



ROBOTIQ PALLETIZING *SOLUTION*

Original Notice

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Robotiq Palletizing Solution
for Universal Robots



Instruction Manual

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Revisions

Robotiq may modify this product without notice, when necessary, due to product improvements, modifications or changes in specifications. If such modification is made, the manual will also be revised, see revision information. See the latest version of this manual online at: support.robotiq.com.

2020/12/16

- Update of the safety section
- Update of the installation section
- Update of the specifications section

2020/11/30

Update of the Installation section.

2020/11/25

Initial release



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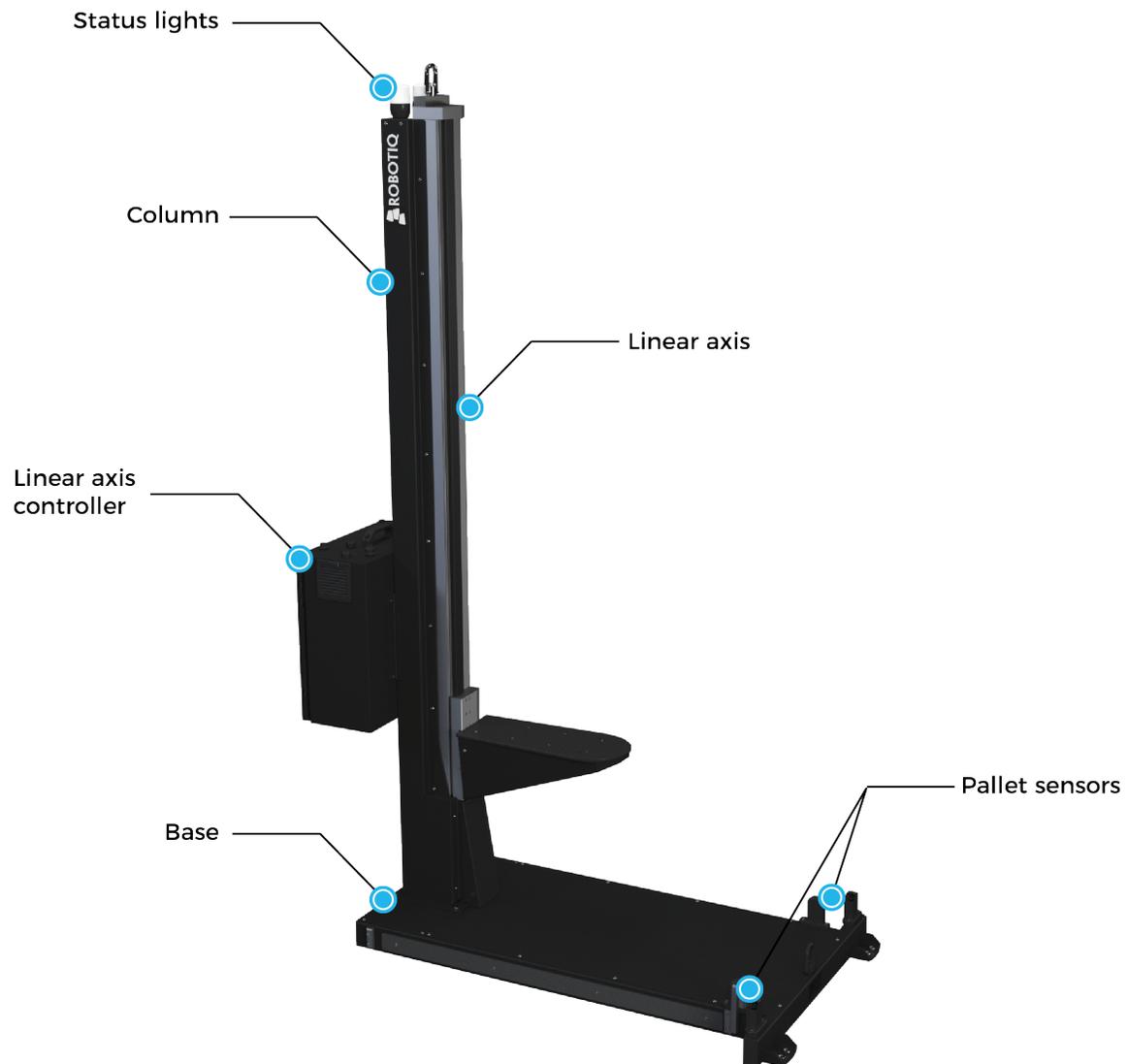
1. General Presentation

The terms "Palletizing", "Palletizing Solution" and "Solution" used in the following manual all refer to the Robotiq Palletizing Solution. The Robotiq Palletizing Solution is a hardware and software solution already connected and ready to install. It is composed of a base fully integrated with the linear axis, pallet sensors and status lights. The extra reach gripper bracket is also included in the Solution to extend the AirPick Gripper of 200 mm from the robot tool flange. The Material Handling Copilot and accessories such as a box sensor, an anchor kit and a cable management system are parts of the Solution.

Info

The following manual uses the metric system. Unless specified, **all dimensions are in millimeters.**

1.1. Palletizing Solution Components



Info

The following section presents the key features of the Robotiq Palletizing Solution and must not be considered as appropriate to the operation of the Solution. Each feature is detailed in the appropriate section.

111. Base and Column

The Robotiq Palletizing Solution is composed of a base and a column on which all the components that are necessary to the good operation of the Solution are attached. Its geometry is designed to facilitate the positioning of the Right and Left pallets without any surrounding obstructions. The base has to be anchored in the floor. For more details, please see the **Installation** section

112. Linear Axis

To extend the reach of the robot, a linear axis is installed inside the column. It allows the robot to move vertically in order to build high pallets.

113. Linear Axis Controller

All the components of the Solution are integrated and controlled via the linear axis controller. It allows simultaneous motion of the axis and the robot during palletizing motion.

114. Pallet Sensors

The Solution is composed of four (4) sensors to detect pallets presence (two per pallet). The sensors will allow the Solution to ensure that the pallets are well positioned on each side of the base to optimize the application process.

115. Status Lights

Two (2) status lights are positioned on the top of the base. Each status light is associated to the nearest pallet. The color of the light allows to know the status of the system or the state of a specific pallet. Please refer **Lights States** section.

116. AirPick Vacuum Gripper

The AirPick is a Vacuum Gripper that creates a vacuum via a pneumatic vacuum generator. It is equipped with one or multiple suction cups. Each suction cup can be adapted to your application and grasping needs. The AirPick Gripper is compatible with the Robotiq standard coupling interface.





Fig. 1-1: Robotiq AirPick Gripper

117. Suction Cup System

A Robotiq Suction Cup System can be installed directly under the Vacuum Gripper. Each Robotiq Suction Cup System includes a bracket, a manifold, air nodes, port plugs, bumpers, tubing and additional suction cups.



Fig. 1-2: Suction cup system

Info

Please refer to the **Installation** section for more information on how to integrate the Suction Cup System to the AirPick.



Tip

The owner can use a custom bracket or a mounting plate. The bracket or mounting plate can be installed directly under the manifold.

118. Extra Reach Gripper Bracket

The extra reach gripper bracket is included in the Solution to extend the AirPick Gripper of 200 mm from the robot tool flange. This way, the Robotiq Palletizing Solution will be able to palletize boxes on large size pallets. Please refer to the **Extra Reach Bracket** section for more details about the limitations of the extension bracket

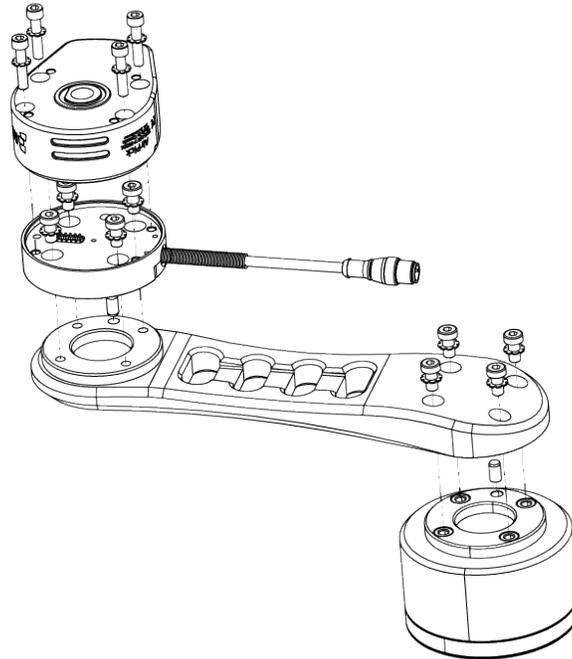


Fig. 1-3: AirPick Vacuum Gripper Extra Reach Bracket

119. Box Detection Sensor

The Solution includes a box sensor that needs to be installed at the end of the conveyor in a way that it is triggered when a box is ready to be picked up.



Fig. 1-4: Box Sensor



12. Object Picking

The AirPick Gripper allows:

1. Main unit suction cup
2. Auxiliary system with multiple suction cups

Warning

Object picking causes the compression of the suction cup(s) , which can result in pinching points between the gripper and the load. Avoid presence of body parts in this zone during operation.

Warning

Before picking any new object or material in autonomous mode, always check that the resulting vacuum level is sufficient to ensure safe gripping, in order to prevent dropping or ejection of the load.

12.1 Main Unit Suction Cup

- In order to use only one suction cup, the single cup can be mounted right in the port of the vacuum generator.

12.2. Auxiliary System with Multiple Suction Cups

- A standard Suction Cup System can be attached to the AirPick Vacuum Gripper. The bracket normally holds two or four suction cups (corresponding to the four ports of the manifold).
- Any unused manifold port should be blocked with a mating plug to avoid air leakage.
- Other custom mounting options can also be used to benefit from a multiple suction cups solution.

Info

For the collision avoidance algorithm, the robot control software considers a generic gripper geometric envelope that does not overlap the box.

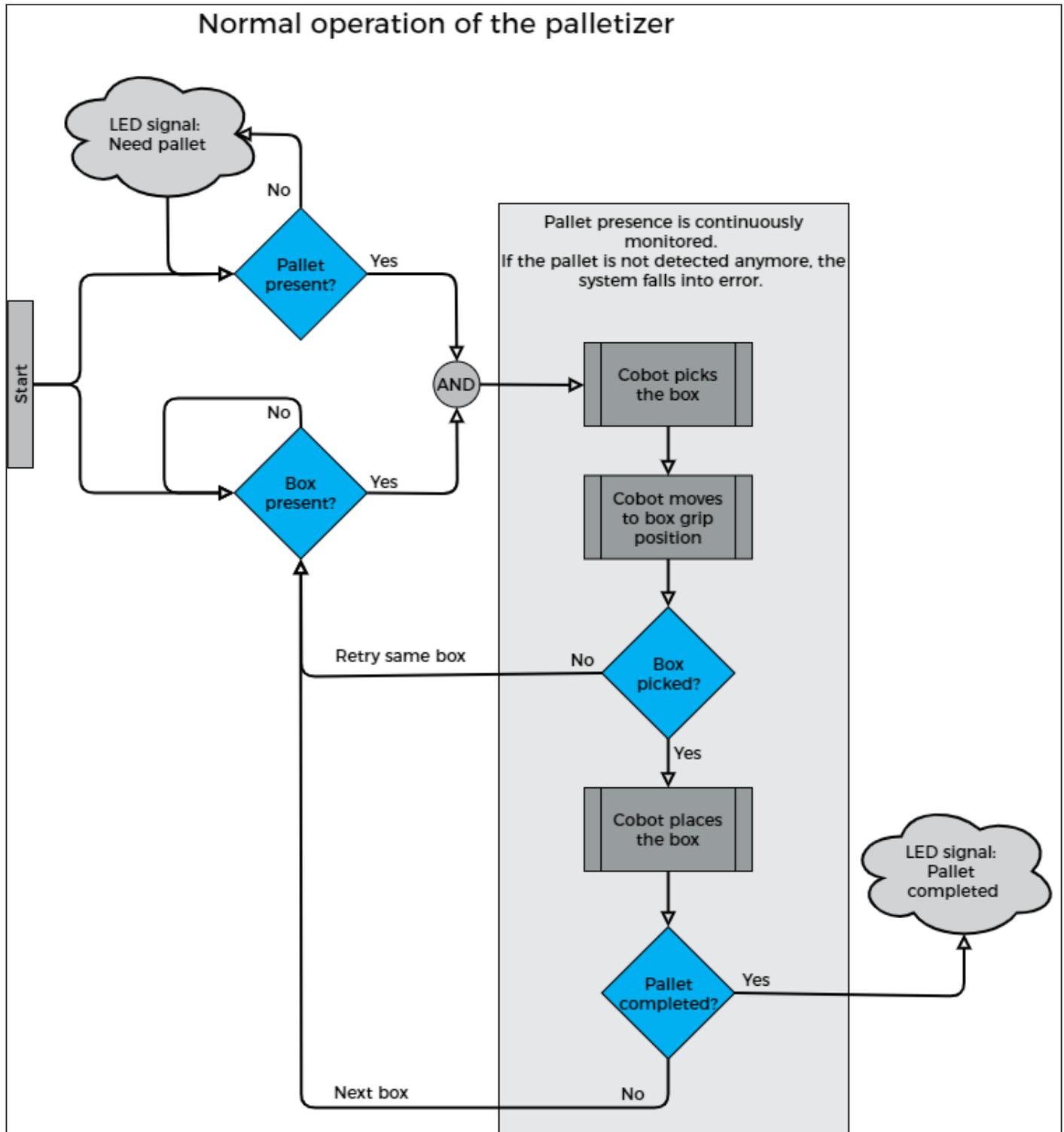
Caution

Custom brackets and plates must meet the required technical specifications (refer to the **Technical dimensions** section).

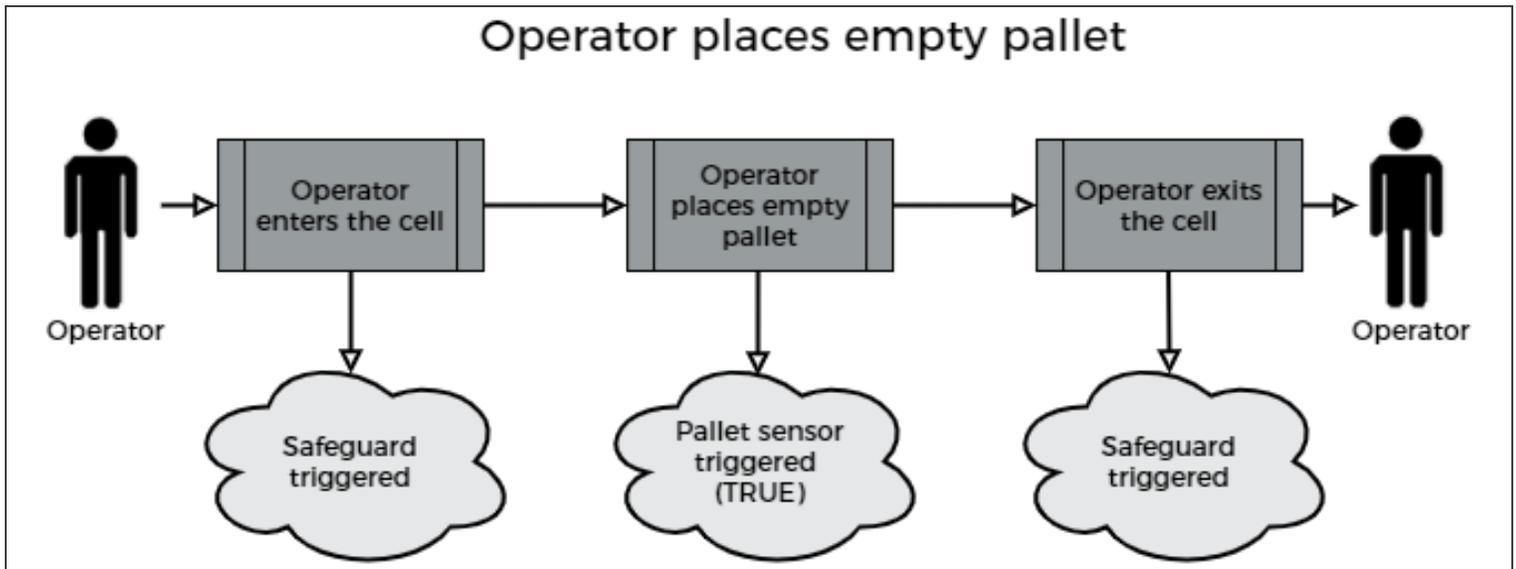


13. Palletizing Operation Diagrams

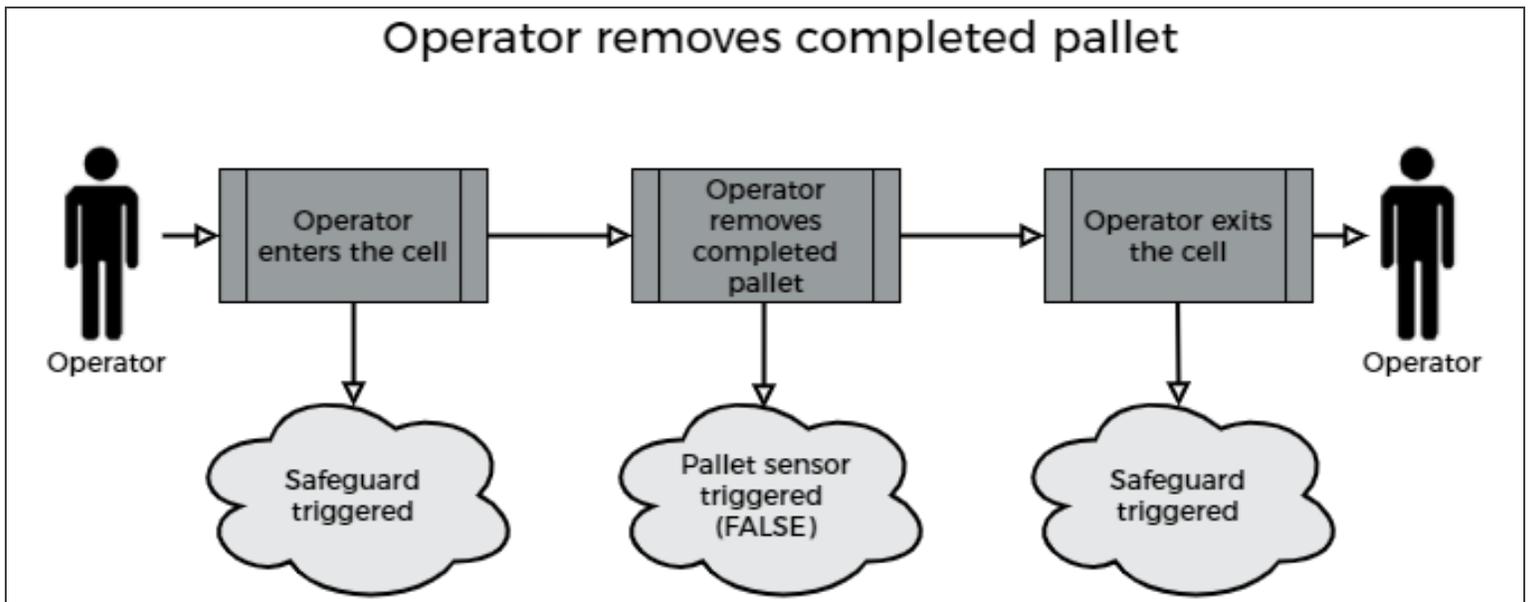
The following diagrams explain the logical operation of the Palletizing Solution, based on the operator's actions and all responses coming out from them such as signals, pallet and box sensors behaviors, etc.



Operator places empty pallet



Operator removes completed pallet



2. Safety

2.1 Disclaimer

The intent of this section is to provide general guidelines for safe use of the Robotiq Palletizing Solution, always follow local regulations. The installer is responsible for the safe installation and commissioning of the Palletizing Solution. Robotiq accepts no liability for damage, injury or any legal responsibility incurred directly or indirectly from the use of this product. The user (installer and operator) shall observe safe and lawful practices including but not limited to those set forth in this document.

Info

The terms "operator", "installer", "commissioning" or "installation" refer to anyone responsible for any of the following operations on the Robotiq Palletizing Solution:

- Installation
- Control
- Maintenance
- Inspection
- Calibration
- Programming
- Decommissioning

The present section is based on the following international standards and technical specifications:

- **ISO 10218-1:2011** : Safety Requirements For Industrial Robots - Robots
- **ISO 10218-2:2011** : Safety Requirements For Industrial Robots - Robots Systems and Integrators
- **IEC 60204-1** : Safety Of Machinery - Electrical Equipment Of Machines
- **ISO/TS 15066:2016** : Robots and robotic devices — Collaborative robots

This manual explains various components of the Robotiq Palletizing Solution and the general operations regarding the whole life-cycle of the product, from installation to operation and decommissioning.

The drawings and photos in this manual are representative examples. However, discrepancies may be observed between the visual supports and the actual product.



2.2. Intended Use

The Robotiq Palletizing Solution is specifically designed for palletization.

Warning

Only use the application in its original condition without unauthorised modifications.

Warning

Only use the application if it is in perfect technical condition.

Warning

The emergency stop function is intended for use in emergency conditions and not for normal condition stop.

Info

The Solution is intended to be used with a UR10 or UR10e from Universal Robots.

Info

Always comply with local, state, province and/or federal laws, regulation and directives automation safety and general machine safety.

Caution

The unit should be used exclusively within the range of its technical data. Any other use of the solution is deemed improper and unintended. Robotiq will not be liable for any damages resulting from any improper or unintended uses.



2.3. Warnings, risk assessment and final application

Warning

The operator must have read and understood all of the instructions in the following manual before operating the Robotiq Palletizing Solution.

Caution

Any use of the Palletizing Solution in non-compliance with these warnings is deemed inappropriate and may cause injury or damage.

The robot, the AirPick Vacuum Gripper or any other gripper used, the linear axis and any other equipment used in the final application must go through a comprehensive risk assessment process before they can be used. Special care must be taken during this step if custom mounting options are used for the suction cups.

Caution

It is the installer/operator's responsibility to ensure that all local safety measures and regulations are met.

The following non-exhaustive list presents risks that must be assessed during the integration process:

- Risk of load ejection resulting from loss of vacuum;
- Risk of load dropping resulting from loss of vacuum;
- Risk of pinching any moving component of the Robotiq Palletizing Solution or the robot;
- Risk of damage or breaking if using a custom suction cup bracket that does not meet the technical requirements;

Depending on the application, there may be hazards that require additional protection and/or safety measures. For instance, the workpiece handled by the gripper could be inherently dangerous to the operator.

Warning

The linear axis is NOT power and force limited. Pinching or crushing risk must be considered seriously.



Warning

When the robot is not moving, the collaborative collision detection is disabled. If the linear axis moves, it can hurt people with the robot.

Warning

Depending on the supply sources, when an emergency stop (e-Stop) button is pressed, the following consequences may occur. The robot owner has the responsibility to do a risk assessment and choose the appropriate option.

Supply sources	e-Stop consequences
Robot tool supply (tool connector)	<p>Power failure to the Vacuum Gripper. The vacuum level will drop to ambient pressure and the object will be lost.</p> <div style="border: 1px solid yellow; padding: 5px; margin-top: 10px;"> <p>Caution</p> <p>For the Palletizing Solution, it is not recommended to connect the Gripper to the tool connector.</p> </div>
Robot controller supply* (Any 24V pin)	<p>Vacuum Gripper powered ON.</p> <ul style="list-style-type: none"> • If an object is detected: the vacuum level will continue to be regulated and the object will not be lost. • If no object is detected: the Vacuum Gripper will go into a standby state 2 seconds after the e-Stop button is pressed.

*The AirPick Vacuum Gripper that comes with the Robotiq Palletizing Solution is connected via the robot controller.

Warning

Loss of vacuum can occur due to power failure or air supply interruption.

2.3.1 Expected system behavior in normal operations:

- **Normal mode:** when no human operator is present within the palletizing cell.
- **Safeguard mode:** when a human operator is present within the palletizing cell in order to manipulate a filled pallet, place pallets in an empty pallet slot or troubleshoot the system or any other operations requiring human intervention. In such a state the robot will be maintained in a stop category 2 and the linear axis will undergo stop category 1 transitioning to stop category 0*. When the safeguards are removed, the system will resume normal operation.

Info

See IEC 60204-1 for definitions of stop categories.



Emergency stop mode when the emergency stop button is pressed. All components of the system will undergo stop category 1 transitioning to stop category 0.

Operation mode	Robot			Linear Axis		
	Force (N)	Power (W)	Speed (mm/s)	Force (N)	Power (W)	Speed (mm/s)
Normal mode (Up to safety limits)	up to 250	up to 1000	up to 5000	2400*	690 (nominal)	500
Protective stop	0 (Stop Cat 2)					
Safeguard stop	0 (Stop Cat 2)			N/A (Stop Cat 1 and transition to Cat 0)		
Emergency stop	N/A (Stop Cat 1 and transition to Cat 0)					

*Calculated using the following assumptions: static force at peak current with a 90% efficient ball screw and no friction.

