

ROBOTIQ PALLETIZING *SOLUTION*

PE Series

Original Notice

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Robotiq Palletizing Solution - PE Series
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.

2022/07/11

- Components image modified in **General Presentation** section for modification of base covers
- Steps and images modified in **Installation** section for modification of base covers.

2022/04/25

- Added warning note for Moving and Positioning the Solution (Installation section).
- Added an **Avoid collision with conveyor** option in the Palletizer node and the different configurations (Software section).
- Added scripts **Get Pallet State** and **Set Palletizer State** in Software section.

2022/03/28

- Updated Electrical Specifications section
- Updated Push Button Enclosure Connection section
- Updated Push Button Enclosure and Teach Pendant Rack section
- Added Robot Limits section

2022/02/03

- Updated Physical Clearance and Reachable Area of the Robot section
- Added new option in Copilot Configuration tab
- Added new option in Palletizer node
- Removed Force and Speed Robot Limits section
- Updated Harmonized Standards section

2022/01/04

Initial Release



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The information contained in this document is subject to change without notice.



1. General Presentation

The terms "Palletizer", "Palletizing Solution", "Robotiq Palletizing Solution", "Solution" and "PE Series" used in this manual all refer to the PE Series Robotiq Palletizing Solution. The PE Robotiq Palletizing Solution is a hardware and software solution already connected and ready to install. It is composed of a base fully integrated with a Robotiq Controller, pallet sensors, a pedestal, and a post with a teach pendant rack and status lights. An extra reach gripper bracket is also included in the Solution to extend the reach of an end-of-arm tool of 200 mm from the robot's tool flange. The Material Handling Copilot software and accessories (e.g., box sensor, anchor kit, cable management system, etc.) are also part of the Solution.

Info

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

1.1. Palletizing Solution Components

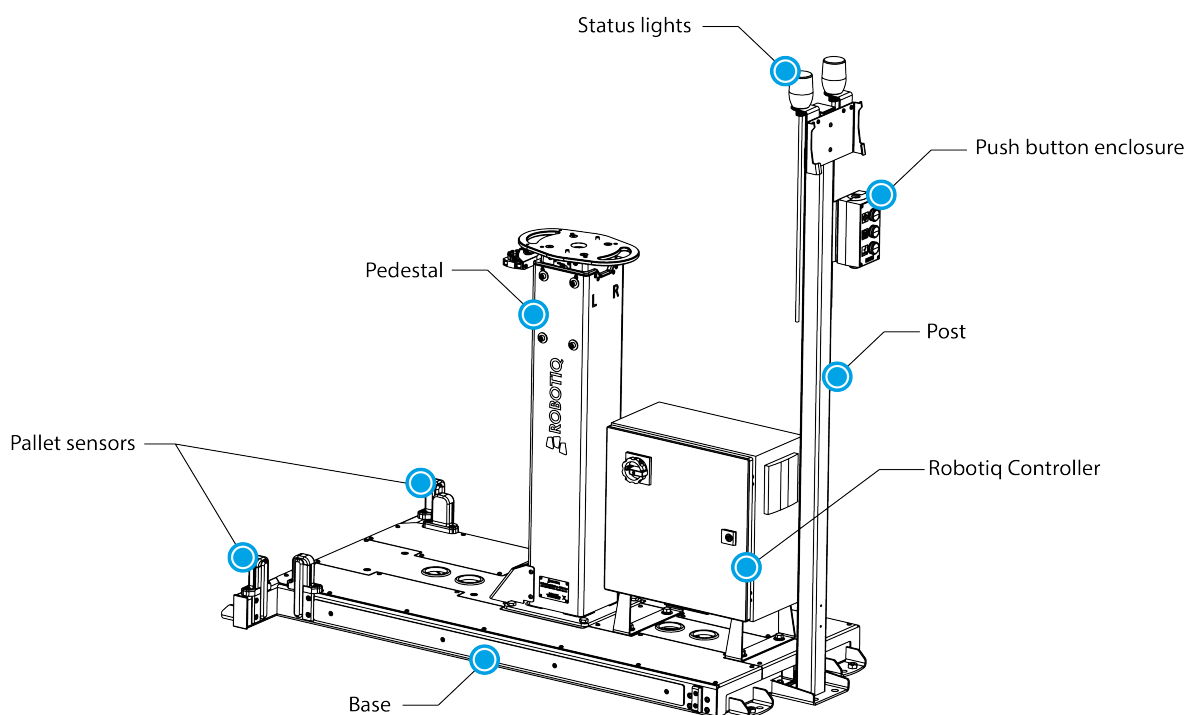


Fig. 1-1: PE Series Robotiq Palletizing Solution

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.

1.1.1. Base, Pedestal and Post

The Robotiq Palletizing Solution is composed of a base, on which a pedestal, pallet sensors and a Robotiq Controller are mounted, and a post, on which a teach pendant rack, a push button enclosure, and status lights are mounted. The inner pedestal section can be adjusted in height (13 different positions) using a plunger latch. The Solution is designed to facilitate the positioning of pallets. The base has to be anchored to the floor. For more details, please refer to the **Installation** section



1.1.2. Robotiq Controller

All the components of the Solution are integrated and controlled via the Robotiq Controller. It allows for the motion of the robot during a palletizing action, and the control of the pallet sensors and status lights.

1.1.3. Standalone Post

The Solution also comprises a post to which a push button enclosure, status lights and teach pendant rack are attached. The post can either be mounted to the base or positioned elsewhere, adjacent to the base.

1.1.4. 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.

1.1.5. Status Lights

Two (2) status lights are positioned at the top of the post adjacent to the base. Each status light is associated to the nearest pallet. The color of the light gives information on the status of the system or the state of a specific pallet. Please refer to the **Light States** section for more information.

1.1.6. 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. 1-2: Robotiq AirPick Gripper



1.1.7. 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. 1-3: 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.



1.1.8. 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

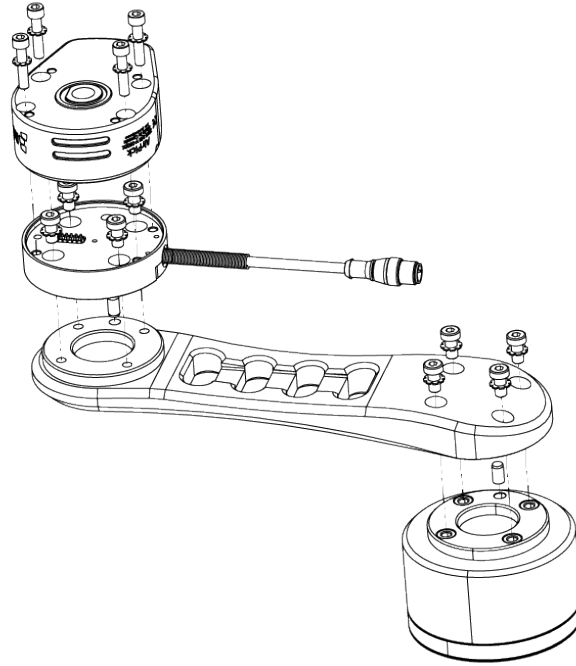


Fig. 1-4: AirPick Vacuum Gripper Extra Reach Bracket

1.1.9. 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. 1-5: Box Sensor

1.2. 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.

1.2.1. 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.

1.2.2. 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.

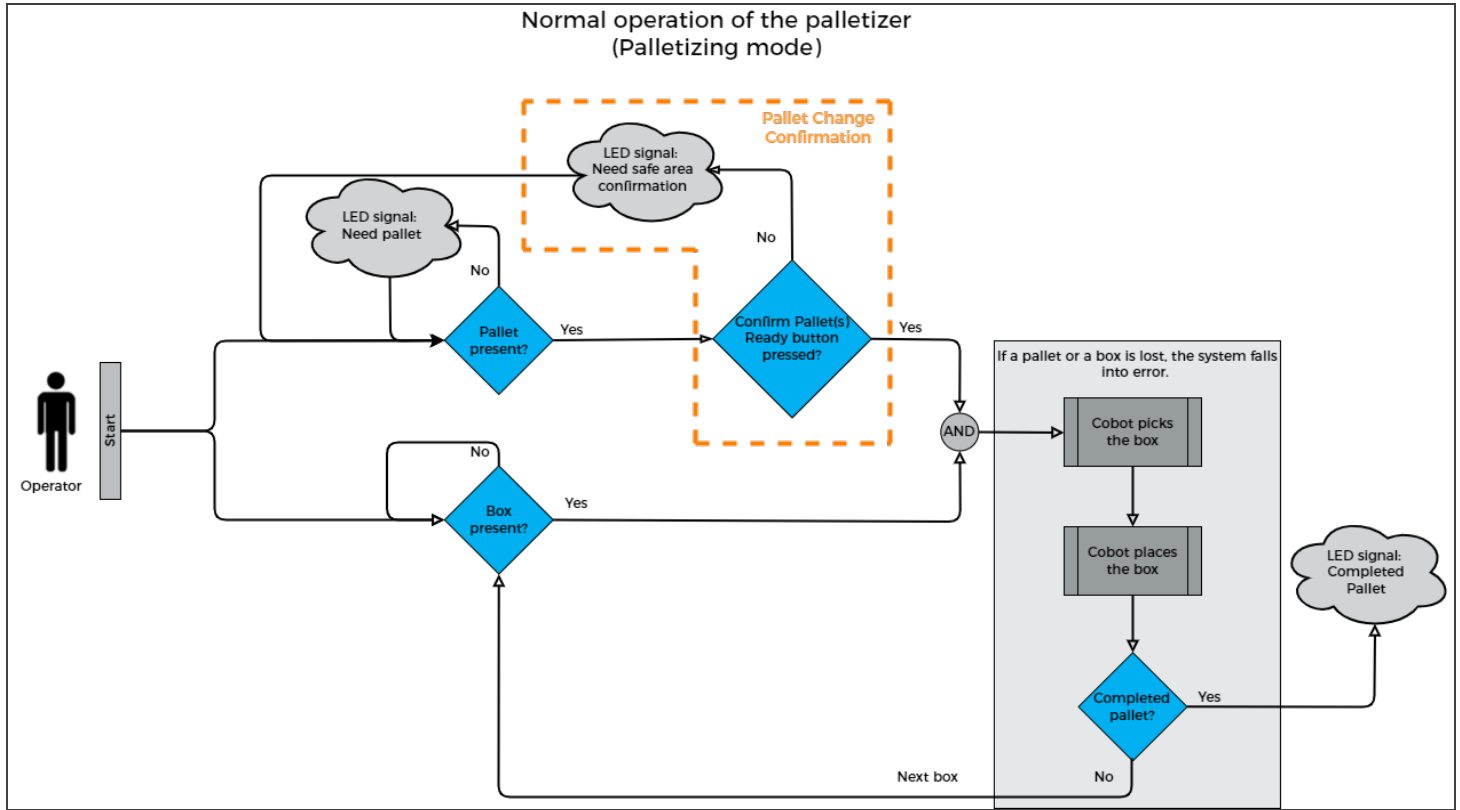
Caution

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



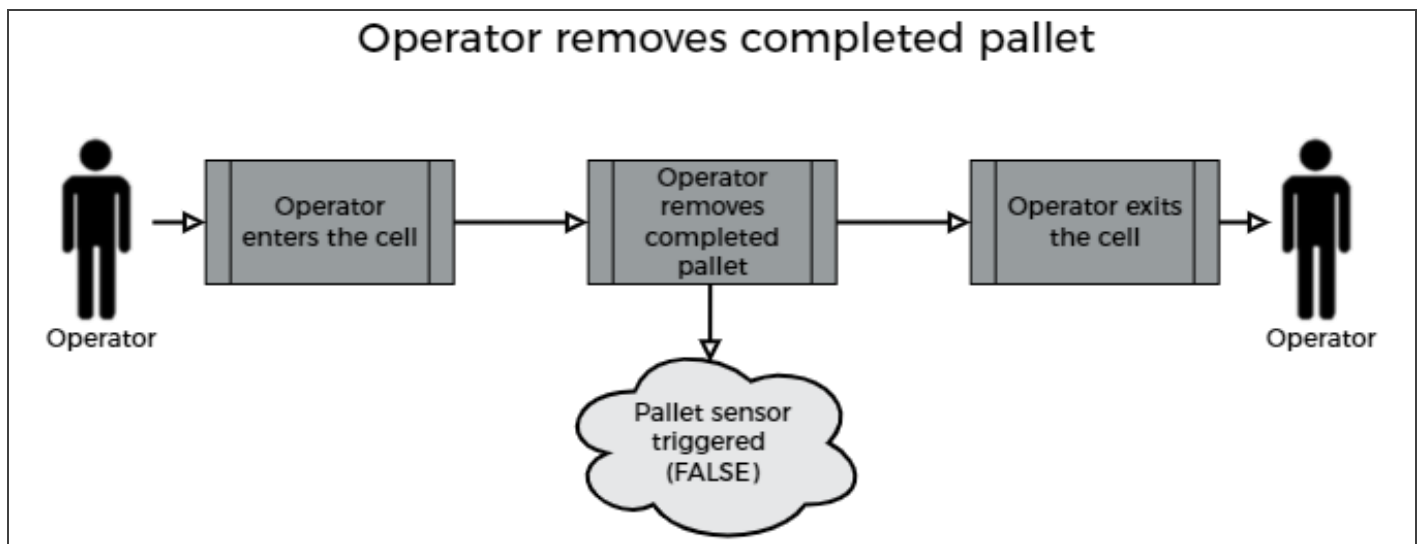
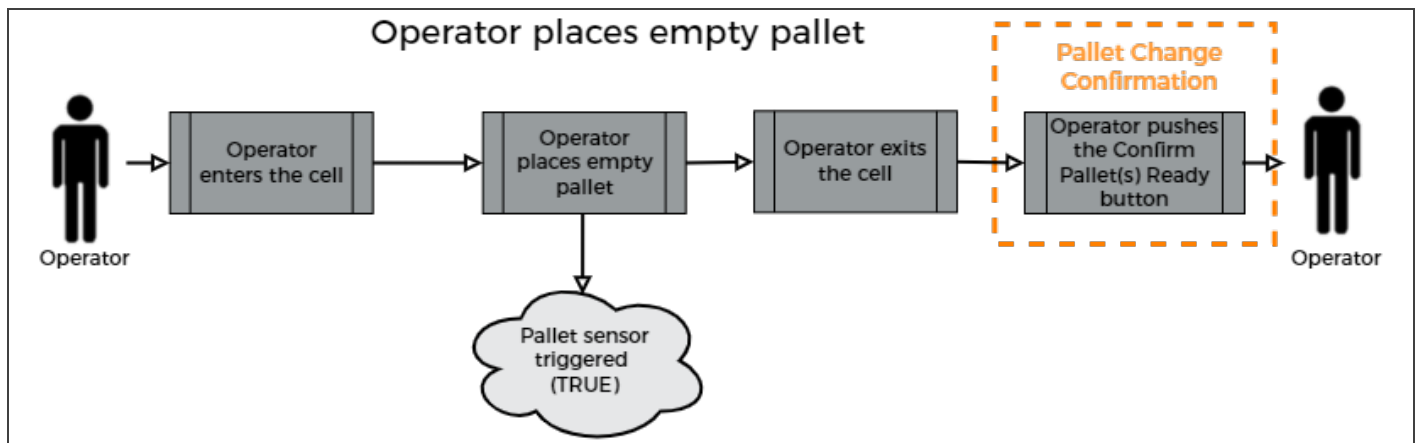
1.3. Palletizing Operation Diagrams

The following diagrams explain the logical operation of the Palletizing Solution based on the operator's actions, as well as responses such as signals, pallet and box sensor behaviors, etc.



Please refer to the Status Lights section for further information about light states.





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 entire cell (i.e., the robot, the AirPick Vacuum Gripper or any other gripper used, 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.

In order to make the palletizing cell collaborative, several aspects should be taken into consideration. All cells being different, it is important to perform a risk assessment and to enforce the required standards. Please note that the results of the risk assessment depend on the usage and application.

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

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: 10px; margin: 10px 0;"> <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.

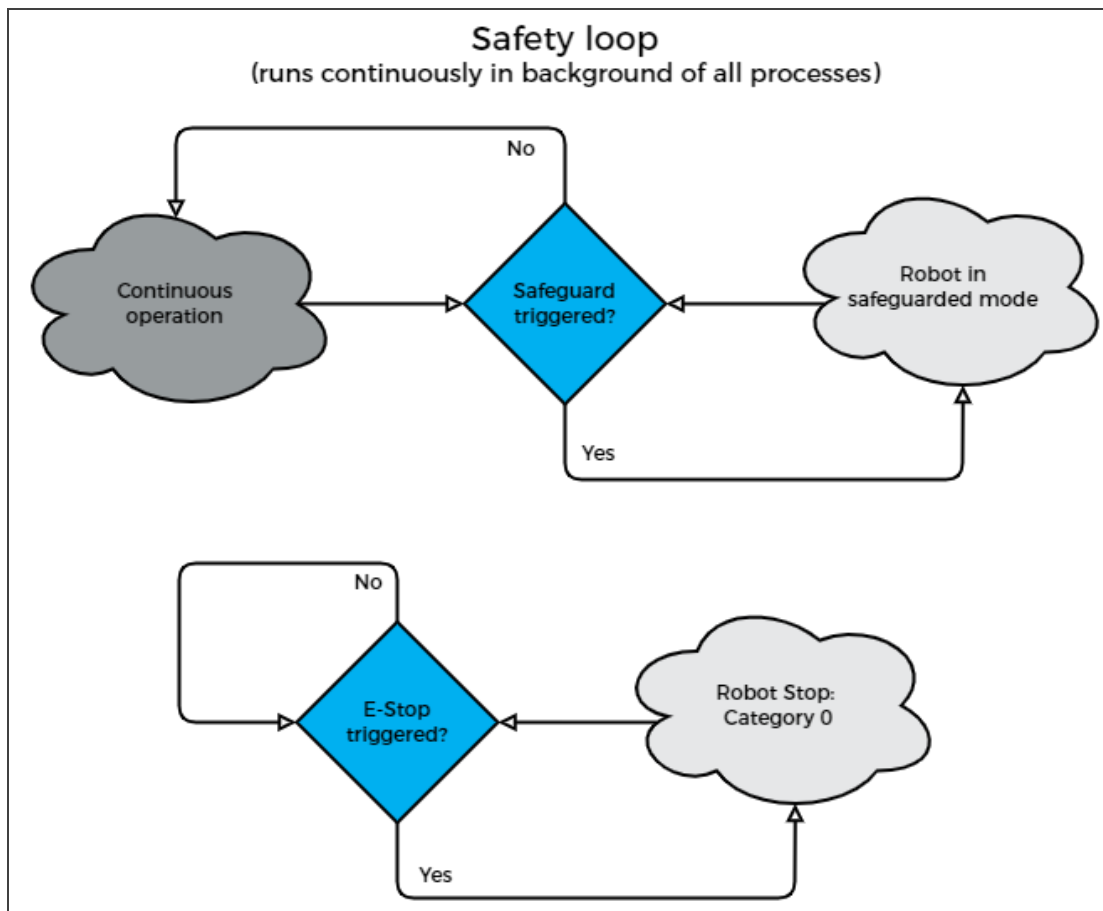
2.3.1. Expected System Behavior in Normal Operating Conditions:

- **Continuous operation:** The palletizer continuously fills pallets when no human operator is within the vicinity of the palletizing cell.
- **Safeguarded operation**
 - **Reduced mode:** The palletizer continuously fills pallets, even when an operator enters the palletizing cell. The operator can safely remove a filled pallet or place a pallet in an empty slot. The system will not start to palletize on an empty pallet unless the operator has pressed the "Confirm pallet(s) ready" button. To obtain this behavior, the "Confirm pallet(s) ready" checkbox in the Installation tab must be ticked. Also, to allow access to the cell to the operator, a complete risk assessment must be performed, and additional parameters must be set (which include, but are not limited to: robot speed, robot force, safety planes, guardrails).
 - **Separation monitoring mode:** The system stops when a human operator enters the vicinity of the palletizing cell 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 maintain a Category 2 Stop. When the safeguards are removed, the system will resume operation in Continuous mode.

Info

See IEC 60204-1 for definitions of stop categories.





Warning

In the event of a collision or after an emergency stop, an inspection of the solution must be performed before resuming the use of the machine. Special attention must be given to the pedestal, the cable management system, and the gripper components. Please contact [Robotiq Support](#) if any sign of damage is detected.



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 bodily injury. In addition, note that in situations where the installation is not compliant, the warranty is void.

Warning

When assembling or moving the Solution, make sure there is enough vertical and horizontal clearance all around so you can avoid material damage and bodily injury.



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 PE Series Palletizing Solution base including:
 - 1 x Pedestal
 - 1 x Robotiq Controller
 - 4 x Pallet sensors
 - 1 x Cable management system
- 1 x PE Series Palletizing Solution post including:
 - 2 x Status lights
 - 1 x Teach pendant rack
 - 1 x Push button enclosure
- 10 x 1/2" - 13 concrete anchors
- 1 x Box detection sensor
- 1 x Extra reach bracket for end-of-arm tooling
- 1 x Vacuum Gripper kit (Airpick, suction cups, brackets for 2 or 4 cups) (Optional)
- 1 x Gripper coupling kit (Optional)
- 1 x 8 mm air tube (already mounted on the column)
- 1 x Material Handling Copilot software license dongle
- 1 x Set of four (4) casters



3.2. Required Tools and Equipment

The following tools are required to install the Palletizing solution.

