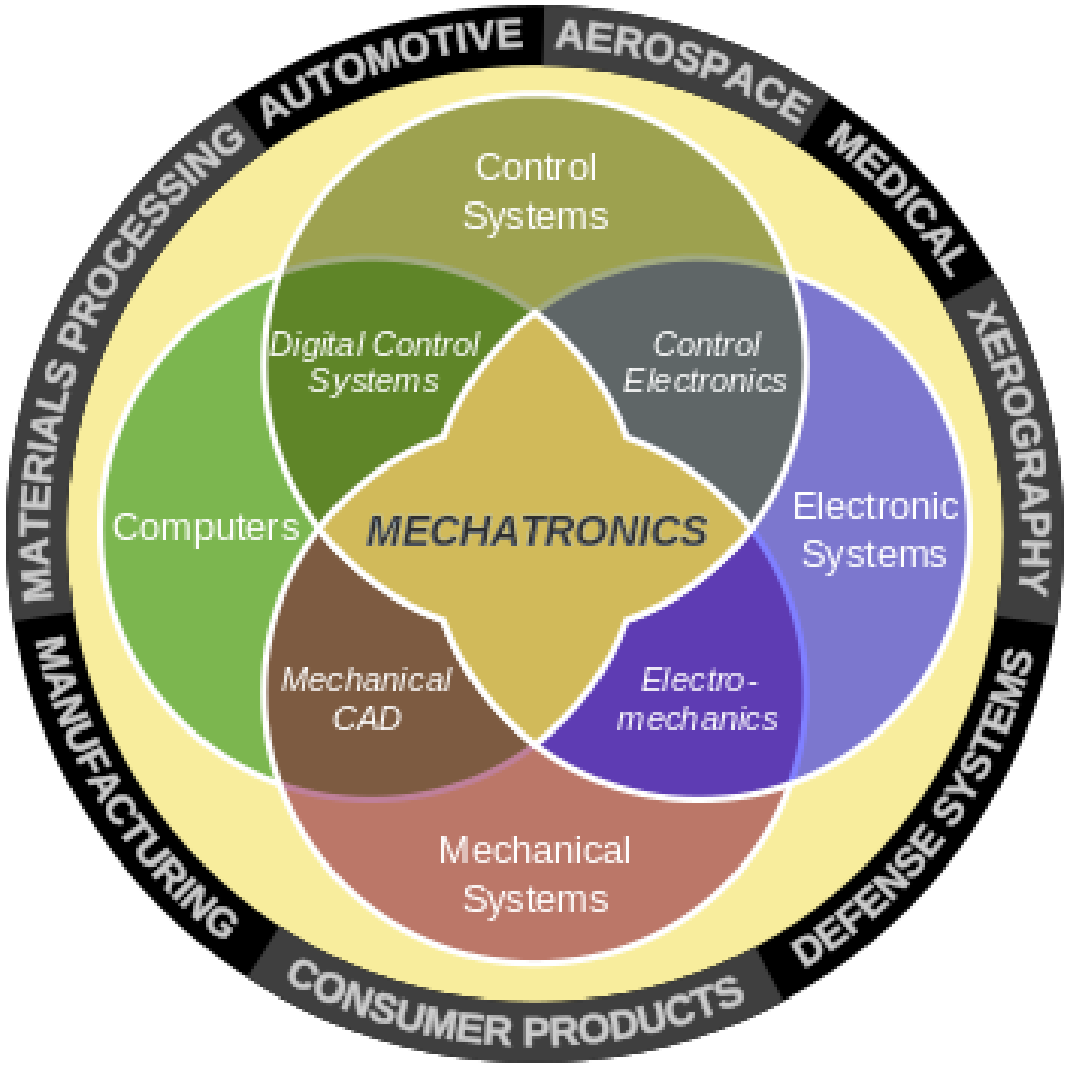
# MTRN3060, Robotics and Automation
# Week 11

# Industrial Robots
# &
# Automation

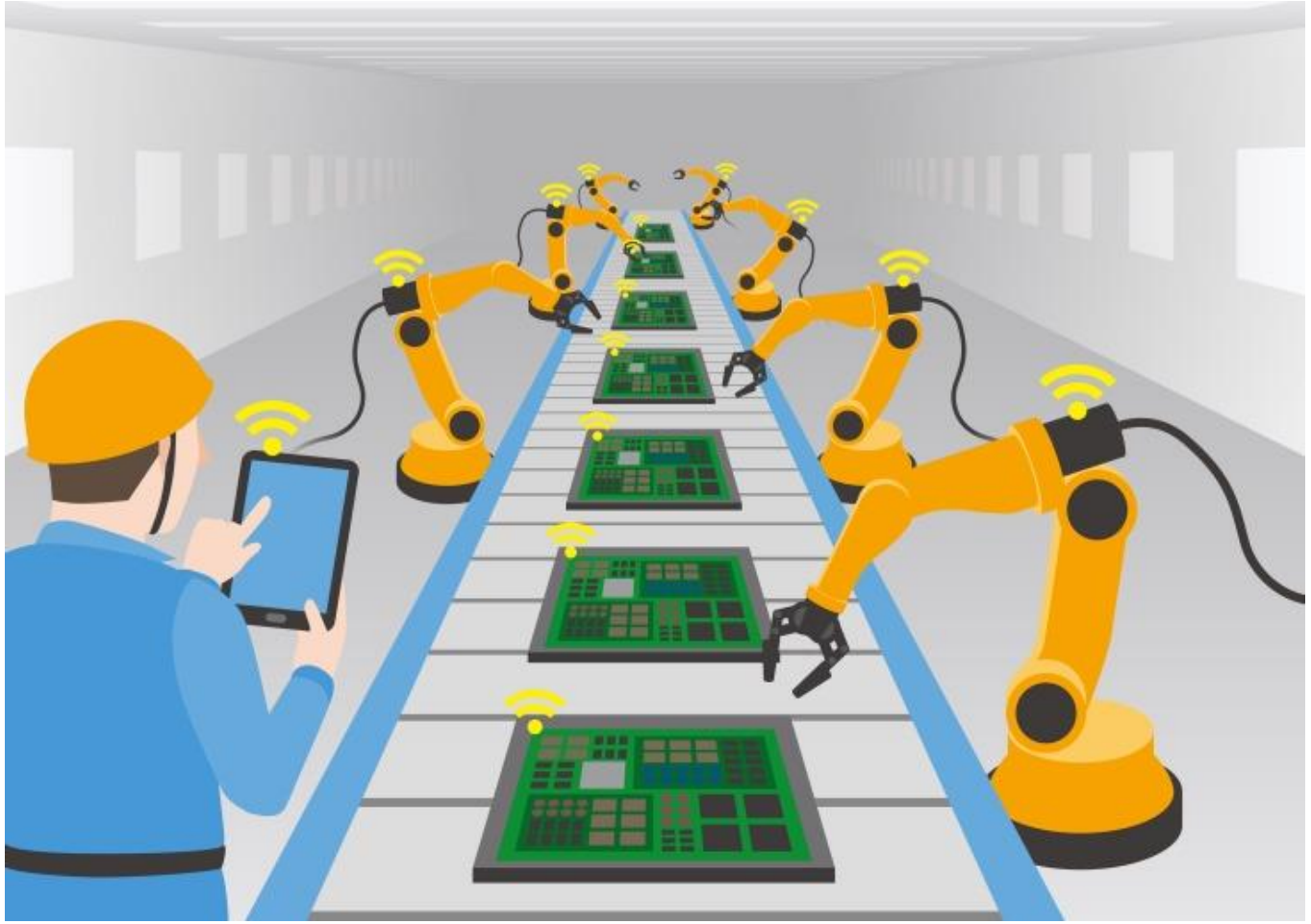
Dr. Reza Haghighi

# Robotics & Automation

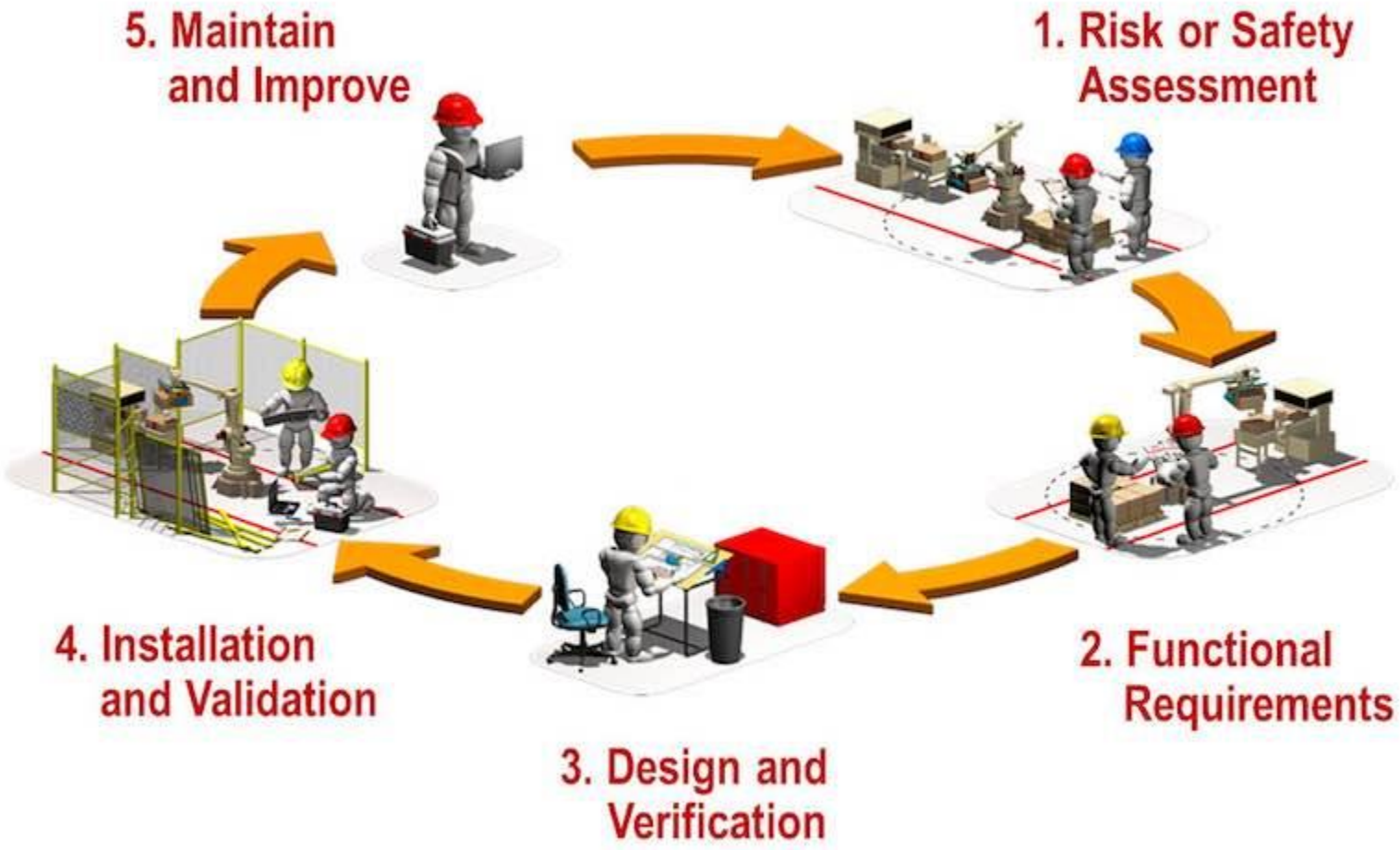


# Automation

Automation is **the creation and application of technologies to produce and deliver goods and services with minimal human intervention**.