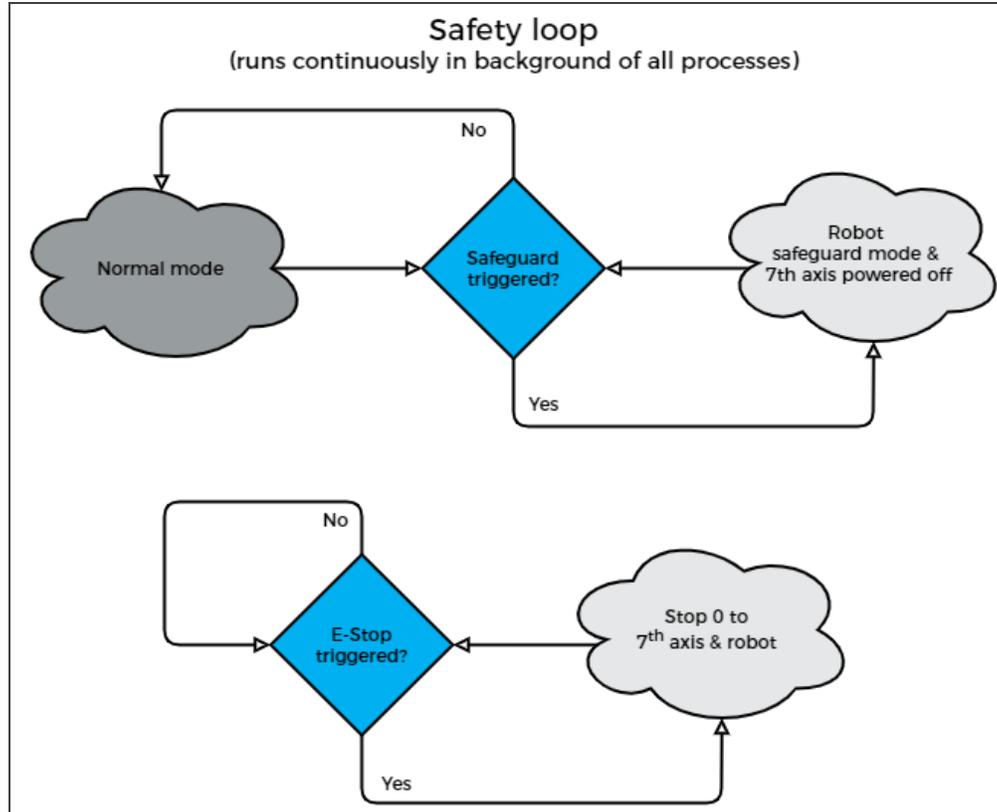


Fig. 2-1: Safety Logical Schema

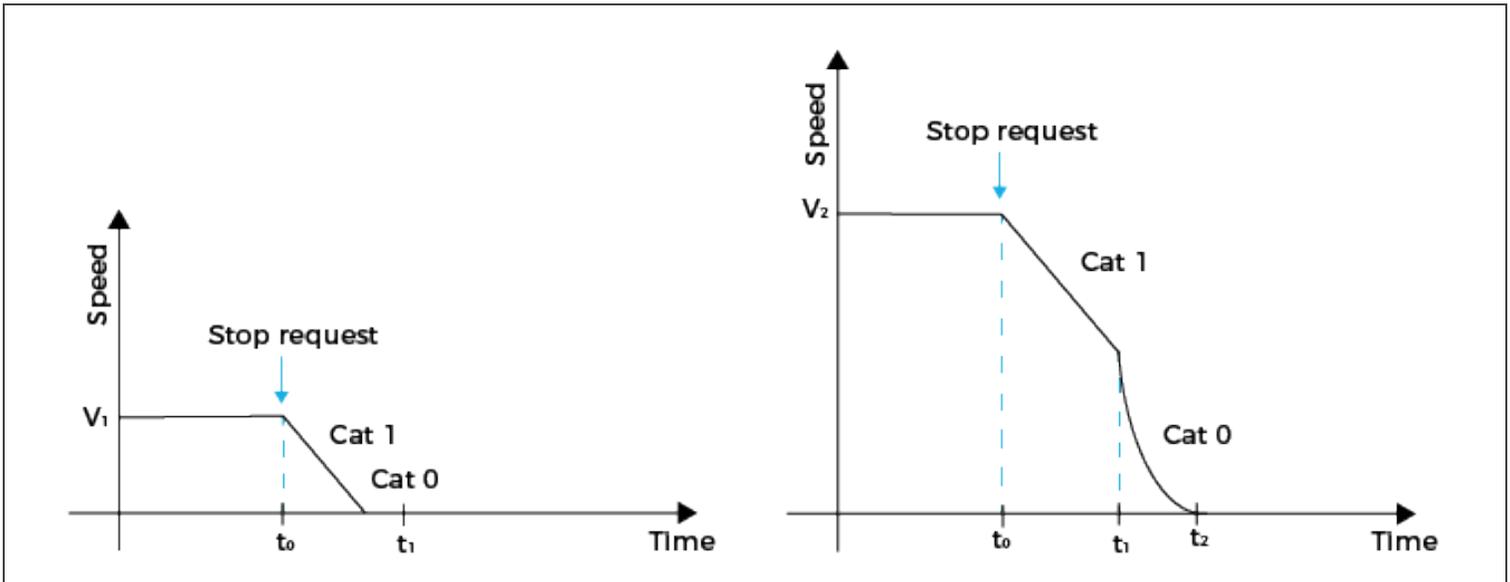


2.3.2. Linear Axis Stop Category 0 and 1

When a stop is required, the robot and the linear axis start the process at the same time, even if they are independent, so the stopping time can differ.

- For robot information, please refer to the Universal Robots documentation.
- For the linear axis:
 - Maximal stopping time for Category 1: 500 ms;
 - Maximal stopping time for Category 0: 100 ms*;
 - Travelled distance when there is a stopping time: 33 mm (1-5/16 in)*

*For cases where the robot is immobile, with a payload of 8 kg and the initial speed of the linear axis is 500 mm/s, which is the maximum allowed speed.



3. Installation

The following subsections will guide you through the installation and general setup of your Robotiq Palletizing Solution.

Info

Before installing:

- Read and understand the safety instructions related to the Palletizing Solution.
- Verify your package according to the scope of delivery and your order.
- Make sure to have the required parts, equipment and tools listed in Scope of delivery.

Warning

When installing:

- Meet the recommended environmental conditions.
- 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 that the air supply is secured.

Warning

Failure to properly secure and install the equipment can result in material damage and serious injury. In addition, note that in situations where the installation is not compliant, the warranty is void.

Warning

When mounting sections of the linear axis base, and when moving it, make sure to let enough of safe space around, so you can avoid material damages and serious injuries.



Warning

- Make sure to follow all the safety rules and regulations of your workplace while using the Robotiq Palletizing Solution.
- Always wear all recommended personal protective equipment in accordance with your workplace's safety standards, including:
 - Safety glasses;
 - Hearing protection;
 - Hard hats;
 - Steel-toe boots
- Always use proper safety precautions when working with tools that contain sharp edges, pinching surfaces, or generate heat.
- Always lift heavy objects with your legs, not your back. If you can not lift an object alone, ask for help or find another method to move it.

3.1. Scope of Delivery

- 1 x robot base including:
 - 1 x Linear axis (1500 mm stroke)
 - 1 x Motor
 - 1 x Linear axis controller
 - 4 x Pallet sensors
 - 2 x Status lights
 - 1 x Cable management system
- 6 x concrete anchors (1/2 - 13)
- 1 x Box detection sensor
- 1 x Extra reach bracket
- 1 x Vacuum Gripper kit (Airpick, suction cups, brackets for 2 or 4 cups)
- 1 x Air tube 8mm (already mounted on the column)
- 1 x Gripper coupling kit
- 1 x Material Handling Copilot software dongle license



3.2. Required Tools and Equipment

The following tools are required to install the Palletizing solution:

- **Included:**

- 12.7 mm concrete drill bit (1/2 in) (for use with a rotary hammer)
- 19mm socket (3/4 in) (10 mm drive size (3/8 in))
- 17mm socket (10 mm drive size (3/8 in))
- 3 mm hex key
- 4 mm hex key
- 6 mm hex key
- 10 mm hex key

- **Not included:**

- Lifting equipment (min. capacity of 200 kg) such as a gantry crane, overhead crane, jib crane, chain block or forklift with a proper lifting hook;
- Drill with a No.2 Phillips bit ;
- Utility knife;
- Ratchet with 10 mm [$\frac{3}{8}$ in] drive (or adapter) ;
- Torque wrench with 10 mm [$\frac{3}{8}$ in] drive (or adapter) (min. torque range: 20 - 50 Nm [14.8 - 36.9 ft-lb]) ;
- Additionally, if you decide to install the type of anchors we provide, you will need:
 - Rotary hammer
 - Hammer



3.3. Environmental and Operating Conditions

Conditions	Value
Minimum storage/transit temperature	-25°C [-13°F]
Maximum storage/transit temperature	60°C [140°F]
Minimum operating temperature	0°C [32°F]
Maximum operating temperature	50°C [122°F]
Humidity (non-condensing)	20-80% RH
Food/ Clean room/ Intrinsic Safety (IS)	No
Dust and water	<ul style="list-style-type: none"> • Dust: Affect the time between maintenance • Water : No
Other	<ul style="list-style-type: none"> • Free from corrosive liquids or gases • Free from explosive liquids or gases

Table 3-1: Environmental and operating conditions of the Robotiq Palletizing Solution

Caution

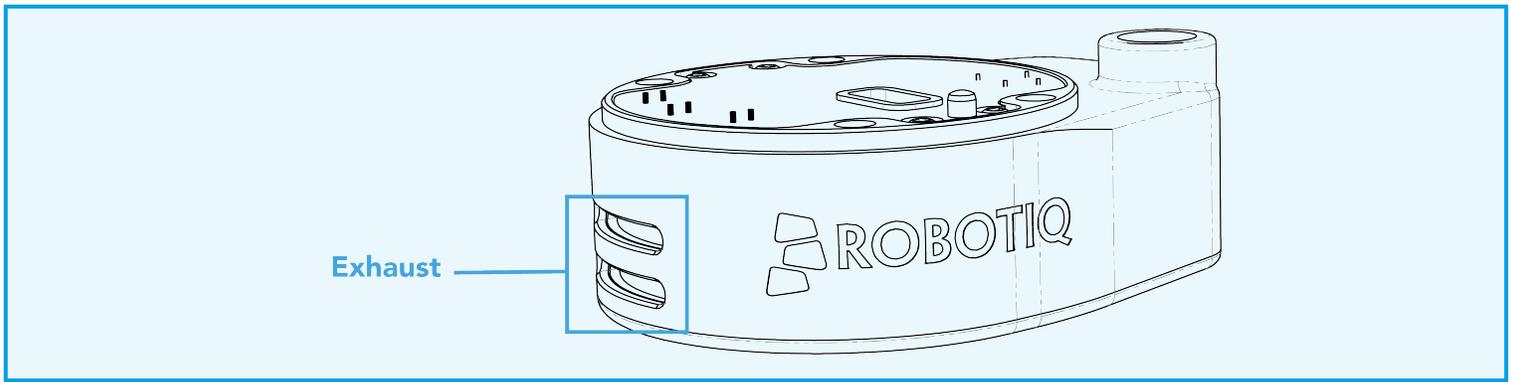
Use of the Robotiq Palletizing Solution is not recommended in presence of chemicals in the environment.

AirPick Gripper Info

The input filter prevents any dust larger than 200 µm from getting inside the gripper. Dry dust will prevent the accumulation on filters. The use of suction cups with integrated filter can be used to reduce dust accumulation.

The exhaust must not be blocked.





3.3.1 AirPick Gripper Air Supply

Compressed air must be supplied to the Vacuum Gripper according to the technical specifications. For maintenance and other purposes, it is recommended to install a lockout valve before connecting to the product. The air supply tubing must be connected and disconnected to, or from, the inlet port, only when the line is depressurized. When the line is pressurized, the safety clip must be at all times installed on the inlet port.

To protect against whipping hazard, the air supply tubing must be securely attached to the robot arm. An air fuse should also be installed.

3.3.2 Depressurizing the Supply Line

In order to safely depressurize the supply line, the air supply must first be shut off. Then, if no lockout valve is present to depressurize the line, the AirPick Gripper can be activated until the pressure is fully released.

3.4. Mounting and Installation

3.4.1 Visual Inspection

The Robotiq Palletizing Solution is shipped on a pallet. A wood crate is protecting the hardware from external elements. Before removing the crate, make an inspection of it to make sure there is no damage or defect. If it's the case, you must contact Robotiq support team.

Caution

Before removing the crate, make sure you have inspected it.

3.4.2 Unboxing

Tip

A minimum of two people is recommended for the following steps.



Warning: Transport & Lift Hazard

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

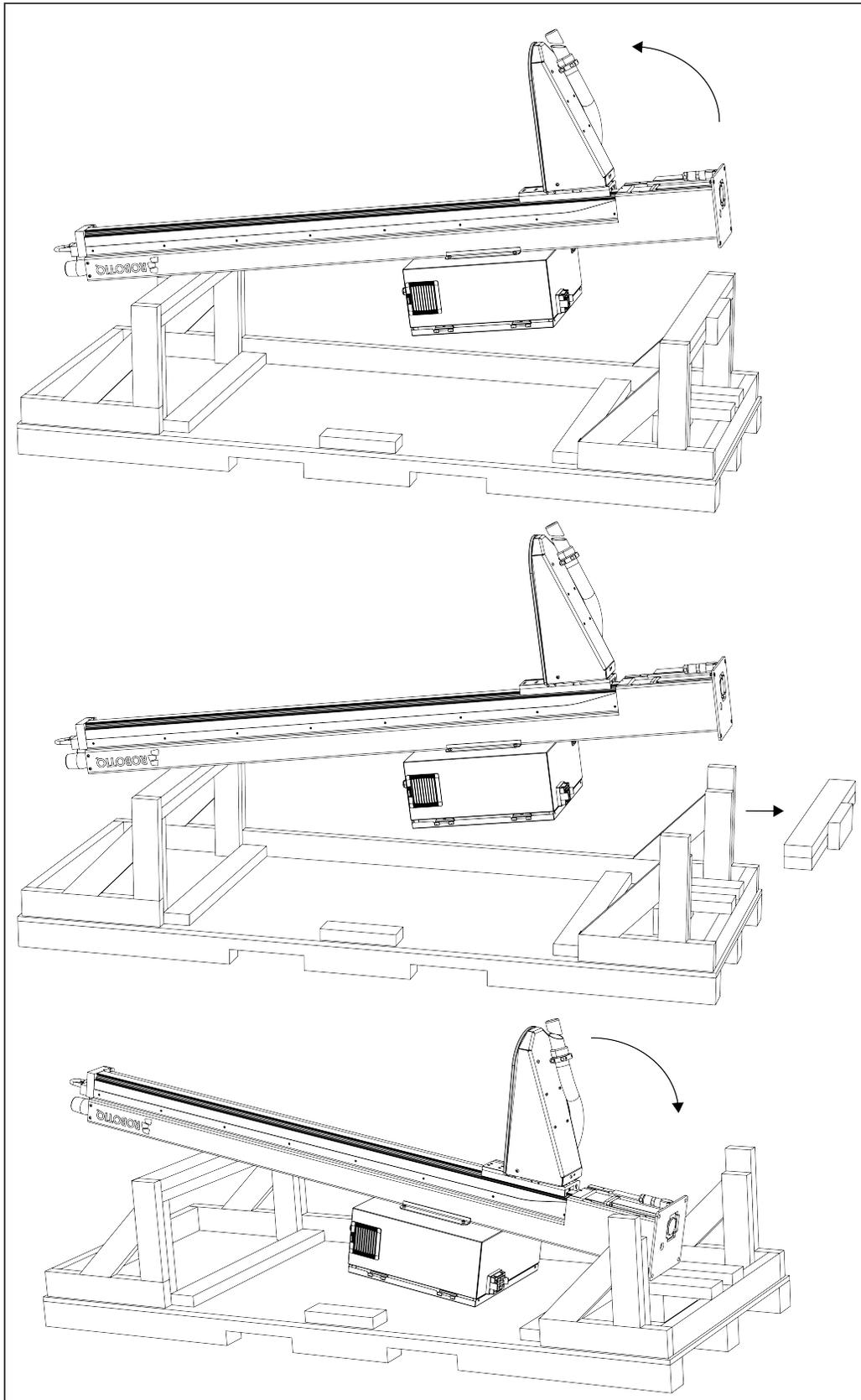
Warning

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.

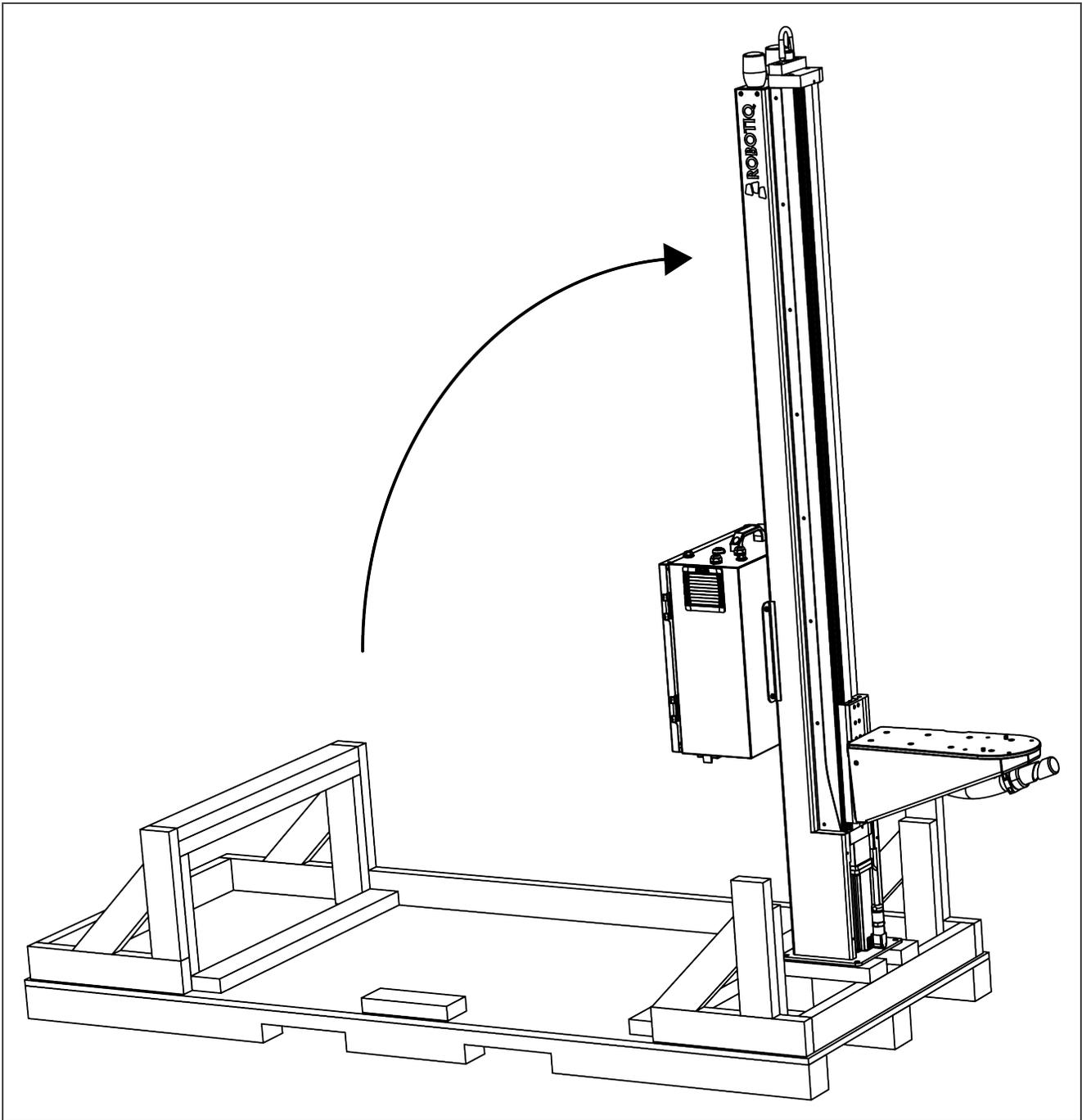
1. Open the crate by removing the top and four (4) sides using a drill.
2. Cut all straps that retain the components and remove all cardboard boxes out of the crate.
3. Unscrew the four (4) bolts that retain the base into the crate.
4. Bring out the base from the crate, using a forklift or manually.
5. Unscrew the two (2) bolts that retain the column into the crate.



6. Lift the foot base, unscrew the piece of wood under the foot base. Remove the piece of wood and descend the Solution slowly and carefully (see the picture below).

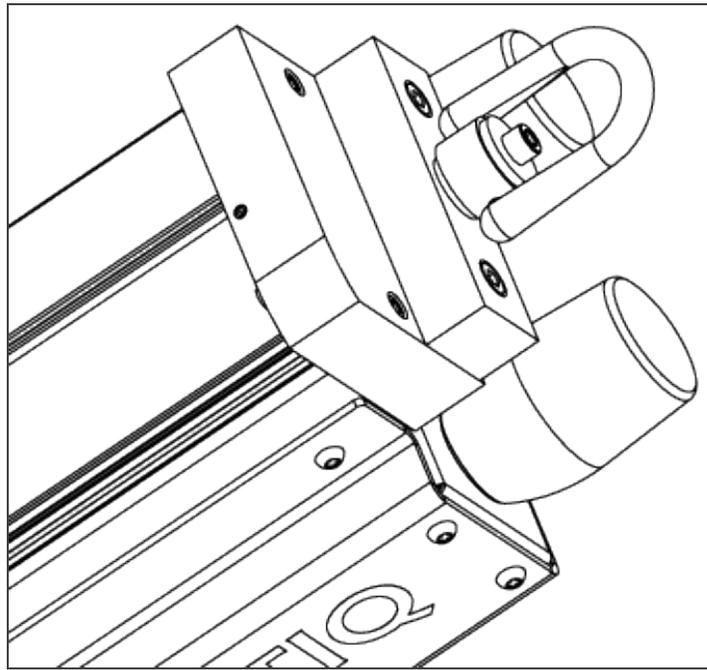


7. Position the column vertically. Use the lift point to rotate the column.

**Caution**

Be careful not to pinch the cables. If necessary, secure them before lifting and placing the column on the base.



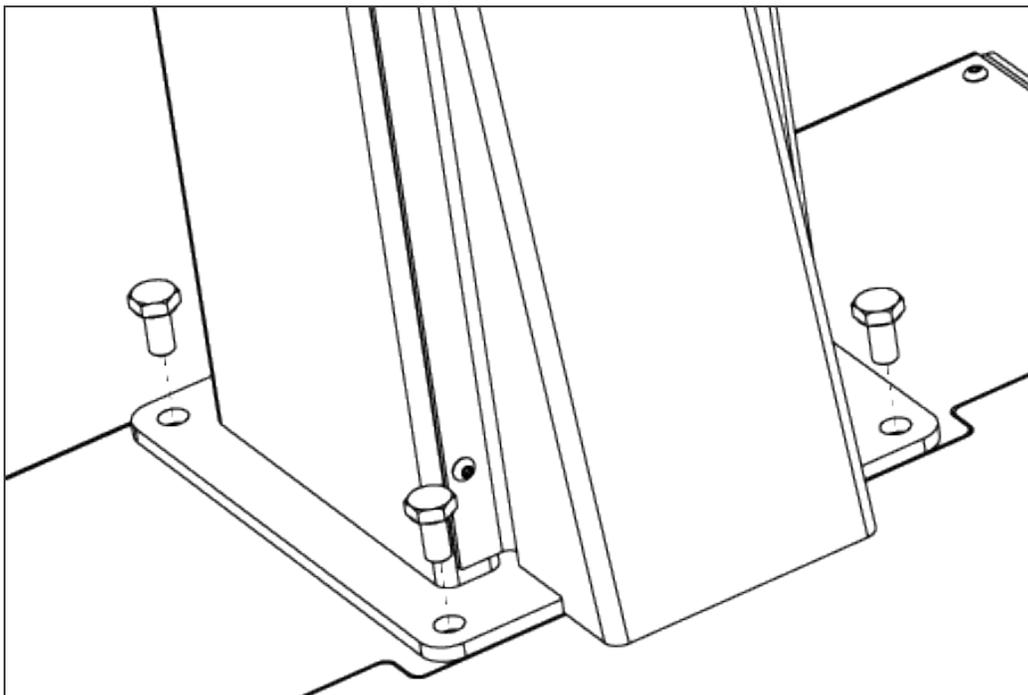


8. Lift and place the column onto the base.

Info

A hook is present at the top of the column. Use it to lift the column.

9. Secure the base with the column using the four (4) M10 screws. Tighten to a torque of 50Nm.



Caution

Make sure to have all parts in hands before throwing away the packaging. Dispose of the packaging according to your local recycling institution.

3.4.3. Moving and Positioning the Solution

Warning

Failure to properly secure and install the equipment can result in material damage and serious injury. In addition, note that in situations where the installation is not compliant, the warranty is void.

Warning: Transport & Lift Hazard

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

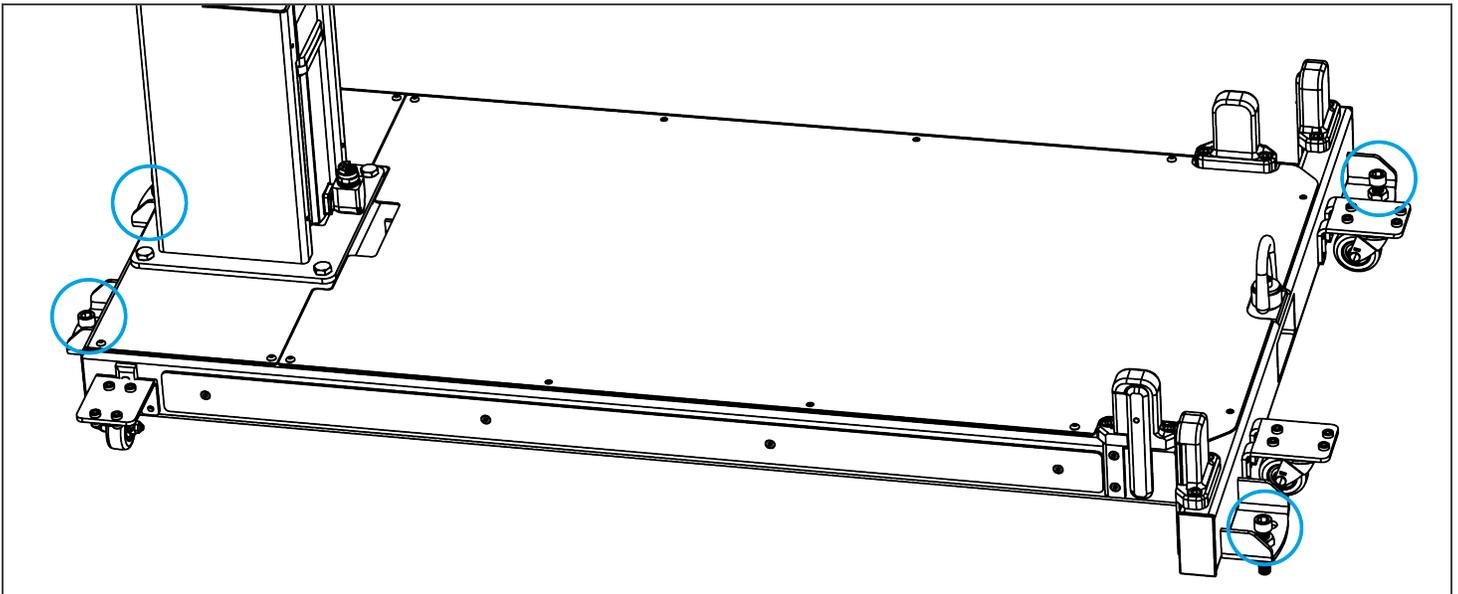
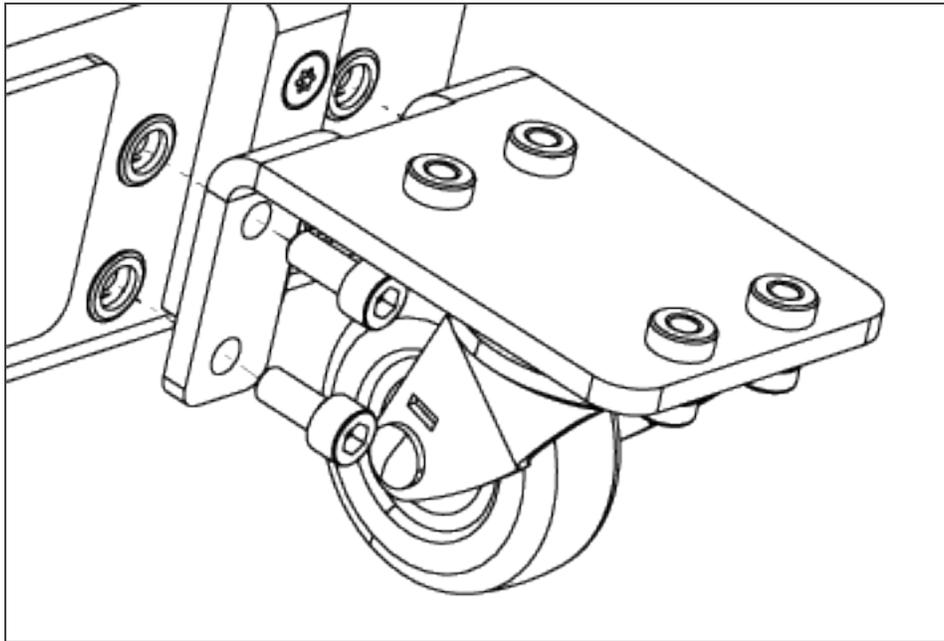
You can mount the solution at the place of your choice. However, to finalize it, you will have to move it to its final location. There are two possibilities to securely move the unit:

1. Using a forklift, pay attention to the center of gravity to prevent the equipment from falling. Make sure to secure/stabilize the Solution before any move.
2. Use the set of wheels provided in the Solution. To use them, screw the four (4) bolts to lift the Solution and then screw the four (4) wheels and unscrew the bolts to get the solution down on its wheels.