Included:

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

Not included:

- Power screwdriver
- #2 Phillips bit
- 2.5 mm slotted screwdriver
- Utility knife
- Ratcheting socket wrench with 10 mm (3/8 in) drive or adapter
- Torque wrench with 10 mm (3/8 in) drive or adapter, minimum torque range of 15 - 50 Nm (11.0 - 36.9 ft-lb)

Additionally, if you decide to install the type of anchors provided by Robotiq, you will need the following:

- Hammer drill
- 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, non-condensing |
| 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

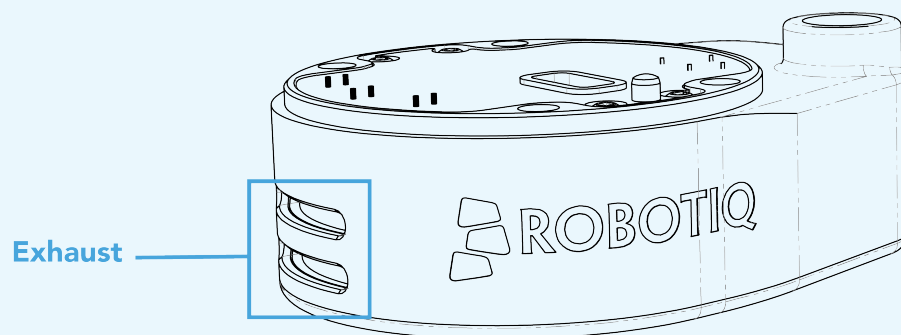
Caution

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.

Since the crate weighs 212 kg (465 lb), Robotiq recommends using a pallet truck or forklift truck to move it. The operation of such machinery should be done by qualified and authorized personnel.

Caution

Before disassembling the crate, inspect it to make sure there is no damage or defect. If damage or defects are discovered, please contact the [Robotiq support team](#).

3.4.2. Unboxing

Tip

A minimum of two people is recommended to perform the following steps.

Warning:

The transport, lifting, and moving of the Robotiq Palletizing Solution should be performed by qualified and authorized personnel. Failure to do so may result to material damage, bodily injury or death.

1. Remove the top panel and the four (4) sides of the crate by unscrewing the screws that hold them into place.
2. Remove the supporting wooden frame by unscrewing the screws that hold it into place.
3. Cut all the strapping material that retains the components, and take all cardboard boxes out of the crate.
4. Unscrew the two (2) bolts that retain the pedestal, and take the pedestal out of the crate.
5. Unscrew the two (2) screws that retain the teach pendant rack, and take the teach pendant rack out of the crate.

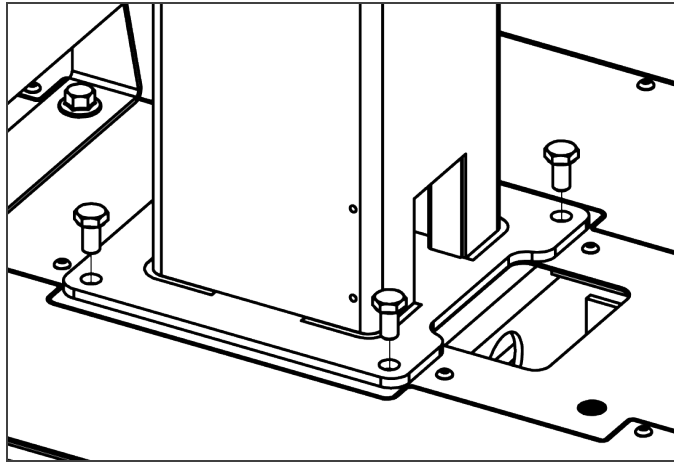


6. Remove the supporting wooden pieces by unscrewing the screws that hold them into place.
7. Unscrew the four (4) bolts that retain the base into the crate.
8. Take the base out of the crate.
9. Position the pedestal on the base.

Caution

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

10. Secure the pedestal on the base using the four (4) M10 screws provided. Tighten to a torque of 50 Nm.

**Caution**

Make sure to have all components in hand before discarding the crate and packaging.

3.4.3. Moving and Positioning the Solution

Warning

Failure to properly secure and install the equipment can result in material damage and bodily injury. In addition, note that the warranty will not cover material damage resulting from an installation that did not comply with the instructions found in this manual.

Warning

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

Although you can assemble the solution at the place of your choice, you will need to move it to its final location afterwards. You can use one of the two following methods to securely move the Solution:

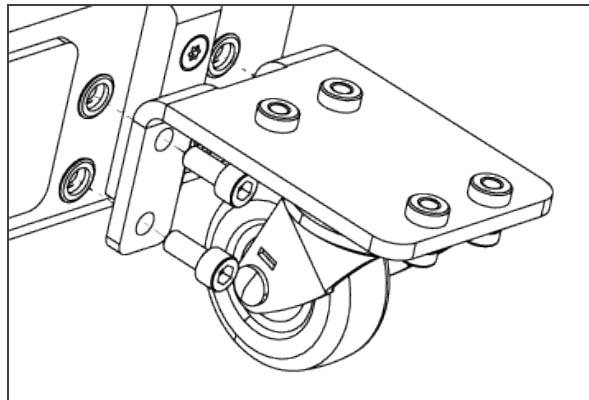
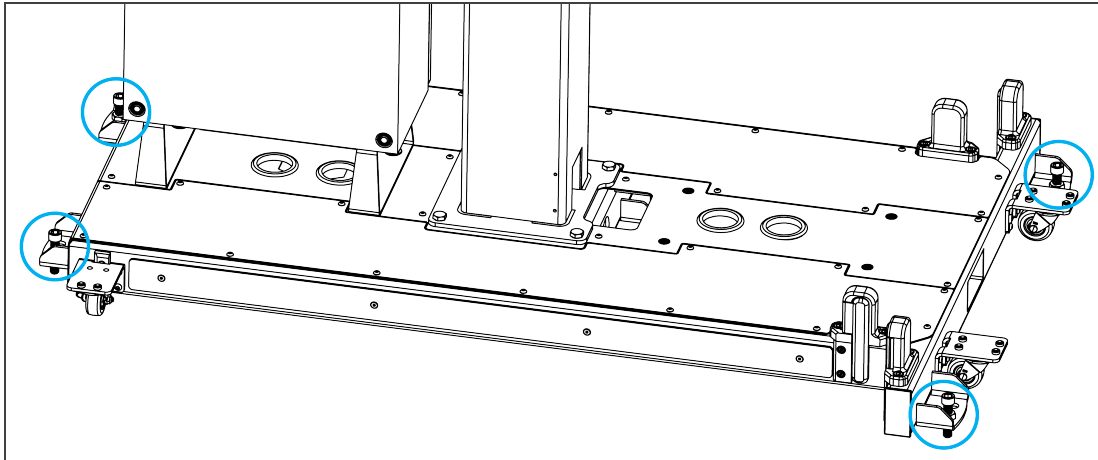
1. Using a forklift. Pay attention to the center of gravity to prevent the equipment from tipping over. Make sure to secure and stabilize the Solution before moving it.



- Using the set of casters provided with the Solution. To install them, screw the four (4) corner bolts highlighted in the image below to lift the Solution. Screw the four (4) casters into the base. Unscrew the corner bolts to set the solution down on its casters.

Warning

The casters are not designed to support the weight of the whole Solution. Do not install the robot before moving the Solution on its casters.



Caution

Do not use the Solution while it stands on its casters. To make the Solution stand upright, simply screw the four (4) corner bolts, remove the casters and unscrew the corner bolts.



3.4.4. Mechanical and Electrical Installation

Tip

A minimum of two people is recommended to execute these steps.

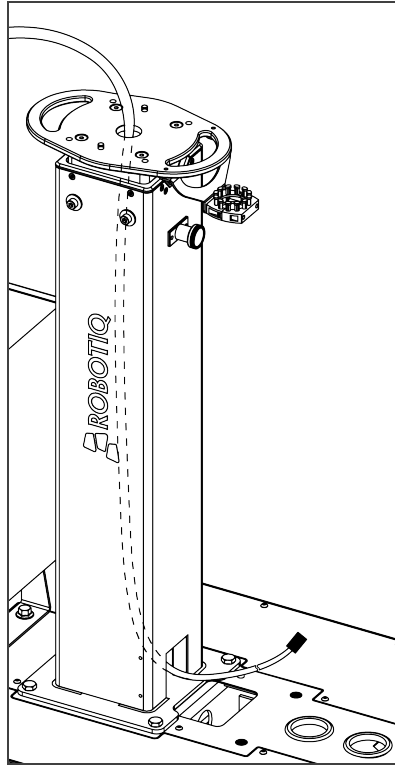
Robot Installation

Info

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

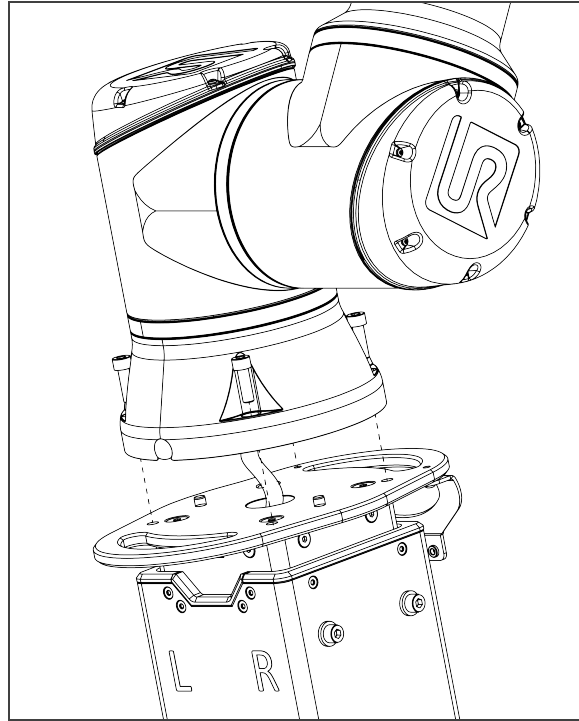
For e-Series Universal Robots

1. Run the cable through the inner pedestal section and pull the cable out at the bottom of the pedestal.



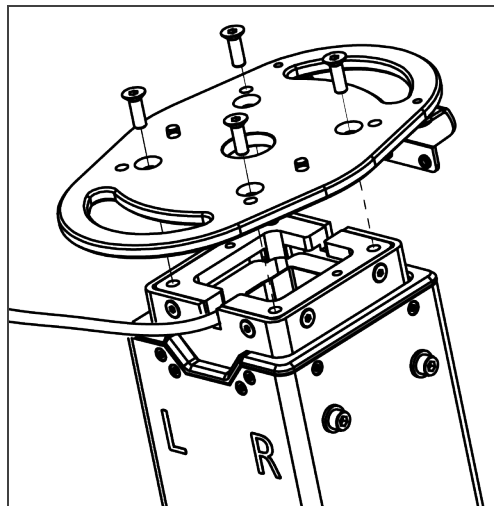
- Place the robot on the robot base plate so that the back of the robot (the side on which is the notch to let the power cable through the robot base) is oriented towards the front of the Solution (towards the Robotiq Controller). Align properly with the two dowel pins (already installed on the robot base), and secure the robot using four (4) M8 x 25 mm screws and Belleville washers.

The required torque value is 20 Nm.

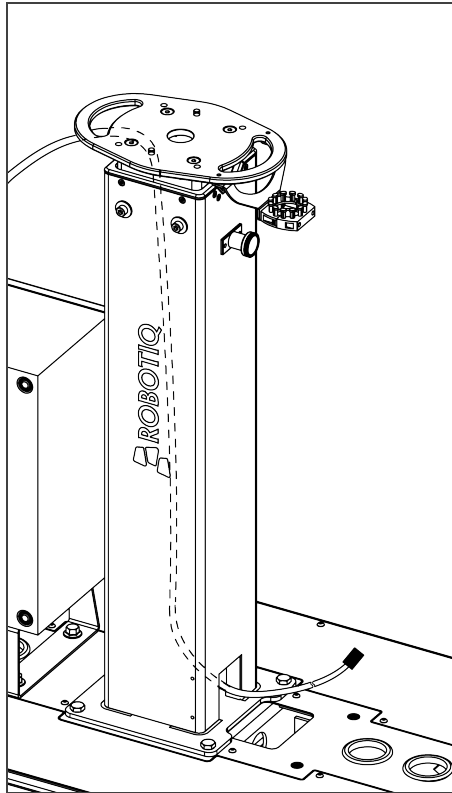


For CB-Series Universal Robots

- Unscrew the four (4) screws that hold the robot base plate.
- Run the robot arm's cable through the opening at the back of the inner pedestal section.

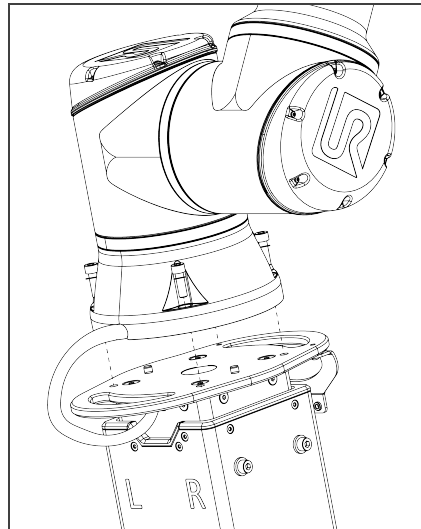


3. Run the cable through to the opening at the bottom of the pedestal.



4. Reposition the robot base plate and secure it with its four (4) screws.
5. Place the robot on the plate so that the back of the robot is oriented towards the Robotiq Controller. Align properly with the two dowel pins (already installed on the robot base), and secure the robot using four (4) M8 x 22 mm screws and Belleville washers.

The torque value required is 20 Nm.



Caution

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

- For e-Series UR: M8 x 25 mm
- For CB-Series UR: M8 x 22 mm



Adjusting Pedestal Height

The pedestal should be positioned at a height that corresponds to the pallet configuration used in the framework of the application.

Caution

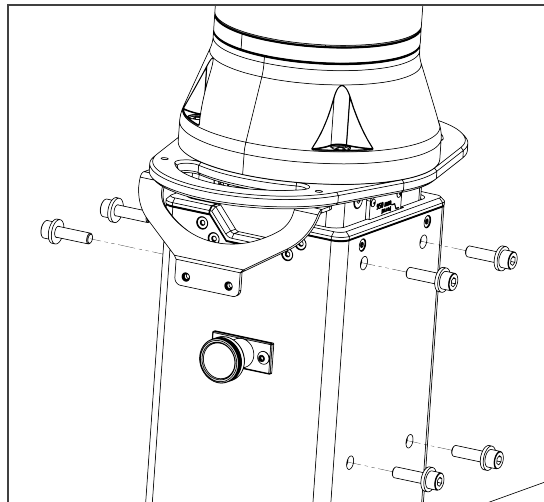
At least two people will be required to perform these installation steps since they consist in lifting material that weighs approximately 50 kg (110 lb).

1. Determine the height required based on your pallet and package configuration. Use the [Robotiq Configurator](#) to simulate your palletizing cell and obtain the exact height required.

Tip

If you will be using several different configurations, the best practice is to find a height that will correspond to all of them. This will keep you from having to manually change the height of the pedestal during production.

2. Make sure the robot arm is folded in as much as possible.
3. Unscrew the six (6) screws that hold the pedestal in place, starting with the two (2) screws on the right side.



4. While holding the inner pedestal section in place using the handles on the robot base plate, pull the plunger latch. Lift the inner pedestal section until it reaches the desired height. Release the plunger latch. The height markers on the left side of the inner pedestal section displays the actual height at which the robot arm stands.
5. Screw the four (4) screws on the left side with a 15 Nm torque, then the two (2) screws on the right side, with a 15 Nm torque.



Push Button Enclosure and Teach Pendant Rack

The post holding the teach pendant rack and push button enclosure is designed to be attached to the Palletizing Solution's base, and anchored to the ground. However, it can be positioned elsewhere, although the final position is dependent on cable length.

Ten-meter cable extensions are available as an option for the push button enclosure and status lights. Please contact support@robotiq.com should you need to add them to your configuration.

1. Screw the post at the front of the base using two (2) M6 x 20 mm screws and washers. Tuck excess cable into the base.
2. Unscrew the screws that hold the status lights into place. Orient the lights so that they stand upright, then tighten the screws.

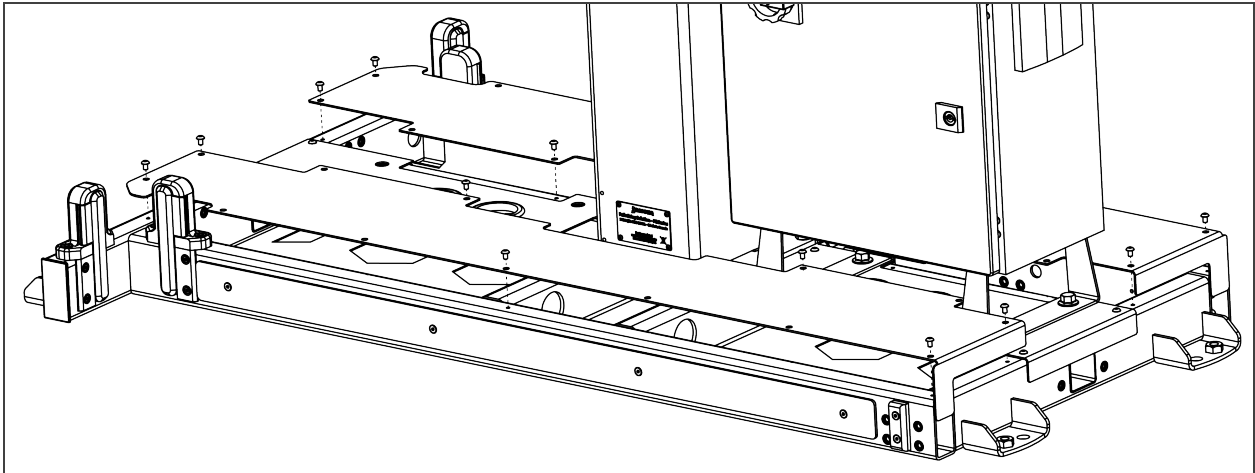
Caution

Do not invert light order (left/right) since they indicate the status of the pallet that is closest to each of them.

3. Once the Solution is at its final position, anchor it to the ground using the anchors provided. Please refer to the **Anchoring the Solution** section should you need more information on the steps to follow.

Cable Routing

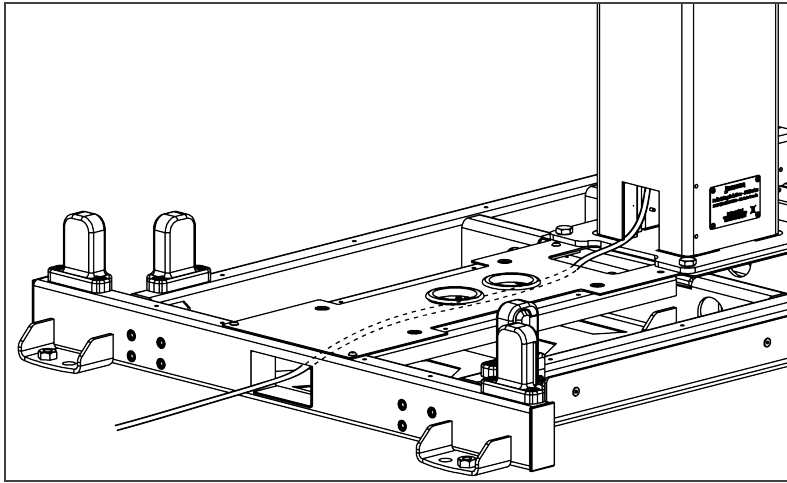
1. Remove the cover plates.



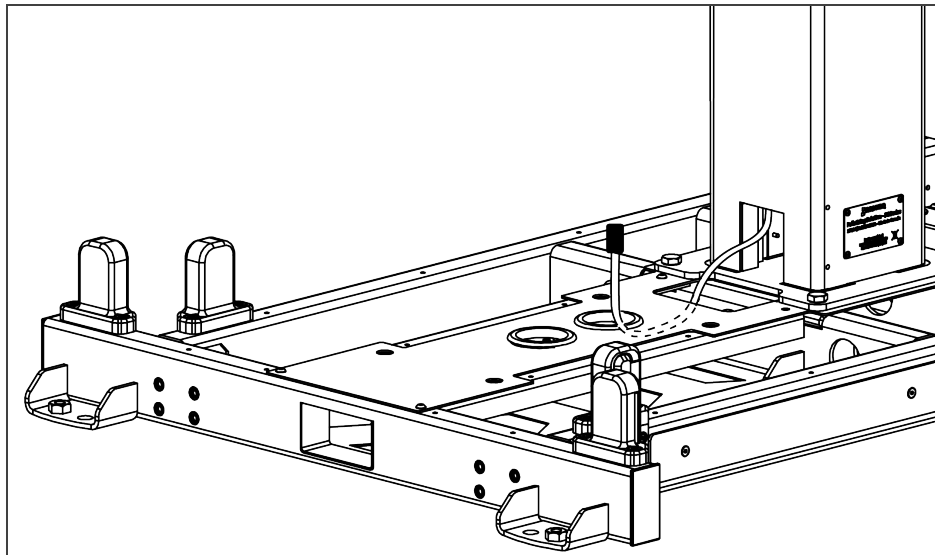
2. Run the cable of the Robotiq coupling through one of the holes in the back base plate.



