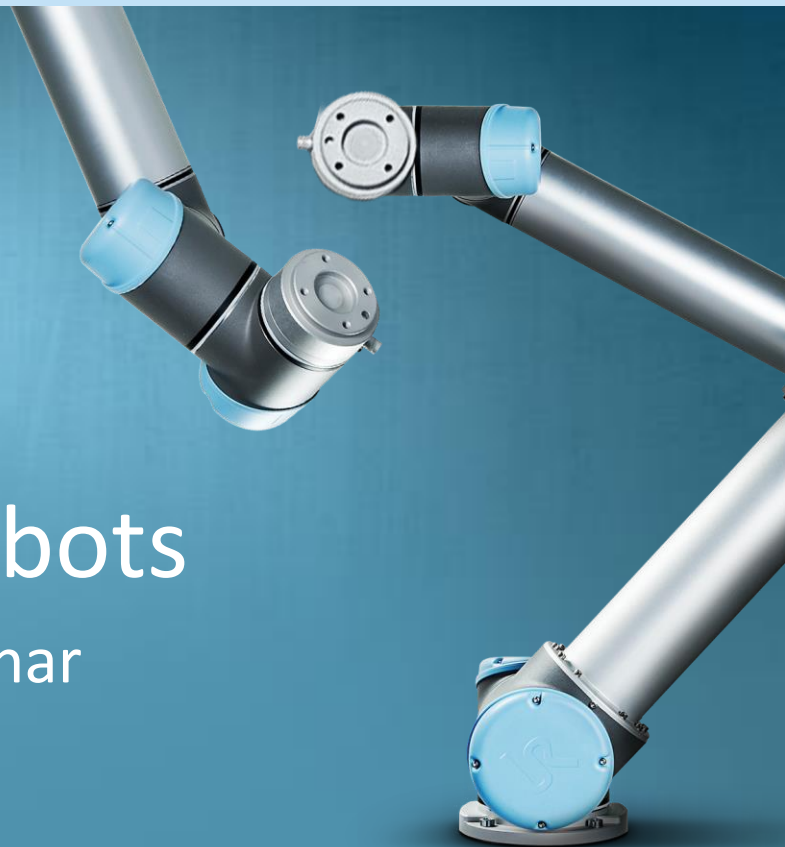




UNIVERSAL ROBOTS

Universal Robots

Technical Webinar

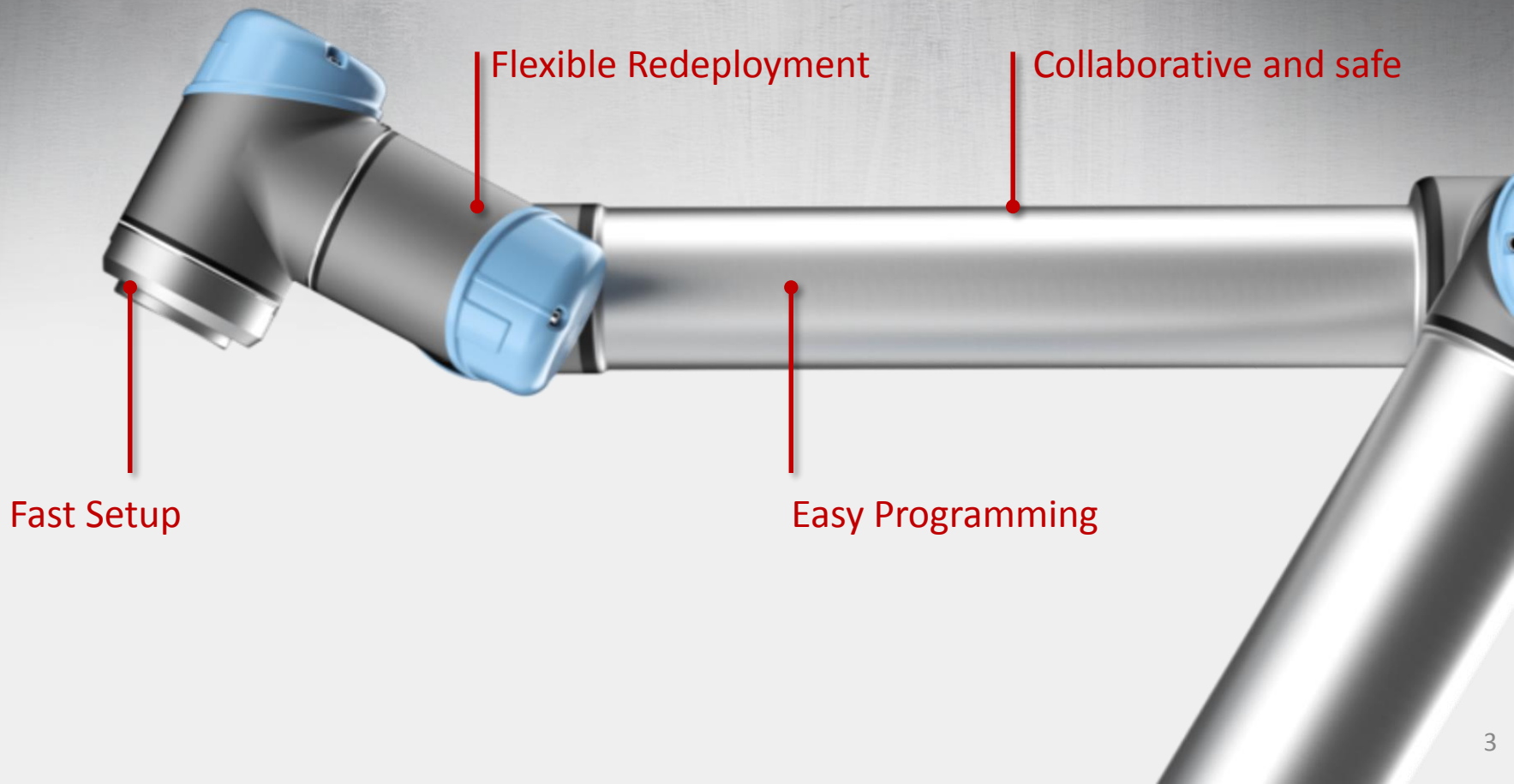




Presenting the Trainer

Name: *Seungmin Baek*

Role: *Technical Support Engineer*



Fast Setup

Flexible Redeployment

Collaborative and safe

Easy Programming



Fast Setup

- Robot arm and Control box comes in **two boxes**
- Power supplied to robot arm: 100~240V, 50~60Hz
- Mount robot with the use of **4 bolts**
- **One cable** from Control box to Robot arm.
- It comes with **full software package** including 19 language user interface and no additional software or extensions needed



