ROBOTIQ PALLETIZING *SOLUTION*
PE10

Original instructions (en)

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Robotiq Palletizing Solution - PE Series
for Universal Robots

User Manual

LEAN ROBOTICS

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Revisions

2023/12/18

- New software features added for Mutli-recipe

- New script functions added: Use Payload with Box, Use Payload No Box & Set Box Payload

2023/05/09

- Multi-recipe feature added in URCap Software section.

- Pallet states updated in URCap Software section.

- General re-organization of the multi-pick feature content.

- Move strategies updated (Snapping vs. Movement steps) in URCap Software section.

- User interface update for Palletizer node.

2023/01/31

- AirPick Gripper is replaced by PowerPick Gripper. Sections are modified accordingly

- Multipick feature added in Software section.

- Script "Get Current Box Type" added in Software section.

- Box sensor(s) subsection modified in Installation section.

2022/11/22

- Cable management installation improved (Installation section).

2022/10/03

- Maximum value for Elbow joint limit changed from 0° to 3°. Minimum and maximum values for Wrist 3 joint limits changed from -270° to -273° and 270° to 273° (Installation section).

- Cable management material and installation modified (Installation section).

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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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 preconnected and ready to install. It is composed of a base fully integrated with a Robotiq control box, pallet sensors, a pedestal, and a post with a teach pendant rack and status lights. The standard delivery also contains the Robotiq PowerPick vacuum gripper and vacuum generator unit. The Material Handling Copilot software and accessories (e.g., box sensor, anchor kit, cable management system, etc.) are also part of the Solution.

⚠️	**CAUTION**
	This section presents the key features of the Robotiq Palletizing Solution and must not be considered as sufficient knowledge to operate the Solution. Each feature is detailed in the appropriate section.

1.1. Palletizing Solution Components
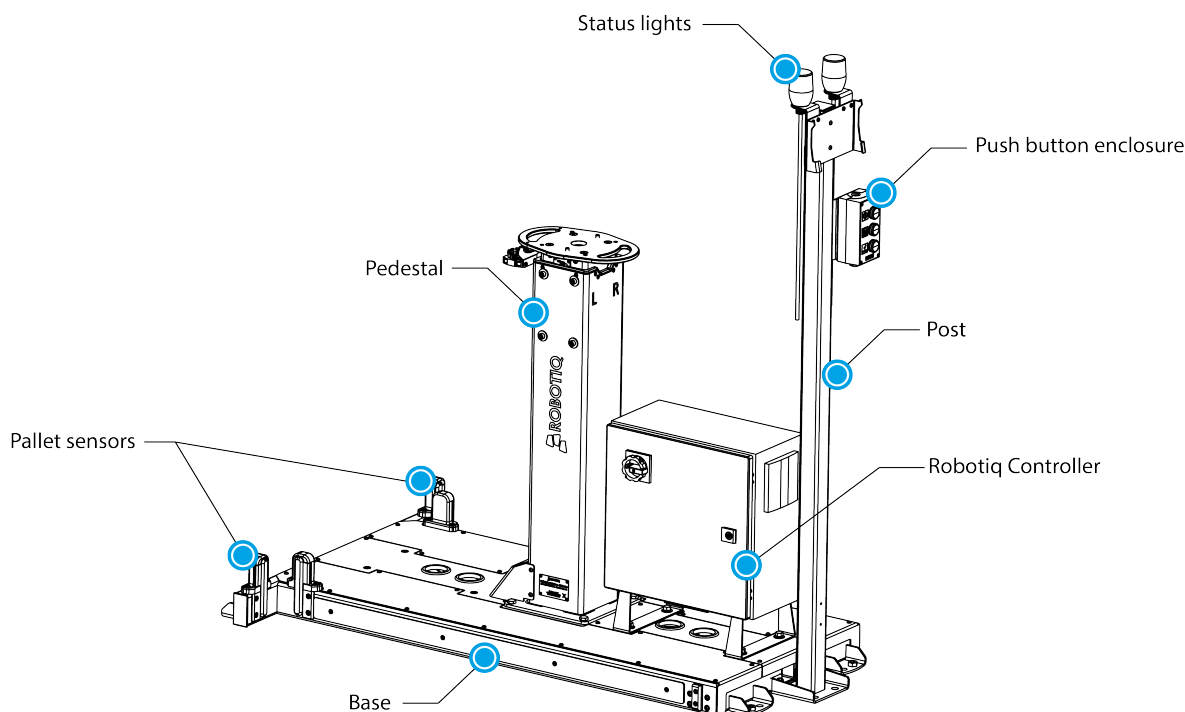
Fig. 1-1: PE Series Robotiq Palletizing Solution

1.1.1. Base, Pedestal and Post

The Robotiq Palletizing Solution is composed of a base, on which a pedestal, pallet sensors and Robotiq control box 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 Control Box

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

1.1.3. Standalone Post

The Solution includes 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 used to detect pallet 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 with 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 **Status Light States** section for more information.

1.1.6. PowerPick Vacuum Gripper (Optional)

PowerPick is a vacuum gripper that uses a venturi system to generate vacuum from a compressed air energy source. The PowerPick Gripper interfaces with the robot via input/output (I/O) cables connected directly to the robot controller.

Fig. 1-2: PowerPick Gripper

Interchangeable Components

The PowerPick Gripper can be installed with various interchangeable components including suction cup brackets, an offset plate, hollow offset links, a tubular wrist extension and various suction cups depending on the application, object material and grasping requirements.

NOTICE
Please refer to the user manual of the PowerPick Gripper on Robotiq's support website for more information on other end-of-arm configurations, including suction cups, suction cup brackets, wrist extension and hollow offset links.

1.1.7. PowerPick Controller

The PowerPick Vacuum Gripper comes equipped with the PowerPick Controller, an electrical and pneumatic device composed of two solenoid valves, a pressure sensor and a vacuum generator. It is an intermediate controller connected to the robot controller and the PowerPick Gripper via I/O cables and air tubing. The PowerPick Controller creates and releases the vacuum for the PowerPick Gripper.

Fig. 1-3: PowerPick Controller

1.1.8. Box Detection Sensor

The Solution includes a box sensor that needs to be installed at the end of the conveyor, and positioned so that it triggers a signal when a box is at the picking position.

Fig. 1-4: Box Sensor

1.2. Object Picking

The PowerPick Gripper is traditionally designed to pick up objects with four suction cups mounted to a suction cup bracket, which in turn is mounted to a hollow offset link.

NOTICE
Please refer to the user manual of the PowerPick Gripper on Robotiq's support website for more information on other end-of-arm configuration, including suction cups, suction cup brackets, wrist extension and hollow offset links.

- The standard suction cup bracket holds four suction cups.

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

2. Safety

2.1. Disclaimer

The intent of this section is to provide general guidelines for the 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.

The terms *user*, *operator* and *installer*, 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 details the components of the Robotiq Palletizing Solution, and the general operations regarding the whole lifecycle 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. Risk Assessment

2.2.1. General Risk Assessment

⚠️	⚠️ **WARNING**
	The user must have read and understood all of the instructions in the following manual before operating the Robotiq Palletizing Solution. Any use of the Palletizing Solution in non-compliance with these instructions is deemed inappropriate and may cause injury or damage.
	It is the user's responsibility to ensure that all local safety measures and regulations are met.

⚠️	⚠️ **WARNING**
	Unauthorized Modification
	DO NOT modify or alter the equipment without the express written consent and approval of the manufacturer.

The entire cell (i.e., the robot, the PowerPick Vacuum Gripper or any other gripper, and any other equipment used in the final application) must go through a comprehensive risk assessment process before they can be used.

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.

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 by 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.

- Risk of damaged objects or injury resulting from a collision between an object and the robot, the gripper or the boxes.

- Risk of injury resulting from a collision between a person and the Solution.

Additional hazards may be present, depending on the configuration and what is being palletized. For instance, the object handled by the gripper could be inherently dangerous to the operator.

To ensure an adequate level of safety, floor markings must be applied to delineate safe zones around the Solution. It is the responsibility of the integrator to establish the proper safe distance from the Solution to protect the user.

⚠️	⚠️ **DANGER**
	A collision between a person and the Solution may result in material damage, bodily injury and even death. Make sure anyone working around the Palletizing cell takes all necessary precautions:
	• Before starting the machine, make sure there is enough clearance around the Palletizer and make sure no one is in the work area of the Solution.
	• During palletization, it is possible to access the cell from all sides. The customer has to assess the risks accordingly.

2.2.2. Emergency Stop

⚠️	**WARNING**
	⚠️
	There is no emergency stop button directly on the Robotiq Palletizer. The emergency stop button used by the Palletizing Solution is the one found on the robot's teach pendant. Make sure operators know how to stop the Solution in case of emergency.

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

Supply Source	Behavior
Robot control boxsupply (any 24V terminal)	The Vacuum Gripper is powered on. • An object is detected: the vacuum level will continue to be regulated and the object will not be lost. Note: the PowerPick gripper (optional) connects to the robot control box supply.
Robot tool supply (tool connector)	Power failure to the Vacuum Gripper. • The vacuum level will drop to ambient pressure and the object will be lost. It is not recommended to connect the Vacuum Gripper to the tool connector.

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

2.2.3. Noise Level

With the PowerPick Gripper operating at the optimal pressure level, the noise level at the workstation is 82 dBA.

⚠️	**WARNING**
	⚠️
	Since the noise level exceeds 80 dBA, hearing protection must be provided to each operator if required by local regulation or safety risk assessment.

Noise levels should be measured regularly under normal operating conditions.

2.2.4. Cyber Risk

• The customer must provide a safe firewall connection to avoid unauthorized remote control of the robot.

• The customer must set a password to avoid unauthorized access to the robot safety configurations.

2.2.5. Residual Risk

For the intended use of the robot system, measures have been taken to prevent personal injury and property damage. Nevertheless, residual risk remains in certain situations.

Misinstallation

⚠️	**WARNING**
	Tip Over Hazard
	Failure to anchor the Solution according to the guidelines found in the **Anchoring the Solution** section may result in material damage, bodily injury or death.

Improper Moving of the Solution

⚠️	**WARNING**
	Tip Over Hazard
	Failure to follow the guidelines found in the **Installation** section and the **Operation** section

Maintenance and Repair

⚠️	**WARNING**
	During maintenance and repair work, make sure that the Palletizing Solution is turned off, de-energized and cannot be accidentally turned on again.

- Maintenance and repair work should only be carried by qualified and authorized service personnel.

- After maintenance and repair work, make sure to remove all tools and equipment to prevent ejected or falling parts, material damage or bodily injury.

- All pneumatic tools and devices must be emptied of compressed air before maintenance and repair work.

- All electric tools and devices must be safely isolated before maintenance and repair work.

- Always inform the operator before performing maintenance or repair work. Notify a supervisor and lock out/tag out the machine to prevent users from turning on and using the system. Enforce local safety regulations.

- If necessary, secure the maintenance and repair area with temporary barriers.

- Before performing repair work, clean the affected parts, especially the connections and fittings.

- Install the Solution in a safe position. Depending on the maintenance and repair work to carry out, parts may come loose and cause injury.

⚠️	**WARNING**
	- Maintenance and repair work on electrical equipment must be carried out by qualified and authorized personnel.
	- Do not bring electrical components into contact with cleaning agents. Electrical components should only be cleaned when the Palletizing Solution is turned off and de-energized.

- After having performed maintenance and repair work, verify screw torque and adjust accordingly if required.

- If the dismantling of safety equipment is necessary before performing maintenance or repair work, the equipment must be reinstalled and assessed immediately after completion of said work.

- Use original spare parts exclusively.

- Perform preventive maintenance and cleaning work at regular intervals according to the **Periodic Inspection and Maintenance** section.

Risk of Accident

⚠️	**WARNING**
	During maintenance, there is an increased risk of accident due to the parts, tools and equipment used in and around the Palletizing Solution area.

- Slip, trip and fall hazards can be avoided by maintaining order and cleanliness in the workplace.

- For work in elevated positions (500 mm and more), fall protection equipment must be installed and used.

- When dismantling or replacing machine parts in elevated positions (500 mm and more), suitable lifting devices should be used.

Hot Surfaces

The proper use of the Palletizing Solution does not create hot surfaces.

If surfaces get hot, please stop using the Solution and contact the Robotiq support team.

Radiation

The proper use of the Palletizing Solution does not create non-ionizing radiation.

Pneumatic Limitations

- The maximum permissible pressure for all pneumatic components must never be exceeded.

- Pneumatic tubing must be checked at regular intervals and replaced if necessary.

- Leaky connections must be sealed to avoid breakage, unnecessary or excessive noise, loss of energy, etc.

