



# Palletizing *Solution* AX Series

## INSTALLATION GUIDE



# THANK YOU FOR CHOOSING ROBOTIQ

This step-by-step guide will allow you to install and test your Robotiq Palletizing Solution on Universal Robots. Visit the [elearning.robotiq.com](https://elearning.robotiq.com) to see the video of the installation steps.



## 1. WHAT IS SUPPLIED?

**Standard upon delivery of SOL-PAL-UR-VAC-1500 and SOL-PAL-UR-1500\*:**

- Palletizing Solution base including:
  - 1 x Linear axis (1500 mm stroke)
  - 1 x Linear axis Controller
  - 4 x Pallet sensors
  - 2 x Status lights
  - 1 x Cable management system
- 6 x Concrete anchors
- 1 x Box detection sensor
- 1 x PowerPick Vacuum Gripper kit (Optional)
- 1 x Air filter kit (optional)
- 1 x Set of four (4) casters
- 1 x Material Handling Copilot software license dongle

\*SOL-PAL-UR-1500 does not contain the gripper, and as such the gripper installation steps do not apply.



## 2. SAFETY & WARNINGS

The operator(s) must have read and understood all of the Safety section in the user manual (available at [support.robotiq.com](https://support.robotiq.com)).

The entire cell must go through a comprehensive risk assessment process before it can be used.

Do not operate the Palletizing Solution or even turn on the power supply before the device is firmly anchored and the machine area is cleared. Make sure the air supply is secured.

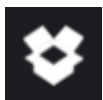
Make sure to follow all safety rules and regulations of your workplace. Always wear all recommended personal protective equipment in accordance with your workplace safety standards.

Failure to properly secure and install the equipment can result in material damage and bodily injury.



### 3. TOOLS NEEDED

Included	Not included
<ul style="list-style-type: none"><li>• 12.7 mm concrete drill bit (1/2 in) (for use with a rotary hammer)</li><li>• 19mm Socket (10 mm drive size)</li><li>• 17mm Socket (10 mm drive size)</li><li>• 2 mm hex key</li><li>• 3 mm hex key</li><li>• 4 mm hex key</li><li>• 5 mm hex key</li><li>• 6 mm hex key</li><li>• 10 mm hex key</li><li>• Optional:<ul style="list-style-type: none"><li>• 2.5 mm hex key</li><li>• 5.5-17 mm double ended wrench</li><li>• 20-21 mm double ended wrench</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Lifting equipment (min. capacity of 200 kg)</li><li>• Power screwdriver</li><li>• Drill with a No.2 Phillips bit</li><li>• 2.5 mm slotted screw- driver</li><li>• Tube cutter</li><li>• Ratcheting socket wrench with 10mm (3/8 in) drive or adapter</li><li>• Torque wrench with 10mm (3/8 in) drive or adapter</li><li>• Isopropyl alcohol</li><li>• Hammer drill</li><li>• Hammer</li></ul>



### 4. UNBOXING

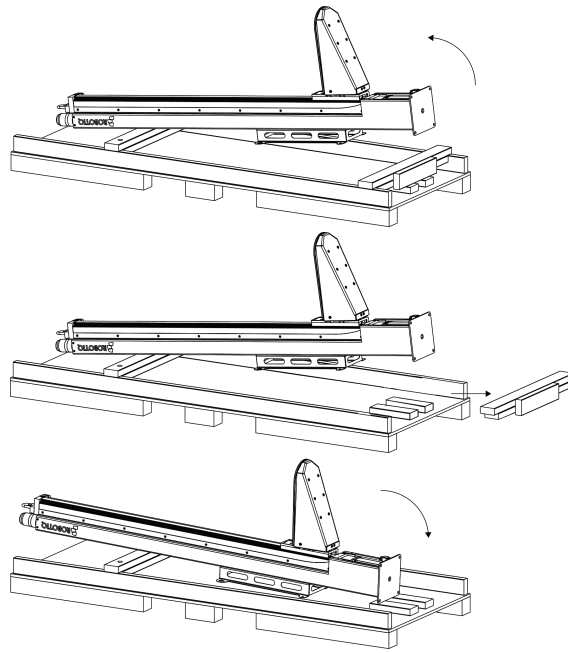


**The transport, lifting and moving** of the Palletizing Solution should be done by qualified and authorized personnel. Failure to do so may result in machine damage, serious injuries or death.

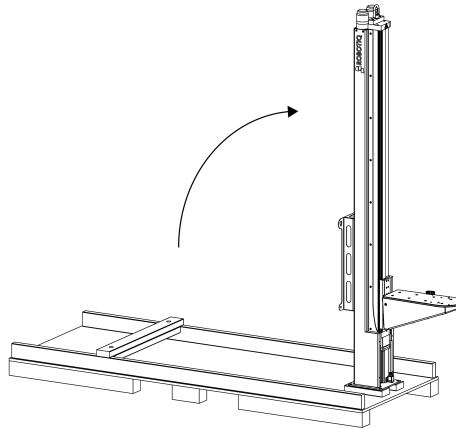


**Crush hazard:** Keep your hands and body parts clear when lowering the column onto the base. Failure to do so could result in serious injuries or death.

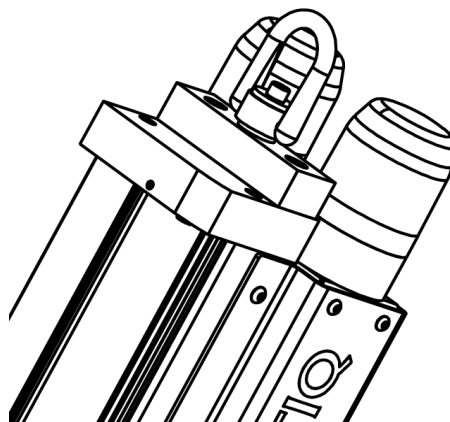
1. Remove the top panel and the four (4) sides of the crate by removing the screws that hold them into place.
2. Remove the upper wooden frame by removing the screws that hold it into place.
3. Cut and remove the strapping material.
4. Remove the linear axis controller.
5. Remove the two (2) bolts that hold the base to the crate.
6. Take the base out of the crate.
7. Take all cardboard boxes out of the crate.
8. Remove the screws that hold the lower wooden frames to the crate.
9. Remove the lower wooden frames.
10. Unscrew the two (2) bolts that hold the column to the crate; discard the metal plate.
11. Remove the screws that hold the piece of wood under the foot base.
12. Lift the foot base, remove the piece of wood and lower the foot base slowly and carefully (see image below).