**The robot arm can be installed and start its first task in less than less than ½ day. Simple Plug & Play.*

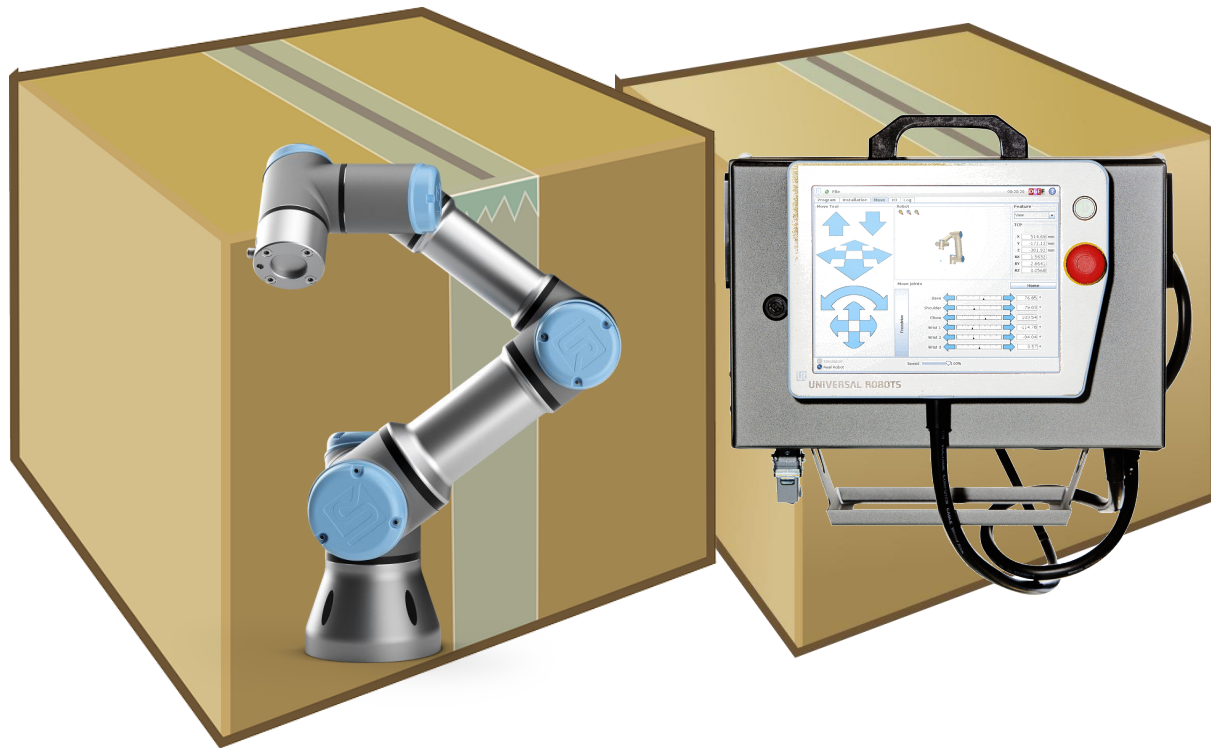
Fast Setup

Box 1

- Robot arm

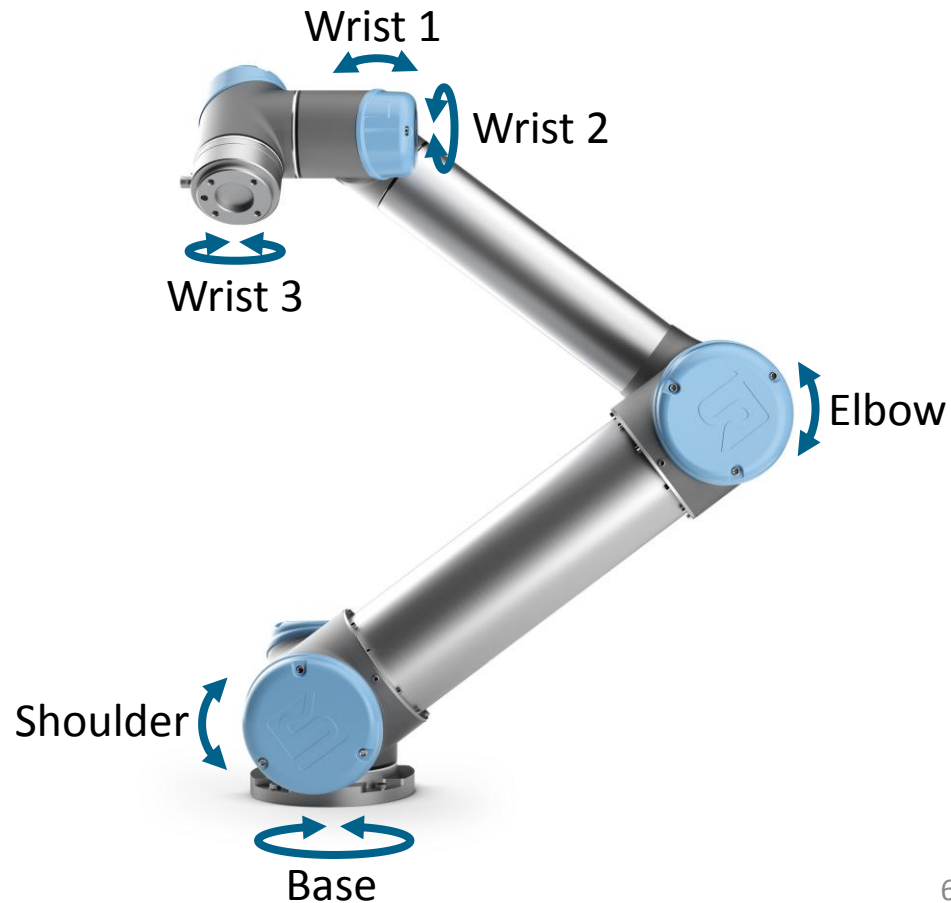
Box 2

- Controller Box
- Teach pendant
- Main and tool cables
- Mounting bracket
- Production test Cert.



Robot arm

- 6 joints → 6 DOF
- Modular design
- Wide range: +/-360 degree





Wide range of joints



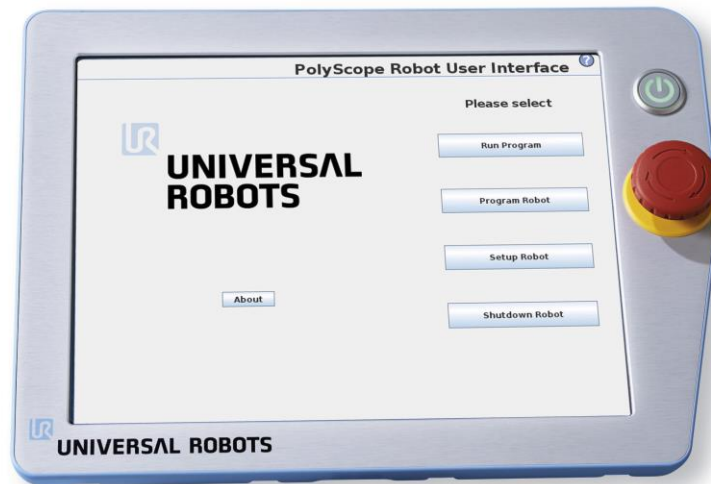
Easy Programming

- Polyscope UI enables engineers and operators to program and control the robot arm easily.
- No need for specialized robot programmers.
- Multiple programming options for the user, either via teach pendant, scripting or offline programming.
- Manually teach and record positions of the robot.



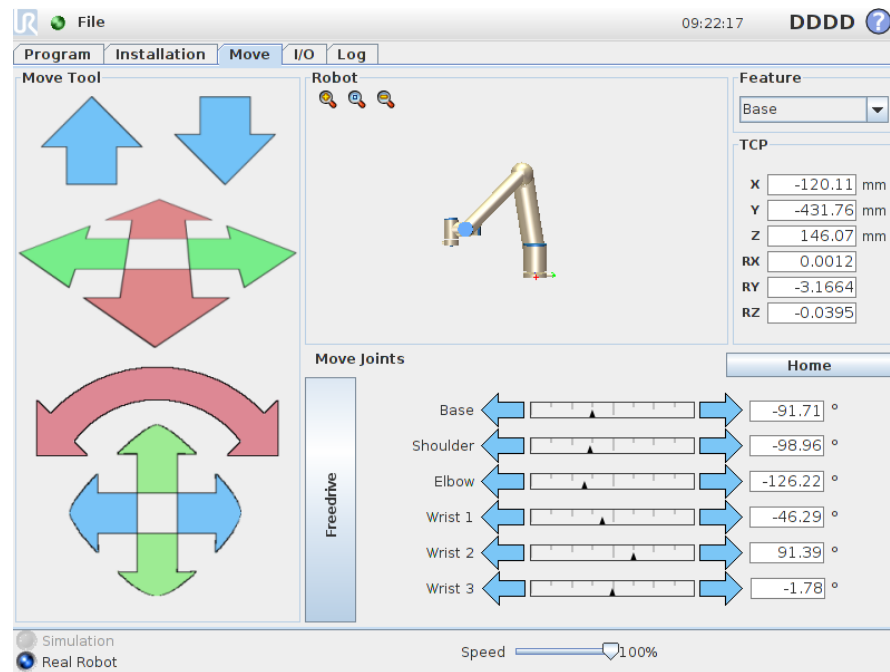
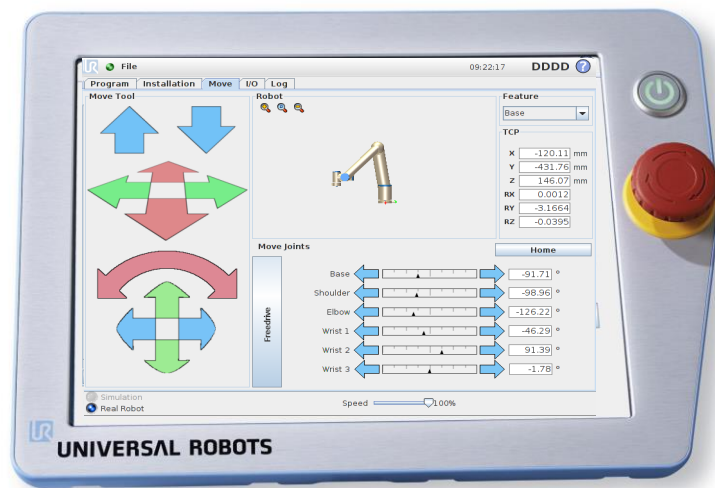