Protective Devices

Manipulating or circumventing protective devices during the operation of the Solution is generally not permitted and should be considered negligent.

⚠️	**WARNING**
	In the event of incorrectly installed, defective or even missing protective devices, operation of the machine is not permitted.

Electromagnetic Compatibility (EMC)

- Unauthorized changes to electrical components can lead to increased sensitivity to interference, and increased interference emission. As a result, safety components may be impaired.

- Work on electrical equipment must only be carried out by qualified and authorized personnel.

- Be aware of the possible residual energy after turning off an electrical device with large capacitive components

Electrical Energy

- Work on electrical equipment must only be carried out by qualified and authorized personnel.

- Be aware of the possible residual energy after turning off an electrical device with large capacitive components. Wait the appropriate amount of time before working on the device.

- Secure the work area with temporary barriers and a warning note. Secure the main switch with a padlock to prevent unauthorized switching on.

- Use only isolated tools in the corresponding voltage level.

- Use only fuses with specified cut-off current and appropriate dielectric strength.

⚠	⚠ **CAUTION**
	Follow the 5 electrical engineering safety rules when working on electrical equipment: 1. Disconnect completely. 2. Secure against reconnection. 3. Make sure there is no voltage. 4. Perform grounding and short-circuiting. 5. Provide protection against adjacent live parts.

Robot Risks

	⚠️ **WARNING**
⚠️	• All personnel working with and around the robot must be informed of the inherent risks and safety instructions. • To avoid being pinched or crushed when the robot moves toward a stationary object, always keep a minimum distance of 500 mm. • To avoid being pinched or crushed when the robot moves toward the floor, always keep a minimum distance of 300 mm. • To avoid being pinched or crushed between the robot (gripper) and walls or peripherals, always keep a minimum distance of 500 mm. • Those values aforementioned are taken from standard EN 13854:2019 (Minimum gaps to avoid crushing of parts of the human body). The installation must maintain the minimum distances specified in this standard.

For more information, refer to the robot's instruction manual.

- Robots move quickly and exert high force. A program interruption or stop can be followed by rapid and dangerous movements.

- Even a programmed robot can be affected by external signals and make unexpected movements. Therefore, when entering the work area, all safety instructions must be observed.

- Robot teaching, robot programming and software modification may only be performed by competent and authorized personnel.

- Changes to the robot's safety settings may only be made by competent and authorized personnel. The changes must be verified and documented.

- Reducing the speed and acceleration of the robot reduces the risks as it:

    - Gives the operator more time to react appropriately.

    - Reduces the robot's braking time.

	⚠️ **WARNING**
⚠️	Reducing the robot's speed does not reduce the risk of pinching or crushing. Even at its slowest speed, the robot movements can cause material damage and bodily injury.

Movement Without Power Supply

⚠️	**DANGER**
	If a person has been trapped by the robot arm, make sure that attempting to free the person does not aggravate an injury or further increase the risk of injury.

In the case of an undesired event (malfunction, emergency, blockage, etc.), power loss or unwanted power surge, you can:

- Use forced back-driving. To perform forced back-driving, push or pull the robot arm hard enough to move the joint. Each joint brake has a friction clutch that enables movement during high forced torque.

⚠️	**WARNING**
	Moving the robot arm manually is intended for urgent/emergency procedures and service purposes only.

The brake inside each joint is not designed for manual release. Attempting to do so without proper training may cause damage to the brake and other joint components, and make the joint unusable.

⚠️	**CAUTION**
	Attempting to release a joint brake manually may cause material damage and bodily injury.

For more information, refer to the robot's instruction manual.

2.3. Use of the Solution

2.3.1. Intended Use

⚠️	**CAUTION**
	The emergency stop function is intended for use in emergency conditions and not for stops in normal conditions.

The Robotiq Palletizing Solution is specifically designed for palletization.

Only use the Solution in its original condition without making unauthorized modifications.

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

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

Always comply with local, state, province and federal laws, regulations and directives, and always operate the Solution in compliance with automation safety and general machine safety guidelines.

Do not use the Solution to handle boxes containing hazardous substances. Should hazardous substances be handled by the Solution, perform a risk assessment that accounts for such substances.

⚠️	⚠️ **CAUTION**
	Since there are numerous different materials used in the packaging industry, and since each material has its own characteristics, properties and behavior with vacuum pressure, a thorough risk assessment is in order, regardless of the box/packaging material.

2.3.2. Misuse

⚠️	⚠️ **WARNING**
	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 use of the Solution.

Any use of the Solution other than that described in this manual is considered a misuse and should be avoided.

Misuse of the Solution includes but is not limited to the following situations.

Integration misuse:

- Use of the Solution with a robot other than a UR10e.

- Use of a payload higher than the robot's maximum payload.

- Use of the Solution outside of the environmental and operating conditions.

Operational misuse:

- Standing on the pallet.

- Operation of the Solution by inexperienced or untrained staff members.

- Manual placing or adjustment of a box on the pallet while the Solution is in operation.

2.3.3. Final Application

Expected System Behavior in Normal Operating Conditions

NOTICE
Various types of external safety devices can interface with the Robotiq Palletizing Solution to ensure a safe operation.

NOTICE
• Category 0 Stop: Stops the Solution by immediate removal of power. • Category 1 Stop: A controlled stop of the Solution. Power is removed when the stop is achieved. • Category 2 Stop: A controlled stop of the Solution. Power is still available once the stop is achieved. Please refer to IEC 60204-1 for additional information on stop categories.

- **Normal mode**: The palletizer continuously fills pallets when no human operator is in 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 cell access 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 a pallet in an empty pallet slot, troubleshoot the system or any other operation requiring human intervention. In such a state the robot will maintain a Category 2 stop. When the safeguards are removed, the system resumes operation in Normal mode.

The system enters emergency stop mode when the emergency stop button is pressed.

The following table indicates which stop category based on the operation mode.

Operation mode	Robot		
	Force (N)	Power (W)	Speed (mm/s)
Normal mode (Up to safety limits)	Up to 250	Up to 1,000	Up to 5,000
Protective stop	Category 2 Stop		
Safeguard stop	Category 2 Stop		
Emergency stop	Category 1 Stop		
Reduced mode	Please refer to the Universal Robots user manual for more details.		
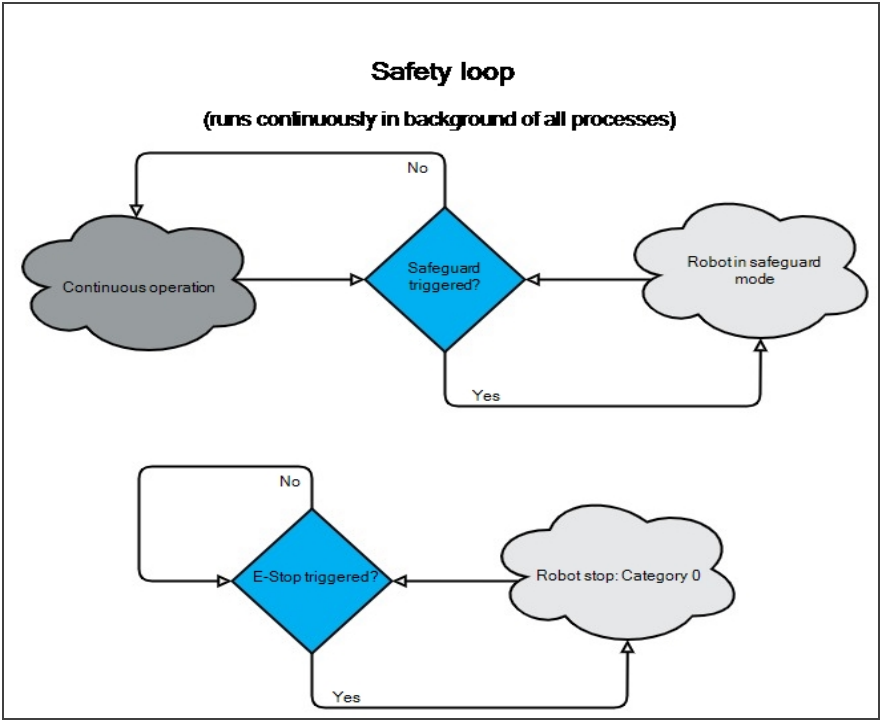
Fig. 2-1: Safety Logic Diagram

	WARNING
⚠️	After a collision or 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 support@robotiq.com if any sign of damage is detected.

3. Installation

This section will guide you through the installation and general setup of the Robotiq Palletizing Solution.

Before installing:

- Read and understand the safety instructions related to the Palletizing Solution. Refer to the **Safety** section.

- Verify the package according to the scope of delivery and the order.

- Make sure to have the required parts, equipment and tools listed in the scope of delivery.

- Make sure to meet the recommended environmental conditions.
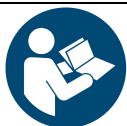
	NOTICE
	Robotiq uses the metric system. Unless otherwise specified, **all dimensions in this manual are in millimeters**.

	WARNING
	- Do not turn on or operate the Palletizing Solution before making sure the device is firmly anchored and the machine area is cleared. - When assembling or moving the Solution, make sure there is enough vertical and horizontal clearance in order to avoid material damage and bodily injury. - Make sure that the air supply source is secured. - Failure to properly secure and install the equipment can result in material damage and bodily injury. - If the installation is not performed in compliance with the manufacturer's instructions, the warranty will be void.

- Make sure to follow all workplace safety rules and regulations when installing, operating, sevicing, inspecting and maintaining the Robotiq Palletizing Solution.

- Always wear all recommended personal protective equipment in accordance with the safety standards of the workplace, including but not limited to:

  - Safety glasses

  - Hearing protection

  - Hard hats

  - Steel-toe boots

- Always use proper safety measures when working with tools that have sharp edges, pinching surfaces, or heat sources.

- Always lift heavy objects with the legs, not the back. Ask for help or find alternative solutions if a heavy object cannot be lifted by a single person.

3.1. Scope of Delivery

- 1 x PE Series Palletizing Solution base including:
    - 1 x Pedestal
    - 1 x Robotiq control box
    - 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 Vacuum Gripper kit (PowerPick, Controller, PowerPick accessories) (Optional)
- 1 x Air Filter Kit (Optional)
- 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

Optional:

- 2.5 mm hex key

- 5.5-17 mm double ended wrench

- 20-21 mm double ended wrench

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)

- Isopropyl alcohol

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

- Hammer drill

- Hammer

3.3. Environmental and Operating Conditions

Attribute	Value
Minimum storage/transit temperature	-25 °C [-13 °F]
Maximum storage/transit temperature	55 °C [131 °F]
Minimum operating temperature	0 °C [32 °F]
Maximum operating temperature	50 °C [122 °F][1]
Humidity (non-condensing)	20-80% RH
Food / Clean room / Intrinsic Safety (IS)	Not compatible
Dust and water	• Dust: Affect maintenance intervals • Water: Not compatible
Other	• Free from corrosive liquids or gases • Free from explosive liquids or gases

[1] Speed values might be derated at temperatures above 35 °C (95 °F) depending on program takt time.

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.	

3.3.1. Air Supply: Compressed Air Supply System to PowerPick Vacuum Generation Unit

Compressed air must be supplied to the PowerPick vacuum generation unit (and in turn to the Vacuum Gripper) according to the technical specifications.

For maintenance and other purposes, it is recommended to install a lockout valve before connecting the product.

The air supply tubing must be connected and disconnected to or from, the inlet port of the PowerPick vacuum generation unit, only when the line is depressurized.

When the line is pressurized, the air supply tubing must securely connected to **Port P+** of the the PowerPick vacuum generation unit.

3.3.2. Depressurizing the Supply Line

In order to safely depressurize the supply line, the air supply must first be shut off. If no lockout valve is present to depressurize the line, activate the vacuum Gripper to release the pressure.

3.4. Mounting and Installation

⚠️	**WARNING**
⚠️	• DO NOT install this equipment without having read and understood the Robotiq PE10 User Manual. • DO NOT install this equipment without having the proper training and experience. • DO NOT install any robot other than the Universal Robots UR10e. Failure to follow these instructions and to properly secure or install the equipment can result in material damage, death or serious injury. The warranty will not cover material damage resulting from an installation that does not comply with the instructions found in this manual. Make sure to follow all safety rules and regulations of the workplace. Always wear all recommended personal protective equipment in accordance with workplace safety standards.

3.4.1. Visual Inspection

The Robotiq Palletizing Solution is shipped on a pallet. A wooden crate protects the hardware from external elements.

The wooden crate containing the Robotiq Palletizing Solution weighs 212 kg (465 lb). A forklift truck or pallet truck is therefore necessary to move it. The operation of such machinery should be done by qualified and authorized personnel.