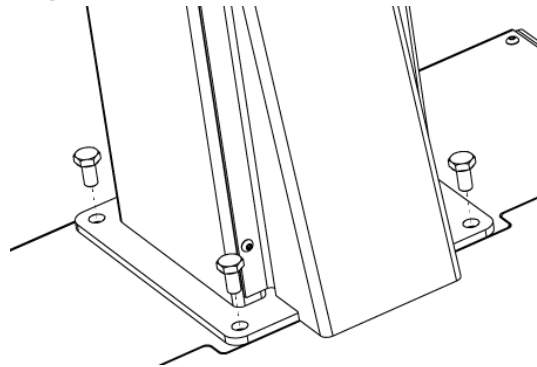
13. Position the column vertically. Use the pivot point at the base to lift the column.



14. Lift and place the column onto the base. Robotiq recommends attaching the hook at the top of the column to a lifting device (e.g., hoist) to bring the column upright (column weight =88 kg / 194 lb).



15. Secure the column on the base using the four (4) M10 screws provided. Tighten to a torque of **50 Nm (37 ft-lb)**.



To securely move and position the unit, there are two possibilities:

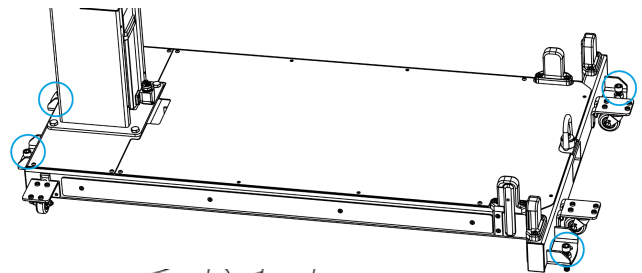
#### Using a forklift



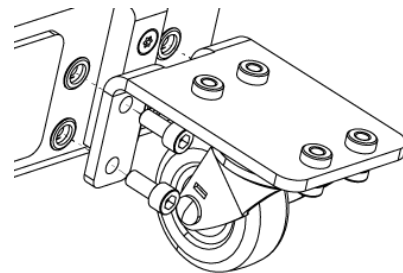
Pay attention to the center of gravity to prevent the equipment from falling. Make sure to secure and stabilize the Solution before any move.

#### Using the set of wheels provided with the Solution

1. Screw the four (4) provided leveling bolts to lift the solution (about 1 centimeter high).
2. Secure the four (4) wheels using the provided screws.
3. Unscrew the four (4) bolts to get the solution down on its wheels.



Do not work on the Solution while it is on its wheels as it is not stable. To return the Solution on its feet, simply screw the four bolts, remove the wheels and unscrew the bolts.





## 5. MECHANICAL & ELECTRICAL INSTALLATION

### Main steps

- A. Robot Installation
- B. Base Cover Plate Removal
- C. Linear Axis Controller Installation
- D. Universal Robots Controller Installation
- E. Power Cables Connection
- F. Inter-Controller Cables Connection
- G. Status LED Connection
- H. Pallet Sensors and Palletizer Base Cable Routing
- I. Safety Signals Connection
- J. Solution Centering
- K. PowerPick Vacuum Gripper Installation (Optional)
- L. PowerPick Controller Installation
- M. Cable Routing System Installation
- N. PowerPick Gripper and Copilot Connection
- O. Box Sensor(s) Cable Connection
- P. Palletizer and Surrounding Equipments Positioning
- Q. Solution Anchoring
- R. Finalization and Power On
- S. Joint Limits Setting

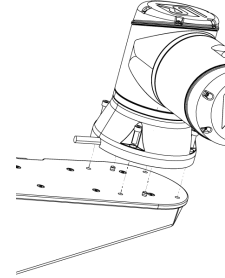
For details of each step, refer to the corresponding section below.



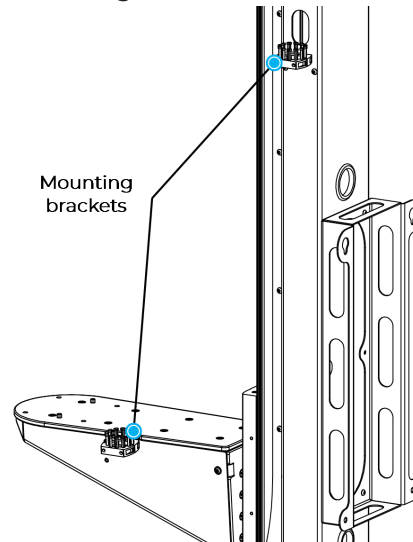
Install the robot before installing the linear axis controller in order to ensure the stability of the Palletizing Solution.

### A. Robot Installation

1. Place the robot on the robot base plate so its power cable is oriented towards the linear axis. Align properly with the two dowel pins (already installed on the robot base), and secure the robot using four (4) M8 x 25 mm screws and Belleville washers. **The required torque value is 20 Nm (15 ft-lb).**



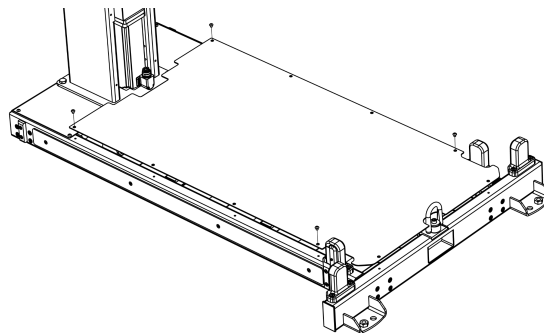
2. Unclip the two mounting brackets of the cable management system: one on the column and one on the carriage.



3. Push the robot power cable into the cable carrier up to the column. There are two separate raceways; one for the air tube and the other for the robot power cable. The robot power cable and the air tube should not use the same section. **Do not channel the cable through the column just yet.**

### B. Base Cover Plate Removal

Remove the cover plate for cable management.



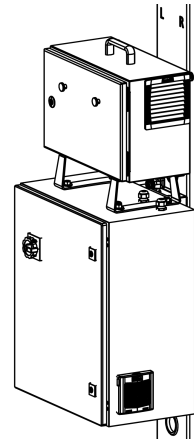
### C. Linear Axis Controller Installation

1. Remove the four (4) screw caps on the linear axis controller.
2. Partially unscrew (approximately 3 mm) each screw at the back of the linear axis controller.
3. Lower the linear axis controller slowly and carefully.
4. Tighten the screws to secure the controller to the controller bracket. **The torque required is 15 Nm (11 ft-lb).**