Teach Pendant and Polyscope UI





Teach Pendant and Polyscope UI





Set up tool center point



Tool Center Point

Set up tool center point

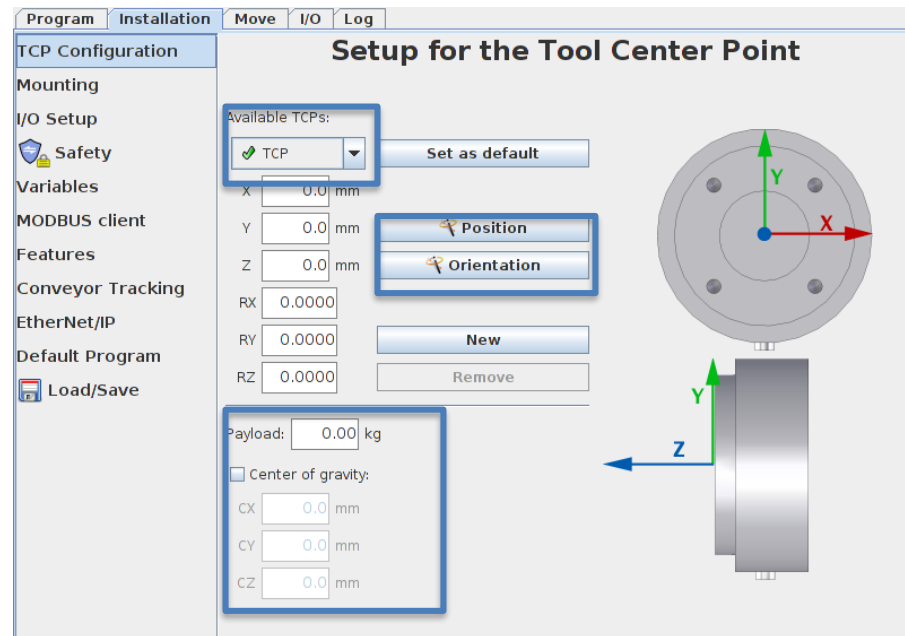
Set Multiple TCP

Quickly configure TCP with wizards

- Position
- Orientation

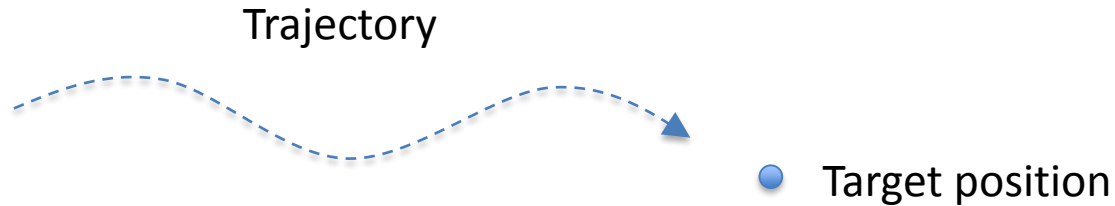
Set Payload and COG

- Can be set dynamically in program



Move types and Waypoints

- **Waypoint** specifies the target position
- **Move** specifies the trajectory robot will follow on it's way to target position