3. Unroll the air supply tubing and make it run through the hole at the back of the base.



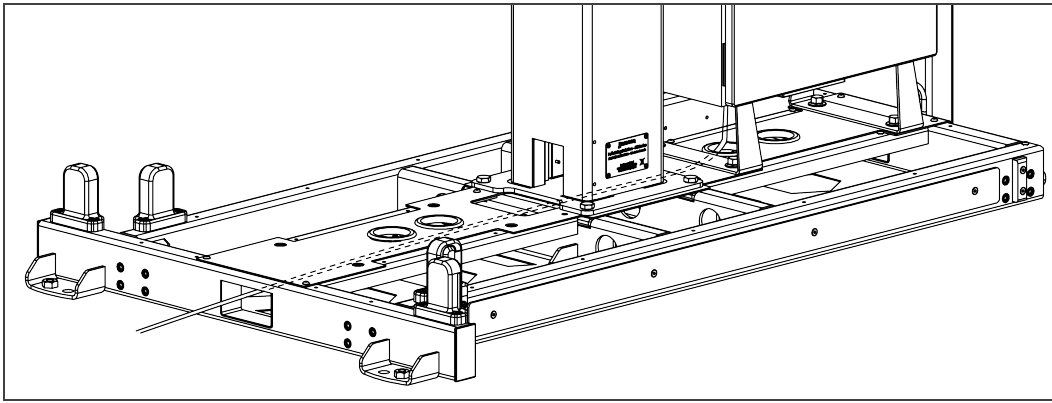
4. Run the robot's power supply cable through the back base plate and pull the connector through the hole that is closest to the pedestal.



5. Pull the Robotiq Controller's power supply cable and Ethernet cable through one of the holes in the front base plate.
6. If required, connect the Teach Pendant's cable to the corresponding socket on the robot controller. Run the cable through the hole at the front of the Solution's base, if needed.
7. Optionally, and depending on your application, the stranded wires of the cable corresponding to the "Restart" and "Pause" buttons of the push button enclosure can be connected to the robot controller.
 - a. In preparation to do so, pull out the cable that is already routed from under the base, through one of the holes of the back base plate.



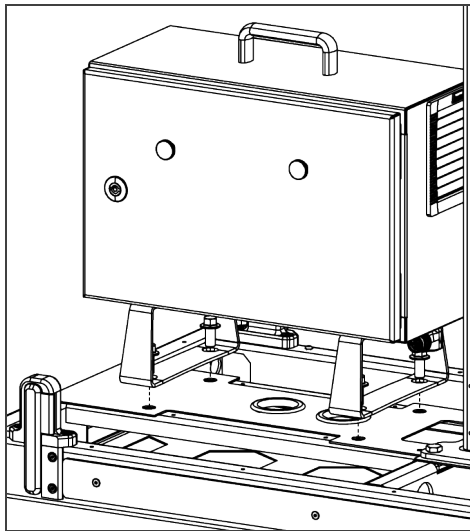
8. Use the power cable provided with the UR robot to power the Robotiq Controller. Pull the cable through the hole at the very back of the base.



9. Run the box sensor's cable through the opening at the back of the base, and pull it out through one of the holes of the back base plate.

Controller Installation and Connection

1. Install the UR controller and secure it using the four (4) M12 screws.



2. Connect the power output cable of the Robotiq controller to the UR controller.
3. Connect the robot arm's power output cable to the socket on the UR controller.
4. Open the UR controller. Connect the USB hub to a USB port.
5. Connect the Ethernet/USB converter cable to a USB port.
6. Connect the Ethernet cable to the Ethernet/USB adapter.



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. Connect the power supply cable to a power outlet.
2. Power on the robot.
3. Make sure the six (6) screws that hold the pedestal in place are tight. Torque required: 15 Nm.

Caution

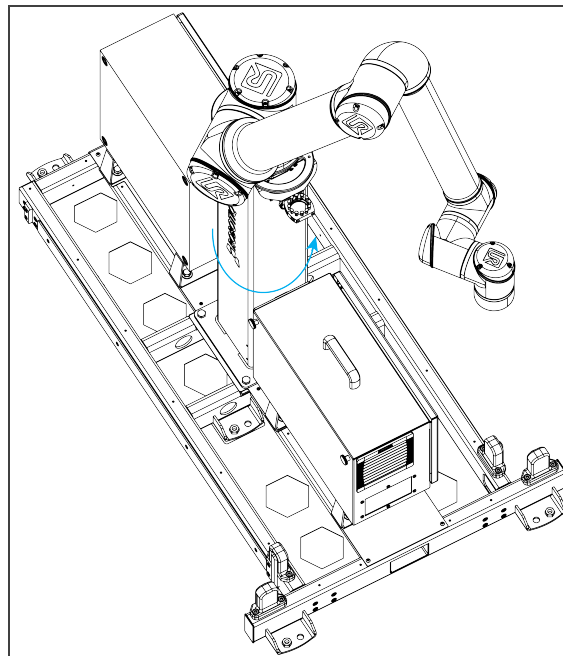
The four (4) screws at the front must be fastened before the two (2) screws at the back.

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

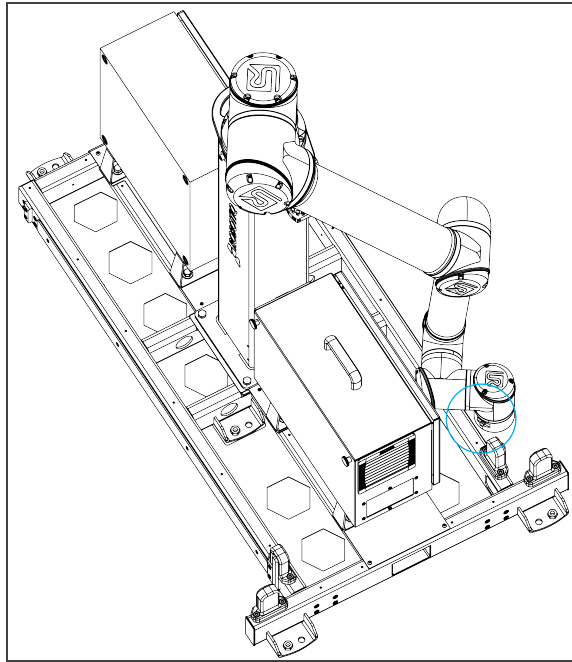
Warning

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 bodily injuries and material damages.

5. Rotate the column counterclockwise as much as possible.



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



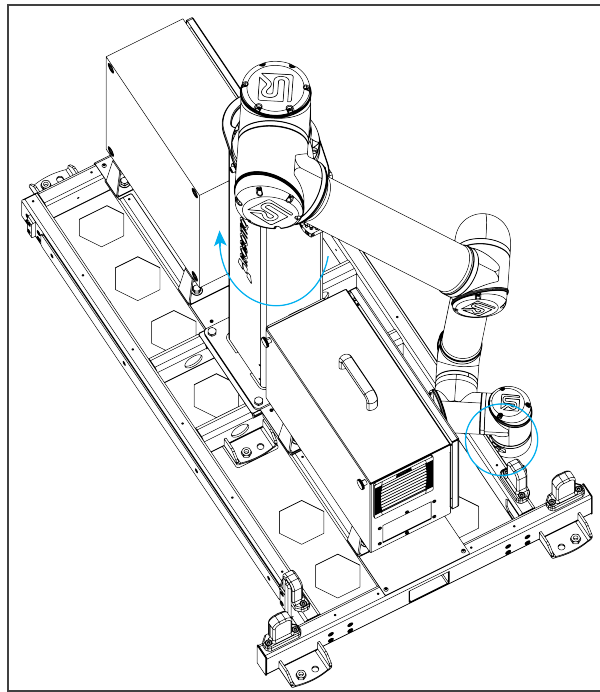
7. Move the robot so the robot tool flange is parallel to the ground: change the feature reference to Base and modify the tool position like the following: $RX=0^\circ$, $RY=180^\circ$, $RZ=0^\circ$.
8. Modify the Tool Position X value (base reference) to 333.35 mm (Make sure the TCP is set to 0 (the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

Warning

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



9. Rotate the column clockwise so that the side of the robot wrist touches the side of the base.



10. Tighten the four (4) screws to secure the column onto the base. **Torque must be 50 Nm.**
11. On the teach pendant, validate that the X value is still 333.35 mm.
12. 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° |

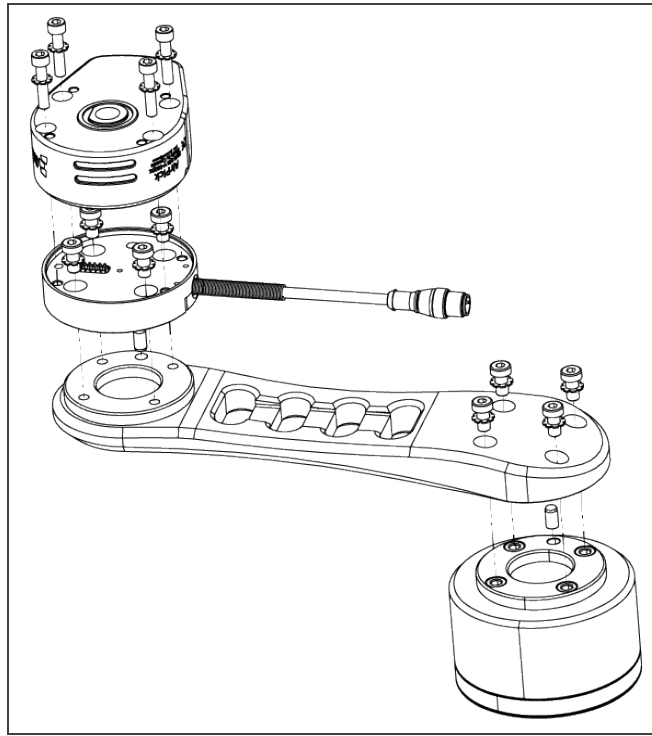
1. If additional reach is needed, install the extra reach gripper bracket on the robot tool flange using four (4) M6 screws and tooth lock washers and align properly with the dowel pin.

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.



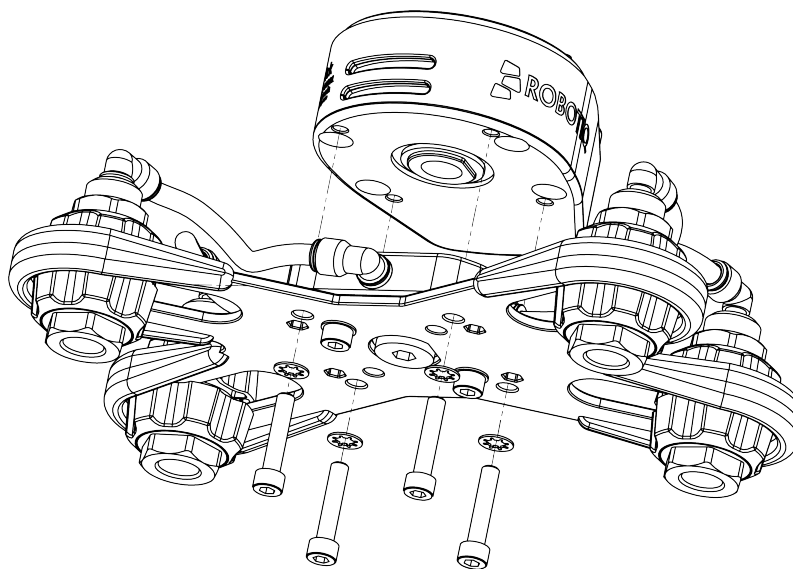


If the two or four suction cups bracket is needed:

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

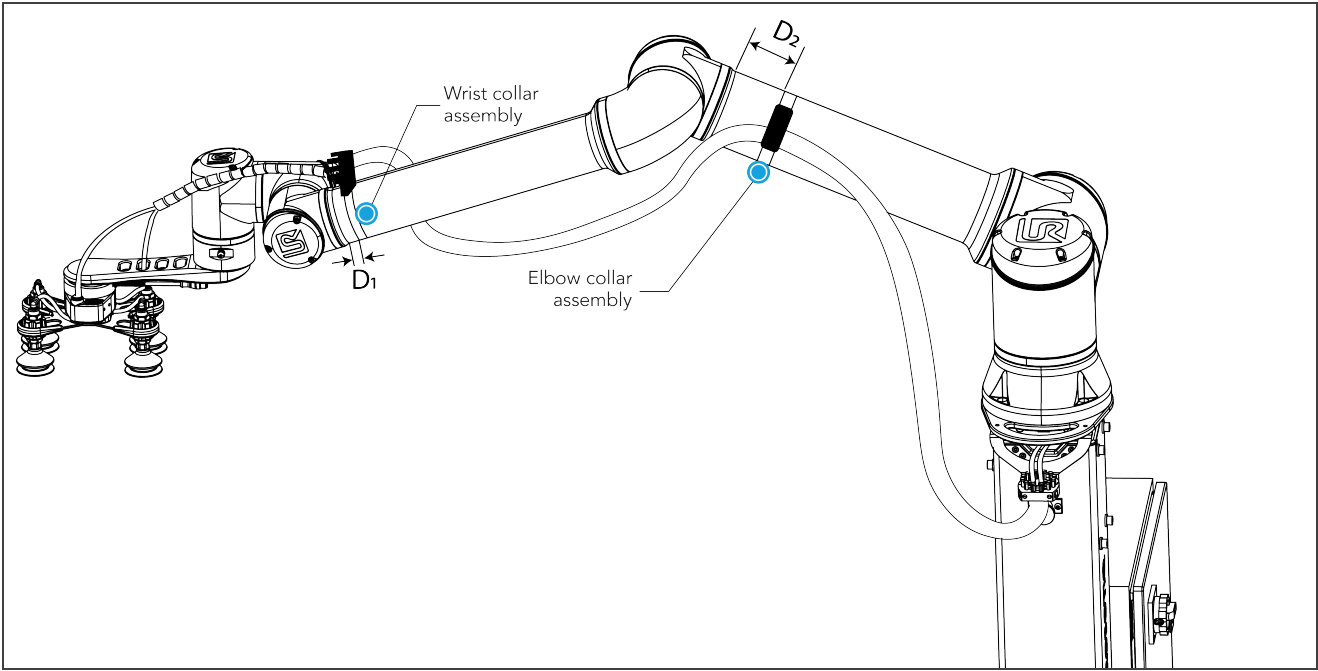
Any unused manifold port should be covered with a provided port plug to avoid air leakage.



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

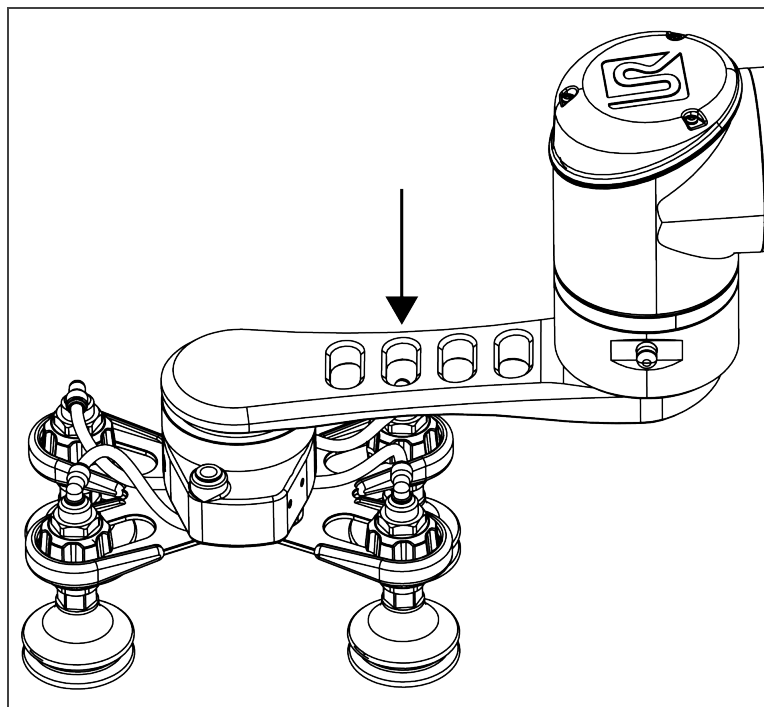
| Joint | Position |
|----------|----------|
| Base | -180° |
| Shoulder | -155° |
| Elbow | -60° |
| Wrist 1 | -80° |
| Wrist 2 | 90° |
| Wrist 3 | -90° |

1. Attach the Igus triflex® R Series (TRE.40B) cable routing system to the robot, as illustrated in the figure below:
- Using a 5 mm hex key, secure the elbow collar assembly (larger collar) to the arm. Account for the orientation and distance from the elbow (D_2).
 - Clip the mounting bracket of the elbow collar assembly on the cable carrier (align the bracket with the sticker shown in the chart below).
 - Using a 5 mm hex key, secure the wrist collar assembly (smaller collar) to the arm. Account for the orientation and distance from the wrist (D_1).



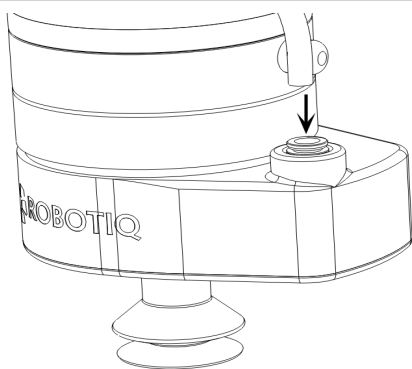
| Robot model | Elbow bracket sticker | D_2 | Wrist bracket sticker | D_1 |
|-------------|-----------------------|--------|-----------------------|-------|
| UR10 | D | 180 mm | E | 10 mm |





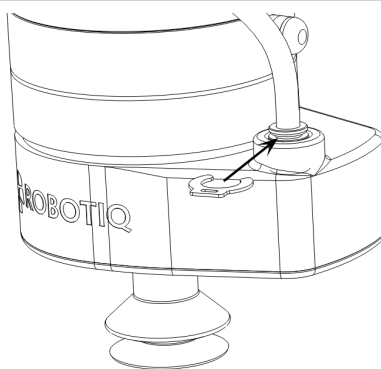
2. If you use the extra reach bracket, make sure to first run the coupling cable through the second hole of the bracket.
3. Connect the coupling cable to the connector visible at the end of the cable carrier.
4. Install Igus R-Lock clips at both ends of the cable carrier before clipping them in the brackets. It will ensure the good functioning of the cable management system.
5. Clip the mounting bracket of the wrist collar assembly on the cable carrier (align the bracket with the sticker shown in the previous chart).
6. Use cable ties to attach the tubing and cable to the strain relief part of the mounting bracket. Make sure not to crush the tubing or the cable with the cable ties.
7. Cut the air tube at the right length (815 mm / 32 in) past the plastic strain relief.
8. Connect the 8 mm air tube to the vacuum generator. Follow the steps below:

Step #1



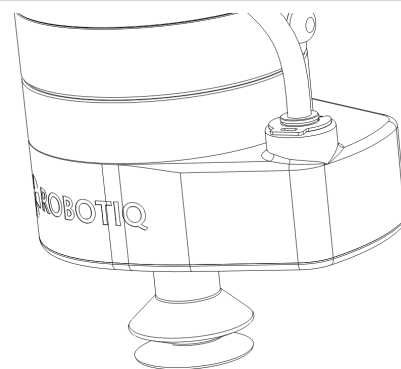
Insert the air tube in the AirPick port

Step #2



Insert the safety clip

Step #3



Ensure the safety clip is properly installed



Caution

Use dry and filtered air only. Follow the **ISO 8573-1, class 3.4.3** standard. 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. Connect the other end of the air tube to your local air supply device.

Caution

- The maximum pressure allowed is 7 bar. The optimal pressure is 7 bar (6.5 bar for an AirPick with serial number \leq V-01351).
- We recommend using a local pressure regulator with a filter and an air dryer.

11. Shut down the robot and power off the Robotiq Controller.

AirPick Gripper and Copilot Connections

1. Connect the Copilot license dongle to the USB hub in the robot controller. It must be connected at all times.
2. Run the gripper's coupling cable to the robot controller.

Info

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

3. 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 to the terminal blocks of the robot controller.

