

# Introduction to Industrial Robot STAUBLI TX90XL

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**ÇANKAYA ÜNİVERSİTESİ**

**MEKATRONİK MÜHENDİSLİĞİ BÖLÜMÜ**

# What is an industrial robot?

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- An industrial robot is a robot system used for manufacturing.
  - They can be programmed to perform dangerous, dirty and/or repetitive tasks with high
    - speed,
    - precision,
    - accuracy and.
    - endurance,
  - Typical applications of robots include
    - welding,
    - painting,
    - assembly,
    - pick and place for printed circuit boards,
    - packaging and labeling,
    - palletizing,
    - product inspection,
    - and testing
-

# Our robot: Stäubli TX90XL

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- ❑ 6 axis articulated robot arm
- ❑ High-speed, high-resolution servo motors with absolute position sensors at each axis
- ❑ Nominal payload: 5 *kg*
- ❑ Repeatability:  $\mp 0.04$  *mm*
- ❑ Weight: 116 *kg*
- ❑ Arm reach: 1.5 *m*



# Our robot: Stäubli TX90XL

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Manual Control Pendant



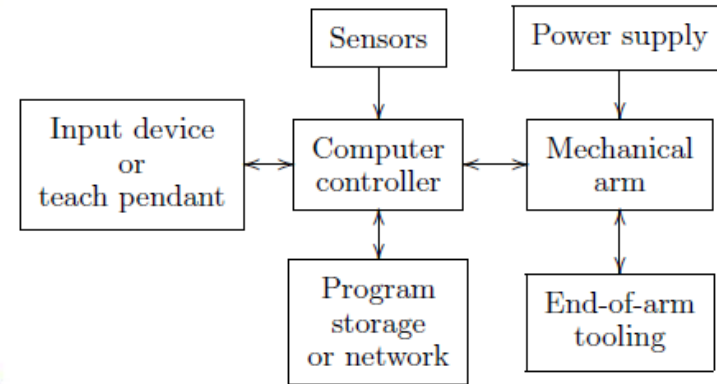
Cabinet



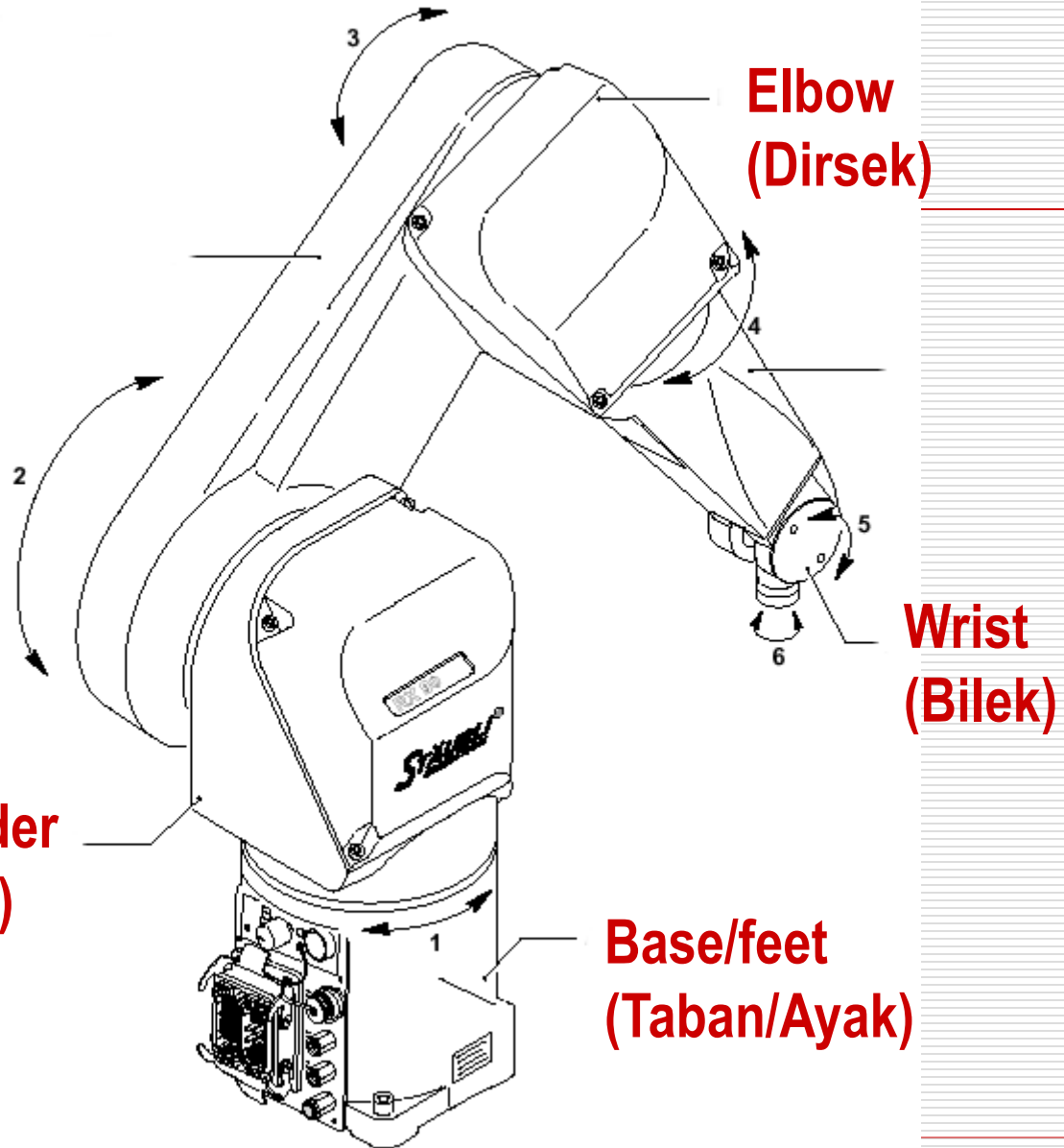
Robot arm



## Robotic Systems



# KOL



# Cabinet : The Controller

- ❑ The CS8C controller is made up of a processor (5), the intelligent part of the installation.
- ❑ The processor controls the robot via digital power amplifiers (1) dedicated to each axis of the arm.
- ❑ The electrical power is converted by the PSM (7) power section, the RPS (2) power supply, and the ARPS (3).
- ❑ To disconnect the system from the power supply, set the master switch (6), located on the front panel of the controller, to 0. Before doing so, you must stop the arm operations and switch off arm power supply.