Before disassembling the crate, inspect it to make sure there is no damage or defect. If damage or defects are observed, contact the Robotiq support team.

3.4.2. Unboxing

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 in material damage, bodily injury or death.

1. Remove the top panel and the four (4) sides of the crate by removing the screws that hold them into place.

2. Remove the wooden frame by removing the screws that hold it into place.

3. Cut and remove the strapping material.

4. Take all cardboard boxes out of the crate.

5. Remove the two (2) bolts that retain the pedestal, and take the pedestal out of the crate.

6. Remove the two (2) screws that hold the teach pendant rack, and take the teach pendant rack out of the crate.

7. Remove the supporting wooden pieces by remove the screws that hold them into place.

8. Remove the four (4) bolts that hold the base to the crate.

9. Take the base out of the crate.

10. 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.

11. Secure the pedestal on the base using the four (4) M10 screws and washers provided. Tighten to a torque of 50 Nm.
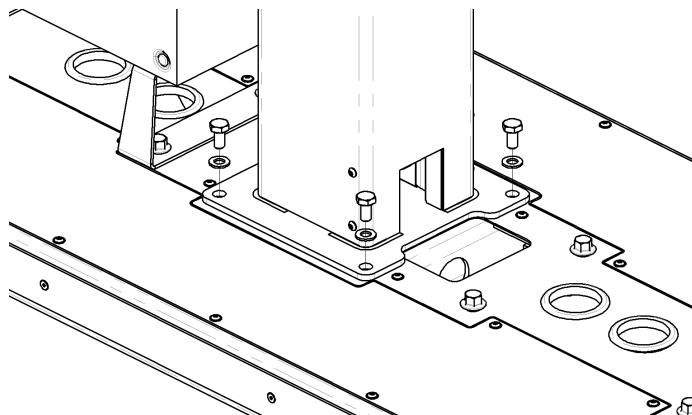
⚠	**CAUTION**
	Make sure to have all components at hand before discarding the crate and the packaging.

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.
	• 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.

The center of gravity of the Solution is as follows:

Robot	X axis (width)	Y axis (depth)	Z axis (height)
Without robot	4 mm	-85 mm	314 mm
With UR10e robot (put-in-the-box position)	-6 mm	-42 mm	516 mm
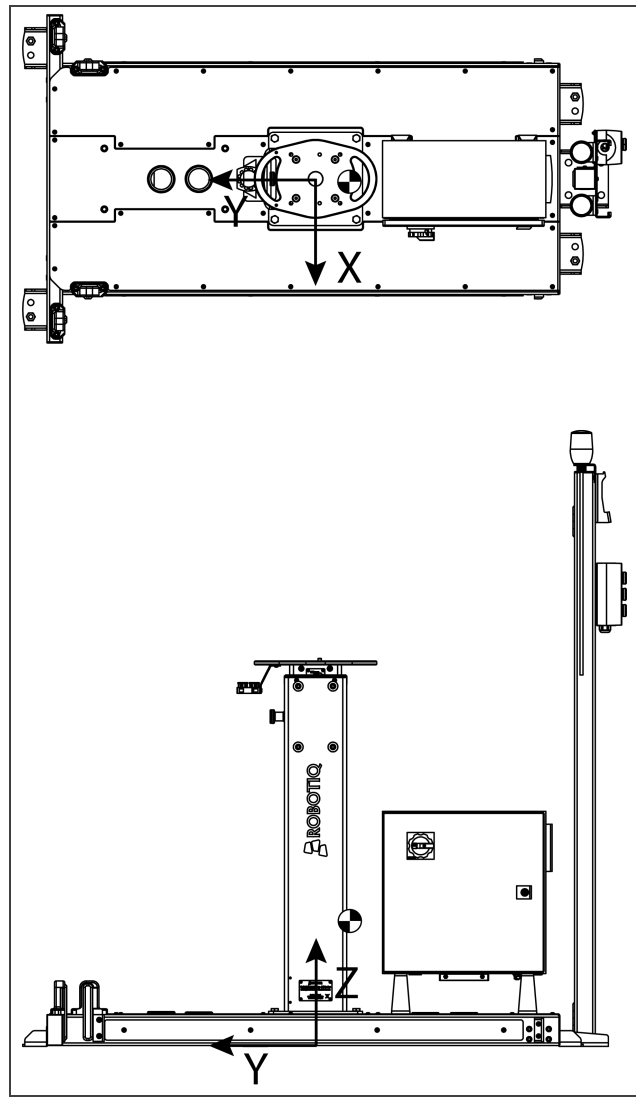
Fig. 3-1: PE Series without robot

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:

- 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) standing bolts highlighted in the image below to lift the Solution. Screw the four (4) casters into the base. Unscrew the standing bolts to set the solution down on its casters.

⚠️	**CAUTION**
	- The casters are not designed to support the weight of the whole Solution. Do not install the robot while the Solution is on its casters.
	- Do not use the Solution while it stands on its casters. To make the Solution stand upright, simply screw the four (4) standing bolts, remove the casters, then unscrew the standing bolts.
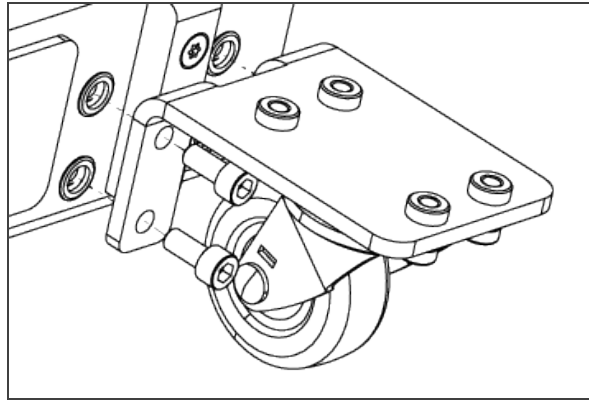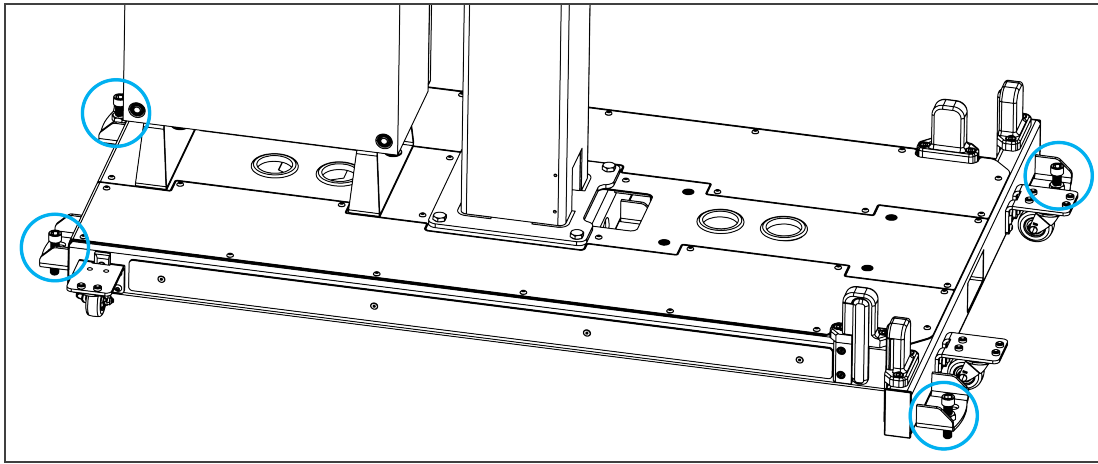
3.4.4. Mechanical and Electrical Installation

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

Robot Installation

1. Run the cable through the inner pedestal section and pull the cable out at the bottom of the pedestal.
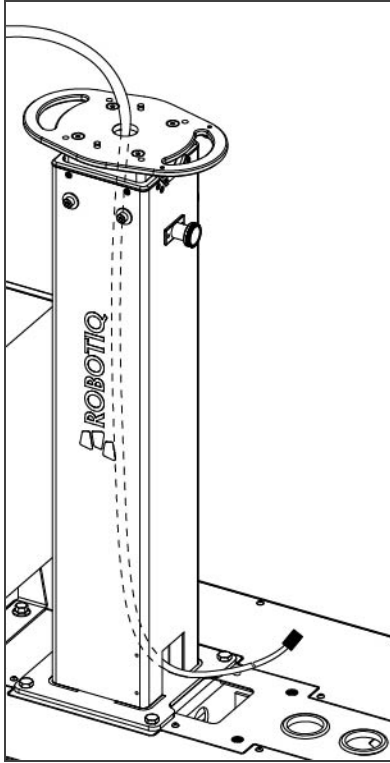
2. Place the robot on the robot base plate so that the back of the robot (the side on which is the notch to let the power cable through the robot base) is oriented towards the front of the Solution (towards the Robotiq Controller). Align properly with the two dowel pins (already installed on the robot base), and secure the robot using four (4) M8 x 25 mm screws and Belleville washers.
   The required torque value is 20 Nm.
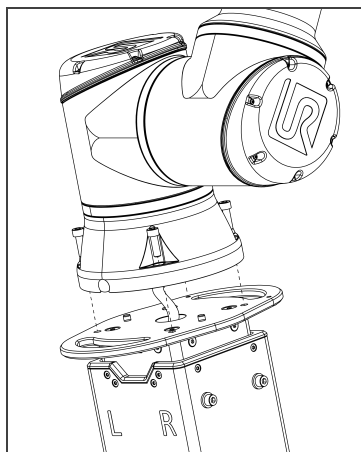
Pedestal Height Adjustment

⚠️	**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 required height based on the pallet and package configuration. Use the Robotiq Configurator to simulate the palletizing cell and obtain the exact height required. The possible heights range from 950 to 1550 mm with 50 mm increments.

    - If several different configurations will be used, the best practice is to find a height that will correspond to all of them. This will prevent manually changing the height of the pedestal during production.

2. Make sure the robot arm is folded in as much as possible.

3. Remove the six (6) screws that hold the pedestal in place, starting with the side that has two (2) screws.
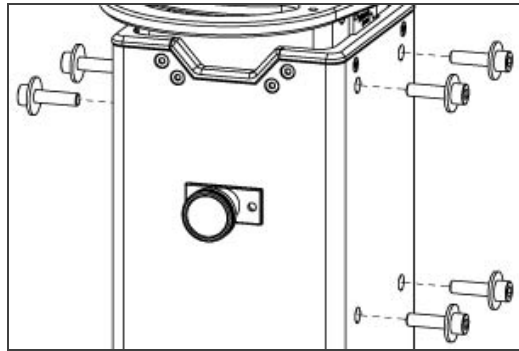
4. While holding the inner pedestal section in place using the handles on the robot base plate, pull the plunger latch. Lift the inner pedestal section until it reaches the desired height. Release the plunger latch. The height markers on the left side of the inner pedestal section displays the actual height at which the robot arm stands.

5. Screw the pedestal back in place, starting with the side that has four (4) screws with a 15 Nm torque. Then tighten the two (2) other screws 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 to add them to the configuration.

1. Install the post at the front of the base using two (2) M6 x 20 mm screws and washers. Tuck any excess cable into the base.