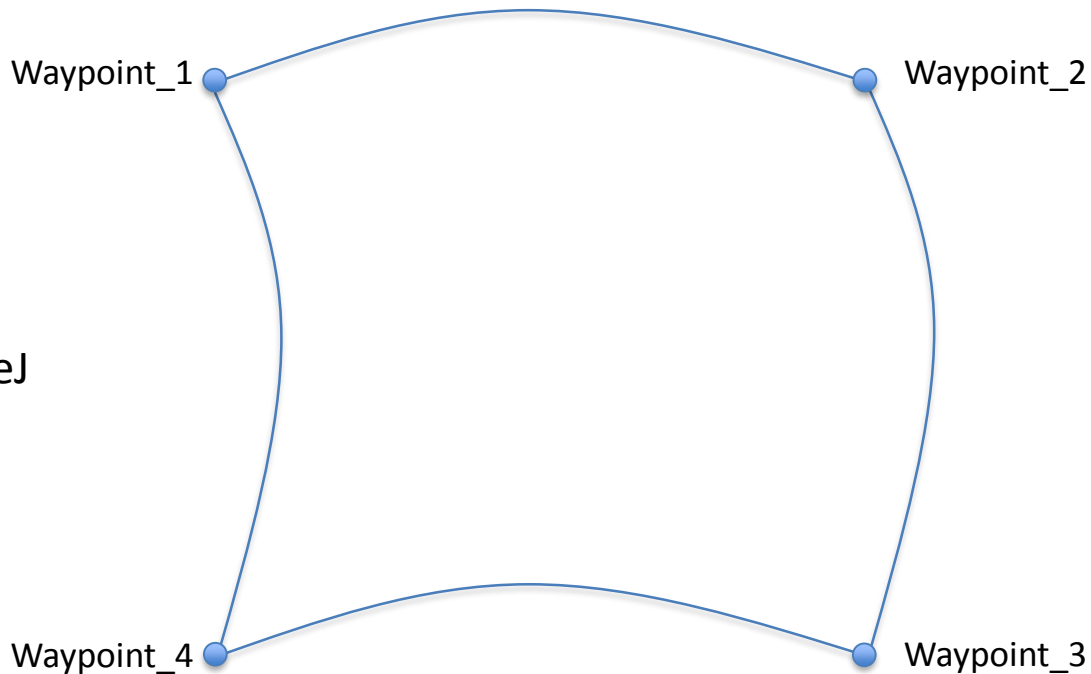


Move types and Waypoints

Joint movement

- No interpolation
- Fastest move type
- Useful in "free" space movements

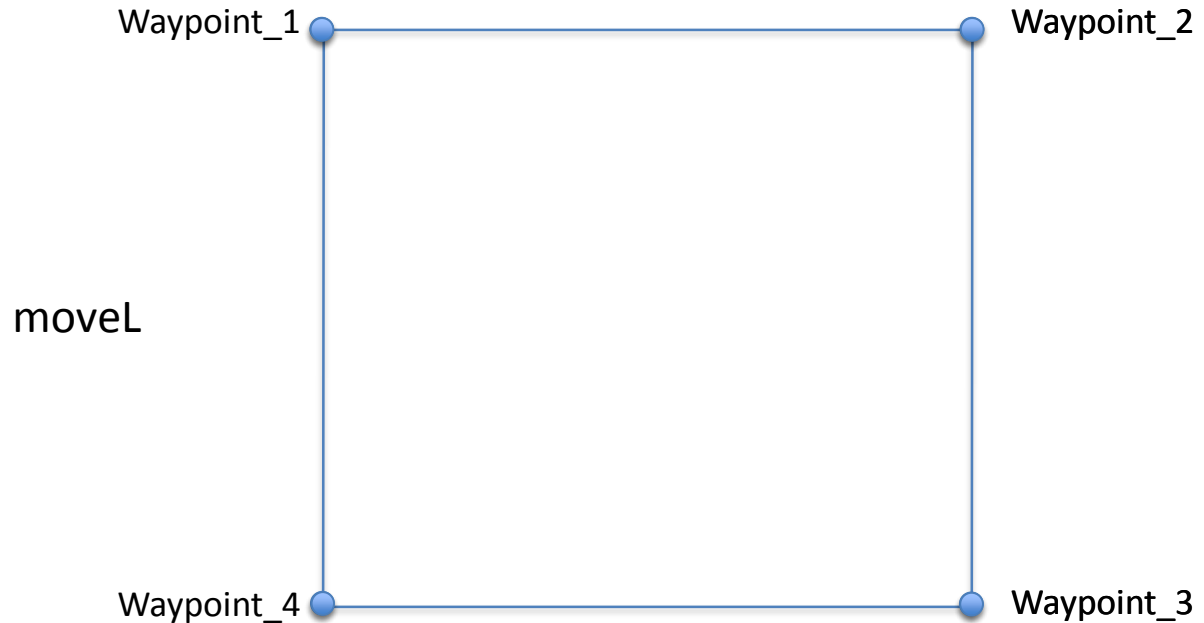
moveJ



Move types and Waypoints

Linear movement

- Interpolation on
- Linear trajectory for TCP

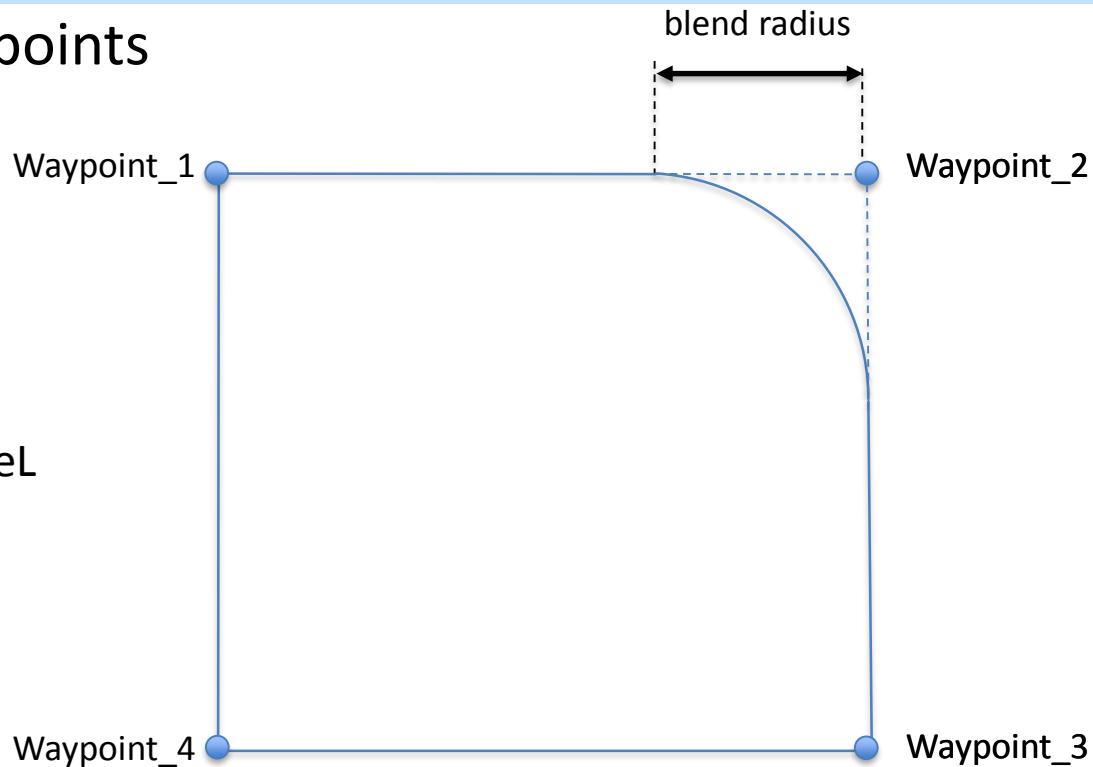


Move types and Waypoints

Blend radius

- Continuous movement
- No stop in Waypoint

moveL

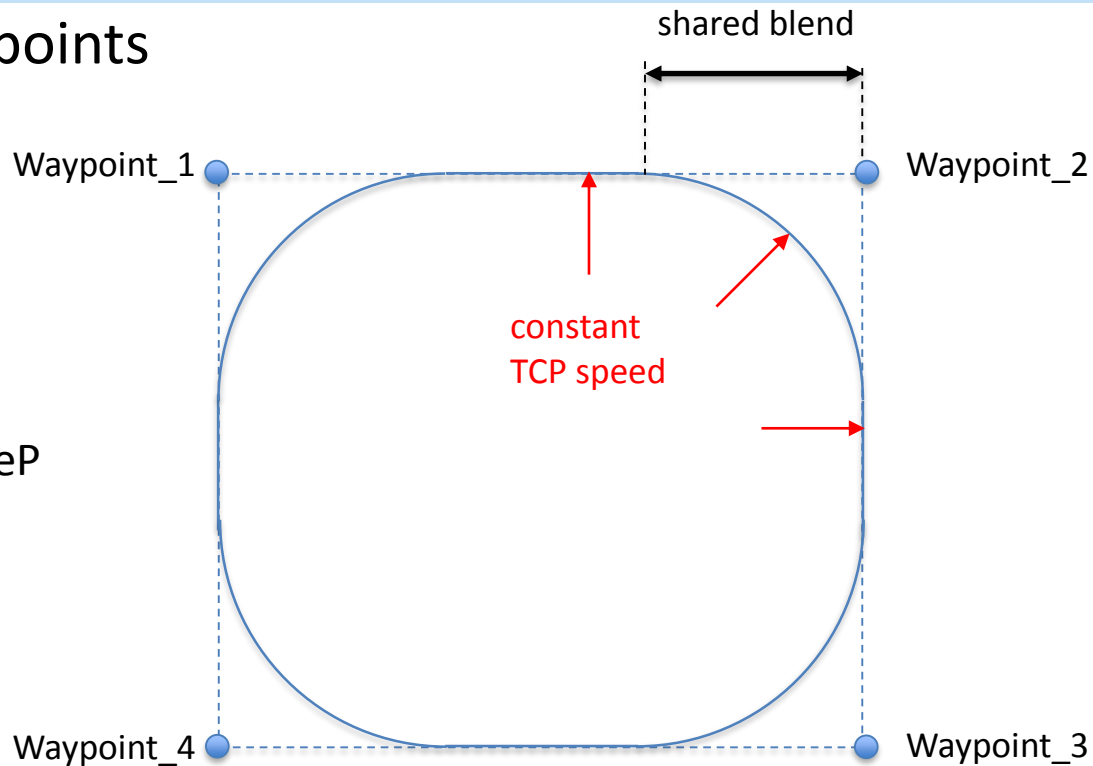


Move types and Waypoints

Process movement

- Process applications
- Linear movement
- Constant TCP speed
- Shared blend radius

moveP





Collaborative and safe

- The Collaborative robot is able to be deployed next to human operators.
- Proper risk assessment has to be performed on every installation. Results of risk assessment can be easily implemented with the adjustable safety feature.



It is estimated that 80% of our installations worldwide run without safety fencing. This directly translates to lower installation cost.

Risk Assessment

- Always perform risk assessment when installing a robot in an application
- The configurable safety settings eases the risk assessment

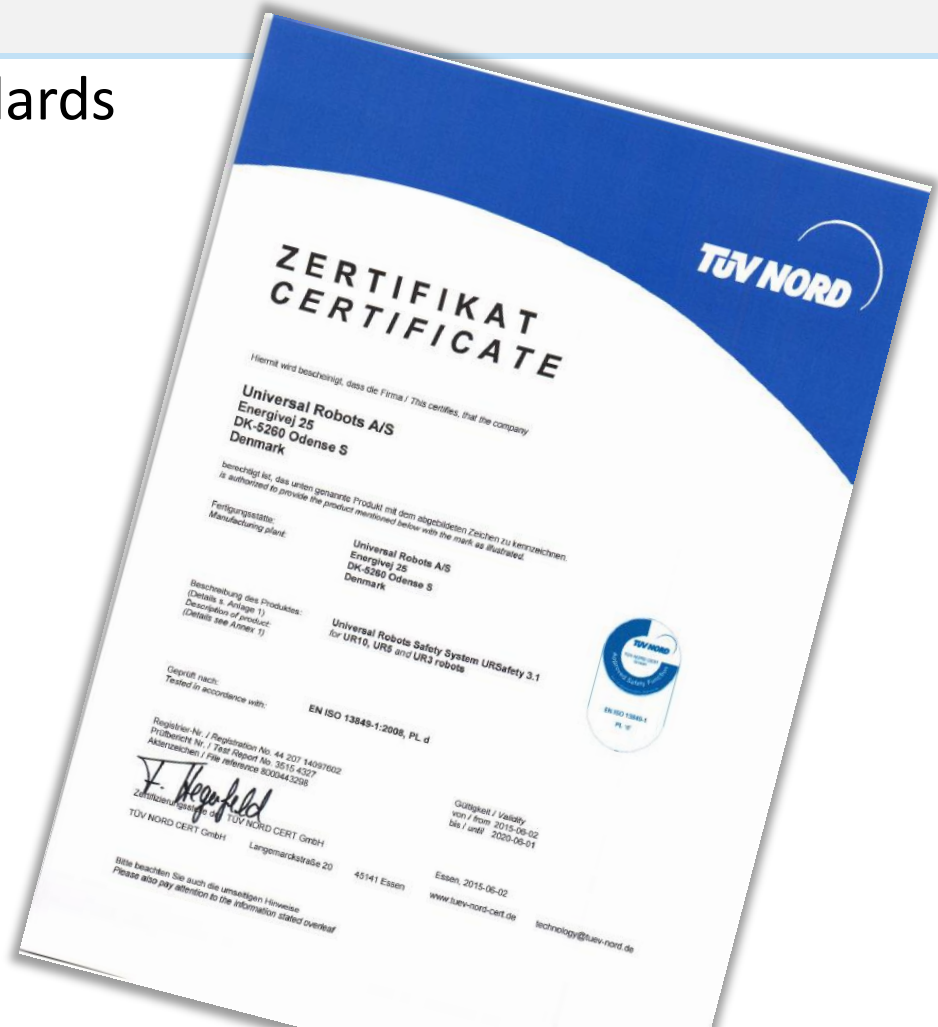


Complied international standards

Standard	Describes	Responsible
ISO 13849-1	Safety related parts of control system	Manufacturer
ISO 10218-1	Safety requirements for industrial robots	
ISO 10218-2	Safety requirements for integration of robots	Integrator
ISO TS 15066	Collaborative robots technical specifications	
ISO 12100	Guidance for performing risk assessment	