# Automation


5. Maintain
and Improve
1. Risk or Safety
Assessment
2. Functional
Requirements
3. Design and
Verification
4. Installation
and Validation

# Machine Safety

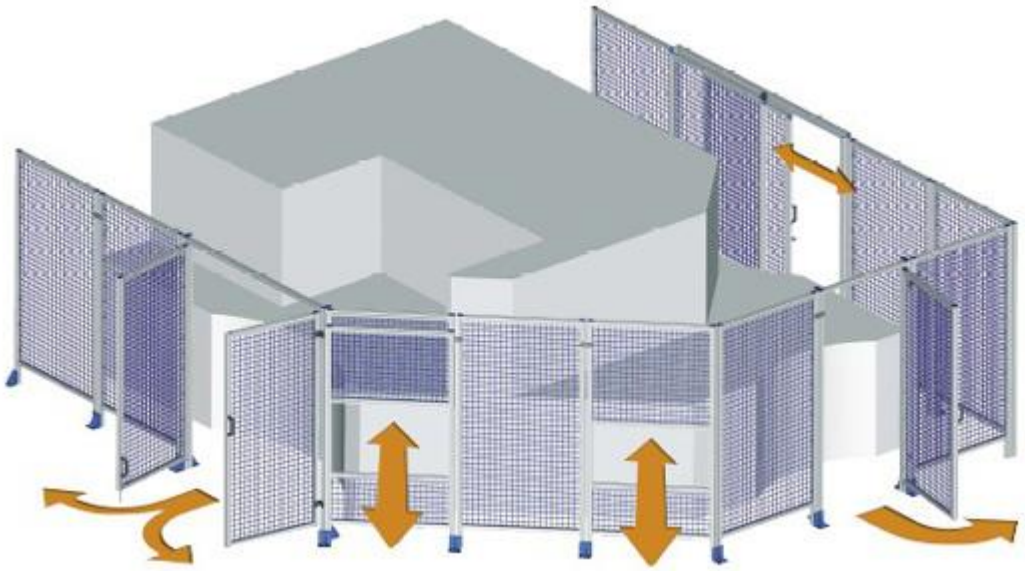
AS/NZS 4024:2019 - Safety of Machinery

ISO 13849-1 & IEC 62061

- IDENTIFY COMMON HAZARDS AND MACHINE PARTS THAT NEED SAFEGUARDING
- REMOVE THE HAZARD AND/OR CONTROL THE RISK
- HOW TO KEEP A SAFE DISTANCE FROM MACHINES