Caution

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.





3.4.4. Mechanical and Electrical Installation

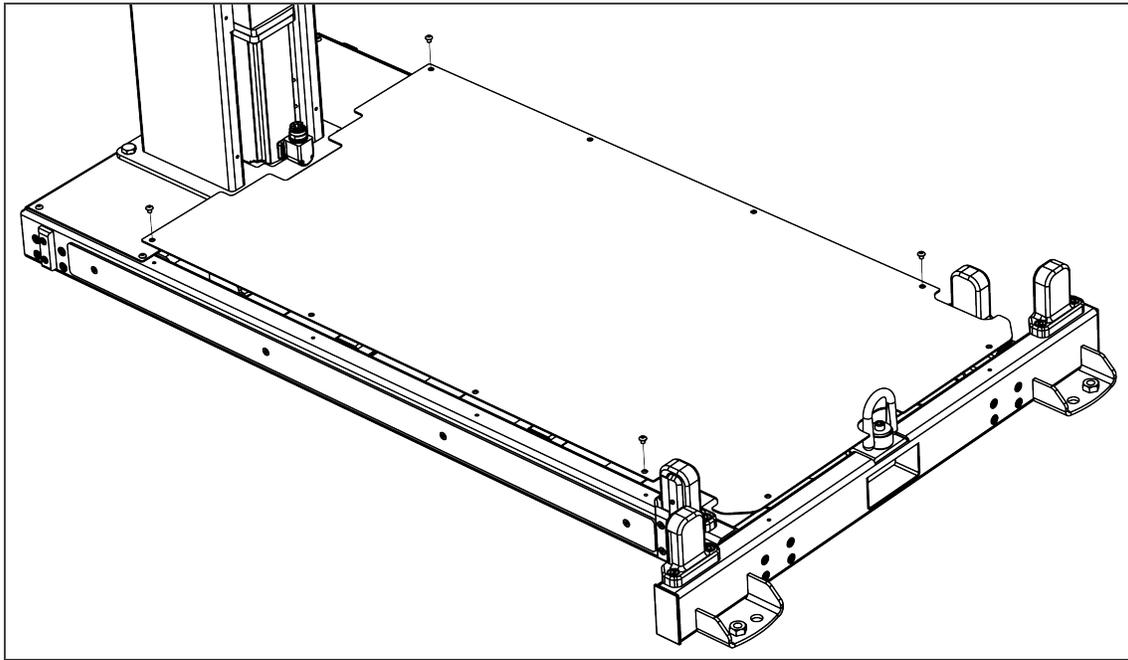
Tip

A minimum of two people is recommended for these steps.

Base Cover

1. Remove the cover that will allow the cable management.



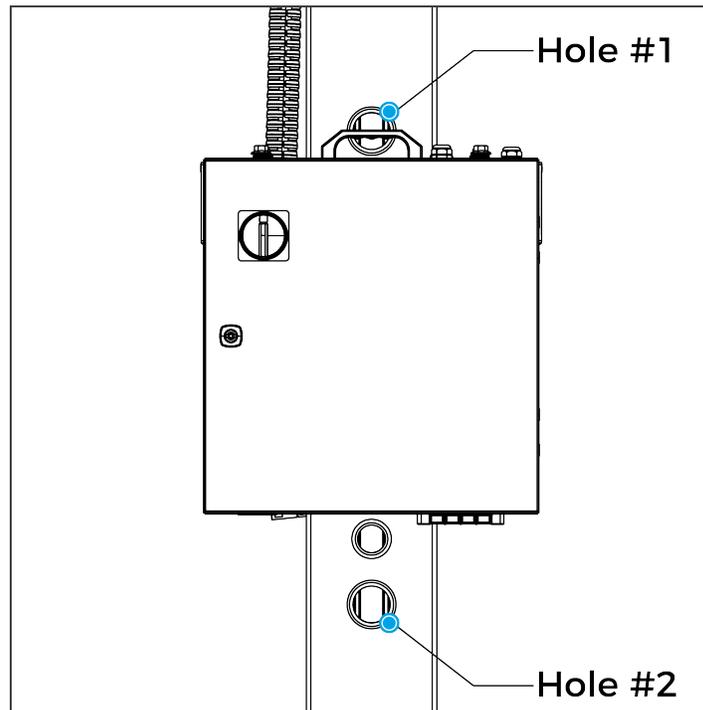


Robot installation

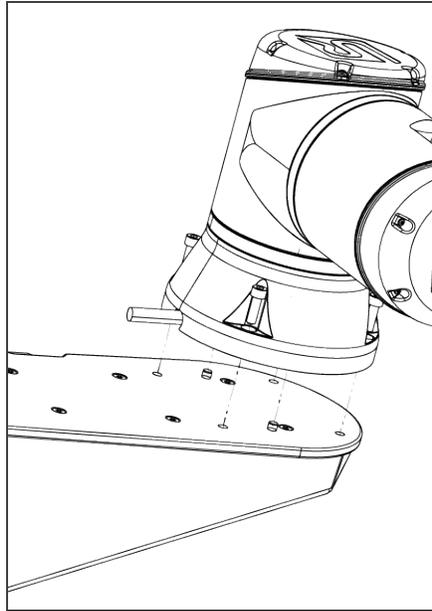
Info

UR10 or UR10e cobot are required for the installation. The cobot is not included in the Robotiq Palletizing solution.

For robot installation, few cables need to be wired. The figure below resumes the identification of the column holes.



1. Place the robot on the plate so its power cable is directed 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 screws. **Torque required: 20 Nm.**

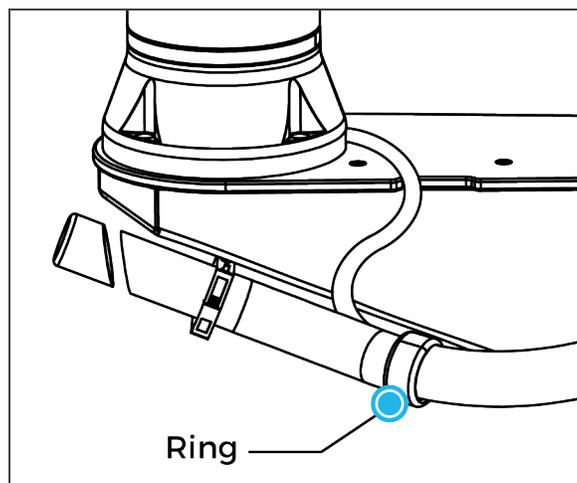


Caution

Depending on your cobot, make sure to install the right size of screw:

- For **CB-Series**: use screws M8 x 22 mm
- For **e-Series**: use screws M8 x 25 mm

2. Unclip the mounting bracket of the cable management system that is right beside the column.
3. Press the robot power cable into the tube up to the column. There are two separate raceways. You must use the same section as the coupling cable. Push the cable into the column (via the side hole) and bring it out by the hole #1.
4. Install the cable management system ring on the protector joint sticker present on the tube (near the carriage). The robot cable must emerge towards the top of the ring so it can be maintained (see the picture bellow).



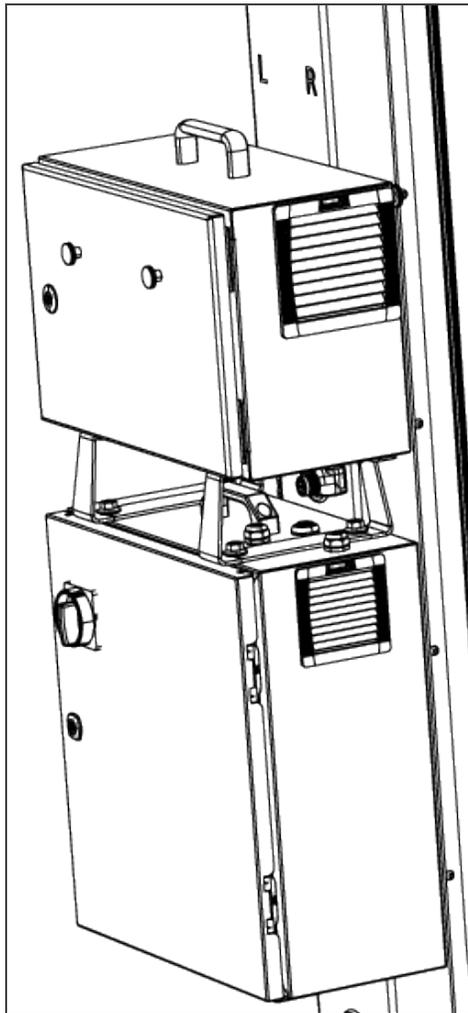
5. Install the Igus R-Lock at the extremity of the cable management system before dipping the tube in the bracket. It will ensure the good functionality of the cable management.
6. Reclip the mounting bracket of the cable management system.

Info

Refer to the cable routing system manufacturer installation instructions for more details.

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 you previously removed.

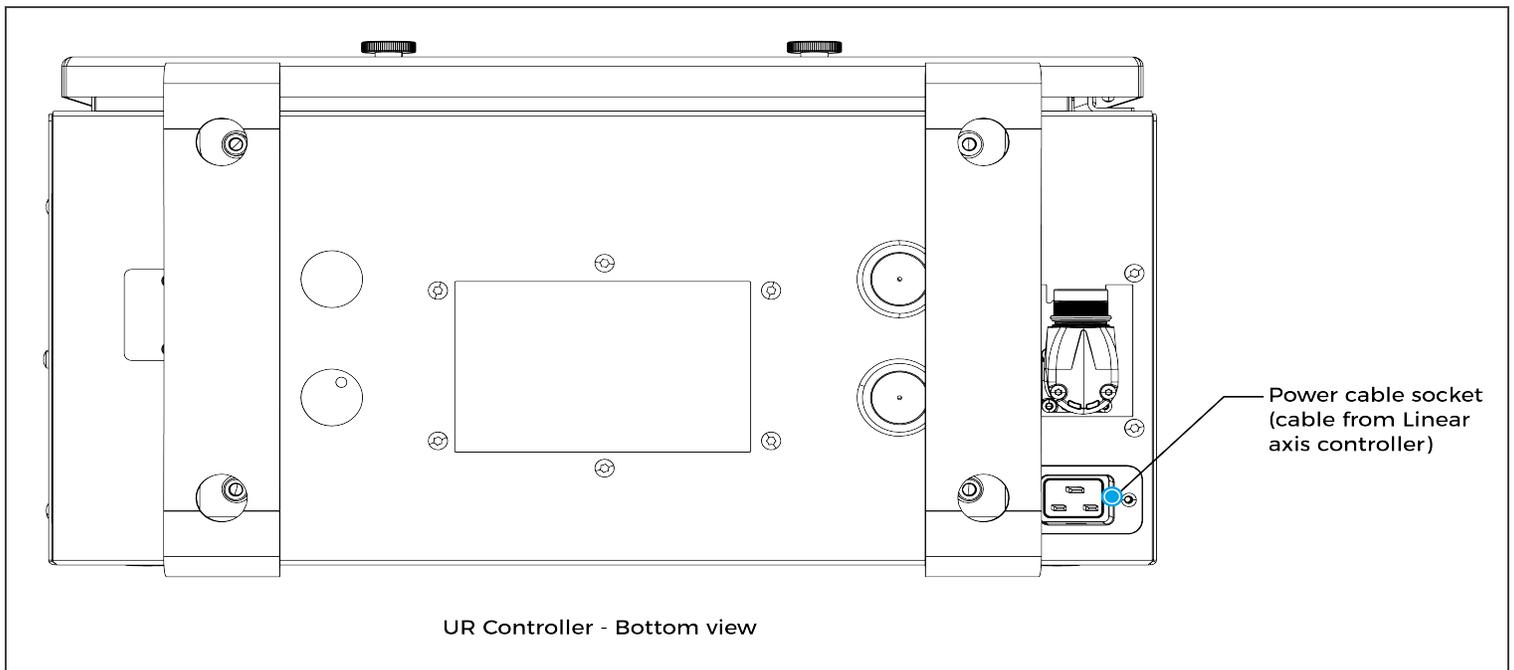
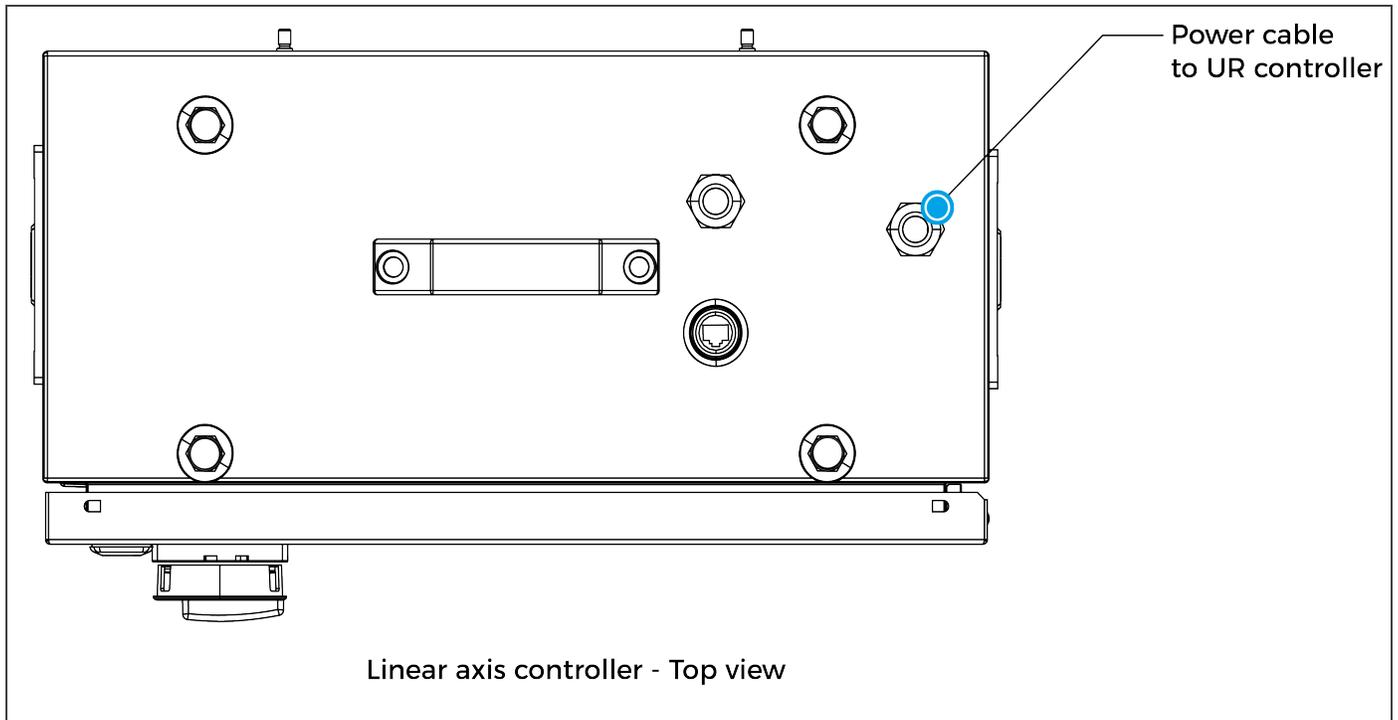
**Caution**

Do NOT plug the UR controller power cable into UR controller .



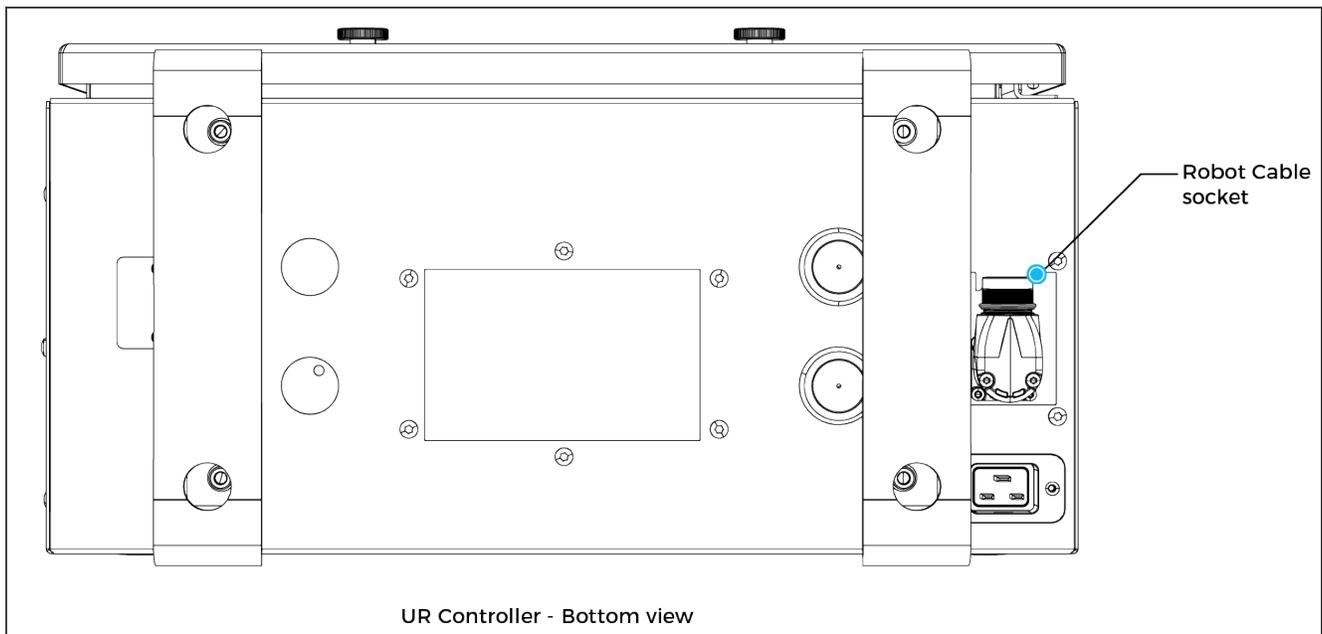
Power Cables Connections

1. Plug the power cable output of the linear axis controller into the UR controller.



2. Plug the robot power cable into the UR controller.
3. Connect the Teach Pendant to the UR controller.

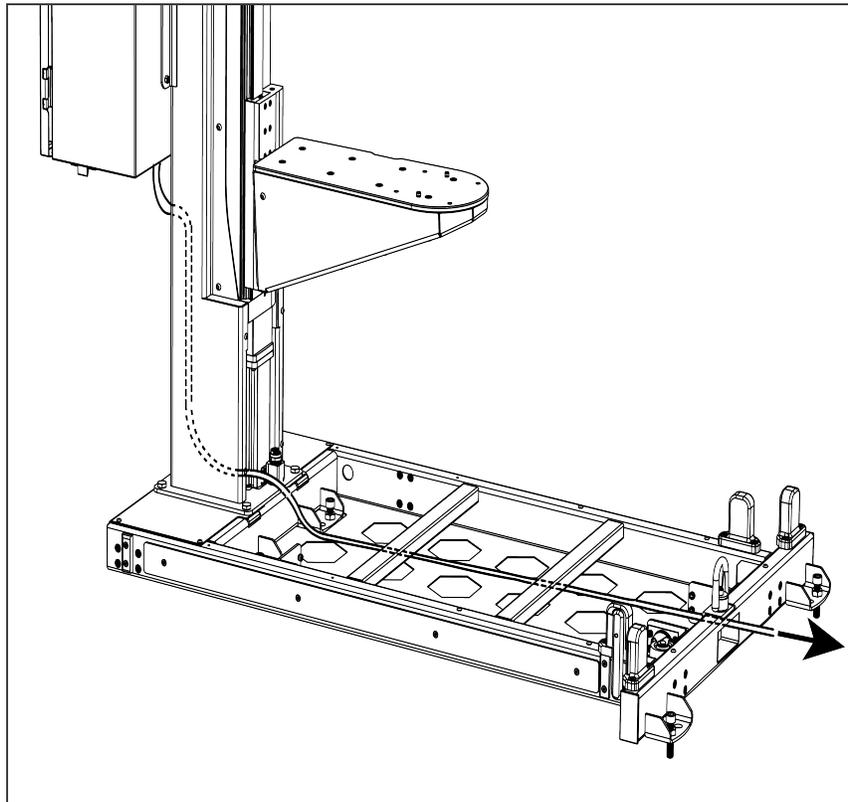




4. Plug the UR controller power cable into the linear axis controller. Pass the cable through the hole #2. Then, continue to channel the cable through the column and the base and bring it out from the other extremity of the base.

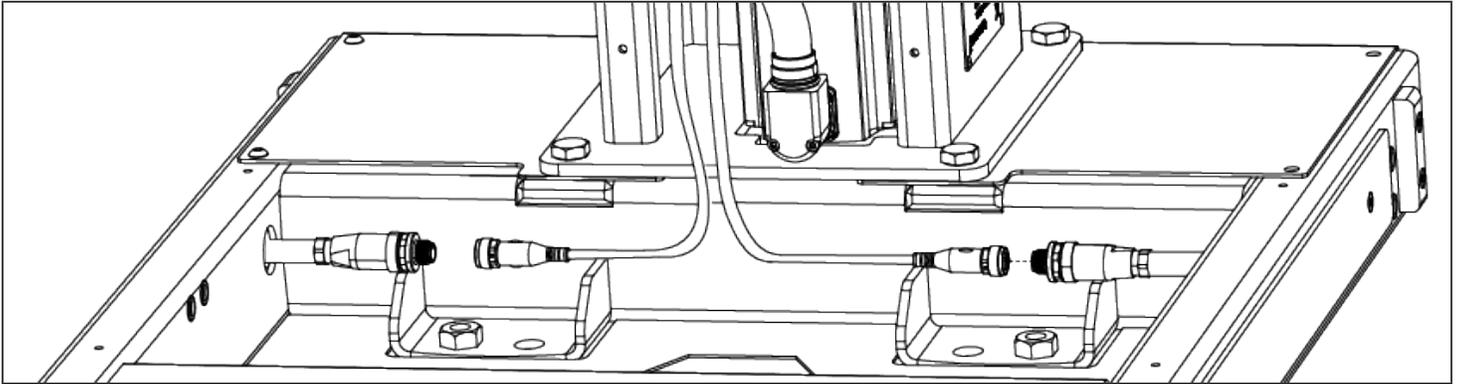
Info

The safety signals wires sticking out of the linear axis controller are inputs only. Therefore, you can power the control box safely even if they are not yet connected.



Pallet Sensors and Base Cables Routing

1. Connect the pallet sensors. The cables are identified for each side. Make sure to connect each pair of cables correctly.



2. 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 extremity of the base (through the rectangle hole).
3. Plug the power cable into the wall outlet.

Centering the Solution

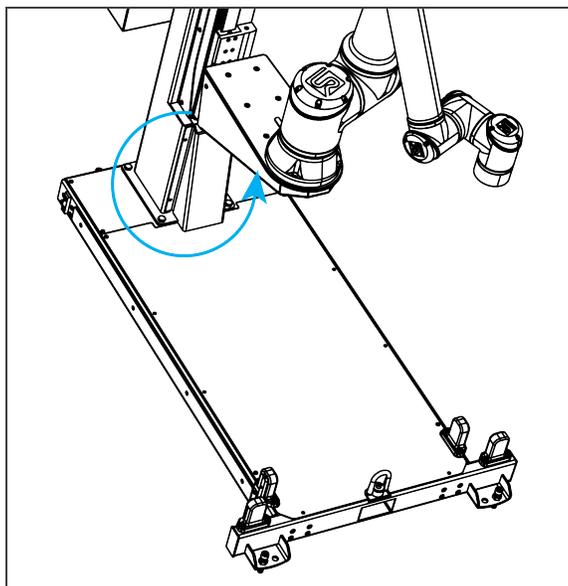
This procedure needs to be done before the AirPick Vacuum Gripper installation. It will ensure proper functioning of the solution. The goal is to properly align the column with the base by placing the robot wrist at a specific position at the same time as it touches the side of the base.

1. Unscrew half a turn the four (4) screws that secure the column onto the base.

Warning

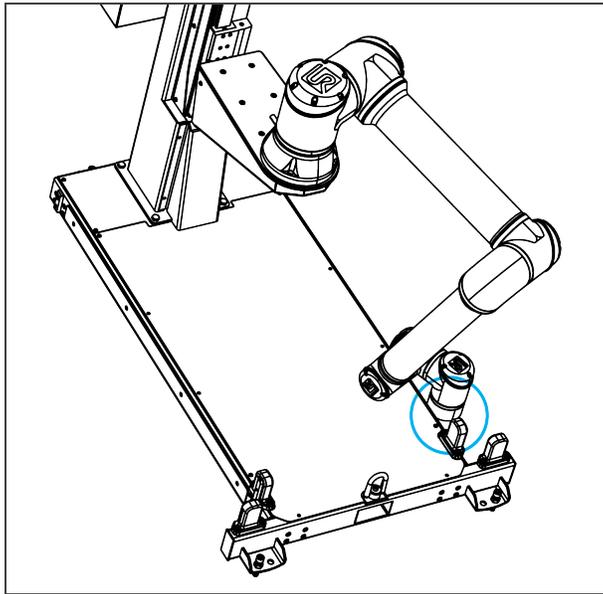
Do not unscrew completely. Unscrew only half a turn to be able to change the orientation of the column. Completely untightening the screws can cause the column to fall and cause serious injuries and material damages.

2. Turn counterclockwise the column as much as possible.



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



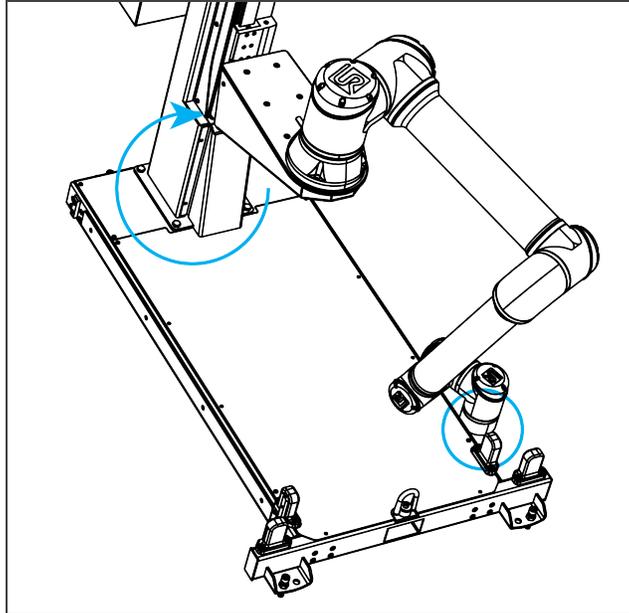


4. Move the robot so the robot tool flange is parallel to the ground: change the feature reference to Base and modify the tool position like the following: $RX=0^\circ$, $RY=180^\circ$, $RZ=0^\circ$.
5. Modify the Tool Position X value (base reference) to 333.35 mm (TCP must be 0).