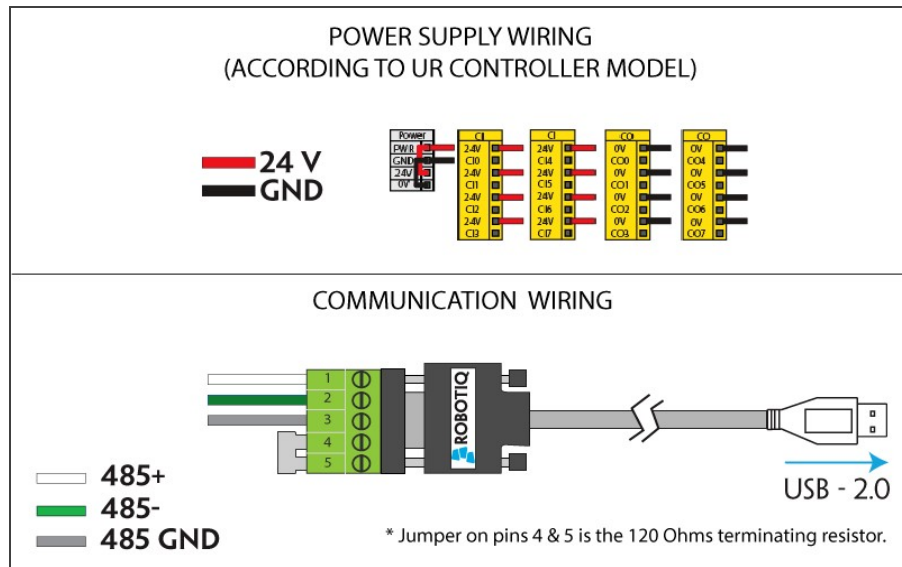


Fig. 3-1: Vacuum Gripper wiring to robot controller

4. Connect the USB cable to a USB port of the robot controller.



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

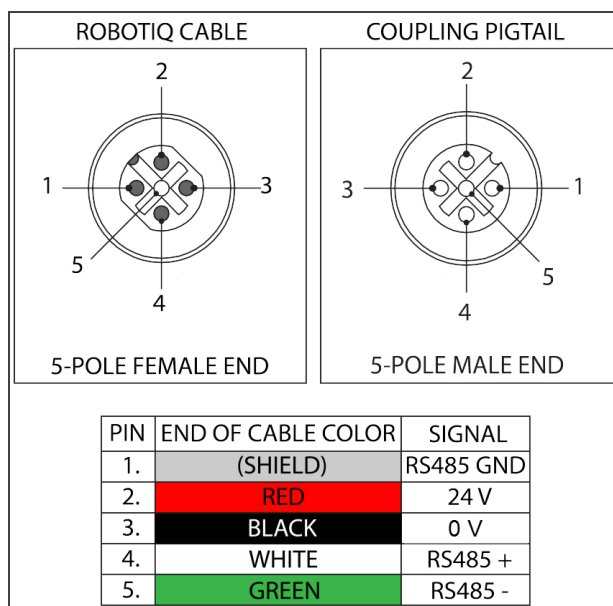


Fig. 3-2: Pinout of the Vacuum Gripper pigtail and device cable

Push Button Enclosure Connection

1. Optionally, and depending on your application, the stranded wires of the cable corresponding to the "Restart" and "Pause" buttons of the push button enclosure can be connected to the robot controller.
 - a. Run the cable to the robot controller.
 - b. Refer to the diagram in the **Robotiq Controller** section to connect the wires. Depending on the application and the safety devices used, there are alternate ways to wire the buttons to the controller. Adjust accordingly.

Warning

Button signals are not redundant. Since they are actual Pause and Restart commands, they should not be construed as safeguarding devices.



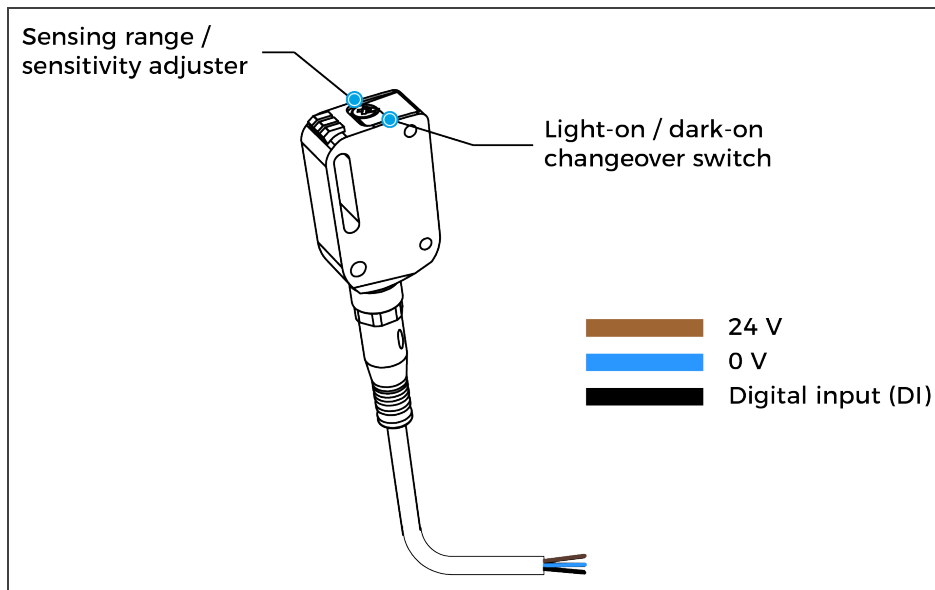
Box Sensor Connection and Installation

1. Run the box sensor's cable through a hole under the robot controller. Connect the brown (24V), blue (0V) and black (digital input) wires to corresponding connectors in terminal blocks.

Info

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

2. Install the box sensor on the bracket that best suits your setup with the provided screws.
3. Position the sensor box's bracket so it can detect the box to be picked.
4. Connect the M8 connector of the box sensor's cable to the sensor.



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.



Anchoring the Solution

Warning:

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

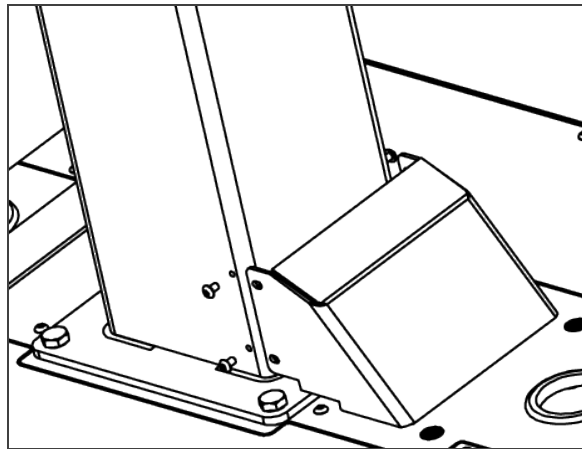
Caution

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 screws.
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. Reinstall the base covers using the 7 provided screws.
2. Install the pedestal cover using the provided screws (4).



3. Connect the power cable to the power outlet.
4. Power on the Robotiq Controller and the robot.

Warning

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



3.4.5. Conveyor

The Robotiq Palletizing Solution does not come equipped with a conveyor. However, the palletizing cell, as construed in this instruction manual, includes a conveyor. It is thus important to enforce standard EN 619 (or the equivalent in your region). The conveyor should be positioned as close as possible to the Solution (maximum 100 mm) to prevent anyone from standing between the conveyor and the Solution.

3.4.6. Physical Clearance and Reachable Area of the Robot

The computed trajectories allow the boxes or the robot to overrun the edges of the pallet when the robot moves the boxes to their final position. Mitigation measures can be put in place to prevent a transient or quasi-static impact between a box, or the robot itself, and an operator. Below are some examples:

- Physical assets such as guardrails, bollards, etc. which prevent the operator from accessing the area
- Sensors such as light curtains or area scanners which can detect the presence of a person, and stop the system before that person reaches the danger zone.
- **Add virtual planes around pallet(s)** option available in the Settings tab of the Palletizer node of the Robotiq URCap to contain the overrun within a certain distance of the pallet. Please refer to **Palletizer Node** section to learn more about this option.

Potential overrun can be determined by the following formulae:

Front overrun

The potential front overrun is the highest value obtained using the following formula:

Potential front overrun (mm) = $\max(\max(0.1 \times \text{box height}, 1280 - \text{pallet depth}, 180 + \text{extra bracket reach} + (0.1 \times \text{box height}) - (\text{minimum horizontal box dimension} / 2))$

Side overrun

Potential side overrun (mm) = $(\text{box diagonal} / 2) + \text{robot reach} + \text{extra bracket reach} - \text{pallet width} - 295$

Moreover, trajectories are not limited to hovering over the picking position, the base of the Solution, and the pallets. It is thus important to implement physical safeguarding devices that must be put in place next to the picking area, depending on the palletizing cell's layout. The robot's reachable area should be clearly identified and marked on the ground.

Info

When the robot is palletizing on one side, and no pallet is present on the opposite side, the Palletizing Solution computes trajectories based on the assumption that there are no obstacles on the opposite side. The robot's elbow (joint #2) can therefore extend to the side where no pallet is present. For a UR10, the possible overrun is represented by a cylinder of 705mm radius, aligned with the robot base's Z-axis.

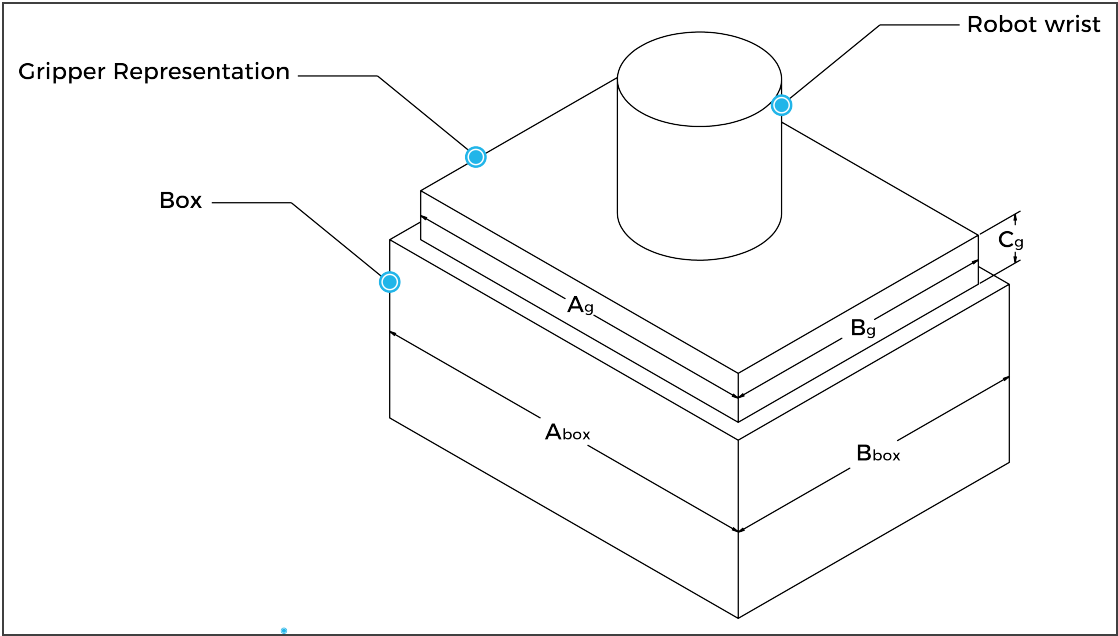


3.5. Other Grippers

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.

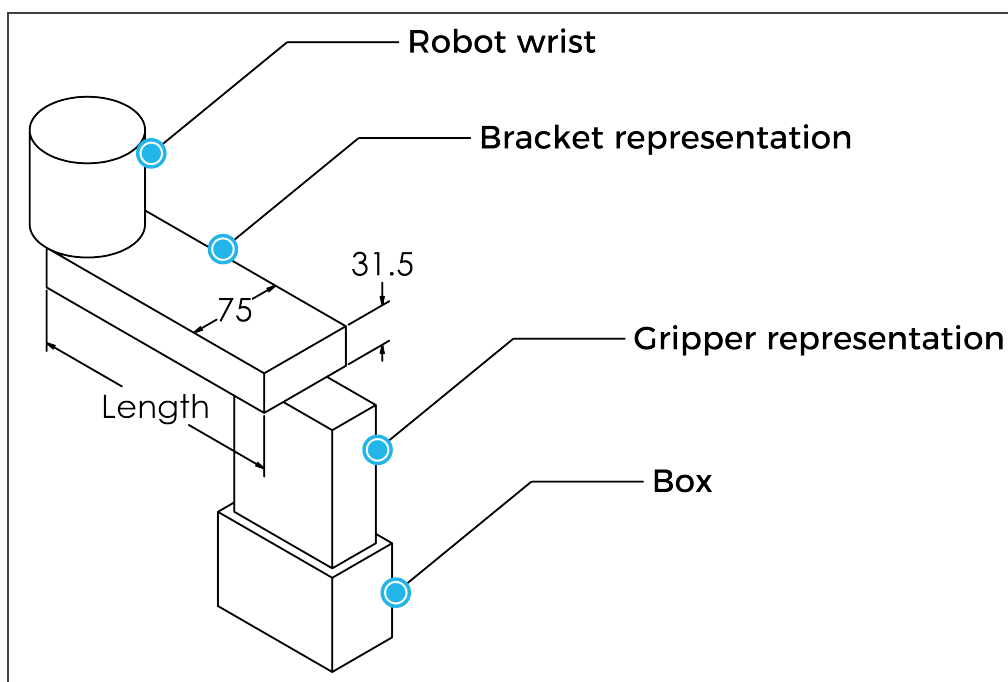
The gripper model is depending on the box dimensions and is obtained according to these criteria:

| 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.

Info

For CB-Series robots, the controller must have been produced after september 2019 (serial number > 2019301732) to be able to be installed on the 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 robot controller.

Info

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

3.7.1. Installing URCap Package

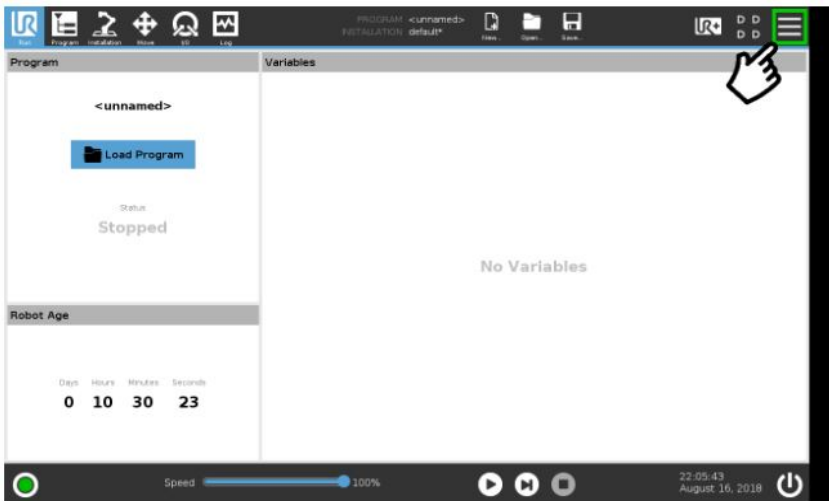
Make sure the Robotiq Paletizing solution is well installed. Refer to the **Mounting and Installation** section for detailed information. Before proceeding with the installation of the URCap package, make sure your Universal Robots controller is compatible with the package.

Tip

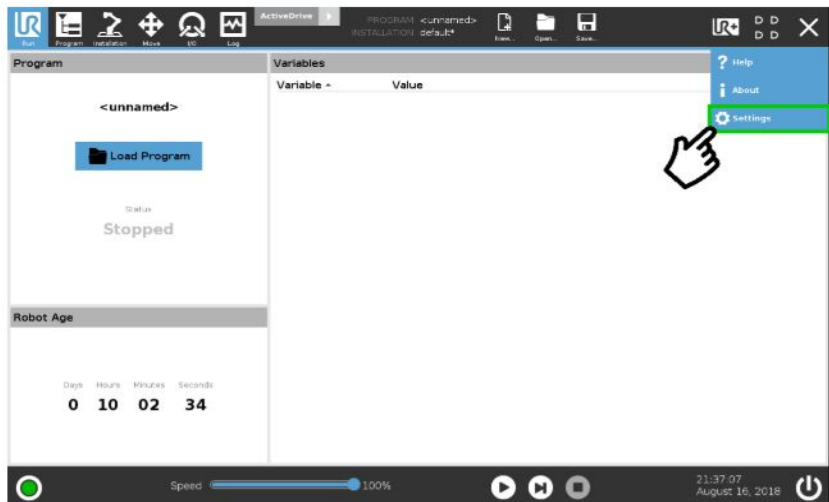
Tap the **triple bar icon** and select the **About** button to view the UR software version.



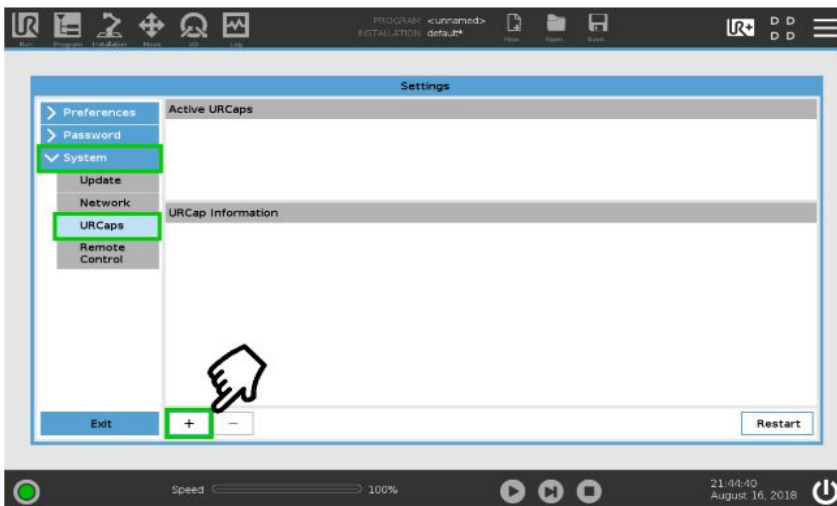
On e-Series Universal Robots



- 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.

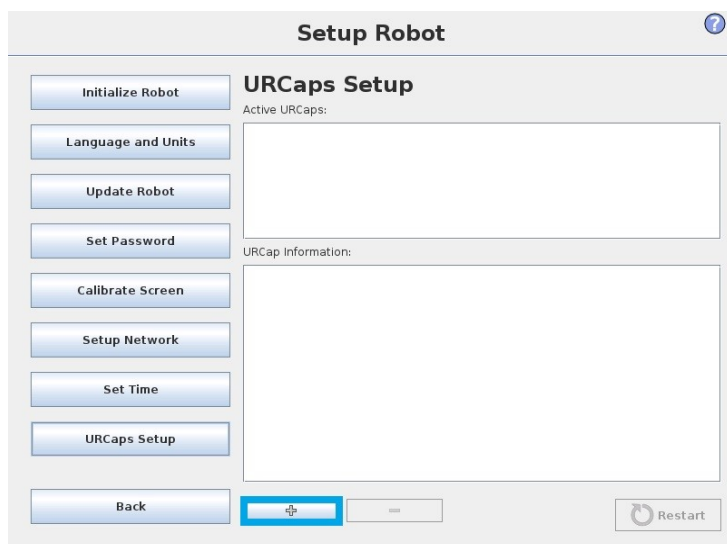
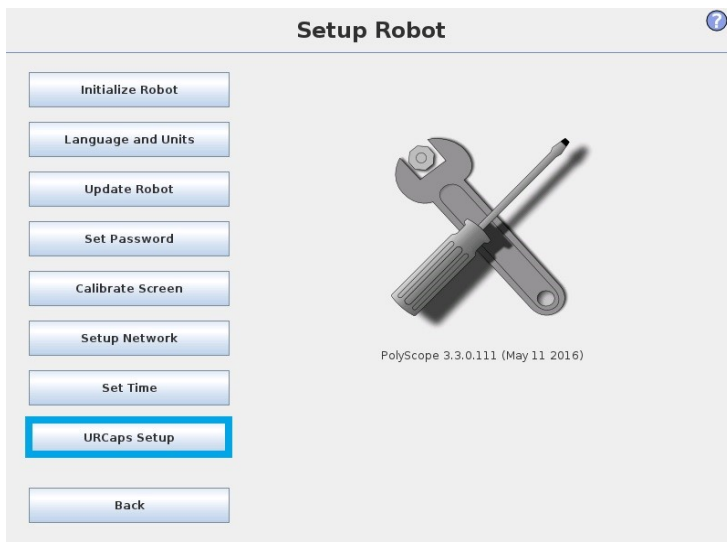
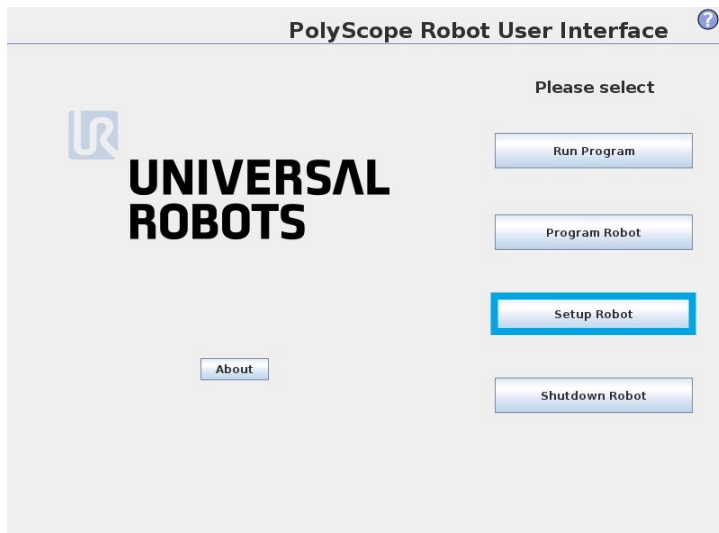




- Once the files are selected, tap the **Open** button.
- Tap the **Restart** button to complete the URCap installation. By doing so, you accept the **license agreement** detailed in the URCap information textbox.