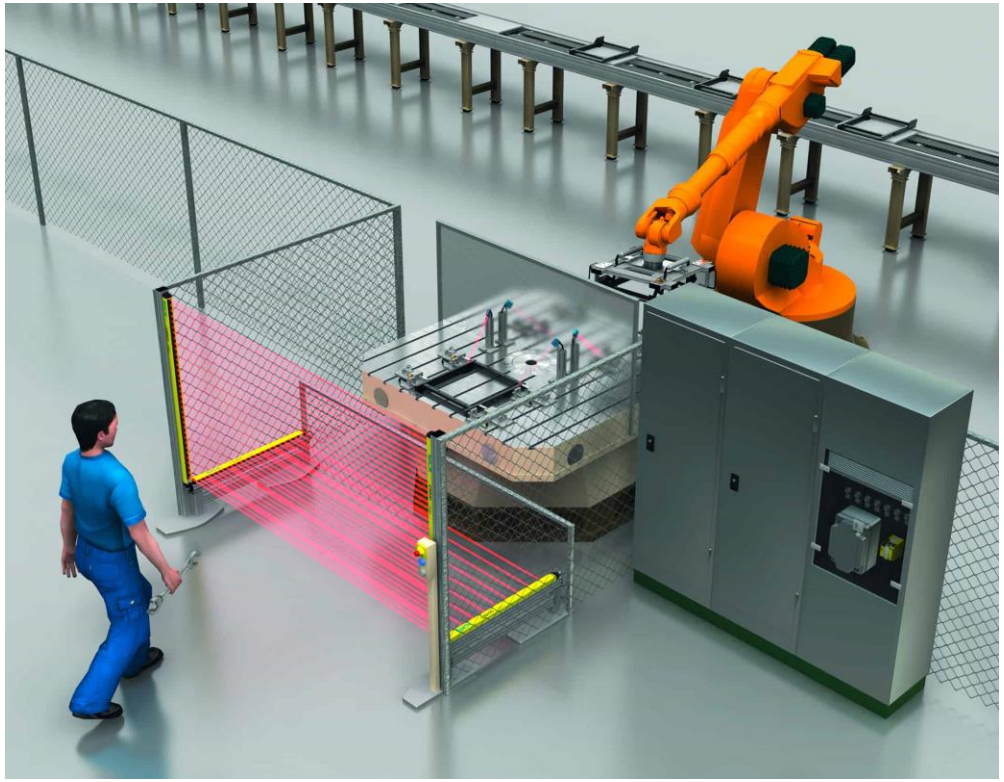
# Safety Components

## Safety Fencing



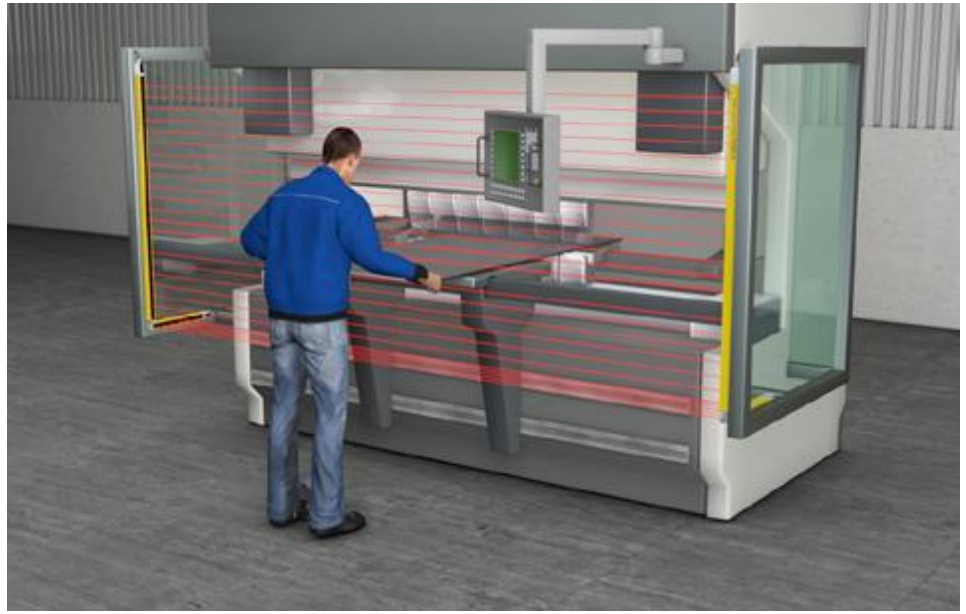
# Safety Components

## Light Curtain



# Safety Components

## Light Curtain



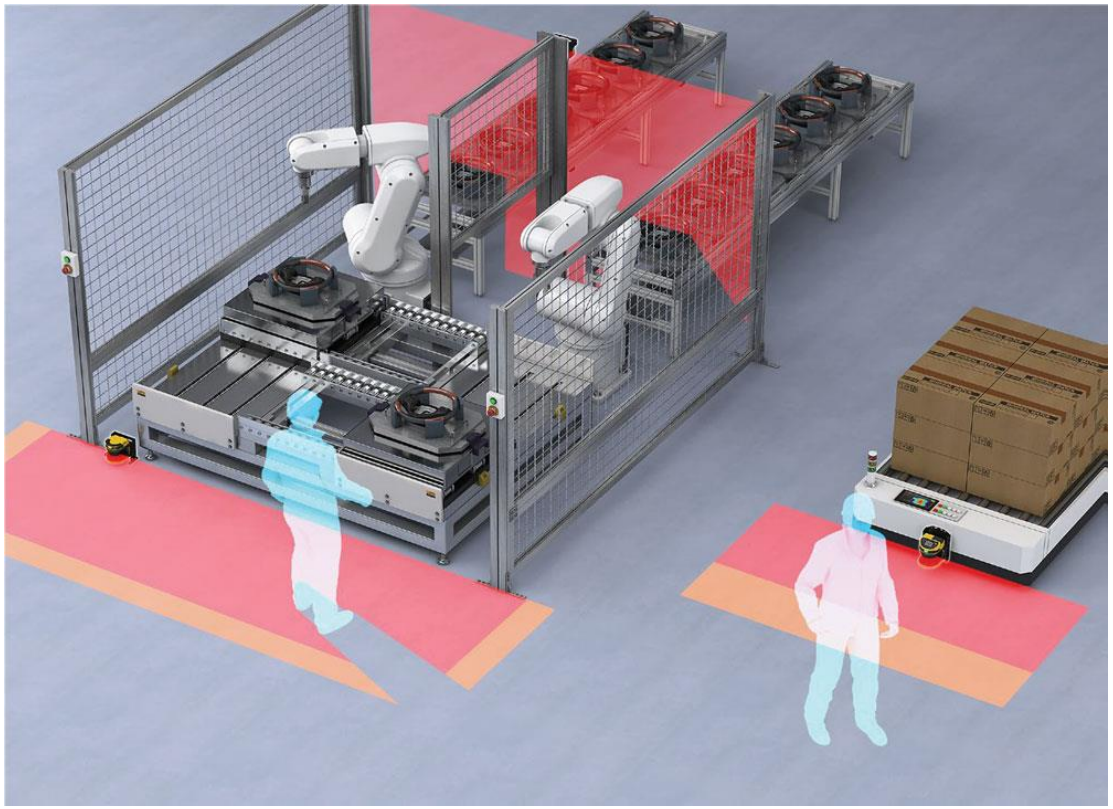
Light Curtain with muting

# Safety Components

## Interlock Gate Switch

# Safety Components

## Safety Scanner



# Safety Components

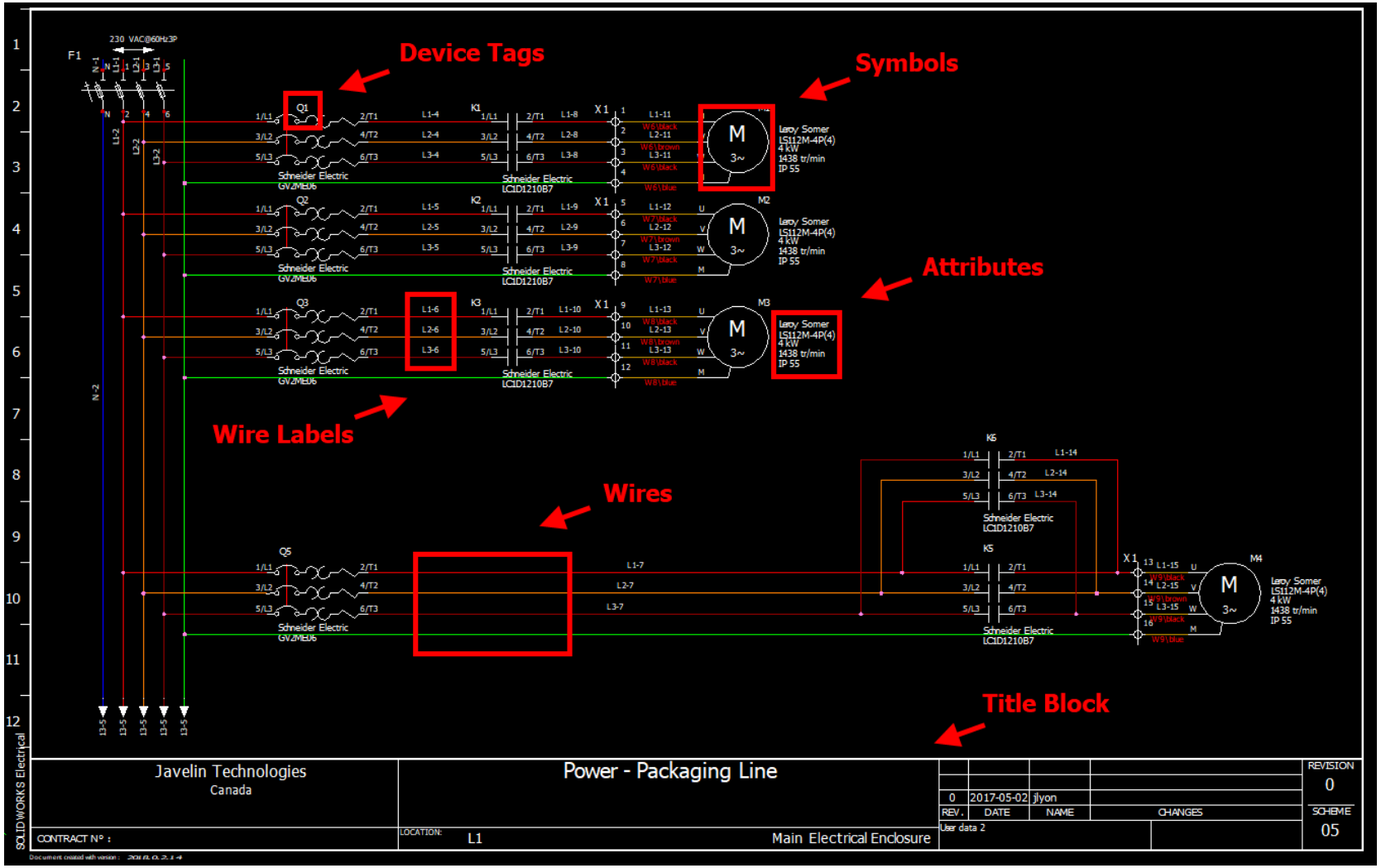
## Emergency Stops

# Automation

- Electrical components
- Electrical drawing
- Common components use in automation
  - Sensors
  - Actuators
  - Controllers

# Electrical Components

# Electrical Drawings



# Sensors

- Pressure Sensors.
- Proximity Sensors.
- Photoelectric Sensors.
- Ultrasonic sensors.

# Pressure Sensors

# Proximity Sensors

## Inductive sensors

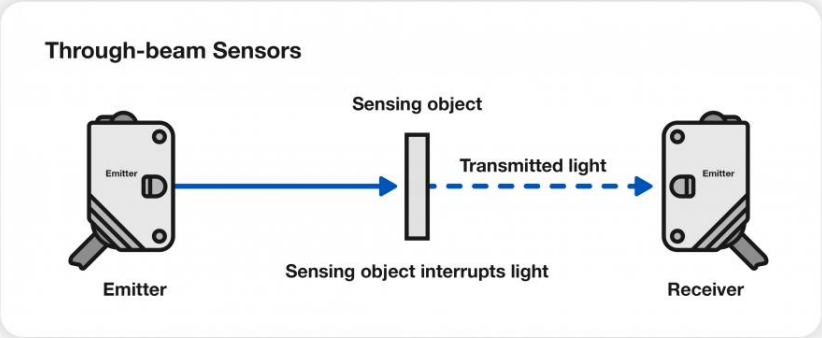
These non-contact proximity sensors detect ferrous targets, ideally mild steel thicker than one millimeter.

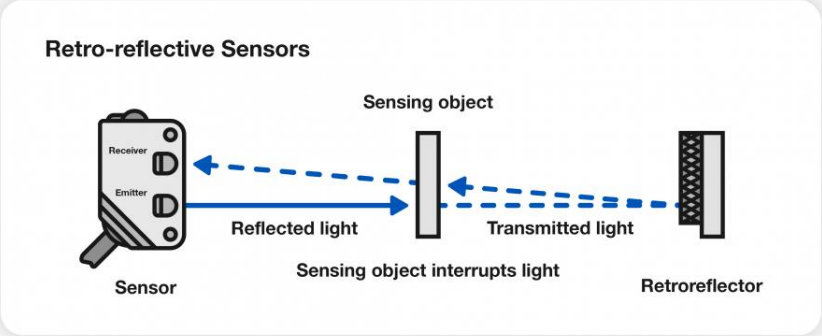
# Proximity Sensors

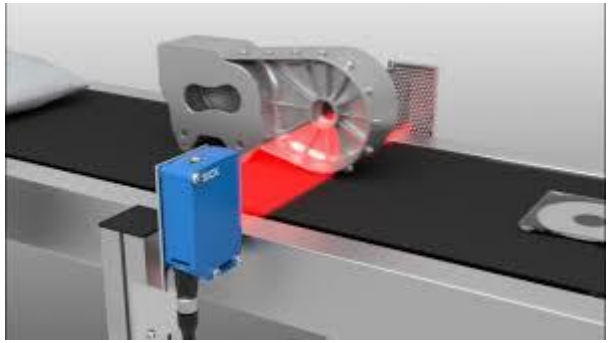
## Capacitive sensors

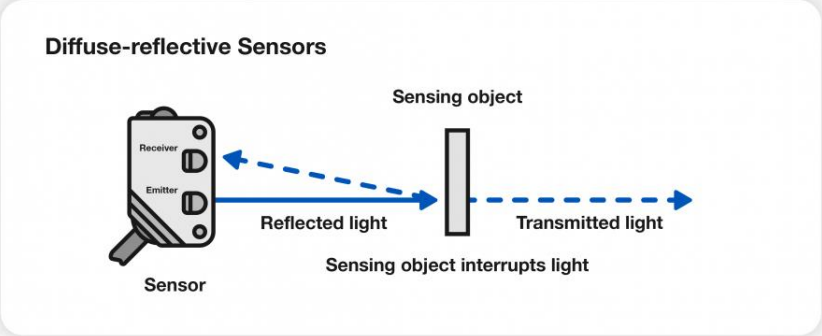
Capacitive sensors can detect both metallic and non-metallic objects

# Photoelectric Sensors

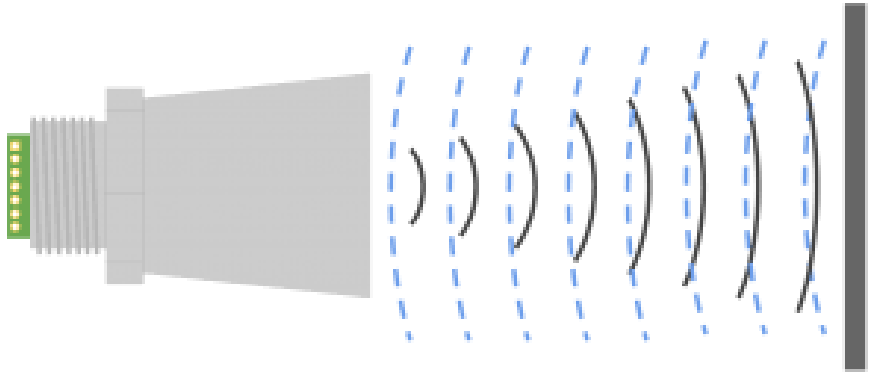






# Ultrasonic sensors



# In class assignment-ilearn submissoin

In this assignment, you will research and compare two sensors, IFM O6P201 and O6H201, with the aim of understanding their specifications, applications, and advantages.

- Write a well-structured discussion that includes:
- An introduction that briefly explains the importance of sensors in various industries.
- Descriptions of sensor O6P201 IFM and O6H201, covering their specifications (e.g., measurement range, accuracy, sensitivity), working principles, and key features.
- A section that discusses the applications for each sensor. Where and how are they used in different industries or settings?