Warning

Move the robot slowly and watch the movement to avoid collisions.

6. Turn 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. **Torque must be 50 Nm.**
8. On the teach pendant, validate that the X value is still 333.35 mm.
9. Put the robot back in position of use.



AirPick Vacuum Gripper Installation

To be able to mount the AirPick Gripper, its accessories, as well as the cable routing system, power on the robot and rotate the joints, as described in the table below. Then, shutdown the robot

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

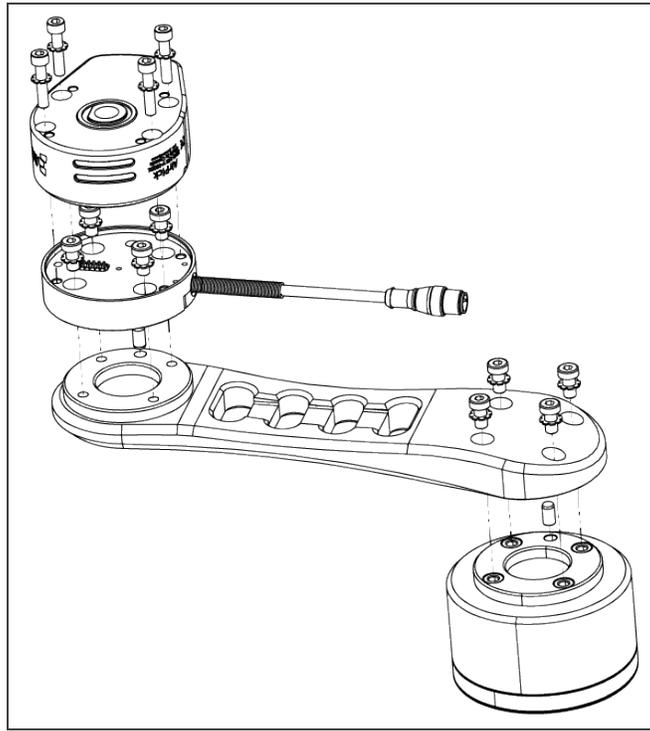
1. If additional reach is needed, install the extra reach gripper bracket on the robot tool flange using four (4) M6 screws and tooth lock washers and align properly with the dowel pin.

Info

Install the bracket only if necessary. Consult the [Configurator](#) to find out if it is needed in your case.

2. Using four (4) M6 screws and tooth lock washers, secure the coupling on the robot tool flange or on the extra reach gripper bracket .
3. Mount the Vacuum Gripper on the gripper coupling. Align with the dowel pin.
4. Secure by inserting the M5 screws and tooth lock washers.



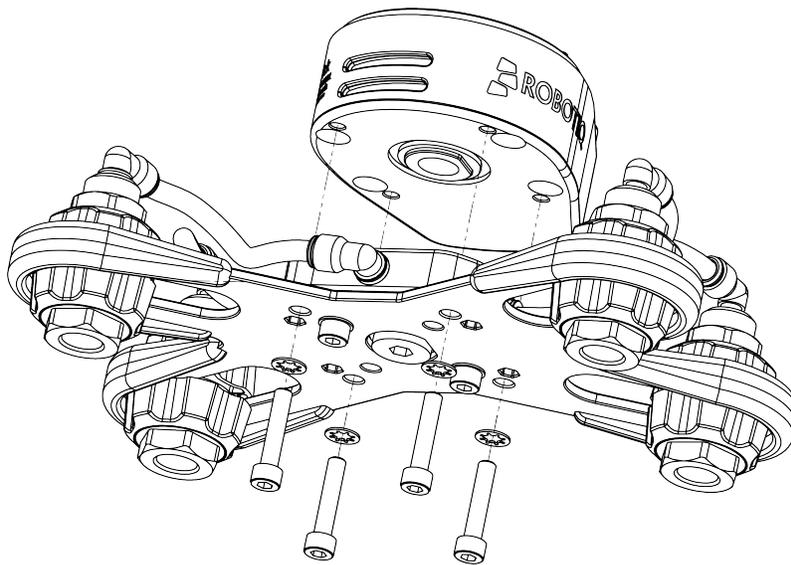


If the two or four suction cups bracket is needed:

1. Align the flat surface on the manifold with the shoulder of the vacuum generator.
2. Secure the manifold by inserting screws and tooth lock washers in a cross pattern to properly compress the O-ring of the generator.
3. Insert each suction cup, with an O-ring, into an air node. Tighten cups by hands.

Warning

Any unused manifold port should be covered with a provided port plug to avoid air leakage.

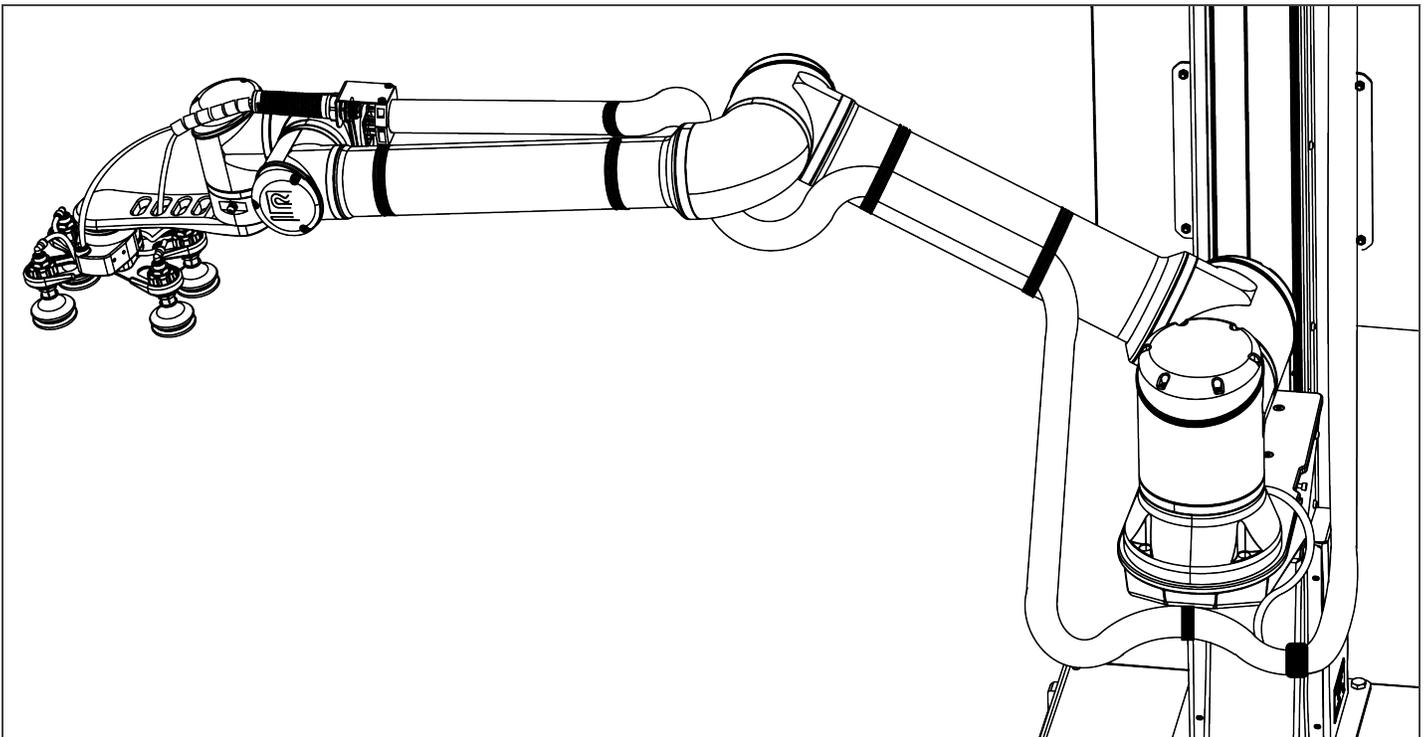


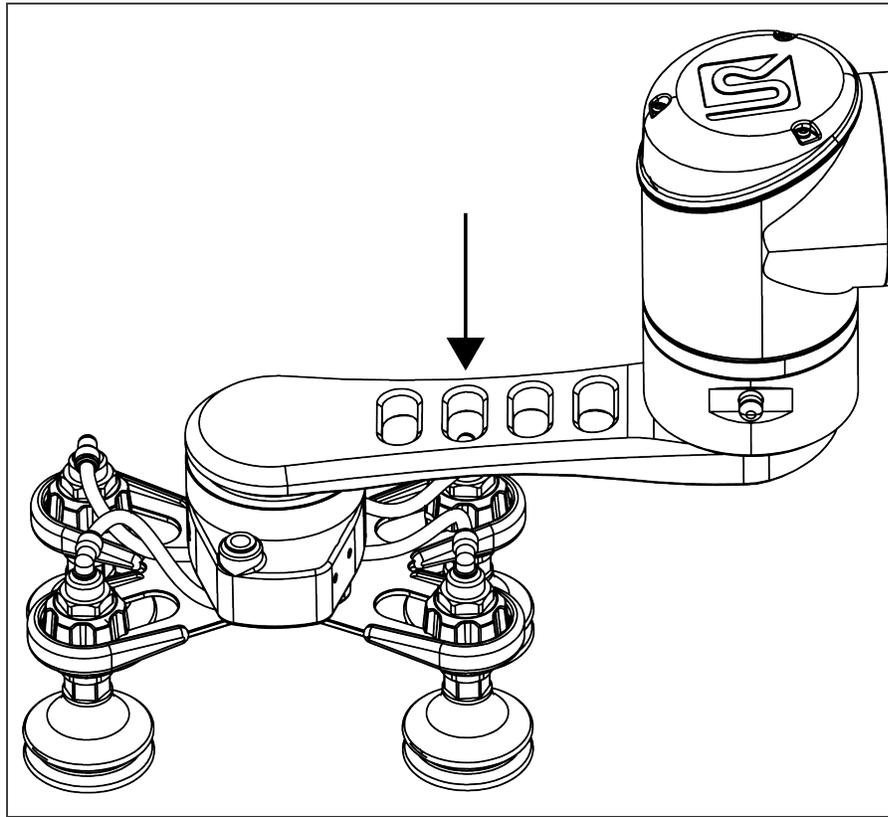
To finish the installation, change the robot position. Refer to the table below:

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

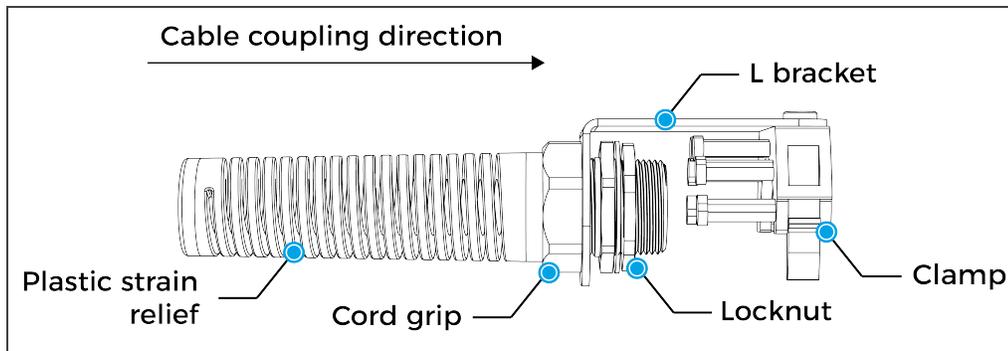
1. Attach the cable routing system onto the robot, as illustrated in the figure below:

- Install the four (4) straps and attach the tube in the three first straps **only**. The strap with a clamp (near to the wrist) has to be installed last.
- Make sure to allow extra cable length to allow all possible robot movements.





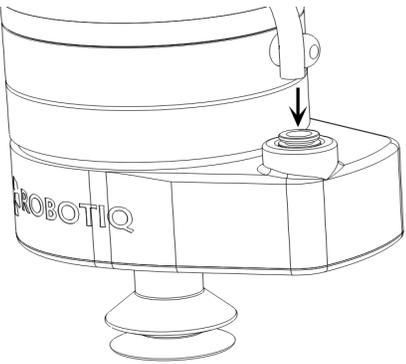
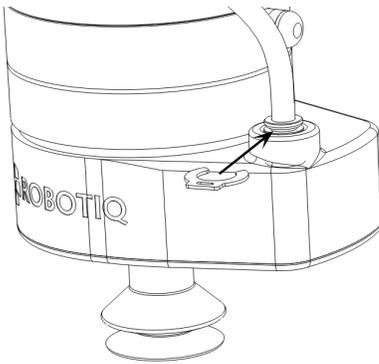
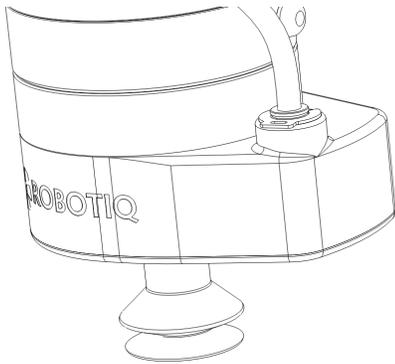
1. Run the coupling cable through the smallest part of the plastic strain relief. If you use the extra reach bracket, make sure to run the cable through the second hole of the bracket first.
2. Orderly thread the cable through the cord grip, the "L" bracket and the locknut.



3. Run the air tube in the opposite direction and tighten the assembly. Make sure to only let the coupling cable connector out.
4. Connect the coupling cable to the connector visible at the end of the cable management.
5. Install the Igus R-Lock at the extremity of the cable management system before dipping the tube in the bracket. It will ensure the good functionality of the cable management.
6. Clip the clamp on the robot and ensure that the tube is also clamped in the assembly.
7. Cut the air tube from the plastic strain relief at the right length: **815 mm (32 in)**.



8. Connect the 8 mm air tube to the vacuum generator. Follow the steps below:

Step #1	Step #2	Step #3
		
<p>Insert the air tube in the AirPick port</p>	<p>Insert the safety clip</p>	<p>Ensure the safety clip is properly installed</p>

Info

Use dry and filtered air only. Follow standard **ISO 8573-1, class 3.4.3**. We recommend using a local pressure regulator with a filter and air dryer.

9. Use the spiral cable sleeve to keep the air tube and the coupling cable together.

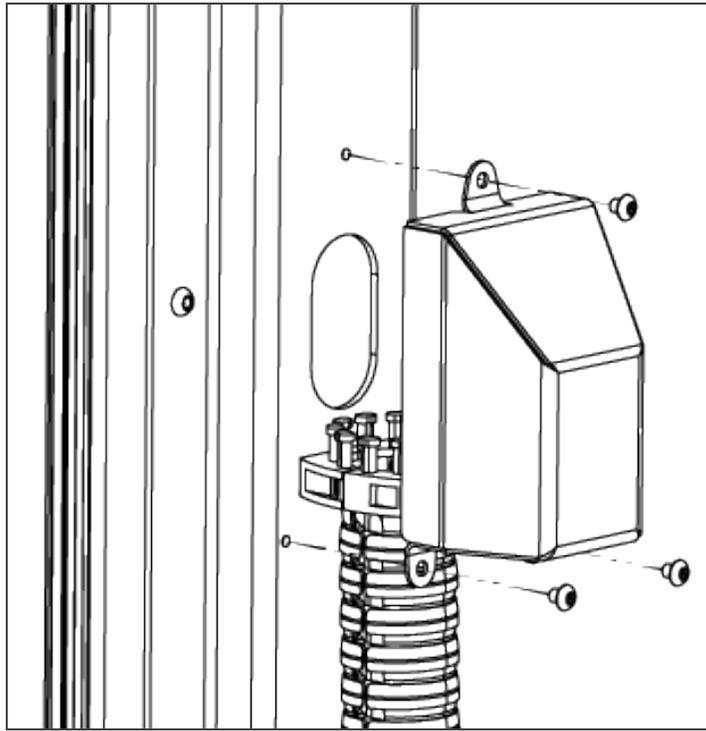
10. Plug the other extremity of the air tube to your local air supply devices.

Caution

- Maximum pressure allowed is 7 bar (recommended pressure is 6.5 bar).
- We recommend using a local pressure regulator with a filter and an air dryer.

11. Install the small cover on the side of the column with the provided screws.





12. Shutdown the robot and power off the linear axis controller.

Caution

You have to shutdown the robot BEFORE starting the inter-controller and safety signal connections.

Inter-controller connections

1. Open the UR controller. Plug the USB hub into a USB port.
2. Plug the Ethernet/USB converter cable into a USB port.
3. Plug the Ethernet cable into the Ethernet socket on the top of the linear axis controller.
4. Pass the other extremity of the cable through the hole under the UR controller and plug it into the Ethernet/USB converter cable that is already plugged.

Info

Follow cable management good practices. You can either drill a hole in the hole plug or use a grommet (not included).



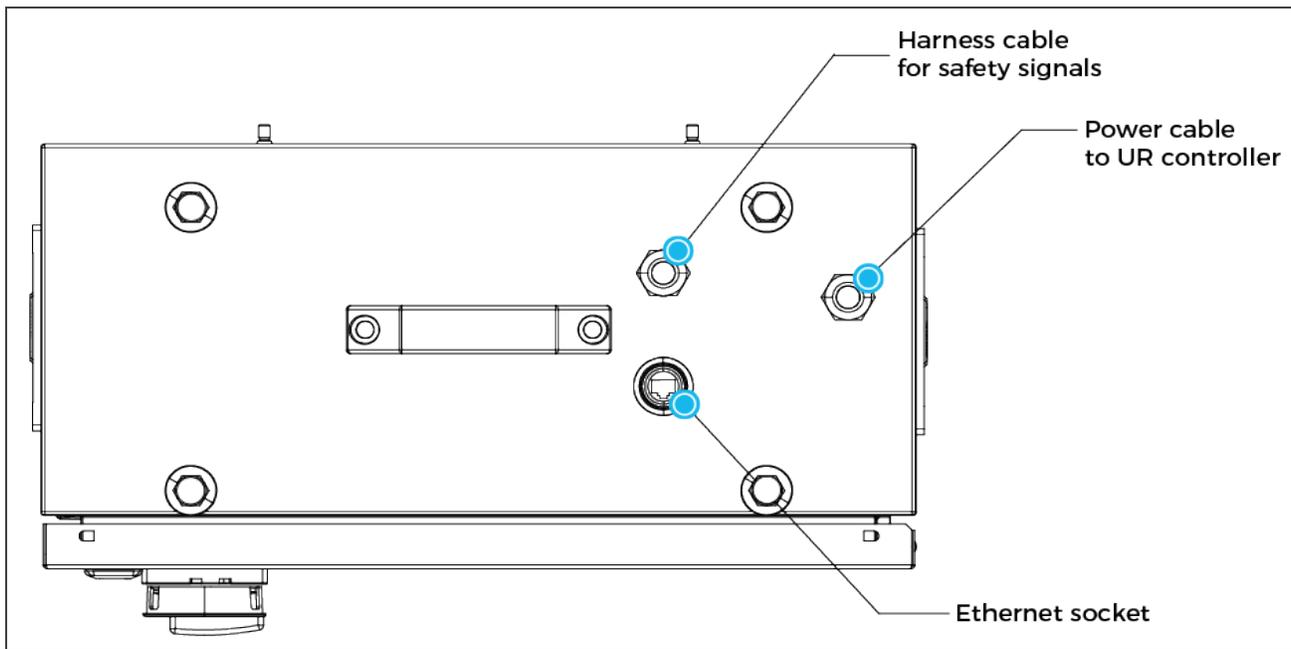


Fig. 3-1: Linear Axis Controller Cable Summary

Safety Signal Connections

1. Take the signal safety cable and pass it through an opening under the UR controller.
2. Wire the cable by following the schema and the table available in the **Appendix** section.

Caution

- Follow the installation guidelines in the UR manual for Emergency stop or Safeguard connections. Use the connector supplied by Robotiq for Safeguard connections.
- If the safeguard is not used, add jumpers between pin 1-2 and 3-4.
- Do not forget to connect the safety reset wire (white color) according to your safety setup. For more details, please refer to the table in the **Safety Connections** section.

AirPick Gripper and Copilot Connections

1. Connect the Copilot license dongle into the USB hub in the UR controller. It must be connected at all times.
2. Pass the coupling cable through the UR controller.

Info

Follow the good practices of the cable management. You can use the plate under the controller and use a grommet (not included).



- Connect the white, green and bare wires to the Robotiq RS-485 signal converter as shown in the figure below. Also connect the red (24V) and black (0V) wires in the terminal blocks of the robot controller.

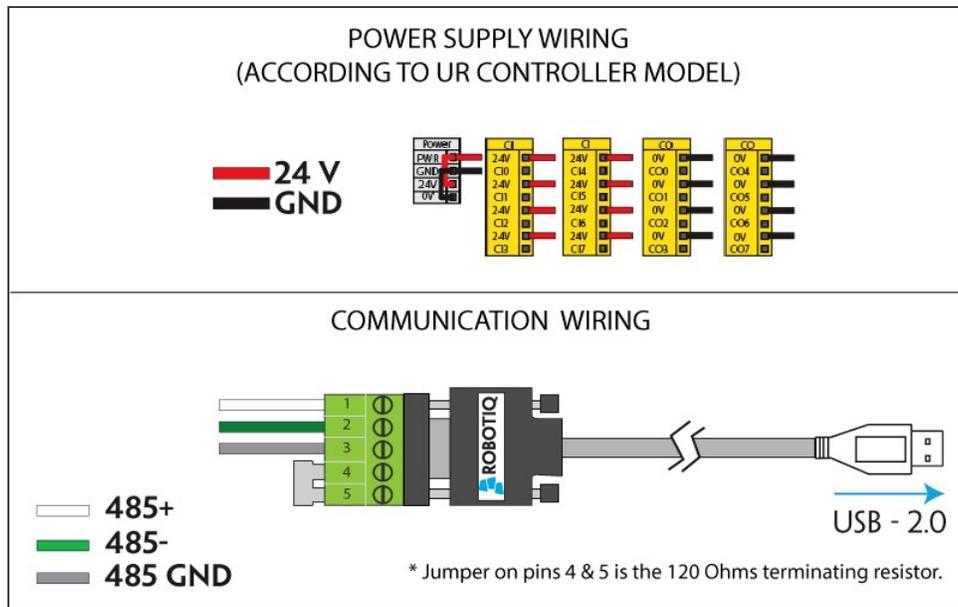


Fig. 3-2: Vacuum Gripper wiring to robot controller

- Connect the USB cable into a USB port of the robot controller.

The figure below illustrates the Vacuum Gripper pigtail connector from the coupling (GRP-CPL-062 or AGC-CPL-XXX-002), the device cable on the robot side (CBL-COM-2065-10-HF) and their associated pinout.

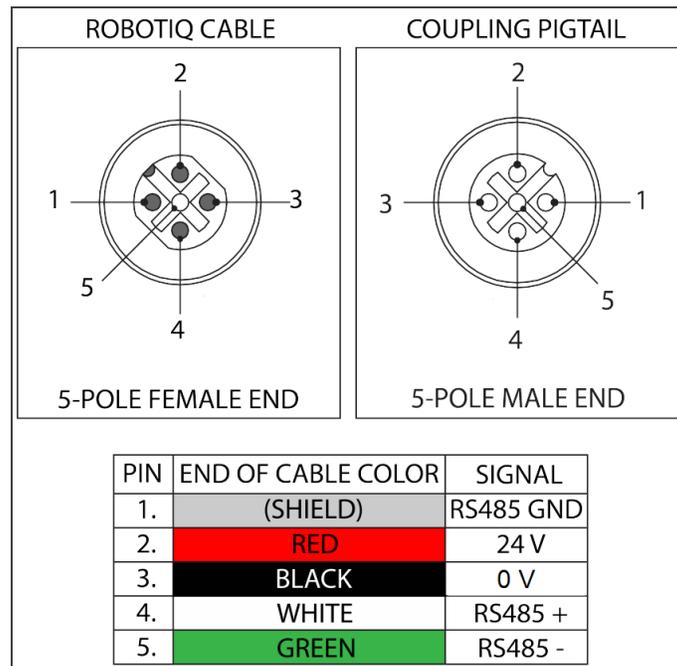


Fig. 3-3: Pinout of the Vacuum Gripper pigtail and device cable

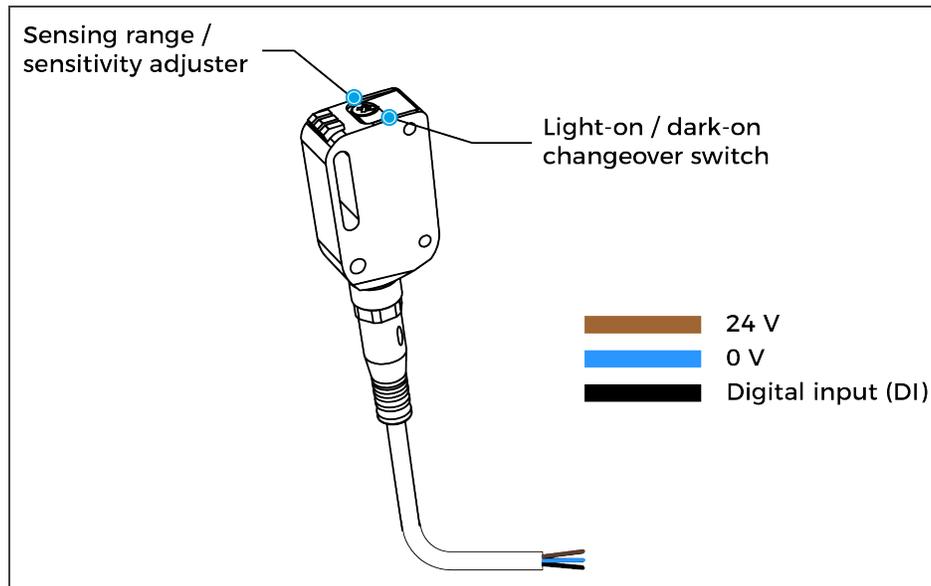
Box sensor

- Via a hole under the UR controller, run the box sensor cable in and connect the brown (24V), blue (0V) and black (digital input) wires.



Info

Follow the good practices of the cable management. You can use the plate under the controller and use a grommet (not included).

**Anchoring the Solution****Warning: Transport & Lift Hazard**

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

Warning

- The Solution must only be installed and anchored by qualified staff. If you use the anchors provided with the Solution, it should be installed in 28 MPa [4000 psi] undamaged concrete (minimum).
- If you choose to use other anchors, each anchor should be able to withstand at minimum the following forces (considering that the fasteners rated values are 25% of the ultimate value).

Warning

It is the responsibility of the end-user to ensure the final anchorage resists for:

Specifications	Metric Units	Imperial Units	Comments
Pull out strength	5200 N	1180 lbf	Ultimate value considering rated value with 4:1 safety factor: 20 800 N [4720 lbf].
Shear strength	1400 N	320 lbf	Ultimate value considering rated value with 4:1 safety factor: 5600 N [1280 lbf]



Warning

- Make sure to follow all the safety rules and regulations of your workplace while using the Robotiq Palletizing Solution.
- Always wear all recommended personal protective equipment in accordance with your workplace's safety standards, including:
 - Dust mask;
 - Safety glasses;
- Always use proper safety precautions when working with tools that contain sharp edges, pinching surfaces, or generate heat.
- Always lift heavy objects with your legs, not your back. If you can not lift an object alone, ask for help or find another method to move it.
- Use a vacuum cleaner if needed.