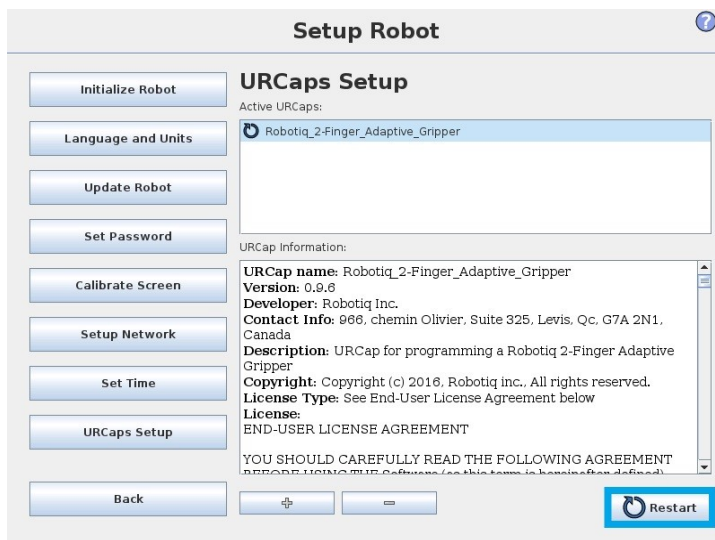
On CB-Series Universal Robots



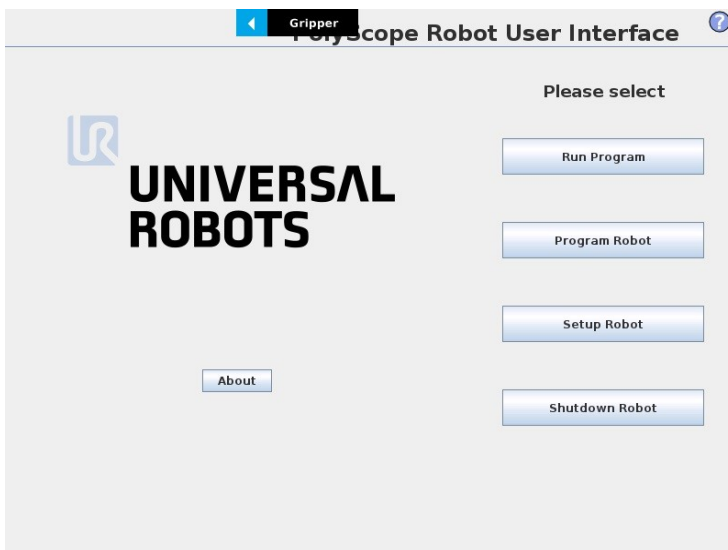
- Make sure that your PolyScope version is up-to-date and that your Universal Robots controller is compatible with the Palletizing URCap package.
- Go to www.support.robotiq.com, select **Browse by product**.
- Click on your **Robotiq product page** and then **Universal Robots**
- Click on **Software** → **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).

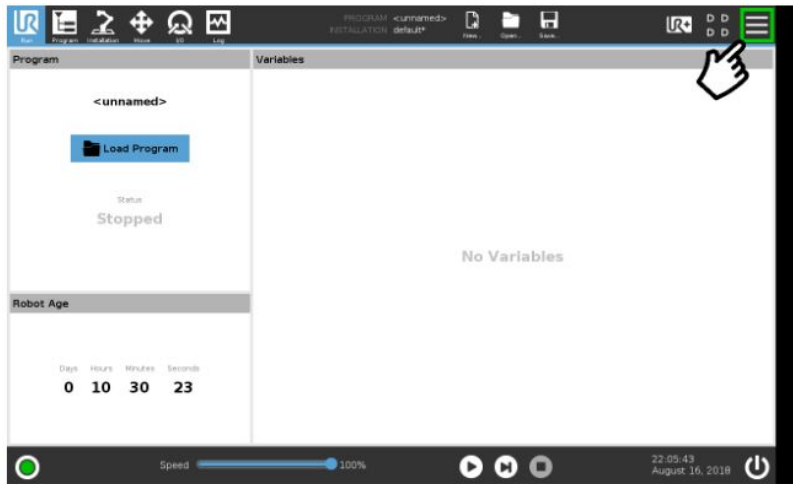


- When PolyScope reopens, the ActiveDrive toolbar will appear on the screen.

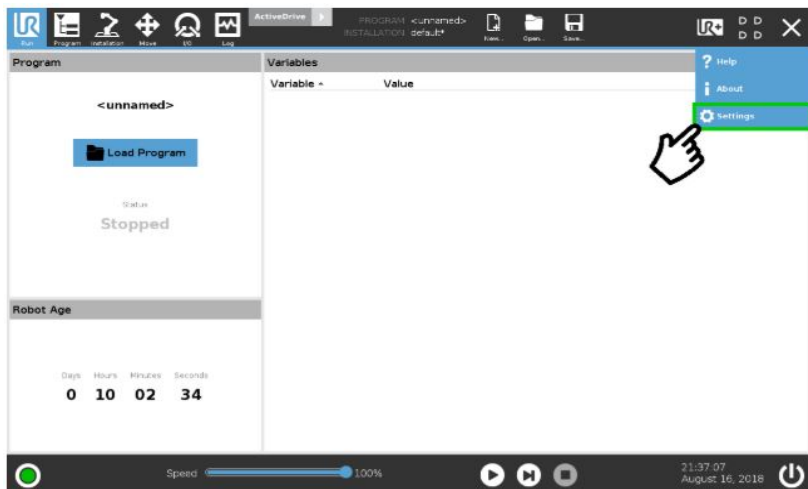


3.7.2. Uninstalling URCap Package

On e-Series Universal Robots



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



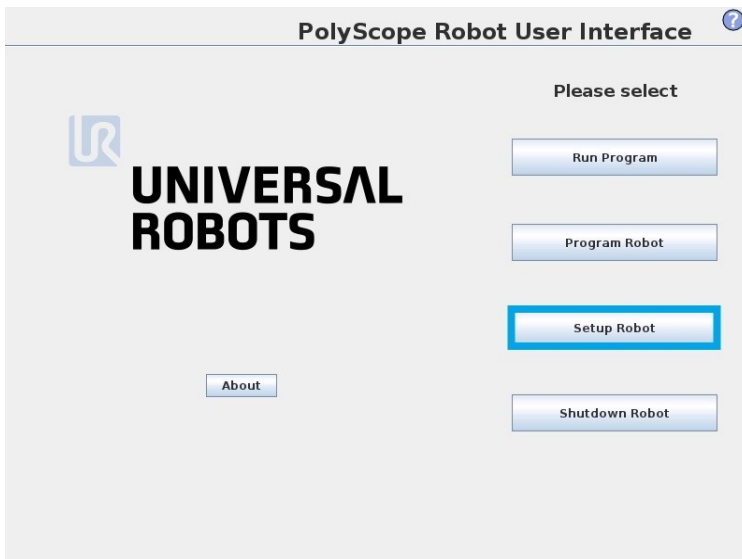
- Tap **Settings**.



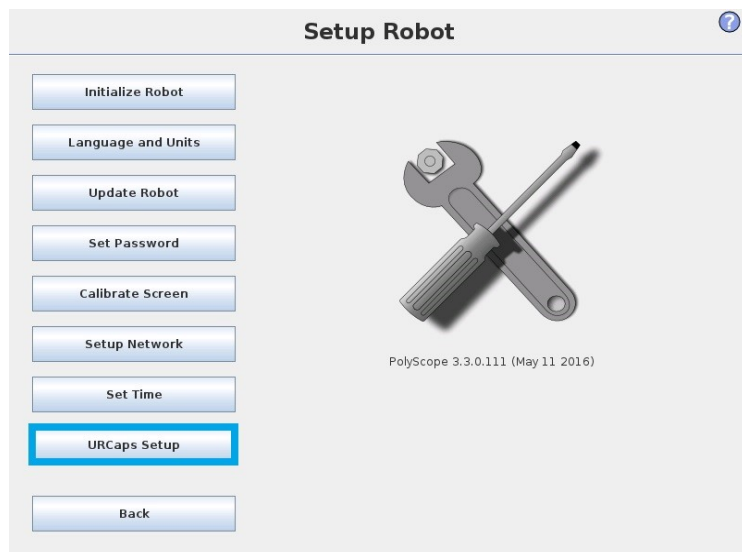
- Select **System** in the navigation pane on the left.
- Select **URCaps**.
- In the **Active URCaps** box, select the URCap to uninstall.
- Tap the **minus (-)** button to uninstall the URCap.
- Restart Polyscope to complete the uninstallation process.



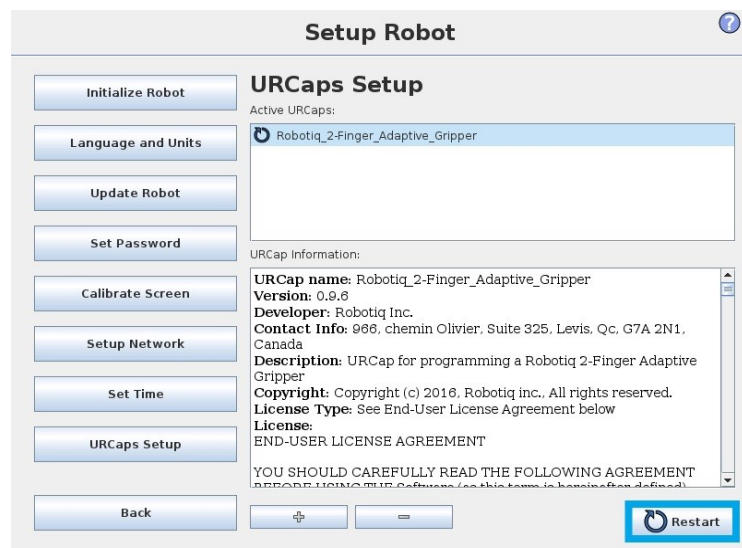
On CB-Series Universal Robots



- 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. Robot Configurations

Info

Some configurations must be done in the Safety section of the Installation tab, to ensure the proper use of the solution.

3.8.1. Robot Limits

To ensure the effective operation of the Solution, Robot Limits should stay at the Least Restrictive setting. Tool speed (1) and tool force (2) can be adjusted as required. Please note that adjusting these settings will reduce the Solution's cycle time.


! DANGER
Use of Safety Configuration parameters different from those defined by the risk assessment can result in hazards that are not reasonably eliminated or risks that are not sufficiently reduced.

☐ Factory Presets Most Restricted ————— Least Restricted

☒ Custom

| Limit | Normal | Reduced |
|-------------------|--------------|-------------|
| Power | 1000 W | 300 W |
| Momentum | 100.0 kg m/s | 25.0 kg m/s |
| Stopping Time | 1000 ms | 400 ms |
| Stopping Distance | 2000 mm | 500 mm |
| 1 Tool Speed | 1000 mm/s | 1000 mm/s |
| 2 Tool Force | 140.0 N | 150.0 N |
| Elbow Speed | 5000 mm/s | 1500 mm/s |
| Elbow Force | 250.0 N | 150.0 N |

Safety password:



3.8.2. Joint Limits

Some joint limits must be configured.

For e-Series:

1. Tap Installation → Safety → Joint Limits
2. Then, unlock the section with the proper password and change the values.
 - The minimum and maximum values for the Elbow will be -167° and 0°.
 - The minimum and maximum values for the Wrist 3 will be -270° and 270°.

Run Program Installation Move I/O Log PROGRAM <unnamed> INSTALLATION default

File Open Save

Manual

General

Safety

Robot Limits

Joint Limits

Planes

Tool Position

Tool Direction

I/O

Hardware

Three Position

Safe Home

Features

Fieldbus

URCaps

Position range

| Joints | Range | Normal Mode | | Reduced Mode | |
|----------|--------------|-------------|---------|--------------|-----------------|
| | | Minimum | Maximum | Minimum | Maximum |
| Base | -363 — 363 ° | -363 | 363 | -363 | 363 +2 ° / -2 ° |
| Shoulder | -363 — 363 ° | -363 | 363 | -363 | 363 +2 ° / -2 ° |
| Elbow | -363 — 363 ° | -167 | 0 | -363 | 363 +2 ° / -2 ° |
| Wrist 1 | -363 — 363 ° | -363 | 363 | -363 | 363 +2 ° / -2 ° |
| Wrist 2 | -363 — 363 ° | -363 | 363 | -363 | 363 +2 ° / -2 ° |
| Wrist 3 | -363 — 363 ° | -270 | 270 | -363 | 363 +2 ° / -2 ° |

Maximum speed

| Joints | Maximum | Normal Mode | | Reduced Mode | |
|----------|--------------|-------------|---------|--------------|---------|
| | | Minimum | Maximum | Minimum | Maximum |
| Base | max: 131 °/s | 131 | | 131 | -11 °/s |
| Shoulder | max: 131 °/s | 131 | | 131 | -11 °/s |
| Elbow | max: 191 °/s | 191 | | 191 | -11 °/s |
| Wrist 1 | max: 191 °/s | 191 | | 191 | -11 °/s |
| Wrist 2 | max: 191 °/s | 191 | | 191 | -11 °/s |
| Wrist 3 | max: 191 °/s | 191 | | 191 | -11 °/s |

Safety password:

Power off Speed 100% Simulation



For CB-Series:

1. Tap Installation → Safety → Joint Limits → Position range
2. Then, unlock the section with the proper password and change the values.
 - The minimum and maximum values for the Elbow will be -167° and 0°.
 - The minimum and maximum values for the Wrist 3 will be -270° and 270°.

The screenshot shows the 'Safety Configuration' window with the 'Joint Limits' tab selected. The 'Position range' option is chosen. The table below shows the configured limits for various joints.

| Joints | Range | Normal Mode | | Reduced Mode | | |
|----------|--------------|-------------|---------|--------------|---------|-------------|
| | | Minimum | Maximum | Minimum | Maximum | |
| Base | -363 — 363 ° | -363 | 363 | -363 | 363 | +3 ° / -3 ° |
| Shoulder | -363 — 363 ° | -363 | 363 | -363 | 363 | +3 ° / -3 ° |
| Elbow | -363 — 363 ° | -167 | 0 | -363 | 363 | +3 ° / -3 ° |
| Wrist 1 | -363 — 363 ° | -363 | 363 | -363 | 363 | +3 ° / -3 ° |
| Wrist 2 | -363 — 363 ° | -363 | 363 | -363 | 363 | +3 ° / -3 ° |
| Wrist 3 | -363 — 363 ° | -270 | 270 | -363 | 363 | +3 ° / -3 ° |

At the bottom, there is a 'Safety password' field, 'Unlock', 'Lock', and 'Apply' buttons.



3.8.3. Configurable Inputs

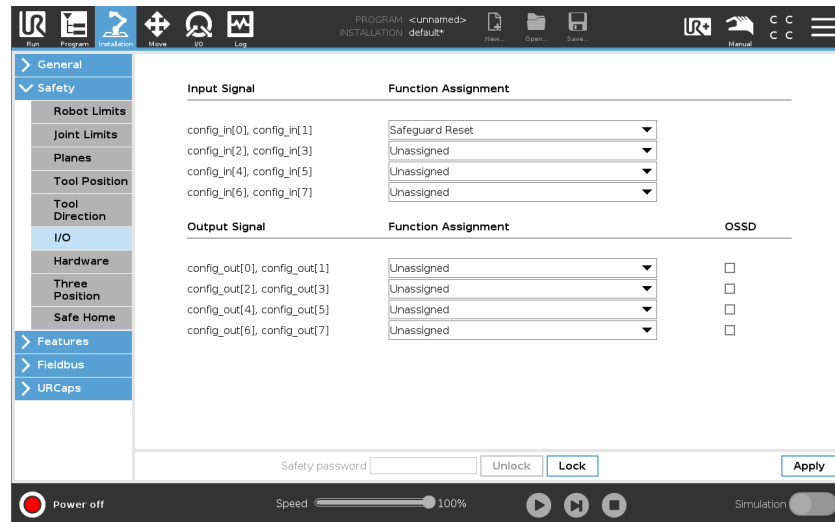
Two of the buttons found on the push button enclosure can be configured to trigger “Pause” and “Restart” commands.

Warning

Button signals are not redundant. Since they are actual Pause and Restart commands, they should not be construed as safeguarding devices.

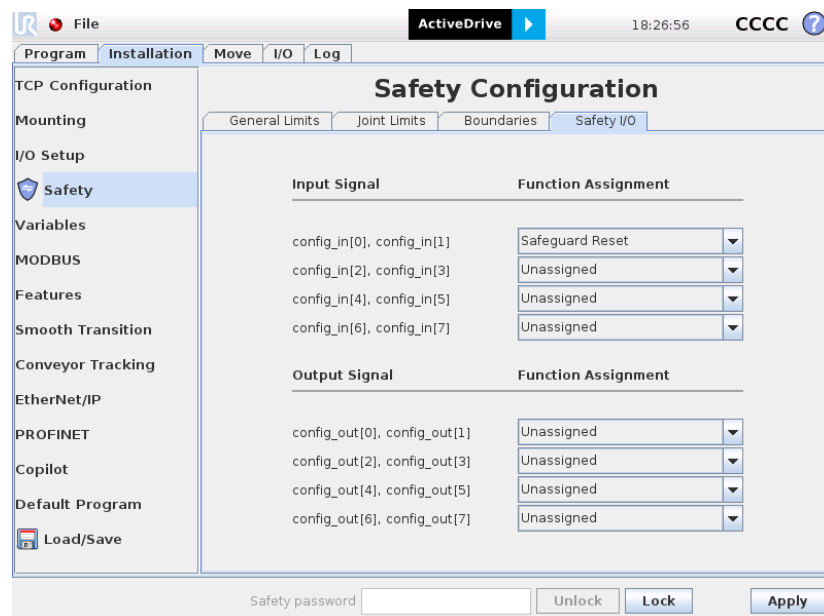
For e-Series Universal Robots:

1. Tap Installation → Safety → I/O
2. Unlock the section with the proper password and set the Input Signal config_in[0], config_in[1] to Safeguard Reset.



For CB-Series Universal Robots:

1. Tap Installation → Safety → Safety I/O
2. Unlock the section with the proper password and set the Input Signal config_in[0], config_in[1] to Safeguard Reset.



3.8.4. Safety Planes

Safety planes, programmable via UR's PolyScope, can be added to the front and sides of pallet zones as safeguarding measures in case of system failure, mainly to prevent the robot from overrunning the edges of the pallet while carrying boxes. Please refer to the instruction manual of the UR robot used for more details in regard to adding and setting up safety planes.

Info

The trajectories computed in the Palletizer node allow boxes to overrun the edge of the pallet. This should be accounted for when adding and setting up safety planes. Please refer to **Physical Clearance and Reachable Area of the Robot** section for more information. The values can vary depending on your configuration.



3.9. License Agreement

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ures and furnish him with information, screenshots and try to reproduce such bugs, defects or failures upon Licensor's demand.

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13. **Miscellaneous.**
 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. Test the box sensor and the digital input : Tap the **I/O** tab and place an object in front of the box sensor to validate if the signal changes.
5. Test the Vacuum Gripper: Tap **Installation** → **URCaps** → **Vacuum** → **Scan**. Then, test the grip and release functions of the Vacuum in the Gripper Toolbar.