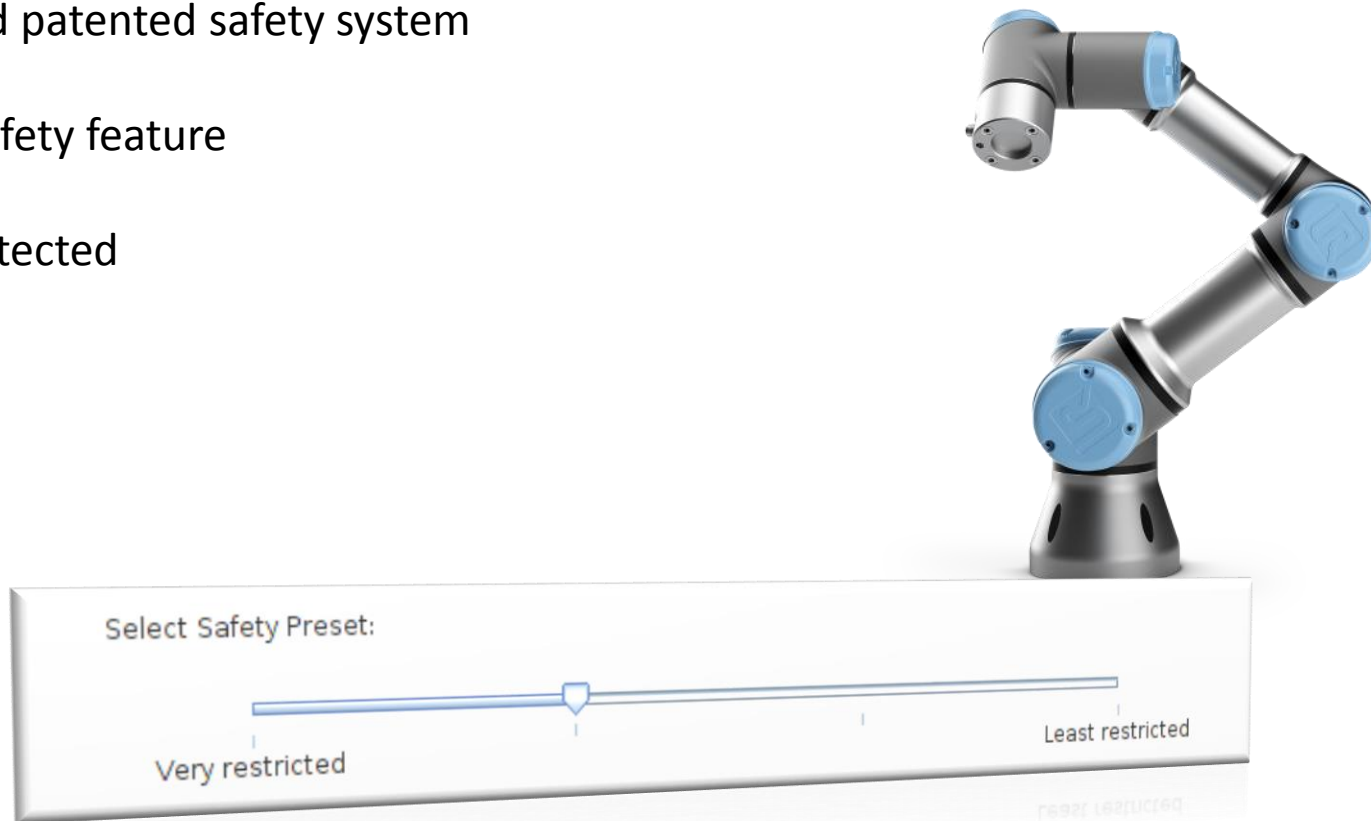
Complied international standards

- **ISO 13849-1: 2008 PL d**
- **ISO 10218-1**
 - Power and force limiting function is always active



Adjustable Safety

- Advanced and patented safety system
- Redundant safety feature
- Password protected



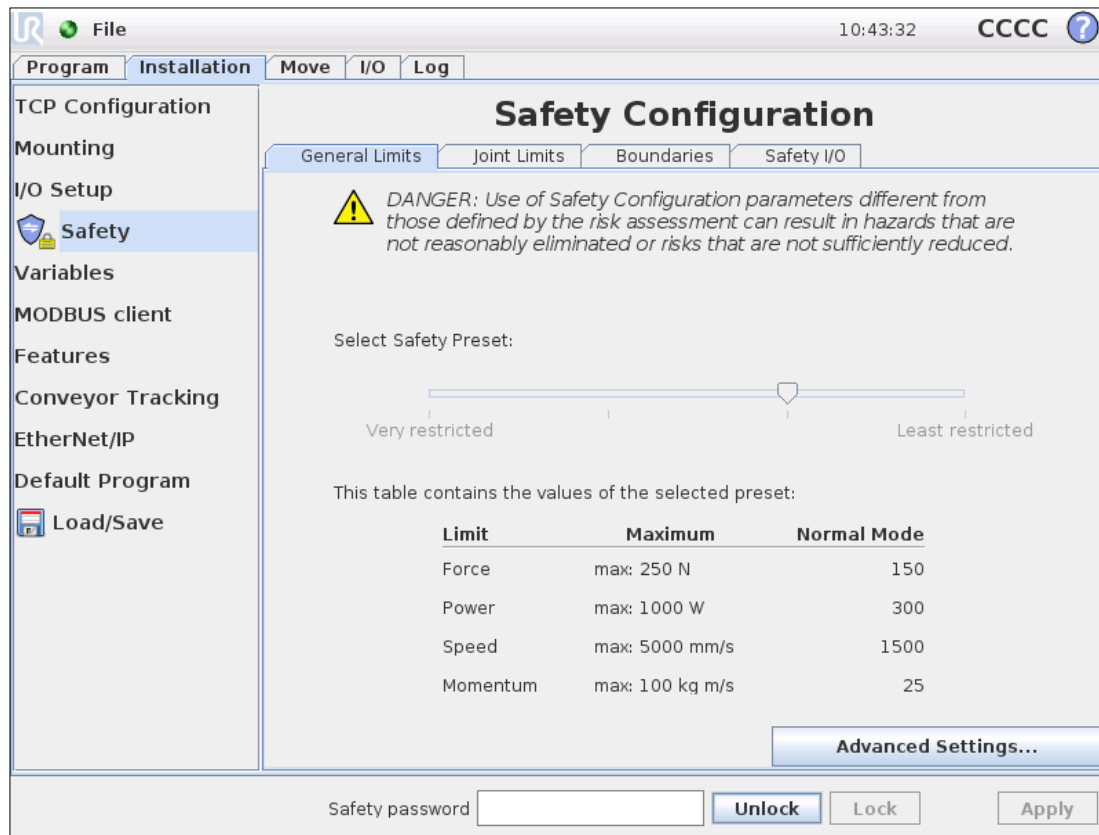


Adjustable Safety



Adjustable Safety

- Configure safety level to suit application.
- 4 pre defined safety settings
- Password protected
- *Perform risk assessment*



Adjustable Safety

Customize safety configuration of the robot.

- Force
- Power
- Speed
- Momentum

The screenshot shows the 'Safety Configuration' window in the Universal Robots software. The left sidebar contains a menu with options: TCP Configuration, Mounting, I/O Setup, Safety (highlighted), Variables, MODBUS client, Features, Conveyor Tracking, EtherNet/IP, Default Program, and Load/Save. The main area has tabs for General Limits, Joint Limits, Boundaries, and Safety I/O. The 'General Limits' tab is active, displaying a table of safety limits. The table has columns for Limit, Maximum, Normal Mode, and Reduced Mode. The values for Normal Mode and Reduced Mode are adjustable via input fields. At the bottom, there is a 'Basic Settings...' button and a section for the safety password with 'Unlock', 'Lock', and 'Apply' buttons.