2. Remove 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.
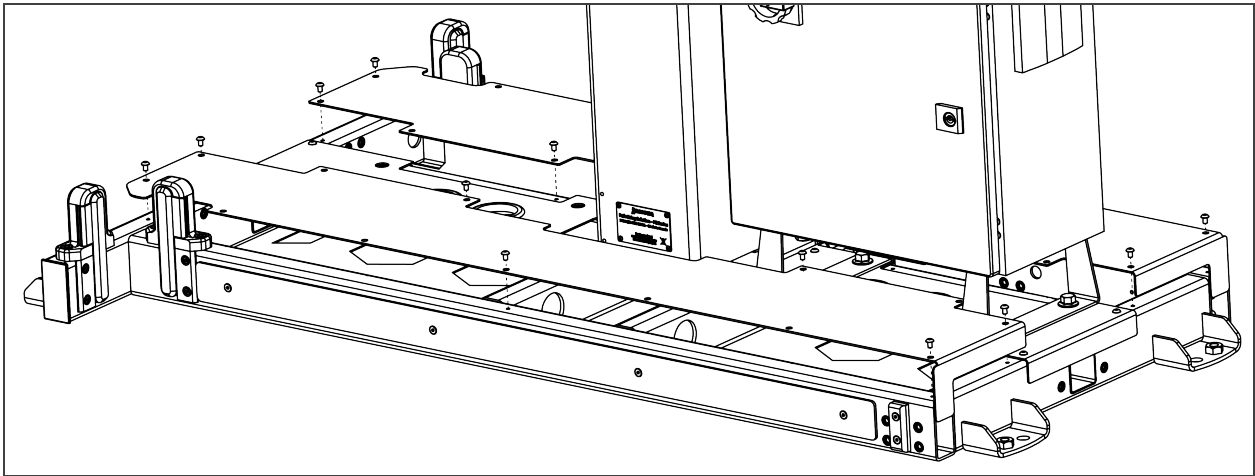
2. Run the robot's power supply cable through the back base plate and pull the connector through the hole that is closest to the pedestal.
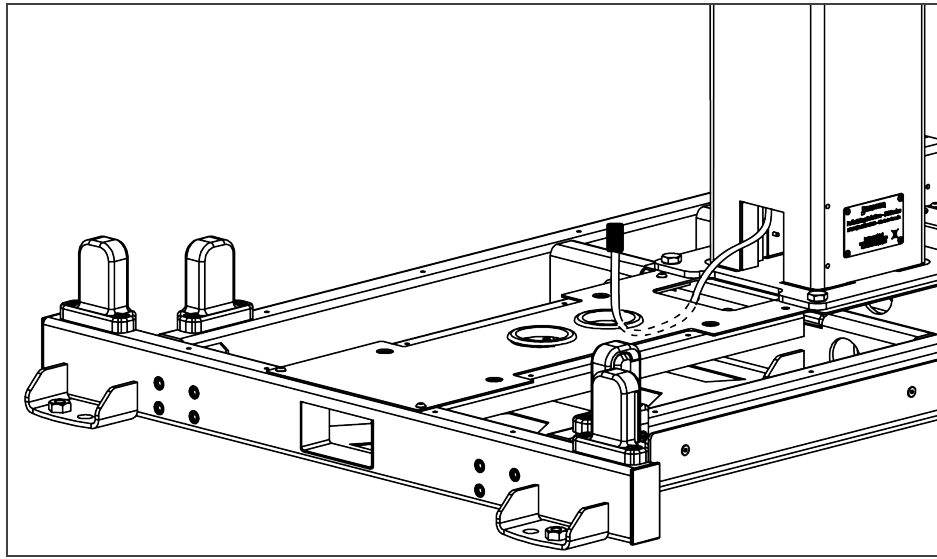
3. Pull the Robotiq control box's power supply cable and Ethernet cable through one of the holes in the front base plate.

4. 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.

5. 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.

6. Use the power cable provided with the UR robot to power the Robotiq control box. Pull the cable through the hole at the very back of the base.
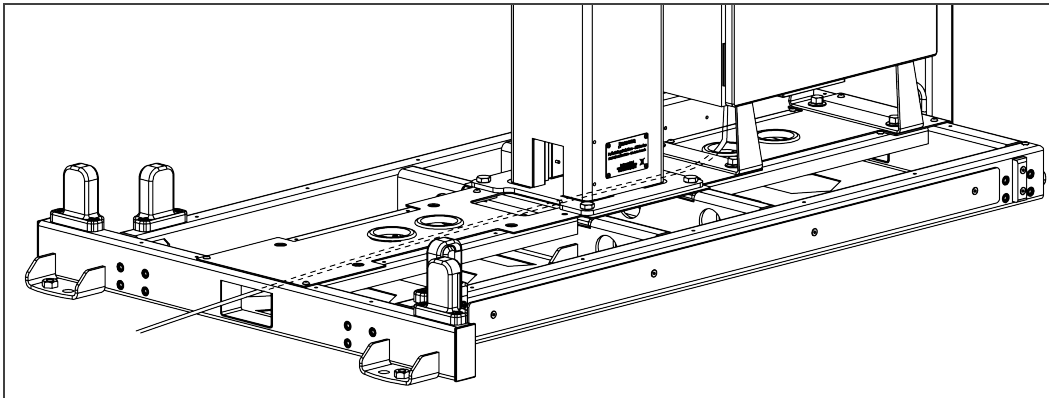
7. Run the box sensor's cable through the opening at the back of the base, and pull it out through one of the holes of the back base plate.

Controller Installation and Connection

1. Install the Universal Robots control box and secure it using the four (4) M12 screws.
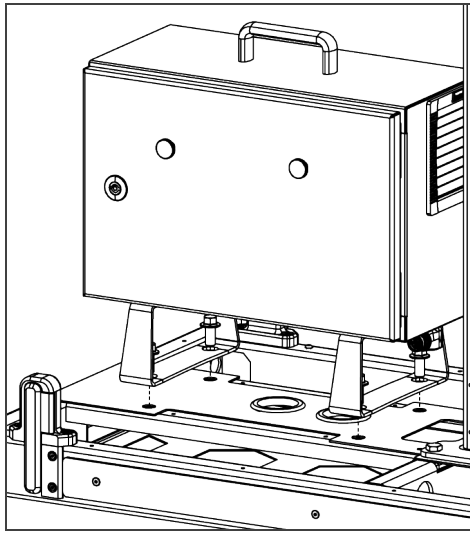
2. Connect the power output cable of the Robotiq control box to the UR controlbox.

3. Connect the robot arm's power output cable to the socket on the UR control box.

4. Open the UR control box. 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 performed before installing the vacuum gripper. It will ensure the 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 when the latter is in contact with 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 fastened tightly. The torque required is 15 Nm.

4. Loosen the four (4) screws that secure the column to the base. Unscrewing the screws half a turn counterclockwise should provide enough clearance to allow for the adjustment of the column's orientation. **The four (4) screws at the front must be fastened before the two (2) screws at the back.**

⚠	**WARNING**
	Do not completely remove the screws. (i.e., do not unscrew more than half a turn). Doing so can cause the column to tip over and, in turn, result in bodily injury and material damage.

5. Rotate the column counterclockwise as much as possible.
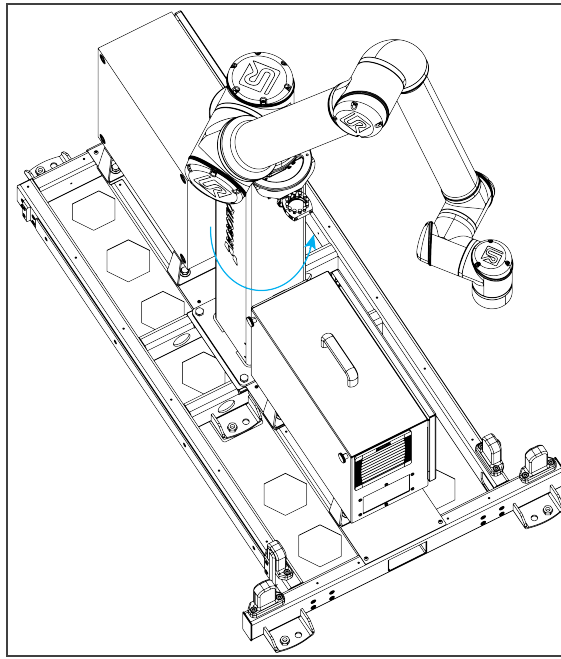
6. Position the robot so that the wrist is on the outer left side of the base, as shown in the figure below.
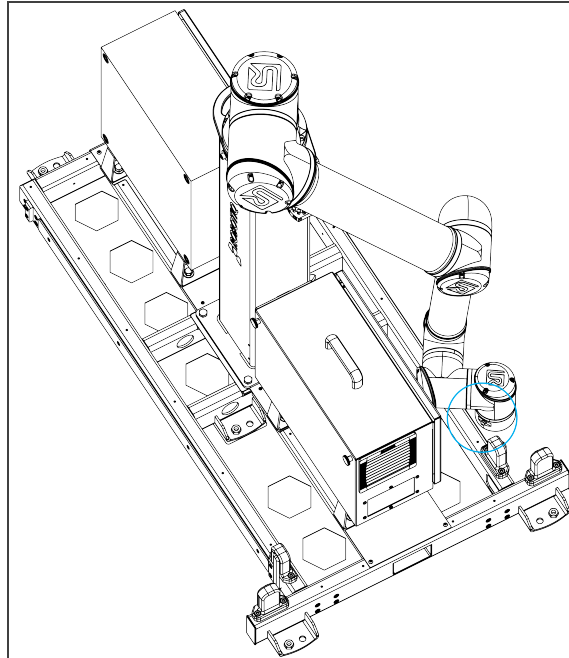
7. Jog the robot so that the robot tool flange is parallel to the ground: change the feature reference to Base, select **Rotation Vector** from the **Units** dropdown menu, and set the tool orientation to the following values: RX=0°, RY= 180°, RZ=0°.

8. In the Installation tab, set the TCP value to [0, 0, 0].

9. Set the Tool Position's X value (base reference) to 333.35 mm.

⚠	⚠ CAUTION
	Move the robot slowly and monitor the movements to avoid collisions.

10. Rotate the column clockwise so that the side of the robot wrist touches the side of the base.
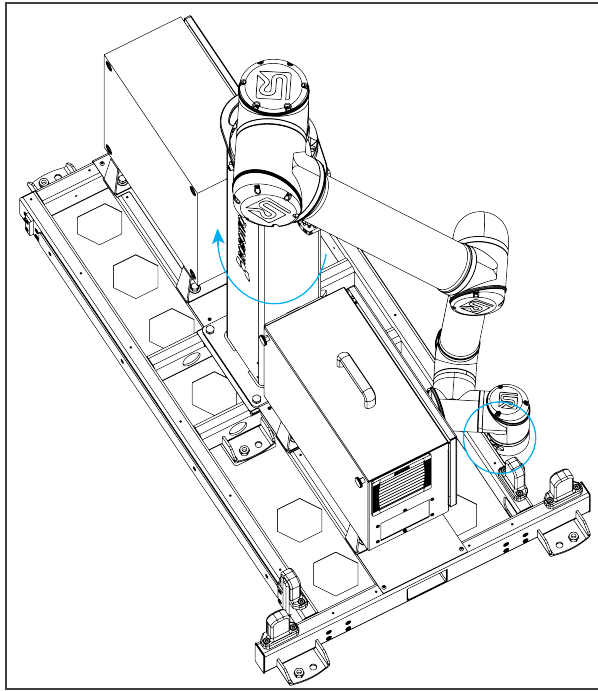
11. Tighten the four (4) screws to secure the column onto the base. **The torque required is 50 Nm**.

12. On the teach pendant, confirm that the X value of the current position is 333.35 mm and the wrist is still in contact with the side of the base.

13. Put the robot back in position of use.

Vacuum Gripper Installation

Generic Gripper Installation

To streamline the installation of grippers and accessories, power on the robot and rotate the joints as described in the table below, then power off the robot.

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

PowerPick Gripper Installation (optional)

Upon delivery, the PowerPick Gripper is already mounted to the 200 mm hollow offset link.

The following instructions are based on that configuration.

Should the application require a different type of configuration, please refer to the PowerPick Vacuum Gripper user manual available on Robotiq's support website or use the Robotiq Configurator.

Using four (4) M6 screws and tooth lock washers, secure the Gripper on the robot tool flange. **The torque required is 9.5 Nm**.
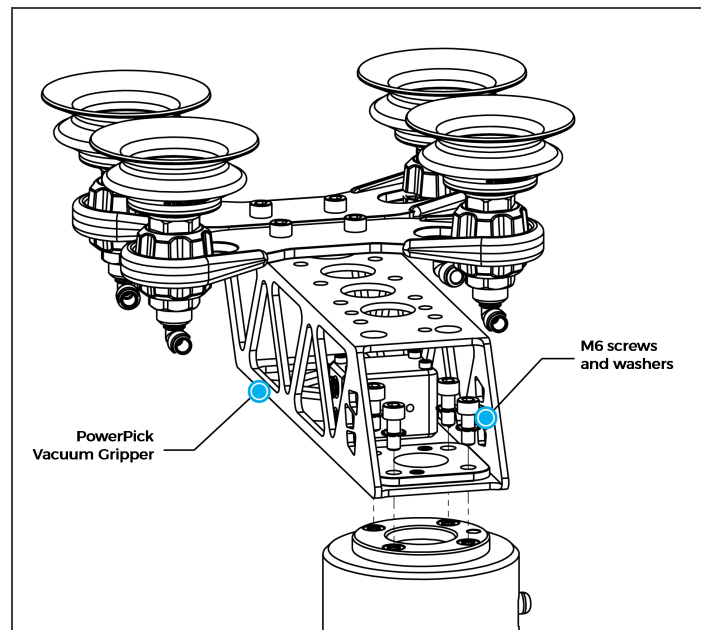
PowerPick Vacuum Generation Unit (optional)

1. Using isopropyl alcohol, clean the area where the PowerPick Vacuum Generation Unit will be placed. Remove the protective layers from the double-sided tape.