4.2. Light States

Light States Legend

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

| Color and signal type | Condition status | Cause or action needed (troubleshooting for e-Series) |
|-----------------------|---|--|
| RED Fast blink | The Robotiq Controller (PLC) is unable to communicate with the robot controller (UR) | <ul style="list-style-type: none"> • The robot has been started and needs time to boot up (Polyscope has not loaded yet) • Make sure your Ethernet/USB adapter is properly connected: the LED on the Ethernet adapter should be ON. • Make sure the Ethernet cable between the Robotiq Controller and robot controller is properly connected (to the USB adapter) . • Try powering off the system (both the robot and the Robotiq Controller). Wait 1 minute. Power up the system again. |
| RED Solid | A Protective or Emergency stop has occurred. | <ul style="list-style-type: none"> • Follow the procedures required by the system to recover from either a Protective or Emergency stop. |
| YELLOW Slow blink | A Safeguard Stop has occurred. | Press the safeguard reset button. |
| BLUE Solid | <ul style="list-style-type: none"> • The pallet is complete or missing; <p style="text-align: center;">AND</p> <ul style="list-style-type: none"> • The system is palletizing on the other side. | Place a new pallet |
| BLUE Fast blink | <ul style="list-style-type: none"> • The pallet is complete and the system is idle; <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> • The pallet is not detected and the system is idle. | Place a new pallet |
| WHITE Solid | <ul style="list-style-type: none"> • The Robotiq Controller (PLC) is connected to the robot controller • A program is running without a Palletizer node. | N/A |
| GREEN Solid | A program with a Palletizer node is running but the pallet present is not completed. | N/A |



5. Software

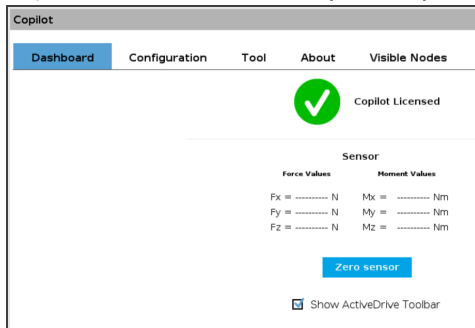
5.1. Installation on e-Series Universal Robots

Caution

To ensure normal operation, make sure the Copilot license dongle remains connected at all times.

1. Connect the license dongle to the USB hub in the UR controller. Make sure your Copilot license is activated:

- a. Tap **Installation** tab > **URCaps** > **Copilot**.



- b. The Copilot license activation will display under the **Dashboard** tab.

2. Set up the Copilot software based on your configuration and application

For e-Series Universal Robots

Tap Installation → URCaps → Copilot → Configuration

For CB-Series Universal Robots

Tap Installation → Copilot → Configuration

Then,

- a. Select the Palletizer model used
 - i. In the Configuration tab, under Palletizing Solution, select Pedestal
 - ii. Select the pedestal height. Use the Robotiq Configurator to simulate your palletizing cell and obtain the exact height.
- b. If required, deactivate the **Use Copilot to manage a soft speed transition when resuming from a Safeguard stop** option. This is required when another URCap or a Polyscope option (for example, ProfiNET or Ethernet/IP) needs to control the speed slider.
- c. If required, select the **Confirm new pallet(s) ready** option. This feature enables the **Confirm new pallet(s) ready** button found on the push button enclosure. When ticked, the **Confirm new pallet(s) ready** option prevents the Palletizer from palletizing on a new pallet detected by the pallet sensors. In order to start the palletization on that new pallet, the operator has to press the **Confirm new pallet(s) ready** button.



- d. If required, select the **Add 25 mm minimum distance between robot arm and base** option. When ticked, this feature ensures a 25 mm clearance between the moving parts and the base of the Solution during trajectory execution.

Caution

When adding moves other than those generated automatically by the Palletizer node, it is the responsibility of the user to observe this distance at all times.

Info

This option can influence box throughput and the furthest positions reachable by the robot end effector. It should only be used in situations where it is strictly necessary.

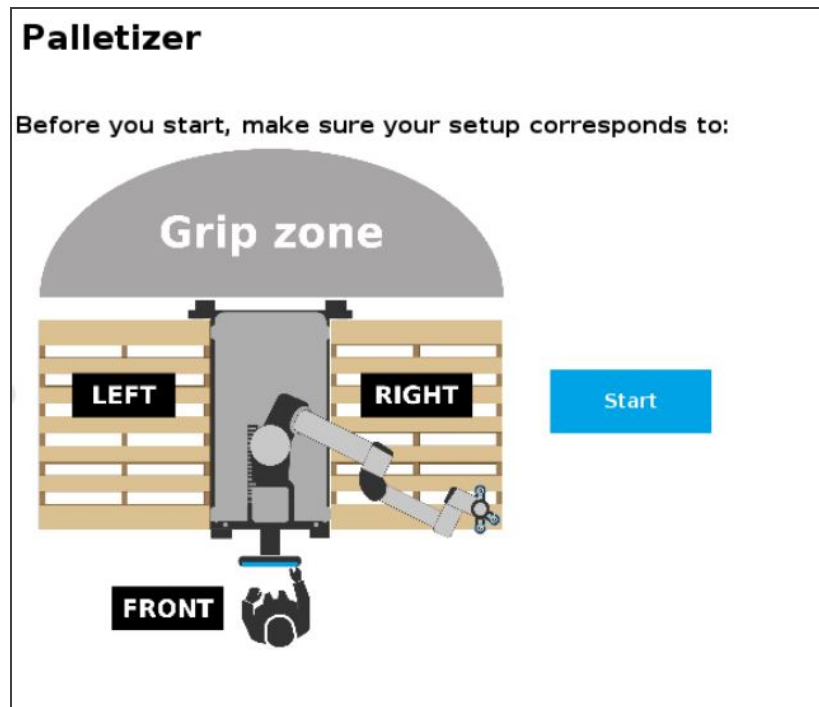
- e. If required, activate the **Limit height for Palletizer program node (low ceiling)** option and enter the maximum height that can be reached by the moves automatically generated by the Palletizing solution. Make sure to keep a clearance to prevent a collision with the ceiling.

| Dashboard | Configuration | Tool | About | Visible Nodes |
|--|---------------|------|-------|---------------|
| General <input checked="" type="checkbox"/> Use Copilot to manage a soft speed transition when resuming from a Safeguard stop | | | | |
| Palletizing Solution Model <div> <input type="radio"/> AX Series <input type="checkbox"/> Start linear axis at program start </div> <div> <input checked="" type="radio"/> PE Series Pedestal height <input type="text" value="1500"/> mm </div> <div> <input type="checkbox"/> Enable "Confirm new pallet(s) ready" button </div> <div> <input type="checkbox"/> Add 25 mm minimum distance between robot arm and base </div> <div> <input type="checkbox"/> Limit height for Palletizer program node (low ceiling) <input type="text" value="3.5"/> m </div> | | | | |
| Force Torque Sensor <input checked="" type="checkbox"/> Show collision detection options Causes a program to stop when the forces and torques monitored by the FT sensor exceed the defined limits. <div> <input type="radio"/> Start monitoring <input checked="" type="radio"/> Stop monitoring </div> | | | | |



5.1.1. Palletizer Node

- 1 Before you start programing 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

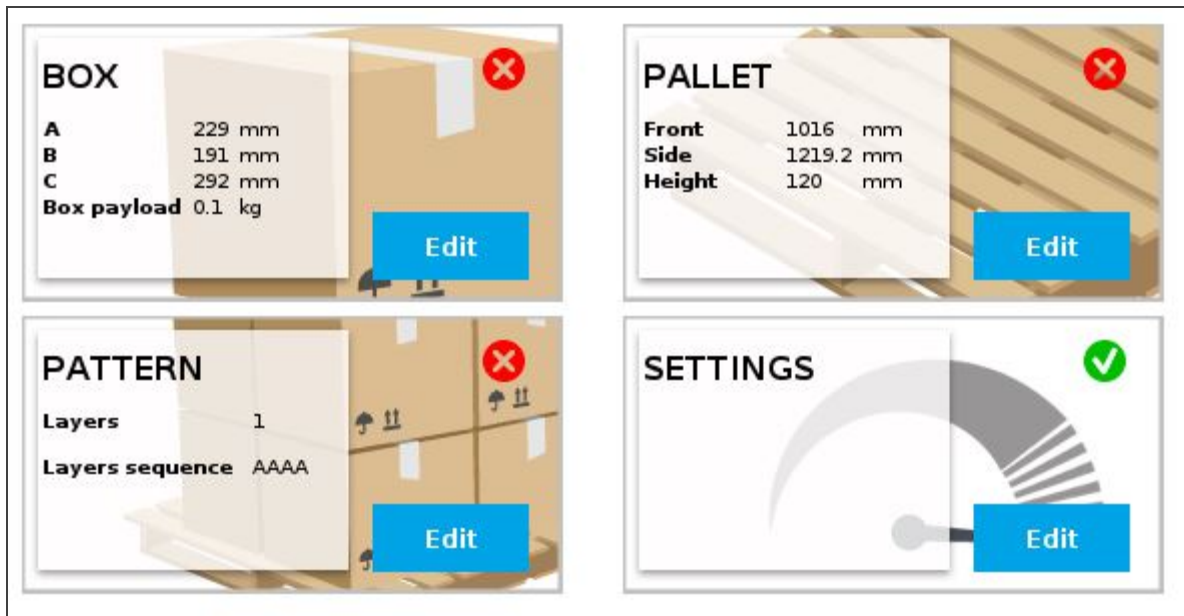
To use the palletizer node in its **depalletizing mode**, see figure in step 13.

Info


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

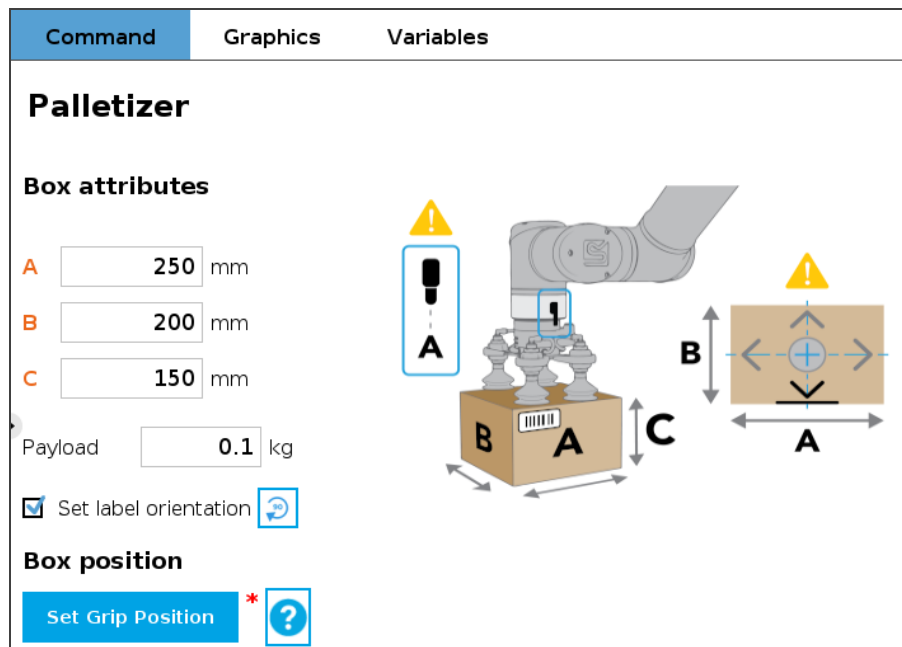


5 To begin, click on **BOX** to set your box dimensions.



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

- Width (A)
- Depth (B)
- Height (C)
- Payload
- If you have labels that need to be oriented on your pallets, check the **Set label orientation** box.
 - You can choose the side on which the label will appear on your box, by clicking on the  button.




- 7 By clicking on the **Set Grip Position** (palletizing mode) or the **Set Drop Position** (depalletizing mode) button, you will have access to determine the coordinates in **X, Y and Z** of your robot, in which the grip or drop position (on a conveyor, for instance) will be:
- Position the robot tool flange connector on side A (same side as the robot wrist), as shown in the picture above. Robot joints should be positioned as close as possible to the center of their motion range.
 - Make sure to align the TCP with the center of the box.
 - Once you are done, click on **Ok**.

The height at which the pedestal has been set is displayed in the interface. Make sure the value displayed corresponds to the height of the actual pedestal.

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

Palletizer


BOX



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

Edit


PALLET



Front 1016 mm
Side 1219.2 mm
Height 120 mm


Edit

PATTERN



Layers 1
Layer sequence A

SETTINGS



Edit



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

a Select the desired pallet:

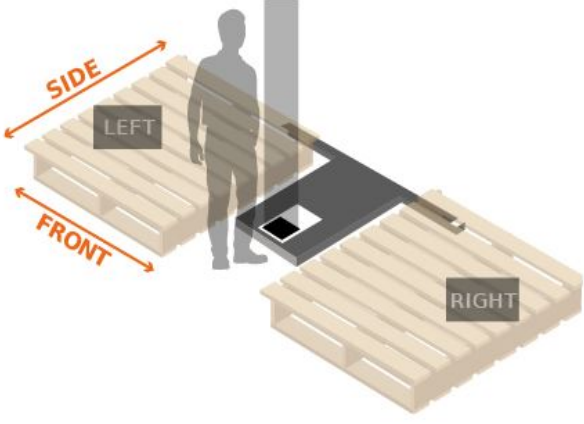
- Right or left
- Both pallets

b Determine the dimensions of the:

- Front
- Side
- Height

Palletizer

Pallet dimensions



Front mm

Side mm

Height mm

Pallet selection *

☐ Pallet LEFT

☐ Pallet RIGHT

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

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

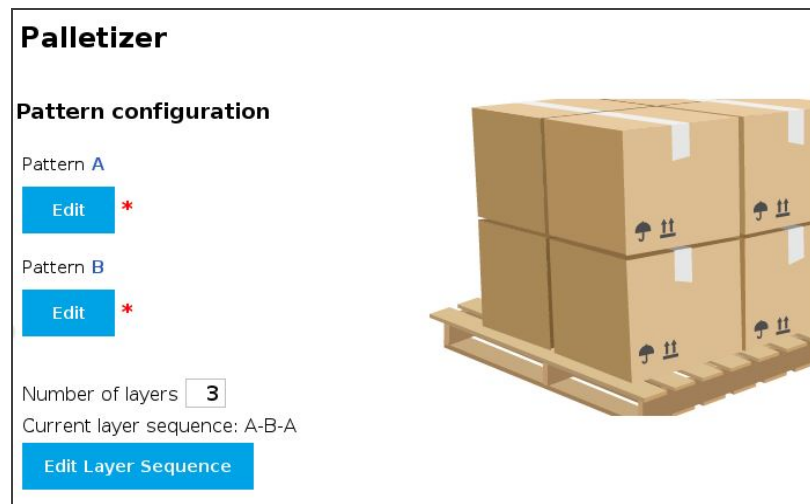
PATTERN

Layers 1
Layer sequence A

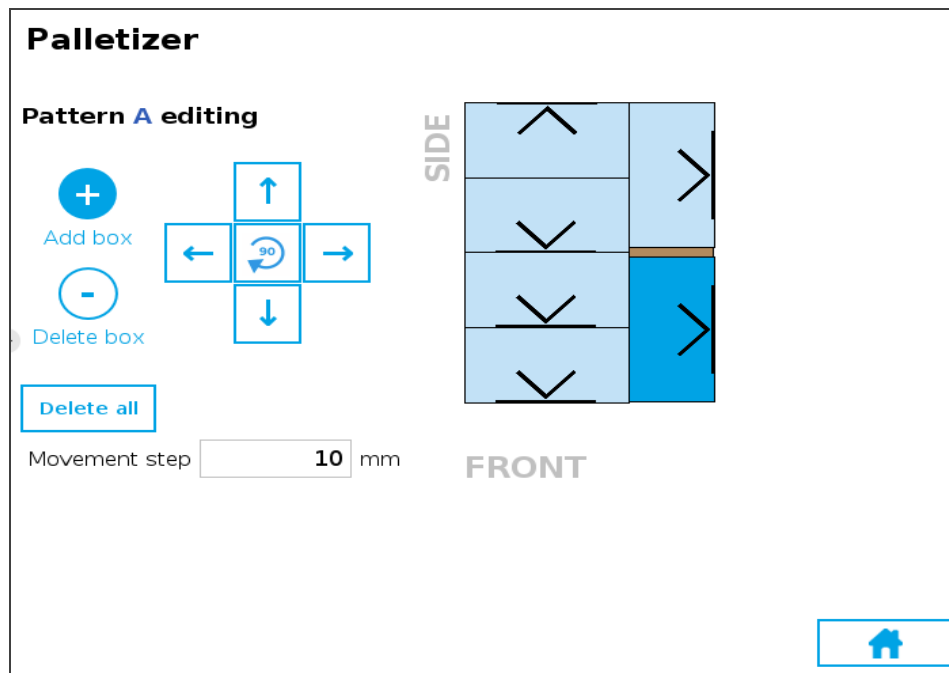
SETTINGS



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.
 - Configure the pattern you chose (A, B or both):
 - i. Click on the **+** button to add boxes.
 - ii. Use the arrows to move and position the boxes on the pallet, as desired.
 - If you have ticked the **Set label orientation** checkbox in the box parameters, the side of the box with the label will be identified.



- Enter the number of layers needed.

Palletizer


Pattern configuration

Pattern A
 Edit *

Pattern B
 Edit *

Number of layers

Current layer sequence: A-B-A
 Edit Layer Sequence



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

Palletizer


Layer Sequence

Select the pattern used for each layer:

3 ☒ A ☐ B

2 ☐ A ☒ B

1 ☒ A ☐ B



- 12 Three (3) of your parameters are now set. Click now on the **SETTINGS** button and complete your configuration as indicated below.

Palletizer

Settings

Acceleration and speed are also limited by UR safety settings

| | Tool speed | Tool acceleration |
|-------------|------------|-----------------------|
| With box | 500 mm/s | 750 mm/s ² |
| Without box | 1000 mm/s | 750 mm/s ² |

Box presence input: digital_in[0]

Palletizer mode: ☒ Palletizing ☐ Depalletizing

Box and pallet display units: ☒ Metric ☐ Imperial

☒ Validate pallet state at program startup

Allow gripper to pick the box at different angles: ☐ 90° ☒ 180°

☒ Avoid collision with conveyor [Configure](#)

☒ Add virtual planes around pallet(s)

Distance: 0 mm

ROBOTIQ

Info

The term **Tool** refers to the Gripper.

- Set tool speed and acceleration, with or without the box.
- Select the digital input for the box sensor.
- To use the Palletizer node in the depalletizing mode, select **Depalletizing**.
- The checkbox **Validate pallet state at program startup** is checked by default. If you unselect it :
 - The first time the program is run, the system will consider that the pallets are empty (palletizing mode) or full (depalletizing mode).
 - If the program is interrupted, the current status (number of boxes processed on each pallet) will be kept.
 - If the program is saved, the status will be saved with it and the next time the program will be loaded, it will restart from this status.
 - If you start a program where the checkbox is checked by default, you can have either one of these pop-up information.



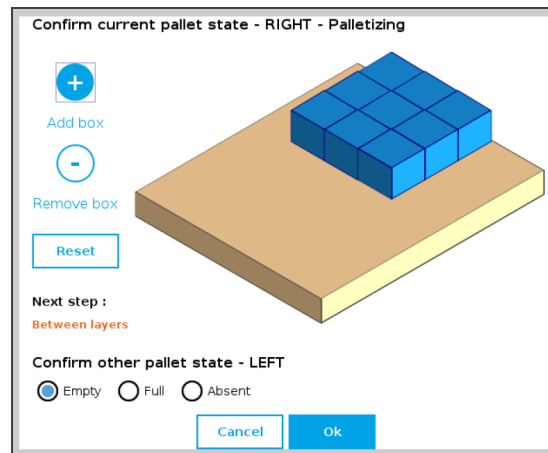
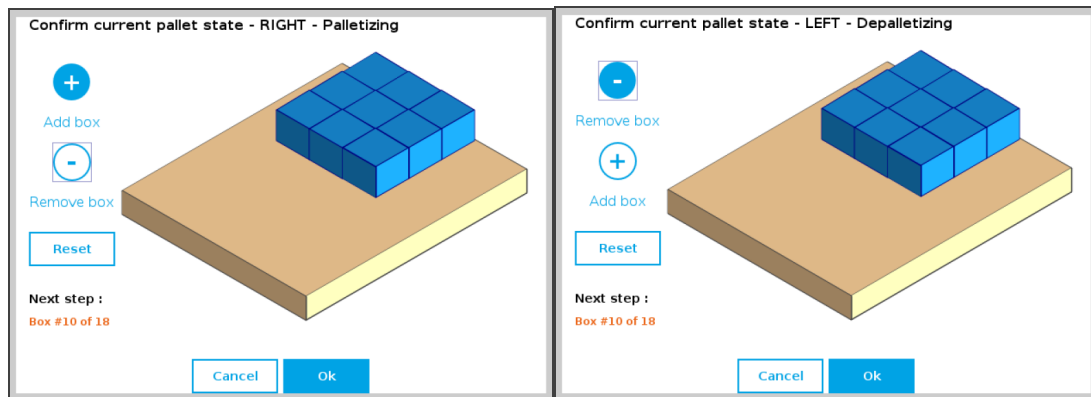


Fig. 5-1: Using pallets on both side requires confirming the other pallet state.

5. By default, the 90° and 180° checkboxes (**Allow gripper to pick the box at different angles**) are ticked. This allows the gripper to perform rotations of 90° or 180° around the Z-axis for trajectory optimization. It can be unticked if it is not possible for the gripper to pick the box at 90° or 180° relative to the gripping position originally taught.
6. To configure a collision avoidance with a conveyor, select the **Avoid collision with conveyor** checkbox. Choose the applicable configuration (perpendicular, parallel or custom) and fill in the fields following the indications on the associated image.