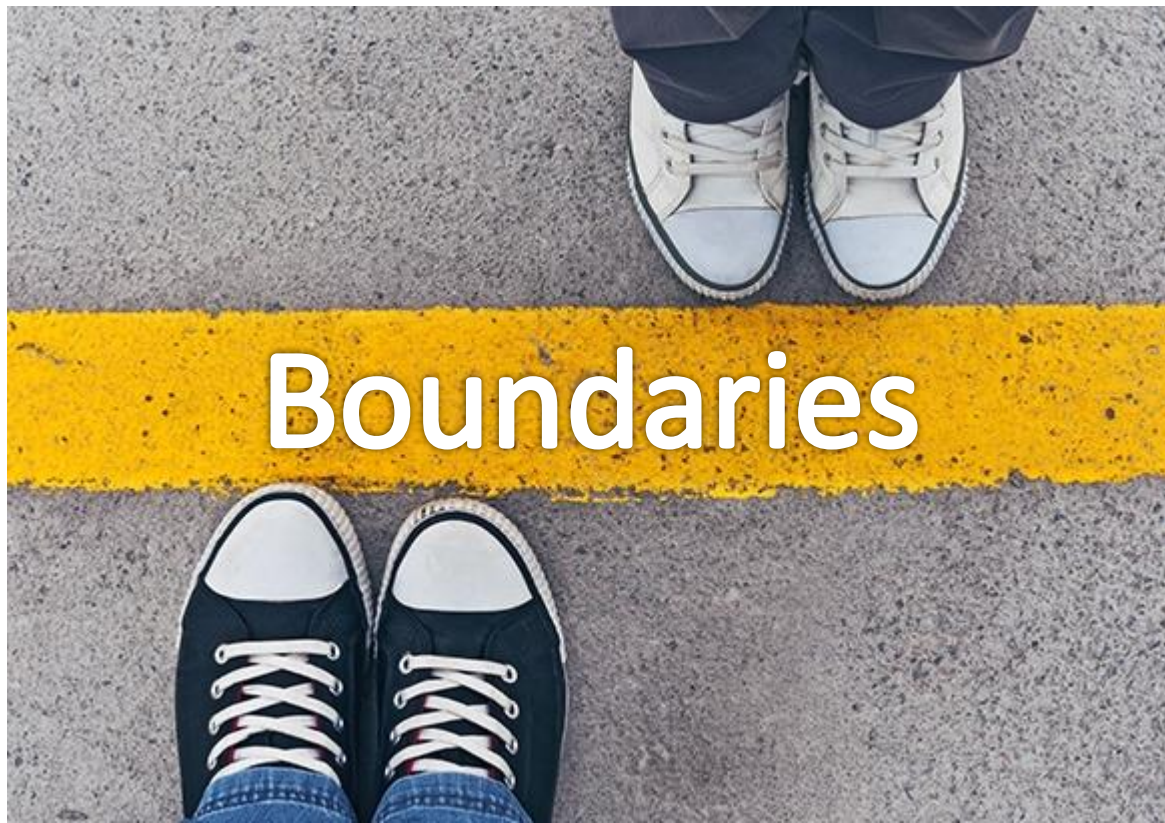
Limit	Maximum	Normal Mode	Reduced Mode	
Force	max: 250 N	<input type="text" value="150"/>	<input type="text" value="120"/>	-25 N
Power	max: 1000 W	<input type="text" value="300"/>	<input type="text" value="200"/>	-0 W
Speed	max: 5000 mm/s	<input type="text" value="1500"/>	<input type="text" value="750"/>	-150 mm/s
Momentum	max: 100 kg m/s	<input type="text" value="25"/>	<input type="text" value="10"/>	-3 kg m/s

Basic Settings...

Safety password

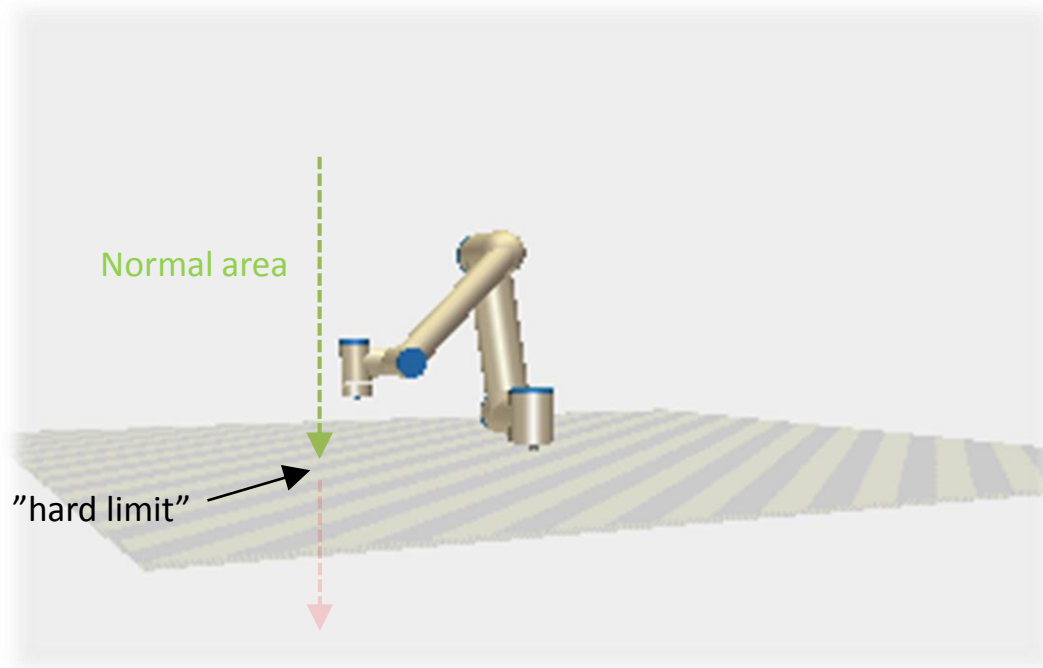


Boundaries



Boundaries

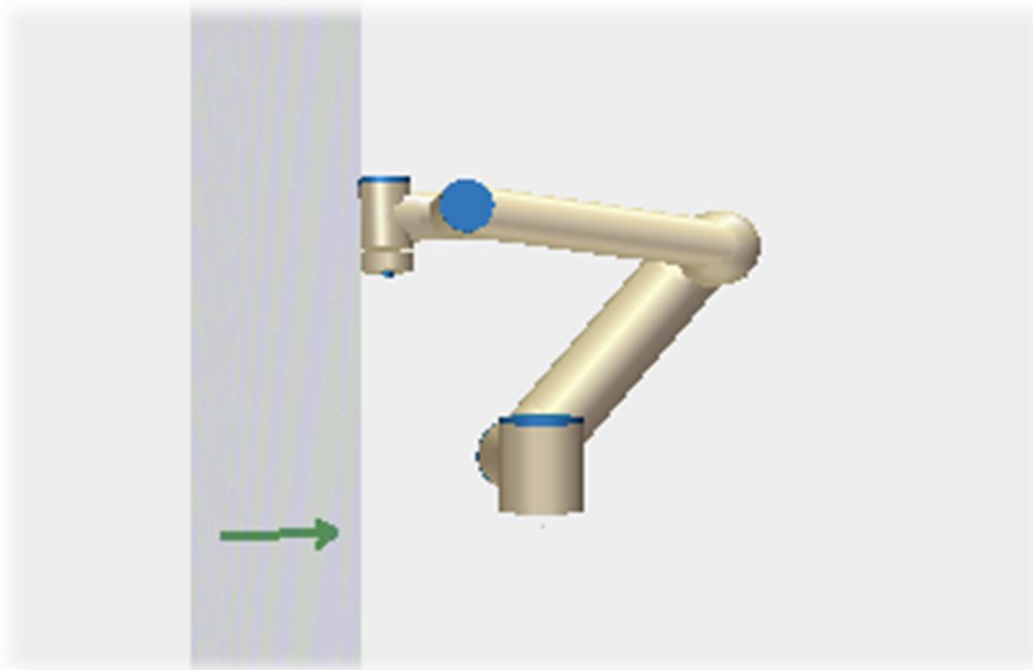
Imaginary walls can be created to restrict the movement of the TCP



Boundaries





Behaviour setting

- Normal mode
 - Create a wall or hard limit
- Reduced mode
 - Slow down the movement of the robot when this area is crossed



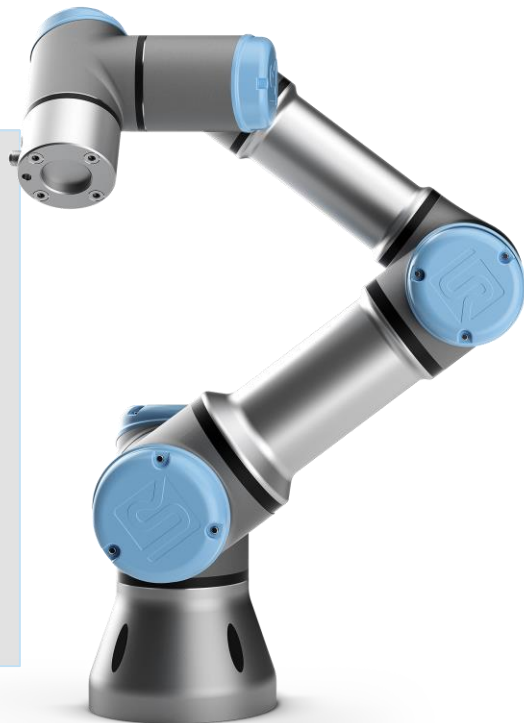
Boundaries

Safety Modes and Behaviours of the robot.