Caution

The Solution must be placed on a flat and leveled floor. If it is not the case, use shims to level it.

1. Position the Solution at its final position.

Caution

Make sure your layout is good and that all distances are respected. See the **Appendix** section.

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 screw.
5. Bang the anchors in place.
6. Secure the solution by screwing the six (6) nuts with a **torque of 54 Nm (40 lb ft)**.

Finalization and Power On

1. Install the box sensor on the bracket that fits your setup with the provided screws.
2. Install the sensor box bracket so it can detect the box to be picked.
3. Plug the M8 connector of the box sensor cable into the sensor.
4. Install the base cover using the provided screws (10).
5. Install the column cover using the provided screws (4).
6. Plug the power cable into the wall outlet.
7. Power on the linear axis controller and the robot.



Tip

The box sensor must be set properly. Once the system is running, adjust the detection distance with the sensitivity adjuster. To have the sensor providing a high state, when detecting a box, be sure to set it in the light-on switching mode (green light beside "L"). To do it, simply press the light-on / dark-on change-over switch for more than 1 second and less than 4 seconds.

Warning

Make sure to do a risk assessment before starting to use the Solution. For more details, please refer to the **Safety** section.

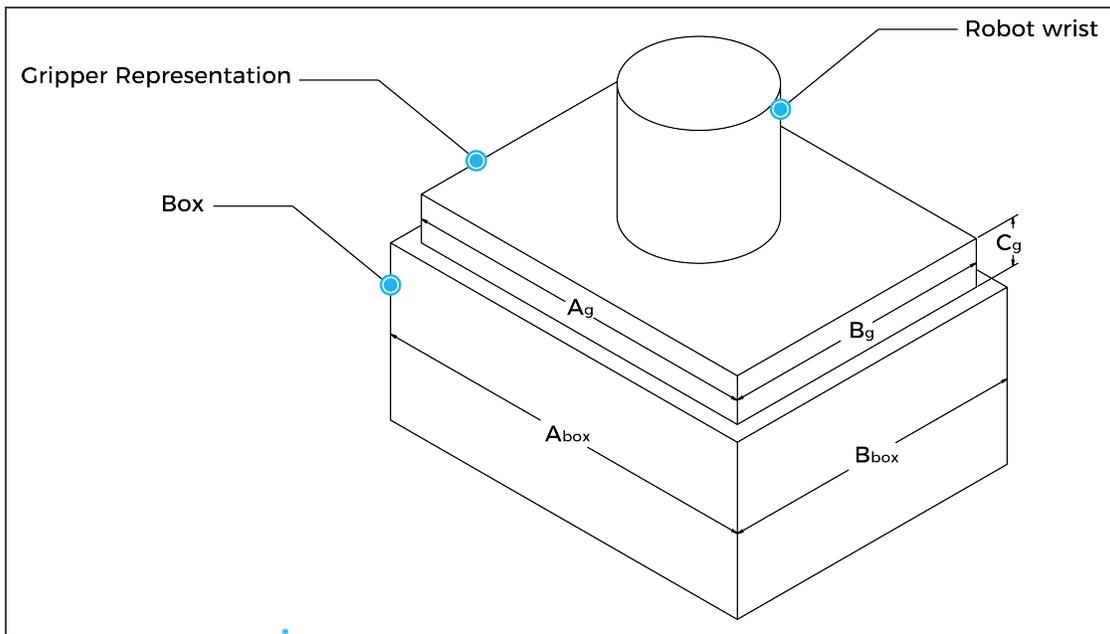
3.5. Other Grippers

It is possible to use a gripper other than the AirPick Vacuum Gripper. If another gripper is used, it is important to validate that its shape is within the gripper model used for the collision detection algorithm of the software. If your gripper does not fit the following models, it can still work, **but Robotiq does not guarantee that there will be no collision.**

The gripper model is depending on the box dimensions and is obtained according to these criteria:

Box Footprint ($A_{box} \times B_{box}$)	Gripper Footprint ($A_g \times B_g$)	Gripper Height (C_g)
$A_{box} < 105 \text{ mm}$ OR $B_{box} < 55 \text{ mm}$	$A_g = A_{box} - 1 \text{ mm}$ $B_g = B_{box} - 1 \text{ mm}$	110 mm
$A_{box} > 450 \text{ mm}$ OR $B_{box} > 350 \text{ mm}$	$A_g = A_{box} - 40 \text{ mm}$ $B_g = B_{box} - 40 \text{ mm}$	55 mm
Otherwise	$A_g = 200 \text{ mm}$ $B_g = 130 \text{ mm}$	110 mm

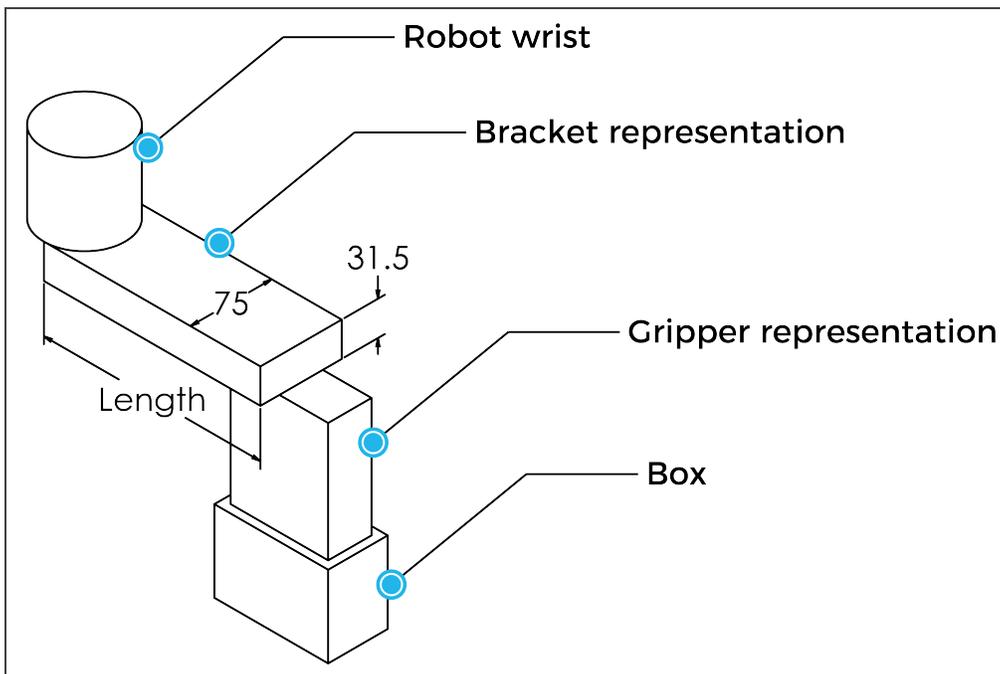




If a TCP offset is added in the X and/or Y direction, it is considered that an extra reach bracket is used. A rectangular prism is then added at the end of the bracket, according to the rules mentioned above.

Bracket representation

Height	Width	Length	Direction
31.5 mm	75 mm	Same length as TCP offset (X, Y)	Same direction as TCP offset (X, Y)



3.6. Installation for Universal Robots

The table below shows which Robotiq software to use with your Universal Robots' controller. Please refer to the URCap Package section for the installation of the UR software packages for the Palletizing Solution.

Robotiq Software	CB3.1 Controller	e-Series Controller
Robotiq Grippers URCap Package 1.5.1 and earlier versions	Incompatible	Incompatible
Robotiq Grippers URCap Package 1.6.0 and later versions	Compatible	Compatible

Table 3-2: Compatibility between Robotiq software and the robot controller

Caution

Please refer to the Installing URCap Package section to configure the Palletizing Solution properly before operating and programming the device.

3.7. URCap Package

Robotiq provides the user with a Universal Robots URCap package that provides a graphical user interface and enables direct serial communication to your UR controller.

Info

Browse to the [Palletizing Solution support page](#) to download the URCap package.

3.7.1. Installing URCap package

Make sure the Robotiq Paletizing solution is well installed. Refer to the **Mounting and Installation** section for detailed information.

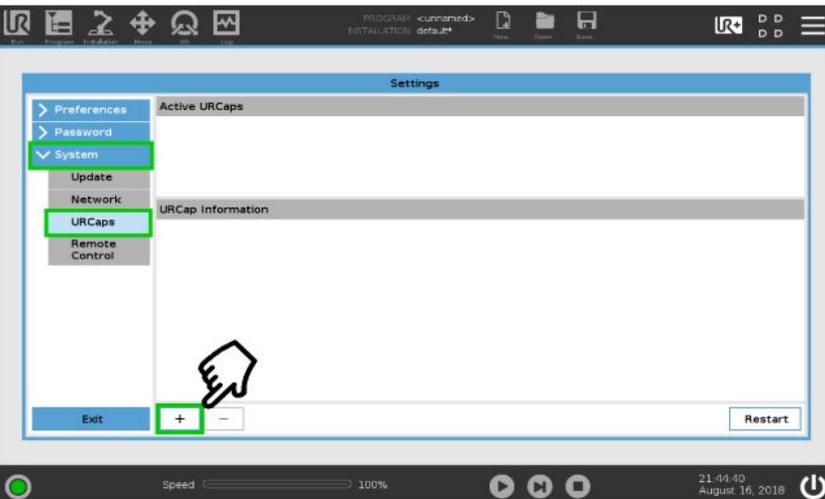
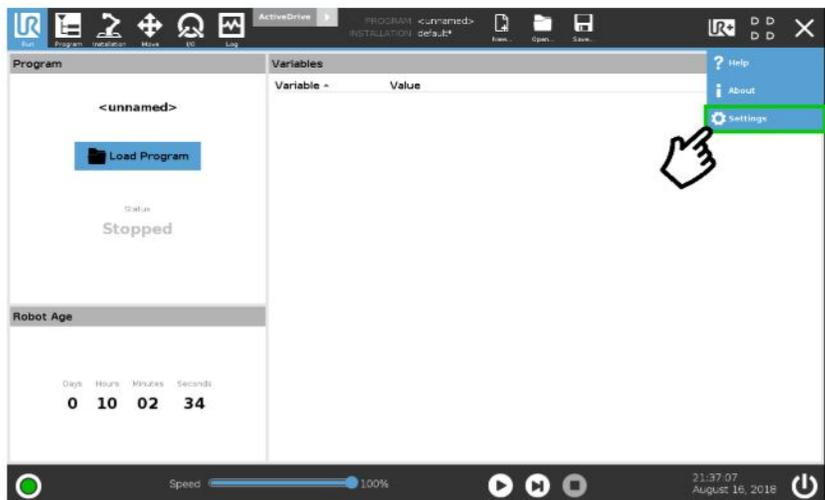
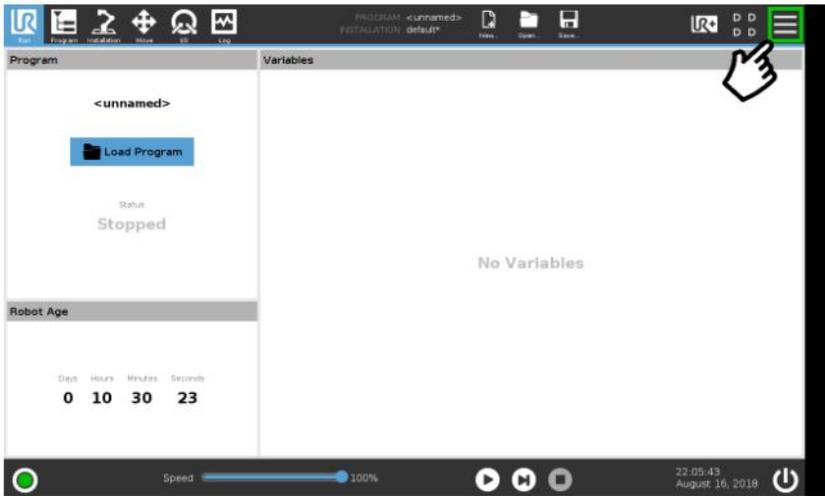
Before proceeding with the installation of the URCap package, make sure your Universal Robots controller is compatible with the package.

Tip

Tap the **triple bar icon** and select the **About** button to view the UR software version.



On e-Series robots



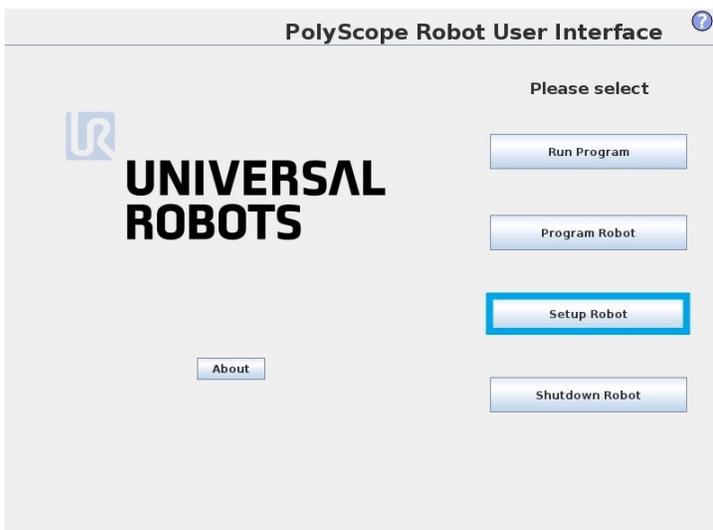
- Make sure that your PolyScope version is up-to-date and that your Universal Robots controller is compatible with the Palletizing solution URCap package.
- Go to support.robotiq.com, and select the Universal Robots brand.
- Select **Palletizing Solution**.
- Click on **Software** → **Palletizing Solution URCaps**, download the zip of URCaps and extract them on the root of a blank USB stick.
- Insert the USB stick in the UR teach pendant or controller.
- On the teach pendant, tap the **triple bar icon** in the upper right corner of the screen.
- Tap **Settings**.
- Tap the **System** button in the navigation pane on the left.
- Select either the Gripper URCap (UCG-X.X.X.) or the Copilot URCap (UCS-X.X.X.) to install a URCap on your Teach Pendant.
- Repeat the previous step and install the second URCap.
- Tap the **plus (+)** button to look for the **.urcap** files in the available drives.





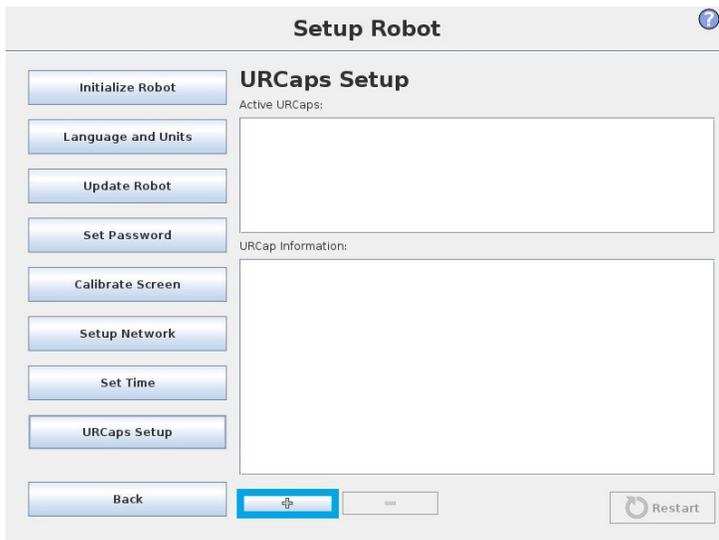
- Once the files are selected, tap the **Open** button.
- Tap the **Restart** button to complete the URCap installation. By doing so, you accept the **license agreement** detailed in the URCap information textbox.

On CB-Series robots



- Make sure that your PolyScope version is up-to-date and that your Universal Robots controller is compatible with the Palletizing URCap package.
- Go to www.support.robotiq.com, select **Browse by product**.
- Click on your **Robotiq product page** and then **Universal Robots**
- Click on **Software** → **Robotiq product URcaps** → download the zip of URcaps and extract them on the root of a blank USB stick.
- Select either the Gripper URcap (UCG-X.X.X.) or the Copilot URcap (UCS-X.X.X.) to install a URcap on your Teach Pendant.
- Repeat the previous step and install the second URcap.
- Insert the USB stick in the UR Teach pendant or controller.
- Go to Setup Robot.
- Tap URcaps Setup.

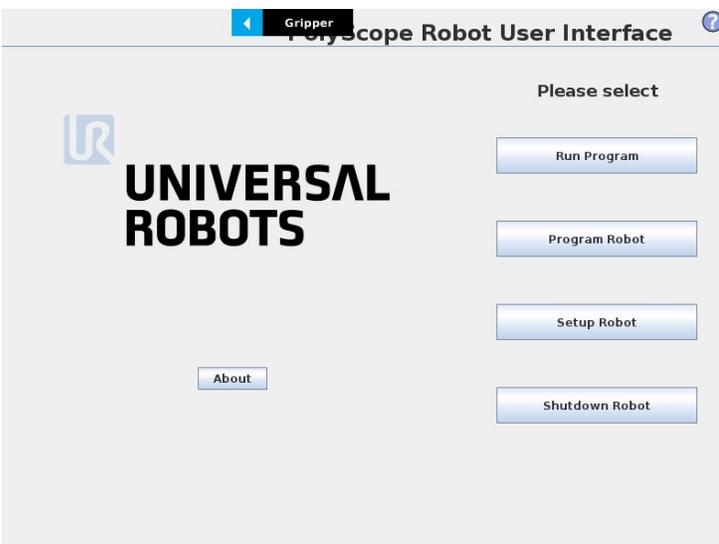




- Tap the plus (+) button to add the URCaps package.
- Open the URCaps.



- Restart PolyScope to complete the URCap installation. By doing so, you accept the License Agreement that is detailed in the URCap Information text box (see below for the License Agreement).

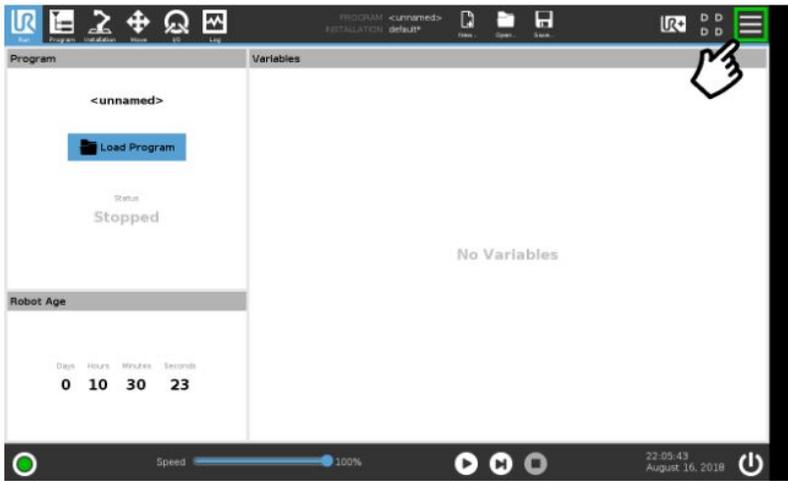


- When PolyScope reopens, the ActiveDrive toolbar will appear on the screen.

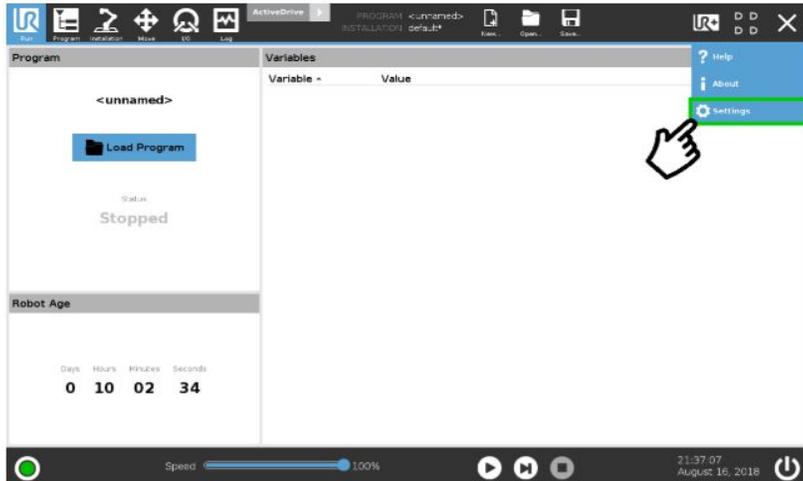


3.7.2. Uninstalling URCap Package

On e-Series robots



- On the teach pendant, tap the **triple bar icon**.



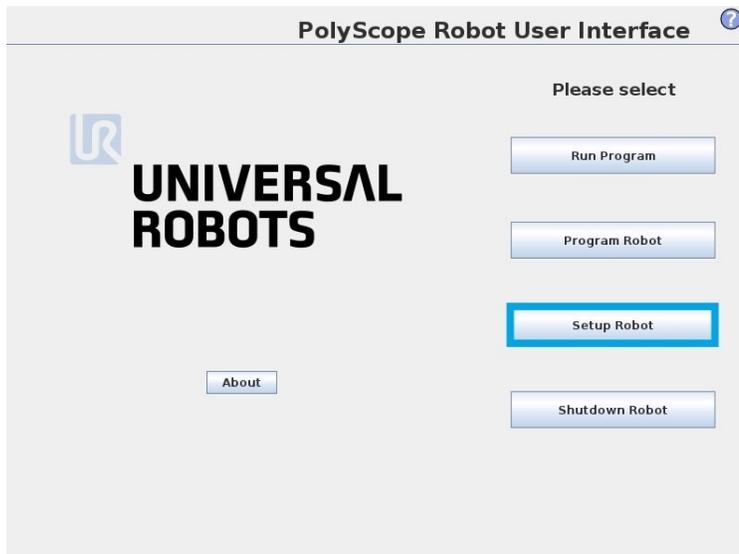
- Tap **Settings**.



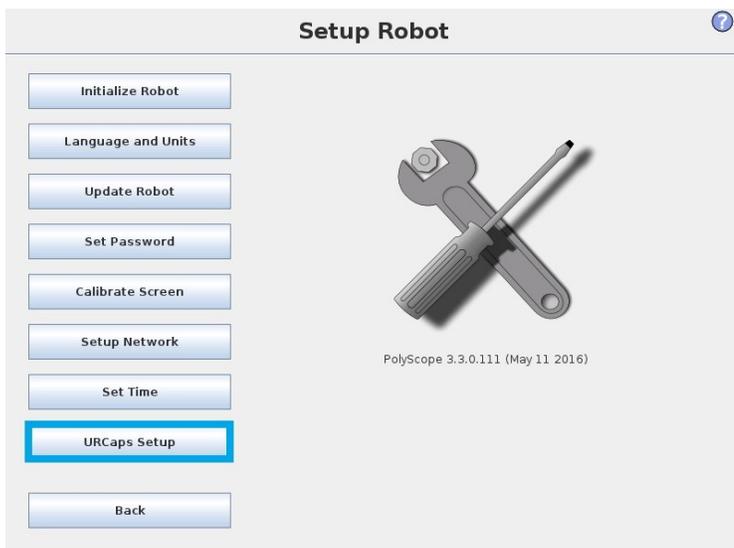
- Select **System** in the navigation pane on the left.
- Select **URCaps**.
- In the **Active URCaps** box, select the URCap to uninstall.
- Tap the **minus (-) button** to uninstall the URCap.
- Restart Polyscope to complete the un-installation process.



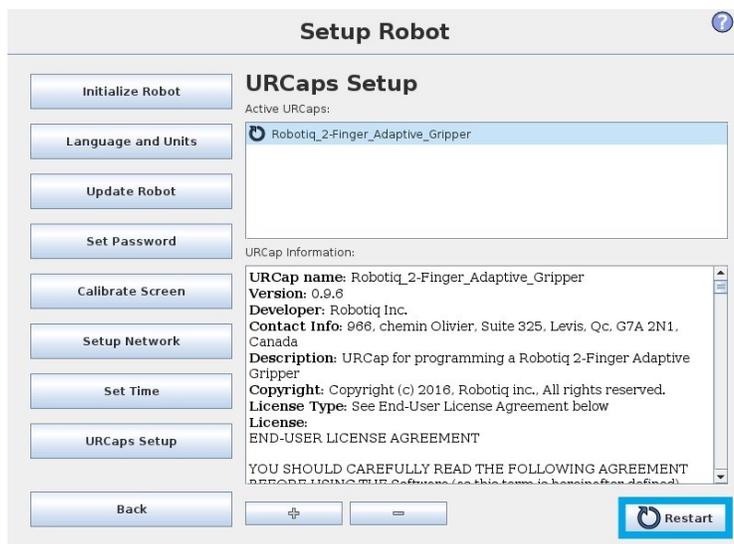
On CB-Series robots



- Go to **Setup Robot**.



- Tap **URCaps Setup**.



- In the Active URCaps box, tap the URCap to uninstall.
- Tap the **minus (-) button** to uninstall the URCap.
- Restart PolyScope to complete the uninstallation process.



3.8. License Agreement

END-USER LICENSE AGREEMENT

YOU SHOULD CAREFULLY READ THE FOLLOWING AGREEMENT BEFORE USING THE Software (as this term is hereinafter defined). Using the Software indicates your acceptance of the agreement. If you do not agree with it, you are not authorized to use the Software.

IMPORTANT-READ CAREFULLY: This End-User License Agreement (the “Agreement”) is a legal agreement between you and the Licensor (as this term is hereinafter defined), the licensor of the Software. This Agreement covers the Software. The Software includes any “on-line” or electronic documentation and all modifications and upgrades related thereto. By installing, or otherwise using the Software, you agree to be bound by the terms of this Agreement. If you do not agree to the terms of this Agreement, the Licensor cannot and does not license the Software to you. In such event, you must not use or install the Software.

1. Definition.

1. “UR” means Universal Robots A/S, a corporation incorporated under the laws of Denmark, having its registered office at Energivej 25, DK-5260 Odense S, which specializes into the conception, advanced manufacturing and sale of robotic products (the “UR’s Business”);
 2. “Software” means any of the Licensor’s softwares provided to its customers for the purposes mentioned in Sub-section 1.4 hereof including their modifications and upgrades and their related materials;
 3. “Licensor” means Robotiq inc., a corporation incorporated under the laws of Quebec, having its registered office at 500-966 chemin Olivier, Lévis, Québec, Canada, G7A 2N1, which specializes into the conception, advanced manufacturing and sale of robotic products (the “Licensor’s Business”);
 4. “End-User” means a customer authorized pursuant to this Agreement to install or use the Software in order to make a specific product from the Licensor’s Products compatible and functional with a specific product of the UR’s Product
 5. “Licensor’s Products” means those products developed by the Licensor in the course of the Licensor’s Business;
 6. “UR’s Products” means those products developed by UR in the course of the UR’s Business;
 7. “Licensor’s Authorized Representatives” means and includes the Licensor and Licensor’s authorized vendors, resellers, distributors and licensors;
 8. “Purchase Agreement” means an agreement between the End-User and the Licensor pursuant to which the End-User purchased one or more of the Licensor’s Products.
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 1. This Agreement constitutes the entire understanding and agreement between the Licensor and the End-User and replaces any prior agreement relating to the same subject matter.
 2. This Agreement shall be governed and construed in accordance with the laws of the province of Quebec and the federal laws of Canada applicable therein. Any legal action or proceeding between the Licensor and the End-User for any purpose concerning this Agreement or the parties' obligations hereunder shall be brought exclusively in a court of competent jurisdiction sitting in the judicial district of Trois-Rivières, Quebec.
 3. The Licensor's failure to insist upon or enforce strict performance of any provision of this Agreement shall not be construed as a waiver of any provision or right. Neither the course of conduct between the parties nor trade practice shall act to modify any provision of this Agreement.
 4. The Licensor may assign its rights and duties under this Agreement to any party at any time without notice to the End-User. The End-User may not assign this Agreement without the prior written consent of the Licensor.
 5. If any part of this Agreement is null, illegal or non-enforceable, this Agreement shall be interpreted as if this part was never part of this Agreement.
 6. The provisions of this Agreement are for the benefit of the Licensor and its officers, directors, employees, agents, licensors and suppliers. Each of these individuals or entities shall have the right to assert and enforce those provisions directly against the End-User on its own behalf. This Agreement is also for the benefit of, and binds, the End-User and its heirs, successors, legal representatives and permitted assigns.
 7. Any rights not expressly granted herein are reserved.
 8. The parties confirm that they have agreed that this Agreement and all related documents be drafted in English only. Les parties aux présentes confirment qu'elles ont accepté que la présente convention et tous les documents y afférents soient rédigés en anglais seulement.