Palletizer

Conveyor ☒ Perpendicular ☐ Parallel ☐ Custom

C1 mm

C2 mm

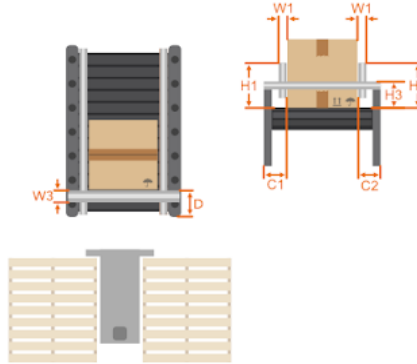
D mm

H1 mm

H3 mm

W1 mm

W3 mm



Palletizer

Conveyor ☐ Perpendicular ☒ Parallel ☐ Custom

Direction

☒ From left

☐ From right

C1 mm

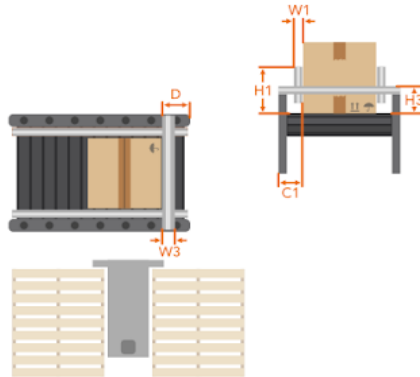
D mm

H1 mm

H3 mm

W1 mm

W3 mm



Palletizer

Conveyor ☐ Perpendicular ☒ Parallel ☐ Custom

Direction

☐ From left

☒ From right

C2 mm

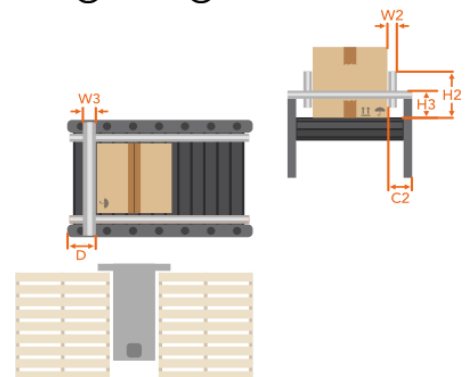
D mm

H2 mm

H3 mm

W2 mm

W3 mm



Palletizer

Conveyor ☐ Perpendicular ☐ Parallel ☒ Custom

A °

C1 mm

C2 mm

D mm

H1 mm

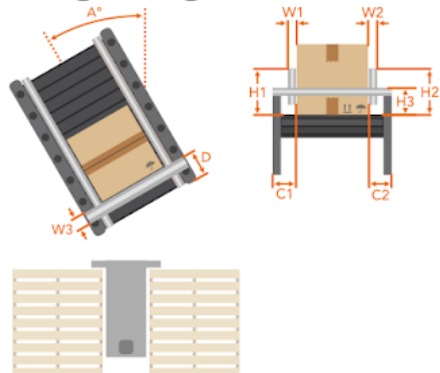
H2 mm

H3 mm

W1 mm

W2 mm

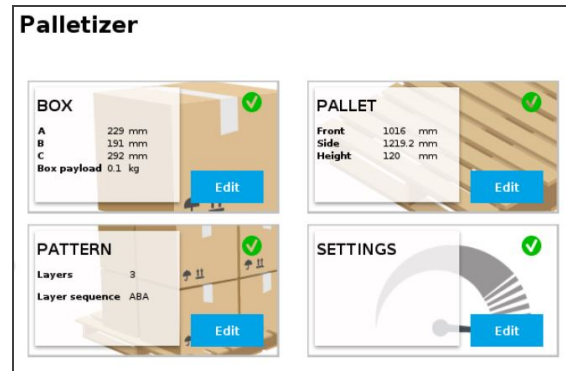
W3 mm



7. If required, select the **Add virtual planes around pallet(s)** option. When ticked, this feature adds virtual planes when the trajectories are computed, in order to prevent the boxes and the robot from extending too far beyond the edges of the pallet during approach. To ensure a proper operation of the Solution, a minimum distance of 50 mm is recommended.

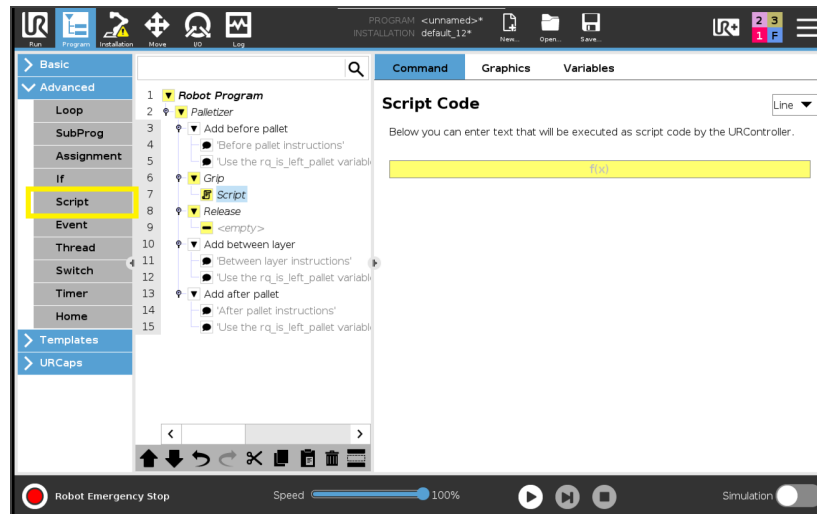


13 All your Palletizer parameters have been configured. You are now ready to start your Solution.

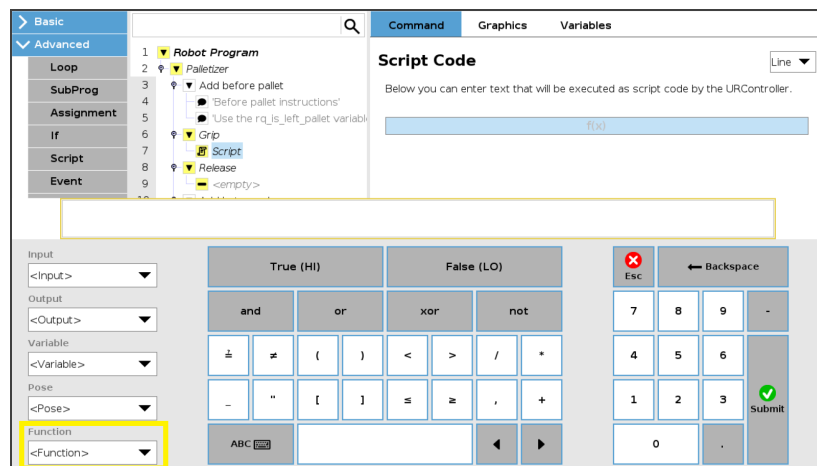


5.2. Palletizing Script Functions

1 Palletizing functions are made available in the **Script** drop-down menu.



2 Tapping on the Script Code textbox ($f(x)$), then on the drop-down **Function** menu gives access to the script functions list.



5.2.1. Number of Processed Boxes

Description

This function must be used inside the palletizer node in order to work properly (see example) and returns the number of processed boxes.

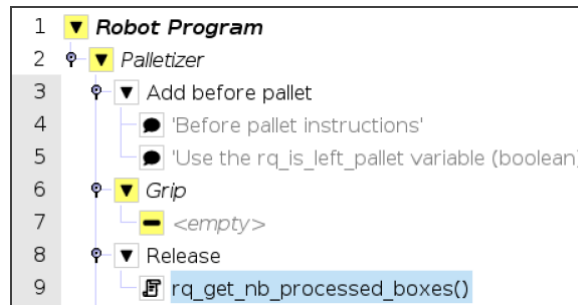
Declaration

`rq_get_nb_processed_boxes()`

Return value

This function returns an integer which expresses the number of processed boxes.

Example of use



5.2.2. Set Pallet Completed

Description

Use this function inside a **Grip** or **Release** folder. The palletizer will process the current box and go directly to the **Add after pallet** folder. The **Add between layer** folder will not be executed.

Declaration

`rq_set_pallet_completed()`

Return value

There is no return value with this function.

5.2.3. Get Pallet State

Description

This function can be used anywhere in the program. It returns the state of a pallet.

Declaration

`rq_get_pallet_state(is_pallet_left)`

Parameters

- Enter **True** to get the state of the **left** pallet.
- Enter **False** to get the state of the **right** pallet.

Return value



This function returns an integer from 0 to 3 :

- 0 = Waiting, Idle : Solution is waiting for a new pallet or a user confirmation that the pallet is ready.
- 1 = Ready : Pallet is ready to begin the palletizing or depalletizing process.
- 2 = In progress : Palletizing/depalletizing is in progress on the pallet.
- 3 = Completed : Pallet is full (palletizing) or empty (depalletizing).

5.2.4. Set Palletizer State

Description

This function must be used outside the palletizer node in order to work properly. It configures the state of a Palletizer node.

Declaration

```
rq_set_palletizer_state(palletizer_index, processed_boxes, next_step, other_pallet_state=INACTIVE, current_pallet=CURRENT)
```

Parameters

- **palletizer_index** : Palletizer nodes for which the state will be numerically ordered, beginning from 0 (the first node number will be 0, the second node number will be 1 and so on).
- **processed_boxes** : Number of boxes palletized or depalletized on the current pallet.
- **next_step** : Next step on the current pallet.
 - BOX : The robot will place a box on next step.
 - BEFORE_PALLET : The robot will execute the **Add before pallet** on next step.
 - BETWEEN_LAYERS : The robot will execute the **Add between layer** on next step.
 - AFTER_PALLET : The robot will execute the **Add after pallet** on next step.
 - NEXT_PALLET : On next step, the robot will start processing the other pallet.
- **other_pallet_state** : State of the other pallet (not currently processed).
 - EMPTY : There is no box on the pallet.
 - FULL : The pallet is full of boxes.
 - ABSENT : The pallet is not in place.
 - INACTIVE : When the Palletizer node does not use the other pallet.
- **current pallet** : The pallet on which the robot is currently working on.
 - LEFT : The current pallet is the left one.
 - RIGHT : The current pallet is the right one.
 - CURRENT : The current pallet is the same as before calling this function.

Return value

There is no return value with this function.



5.3. 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.

5.4. 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

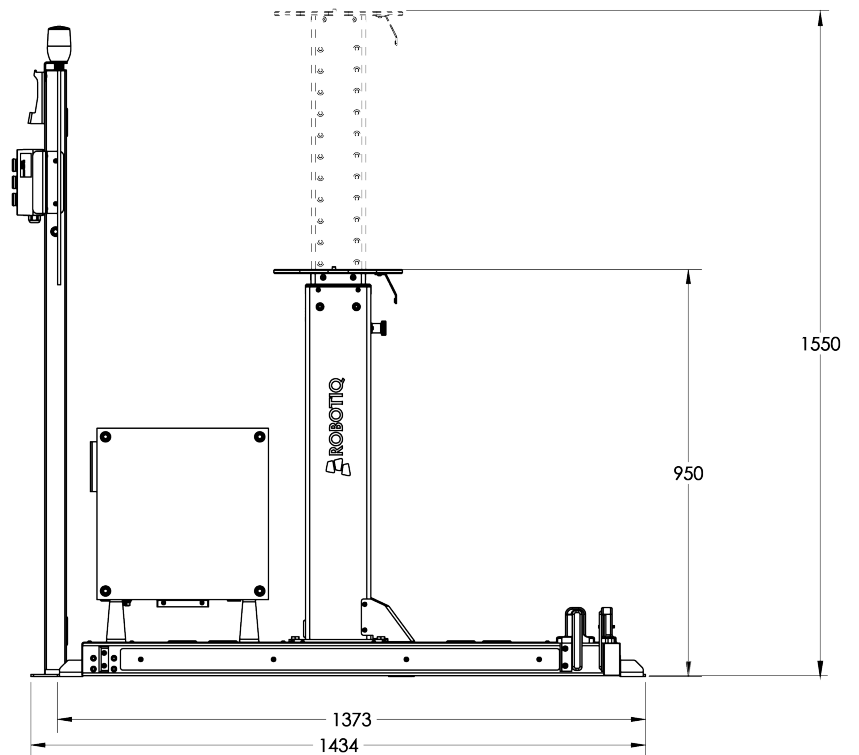
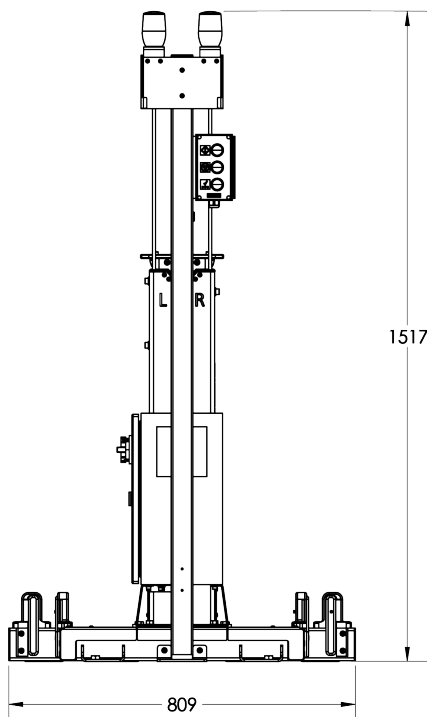
Caution

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. Base with Pedestal, Robotiq Controller and Post



6.1.2. AirPick Vacuum Gripper

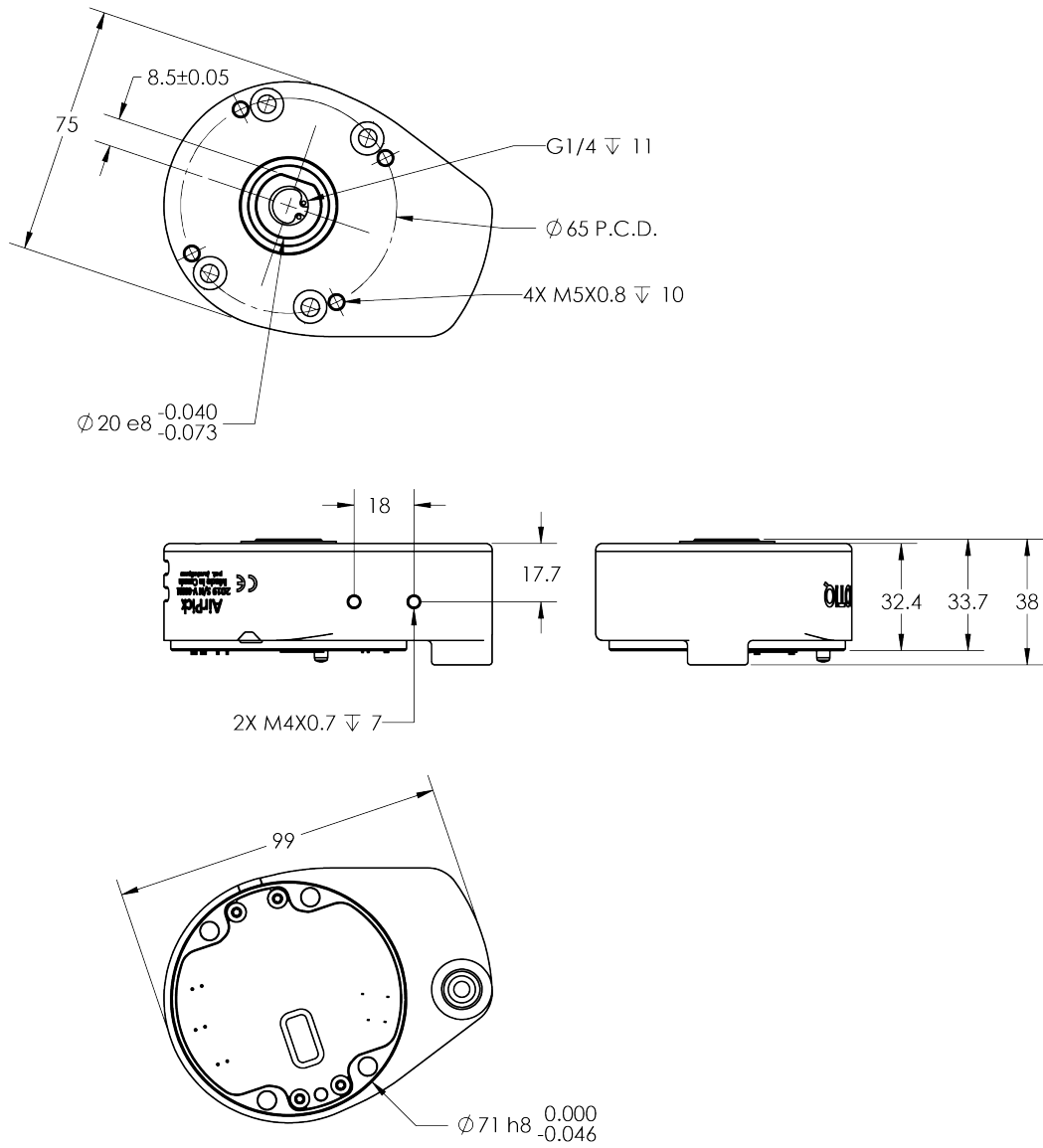
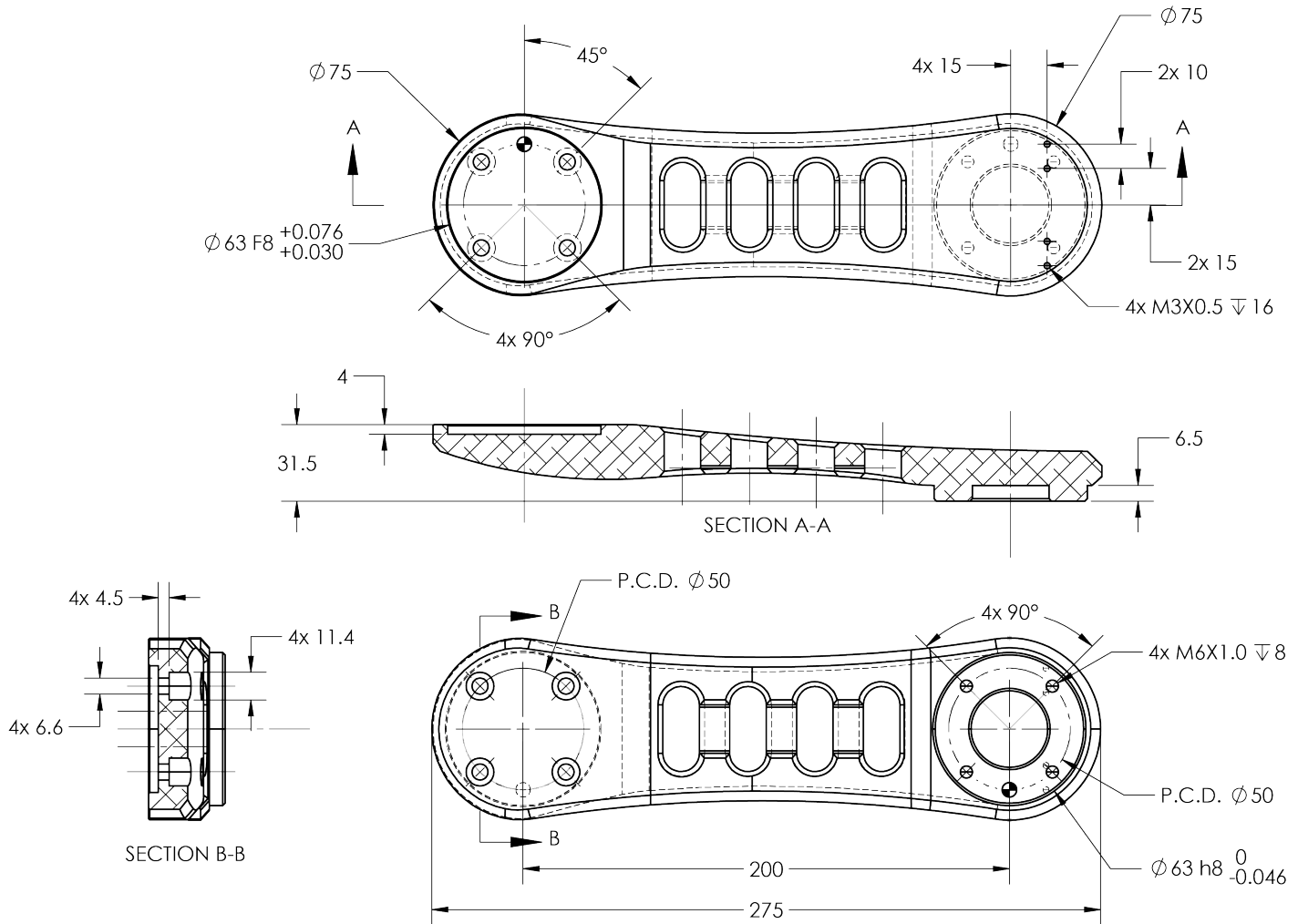