### D. Universal Robots Controller Installation

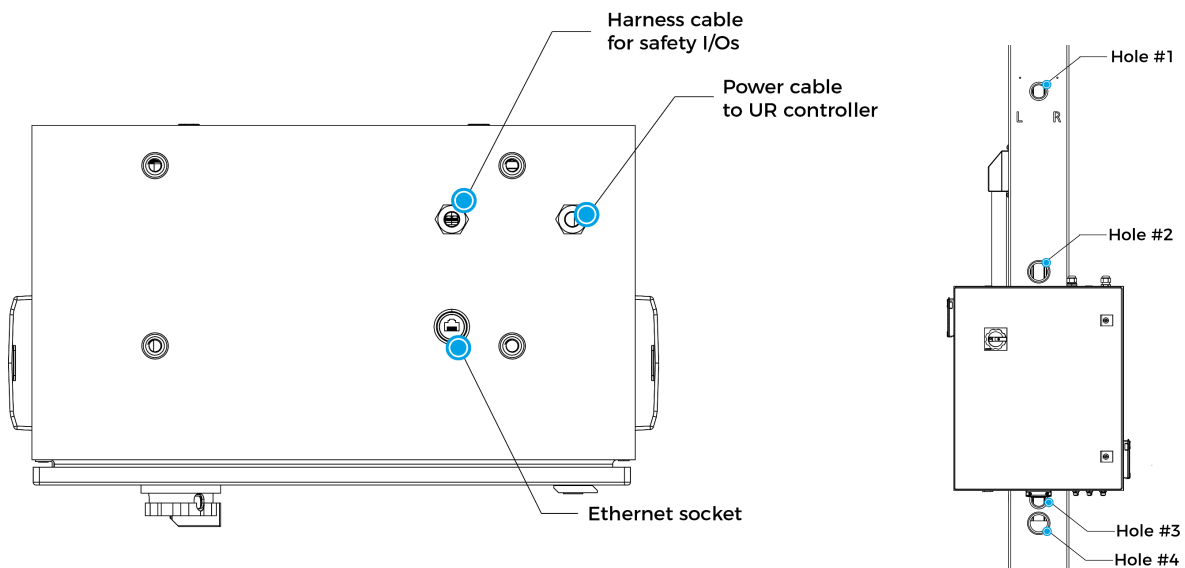
1. Remove the four screws on the top of the linear axis controller.
2. Place the UR controller on top of the linear axis controller and secure it with the four screws previously removed.

Do NOT connect the UR controller's power cable to the UR controller.



### E. Power Cables Connection

Refer to the linear axis & controller nomenclature summary below for next steps.

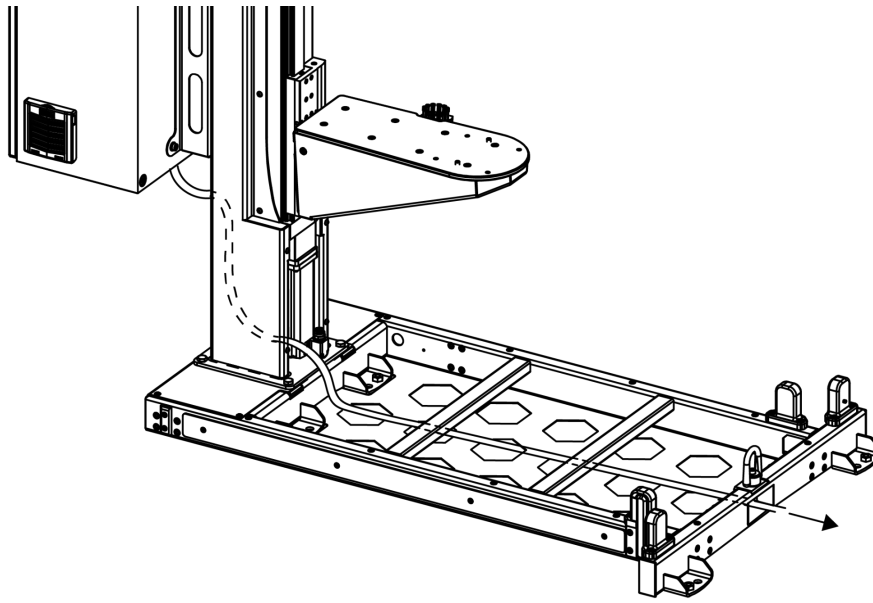


The Solution should only be connected to a power source once all connections have been made and completed.

1. Connect the power cable of the linear axis controller to the UR controller.
2. Push the robot's power cable into the column via the hole on the side and bring it out through hole #2.



3. Connect the robot power cable to the UR controller.
4. Connect the Teach Pendant to the UR controller.
5. Connect the power cable of the UR controller to the linear axis controller. Insert it through hole #4.
6. Continue to channel the cable through the column and the base and bring it out from the other end of the base. **Do not connect the power cable to a power source just yet.**

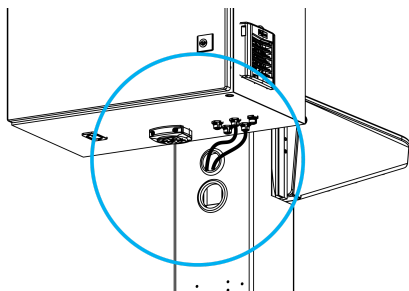


#### F. Inter-Controller cables Connection

1. Open the UR controller. Connect the USB hub to a USB port.
2. Connect the Ethernet/USB converter cable to a USB port.
3. Connect the Ethernet cable into the Ethernet socket on top of the linear axis controller.
4. Push the other end of the Ethernet cable through the hole under the UR controller and connect it to the Ethernet/USB converter cable that is already connected.

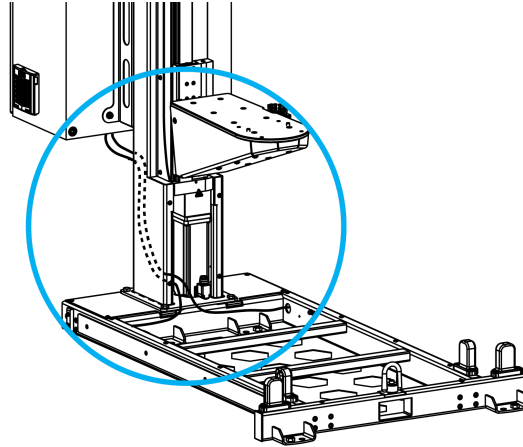
#### G. Status LED Connection

1. Channel the status LED cables (W70 and W80) through the column and pull them out via hole #3.
2. Connect both status LED cables (W70 and W80) to the linear axis controller. Follow cable labeling and connector identification.