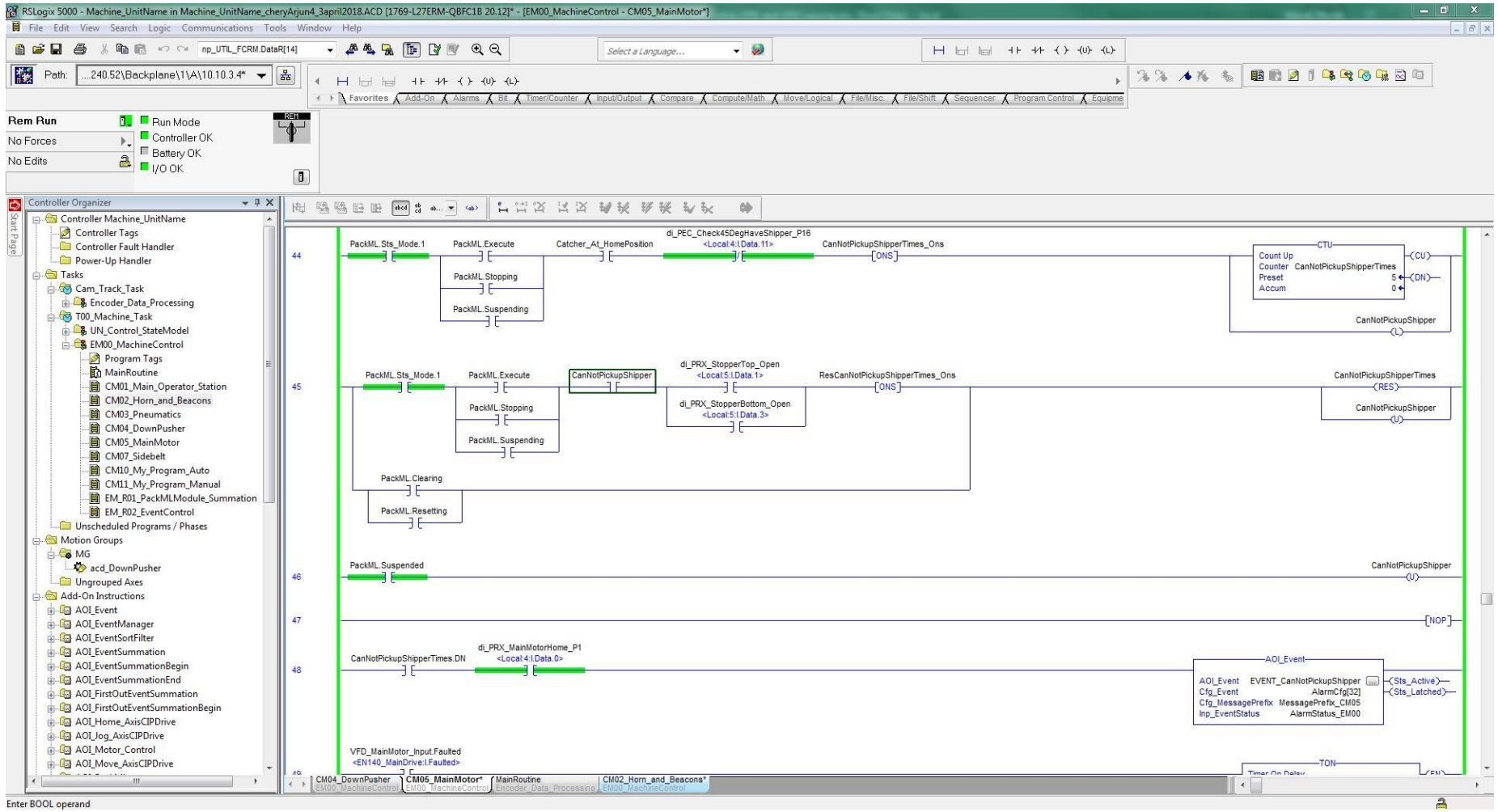
# Actuators

Pneumatic Cylinder

# Controllers

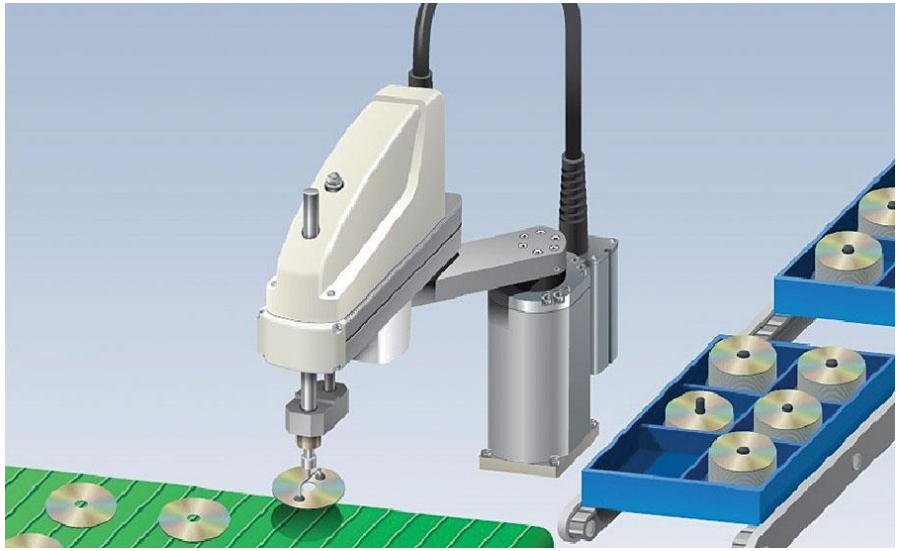
PLC

# PLC

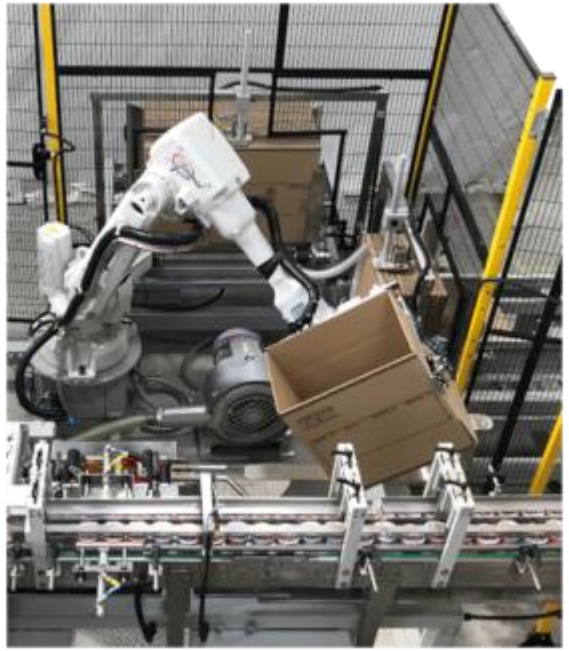

RSLogix 5000 - Machine_UnitName in Machine_UnitName_cheryArjun4_3april2018.ACD [1769-L27ERM-QBFC1B 20.12]* - [EM00_MachineControl - CM05_MainMotor*]
Rem Run
Run Mode
Controller OK
Battery OK
I/O OK
No Forces
No Edits
Controller Organizer
Controller Machine_UnitName
Controller Tags
Controller Fault Handler
Power-Up Handler
Tasks
Cam_Track_Task
Encoder_Data_Processing
T00_Machine_Task
UN_Control_StateModel
EM00_MachineControl
Program Tags
MainRoutine
CM01_Main_Operator_Station
CM02_Horn_and_Beacons
CM03_Pneumatics
CM04_DownPusher
CM05_MainMotor
CM07_Sidebelt
CM10_My_Program_Auto
CM11_My_Program_Manual
EM_R01_PackMLModule_Summation
EM_R02_EventControl
Unscheduled Programs / Phases
Motion Groups
MG
acd_DownPusher
Ungrouped Axes
Add-On Instructions
AOI_Event
AOI_EventManager
AOI_EventSortFilter
AOI_EventSummation
AOI_EventSummationBegin
AOI_EventSummationEnd
AOI_FirstOutEventSummation
AOI_FirstOutEventSummationBegin
AOI_Home_AxisCIPDrive
AOI_Jog_AxisCIPDrive
AOI_Motor_Control
AOI_Move_AxisCIPDrive
PackML.Sts_Mode.1
PackML.Execute
Catcher_At_HomePosition
di_PEC_Check45DegHaveShipper_P16
CanNotPickupShipperTimes_Ons
PackML.Stopping
PackML.Suspending
CTU
Count Up
Counter CanNotPickupShipperTimes
Preset 5
Accum 0
CU
DN
CanNotPickupShipper
di_PRX_StopperTop_Open
ResCanNotPickupShipperTimes_Ons
di_PRX_StopperBottom_Open
CanNotPickupShipperTimes
PackML.Clearing
PackML.Resetting
PackML.Suspended
NOP
CanNotPickupShipperTimes.DN
di_PRX_MainMotorHome_P1
AOI_Event
AOI_Event EVENT_CanNotPickupShipper
Cfg_Event AlarmCfg[32]
Cfg_MessagePrefix MessagePrefix_CM05
Inp_EventStatus AlarmStatus_EM00
Sts_Active
Sts_Latched
VFD_MainMotor_Input.Faulted
TON
CM04_DownPusher
CM05_MainMotor*
MainRoutine
CM02_Horn_and_Beacons*
Enter BOOL operand

# Industrial Robot Application

Pick & place robot
(Delta)



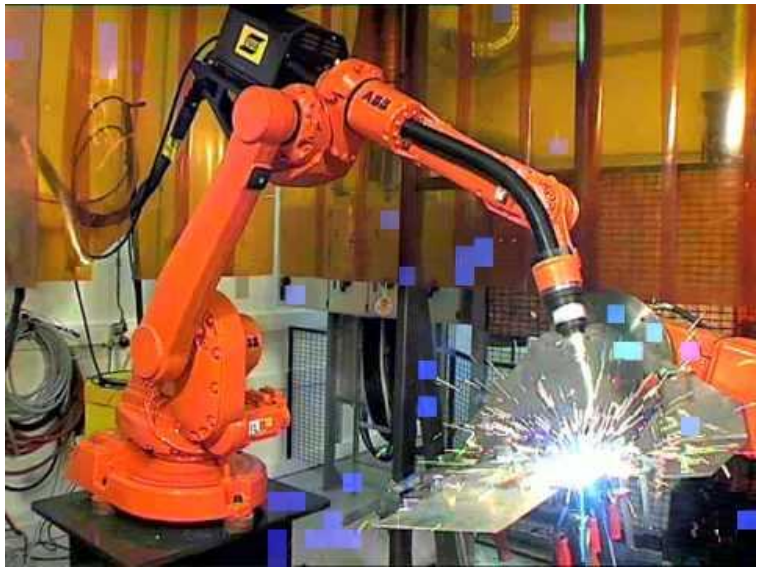
Pick & place robot
(SCARA: Selective Compliance Assembly Robot Arm)