# Pendant

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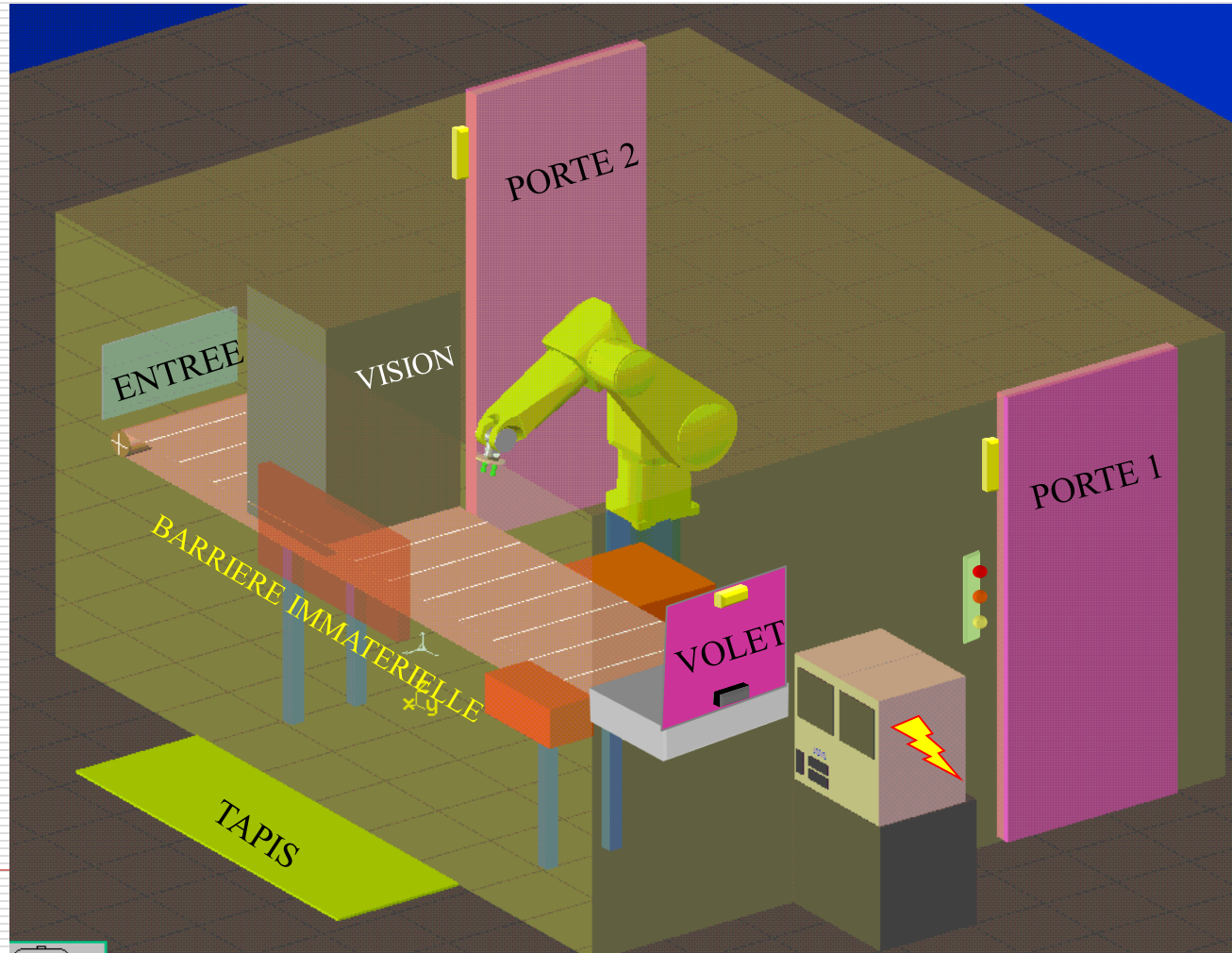
- The MCP (Manual Control Pendant) can be used to enable arm power supply and control its movements.



# ROBOT CELL

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- **Robot system is always installed in a security cell**





# OPERATORS SECURITY

- ❑ Do not enter in the cell if the arm power is on
- ❑ Robot might move very fast
- ❑ Robot may make unpredictable move depending on the program
- ❑ Robot may damage itself and its surrounding.
- ❑ Robot may cause serious engineering.



Do not work in the cabinet if the power is on.

# SAFETY

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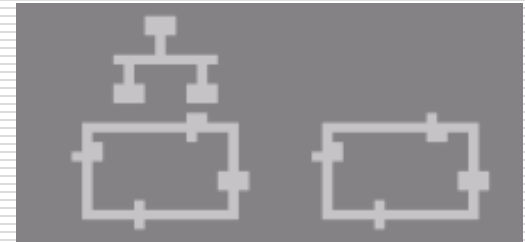
- ❑ Check the position of robot arm before powering up
- ❑ Always operate the robot arm at low speed (%10 speed) at first.
- ❑ Close the door of the cell.
- ❑ Be at a place unreachable by robot.
- ❑ Be ready to stop the robot motion
  - Emergency stop ( global interruption, in emergency only)
  - Arm power off ( only robot is off)
  - MOVE/HOLD key ( “software” stop no arm power off)



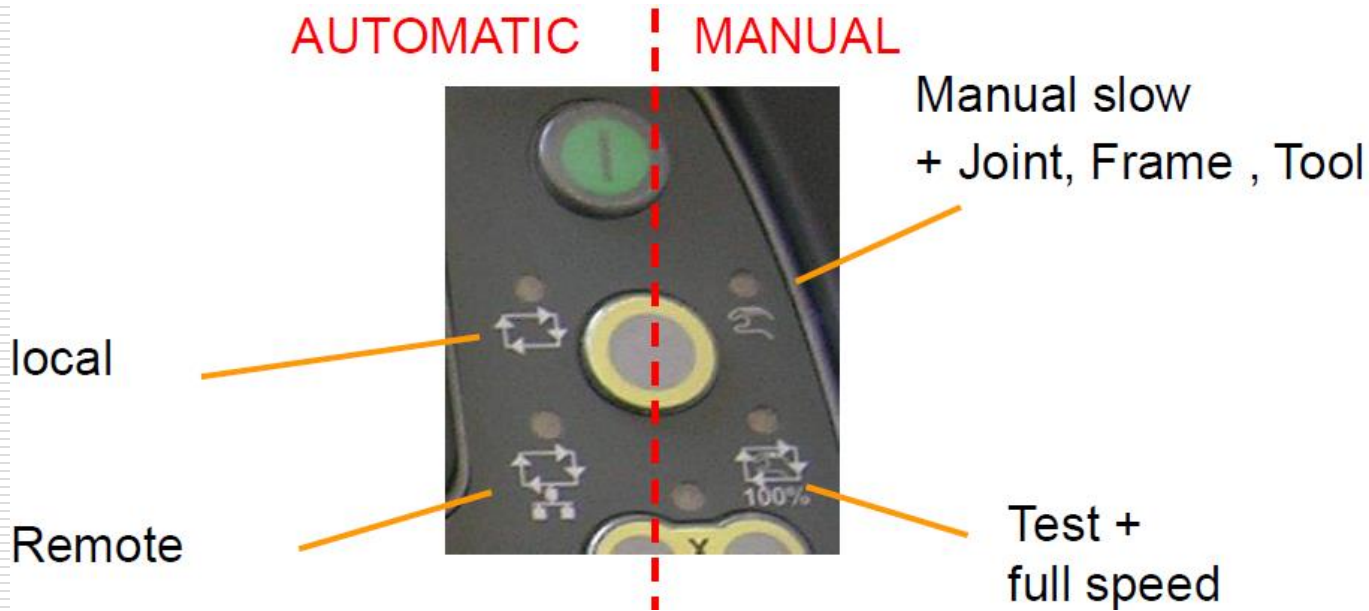
# WORKING MODES INTRODUCTION

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- **AUTOMATIC (production mode )**
  - The Robot cell is closed, nobody inside.  
The robot is under program control.  
Motions can be done at very high speed.
  