4. Operation

4.1. Starting Up

After the mechanical and electrical installation, follow these steps:

1. Make sure you have installed the URCaps. Please refer to the **Installing URCap package** section
2. Configure the TCP. Use the proper values depending on if you use the extra reach bracket or not.
3. Open the Gripper Toolbar (top right of your screen). To make sure that the Toolbar is always displayed, tap **Installation** → **URCaps** → **Vacuum** and tick the "**Show Vacuum Toolbar**" checkbox.
4. Select the digital input for box sensors.
5. Test the box sensor and the digital input : Tap **Installation** → **I/O Setup** and place an object in front of the box sensor to test to validate if the signal changes.
6. Test the Vacuum Gripper: Tap **Installation** → **URCaps** → **Vacuum** → **Scan**. Then, test the grip and release functions of the Vacuum in the Gripper Toolbar.
7. Activate and test the linear axis: Tap **Installation** → **URCaps** → **Copilot** → **Linear Axis** → **Scan**. Then, with the Copilot Toolbar, test the linear axis by moving it.
8. Configure the Safeguard I/O and Safeguard reset.

4.2. Lights States

Light States Legend

- **Blink fast:** 2 Hz (0.25s ON, 0.25s OFF)
- **Blink slow:** 0.5 Hz (1s ON, 1s OFF)



Light Dependency	Light	Condition	Action needed (Troubleshooting for e-Series)
Both same	Red blink fast	Linear axis controller (PLC) is unable to communicate with the Robot controller (UR).	<ul style="list-style-type: none"> • Robot has started and needs time to boot up (poly-scope is not loaded yet) • Verify that your USB-Ethernet adapter is properly connected: LED on the ethernet adapter should be lighted up. • Verify that your Ethernet cable between the PLC and robot controller is properly connected (on the USB adapter) . • Try to tap the Scan button in the installation tab. • Try powering off the system (robot and the linear axis controller). Wait 1 minute. Power up the system again.
Both same	Red blink slow	Communication between the robot and the linear axis controller (PLC) is established, but Copilot has not established the communication yet with the linear axis controller.	<ul style="list-style-type: none"> • Tap Installation → URCaps→ Copilot → Linear Axis and click on Scan button.
Both same	Solid red	An axis error happened.	<ul style="list-style-type: none"> • Tap Installation → URCaps→ Copilot → Linear Axis. Then, check the error message and act accordingly.
Both same	Solid red	When the protective or emergency stop on the robot is activated.	<ul style="list-style-type: none"> • Recover from those situations on the robot.
Both same	Solid Yellow	When the Scan has succeeded, but the axis brakes aren't released (Start not done yet)	<ul style="list-style-type: none"> • Tap Installation → URCaps→ Copilot → Linear Axis and click on Start button. You may need to press the safeguard reset button (if you have one in your specific safety setup).
Both same	Yellow Blink slow	Safeguard Stop is active	<ul style="list-style-type: none"> • Put the system out of Safeguard stop with the safeguard reset button.
Left and/or Right	Solid Blue	When: <ul style="list-style-type: none"> • The pallet is completed or missing ; <p style="text-align: center;">AND</p> <ul style="list-style-type: none"> • The system is palletizing on the other side. 	<ul style="list-style-type: none"> • Place a new pallet



<p>Left and/or Right</p>	<p>Blue Blink fast</p>	<p>When:</p> <ul style="list-style-type: none"> • The pallet is completed and the system is idle or; • The pallet is not detected and the system is idle. 	<ul style="list-style-type: none"> • Place a new pallet
<p>Left and/or Right</p>	<p>Solid White</p>	<p>When:</p> <ul style="list-style-type: none"> • The linear axis is activated and brake is released; • A program is running without Palletizer node. 	<p>N/A</p>
<p>Left and/or Right</p>	<p>Solid Green</p>	<p>When:</p> <ul style="list-style-type: none"> • A program with Palletizer node is running but the pallet present is not completed. 	<p>N/A</p>



5. Software

5.1 Installation on Universal Robots e-Series

- 1 Connect your License Dongle into the USB hub in the UR controller. Make sure your Copilot license is activated:
 - a Tap **Installation** tab > **URCaps** > **Copilot**.
 - b On the **Dashboard** tab the Copilot License activation will appear.

Caution

The License Dongle should not be disconnected at any time, otherwise, all your program can be lost.

Copilot

Dashboard
Configuration
Tool
Linear Axis
About



Copilot Licensed

Sensor

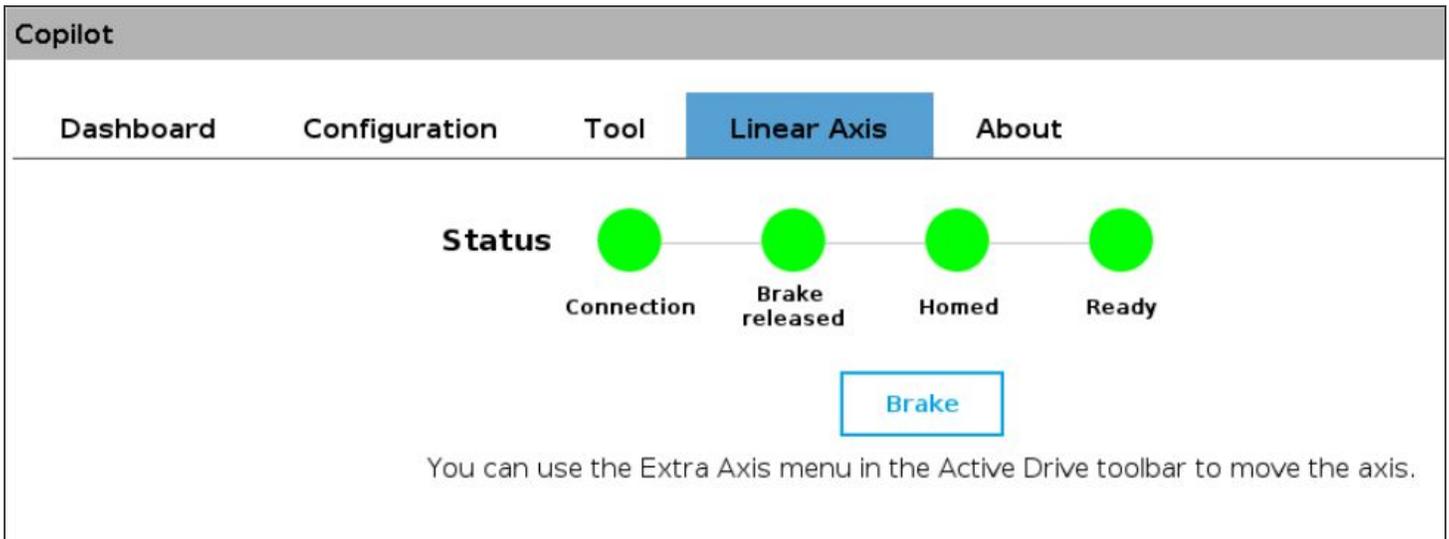
Force Values		Moment Values	
Fx =	6.3 N	Mx =	-0.10 Nm
Fy =	-3.2 N	My =	-0.25 Nm
Fz =	7.7 N	Mz =	-0.04 Nm

Zero sensor

Show ActiveDrive Toolbar

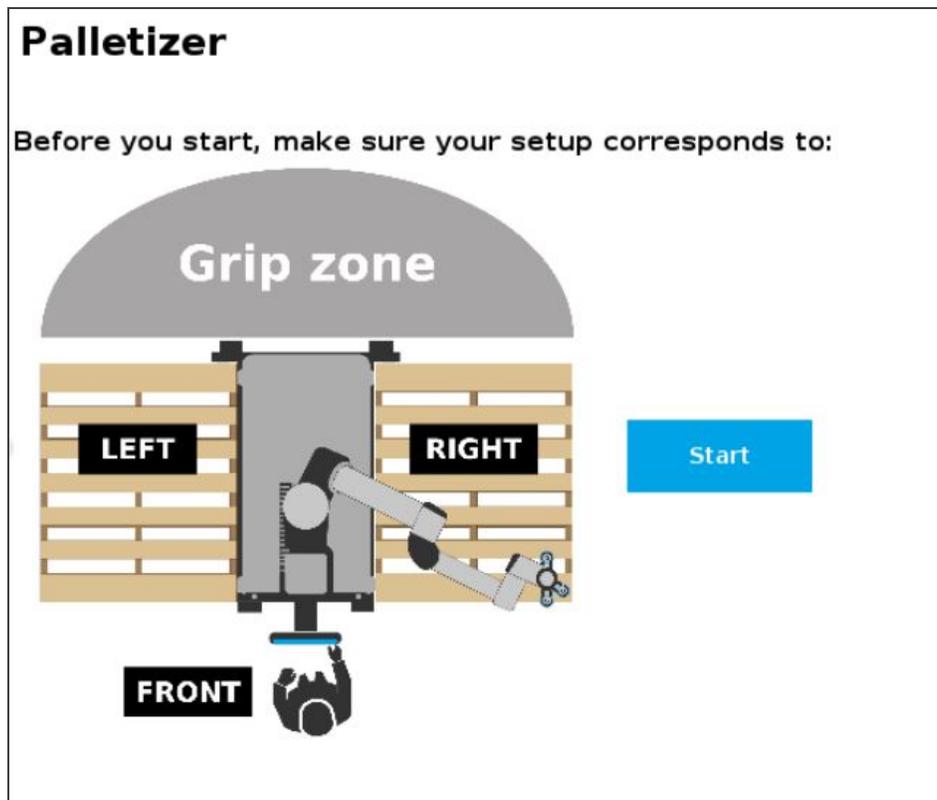


- 2 In the **Linear Axis** tab, click on **Scan** and make sure your linear axis is ready.



5.11 Palletizer node

- 1 Before you start programming your features, make sure that your Robotiq Palletizing Solution is set this way:



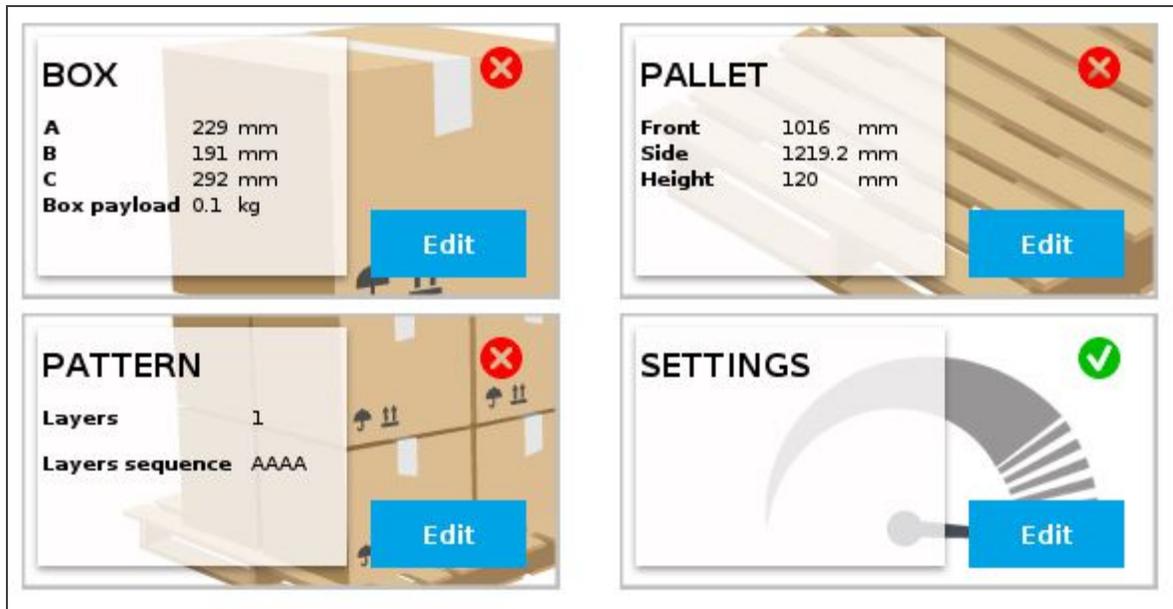
- 2 On the Teach Pendant, tap the **Program** button.
- 3 Select **URCaps** in the navigation pane on the left.
- 4 Tap the **Palletizer** button.



Info

You will have to configure **four (4) parameters** to program your Palletizing Solution.

5 To begin, click on **BOX** to set your box dimensions.



6 In the **Box dimensions** parameter, you have to set the box's:

- Width (A)
- Depth (B)
- Height (C)
- Payload



Palletizer

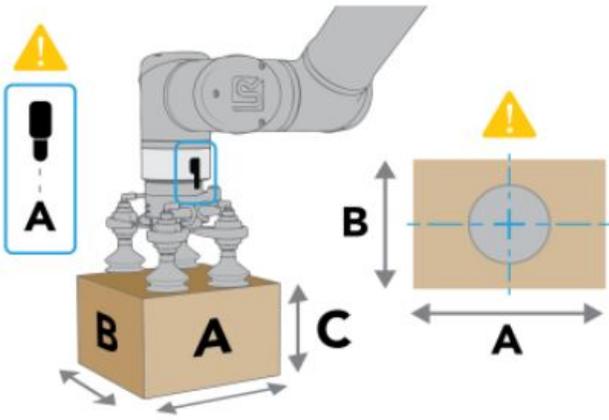
Box dimensions

A mm

B mm

C mm

Box payload kg



Box position

How to set up grip position 

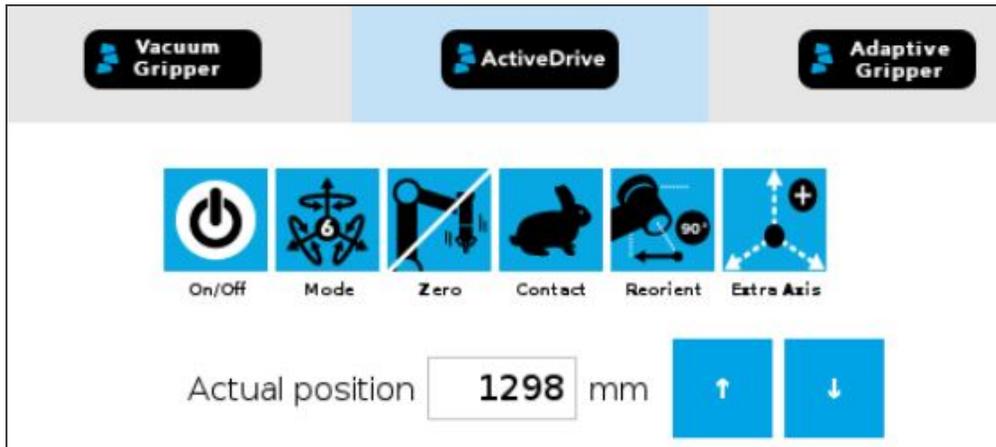
[Set Grip Position](#)

[Move Here \(Robot\)](#) [Move Here \(Linear Axis\)](#)

7 By clicking on the **Set Grip position** button, you will have access to determine the coordinates in **X, Y and Z** of your robot, in which the grip position will be:

- Position the robot tool flange connector on side A (same side as the robot wrist), as shown in the picture above.
- Make sure to align the TCP with the center of the box.
- Once you are done, click on **Ok**

You can also move the linear axis and to do so : click on **Active Drive** → **Extra Axis**.



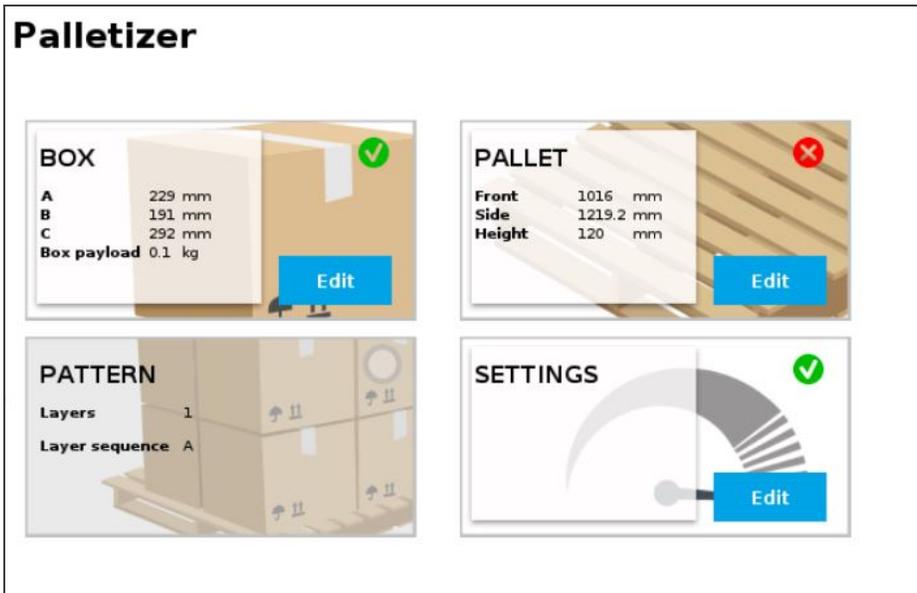
Vacuum Gripper ActiveDrive Adaptive Gripper

On/Off Mode Zero Contact Reorient Extra Axis

Actual position mm  

8 The **BOX** parameter is now completed. Click on **PALLET** to continue the configuration.





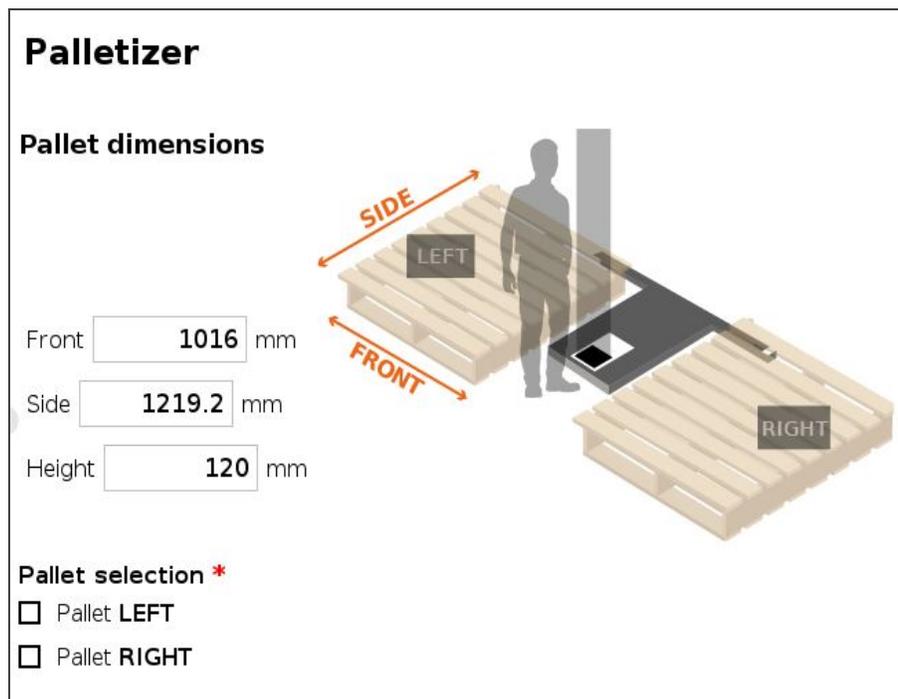
9 For the **Pallet dimensions** parameter you will have to:

a Select the desired pallet:

- Right or left
- Both pallets

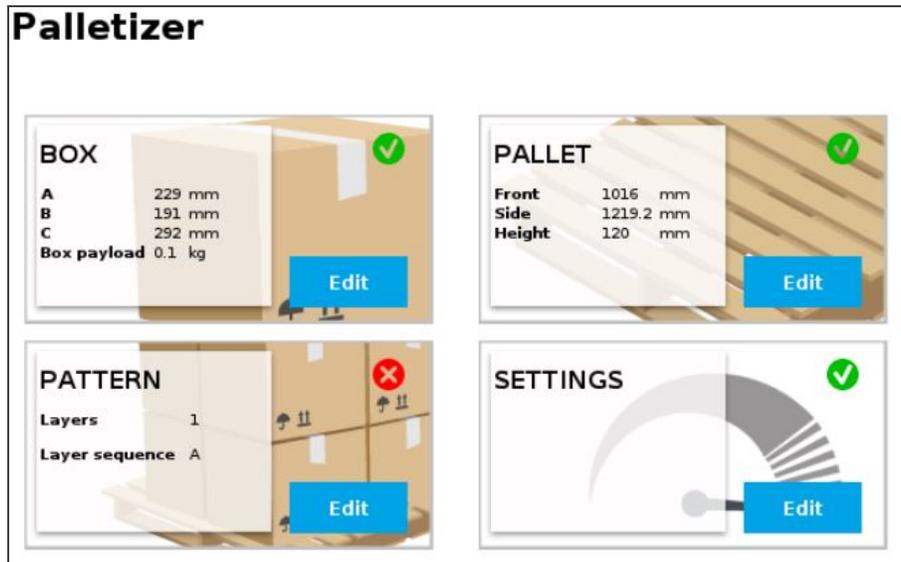
b Determine the dimensions of the:

- Front
- Side
- Height



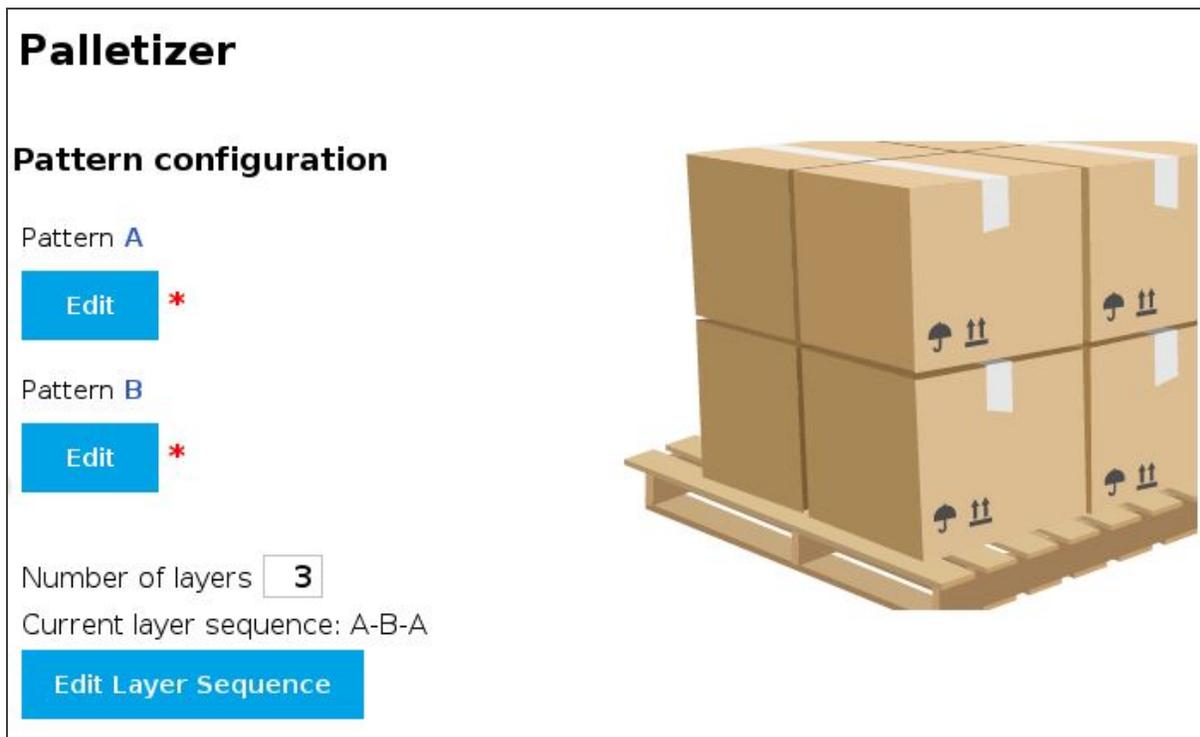
10 The **PALLET** and **BOX** parameters are now completed. Click on **PATTERN** to continue the configuration.