Case erecting robot

# Industrial Robot Application

Palletising robot



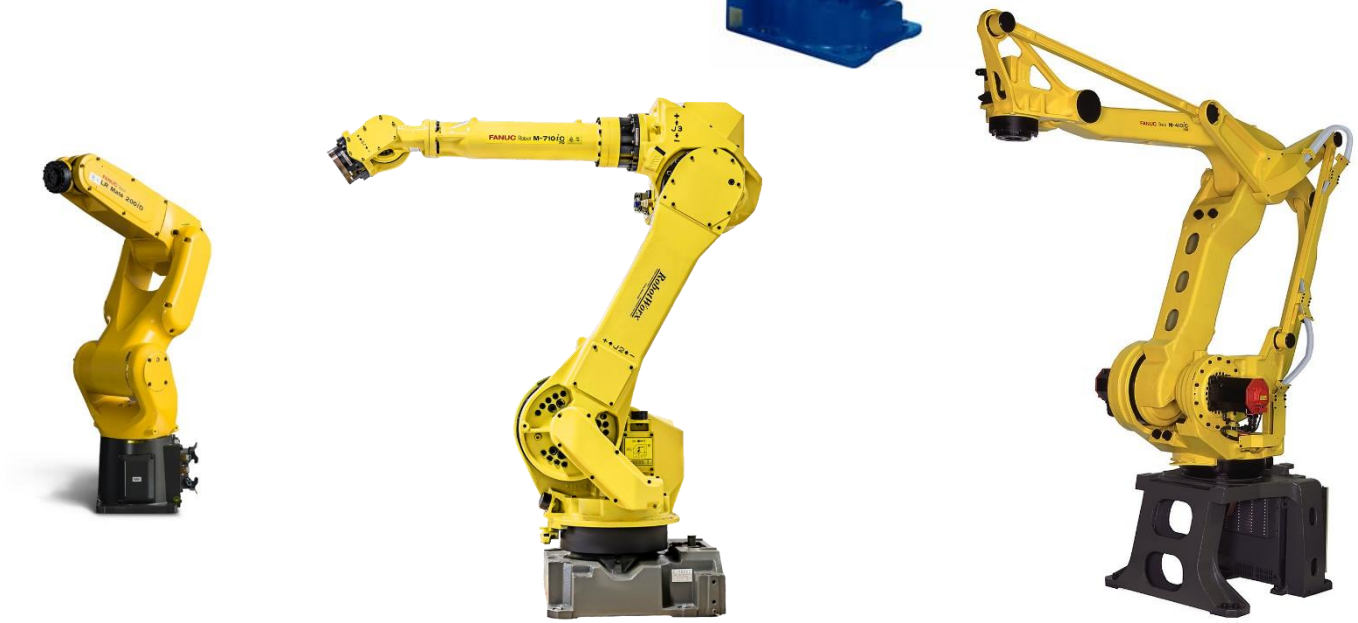
Welding robot

Painting robot

# Industrial Robot Brands

Motoman

Fanuc



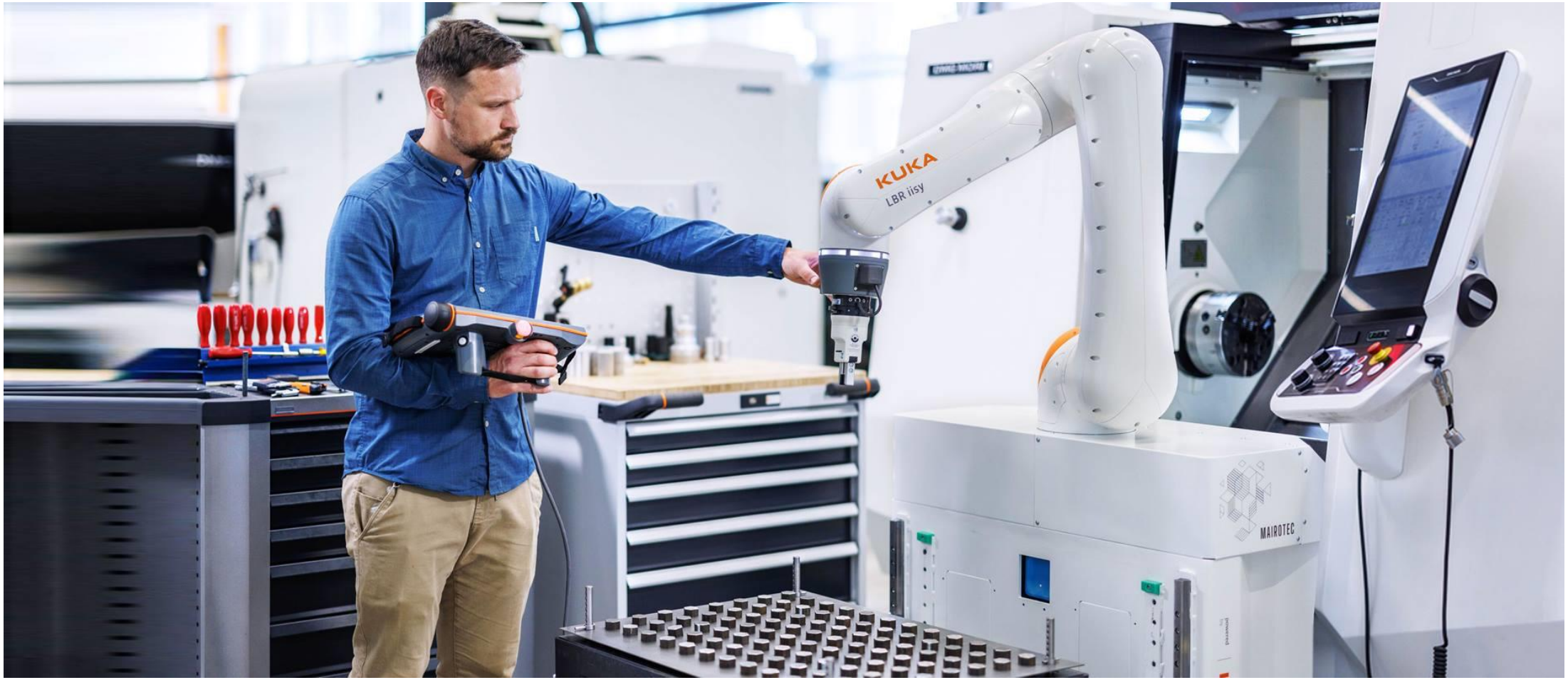
# Industrial Robot Brands

ABB

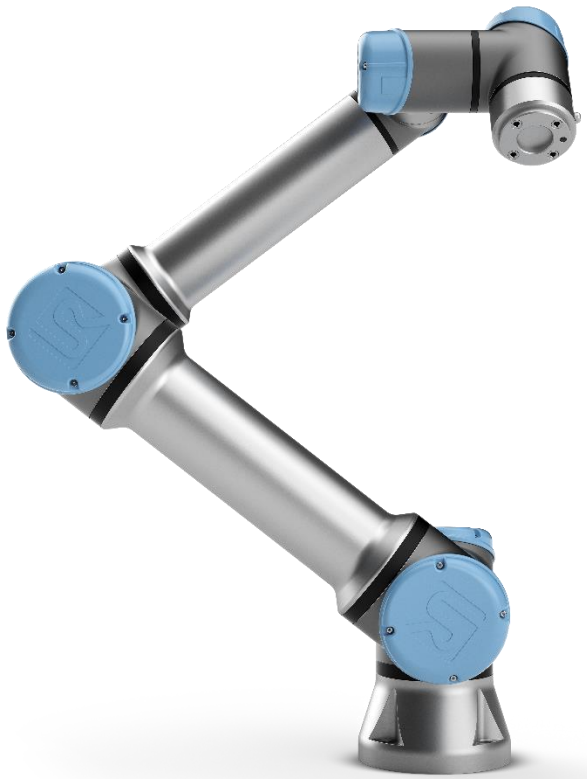
Kawasaki

OTC

# Cobots



# Cobots



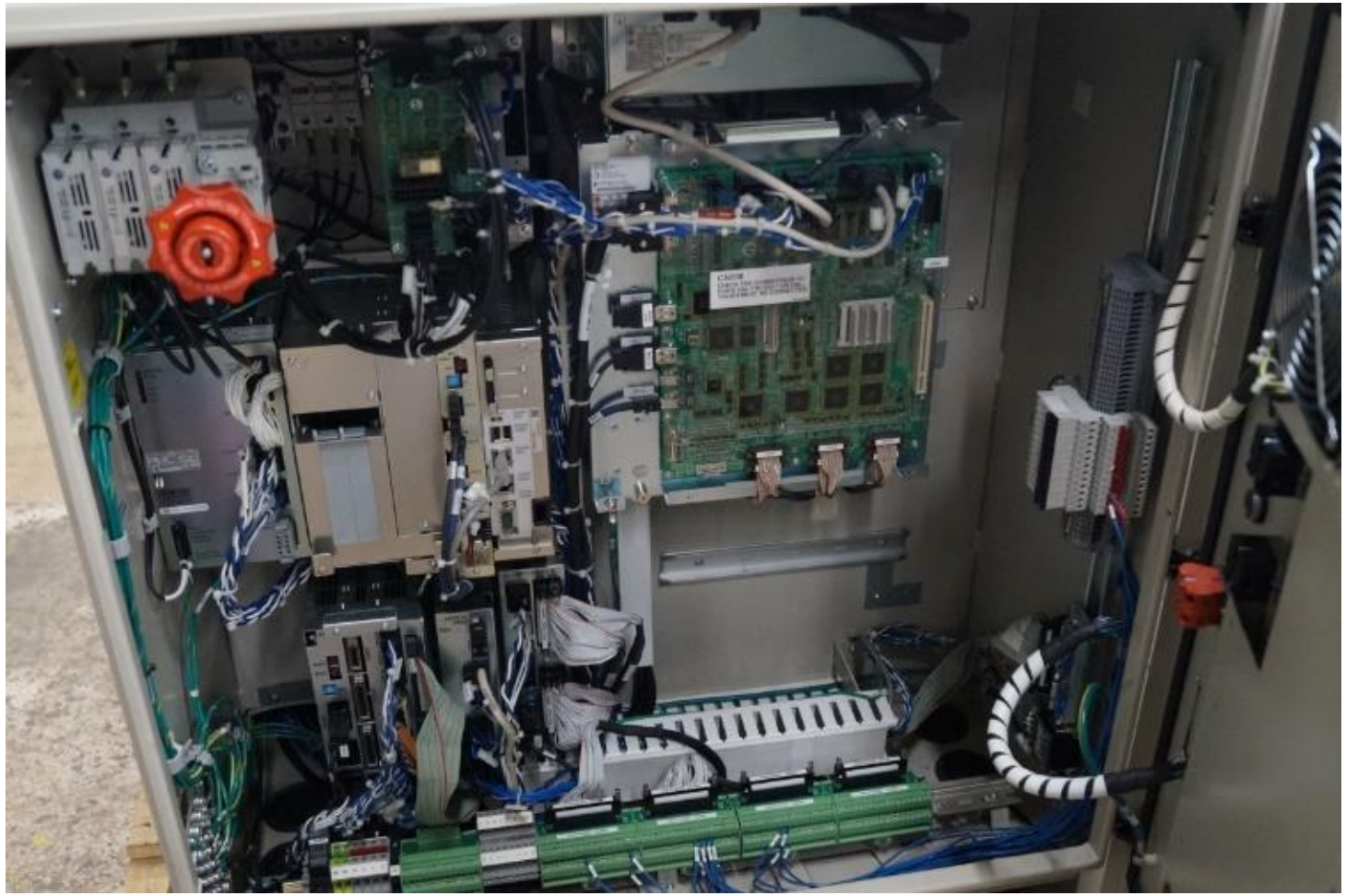
# Robot Controllers

Motoman