- **MANUAL (Trajectory teaching,  
Manual motion to the start position)**
  - This robot is controlled by the operator with teach Pendant in hands
  - The speed is limited to 250 mm/s maximum
  - The operator can be close to the robot



# WORKING MODES



- ❑ No working mode selection from MCP
- ❑ Command by a key outside the robot cell



# ROBOT STARTUP

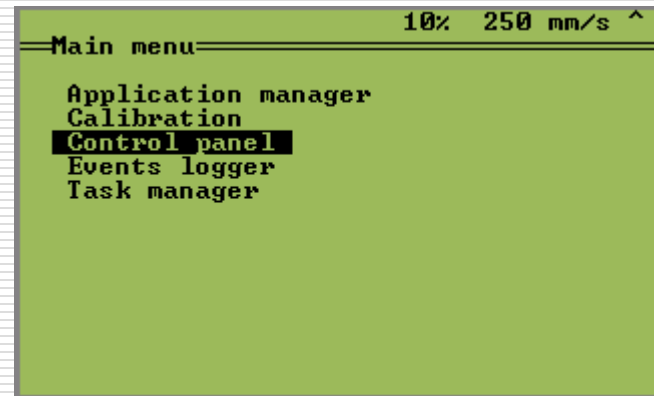
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1



2

Wait for main menu



3

An application can be automatically loaded and/or manually executed.

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# SYSTEM STOP

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- 1 Arm power off



- 
- 2 Main switch OFF

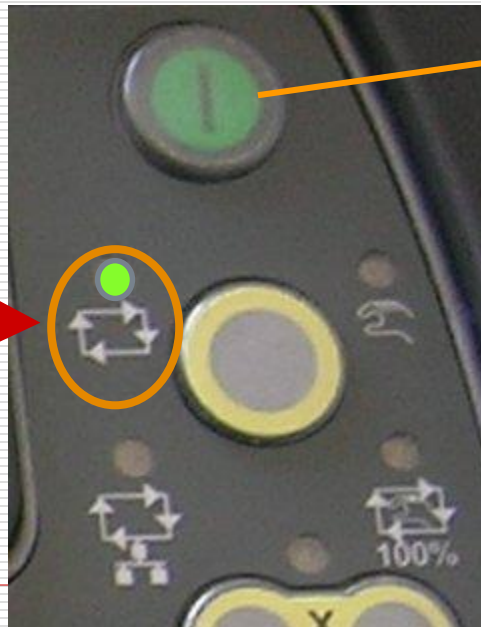


# ARM POWER ON (LOCAL)

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- ① Cell door closed (DOOR ES chain)
- ② Press Arm Power ON

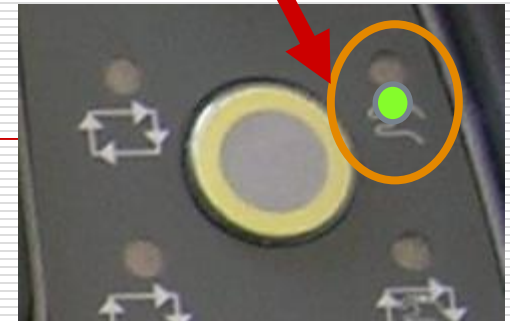
Local Mode  
is selected.



Arm power  
ON

Manual Mode  
is selected.

# ARM POWER ON (MANU)



① MCP on park

MCP on hands

② Remove and place it on  
if > 15 seconds

Release and maintain  
Dead Man

if > 15 seconds

③

Arm power ON butonu

Cell opened

After pressing power button if the enable button (deadman) has been put into its middle position in the last 15 seconds or if the MCP has been placed on its holder in the last 15 seconds.

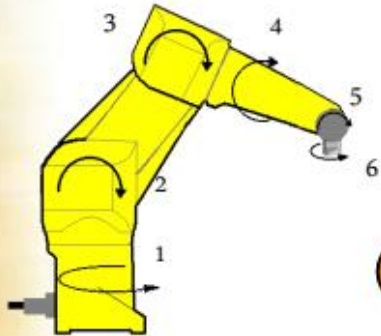


# Manual Movement

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- Joint move: Moves the robot by rotating the individual joints
    - Cannot do linear movement
    - Is not subject to singularity
  - Frame move: Moves the robot in a specified coordinate frame
    - Can do linear movement
    - Subject to singularity
  - Tool move: Moves the robot with respect to the tool coordinate frame
    - Can do linear movement
    - Subject to singularity
-

## JOINT MANUAL MOTION



1 Joint



2 Speed

- +



-JT1

-JT2

-JT3

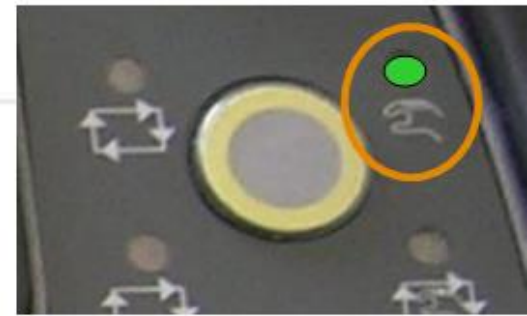
-JT4

-JT5

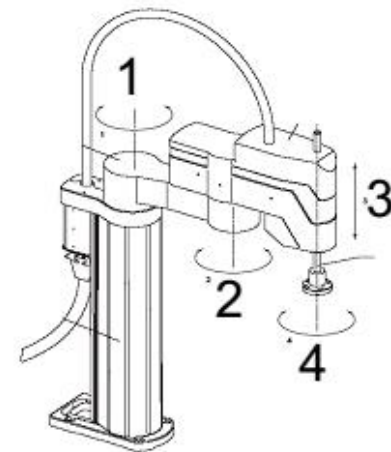
-JT6

- +

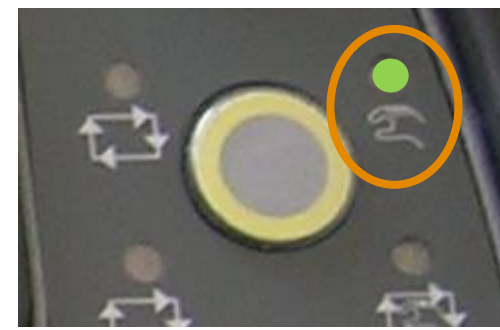
3



! Requested !



# MINI JOG



! Requested !