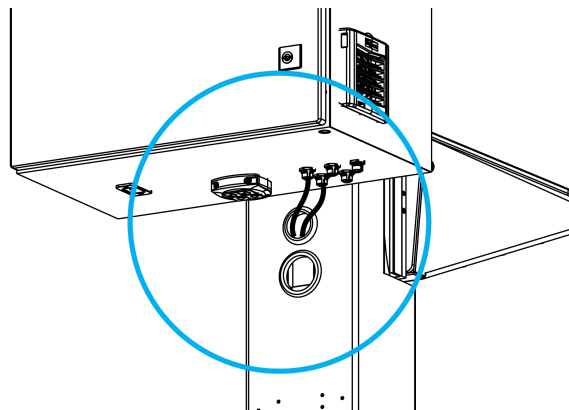


## H. Pallet Sensors and Palletizer Base Cable Routing

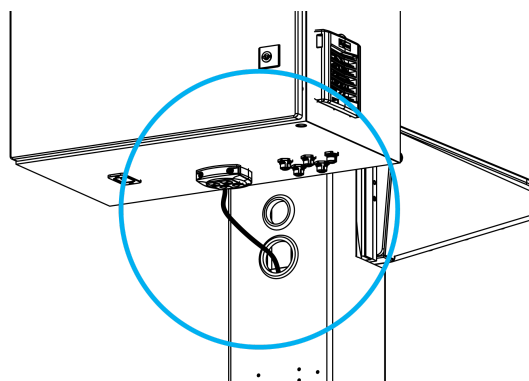
1. Channel the pallet sensor cables (W50 and W60) through the column and pull them out via hole #3.



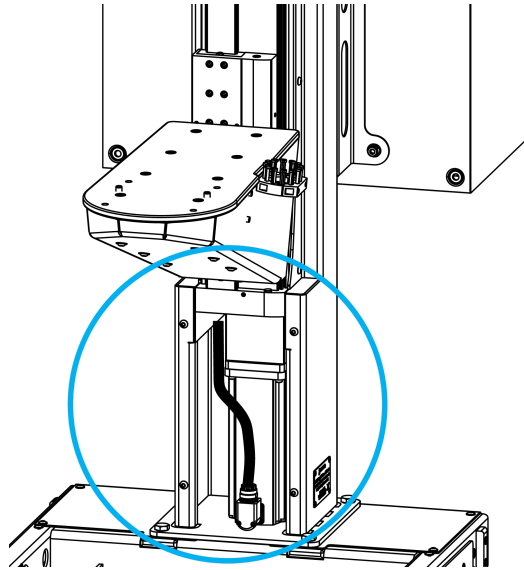
2. Connect the pallet sensor cables to the linear axis controller. Follow cable labeling and connector identification.



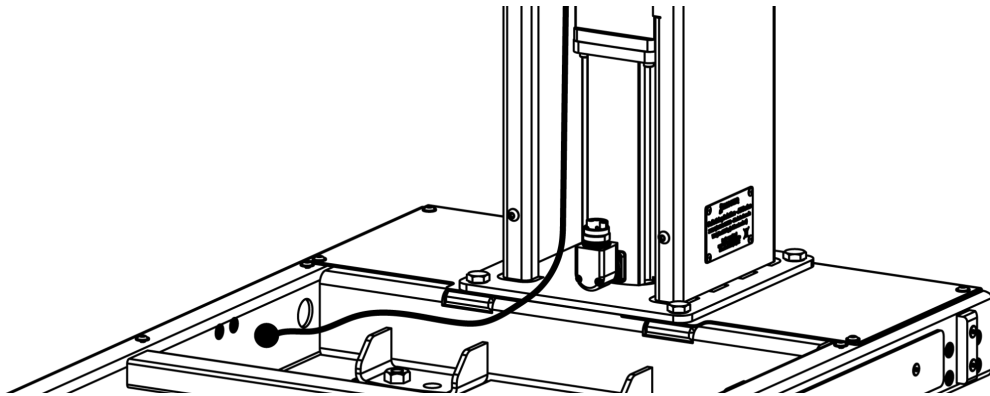
3. Push the linear axis cable into the column via hole #4 and bring it out at the front of the column.



4. Connect the linear axis cable to the linear axis.



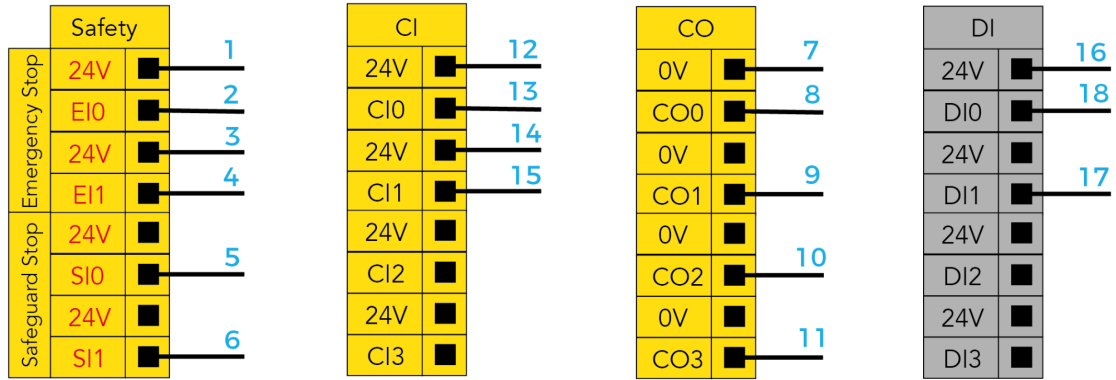
5. Push the grounding (green) cable into the column via hole #4 and bring it out at the front of the column.
6. Secure the grounding cable to a tapped hole on the interior walls of the base using an M5 screw and a tooth lock washer.



7. Bring out the air tube and the box sensor cable from the bottom of the column and continue to channel it until you bring it out from the other end of the base (through the rectangular hole). **Do not connect the Solution to a power source just yet.**

### I. Safety Signals Connection

1. Run the safety I/O cable harness (W103) through an opening under the Universal Robots controller.
2. Connect the cables following the diagram and table on the next page.

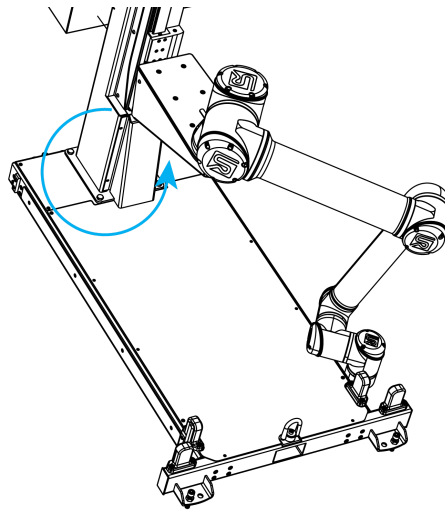


Wire #	Function	Description
1	24 V	24 V supply
2	UR e-Stop Status 1	e-Stop status signal when an emergency signal is applied to EIO
3	24 V	24 V supply
4	UR e-Stop Status 2	e-Stop status signal when an emergency signal is applied to EI1
5	UR Safeguard input 1	Safeguard status signal when a safeguard signal is applied to SIO
6	UR Safeguard input 2	Safeguard status signal when a safeguard signal is applied to SI1
7	0 V	0 V supply
8	Emergency Stop	Emergency stop status signal (from robot) to safety relay input of Robotiq controller (signal #1)
9	Emergency Stop	Emergency stop status signal (from robot) to safety relay input of Robotiq controller (signal #2)
10	Reserved	
11	Reserved	
12	24 V	24 V supply
13	Reserved	
15	Reserved	
14	24 V	24 V supply
16	24 V	24 V supply
17	Reserved	