2. Position the PowerPick Vacuum Generation Unit on the Robotiq control box, with the pneumatic fittings pointing to the column of the pedestal.

3. Leave enough space (recommendation of 250 mm) between the PowerPick Vacuum Generation Unit and the pedestal to make sure that the tubing and electrical cabling can be connected easily.

4. Hold the Vacuum Generation Unit in place for 50 seconds to ensure a good grip.

TCP and Center of Mass

1. In the PolyScope interface, go to **Installation > General**.

2. Expand the **TCP** dropdown menu, then select **Payload**.

3. Enter the appropriate center of mass and TCP of the gripper.

	NOTICE
📖	The TCP and center of mass of the PowerPick10 Vacuum Gripper can be found at section **Tool Center Point and Center of Mass** of the PowerPick10 user manual available at robotiq.com/support.

Cable Management System

1. To correctly position the cables, 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°

	NOTICE
📖	• Both cable management sleeves are identical (one for the robot biceps, the other for the robot forearm). • There are two hook and loop (VELCRO®) fasteners on each cable management sleeve: one is used to close the sleeve and the second is used to hold the cables in place.

2. Install the first cable management sleeve:

    a. Working your way from the shoulder to the elbow of the robot arm, wrap the biceps of the robot arm in one of the cable management sleeves. The left edge of the sleeve should overlap the right edge.

    b. Tighten the cable management sleeve and close the first hook and loop fastener.

    c. Push the cable management sleeve until it touches the next joint of the robot and then rotate the sleeve so that the **upper hook and loop fastener faces up**. This will ensure the good positioning of the cables.

3. Install the second cable management sleeve:

    a. Working your way from the elbow to wrist #1, wrap the forearm of the robot arm in the other cable management sleeve. The left edge of the sleeve should overlap the right edge.

    b. Tighten the cable management sleeve and close the first hook and loop fastener.

    c. Push the cable management sleeve until it touches the next joint of the robot and then rotate the sleeve so that **the lower hook and loop fastener faces up**. This will ensure the good positioning of the cables.

4. Apply double-sided tape:

    a. Take two pieces of double-sided tape and remove one protective layer from each of them.

    b. Partially open either end of one of the cable management sleeves partially and apply both pieces of double-sided tape, side by side, 100 mm from the closest robot arm joint.

    c. Repeat with the other end of the cable management sleeve.

    d. Repeat with the other cable management sleeve.

	NOTICE
	The spiral cable wraps are installed backward, from the gripper to the robot base.

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

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

    a. Partially open the end of the forearm cable management sleeve closest to wrist #1. Remove the remaining protective layers from the pieces of double-sided tape.

    b. Place the 10 mm air tube on the pieces of double-sided tape to secure it, making sure white label #1 is at the edge of the cable management sleeve, closest to wrist #1.

    c. Partially open the end of the forearm cable management sleeve closest to the robot arm's elbow. Remove the remaining protective layers from the pieces of double-sided tape.

    d. Place the 10 mm air tube on the pieces of double-sided tape to secure it, making sure white label #1 is at the edge of the cable management sleeve, closest to the robot arm's elbow.

    e. Close the forearm sleeve. The 10 mm air tube should run along the forearm under the sleeve.

7. Secure the 10 mm air tube onto the robot's biceps.

    a. Partially open the end of the biceps cable management sleeve closest to the robot arm's elbow. Remove the remaining protective layers from the pieces of double-sided tape.

    b. Place the 10 mm air tube on the pieces of double-sided tape to secure it, making sure white label #2 is at the edge of the cable management sleeve, closest to the elbow.

    c. Partially open the end of the biceps cable management sleeve closest to the robot arm's shoulder. Remove the remaining protective layers from the pieces of double-sided tape.

    d. Place the 10 mm air tube on the pieces of double-sided tape to secure it, making sure white label #2 is at the edge of the cable management sleeve, closest to the robot arm's elbow.

    e. Close the biceps sleeve. The 10 mm air tube should run along the forearm under the sleeve.

8. Using a cable tie, attach the 10 mm air tube to the bracket just under the robot base plate so that white label #3 is under the bracket.

	CAUTION
	Make sure not to crush the cables with the cable tie.

Insert wires and air tube in bracket and hold with cable tie.
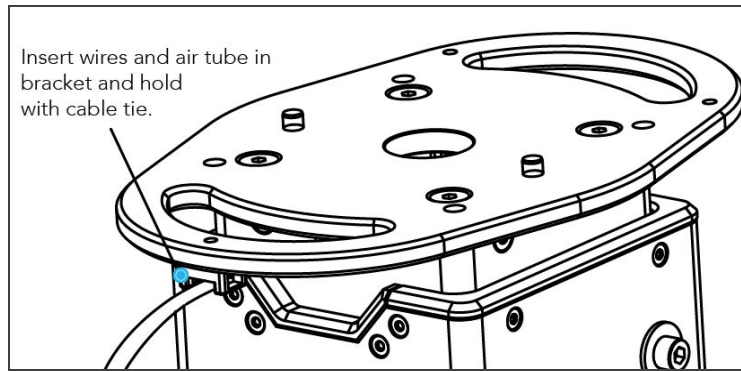
9. Once the pedestal is at the desired height, cut the 10 mm air tube at the correct length using a tube cutter, making sure there is enough length left for it to connect to the PowerPick Vacuum Generation Unit.

⚠️	**WARNING**
	To avoid collisions / protective stops, make sure that the air tube does not go over the sides of the column.

10. Connect the 10 mm air tube to **Port P-** of the PowerPick Vacuum Generation Unit.
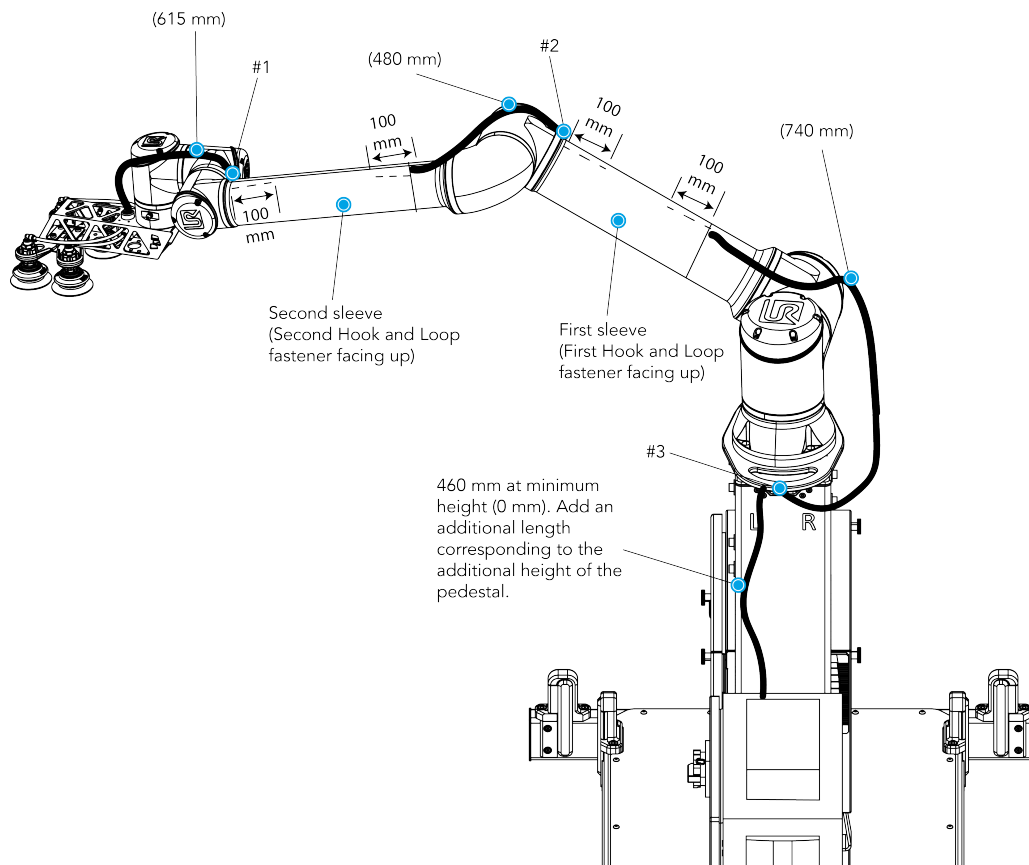
11. Remove the safety clip from **Port P+** of the PowerPick Vacuum Generation Unit.

12. Connect one end of the **8 mm air tube** to Port P+ of the PowerPick Vacuum Generation Unit.

13. Replace the safety clip

14. Slip the 8 mm air tube through a hole under the Robotiq control box.

15. Run the 8 mm air tube through the base of the palletizer and slip it through the hole at the back of the base.

16. Connect the 8 mm air tube to the filter kit provided (or equivalent).

17. Connect the filter kit to the local air supply device (air tube not provided).

	NOTICE
	The air supplied must comply with the specifications described in the **Environmental and Operating Conditions** section.

	CAUTION
	• Use dry and filtered air only. Follow the **ISO 8573-1, class 7.4.4** standard. • The maximum pressure allowed is 8 bar. The optimal pressure for compressed air consumption is 5.5 bar. • Robotiq recommends using a local pressure regulator with a filter and an air dryer. A filter kit is provided upon delivery.

18. Shut down the robot and the Robotiq control box.

PowerPick Gripper and Copilot Connections

1. Connect the Copilot license dongle to the USB hub in the robot controller. It must remain connected at all times.

2. Connect the M12 connector of the I/O cable to the PowerPick Vacuum Generation Unit.

3. Push the I/O cable through hole #1, pull it out via hole #2, and connect it to the robot controller.

4. Slip the I/O cable through a hole under the Robotiq control box, then run the cable through the base of the palletizer and to the robot controller via a hole under it.

	NOTICE
	Follow good cable management practices. If needed, use the plate under the controller and a grommet (not included).

5. Connect the I/O cable to the robot controller according to the table and figure below.

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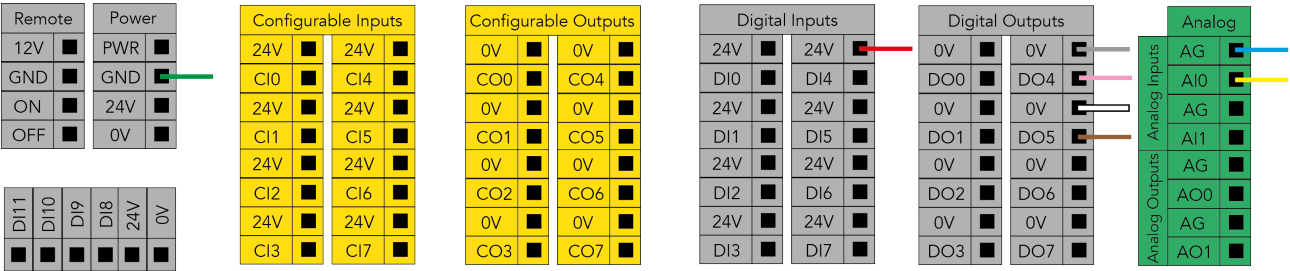
Push Button Enclosure Connection

1. Optionally, and depending on the 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 Control Box** 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.

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

Box Sensor (Single Box Type)

1. Run the box sensor cable through a hole under the robot control box.

2. Connect the wires to the terminal blocks of the robot control box:
    - Connect the brown wire to a 24 V terminal in a Digital Inputs block
    - Connect the blue wire to a 0 V terminal in a Configurable Outputs block
    - Connect the black wire to a digital input (DI) terminal (e.g. DI4, as shown in the figure below)

3. Secure each connection using a 2 mm flat head screwdriver (not provided).

📖	**NOTICE**
	Follow good cable management practices.
	Use the plate under the control box, and use a grommet if needed (not included).

