

Commands:- → Instructions given to a robot to perform specific actions.

→ Depending on robot systems, Commands may differ.

1) Motion Commands:-

→ A Motion Command tells the robot to go from the current state to a target state.

* Joint/point-to-point Move:-

→ Move each joint from current angles to target joint angles using joint space interpolation.

→ For Repositioning, non-critical travel, it is used.

* Linear Move:-

→ Move the tool in a straight line in cartesian space from start pose to target pose.

→ For welding, cutting, any task requiring a straight tool path.

* Circular/Arc Move:-

→ Move the tool along a circular arc defined by start, center and

end points. For Arc welds, Machining arcs.

* Jog/Teach/Manual Move:-

- Slow Manual Motion Commanded by pendant joystick.
- For Manual adjustments.

Parameters:-

- Speed - Could be Joint speed.
- Acceleration/Deceleration - How fast the speed changes
- Accuracy - Defines whether the robot must reach the point exactly.
- Payload - How much weight a robot can carry.

2) Sensor Commands:-

- Allow a robot to read, process and react to sensor data.
- Without sensor commands, a robot just executes blind motion.

* Read/S/p Commands:-

- Acquires data from a sensor (Analog/Digital).

- Example:- Read Sensor - Returns a raw value

A.I. Read - reads analog S/p
D.D. Read - reads digital S/p.

- Applications * Checking if part is present
 * Reading temperature
 * Detecting contact.

* Wait / Conditional Commands :-

→ Pause program execution until a sensor condition is met.

Example :- { → WAIT DI [I] = ON ;
 → WAIT Sensor Value > 100.

→ Applications * Robot waits for a Conveyor sensor to detect a workpiece.

* If / While :-

→ Take decision based on sensor
 → Branching logic depending on sensor value.

Example :- { → IF Force > 20 N THEN STOP.
 → WHILE VISION_OK = FALSE DO Retry.

→ Applications * Quality control
 * Error handling.
 * Safe stopping.

* Trigger / Interrupt Commands :-

→ Immediate response when sensor condition occurs, even during motion.

Example :- { → ON INTERRUPT WHEN DI [5] = 1
 CALL emergency-stop

→ Applications * Collision detection

* Emergency stops.

* Calibration/Zeroing Commands:-

→ Reset/calibrate a sensor to reference values.

→ calibrate vision (camera ID).

→ Ex:- Recalibrating camera

* Feedback/Adaptive motion Commands:-

→ Sensor continuously modifies robot motion in a closed loop.

→ Ex:- Vision guided pick and place.

3) End-Effector Commands (EEC):-

→ EEC control what the tool does, not the arm motion.

→ They open/close grippers, turn on/off suction, activate welding arcs.

* Gripper Commands:-

→ Control open/close of mechanical or pneumatic grippers.

→ Ex:- Gripper (OPEN),
Gripper (CLOSE).

→ Application:- pick & place, Assembly.

* Vacuum/suction Commands:-

→ Control vacuum pumps/
suction cups.

→ Ex:- Vacuum (ON),
Vacuum (OFF).

→ Applications:- Packaging, Glass handling.

* Welding/cutting tool commands:-

→ Start/stop Material processing tools.

→ Ex:- ArcStart(), ArcEnd(),
LaserOn(), LaserOff().

* Painting commands:-

→ Control flow of adhesives, paints, sealants.

→ Ex:- Dispenser(ON),
Dispenser(OFF).

→ Applications:- Spray painting,
Sealing.

* Custom End-Effector I/O:-

→ User-defined tool control through analog/digital I/Os.

→ Ex:- DO[5] = ON → Activates solenoid for gripper.

AO[2] = 3.3V → sets analog voltage for proportional actuator.

→ Application:- Universal - Any tool
Integration.

Simple programs:-

1) Motion Commands:-

MoveJ(Home) # Joint move to home.

MoveL(pick, speed=100) # Linear. Move to pick.

MoveL(place, speed=100) # Linear Move to place.

MoveJ(Home) # Return home.

Op:-

Moving Jointly to Home. . . .

Moving Linearly to pick location at 100 mm/s.

Moving linearly to place location at 100 mm/s.

Returning Home (Joint Move)

Program Complete.

2) Sensor Commands:-

WAIT DI[i]==ON # wait until digital sensor 1 detects a part.

MOVE L(pick, speed=80) # Move to pick when sensor is ON.

Op:-

Waiting for sensor DI[i]

sensor DI[i]=ON (part detected !)

Moving linearly to pick location at 80 mm/s

Program Complete

3) End-effector Commands:-

MoveL(pick, speed=100)

Gripper(CLOSE)

WAIT Gripper Sensor == ON

MoveL(place, speed=100)

Gripper(OPEN).

Op:-

Moving to pick location . . .

Gripper closing . . .

Gripper closed confirmed (sensor ON) . .

Moving to place location . . .

Gripper opening . . .

Program Complete . . .