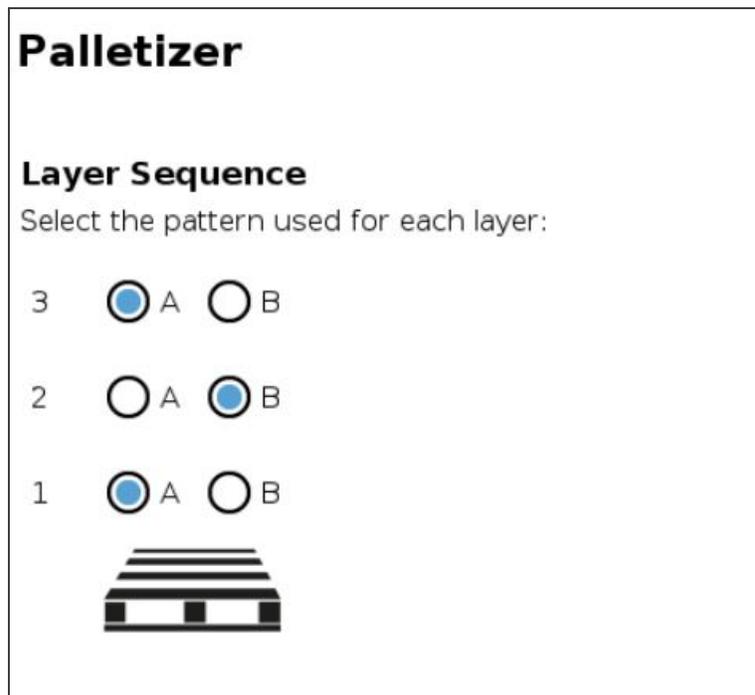


11 The **PATTERN** parameter allows you to set the number and sequence of your layer's boxes.

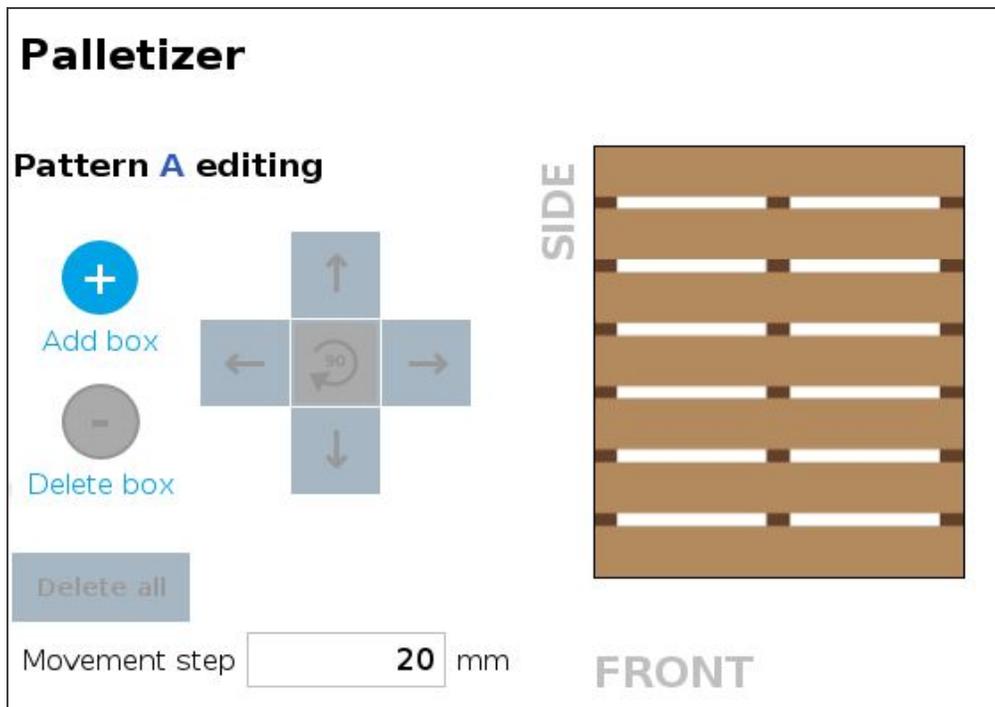
- You can create and use a maximum of two patterns: the **Pattern A** and the **Pattern B**. Make sure to select the desired ones.
- Click on **Edit** to configure your pattern.
- Enter the number of layers needed.



- 12 Your current layer sequence is represented. Click on **Edit Layer Sequence** to modify it.



- 13 Configure the pattern you chose (A, B or both):
- Click on the **+** button to add boxes.
 - Use the arrows to move and position the boxes on the pallet, as desired.



- 14 Three of your parameters are now set. Complete your configuration by clicking on the **SETTINGS** button.

- 15 For this configuration, set the tool speeds and accelerations, with the box or without the box.



Info

The term "**Tool**" refer to the Gripper.

- The checkbox "**Validate pallet state at program startup**" is checked by default. . If you unselect it, then the system will consider that the pallets are empty.

Palletizer

Settings

	Tool speed	Tool acceleration
With box	<input type="text" value="250"/> mm/s	<input type="text" value="5000"/> mm/s ²
Without box	<input type="text" value="250"/> mm/s	<input type="text" value="5000"/> mm/s ²

Box presence input ▼

Box and pallet display units Metric Imperial

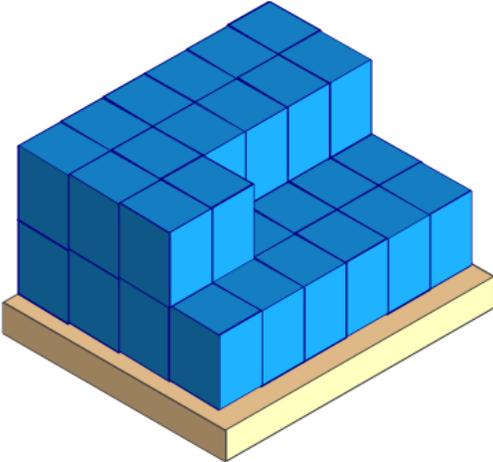
Validate pallet state at program startup

- 16** If you start a program where the checkbox is filled by default, you can have either one the these pop-up information, depending of your pallet number.

Confirm current pallet state - LEFT

+
Add box

-
Delete box

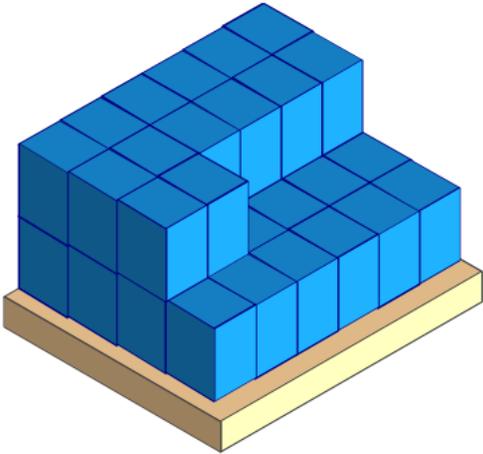


Next step :
Box #39 of 120



Confirm current pallet state - LEFT

 Add box
 Delete box



Next step :
Box #39 of 120

Confirm other pallet state - RIGHT

Empty or absent
 Complete

17 All your Palletizer parameters have been configured. You are now ready to start your Solution.

Palletizer

BOX 

A	229 mm
B	191 mm
C	292 mm
Box payload	0.1 kg

PALLET 

Front	1016 mm
Side	1219.2 mm
Height	120 mm

PATTERN 

Layers	3
Layer sequence	ABA

SETTINGS 



5.12. Linear Axis Move node

- The **Linear axis move** node can be used to move the linear axis to a specific position. It can be used inside or outside the Palletizer node.

Position

Current position --- mm

Move (fixed position) mm Move Here

Motion

Speed mm/s

Acceleration mm/s²

Wait for motion completed

5.2. Vacuum Gripper behavior

Workpiece gripping /releasing is performed by changing the values of the gripper input registers. While the control is very simple, some behaviors deserve a better explanation. The Vacuum Gripper can work in two different mode: the **Automatic** and **Advanced** modes. For more details, please refer to the AirPick Vacuum Gripper instructions manual.

5.3. AirPick Vacuum control over Universal Robots with URCaps

Info

Please refer to the AirPick Vacuum Gripper instructions manual to have all the information about the URCap.



6. Specifications

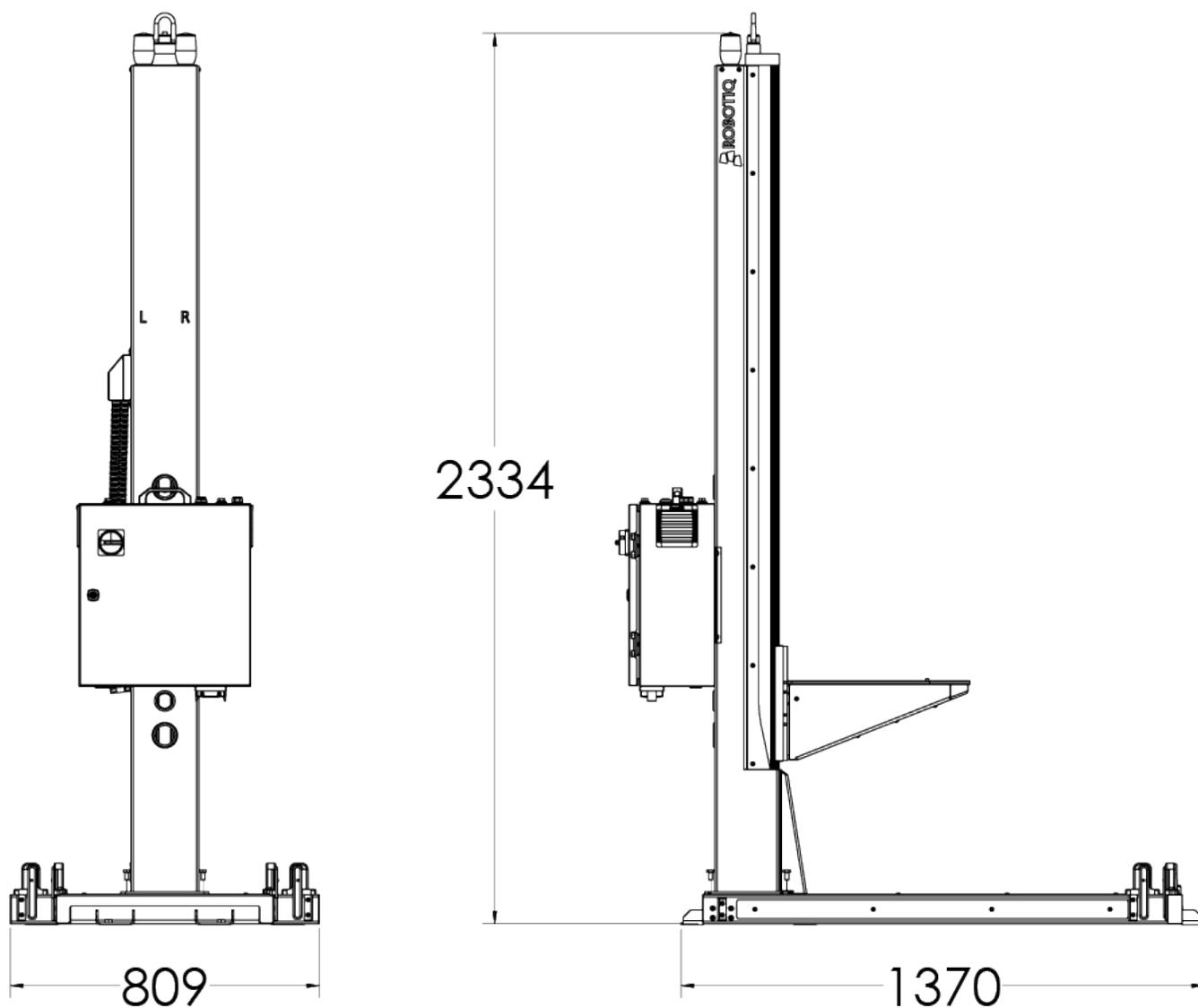
Caution

This manual uses the metric system, unless specified, **all dimensions are in millimeters.**

The following subsections provide data on the various specifications for the Robotiq Palletizing Solution.

6.1 Technical dimensions

6.1.1 Linear Axis Base with Controller



6.12. AirPick Vacuum Gripper

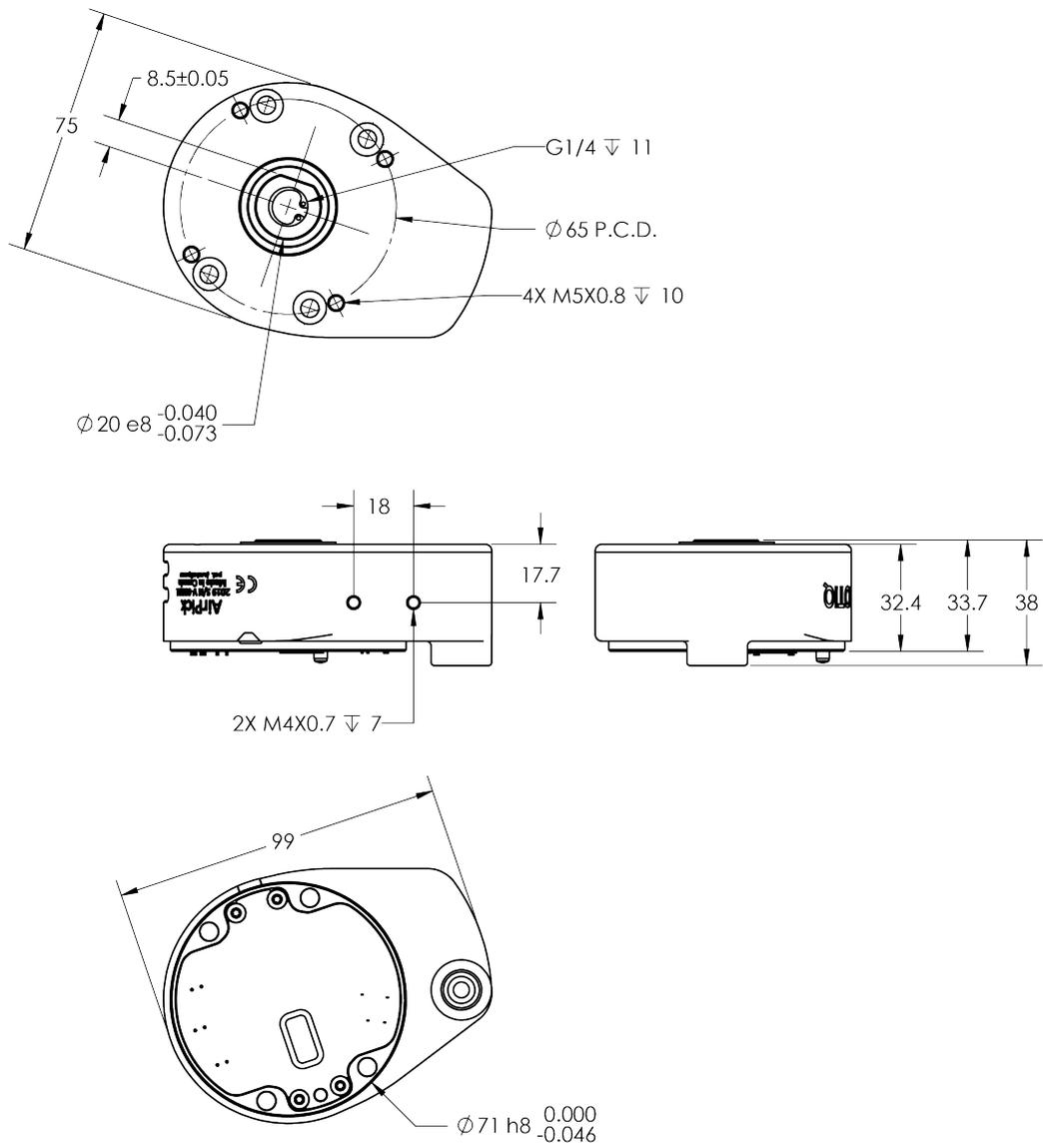
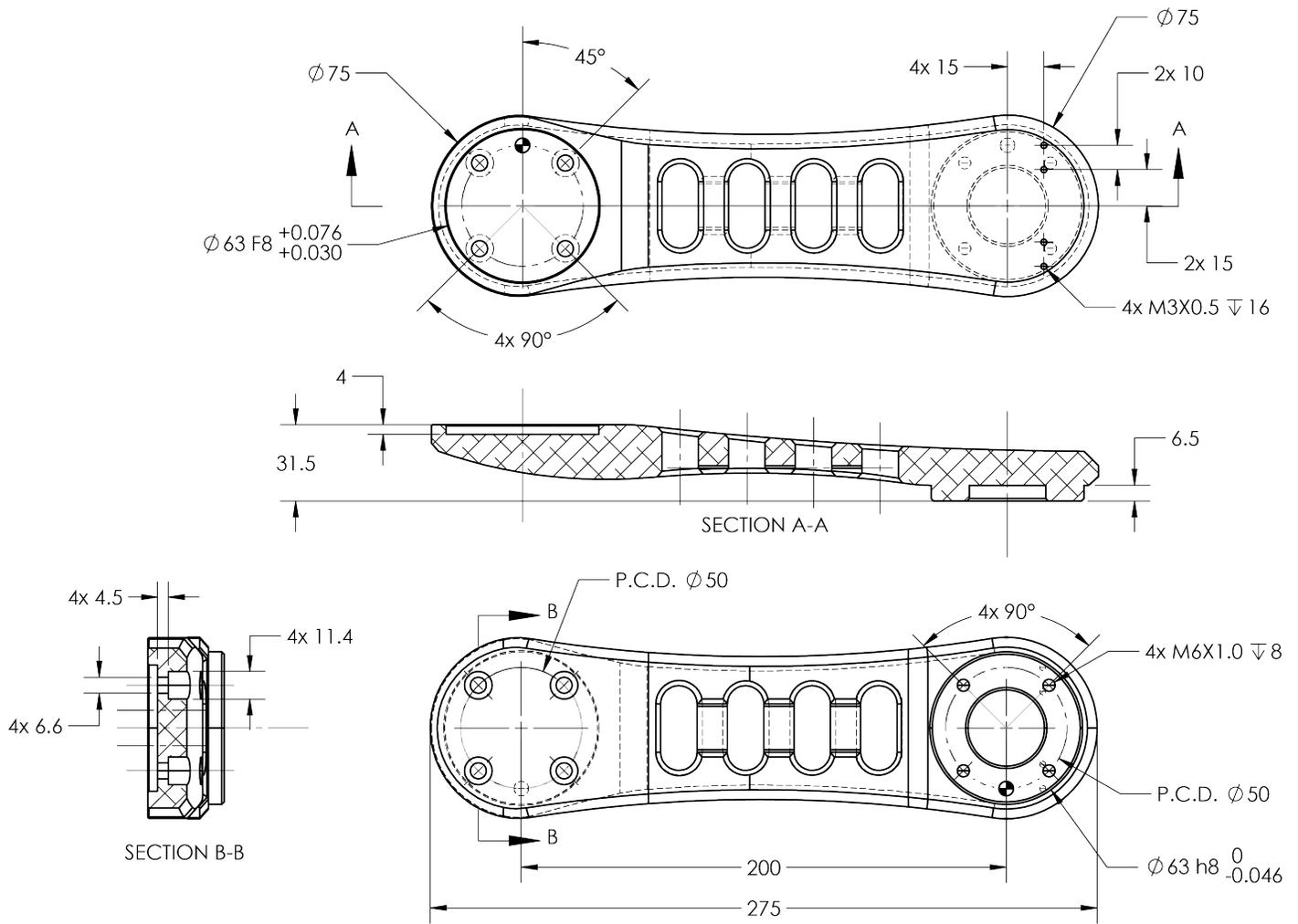


Fig. 6-1: AirPick general dimensions



6.13. Extra Reach Bracket



6.14. Bracket for two (2) Suction Cups

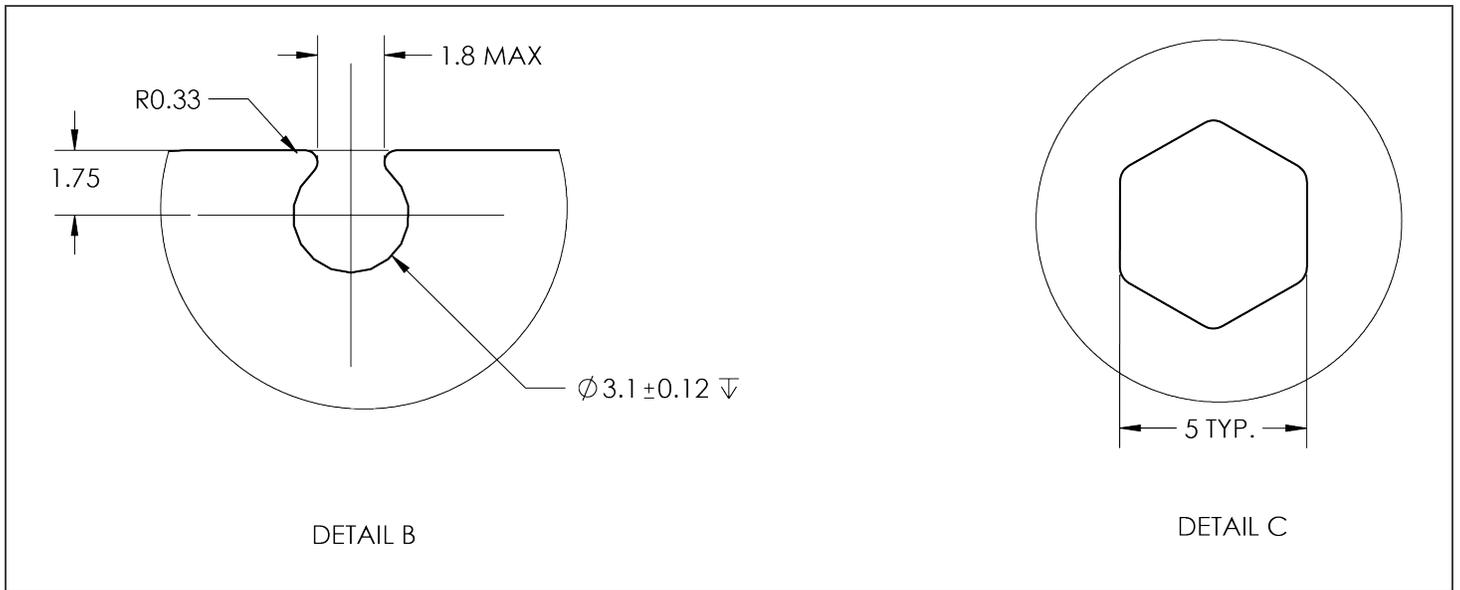
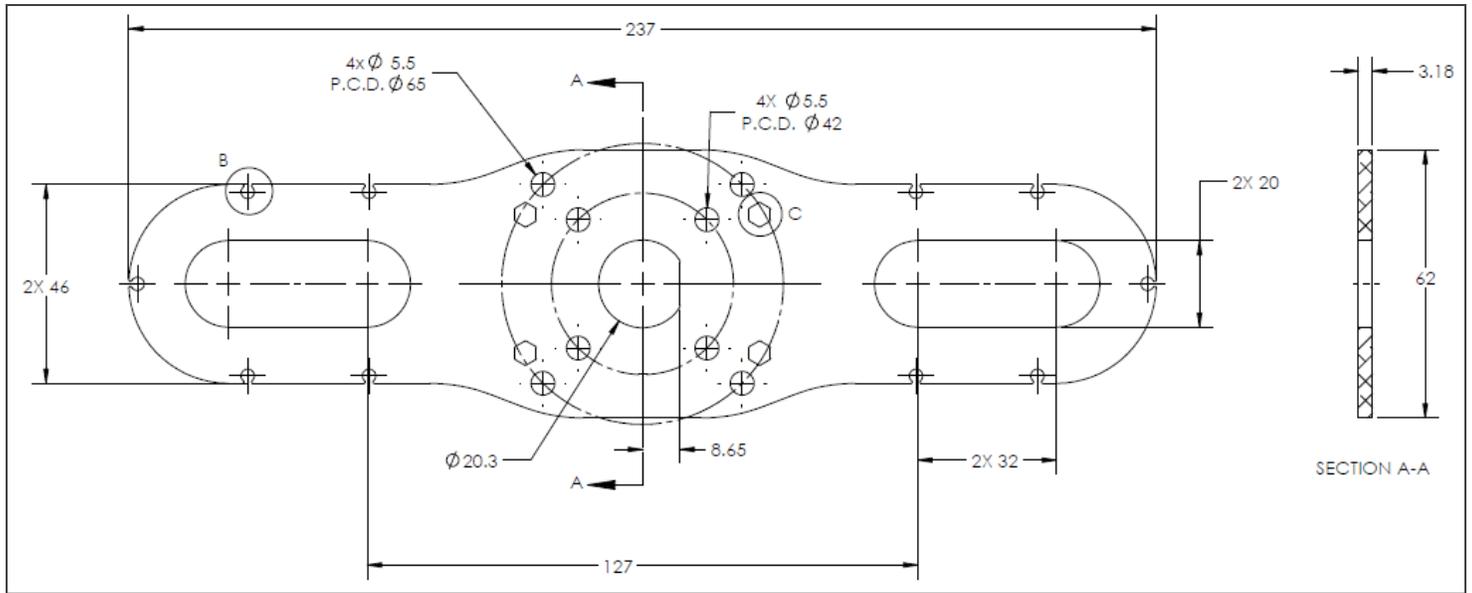


Fig. 6-2: Two air nodes bracket's dimensions



6.15. Bracket for 4 Suctions Cups

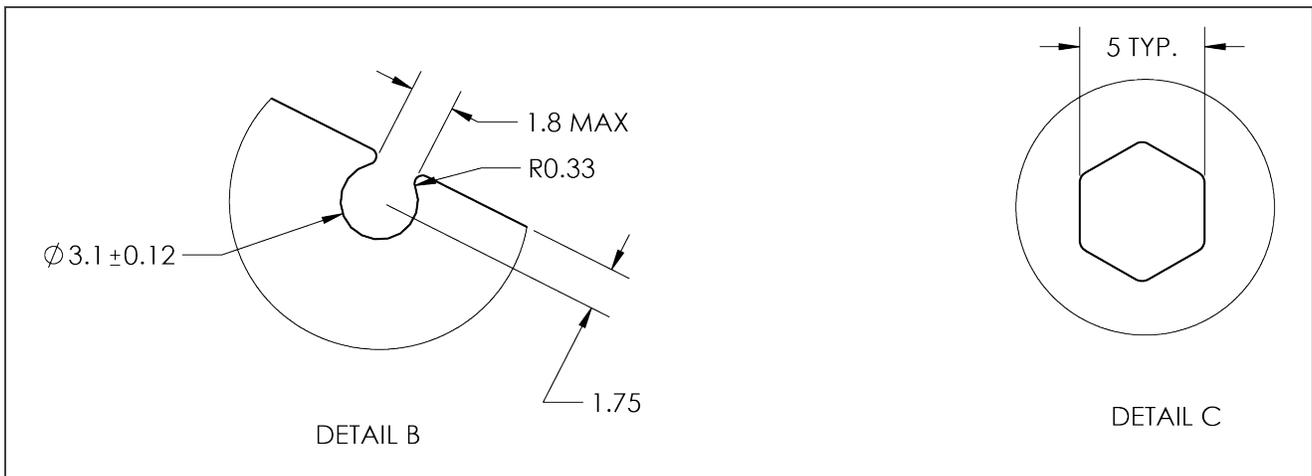
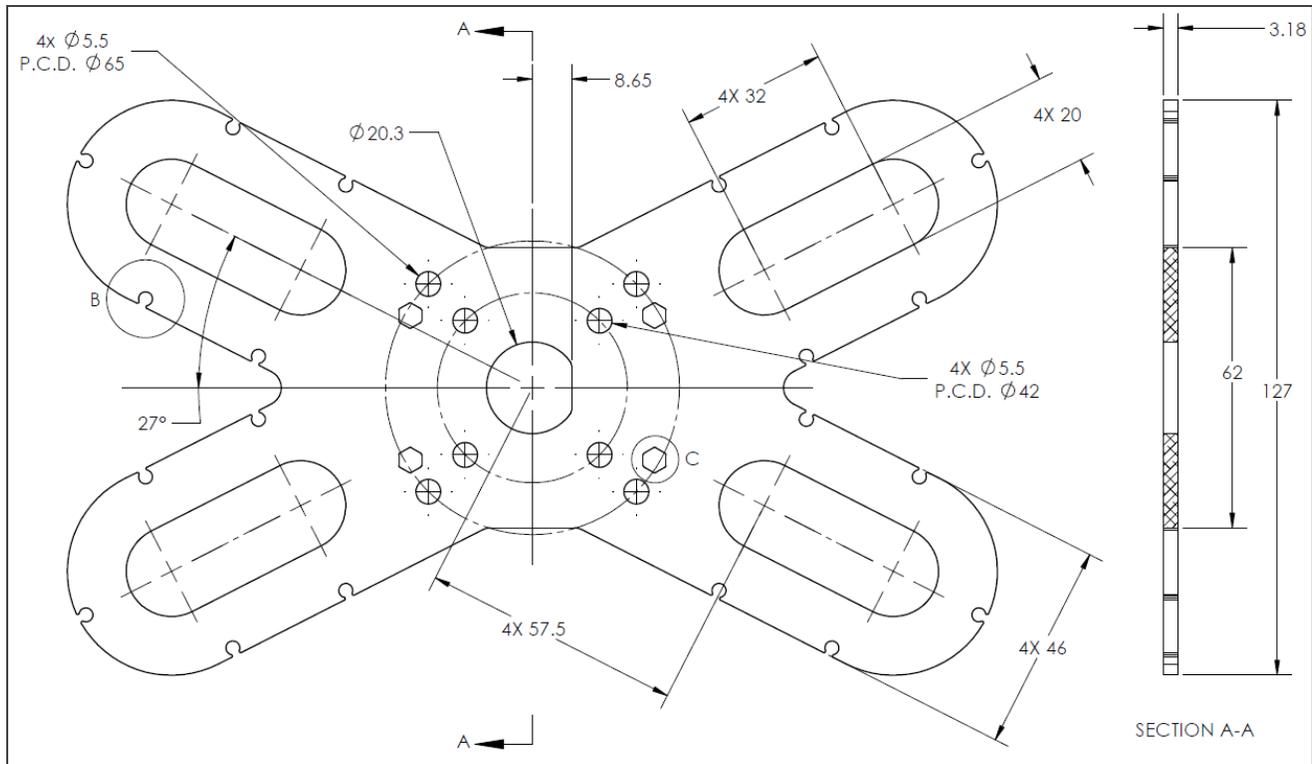


Fig. 6-3: Four air nodes bracket's dimensions



6.2. Mechanical specifications

6.2.1 Palletizing Solution (without AirPick Vacuum Gripper)

Specifications	Metric Units	Imperial Units
Product weight (without robot and gripper)	155 kg	340 lbs
Base weight	45 kg	98 lbs
Column weight	110 kg	242 lbs
Maximum box weight	Up to 8 kg	Up to 17.5 lbs
Minimum box dimensions	50mm x 50mm x 50mm	[2 x 2 x 2] in
Pallet dimensions- Width	From 300mm to 1016mm	From 12 in to 40 in
Pallet dimensions- Depth	From 300mm to 1219mm	From 12 to 48 in
Pallet height (empty)	Min 25mm	Min 2 in
Pallet height (filled)	Max 2200mm	Max 87 in
Shipping crate dimensions	[2380, 950, 1250] mm (L, W, H)	[93-7/8", 37-3/8", 49-1/16"] in (L, W, H)
Shipping weight (Gross weight)	317 kg	697 lbs
Maximal acceleration in operating condition	2 g	
Maximum box throughput	Up to 13 boxes/min *	
Maximum number of box patterns	2	
Energy source	Electricity	

*Depends on box weight, dimensions, surface, pallet dimensions and layouts.