Change selected axe  
or direction

Motion Control



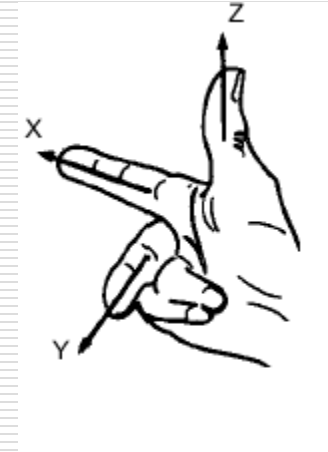
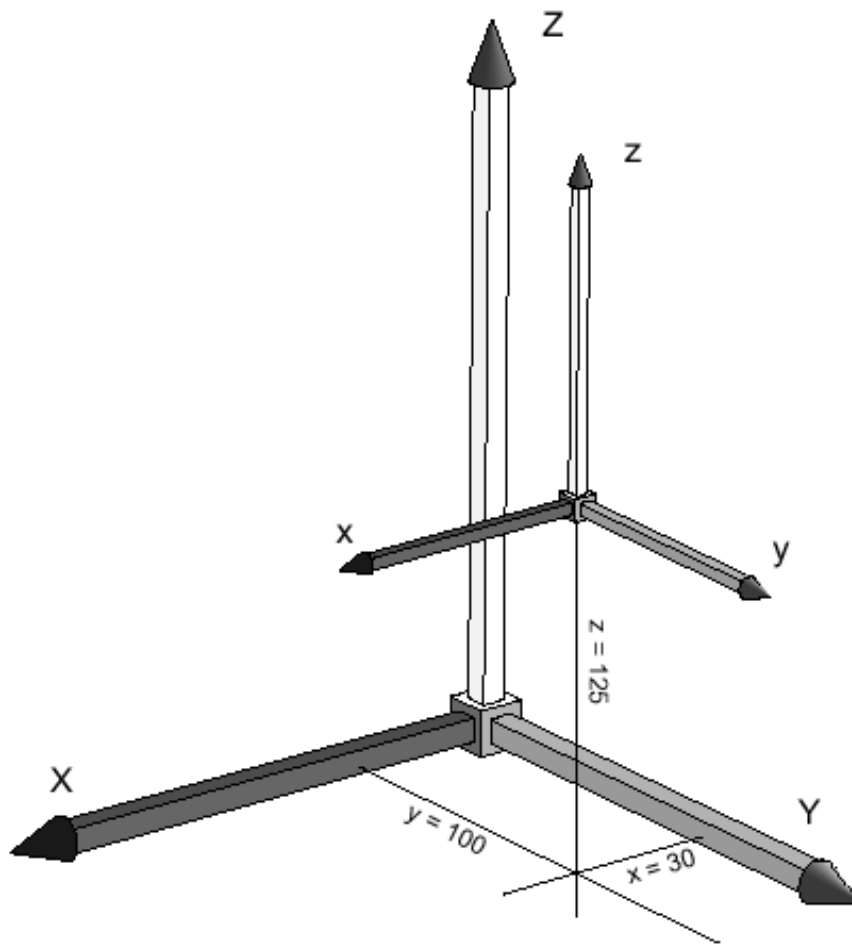
# Cartesian Motion with MCP

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# COORDINATE SYSTEM

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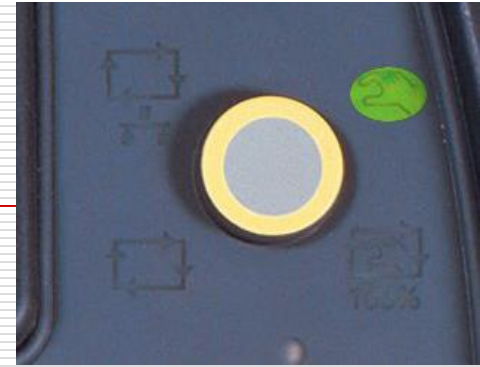
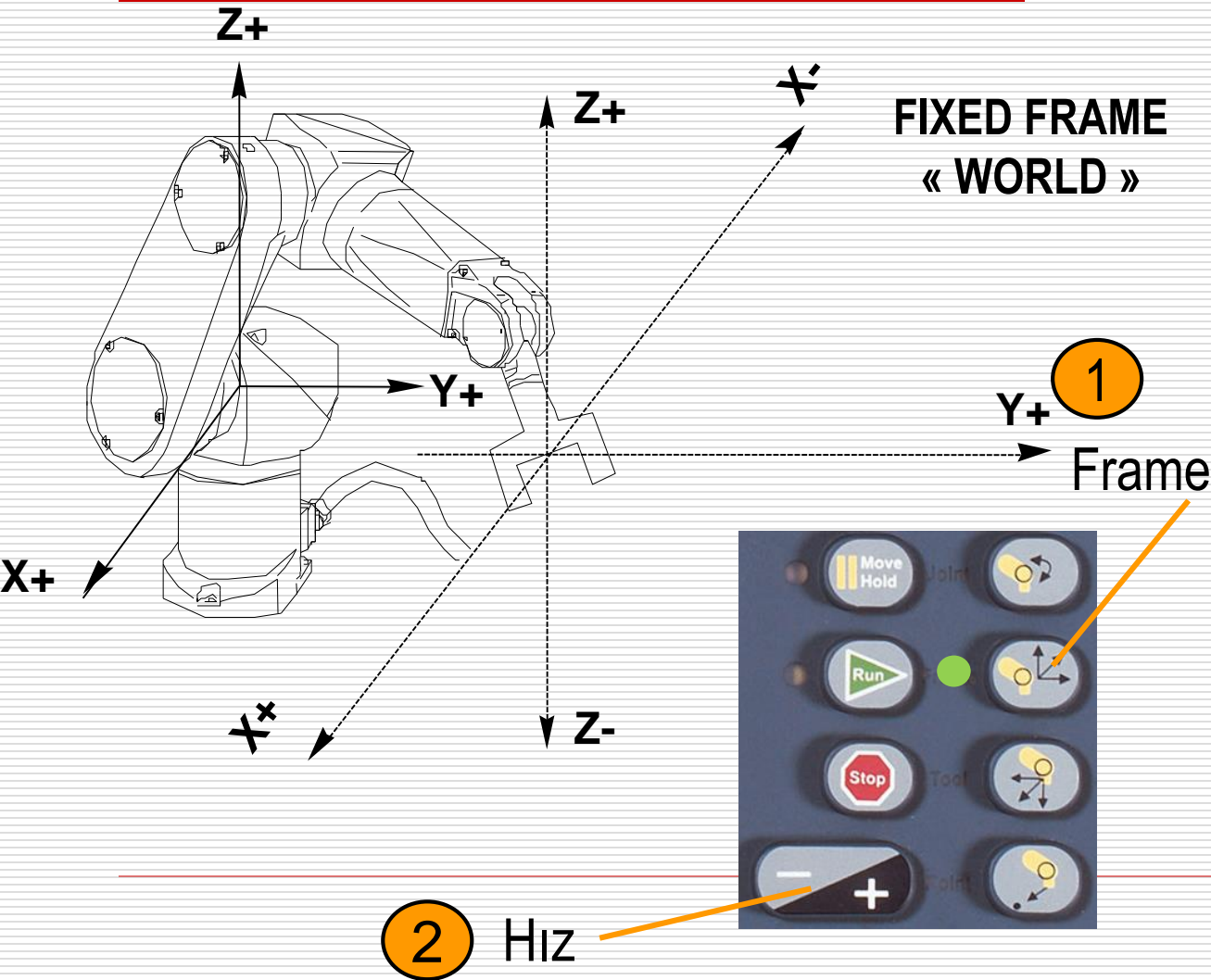
!! Right Hand !!