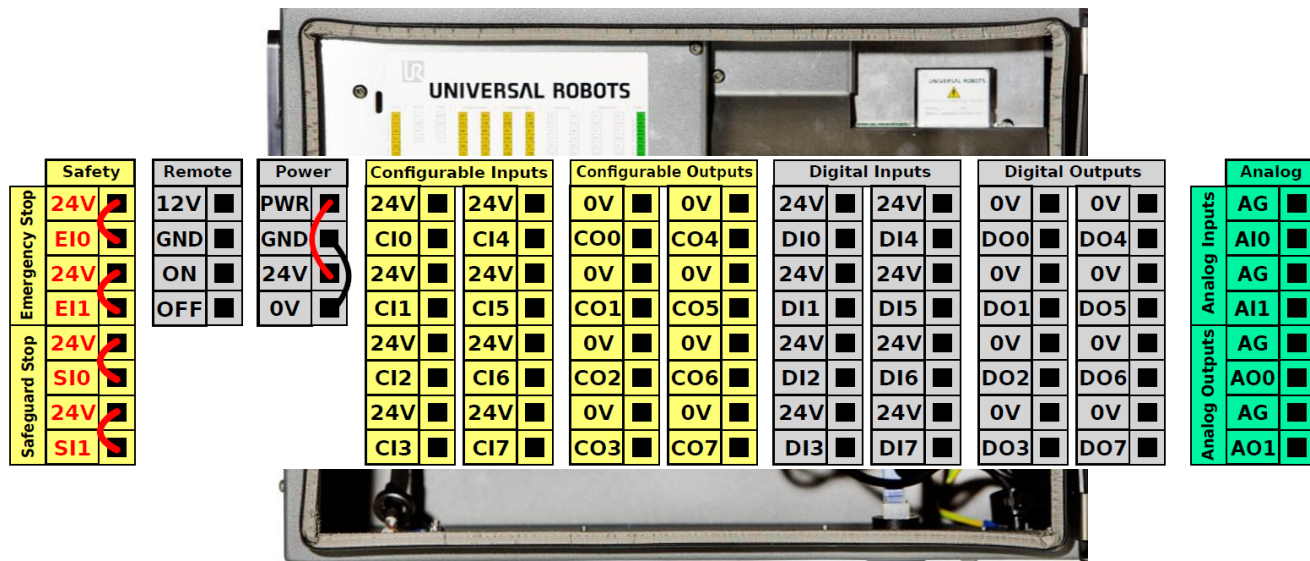
Safety Mode	Behaviour
Disabled	inactive
 Normal	acts as "hard limit" when in normal mode
 Reduced	acts as "hard limit" only if robot is in reduced mode
 Both	acts as "hard limit" at all times
 Trigger Reduced Mode	robot switches to reduced mode when TCP is entering plane

Flexible Redeployment

- With its **light weight**, the UR robot arm can easily be redeployed around the factory to tackle seasonal production.
- The robots **compact design** enables it to operate in restricted spaces.
- It is easy to integrate the robot with external devices.
- The same robot can be used for different jobs.



I/O



I/O

■ Safety

- Emergency stop
- Safeguard stop

■ Remote

- Power on/off

■ Power

- 2A internal PSU
- External PSU

■ Config. signals

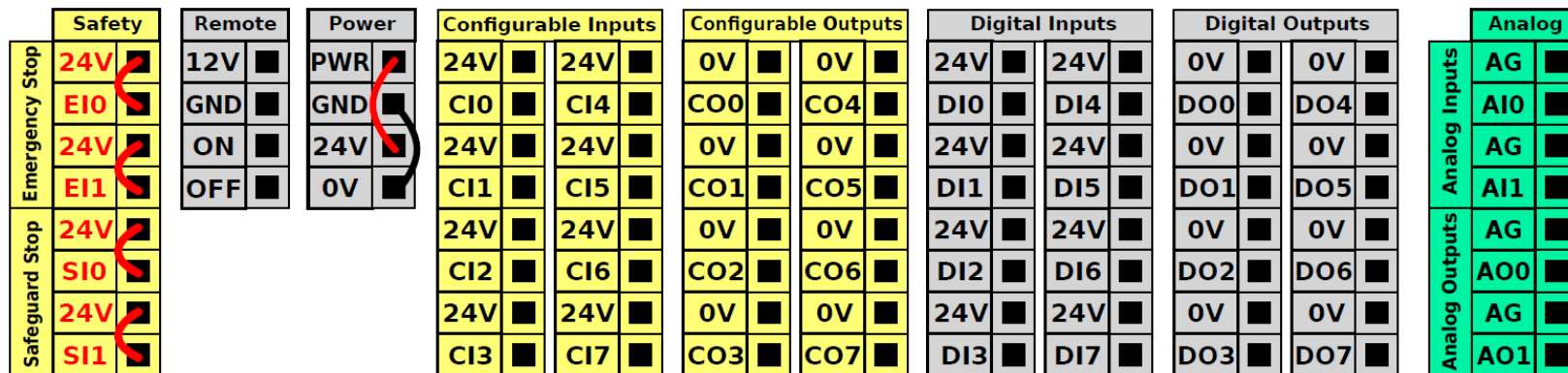
- 8 inputs
- 8 outputs
- 24V DC, PNP

■ Digital signals

- 8 inputs
- 8 outputs
- 24V DC, PNP

■ Analog signals

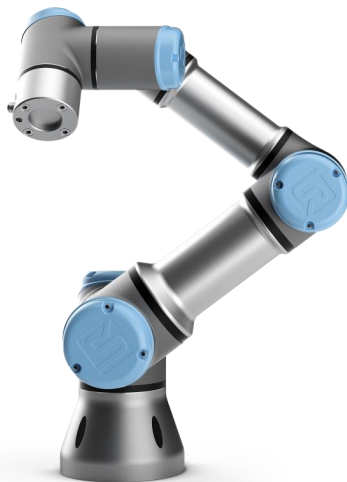
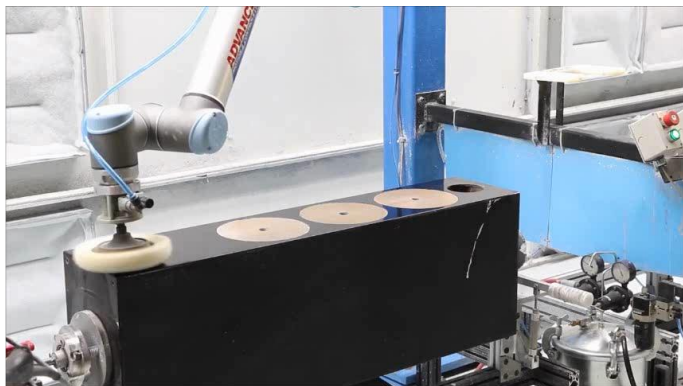
- 2 inputs
- 2 outputs
- 0-10V DC
- 4-20 mA



Flexible Redeployment – Communication Protocols

- Modbus TCP
 - Modbus Server and Client interface available in the robot.
- Ethernet/IP & Profinet
 - Connect to PLC and other devices over Ethernet/IP & Profinet
- Dashboard server
 - Control Robot remotely by sending simple commands to the GUI over TCP/IP
- Client interface
 - Send commands and functions directly to the robot.

Flexible Redeployment





Common Applications

Industries:

- Automotive
- Metal (Eg. Machining Tools, Precision Engineering etc.)
- Plastic
- Rubber
- Food & Beverages
- Consumer Products (Eg. Jewelry, Furniture etc.)
- Pharmaceutical
- Aerospace
- Electronics
- Semi Conductors
- Construction
- Medical



Applications:

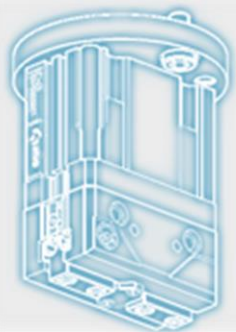
- Spray Painting
- Gluing
- Screwing
- Assembling and Disassembling
- Pick and Place/ Loading and Unloading
- Packaging
- Sorting
- Inspection
- Welding
- Grinding
- Polishing

About 80% of the UR robots we know that are installed worldwide and in operation are run without safety guarding



Application

UR+



HOTIRON SOLDERING
TOOL

[View product](#)

ATN
Automatisierungstechnik
Niemeier - Germany



UR 5 PROTECTIVE
COVER/SUIT

[View product](#)

RoboWorld - USA



ADAPTIVE ROBOT
GRIPPER 2-FINGER 85

[View product](#)

Robotiq - Canada



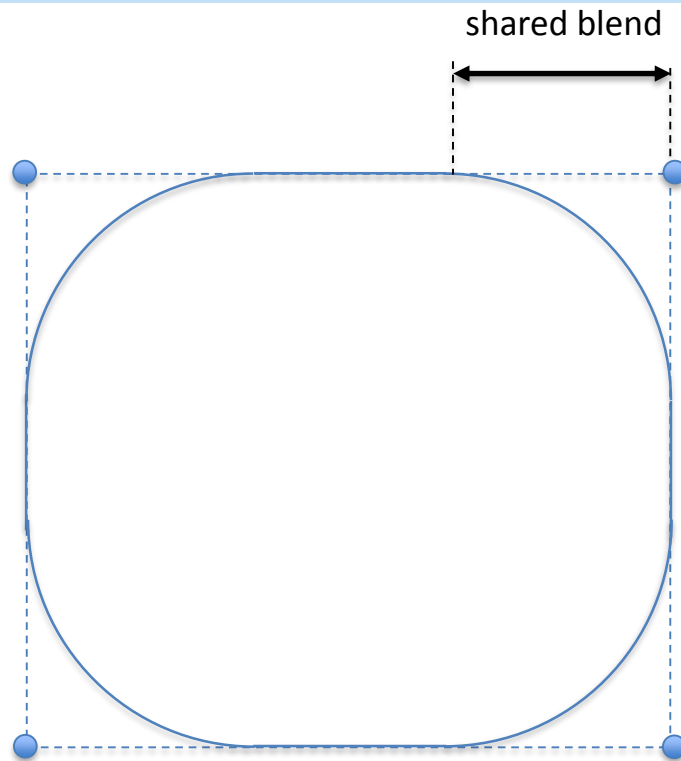
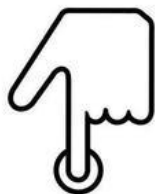
EMPIRE ROBOTICS -
VERSABALL GRIPPER