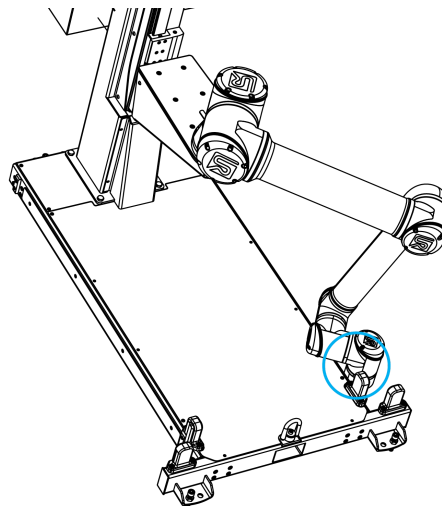
## J. Solution Centering

This procedure needs to be done before the PowerPick Vacuum Gripper installation. It will ensure the proper functioning of the Solution.

1. Unscrew half a turn the four (4) screws that secure the column onto the base. **Do not unscrew completely.** Unscrewing only half a turn allows you to change the orientation of the column.
2. Rotate the column counterclockwise as much as possible.

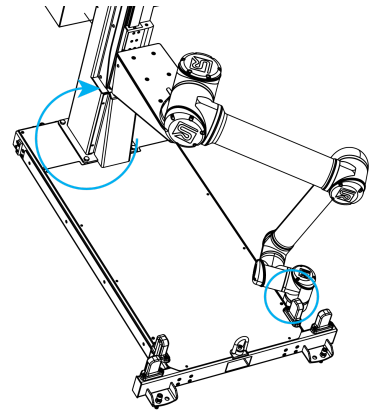


3. Position the robot so that the wrist is on the outer left side of the base like shown in the figure below.



4. Move the robot so the robot tool flange is parallel to the ground: change the feature reference to Base and modify the tool position as such:  $RX=0^\circ$ ,  $RY=180^\circ$ ,  $RZ=0^\circ$ .
5. Set the Tool Position's X value (base reference) to 333.35 mm. Make sure the TCP is set to 0 (the TCP menu can be found in the Installation tab).

6. Rotate the column clockwise so that the side of the robot wrist touches the side of the base.
7. Tighten the four (4) screws to secure the column onto the base. **The torque required is 50 Nm (37 ft-lb).**
8. On the teach pendant, confirm that the X value is still 333.35 mm.
9. Put the robot back in position of use.

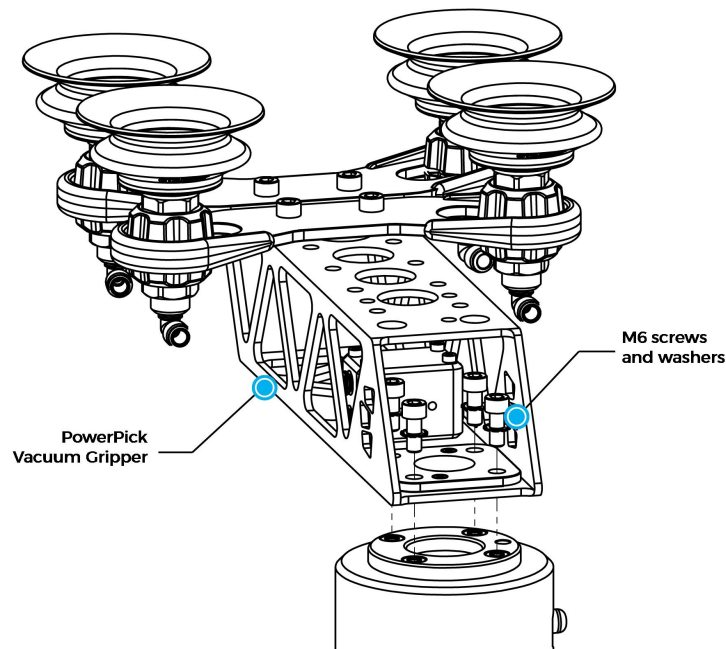


### K. PowerPick Vacuum Gripper Installation (Optional)

Upon delivery, the PowerPick Gripper is already mounted to the 200 mm hollow offset link. The following instructions are based on that configuration. Should the application require a different type of configuration, please refer to the PowerPick Vacuum Gripper user manual available on Robotiq's support website or use the Robotiq Configurator.

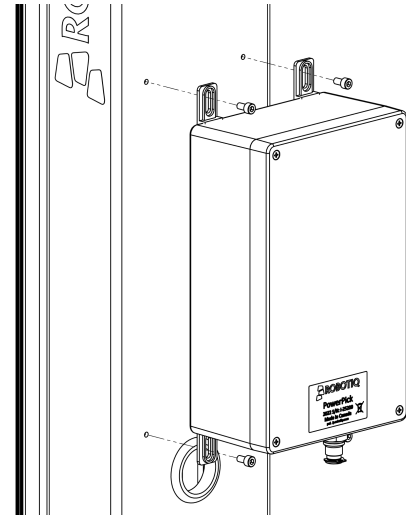
1. In order to mount the PowerPick Gripper and its accessories, power on the robot and rotate the joints as described in the table on the right, then shut down the robot.
2. Using four (4) M6 screws and tooth lock washers, secure the Gripper on the robot tool flange. **The torque required is 9.5 Nm (7 ft-lb).**

Joint	Position
Base	-180°
Shoulder	-155°
Elbow	-60°
Wrist 1	-80°
Wrist 2	270°
Wrist 3	-180°