**Cartesian Coordinate**

**3 axis perpendicular each other**

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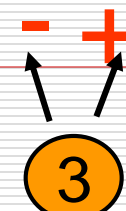
# MANUAL MOTION WITH FRAME MODE



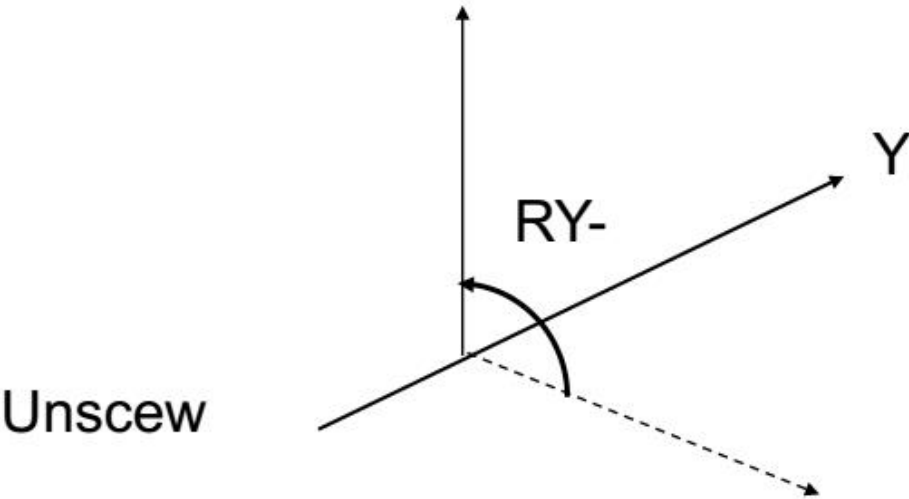
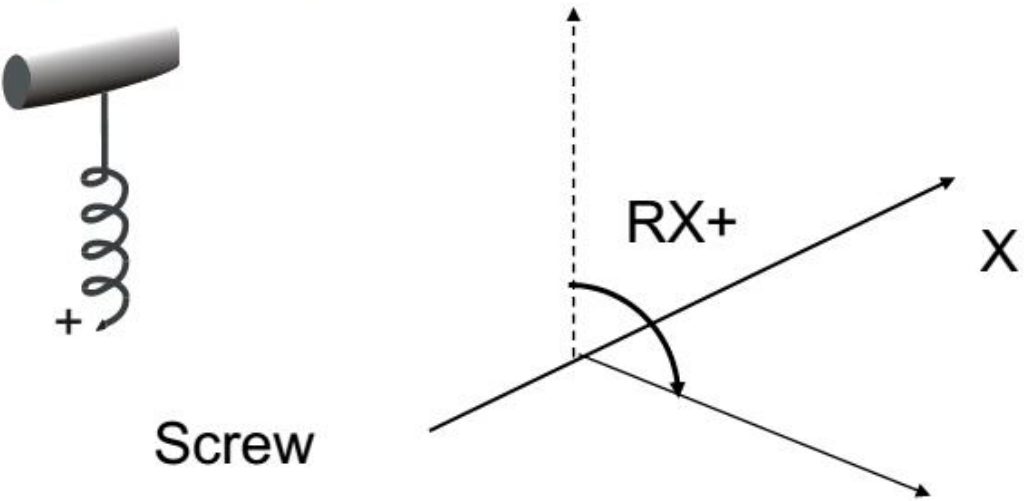
! Requested !



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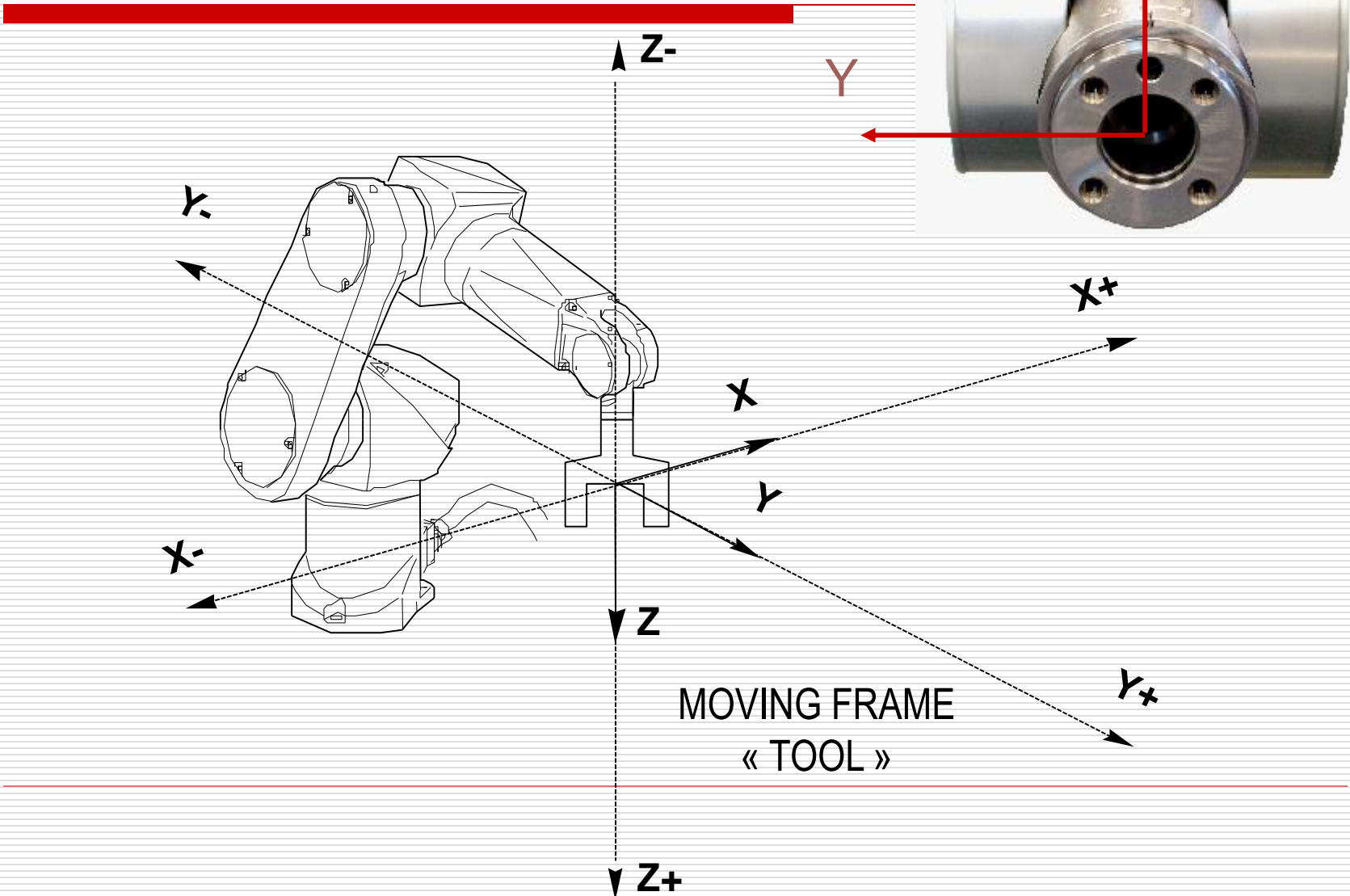