[View product](#)

Empire Robotics - USA

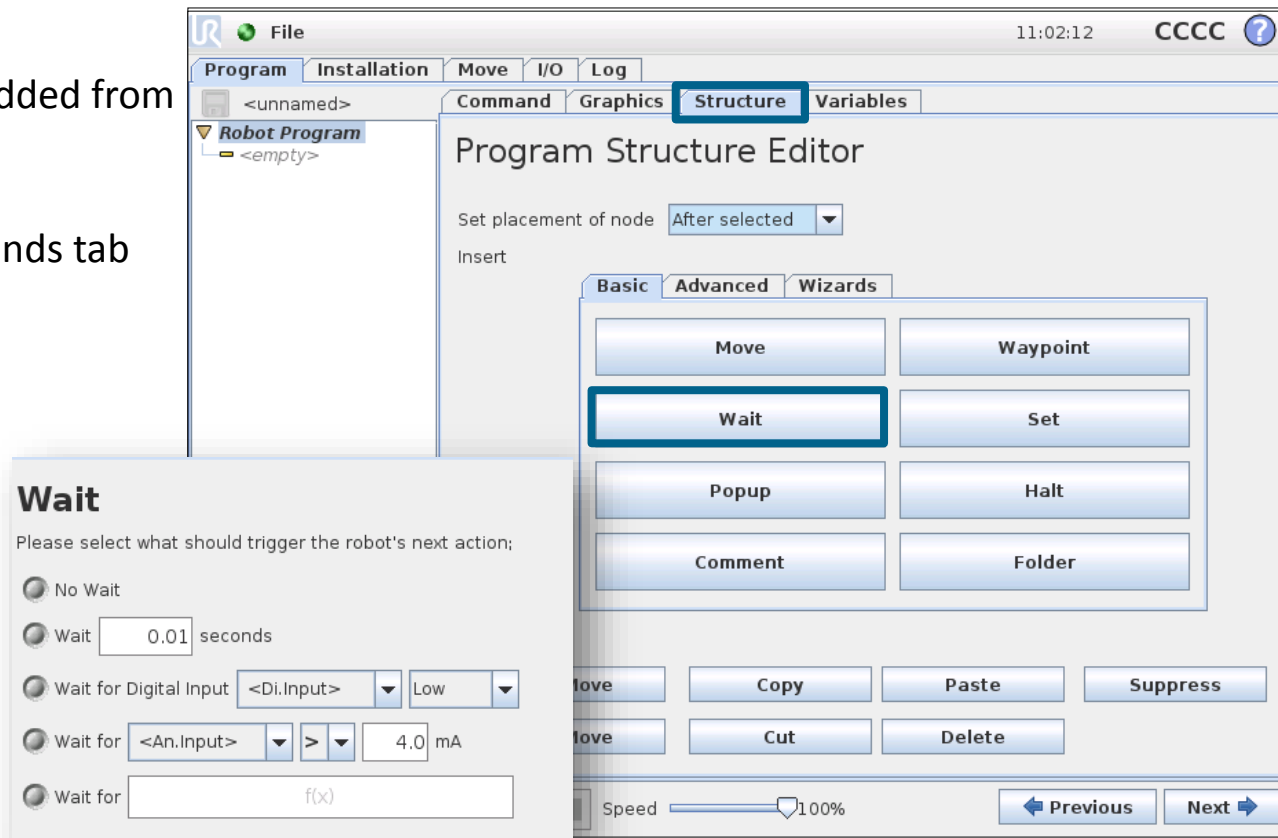
Wait...

- Set amount of time
- Input to change
- Expression or condition to be fulfilled.



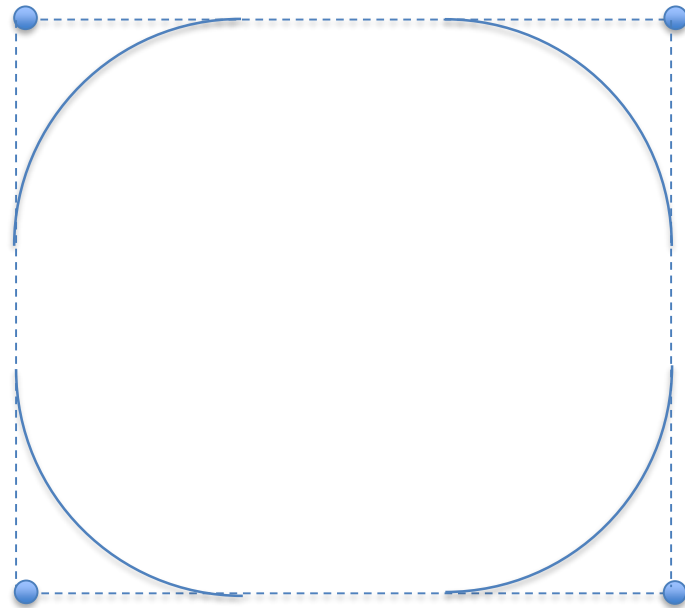
Wait...

- Commands can be added from the structures tab
- Edited in the commands tab



Set

- Set digital or analogue values
- Set an expression
- Increment variables
- Set TCP
- Set Payload



Set

- Commands can be added from the structures tab and edited in the commands tab

Set

Select the action you wish the robot to perform at this point in the program. You can also specify changes in the robot's payload.

☐ No Action

☐ Set Digital Output

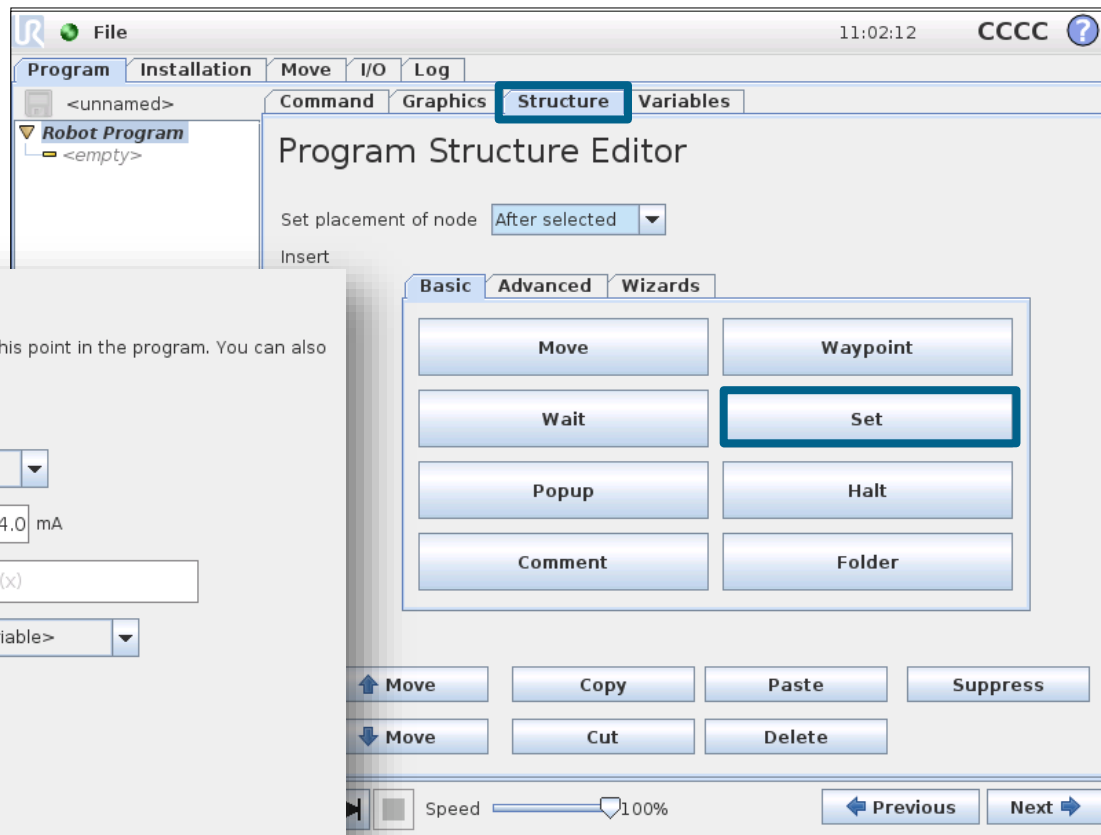
☐ Set Analog Output mA

☐ Set

☐ Increment installation variable by one:

☐ Set the total payload to kg

☐ Set TCP





Questions?