between the tool center point and the joint axis.

ENVELOPE: A three-dimensional shape, that defines the boundaries that the robot manipulator can reach; also known as reach envelope.

REACH: The maximum horizontal distance between the center of the robot base to the end of its wrist.

MAXIMUM SPEED: A robot simultaneously moving with all joints in complimentary directions at full speed with full extension. The maximum speed is the theoretical values which does not consider under loading condition.

PAYLOAD: The maximum payload is the amount of weight carried by the robot manipulator at reduced speed while maintaining rated precision. Nominal payload is measured at maximum speed while maintaining rated precision. These ratings are highly dependent on the size and shape of the payload due to variation in inertia.