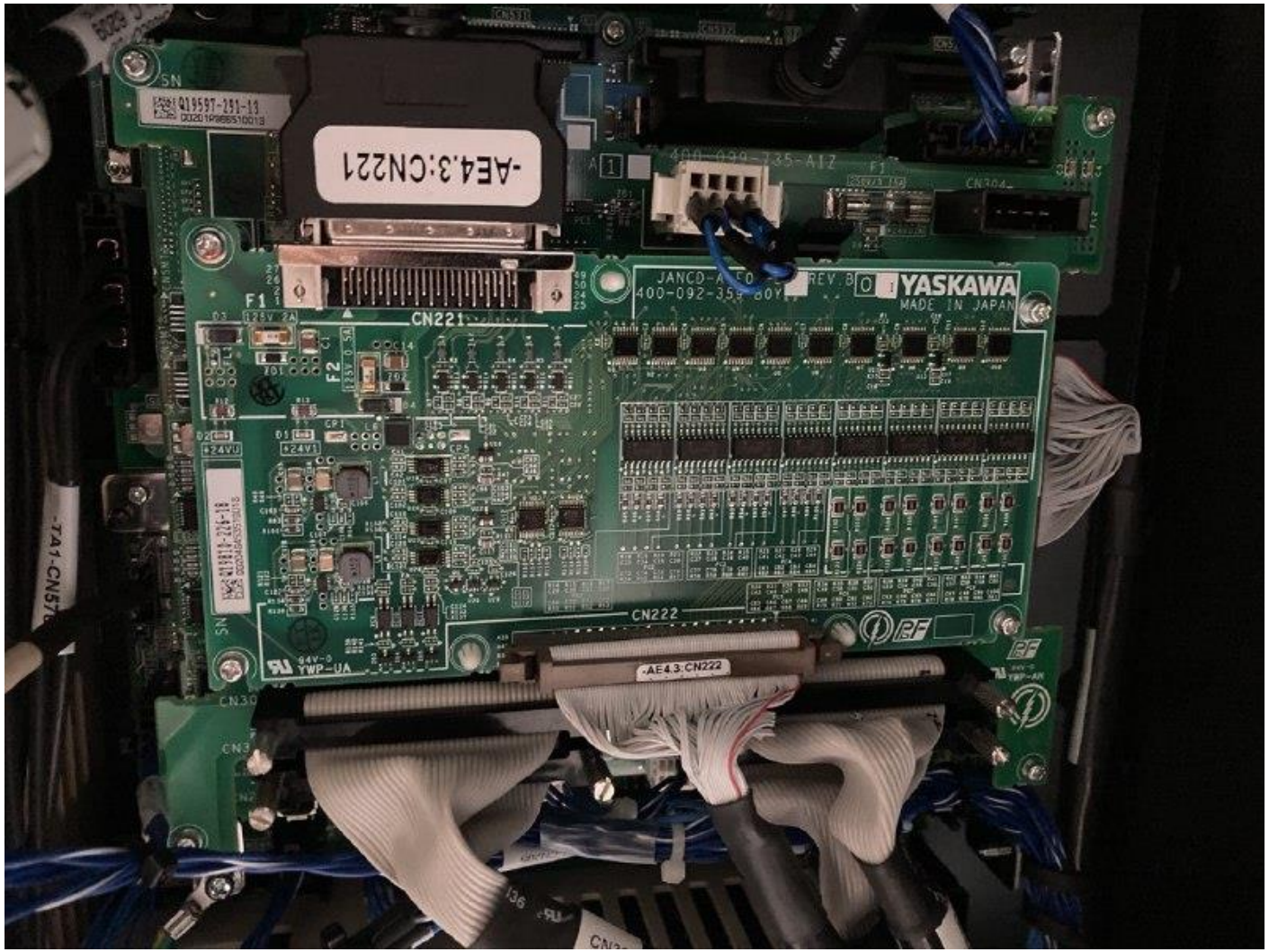
ABB

Kawasaki

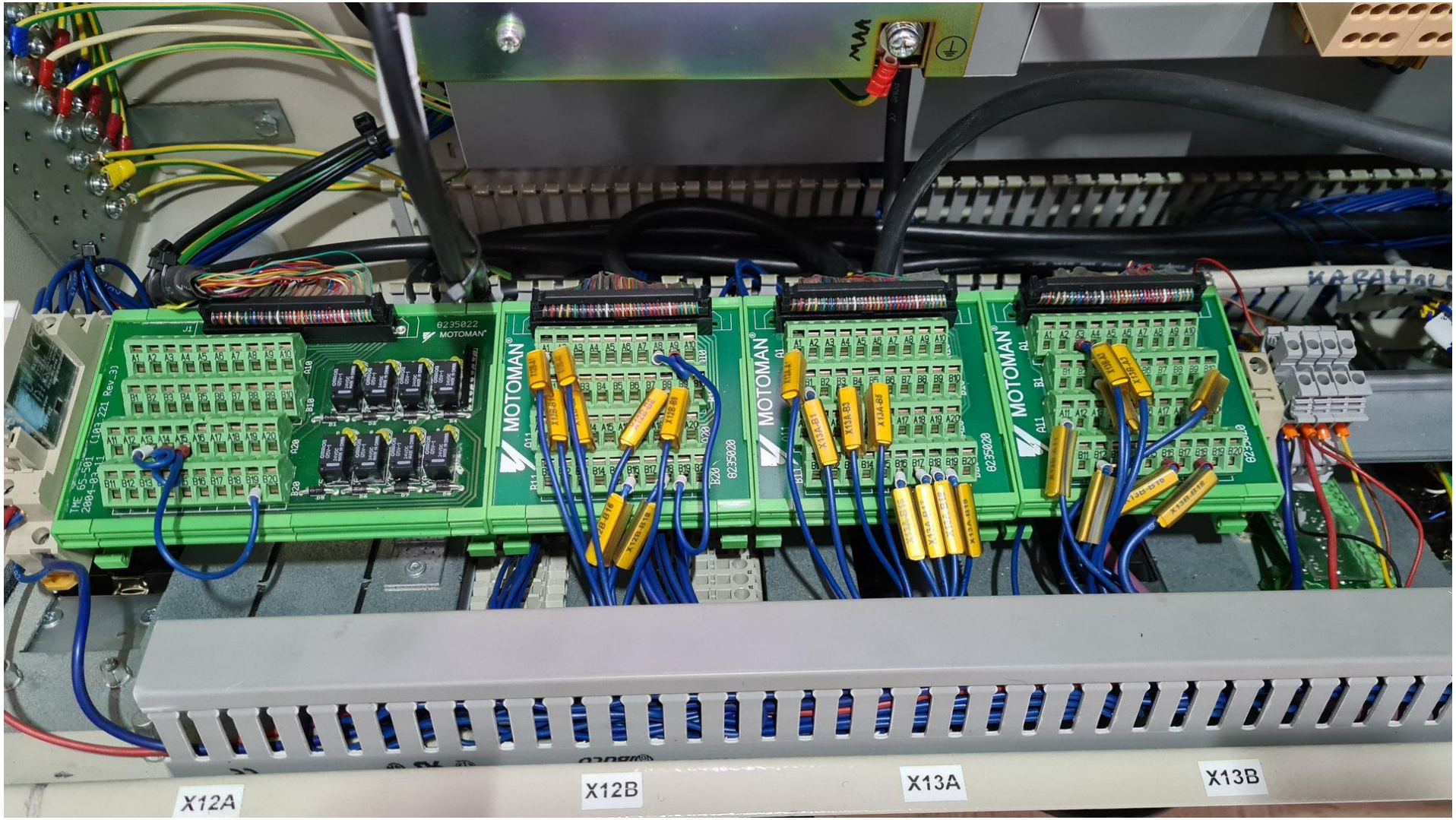
# Controller Parts



# Controller Parts

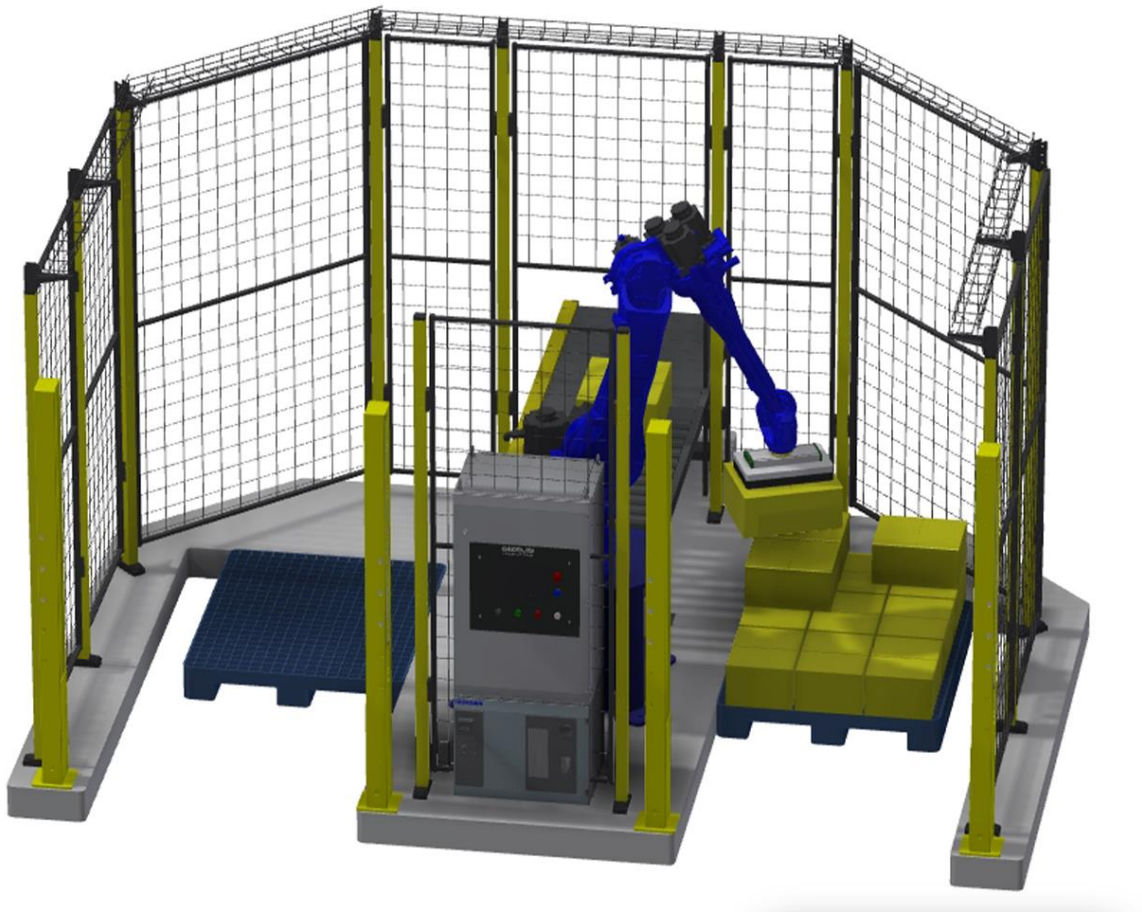


# I/O Module



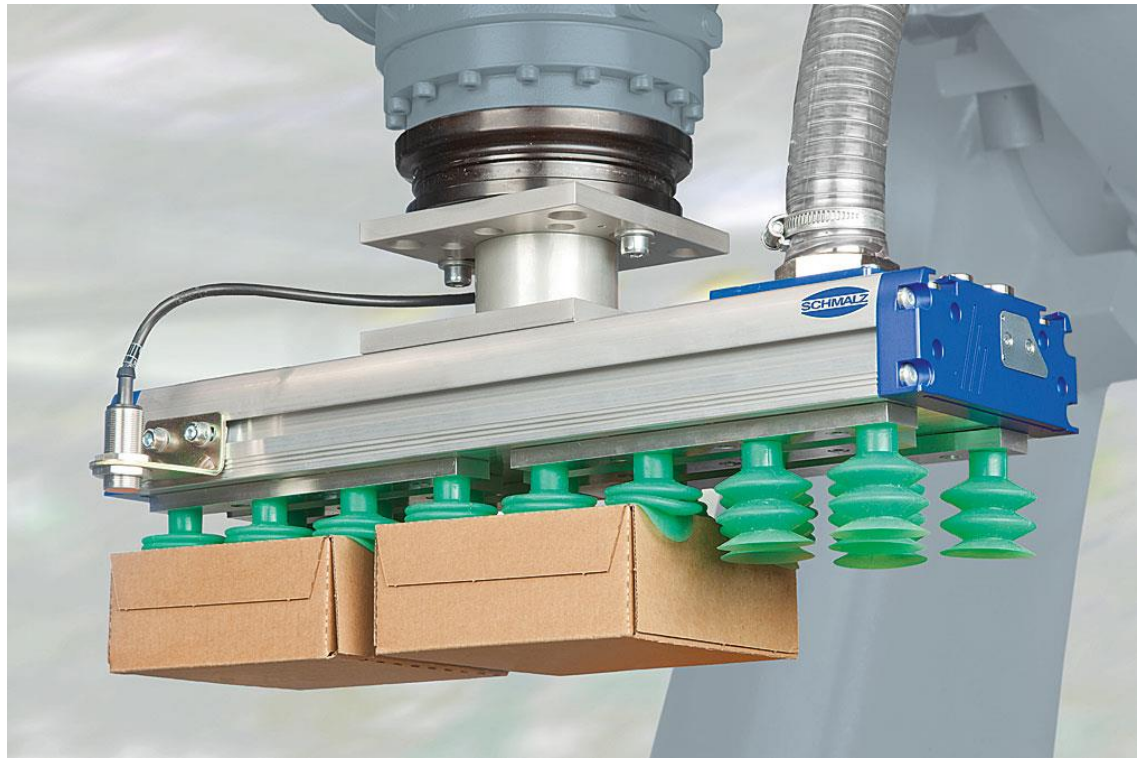
# Industrial Robots

# Industrial Robots



# Grippers

# Grippers

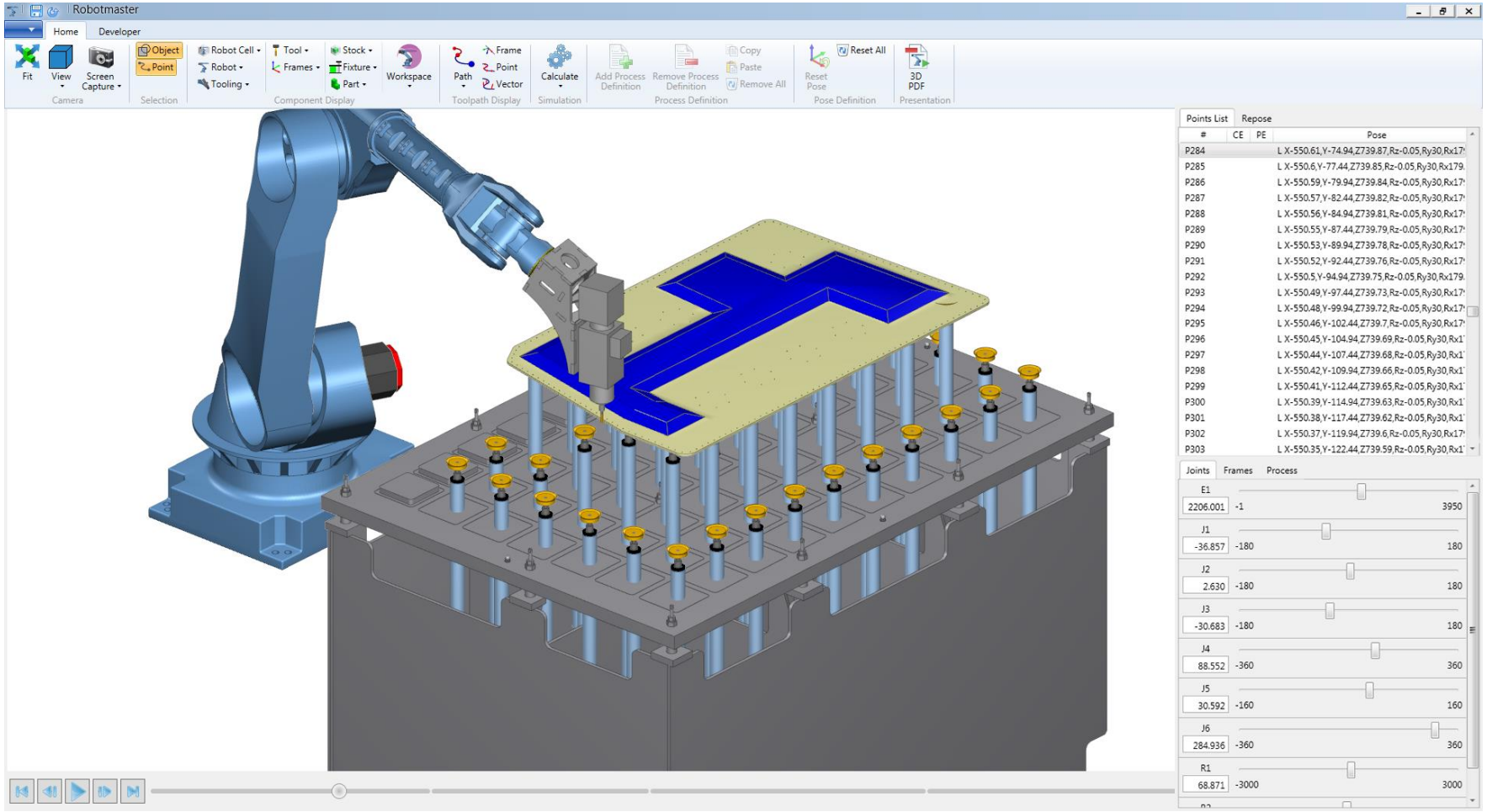


# Grippers

# Off-line Programming

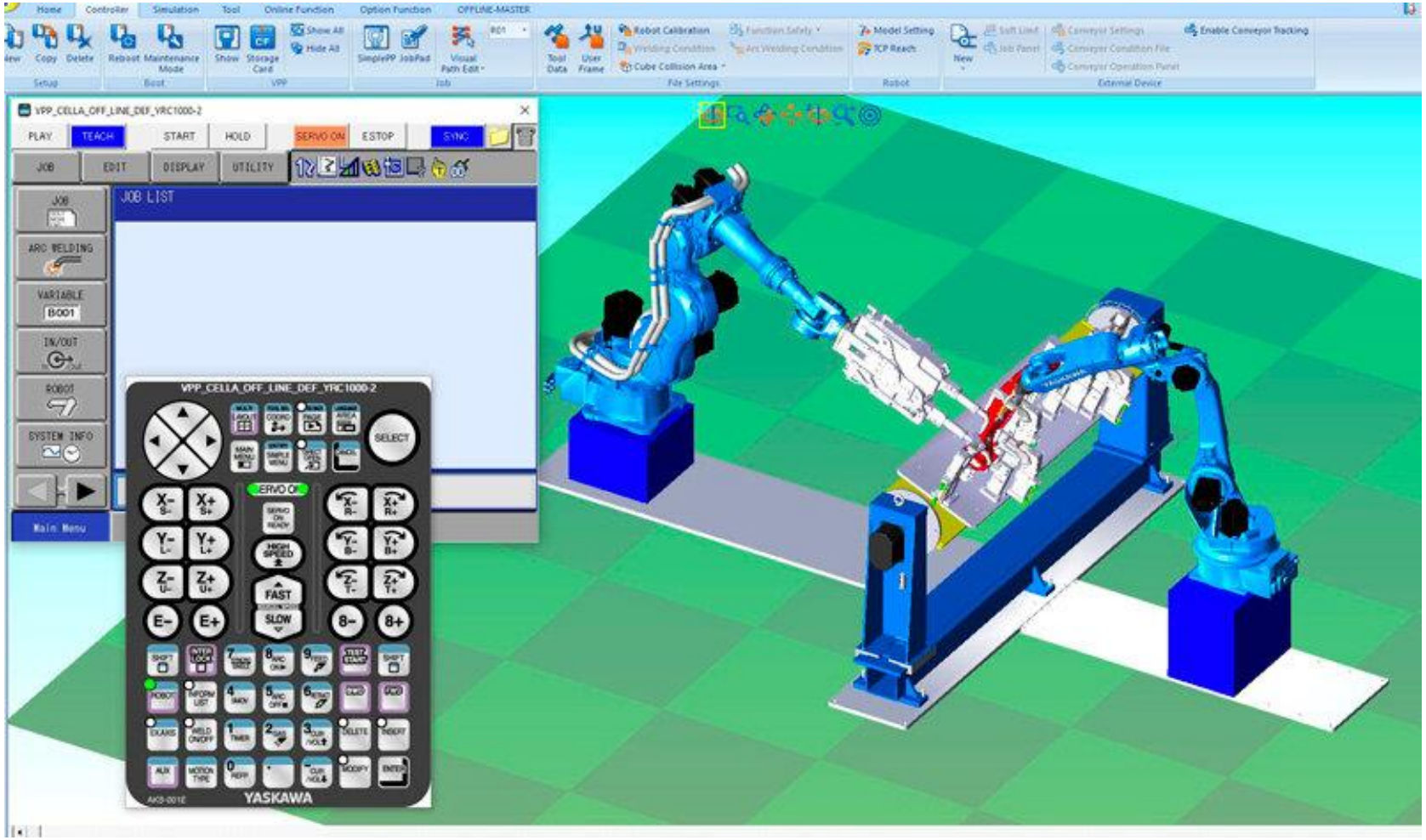
- **Offline Programming** (or Off-Line Programming) means programming robots outside the production environment.
- Offline Programming eliminates production downtime caused by shopfloor programming.
- Simulation and Offline Programming allows studying multiple scenarios of a robot work cell before setting up the production cell.
- Mistakes commonly made in designing a work cell can be predicted in time.