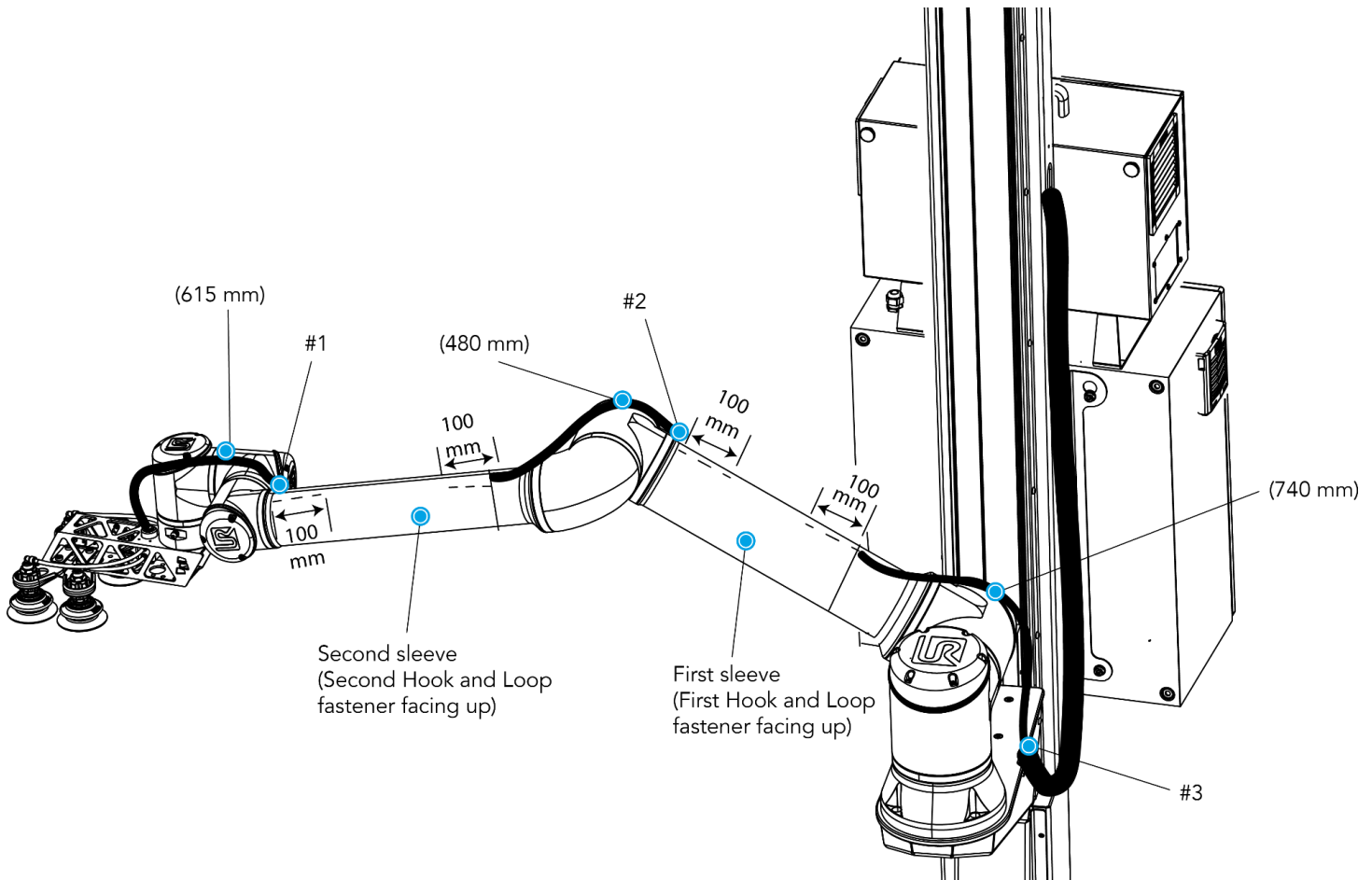


## L. PowerPick Controller Installation

1. Install the four (4) mounting brackets on the PowerPick Controller.
2. Position the PowerPick Controller on the column of the linear axis, above the robot controller, with the pneumatic fittings pointing downward.
3. Secure the PowerPick Controller by tightening the four (4) screws.



## M. Cable Routing System Installation (see image for reference)



1. To correctly position the cables, change the robot position. Refer to the table on the right.

2. Install the first cable management sleeve

- a. Working your way from the shoulder to the elbow of the robot arm, wrap the biceps of the robot arm in one of the cable management sleeves. The left edge of the sleeve should overlap the right edge.
- b. Tighten the cable management sleeve and close the first hook and loop fastener.
- c. Push the cable management sleeve until it touches the next joint of the robot and then rotate the sleeve so that the upper hook and loop fastener faces up. This will ensure the good positioning of the cables.

Joint	Position
Base	-180°
Shoulder	-155°
Elbow	-60°
Wrist 1	-80°
Wrist 2	90°
Wrist 3	-90°

3. Install the second cable management sleeve

- a. Working your way from the elbow to wrist #1, wrap the forearm of the robot arm in the other cable management sleeve. The left edge of the sleeve should overlap the right edge.
- b. Tighten the cable management sleeve and close the first hook and loop fastener.
- c. Push the cable management sleeve until it touches the next joint of the robot and then rotate the sleeve so that the lower hook and loop fastener faces up. This will ensure the good positioning of the cables.

4. Apply double-sided tape

- a. Take two pieces of double-sided tape and remove one protective layer from each of them.
- b. Partially open either end of one of the cable management sleeves partially and apply both pieces of double-sided tape, side by side, 100 mm from the closest robot arm joint.
- c. Repeat with the other end of the cable management sleeve.
- d. Repeat with the other cable management sleeve.

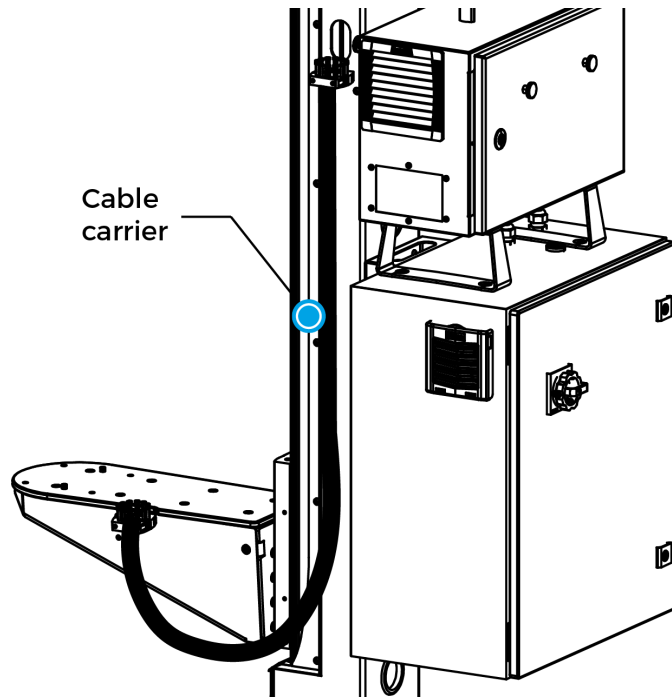
5. Take the 10 mm air tube and locate the end that has white labels. Connect that end to the PowerPick Gripper.