4. Install each box sensor on a bracket using the provided screws.

5. Position each box sensor bracket so it can detect the box to be picked.

6. Connect each box sensor's M8 connector cable to the corresponding sensor.

Configurable Outputs

0V	0V
CO0	CO4
0V	0V
CO1	CO5
0V	0V
CO2	CO6
0V	0V
CO3	CO7

Digital Inputs

24V	24V
DI0	DI4
24V	24V
DI1	DI5
24V	24V
DI2	DI6
24V	24V
DI3	DI7

Digital Outputs

0V	0V
DO0	DO4
0V	0V
DO1	DO5
0V	0V
DO2	DO6
0V	0V
DO3	DO7
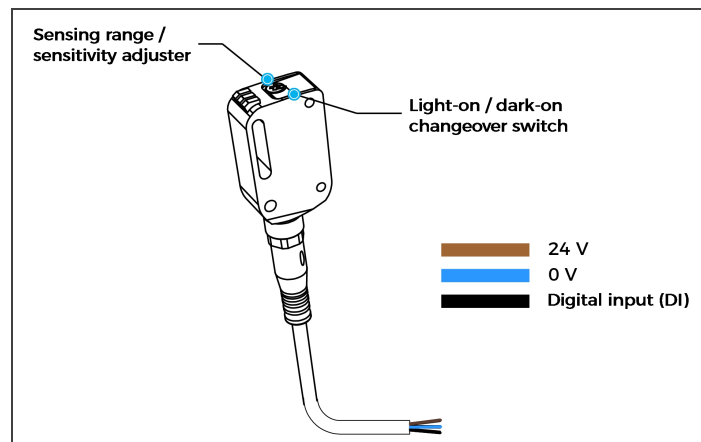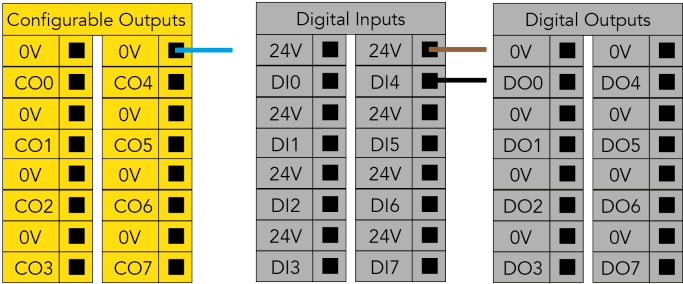
7. Once the system is running, adjust the detection distance of each box sensor using the sensitivity adjuster.

NOTICE
In order for the sensor to provide a high state when detecting a box, set the sensor to the light-on switching mode (green light beside "L"). To do so, press the light-on / dark-on changeover switch and hold for one to four seconds.

Box Sensor (Multiple Box Types - Multi-Pick Feature)

NOTICE
The example below presents a configuration with two box types and two box sensors. Should the user need to pick more than two boxes, add a sensor for each additional box type to be picked. The scope of delivery includes one (1) box sensor. Additional sensors can be ordered; refer to the **Spare Parts, Kits and Accessories** section for more information.

1. Connect each box sensor as described in the **Box Sensor (Single Box Type)** section.

2. Take note of the digital input terminal to which each box sensor is connected.

NOTICE
The figure below shows an example in which the digital input terminal for box sensor #1 is DI0, and the digital input terminal for box sensor #2 is DI1.

3. Lay a wire between an unused digital input terminal and an unused digital output terminal (this is depicted by the green wire in the figure below).

NOTICE
In the figure below, digital output DO0 will activate digital input DI4.
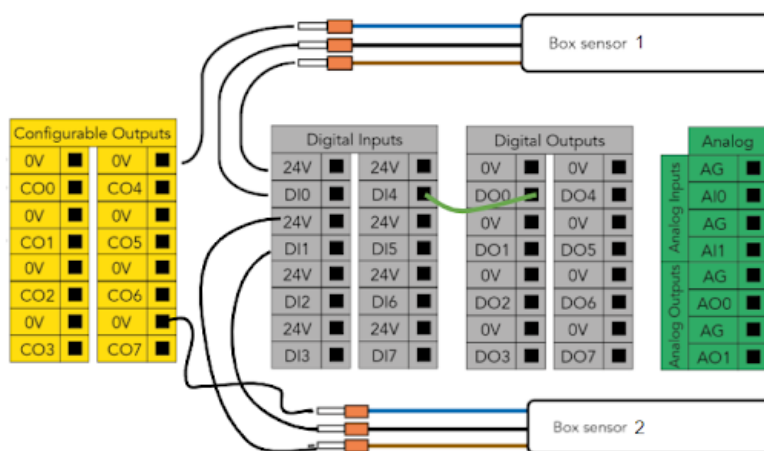
Fig. 3-2: Wiring Box Sensors for Multiple Box Types

⚠	**CAUTION**
⚠	**Connection Between Digital Input and Digital Output** This wiring procedure is the hardware step of the multi-pick feature, and will not make the feature functional on its own unless it is properly programmed in the robot software. Please refer to the **Palletizer Node With Multi-Pick Feature** section to go through the software steps and enable the multi-pick feature. The end result of this wiring procedure is for the robot to receive a combined signal indicating that both box sensors have been activated simultaneously, and that it can pick up the group of boxes altogether. And so, when both box sensors detect a box, the digital output (DO0 in the above figure) will send that combined signal to the robot. For that reason, the digital output must be connected to digital input (DI4 in the above figure) for it to be usable in the robot program.

Anchoring the Solution

The Robotiq Palletizing Solution must be anchored for it to be used.

Contact Robotiq if anchoring is not possible.

⚠️	**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 even death.

⚠️	**CAUTION**

	• Make sure to follow all the safety rules and regulations of your workplace and wear all recommended personal protective equipment in accordance with your workplace's safety standards, including:
	   • Safety glasses
	   • Hearing protection
	   • Hard hats
	   • Steel-toe boots
	   • Dust mask
	 • 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.

1. Choose the anchors:
   - With the anchors provided with the Solution, it should be installed in 28 MPa undamaged concrete (minimum).
   - With other anchors, each anchor should be able to withstand the following forces (as a minimum, considering that the rated values of fasteners are 25% of the ultimate value). **It is the responsibility of the end-user to ensure the final anchorage is resistant enough.**

Specification	Value	Comments
Pull out strength	5200 N	Ultimate value of 20 800 N, with a 4:1 safety factor
Shear strength	1400 N	Ultimate value of 5600 N, with a 4:1 safety factor

2. Move the Solution to its final position.
   - Make sure the layout is suitable and all distances are respected. Please refer to the **Palletizing Cell Layout** section for additional information.
   - The Solution must be placed on a flat and level floor. If it is not the case, use shims to level it.

3. Using the provided drill bit, make six (6) holes based on the anchoring pattern.

4. Screw or unscrew the nuts so that they come flush with the end of the threaded anchor body.

5. Make the anchors go through the holes of the Solution's base and into the drilled holes in the concrete floor.

6. Use a tool to hammer the anchors in.

7. Secure the Solution by screwing the nut of each anchor with a **torque of 54 Nm**.

⚠️	⚠️ **WARNING**
	Tip Over Hazard • The solution must be anchored at all corners. • The anchors provided with the Solution are Wej-It Ankr-TITE® Wedge Anchors model ATG1233 (1/2 x 3-3/4), but they may not be in compliance with the local rules, regulations and standards in force where the Solution is installed (the technical data sheet can be found on the [Robotiq support website](), in the Palletizing Solution section). A qualified engineer should measure the anchoring resistance of the anchors and confirm they can resist the following loads, or select alternative anchors designed to resist the following loads. ◦ **Operational load (per anchor)**: 1,200 N tensile resistance and 80 N shear resistance ◦ **Load at emergency stop (per anchor)**: 2,640 N tensile resistance and 279 N shear resistance ◦ **Design load (per anchor)**: 6,200 N tensile resistance and 2,350 N shear resistance • If the anchors provided with the Solution comply with the local rules, regulations and standards in force where the Solution is installed, use them in compliance with the following installation requirements. ◦ Anchors must be installed in concrete with a minimum strength of 17 MPa (2,500 psi). ◦ Anchors must penetrate at least 65 mm (2-1/2 in) into the concrete. ◦ Anchors must be located at least 200 mm (8 in) from any edge of a concrete slab. ◦ Anchors must be installed at least 150 mm (6 in) from one another. ◦ Anchors must be installed in conjunction with the provided serrated flange locknuts. ◦ Anchor nuts must be tightened to a torque ranging between 68 Nm and 74 Nm (50-54 lb-ft). Failure to account for these factors may result in material damage, bodily injury or death.
⚠️	⚠️ **WARNING** Appropriate personal protective equipment as required by safe work practices must be worn when anchoring the Solution, namely safety glasses, masks, steel-toe boots.
⚠️	⚠️ **CAUTION** The maximum gap between the anchoring points and the ground should be 2 mm (0.08 in).

8. Add the four (4) 1/2 in-13 serrated flange nuts.

9. Tighten to a torque ranging between 68 Nm and 74 Nm (50-54 lb-ft) using a 3/4 in (19 mm) socket.

Finalization and Power On

1. Reinstall the base covers using the 7 provided screws.

2. Install the pedestal cover using the provided screws (4).
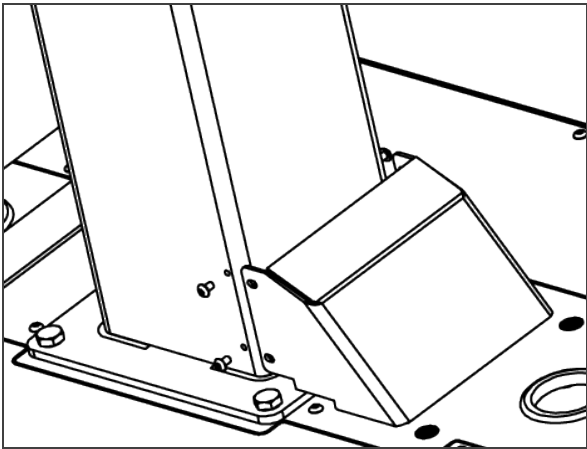
3. Connect the power cable to the power outlet.

4. Turn on the main power switch located on the Robotiq control box.

5. Power on the robot.

⚠	**WARNING**
	Make sure to perform a risk assessment before using the Solution. For more details, 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).

⚠	**CAUTION**
	The appropriate safety clearance between the conveyor and the pallet must comply with the distances set forth in the layout.

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 and bollards, 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.

- The **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 the **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 (0.1 x box height, 1280 - pallet depth, 180 + extra bracket reach + (0.1 x box height) - (minimum horizontal box dimension /2))

Side overrun

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

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 next to the picking area, depending on the layout of the palletizing cell. The robot's reachable area should be clearly identified and marked on the ground.

	NOTICE
	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 UR10e, tthe potential overrun is represented by a cylinder with a radius of 705 mm, with its axis aligned with the Z-axis of the robot base.

Floor marking

Floor marking to delineate the working zone should be added.
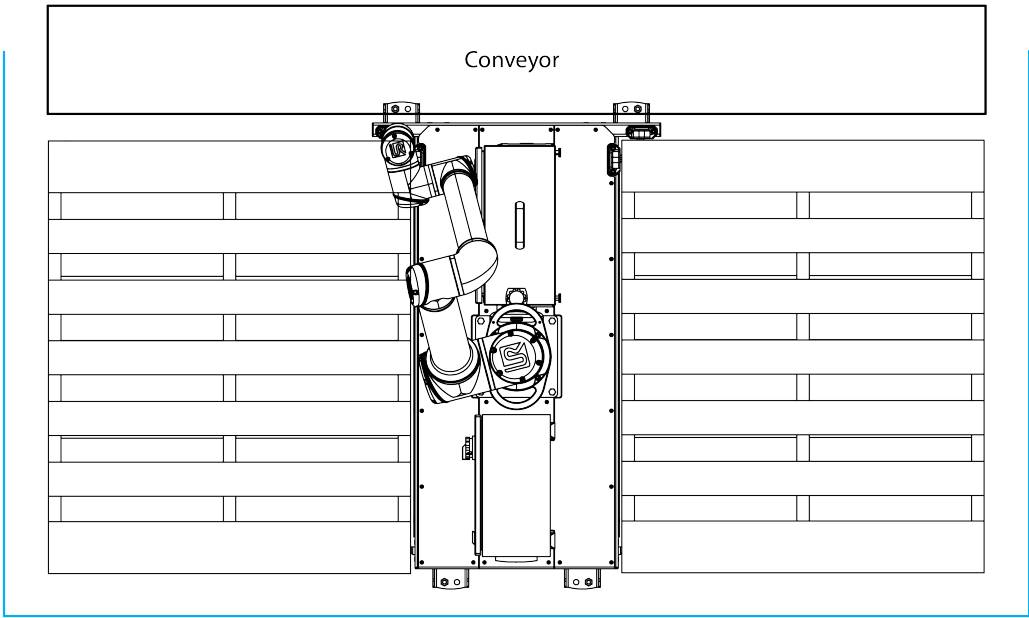
3.5. Other Grippers

It is possible to use a gripper other than the PowerPick 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 the shape of the alternative gripper does not correspond with the shape of the following models, it might function as well, but Robotiq does not guarantee that there will be no collision.