# Off-line Programming



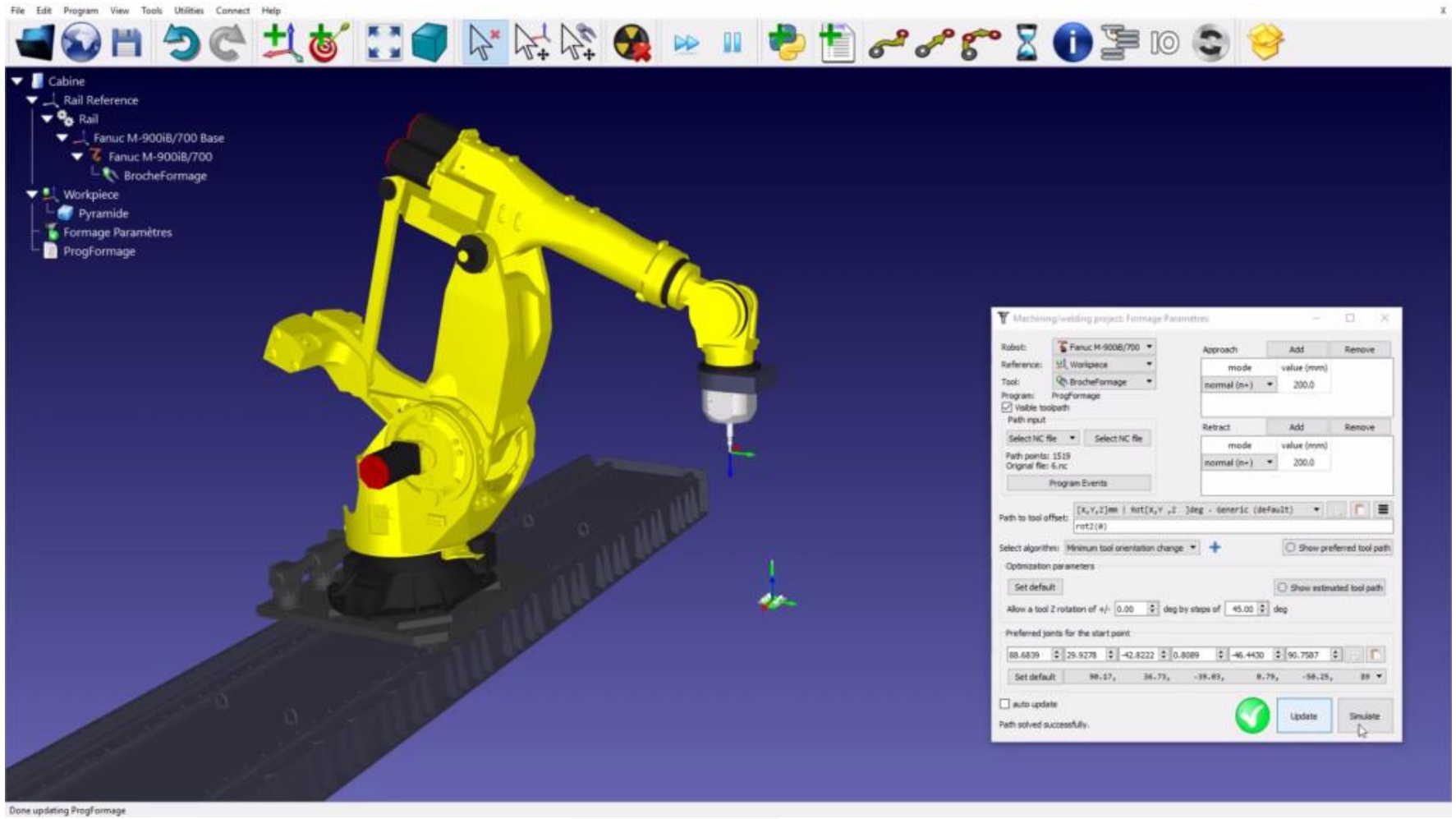

Robotstudio

# Off-line Programming



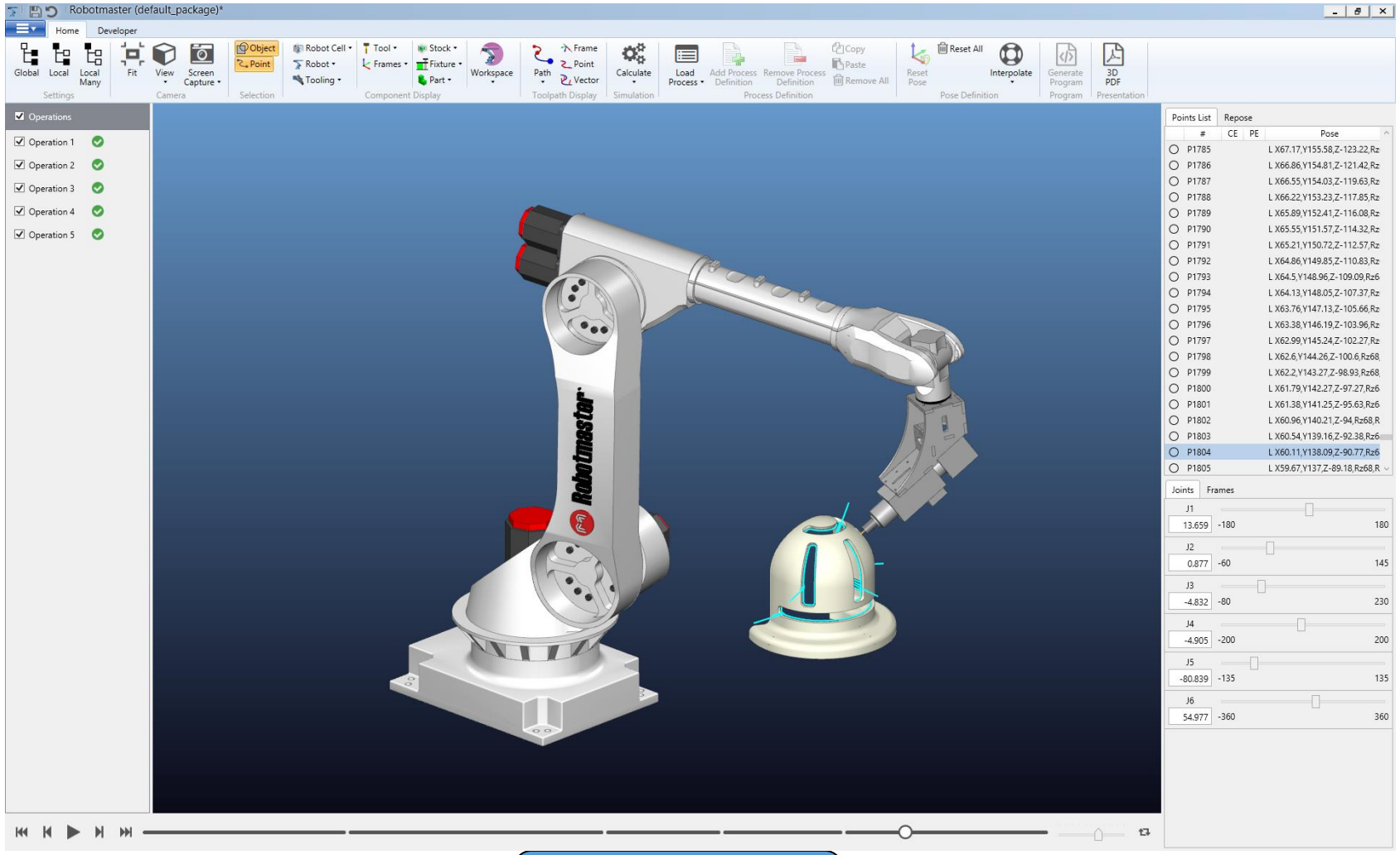

Motosim

# Off-line Programming



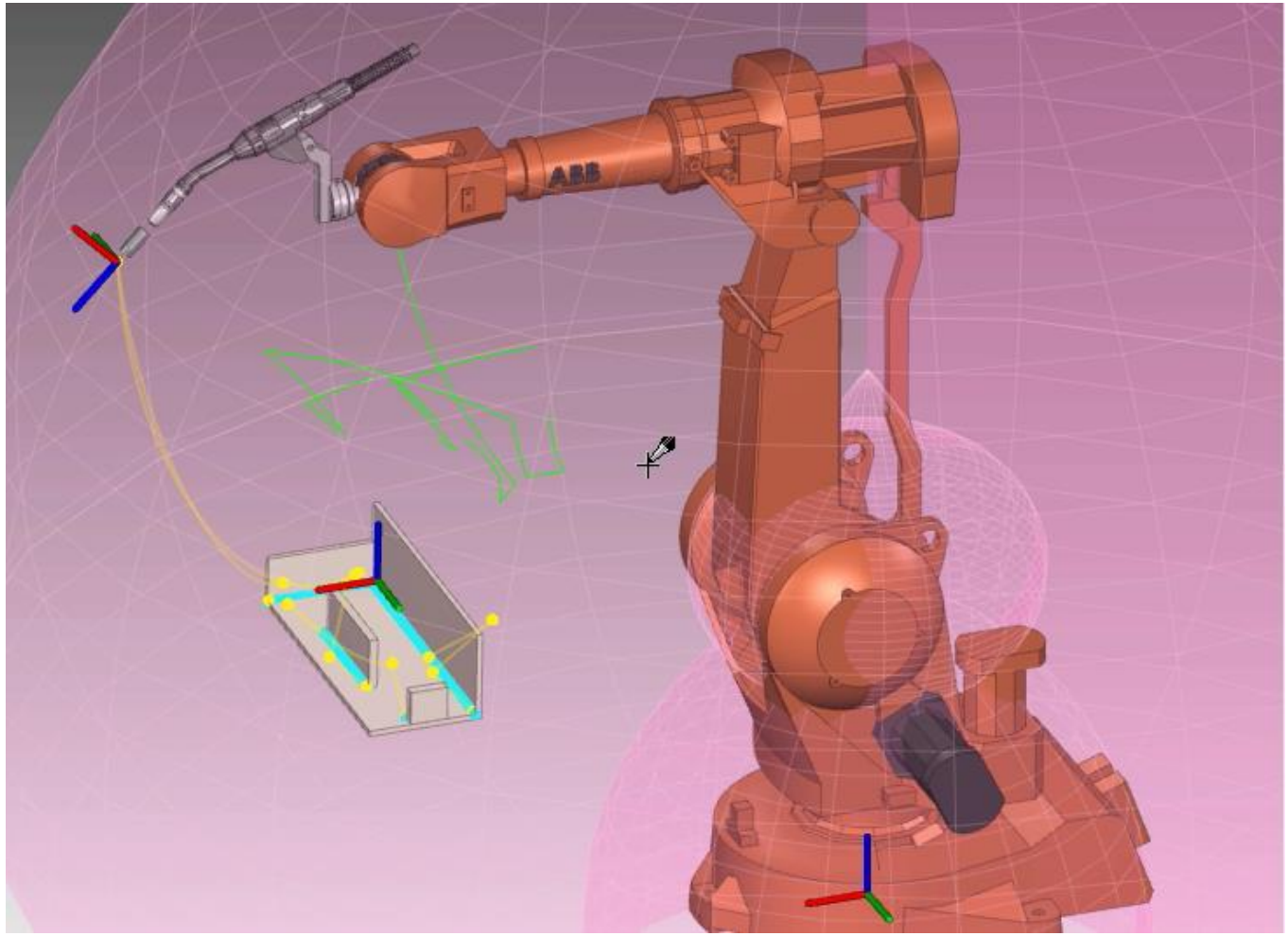

RobotDK

# Off-line Programming



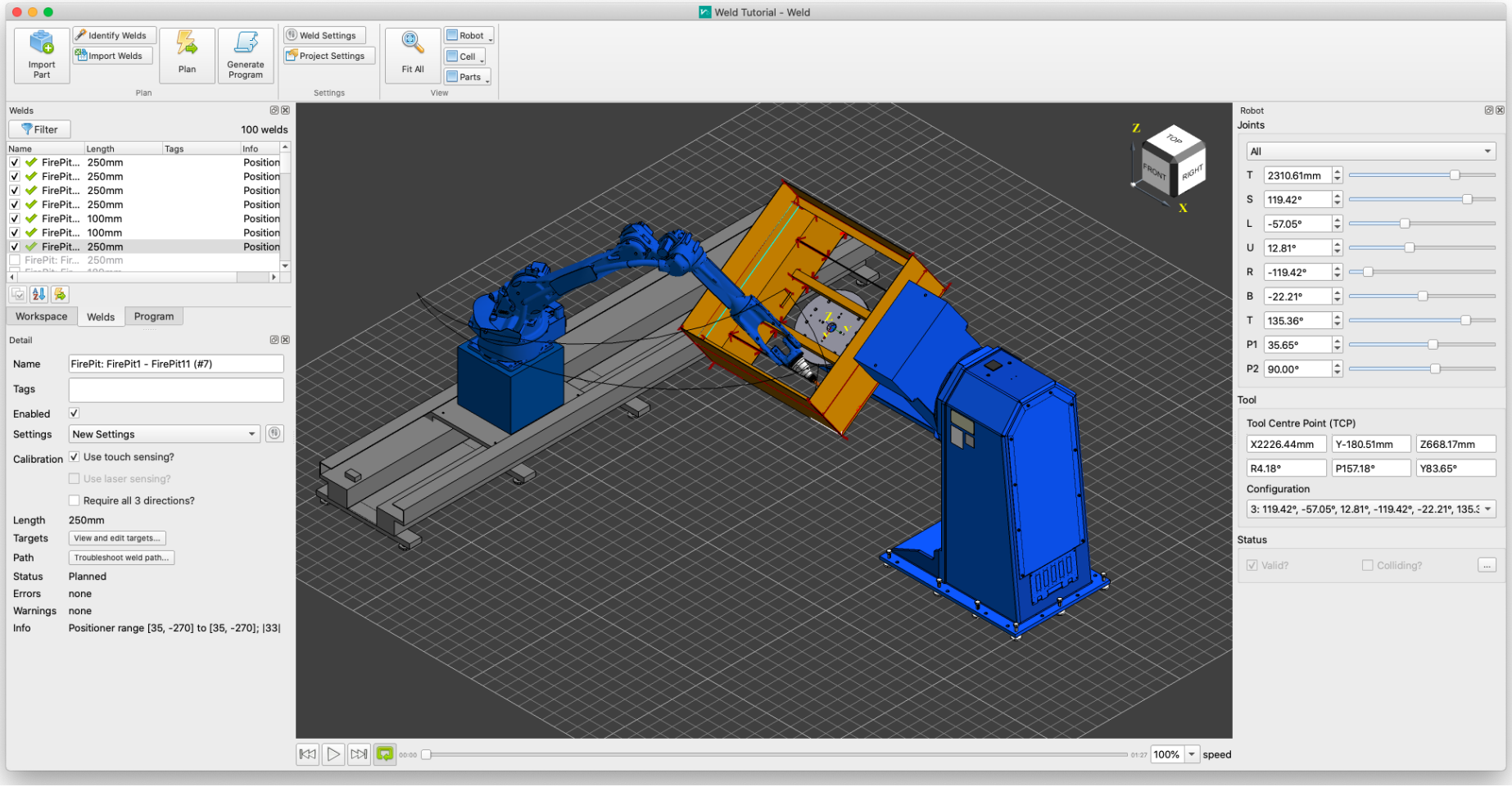

Robotmaster

# Off-line Programming




RobotMaster

# Off-line Programming




Verbotics

MACQUARIE University