6. Secure the 10 mm air tube onto the robot's forearm.

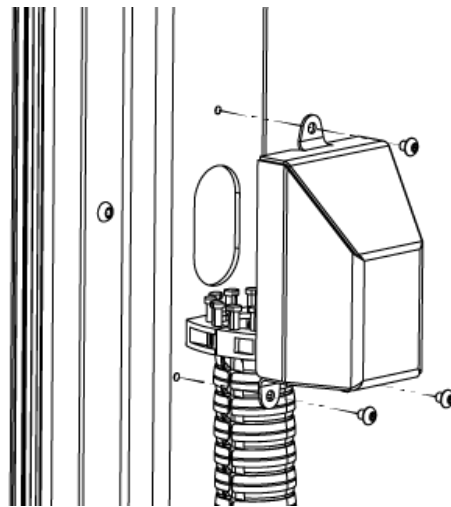
- a. Partially open the end of the forearm cable management sleeve closest to wrist #1. Remove the remaining protective layers from the pieces of double-sided tape.
- b. Place the 10 mm air tube on the pieces of double-sided tape to secure it, making sure white label #1 is at the edge of the cable management sleeve, closest to wrist #1.
- c. Partially open the end of the forearm cable management sleeve closest to the robot arm's elbow. Remove the remaining protective layers from the pieces of double-sided tape.



- d. Place the 10 mm air tube on the pieces of double-sided tape to secure it, making sure white label #1 is at the edge of the cable management sleeve, closest to the robot arm's elbow.
    - e. Close the forearm sleeve. The 10 mm air tube should run along the forearm under the sleeve.
  - 7. Secure the 10 mm air tube onto the robot's upper arm.
    - a. Partially open the end of the biceps cable management sleeve closest to the robot arm's elbow. Remove the remaining protective layers from the pieces of double-sided tape.
    - b. Place the 10 mm air tube on the pieces of double-sided tape to secure it, making sure white label #2 is at the edge of the cable management sleeve, closest to the elbow.
    - c. Partially open the end of the biceps cable management sleeve closest to the robot arm's shoulder. Remove the remaining protective layers from the pieces of double-sided tape.
    - d. Place the 10 mm air tube on the pieces of double-sided tape to secure it, making sure white label #2 is at the edge of the cable management sleeve, closest to the robot arm's elbow.
    - e. Close the biceps sleeve. The 10 mm air tube should run along the forearm under the sleeve.
  - 8. Tuck the 10 mm air tube into the cable carrier. The robot power cable and the air tube should not run through the same section of the carrier. White label #3 should appear at the end of the cable carrier closest to the robot arm's base.
  - 9. Cut the 10 mm air tube at the correct length (approximately 380 mm from the end of the cable carrier to the PowerPick Controller).
  - 10. Push the 10 mm air tube in the column and bring it out at the back of the column via hole #1.
  - 11. Connect the 10 mm air tube to Port P- of the PowerPick Controller.
  - 12. Remove the safety clip from Port P+ of the PowerPick Controller.
  - 13. Connect one end of the 8 mm air tube to Port P+ of the PowerPick Controller.
  - 14. Replace the safety clip.
  - 15. Install an Igus R-Lock at each end of the cable carrier.



16. Use cable ties to attach the air tube to the strain relief part of the mounting brackets.
17. Close both brackets.
18. Install the small cover on the side of the column with the provided screws.



19. Connect the 8 mm air tube to the filter kit provided (or equivalent).
20. Connect the filter kit to the local air supply device (air tube not provided).
21. Shut down the robot.

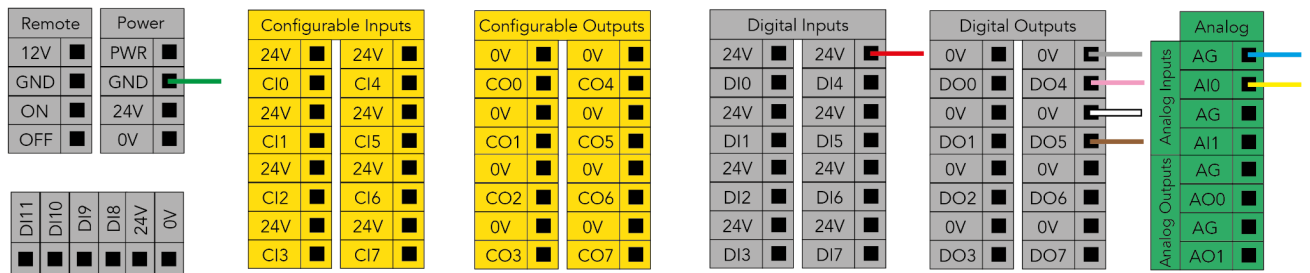


Shut down the robot before making inter-controller and safety signal connections.

## N. PowerPick Gripper and Copilot Connection

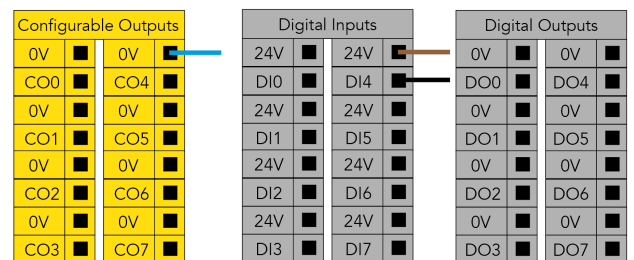
1. Connect the Copilot license dongle to the USB hub in the robot controller. It must remain connected at all times.
2. Connect the M12 connector of the I/O cable to the PowerPick Controller.
3. Push the I/O cable through hole #1, pull it out via hole #2, and connect it to the robot controller.
4. Connect the I/O cable to the robot controller according to the table on the right and figure below.

Color	Connection	Function
Blue	AG (Analog Ground)	Pressure sensor
Yellow	AI (Analog Input)	
Gray	0V	Blow off
Pink	DO (Digital Output)	
White	0V	Suction
Brown	DO (Digital Output)	
Red	24V	24VDC
Green	GND (Ground)	Ground



## O. Box Sensor(s) Cable Connection

1. Run the box sensor's cable through a hole under the robot controller.
2. Connect the wires to the terminal blocks of the robot controller:
  - a. Connect the brown wire to a 24 V terminal in a Digital Inputs block
  - b. Connect the blue wire to a 0 V terminal a Configurable Outputs block
  - c. Connect the black wire to a digital input (DI) terminal
3. Secure each connection using a 2 mm flat head screwdriver (not provided).



## P. Palletizer and Surrounding Equipments Positioning



Failure to follow this recommended cell layout may result in the inability to operate the Solution. The dimensions found in the figure are conservative. If for any reason it is impossible for the user to implement this layout, please contact Robotiq's application experts for assistance and support.

Appendix A and B of this document present a top and a side view of the recommended cell layout, which is valid for a typical range of box dimensions. The different zones in the figures are defined in the following table.