Fig. 6-1: AirPick general dimensions

6.1.3. Extra Reach Bracket



6.1.5. Bracket for Four (4) Suctions Cups

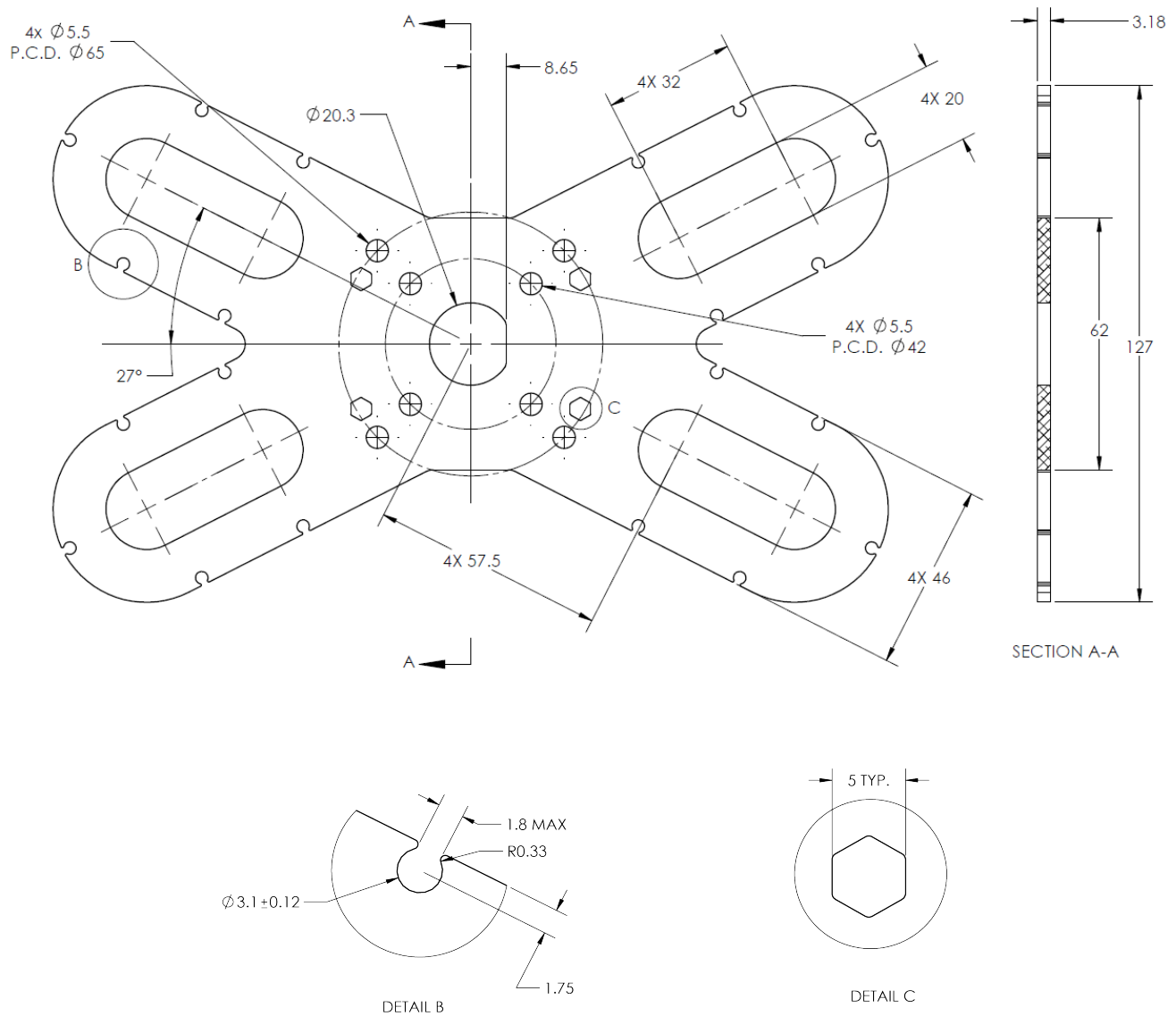


Fig. 6-3: Four air nodes bracket's dimensions



6.2. Mechanical Specifications

6.2.1. Palletizing Solution (Without AirPick Vacuum Gripper)

| Parameter | Specification | |
|--|-----------------------------------|-----------------------------------|
| | Metric | Imperial |
| Net product weight (without robot and gripper) | 99 kg | 218 lb |
| Base weight | 62 kg | 136 lb |
| Pedestal weight | 37 kg | 81 lb |
| Maximum box weight ¹ | Up to 16 kg | Up to 35 lb |
| Minimum box dimensions ² | See explanations below | |
| Minimum pallet width and depth | 300 mm | 12 in |
| Maximum pallet dimensions width and depth ³ | See explanations below | |
| Minimum pallet height (empty) | 50 mm | 2 in |
| Maximum pallet height (filled) | 1500 mm | 60 in |
| Shipping crate dimensions | [1500, 950, 810] mm (L, W, H) | [59, 37-1/2, 32] in (L, W, H) |
| Gross shipping weight | 199 kg | 438 lb |
| Maximal acceleration in operating conditions | 2 g | |
| Maximum box throughput | Up to 13 boxes/min ⁴ | |
| Maximum number of box patterns | 2 | |
| Energy source | Electricity | |

¹ Maximum box weight depends on the robot model and gripper used.

²The minimum box dimensions depend on pallet dimensions. Use the [Robotiq Configurator](#) to validate the combination.

³The maximum pallet dimensions depend on your box dimensions. Use the [Robotiq Configurator](#) to validate the combination.

⁴The maximum box throughput depends on box weight, box dimensions, box surface, pallet dimensions, and pallet layout.

Table 6-1: 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) | 545 g | 1.20 lb |
| Minimum Feed pressure | 3 bar | 43.5 PSI |
| Maximum Feed pressure | 7 bar | 101.5 PSI |
| Optimal feed pressure ¹ | 6.5 bar / 7 bar | 95 PSI / 101.5 PSI |
| Air consumption at optimal pressure ¹ | 135.9 SLPM / 106.7 SLPM | 35.9 gpm / 28.2 gpm |
| Maximum torque permissible by custom suction cup bracket | 150 Nm | 110 lbf-ft |
| Air supply connection type | 8 mm OD Tube | 5/16 in OD Tube |
| AirPick Gripper noise level | 70.5 dBa | |
| Maximum Vacuum level at optimal pressure ¹ | 85 % / 80% | |
| 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 | |

¹Data is presented as follows : for serial number \leq V-01351 / for serial number \geq V-01352.



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) | -0.5 | -9.0 | 21.0 | 0.0 | 0.0 | 44.7 | 545 |
| AirPick (with 1 suction cup) | -0.5 | -8.5 | 23.4 | 0.0 | 0.0 | 76.7 | 580 |
| AirPick (with 2 suction cups) | -0.3 | -5.1 | 40.3 | 0.0 | 0.0 | 127.7 | 955 |
| AirPick (with 4 suction cups) | -0.2 | -4.2 | 46.7 | 0.0 | 0.0 | 127.7 | 1180 |
| AirPick (without suction cup) + extra reach bracket | 145.8 | -4.1 | 27.9 | 200.0 | 0.0 | 72.2 | 1192 |
| AirPick (with 1 suction cup) + extra reach bracket | 147.3 | -4.0 | 29.6 | 200.0 | 0.0 | 104.2 | 1227 |
| AirPick (with 2 suction cups) + extra reach bracket | 159.6 | -3.0 | 44.7 | 200.0 | 0.0 | 155.2 | 1602 |
| AirPick (with 4 suction cups) + extra reach bracket | 164.6 | -2.7 | 51.6 | 200.0 | 0.0 | 155.2 | 1827 |
| Extra reach bracket (alone) | 100.5 | 0 | 10.5 | 200 | 0 | 27.5 | 647 |



6.3. Electrical Specifications

6.3.1. Robotiq Controller

| Parameter | Specification |
|---------------------------------------|---|
| Operating supply voltage | 100-240 Vac 60/50 Hz |
| Current consumption (excluding robot) | 2.2 A (100V AC) 1.9A (120V AC) 1.1 A (230V AC) 1.1 A (240V AC) |

Fig. 6-4: Robotiq Controller electrical specifications

Info

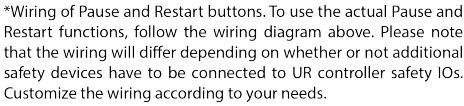
These are the specifications of the Robotiq Controller, excluding the robot. The overall voltage consumption will vary depending on the robot used.

Warning

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

The following diagram illustrates the basic connections of the Robotiq Controller. For more information, download the electrical package on the [Robotiq support website](#). Do not modify the wiring unless you can recertify the Robotiq Controller with local authorities.





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

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

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. 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] |
| M8 | Pallet sensors | 15.0 | 11.1 |
| M10 | Base - Pedestal | 50.0 | 36.9 |
| 1/2"-13 | Wedge anchors | 54.2 | 40.0 |
| M8 | Robot-pedestal link | 20.0 | 14.8 |
| M8 | Pedestal height adjustment | 15.0 | 11.1 |

Table 7-1: Torque Settings - Palletizing Solution

7.2. 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.



7.3. Cleaning

7.3.1. Air Filter Cleaning

Periodically clean the control panel air filters.

7.3.2. Solution Cleaning

Clean the mechanical parts 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.

7.4. 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 |
|---|---|------------------|
| Vacuum Cups 1.5 Bellows 55 mm (Silicone) | <ul style="list-style-type: none"> 4 x Vacuum Cups 1.5 Bellows 55 mm (white silicone) | VAC-CUP-55-SI |
| Status Light for Palletizing Solution | <ul style="list-style-type: none"> 1 x Status Light for the Robotiq Palletizing Solution | PAL-STAT-LIGHT |
| Type A Pallet sensor - Palletizing Solution | <p>Type A Pallet Sensor Kit for the Robotiq Palletizing Solution</p> <ul style="list-style-type: none"> 1 x Type A Pallet Sensor 1 x screw kit <p>Used for:</p> <ul style="list-style-type: none"> Left pallet, back sensor Right pallet, side sensor | PAL-SENS-A |
| Type B Pallet Sensor - Palletizing Solution | <p>Type B Pallet Sensor Kit for the Robotiq Palletizing Solution</p> <ul style="list-style-type: none"> 1 x Type B Pallet Sensor 1 x screw kit <p>Used for:</p> <ul style="list-style-type: none"> Left pallet, side sensor Right pallet, back sensor | PAL-SENS-B |
| Box Sensor Kit - Palletizing Solution | <p>Box Sensor Kit for the Robotiq Palletizing Solution</p> <ul style="list-style-type: none"> 1 x Box Sensor 1 x Cable 1 x Mounting Brackets | PAL-BOX-SENS-KIT |



9. Troubleshooting

9.1. Palletizing Solution (except the AirPick Gripper)

| Symptom / Issue | Cause | Solution |
|--|--|---|
| The robot was brought to a protective stop after a few layers | A collision occurred between the gripped box and a box on the pallet. A minor palletizing error carried over from previous layers. | <ul style="list-style-type: none"> • Increase the box height value to compensate for box size discrepancies. • A good practice to determine box height is to measure the height of a full pallet (boxes only), and divide it by the number of layers on the pallet. |
| The robot started dropping boxes from a great height | A minor palletizing error carried over from previous layers. | Decrease the box height value. |
| | The TCP entered is incorrect. | Confirm that the TCP is located above the box, at the picking position. |
| | The pallet height value entered is too low. | Increase the pallet height value. |
| The robot entered in collision with a box already placed on the pallet | A collision occurred between the gripped box and a box on the pallet. A minor palletizing error carried over from previous layers. | <ul style="list-style-type: none"> • Increase the box height value to compensate for box size discrepancies. • A good practice to determine box height is to measure the height of a full pallet (boxes only), and divide it by the number of layers on the pallet. |
| | One or several faces of the box are rounded. | Increase the box width and/or box length value. |
| | The pallet state in the pallet viewer does not correspond to the actual pallet state. | Inspect the pallet viewer at program start and confirm that the virtual layout corresponds with the actual layout. |
| | The pallet height value entered is too high. | Decrease the pallet height value. |



| | | |
|---|---|--|
| The robot triggered a protective stop when placing a box on the first layer | The box height value entered is too high. | Verify the box height value. |
| | The pallet height value entered is too high. | Verify the pallet height value. |
| | The TCP entered is incorrect. | Confirm that the TCP has been set correctly. |
| Boxes are not consistently placed straight on the pallet | The picking position is not stable. | Make sure your conveyor stop consistently places boxes in the same position. Box position should be consistent in order to ensure a reliable picking. |
| | The picking position is incorrect. | Make sure that the picking position places the vacuum gripper so that it is squared and centered with the box. |
| Error Message "Collision detected" during trajectory. | The layout in the pallet viewer does not correspond with the actual layout. The robot detected a collision with an object that is not actually present. | <ul style="list-style-type: none"> Restart the program and select the right box step. Verify the TCP position and orientation values. |
| Error Message "Discontinuous path / joint solution impossible detected, please change your starting point." | A singularity was reached on a planned trajectory. | <ul style="list-style-type: none"> Go to PolyScope's Move tab, and verify if the joints are at the center of their range (0°) when the robot is at the picking position. The algorithm will adjust wrist 3 automatically at program start. If the box position is too close to robot base, discontinuous path issues can occur. Verify that the picking zone is respected. If this situation only occurs with pallets on one side of the Solution, try centering the layer pattern on the pallet. Verify TCP position and orientation values. The robot may have reached a singularity or be closed to reaching a singularity. Move the robot to the Home position and restart the program. Should none of the above steps solve the issue, please contact the Robotiq support department. |



| | | |
|---|--|--|
| Collisions occur with the pallet sensor on one side, but not on the other | The pedestal is not centered on the base. | Execute the centering procedure found in the Installation section. |
| An actual collision occurred | The TCP entered is incorrect. | Confirm that the TCP has been configured correctly |
| | The TCP entered is incorrect since it does not account for the bracket used. | Configure the TCP correctly. |
| | The gripper is bigger than the box. | The size of the surface covered by the gripper or suction device should always be equal or smaller than the size of the face of the box that is being gripped. Please refer to the Other Grippers section for more details. |
| | The actual pedestal height does not correspond with the pedestal height value entered in the Installation tab. | Adjust the pedestal height so that it corresponds to the configuration displayed in the Installation tab. |
| The robot waits indefinitely over the picking position | The box presence sensor is misused or not connected. | <ul style="list-style-type: none"> • Verify that the correct box presence input has been selected. • Verify that the sensor used is active-high if a sensor other than the sensor provided is being used. |
| The robot was brought to a protective stop while palletizing | A joint limit has been exceeded. | <ul style="list-style-type: none"> • Verify that the joint speed and position limit have been configured correctly. Please refer to the Robot Configurations section for more information. • Decrease the value of the acceleration parameter in the Palletizer node. |
| The robot does not restart after a pallet has been changed | The "Confirm pallet(s) ready" feature is enabled. | Press the "Confirm pallet(s) ready" button after the pallet has been changed. |
| Error message: "RTDE interface cannot initialize. Make sure that Ethernet/IP adapter and Profinet are disabled, and that no tother URCaps use the RTDE interface." | <p>We employ registers that cannot be used with Ethernet/IP or Profinet at the same time when the following function checkbox is ticked:</p> <p>Installation > URCaps > Copilot > Configuration > General: "Use Copilot to manage a soft speed transition when resuming from a Safeguard stop"</p> | <ul style="list-style-type: none"> • Update to the latest version of the Copilot software. • Untick the "Use Copilot to manage a soft speed transition when resuming from a Safeguard stop" checkbox. |



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 :
 - a. If Gripper LED is not blue, follow the steps in the first section above
 - b. If Gripper LED is blue, URCap is installed with the latest available version, contact support@robotiq.com
3. 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
4. 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 checkout :
 - 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;
 - For AirPick only : 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 Robotiq Palletizing Solution and the AirPick Vacuum Gripper. For more information on the standards used for each individual product, please refer to their respective declaration of conformity.

Caution

Compliance of the product is only met if all instructions of the current user manual are followed, which include, but are not limited to, appropriate installation, compliance with safety measures, and normal usage. A risk assessment specific to the user's final application must also be carried out.

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 |
| EN 61000-6-2:2016 | Generic standards – Immunity standard for industrial environments |
| EN 61000-6-4:2007 + A1:2011 | Generic standards – Emission standard for industrial environments |
| EN 60204-1:2018 | Safety of machinery – Electrical equipment of machines – Part 1: General requirements |

Moreover, the Robotiq Controller is cCSAus certified according to the CAN/CSA C22.2 n 14-05 and UL 508A standards.

11.2. EC Declaration of Incorporation

11.2.1. Robotiq Palletizing Solution

Info

For all information about the EC Declaration of Incorporation for the Robotiq Palletizing Solution, please refer to the [Robotiq support website](#). The declarations are available for download (Robotiq Palletizing Solution > Universal Robots > Documents > Standards, Declarations and Certificates).



11.2.2. AirPick Vacuum Gripper

Info

For all information about the EC Declaration of Incorporation for the AirPick Vacuum Gripper, please refer to the instruction manual of the device, available on the [Robotiq support website](#). The declarations are available for download (Vacuum Grippers> Universal Robots > Documents > AirPick Standards, Declarations and Certificates).



12. Appendix

12.1. Anchoring Pattern

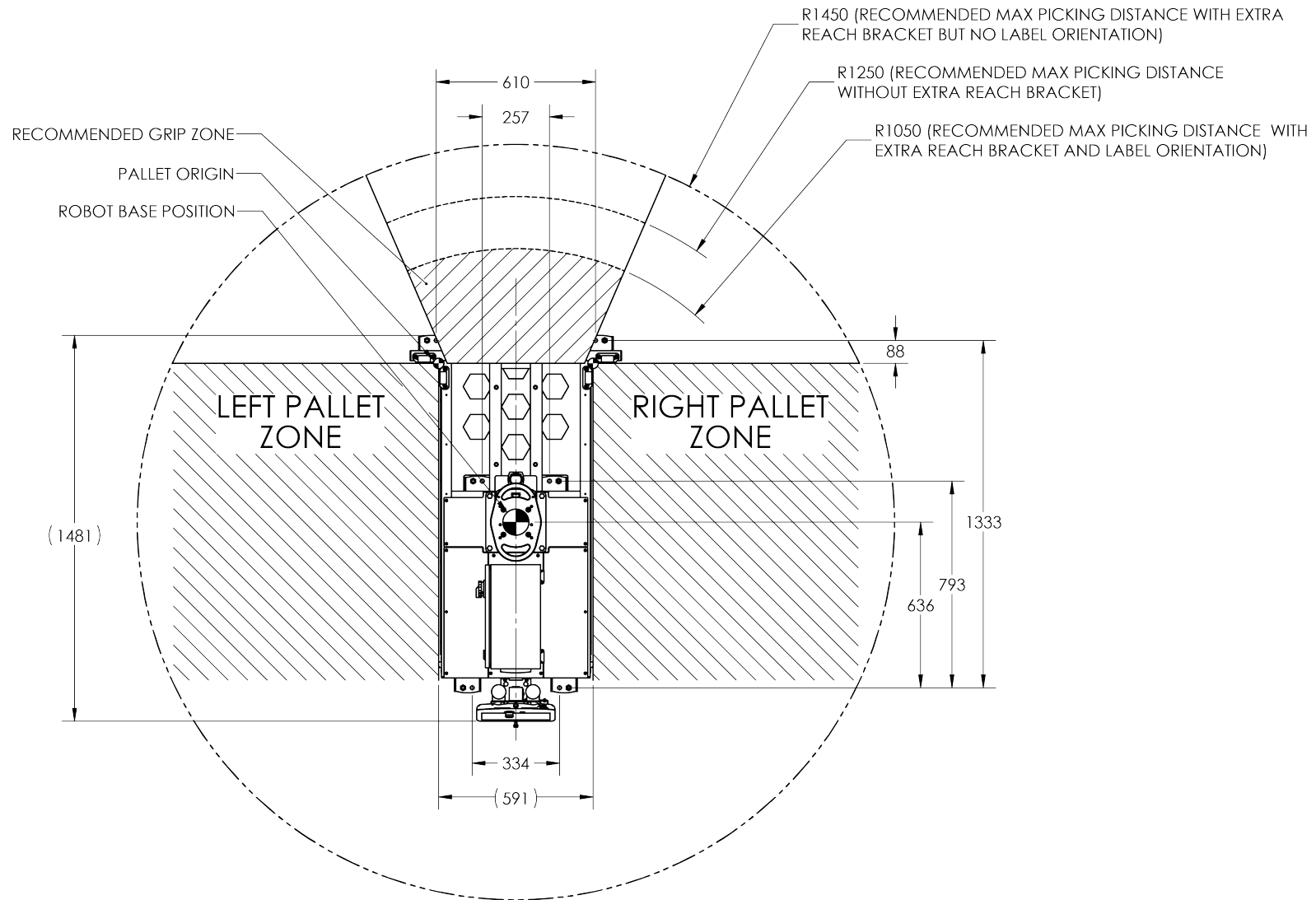


Fig. 12-1: Palletizing Work Zones Schema for UR10



13. Contact

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