The dimensions of the gripper model depends on the dimensions of the box to palletize and are obtained using the following criteria:

Box Footprint $(A_{box} \times B_{box})$	Gripper Footprint $(A_g \times B_g)$	Gripper Height (C_g)
$A_{box} < 105$ mm OR $B_{box} < 55$ mm	$A_g = A_{box} - 1$ mm $B_g = B_{box} - 1$ mm	110 mm
$A_{box} > 450$ mm OR $B_{box} > 350$ mm	$A_g = A_{box} - 40$ mm $B_g = B_{box} - 40$ mm	55 mm
Otherwise	$A_g = 200$ mm $B_g = 130$ mm	110 mm
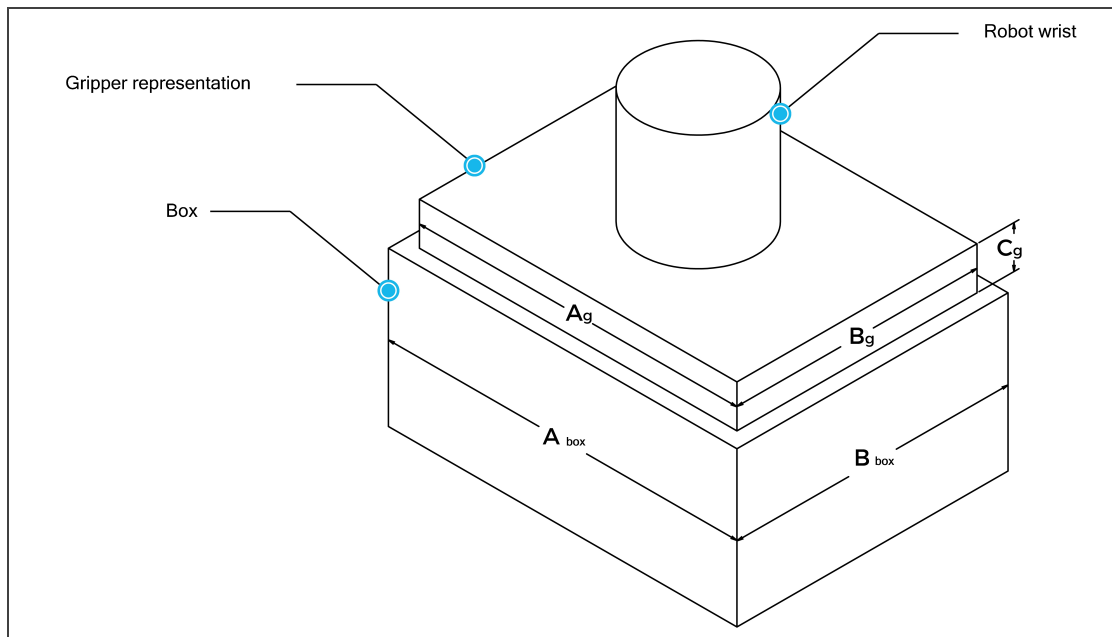
If a TCP offset is added in the X or Y directions, the software will act as if an extra reach bracket is being used.

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)
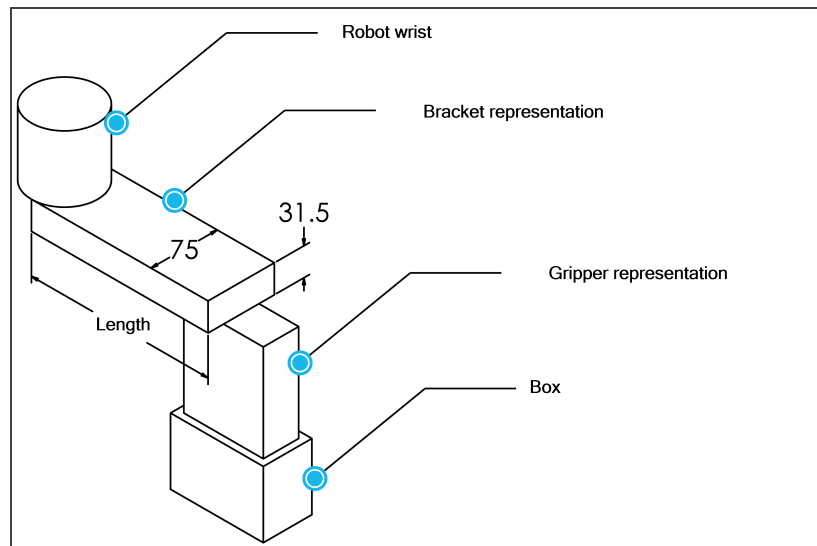
3.6. URCap Package

	WARNING
⚠️	Starting in July 2023, all new Palletizing Solutions sold are not compatible and not supported on Universal Robots CB Series. Only e-Series and new generations of Universal Robots can be used. For more information, please contact the Robotiq support department.

The Robotiq URCap package provides a graphical user interface and enables direct serial communication to the robot control box.

3.6.1. URCap Package Installation

Make sure the Robotiq Paletizing Solution is installed properly.

Refer to the **Mounting and Installation** section for detailed information.

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

To download the latest version of the Copilot URCap required to run the Palletizing Solution, refer to the Robotiq support website at robotiq.com/support under the sections Palletizing Solution, Universal Robots and Software.

- Download the Copilot URCap and extract it on the root of a blank USB storage device.

- Insert the USB storage device in the UR teach pendant or robot control box.

- 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.

- Tap the **URCaps** button.

- Tap the **plus (+)** button to look for the **.urcap file** in the available drives.

- Select the Copilot URCap (UCS-X.X.X.) to install the URCap.

- Once the file is 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.

3.7. Robot Configurations

	NOTICE
📖	To ensure the appropriate use of the Palletizing Solution, certain configurations found in the Safety section must be performed.

3.7.1. 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.

3.7.2. Joint Limits

Joint limits must be configured.

1. Tap **Installation→ Safety → Joint Limits**

2. Unlock the section with the password and change the values.
   - The minimum and maximum values for the Elbow are -167° and 3°.
   - The minimum and maximum values for the Wrist #3 are -273° and 273°.

3.7.3. Configurable Inputs

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

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

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.
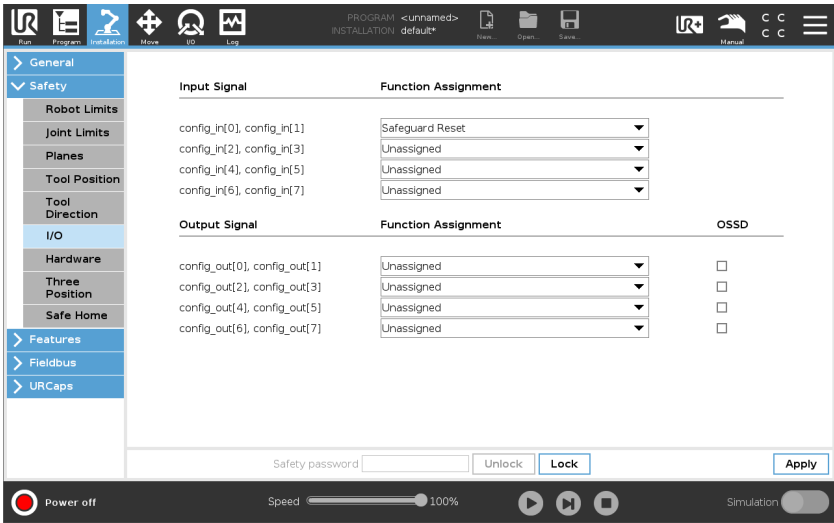
3.7.4. Safety Planes

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.

	NOTICE
	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 the **Physical Clearance and Reachable Area of the Robot** section for more information. The values can vary depending on your configuration.

4. Operation

⚠	CAUTION
	All information in this section must be read and understood before using the Solution.

4.1. Start Up

Perform the following steps after the mechanical and electrical installation.

1. Make sure the URCap package is installed. Please refer to the **URCap Package Installation** section for more information.

2. Configure the TCP. Use the appropriate values based on the gripper configuration. Please refer to the **Center of Mass, Tool Center Point (TCP)** section for more details.

3. Test the box sensor and the digital inputs : Place an object in front of the box sensor to validate if the signal changes in the I/O interface of PolyScope.

4. Test the Vacuum Gripper: Make sure the compressed air is supplied. Go to the I/O interface in PolyScope and manually activate the digital output (DO) that corresponds to the vacuum of the gripper. Repeat for the DO corresponding to the blow off action of the gripper.

4.2. Palletizing Operation Instructions

⚠	WARNING
	There is no emergency stop button directly on the Robotiq Palletizer. The emergency stop button used by the Palletizing Solution is the one found on the robot's teach pendant. Make sure operators know how to stop the Solution in case of emergency.

The following section explains 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. These steps are also represented in the form of diagrams in the **Palletizing Operation Diagrams** section.

1. Once the program is selected:
   a. Tap the **Play** button on the robot teach pendant.
      - If the **Validate pallet state at program startup** option is checked in the Palletizer node settings, the **Confirm current pallet state** window will appear on the robot teach pendant. Enter the pallet state and tap **OK**. The Palletizer will then start palletizing.

2. The operator has access to a **Pause** button and a **Restart** button, both available on the push button enclosure. If an accident occurs, an emergency stop button is also present on the robot teach pendant.

Emergency Stop button
Status lights
Push button enclosure
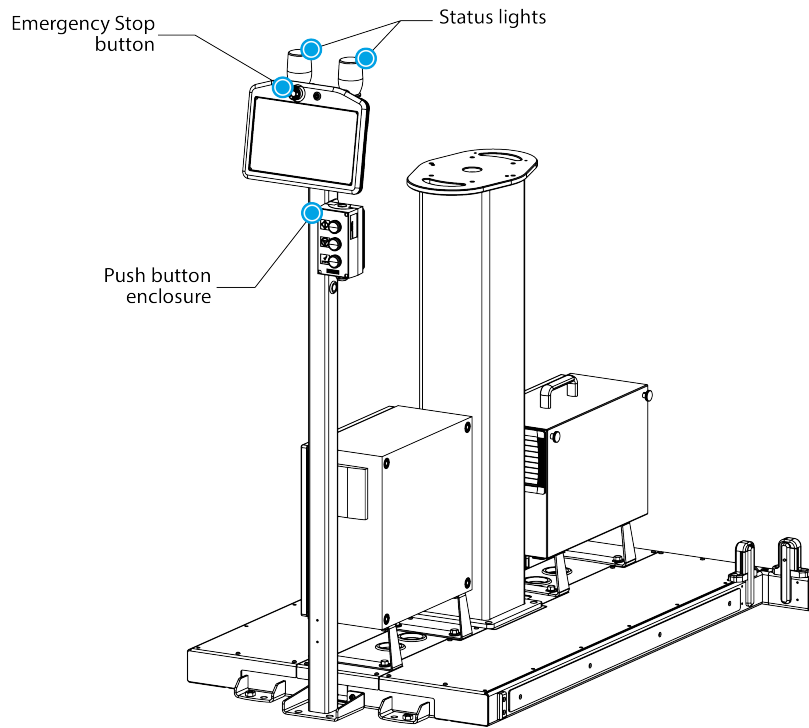
3. When using the **Confirm new pallet(s) ready** button:

   a. Once a pallet is full, the status light will turn solid blue or blinking blue (see **Status Light States** section for all the information about light states).

   b. Remove the full pallet and place an empty one.

   c. Press the **Confirm pallet(s) ready** button on the push button enclosure to confirm that the pallet is ready and that the area is cleared.

4. When NOT using the **Confirm new pallet(s) ready** button with safeguarded devices:

   a. Once a pallet is full, the status light will turn solid blue or blinking blue (see **Status Light States** section for all the information about light states).

   b. Enter the safeguarded area; palletizer falls in safeguard state.

   c. Remove the full pallet and place an empty one.

   d. Exit the safeguarded area and, after making sure no one is in the palletizer work area, make a safeguard reset to restart the palletizer.

⚠️	⚠️ **CAUTION**
	When adding safety components, make sure to respect all electrical wiring standards (example for redundant signals).

5. To safely resume the solution after a protective stop:

    a. Ensure the work area is clear and safe.

    b. Validate the protective stop window and press the resume button to restart the program.

    c. If necessary, stop the program, reposition the robot and restart the program.

6. To safely resume after an emergency stop:

    a. Ensure the work area is clear and safe.

    b. Release the emergency stop button and validate the emergency stop window.

    c. Restart the robot.

    d. If necessary, reposition the robot and restart the program.

4.3. Palletizing Operation Diagrams

The following diagrams explain the logic of the Palletizing Solution process based on the operator's actions, as well as responses such as signals, pallet and box sensor behaviors, etc. These steps are also explained in the **Palletizing Operation Instructions** section.