# MCP (ROTATION)



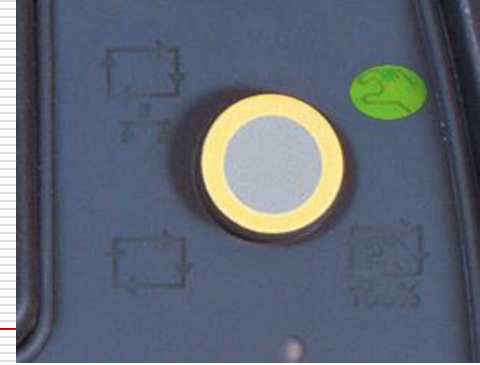
Rotation

# FRAME (TOOL)

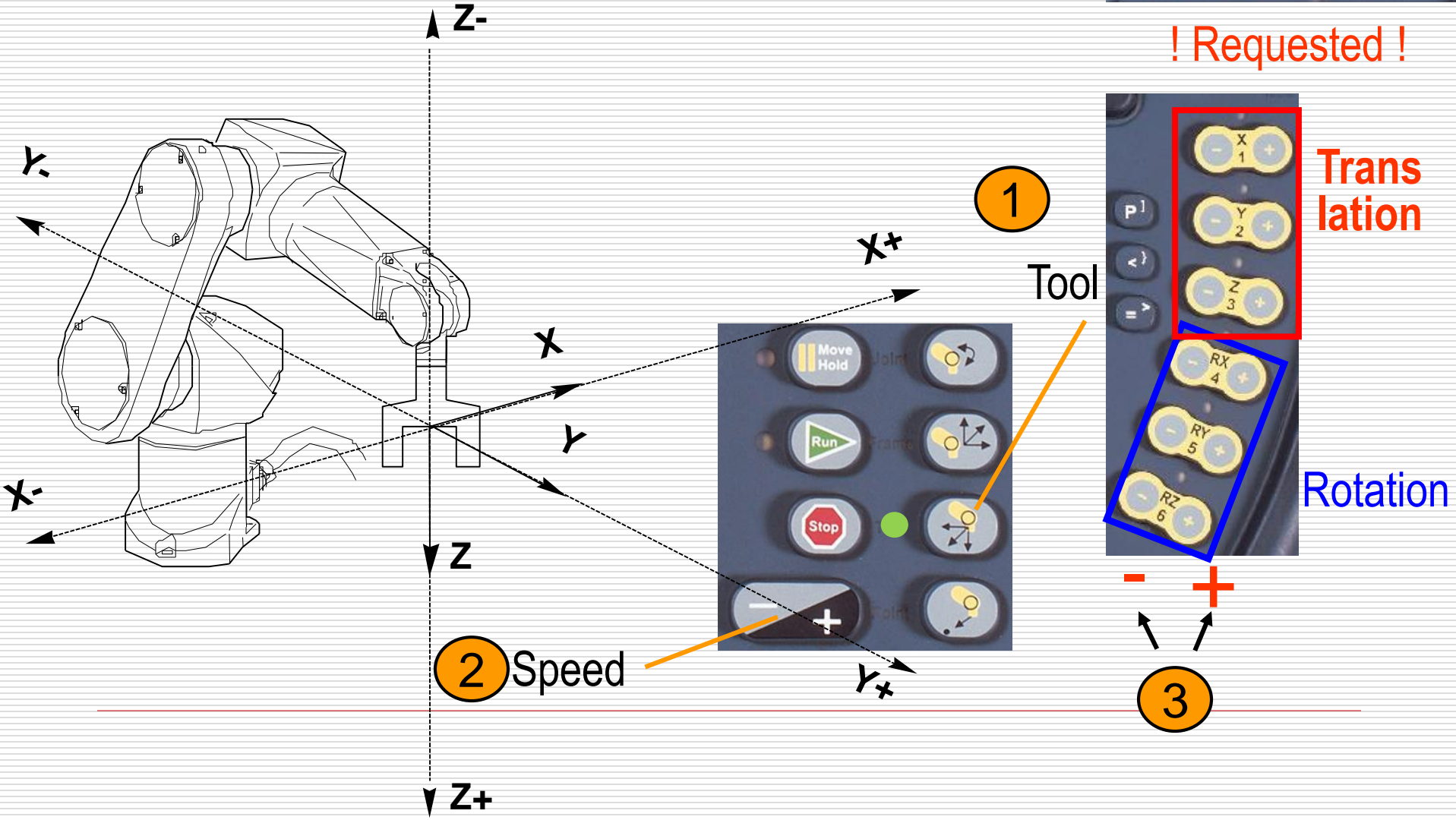




# MANUAL MOTION WITH TOOL MODE



! Requested !



# VAL3 EĐİTİMİ

## *MCP ile Kartezyen Hareket*

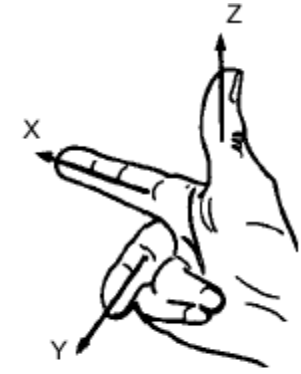
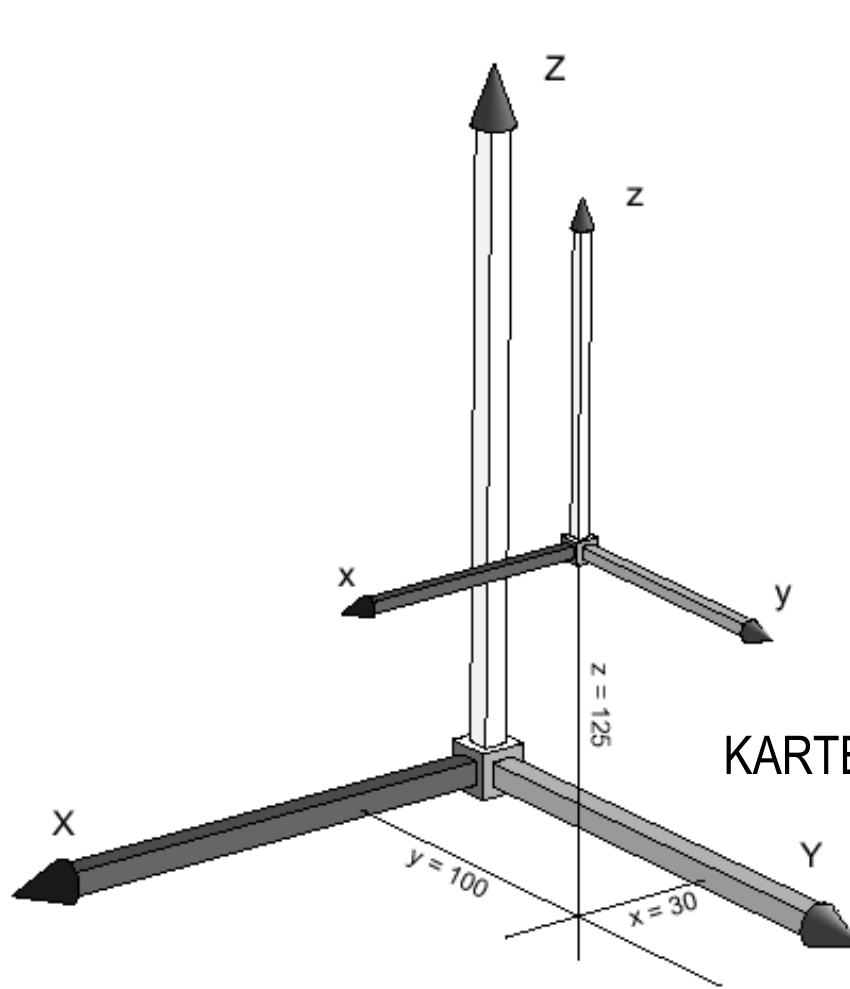


