JOINTS:

Robots may have different types of joints, such as linear, rotary, sliding, and spherical. Spherical joints are common in many systems, but they possess multiple DOF and therefore are difficult to control. Consequently, they are not common in robotics except in research . Most robots have either a linear (prismatic) or a rotary (revolute) joint. Prismatic joints are linear; there is no rotation involved. They are either hydraulic or pneumatic cylinders or linear electric actuators. These joints are used in gantry, cylindrical, or spherical robots. Revolute joints are rotary, and although hydraulic and pneumatic rotary joints are common, most rotary joints are electrical, driven either by stepper motors or, more commonly, by servomotors.

ROBOT COORDINATES:

Robot configurations generally follow the common coordinate frames with which they are defined, as Prismatic joints are denoted by P, revolute joints are denoted by R, and spherical joints are denoted by S. Robot configurations are specified by a succession of P, R, and/or S designations. For example, a robot with three prismatic and three revolute joints is specified by 3P3R. The following configurations are common for positioning the hand of the robot:

- Cartesian/rectangular/gantry (3P): These robots use three prismatic joints to position (Where it is) the end effector, usually followed by additional revolute joints that orient the end effector.
- Cylindrical (PRP): Cylindrical coordinate robots have two prismatic joints and one revolute joint for positioning the part, plus revolute joints for orientation (How its rotated).
- Spherical (P2R): Spherical coordinate robots follow a spherical coordinate system, which has one prismatic and two revolute joints for positioning the part, plus additional revolute joints for orientation.
- Articulated/anthropomorphic (3R): An articulated robot’s joints are all revolute, similar to a human’s arm. They are the most common configuration for industrial robots.

- Selective Compliance Assembly Robot Arm (SCARA): SCARA robots have two (or three) revolute joints that are parallel and allow the robot to move in a horizontal plane, plus an additional prismatic joint that moves vertically. SCARA robots are very common in assembly operations.