Fig. 6-4: Mechanical Specifications of the Robotiq Palletizing Solution



6.2.2. AirPick Vacuum Gripper

Specifications	AirPick Vacuum Gripper	
	Metric Units	Imperial Units
Energy source	Electricity and compressed air	
Gripper mass (including coupling)	511 g	1.13 lbs
Minimum Feed pressure	3 bar	43.5113 PSI
Maximum Feed pressure	7 bar	101.526 PSI
Air consumption at optimal pressure	135.9 SLPM	35.9 gpm
Maximum torque permissible by custom suction cup bracket	150 Nm	110 lbf-ft
Air supply connection type	8 mm OD Tube	5/16in OD Tube
AirPick Gripper noise level	70.5 dBa	
Maximum Vacuum level at optimal pressure	85 %	
Blow off flow at 0.65 MPa feed pressure	130 SLPM	
Maximum acceleration in operating condition	2 g	
Contaminants and purity classes	ISO 8573-1 class 3.4.3	



6.2.3. Center of mass, tool center point (TCP)

Products	Center of mass (mm)			TCP (mm)			Mass (g)
	X	Y	Z	X	Y	Z	
AirPick (without suction cup)	0.55	-9.89	21.72	0	0	44.7	481
AirPick (with 1 suction cup)	0.50	-9.30	24.60	0	0	76.7	515
AirPick (with 2 suction cups)	0.30	-5.40	42.20	0	0	127.7	890
AirPick (with 4 suction cups)	0.20	-4.30	48.70	0	0	127.7	1115
AirPick (without suction cup) + extra reach bracket	143.2	-4.20	15.30	200	0	72.2	1128
AirPick (with 1 suction cup) + extra reach bracket	144.8	-4.10	16.80	200	0	104.2	1162
AirPick (with 2 suction cups) + extra reach bracket	158.3	-3.10	28.9	200	0	155.2	1537
AirPick (with 4 suction cups) + extra reach bracket	163.6	-2.70	34.7	200	0	155.2	1762



6.3. Electrical specifications

6.3.1 Linear Axis Controller

Specifications	Value
Operating supply voltage	100-240 Vac 60/50 Hz
Quiescent power (minimum power consumption)	290 Wmax 205 Wrms
Peak current	12.8A at 120Vac 6.4A at 240Vac

Fig. 6-5: Linear Axis Controller electrical specifications

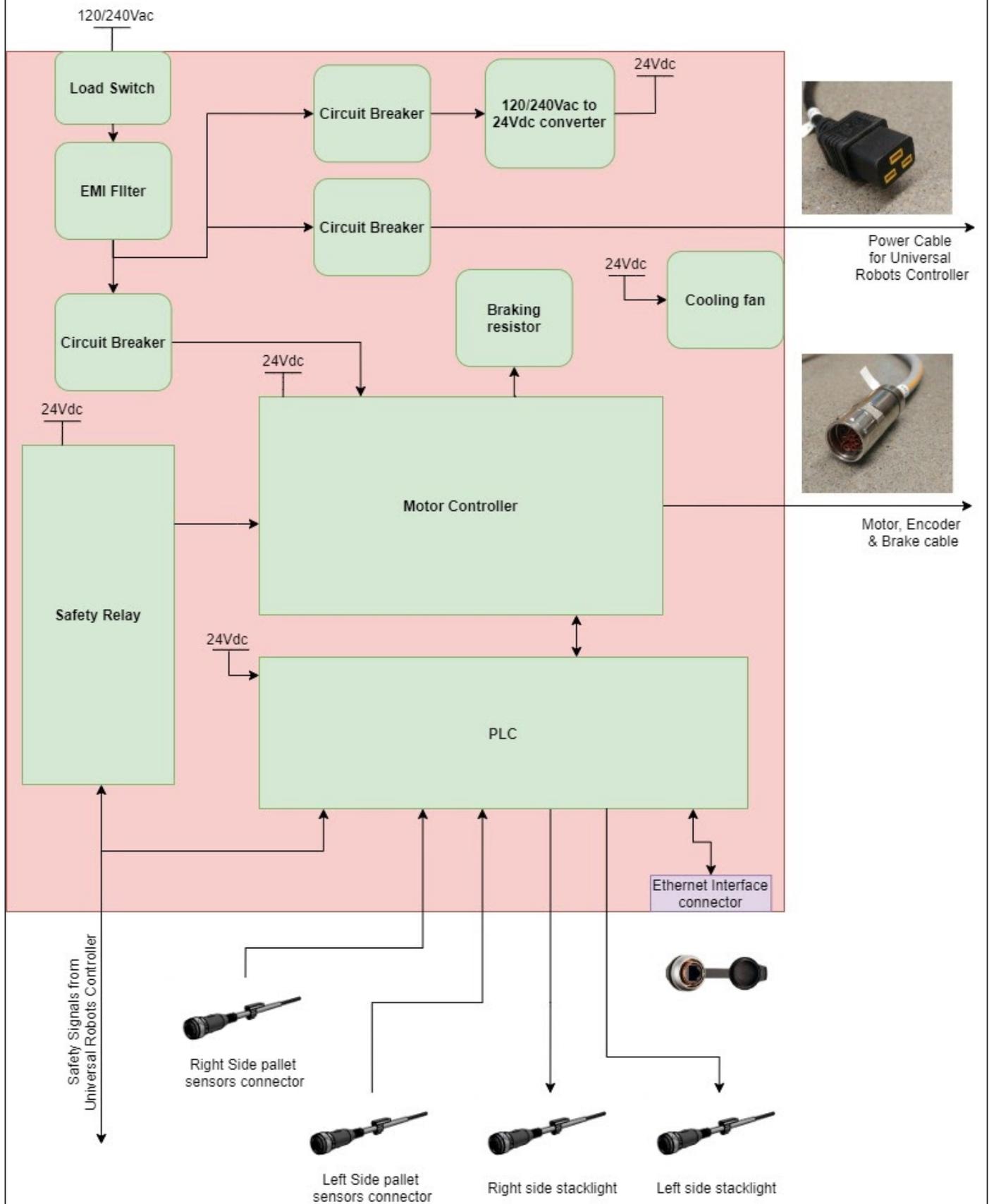
Warning

The linear axis controller is CE marked and cCSAus certified. Any modification will void the certification.

The following Palletizing Control Box diagram shows roughly how the connections are made. For more information, download the electrical package on the Robotiq support website . Do not modify wiring unless you can re-certify the control box with local authorities.



Palletizer Control Box Diagram



Info

The complete electrical diagram is available on our [support website](#).

6.3.2. AirPick Vacuum Gripper

Info

For all information about AirPick Vacuum Gripper specifications, please consult its instruction manual available on our [support website](#).

6.3.3. Universal Robots Controller

Please, refer to the **Installation** section for more details about all connections in the UR controller.



7. Maintenance

Following the maintenance interval will ensure:

- Correct functioning of the equipment;
- Validity of the warranty;
- Proper lifetime of the equipment.

Caution

Maintenance operations are for the average normal usage of the Robotiq Palletizing Solution, the maintenance intervals must be adjusted according to the environmental conditions such as:

- Operating temperature
- Humidity
- Presence of chemical(s)
- Presence of physical objects (debris, scraps, dust, grease, etc.)
- Interaction with operated parts (sharp or rough)
- Dynamics of the operation (accelerations)

Caution

Always turn off the Palletizing Solution and depressurize the air supply tube before performing any maintenance operation on it. For more details about the depressurization, please refer to **Depressurizing the Supply Line** section.

Caution

The Palletizing Solution is not waterproof or water resistant without additional protection. Only clean the equipment with a dry towel.

Caution

Maintenance operator must be grounded to prevent electrostatic discharge that could damage electronic equipments.



7.1 Linear Axis

Caution

For every maintenance operation, please verify the axial backlash in the ball screw. If it is greater than 0.2 mm, the linear axis must be replaced.

7.1.1 Components lubrication

Info

If needed, clean the components before the lubrication.

Info

Recommended lubricant : LUB-KC1.

Ball Screw and Bearing Guide Lubrication

Lubrication of the axis should be done every 2 years considering a typical use of 80h/week. When lubricating, move the carriage all over the axis stroke to distribute the lubricant uniformly.

Cover Strip and Guide Rail Lubrication

Lubrication have to be done if it is needed or when the component doesn't have its grease film anymore.



7.2. Fasteners

Periodically ensure that the bolts are tightened all over the Solution. If necessary, tight again according to the specified torques represented in the table below.

Designation	Location	Tightening Torque	
		(Nm)	[ft-lb]
M6	Column-Axis interface	10.5	7.7
M6	Linear axis carriage interface	9.9	7.3
M8	Pallet sensors	15	11.1
M10	Base - Axis interface	50.0	36.9
1/2-13	Wedge anchors	54.2	40.0
M8	Hoist ring	9.5	7.0
M8	Robot carriage interface	20.0	14.8
M8	Lifting bracket - Linear axis interface	9.5	7.0
Motor Coupling	Coupling collar	8.0	5.9

Table 7-1: Torque Settings - Palletizing Solution

7.3. Air Filter Cleaning

Periodically clean the control panel air filters.

7.4. AirPick Vacuum Gripper

The Vacuum Gripper only requires external maintenance with limited downtime. Maintenance is required after specified usage, measured in cycles (workpiece pick-up and release) or use time (hours).

Warning

Unless specified, any **repairs** done on the Vacuum Gripper will be done by Robotiq.



Operation	Daily	Monthly	1 M cycles or 1000 hours
Gripper Cleaning	Dirty conditions	Normal conditions	
Periodic Inspection			X

Info

For more details about the AirPick Vacuum Gripper maintenance, please consult its instruction manual available at robotiq.com/support.

7.5. Solution Cleaning

Clean the mechanical parts (including the guide rail of the linear axis) with a soft cloth as required. Cleaning agents include all non-abrasive media.

Caution

Do not use compressed air to clean the Vacuum Gripper. Doing so can result in a damage to the check valve or the release valve.

For more information about the AirPick Gripper filter cleaning, please refer to the maintenance section of its instruction manual.

7.6. Solution Storage

Ensure short storage times. Choose cool, dry, wellshaded, corrosion-resistant locations.



8. Spare Parts, Kits and Accessories

Info

The following list is up to date at print time and is subject to change, check online for updates.

Item	Description	Ordering Number
SOL-PAL-UR-VAC-1500	<p>Robotiq Palletizing Solution 1.5 M with AirPick Vacuum Gripper</p> <ul style="list-style-type: none"> • 1 x 7th axis base including: <ul style="list-style-type: none"> ◦ 1 x Mechanically welded assembly ◦ 1 x Vertical axis 1500mm ◦ 1 x Motor ◦ 1 x Control Motion Box (PLC, Drive, safety relay) ◦ 4 x Pallet sensors ◦ 2 x Status Lights ◦ 1 x Cable management system • 1 x Box detection sensor • 1 x Extra reach bracket • 1 x Vacuum Gripper kit (AirPick, suction cups, brackets for 2 or 4 cups) • 1 x Air tube 8mm • 1 x Gripper coupling kit • 1 x Material Handling Copilot software dongle license 	



9. Troubleshooting

9.1. Palletizing Solution (except the AirPick Gripper)

Problem	Potential Solution
Robot entered in protective stop after few layers.	<ul style="list-style-type: none"> • Make sure to enter a box height that is high enough to compensate box variability. You may have to enter a box height that is slightly bigger than your real box dimensions. A small error can accumulate and appear only after many layers.
Robot starts dropping box from a height that gradually increase with each layer.	<ul style="list-style-type: none"> • Make sure to enter a box height that is not too big. Try to reduce it. A small error can accumulate and appear only after many layers.
Robot entered in collision with a box already placed on the pallet.	<ul style="list-style-type: none"> • Make sure to enter a box height that is not too small. • Make sure you entered box width and length that are not too short. If your box has rounded sides, you need to compensate by entering a slightly bigger box width and/or length. • Make sure you have started your program with the pallet viewer representing your current situation.
Robot triggers a protective stop when placing a box on the first layer.	<ul style="list-style-type: none"> • Verify the box height dimension. You may have to compensate for a convex box. • Verify pallet height. • Verify that your TCP height is properly set.
A box has dropped on the pallet from a high height.	<ul style="list-style-type: none"> • Validate that the TCP is located over the box at the grip position. • Validate the height of the pallet in the pallet configuration menu.
Boxes are not always placed straight on the pallet.	<ul style="list-style-type: none"> • Make sure your conveyor stop rig always places the box at the same place every time. You need to have a stable box position to ensure a reliable box positioning. • Make sure the "Grip position" you have set makes the Vacuum Gripper is centered and parallel to the box.
A collision has been detected during the trajectory.	<ul style="list-style-type: none"> • Make sure the pallet viewer corresponds to reality. • Move the gripper away from the robot and the linear axis



Discontinuous path detected, please change your starting point.	<ul style="list-style-type: none"> Verify in the Move tab that the joints are in the center of the limits. For the wrist #3, the algorithm will adjust the wrist at the start of the palletization.
Violation: A joint exceeded the torque window	<ul style="list-style-type: none"> Robot joint limits may be too restricted. Modify by tapping: Installation → Safety.

9.2. AirPick Vacuum Gripper

9.2.1 Communication

When using AirPick Vacuum gripper with USB to RS485 serial converter:

Troubleshooting from the Gripper LED:

1. LED is not lit, Gripper not powered.
 - a. Check Gripper power supply and electrical setup
2. LED is solid blue and red, Gripper is in fault.
 - a. Disconnect the communication and power cycle the Gripper. The LED should turn solid red when powered.
 - b. While powered with red LED, connect the communication, LED should turn solid blue when connection is established.
3. Flashing blue and red LED, Gripper is in fault.
 - a. Gripper may be in auto-release, wait for auto-release to be completed, then turn off auto-release and initialize the Gripper.
 - b. Gripper may have a major fault, check the error from fault status and contact support.
4. Solid blue, no fault and communicating.
 - a. If you can control the Gripper from the GUI on the pendant, check your program structure.
 - b. If you can not control the Gripper from the pendant, contact support.
5. Solid red, no fault, but Gripper is not communicating.
 - a. USB-RS485 converter LEDs are :
 1.
 - Not lit, no USB communication.
 - i. Check USB connection.
 - ii. Re-install drivers.
 - iii. Contact support.



- Red flashes at slow rate.
 - i. Check the DB-9 connector.
 - ii. Check the cable.
 - iii. Check the communication parameters from the Robotiq User Interface, see recovery procedure.
 - iv. Contact support.
- Red and green flashing at high speed.
 - i. Check fault status, maximum operating temperature could be exceeded.
 - ii. Contact support.

When using AirPick vacuum gripper with Universal Robots package:

Troubleshooting from the previous section (LED references) still applies.

From the UR teach pendant:

URCap install:

1. Verify that the latest URCap is installed from the **Robot Setup** menu, inside the **URCaps** tab
 - a. URCaps installation instructions are in the **Installation** section
 - b. Inside the URCaps tab, if you select the appropriate URCap file, you can see the current software version
 - c. Gripper toolbar should appear if installed properly
2. URCap is installed but Gripper cannot be controlled :
 1. If Gripper LED is not blue, follow the steps in the first section above
 2. If Gripper LED is blue, URCap is installed with the latest available version, contact support@robotiq.com
1. Verify that the latest URCap is installed by tapping the **triple bar icon** in the upper right corner, selecting **Settings**, then tapping the **System** menu and the **URCaps** button in the navigation pane on the left
 - a. URCaps installation instructions are in the **Installation** section
 - b. Inside the URCaps menu, if you select the appropriate URCap file, you can see the current software version
 - c. The Gripper toolbar should appear if installed properly
2. URCap is installed but Gripper cannot be controlled :
 1. If Gripper LED is not blue, follow the steps in the first section above
 2. If Gripper LED is blue, URCap is installed with the latest available version, contact support@robotiq.com

Driver package install:

1. Driver checkup :
 - a. Use the latest driver version available at support.robotiq.com
 - Use the installation instruction from the **Installation** section



- b. To check your driver version :
 - With the Gripper unplugged
 - From the UR teach pendant screen, click the " Gripper" button
 - i. Driver version will be shown
 - ii. If Gripper button is not displayed, driver package is not properly installed, see instruction from the
2. Driver is installed but Gripper cannot be controlled :
 - a. If Gripper LED is not blue, follow the steps in the first section above
 - b. If Gripper LED is blue, driver is installed with the latest available version, contact support@robotiq.com

9.2.2. Vacuum Gripper verification

If you are not able to attain the desired vacuum level or if a diminution of the vacuum level occurs, verify:

- The suction cups status
- That the air path is clean and not obstructed (including the manifold)
- If a filter cleaning is necessary



10. Warranty

Robotiq warrants the Robotiq Palletizing Solution and all its components against defects in material and workmanship for a period of one year from the date of reception when utilized as intended. Robotiq also warrants that this equipment will meet applicable specifications under normal use.

Warning

Warranty applies under the following conditions:

- Usage respects the operating and storage conditions specified in the Environmental and Operating Conditions section.
- Proper installation of all the components as specified in the Installation section and the following subsections.
- Until one of these condition is reached:
 - 1 year
 - 2 000 000 cycles performed (boxes or objects manipulated). Once, one of the components reaches the count, the warranty is not applicable anymore.
- Usage respects maintenance specified in the Maintenance section.
- Usage respects recommended payload, force, acceleration and speed specified in the Mechanical specifications section.

During the warranty period, Robotiq will repair or replace any defective component of the Palletizing Solution, as well as verify and adjust the component free of charge if the equipment should need to be repaired or if the original adjustment is erroneous. If the component is sent back for verification during the warranty period and found to meet all published specifications and work as intended, Robotiq will charge standard verification fees.

The component is considered defective when at least one of the following conditions occurs:

- The component feedback necessary for the robot program is not accessible.
- If applicable, the component cannot be controlled from the robot teach pendant
- Wear of the components due to direct contact with the workpiece or obstacles is not covered by the warranty.



Caution

The warranty will become null and void if the :

- Unit has been tampered with, repaired or worked on by unauthorized individuals.
- Screws, other than as explained in this guide, have been removed.
- Unit has been opened other than as explained in this guide.
- Unit serial number has been altered, erased, or removed.
- Unit has been misused, neglected, or damaged by accident.

This warranty is in lieu of all other warranties expressed, implied, or statutory, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. In no event shall Robotiq be liable for special, incidental, or consequential damages.

Robotiq shall not be liable for damages resulting from the use of the Palletizing Solution, nor shall Robotiq be responsible for any failure in the performance of other items to which the Palletizing Solution is connected or the operation of any system of which the Palletizing Solution may be a part.

Exclusions

This warranty excludes failure resulting from: improper use or installation, normal wear and tear, accident, abuse, neglect, fire, water, lightning or other acts of nature, causes external to the Palletizing Solution or other factors beyond Robotiq's control. It also excludes all consumable parts, such as suction cups, and their normal wear.

Robotiq reserves the right to make changes in the design or construction of any of its products at any time without incurring any obligation to make any changes whatsoever on units already purchased.



11. Harmonized Standards

11.1. Applied standards

This section describes all applied harmonized standards for the design and production of the AirPick Vacuum Gripper. Conformity of the product is only met if all instructions of the current user manual are followed. Among others; proper installation, safety measures and normal usage must be respected. A risk assessment specific to the user's final application must also be carried out.

Caution

Conformity of the product is only met if all instructions of the following manual are followed. Among others; installation, safety measure and normal usage must be respected.

The following standards have been applied:

ISO 12100	2010	Safety of machinery — General principles for design — Risk assessment and risk reduction
ISO 9409-1	2004	Manipulating industrial robots – Mechanical interfaces – Part 1: Plates
ISO 4414	2010	Pneumatic fluid power – General rules and safety requirements for systems and their components
IEC 61000-6-2	2016	Generic standards – Immunity standard for industrial environments
IEC 61000-6-4	2018	Generic standards – Emission standard for industrial environments
EN 50581	2012	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances



12. Appendix

12.1 Anchoring pattern

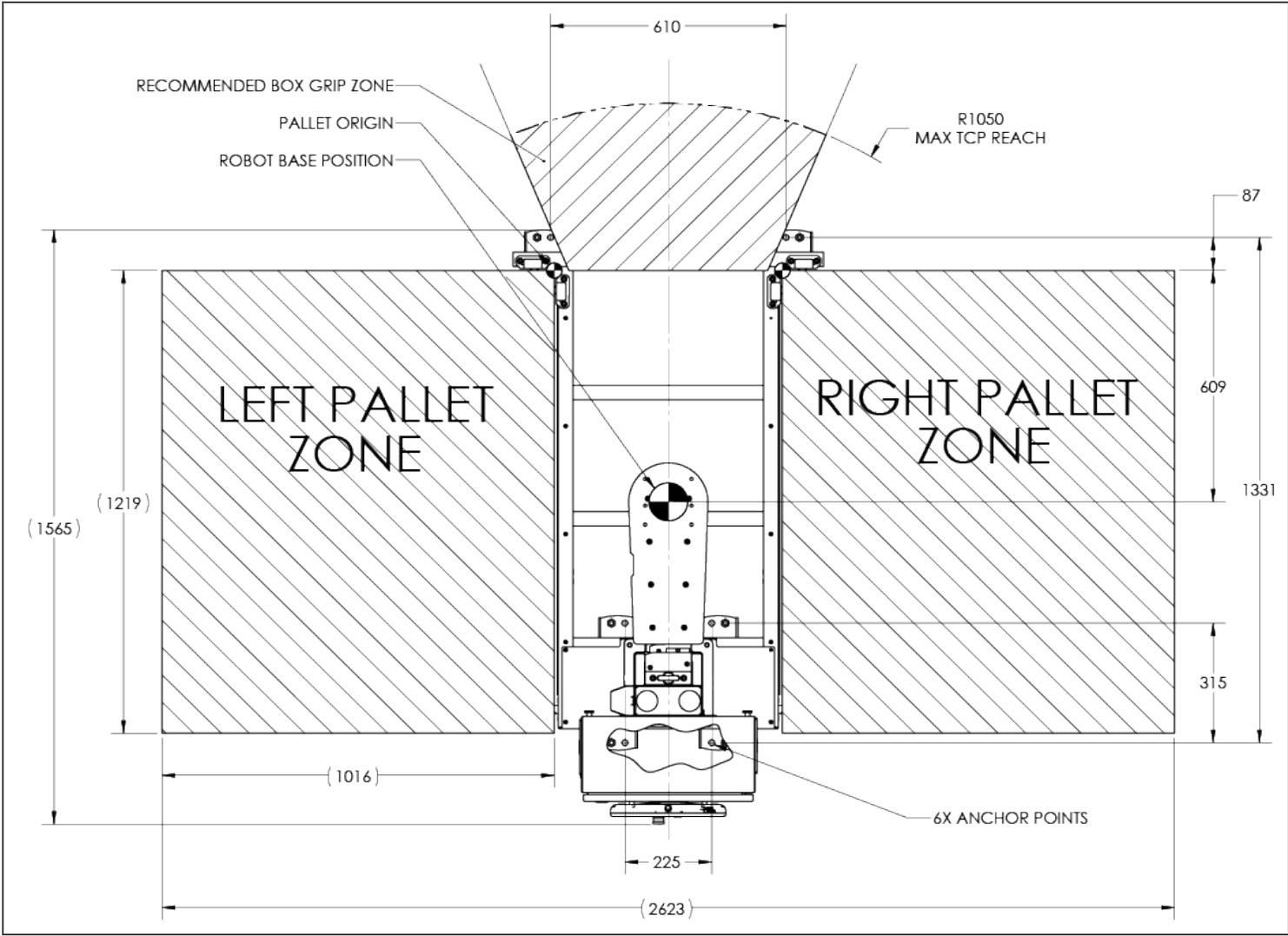


Fig. 12-1: Palletizing Work Zones Schema



Wire #	Color	Function	Description
1	White	Safety-Reset	<ul style="list-style-type: none"> • When using area scanner: Connect wire #1 to available 24V in UR controller. The system will auto-start when you step out of the protected area. • When using light curtain: Connect wire #1 to normally-open (NO) reset switch. Connect switch's second pole to available 24V in UR controller. <u>Place reset switch outside of the protected area.</u>
2	Brown	0V	0V link between both electrical enclosures.
3	Green	UR E-Stop Status 1	E-Stop status signal when a emergency signal is applied to EI0.
4	Yellow	UR E-Stop Status 2	E-Stop status signal when a emergency signal is applied to EI1.
5	Grey	UR Safeguard input 1	UR does not support a safeguard status in configurable outputs. Connect this pin to the regular safeguard input S0 for status.
6	Pink	UR Safeguard input 2	UR does not support a safeguard status in configurable outputs. Connect this pin to the regular safeguard input S1 for status.

Table 12-1: Safety Wires Description



13. Contact

www.robotiq.com

Contact Us

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