Zone	Purpose
0	<p><b>Approach Zone:</b> reserved for approach motion during the box placement process. Keep this zone free of obstacles.</p> <p>Conveyors, safety features and other physical devices should not enter this zone.</p>
1	<p><b>Presentation and Transport Zone:</b> used for box presentation (usually via conveyor) and transport to Zone 0 and to the pallet.</p> <p>Physical devices/obstacles can only be present in this zone if they are found at a position lower than the top of the conveyor, and part of the conveyor dimensions defined in the Palletizer node settings</p> <p>Such devices/obstacles may force the robot to take longer trajectories and lower the palletizing speed.</p>
2	<p><b>Extension Zone:</b> same characteristics as Zone 1, but if box length is less than 300 mm, obstacles can be present.</p>
3	<p><b>Interlayer Storage Zone:</b> recommended for the storage of interlayer material, if box length is less than 300 mm.</p> <p>Please note that based on this configuration, the robot and gripper can only reach the end of the interlayer zone/material that is closest to the Solution.</p>

### Q. Solution Anchoring



Make sure to follow all safety rules and regulations of your workplace while working on/with the Solution.

1. Position the Solution at its final position.
2. Drill the six (6) holes with the provided drill bit.
3. If necessary, level the Solution using shims.
4. Place the anchors into the holes and fasten the nuts flush to the screws.
5. Bang the anchors in place.
6. Secure the Solution by screwing the six (6) nuts. **Required torque is 54 Nm (40 ft-lb).**

### R. Finalization and Power On

1. Install each box sensor on a bracket that fits your setup with the provided screws.
2. Position each box sensor bracket so it can detect the box(es) to be picked.
3. Connect each box sensor M8 connector cable to its sensor.
4. Install the base cover using the provided screws.
5. Install the column cover using the provided screws.
6. Connect the power cable to the wall outlet.
7. Power on the Linear Axis Controller and the robot.



Make sure to do a risk assessment before starting to use the Solution.



The column cover must be properly installed to achieve maximum structure rigidity.

### S. Joint Limits Setting

1. Go to **Installation** □ **Safety** □ **Joint Limits**
2. Unlock the section with the proper password and change the **Elbow** and **Wrist 3** values as follows.

Joint	Minimum	Maximum
Base	-167°	3°
Wrist 3	-273°	273°

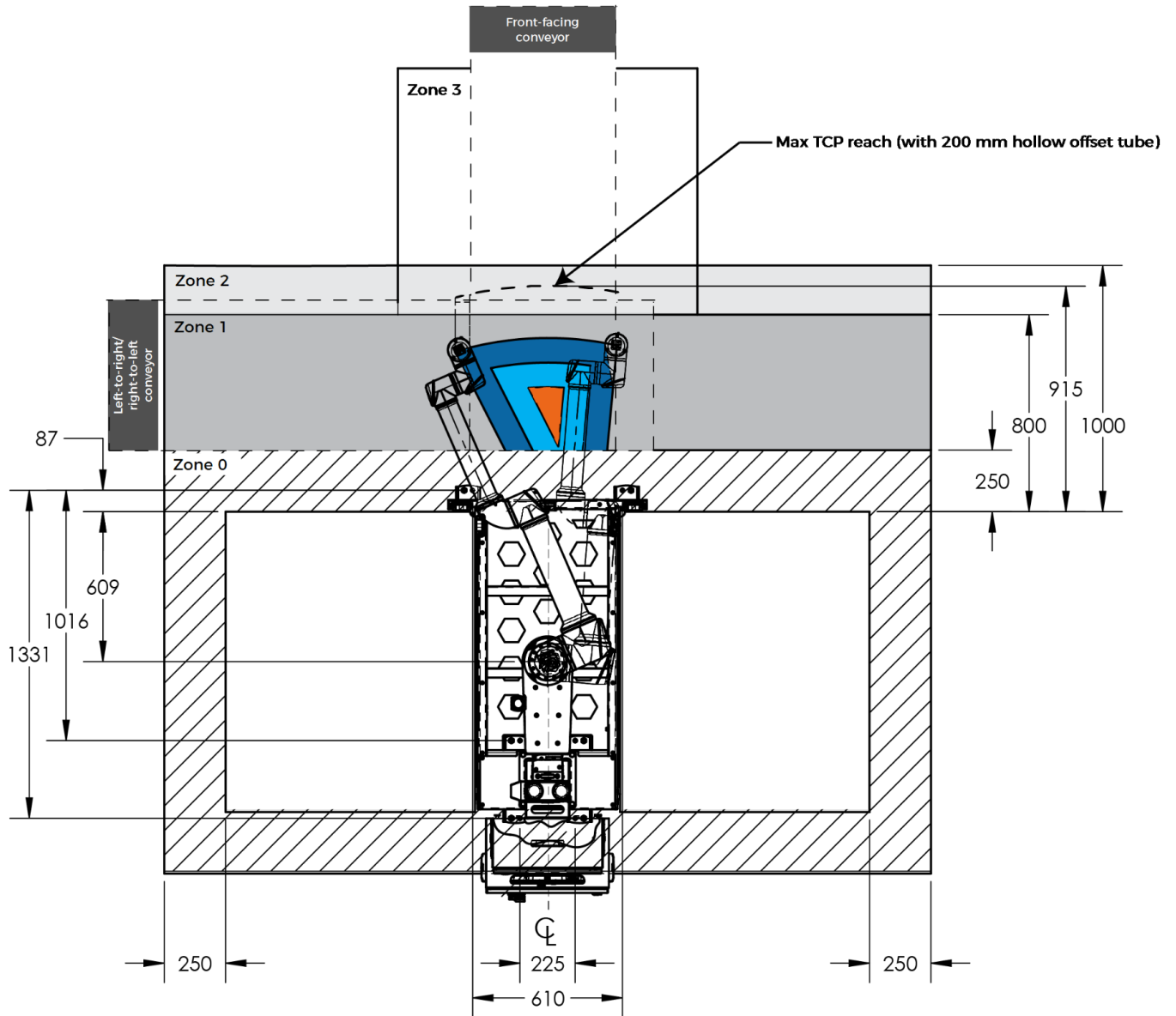
3. To ensure the effective operation of the Solution, Robot Limits should stay at the Least Restrictive setting. Go to **Installation** □ **Safety** □ **Robot Limits**.  
Tool speed and tool force can be adjusted as required. Please note that adjusting these settings will reduce the Solution's cycle time.



## 6. SOFTWARE & OTHER INFOS

To complete the installation and for all additional information about the Robotiq Palletizing Solution and its software, please refer to the corresponding sections of the instruction manual at [robotiq.com/support](https://robotiq.com/support).

# Appendix A - Recommended layout (top view)



- Picking zone (any Gripper orientation) with 0 mm offset plate.
- Picking zone (any Gripper orientation) with 100 mm hollow offset tube.
- Picking zone (any Gripper orientation) with 200 mm hollow offset tube.

# Appendix B - Recommended layout (side view)