# Manual movement with the frame move: Coordinate system

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# KOORDİNAT SİSTEMİ

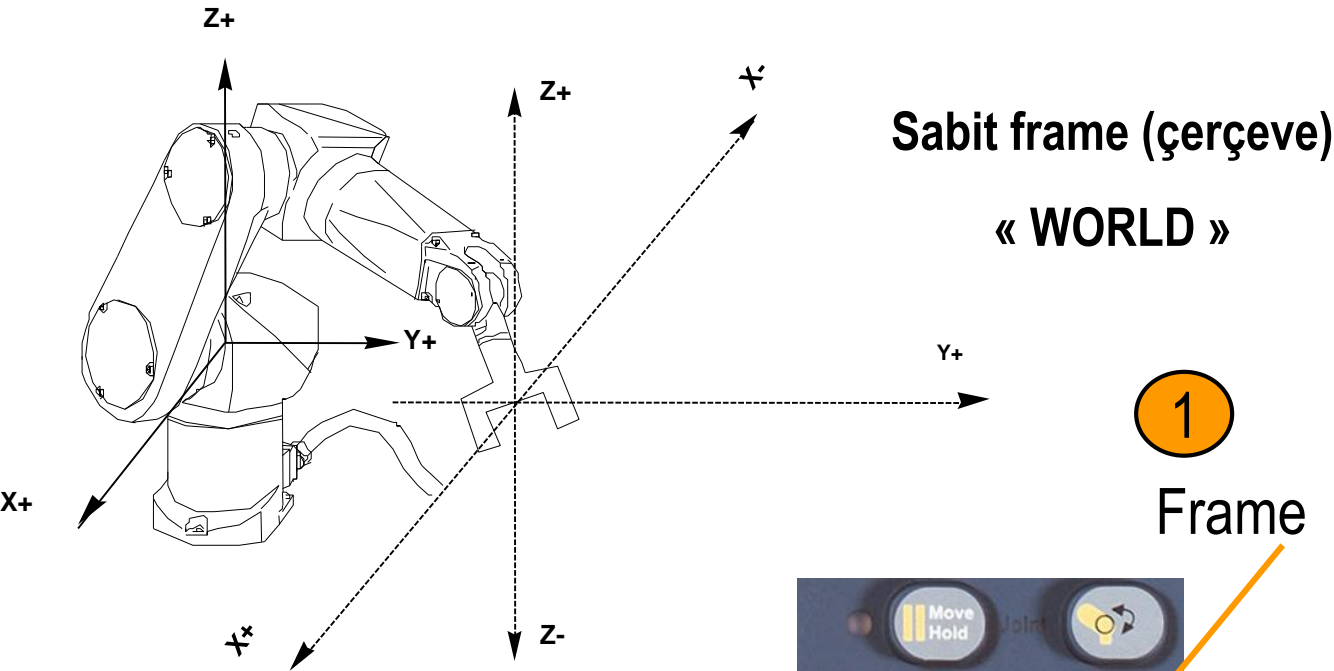


Sağ el kuralı

KARTEZYEN KOORDİNATLAR

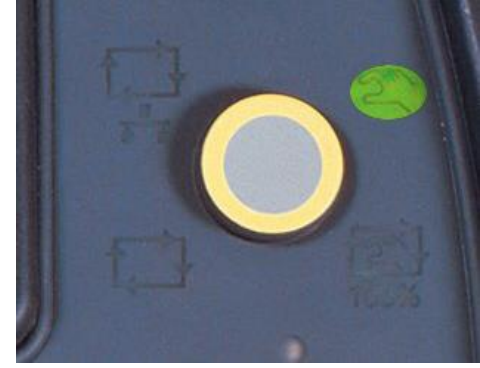
3 eksen birbirine dik

# FRAME MODUNDA MANUEL HAREKET

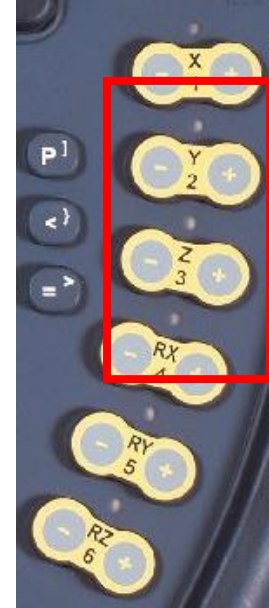


1  
Frame

2 Hız



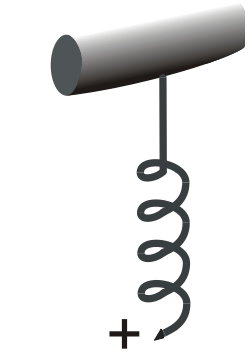
GEREKLİ



ÖTELEME

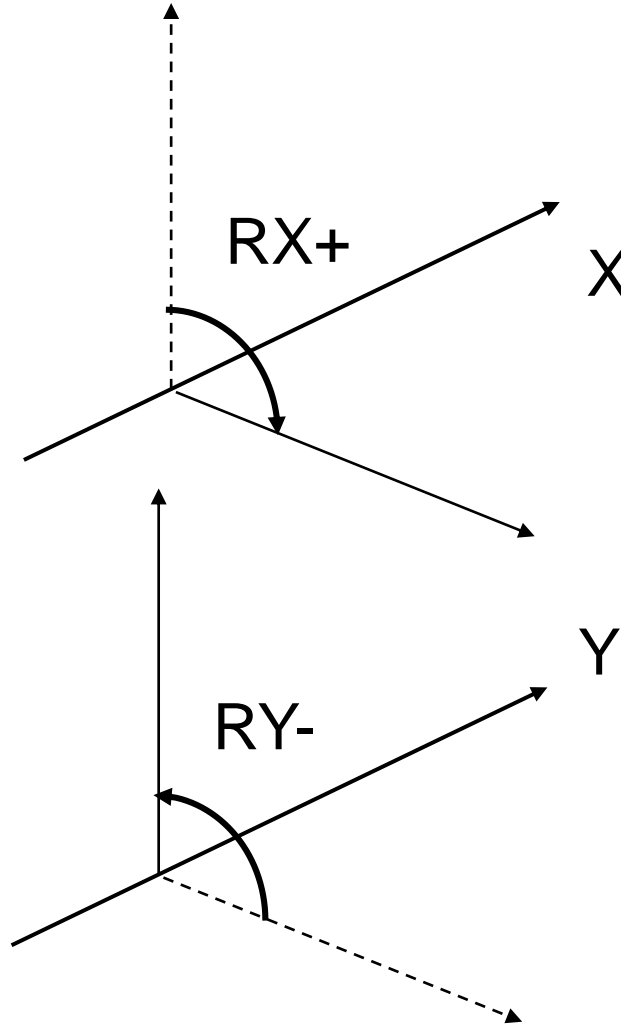
- +  
3

# MCP (DÖNME)



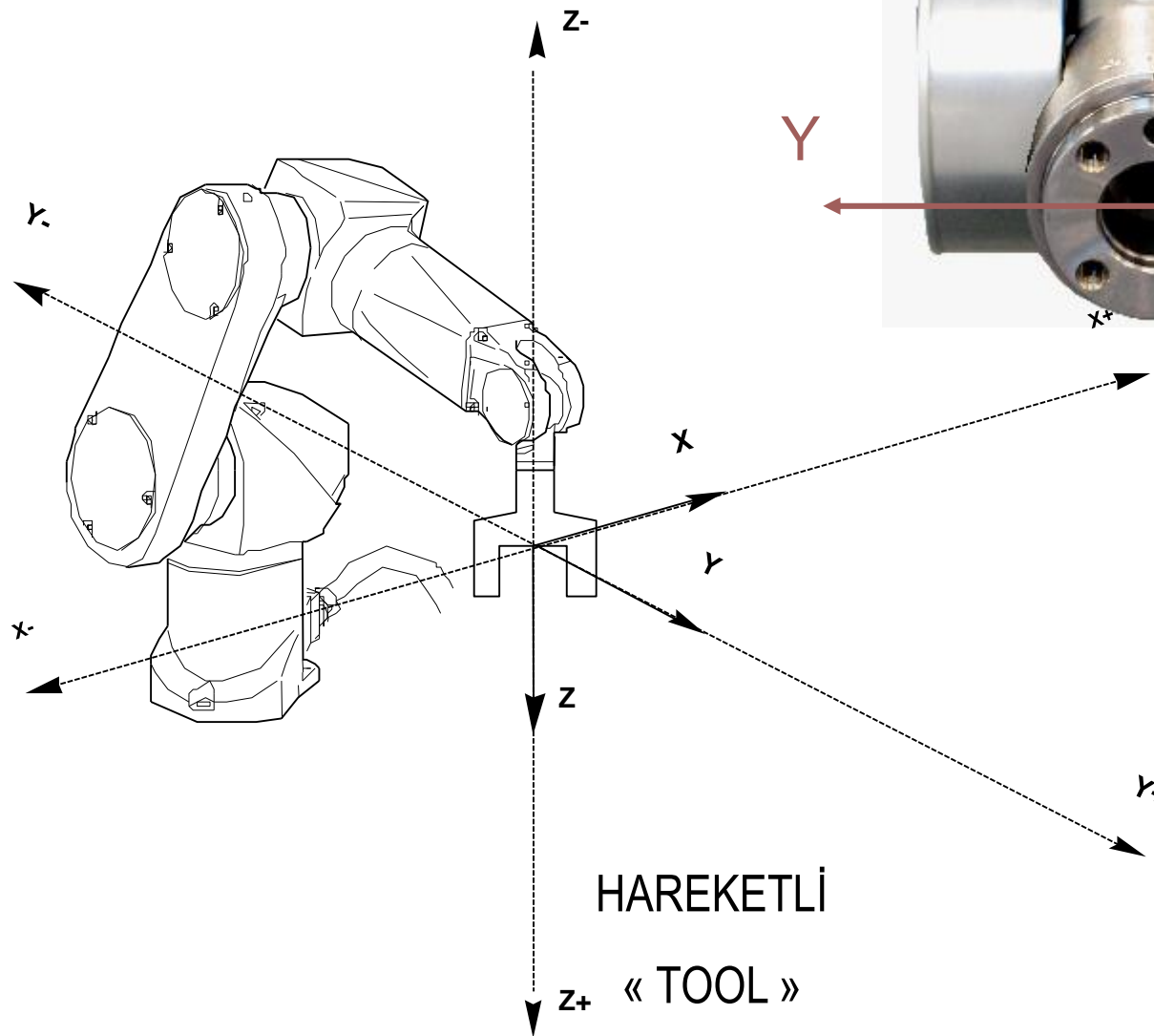
Sıkıştırma

Gevşetme



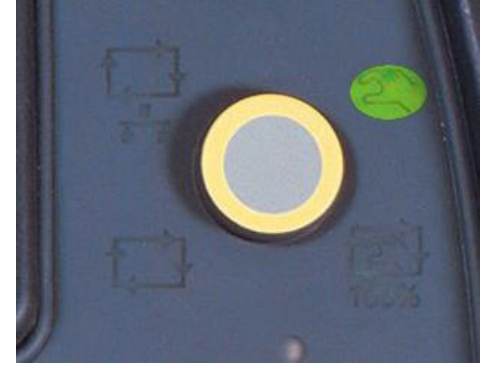
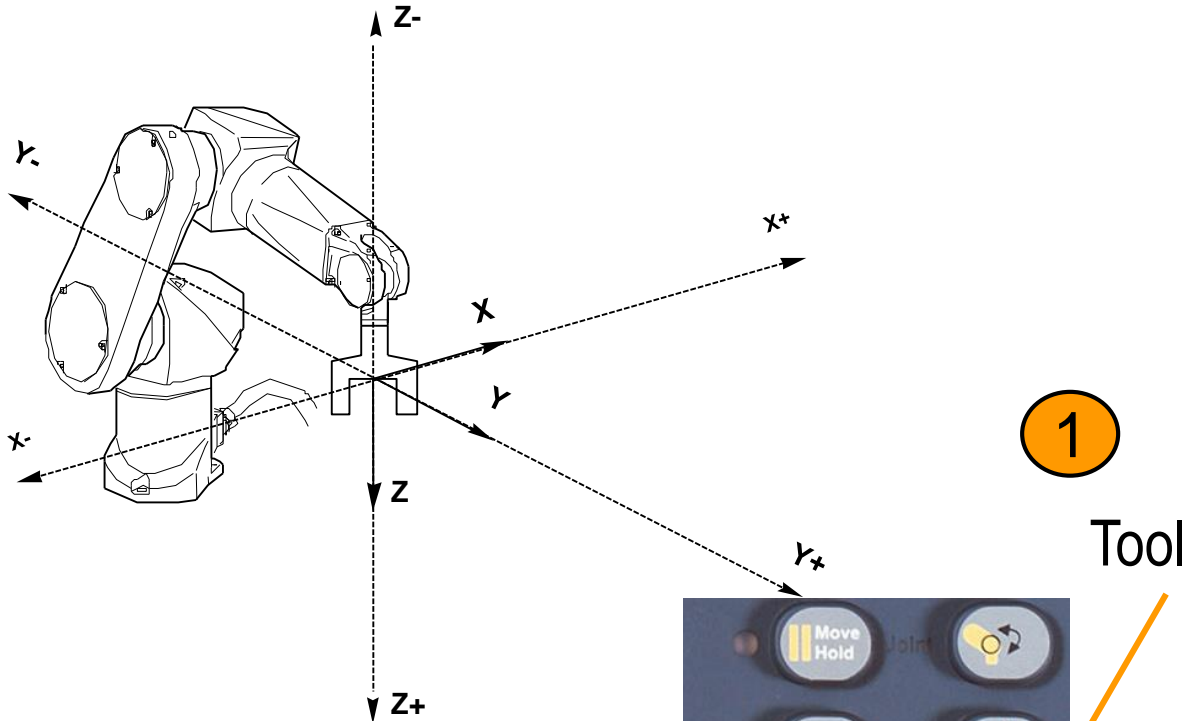
Dönme

# FRAME (TOOL)





# TOOL MODUNDA MANUEL HAREKET



GEREKLİ!!!

1



Ö t e l e m e

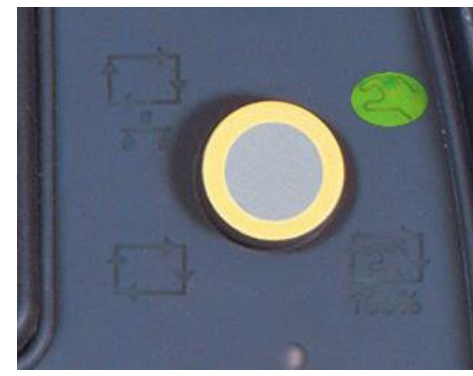
2 Hız



3

Dönme

# GRIPPER MANUAL KONTROLÜ



**GEREKLİ**



Bu üç buton, başka dijital çıkışlarla da eşleştirilebilir. (SHIFT ile)



# Pendant