Normal operation of the palletizer (Palletizing mode)
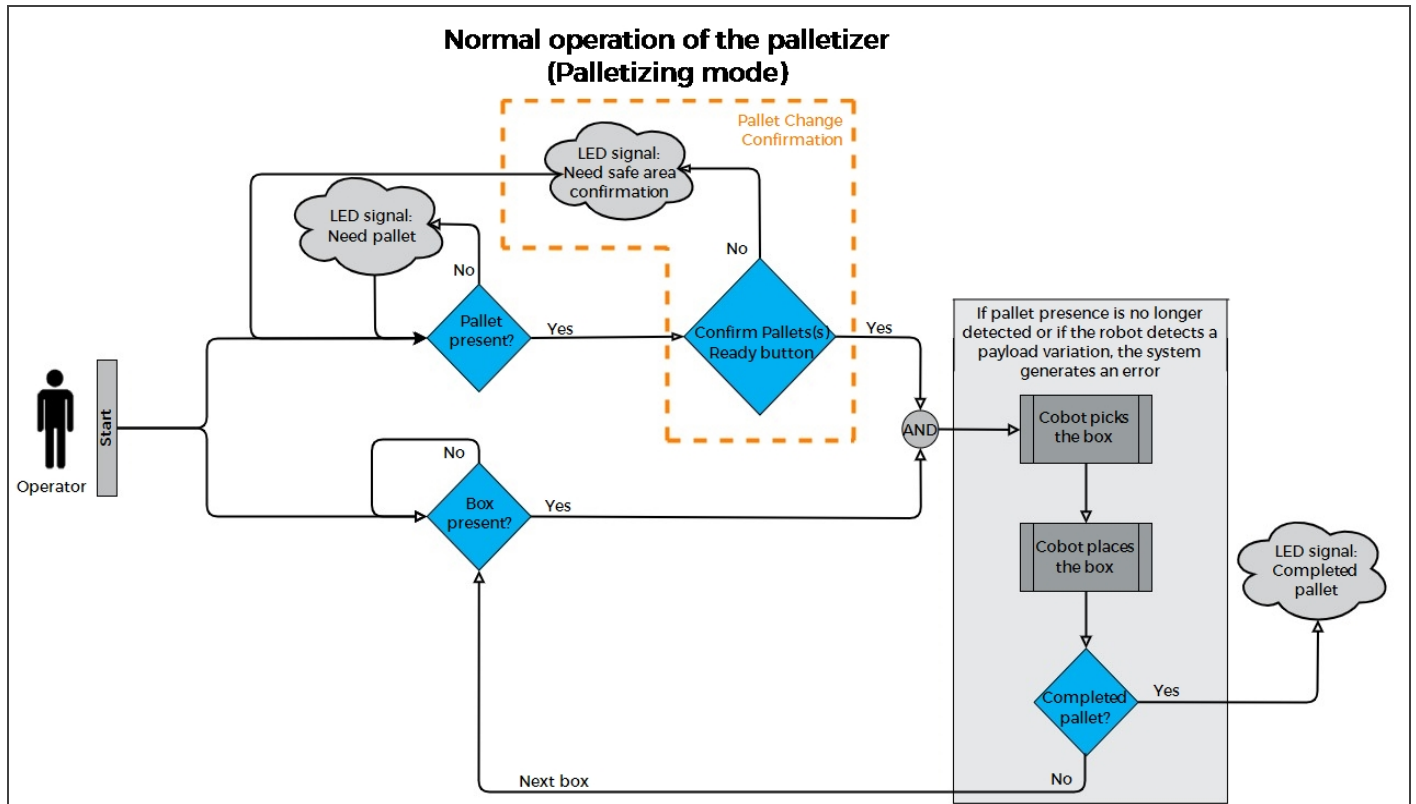
Please refer to the **Status Light States** section for further information about light states.

Operator places empty pallet

Operator removes completed pallet
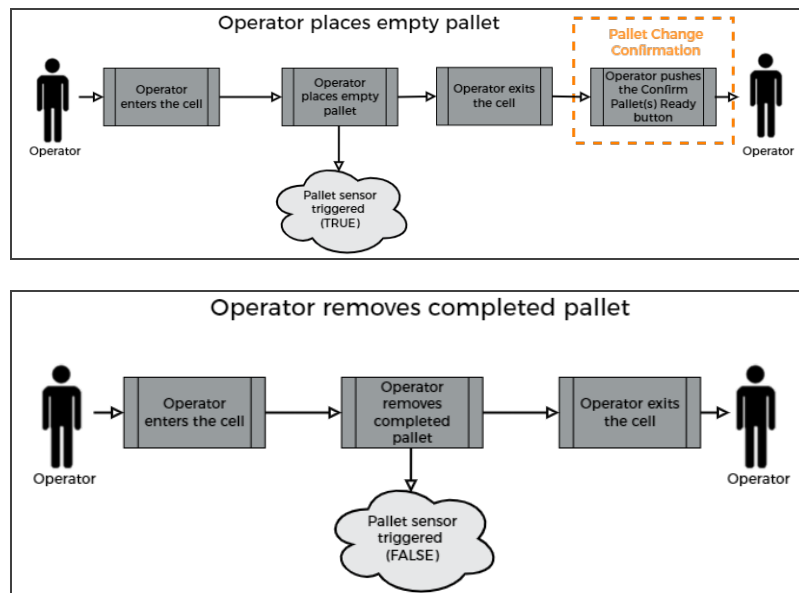
4.4. Status Light States

Status Light Activity

- **Fast blink:** 2 Hz (0.25 s ON, 0.25 s OFF)

- **Slow blink:** 0.5 Hz (1 s ON, 1 s OFF)

Color and signal type	Condition status	Cause or action needed
RED Fast blink	The Robotiq control box (PLC) is unable to communicate with the robot control box(UR)	- 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 control box and robot control box is properly connected to the USB adapter. - Try powering off the system (both the robot and the Robotiq control box). Wait 1 minute. Power up the system again.
RED Solid	A Protective or Emergency stop has occurred.	- Follow the procedure 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	- The pallet is complete or missing; AND - The system is palletizing on the other side.	Place a new pallet
BLUE Fast blink	- The pallet is complete and the system is idle; OR - The pallet is not detected and the system is idle.	Place a new pallet
WHITE Solid	- The Robotiq control box (PLC) is connected to the robot control box. - 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. URCap Software

5.1. License Agreement

END-USER LICENSE AGREEMENT

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

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1. Definition.

    1. *UR* means Universal Robots A/S, a corporation incorporated under the laws of Denmark, having its registered office at Energivej 25, DK-5260 Odense S, which specializes into the conception, advanced manufacturing and sale of robotic products (the *UR's Business*);

    2. *Software* means any of the Licensor's softwares provided to its customers for the purposes mentioned in Sub-section 1.4 hereof including their modifications and upgrades and their related materials;

    3. *Licensor* means Robotiq inc., a corporation incorporated under the laws of Quebec, having its registered office at 500‑966 chemin Olivier, Lévis, Québec, Canada, G7A 2N1, which specializes into the conception, advanced manufacturing and sale of robotic products (the *Licensor's Business*);

    4. *End-User* means a customer authorized pursuant to this Agreement to install or use the Software in order to make a specific product from the Licensor's Products compatible and functional with a specific product of the UR's Product;

    5. *Licensor's Products* means those products developed by the Licensor in the course of the Licensor's Business;

    6. *UR's Products* means those products developed by UR in the course of the UR's Business;

    7. *Licensor's Authorized Representatives* means and includes the Licensor and Licensor's authorized vendors, resellers, distributors and licensors;

    8. *Purchase Agreement* means an agreement between the End-User and the Licensor pursuant to which the End-User purchased one or more of the Licensor's Products.

2. License. Subject to the terms and conditions hereof, the Licensor grants to the End‑User a personal, temporary, non-exclusive, non-assignable and non-transferable and revocable license to use the Software in accordance with the terms and conditions hereof.

3. Software and Documentation. The Licensor may provide, if applicable, all documentation containing the detailed specifications for operation and use of the Software, which Software shall be used in accordance with such documentation. This documentation, if applicable, will be provided, wholly or in part, within (i) this Agreement, (ii) the Licensor's Web site http://robotiq.com/ (iii) the Licensor's Products and the Purchase Agreement therewith, or (iv) any other agreement, document, support, whatsoever decided by the Licensor.

    The use of the Software requires the Licensor's Products, UR's Products , compatible systems and certain software (which may require some expenses), may require periodical updating and may be affected by such elements. Most equipment will be compatible with the Software. However, the Software may not function on certain types of equipment.

4. Modifications and Upgrades. The Licensor shall be under no obligation to provide any upgrade or modification to the Software. However, the End-User shall be entitled to receive free of charge all modifications and upgrades of the Software provided by the Licensor if, at such time, the End-User is not in default in respect of any of its obligation contained herein. Such modifications and upgrades of the Software shall be installed by the End-User itself by consulting the Licensor's Website http://robotiq.com/ where a link to proceed to such installation will be made available thereof. A new version of the Software shall not be covered by this Section 4 but shall require that a new End-User Software License Agreement be entered into between the Licensor and the End-User.

5. Fees. The grant by Licensor to the End-User of the present license shall be free to the extent that the End-User agrees and complies to the term and conditions herein at all time.

6. Maintenance. During the term of this Agreement, the Licensor will maintain the Software in an operable condition and will make available any corrections and improvements as are generally incorporated in the Software by the Licensor without additional charge to the End-User. The Licensor may temporarily and without notice suspend or limit access to the Software if necessary or desirable in order to maintain, restore, modify or repair any part of the Software or for any reason related to business. During such works, the Software will not be available but the Licensor undertakes to deploy its best efforts to perform such works at appropriate times and to limit any inconvenience arising therefrom.

7. Title to Software. The licensed Software is composed of confidential data and trade secrets and is proprietary to and constitutes trade secret information and intellectual property of the Licensor. Title and ownership rights to the Software, including the intellectual property rights related thereto, shall remain with the Licensor. The End-User agrees to maintain the confidential nature of the Software and related materials provided for the End-User's own internal use under this Agreement. The license granted herein does not include the right to sublicense to others, and may not be assigned to others, in whole or in part, without the prior written consent of the Licensor. The End-User may not or allow others to modify or prepare directive works, copy (except for normal backups for recovery purposes), reproduce, republish, reverse engineer, upload, post, transmit, or distribute, in any manner, the Software.

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10. Limitation of liability. TO THE MAXIMUM EXTENT PERMITTED BY LAW, LICENSOR AND LICENSOR'S AUTHORIZED REPRESENTATIVES SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY, BREACH OF CONTRACT, NEGLIGENCE, STRICT LIABILITY OR ANY OTHER LEGAL THEORY RELATED TO THE Software. SUCH DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, LOSS OF PROFITS, LOSS OF REVENUE, LOSS OF DATA, LOSS OF USE OF THE PRODUCT OR ANY ASSOCIATED EQUIPMENT, DOWN TIME AND USER'S TIME, EVEN IF THE LICENSOR HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN ANY CASE, LICENSOR ENTIRE LIABILITY UNDER ANY PROVISION OF THIS AGREEMENT SHALL BE LIMITED TO THE AMOUNT ACTUALLY PAID IN RESPECT OF THE LICENSOR'S PRODUCTS PURCHASED BY THE END-USER PURSUANT TO A PURCHASE AGREEMENT.

11. Training, Maintenance and Support There is no entitlement to training, maintenance and support under this license unless otherwise specified in the Purchase Agreement or any other written agreement between the End-User and the Licensor. The

End-User may provide the Licensor with details regarding any bug, defect or failure in the Software promptly and with no delay from such event; the End-User shall comply with the Licensor's request for information regarding bugs, defects or failures and furnish him with information, screenshots and try to reproduce such bugs, defects or failures upon Licensor's demand.

12. Expiration and Termination. The Licensor may terminate this Agreement for default by the End-User. This Agreement will also be automatically terminated upon the election of such by the Licensor or the official launch of the Software, whichever event comes first. Upon termination of this Agreement for any reason, the End-User shall promptly uninstall the Software on any UR's Productsand Licensor's Products, computer, or server on which it has been installed, deliver to the Licensor all CDs, DVDs, magnetic tapes, cards, and other tangible items and materials embodying the Software, and return to the Licensor all copies thereof or destroy such copies and warrant in writing that all copies thereof have been destroyed. In the event of termination of this Agreement, all obligations of the parties under this Agreement due for performance on the date of termination shall survive the termination, and the party terminating shall not be liable to the other party for any damages arising out of the termination.

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.

5.2. Copilot

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

1. Connect the license dongle to the USB hub in the UR control box.

2. Go to **Installation** > **URCaps** > **Copilot** > **Dashboard** to ensure your Copilot license is activated.
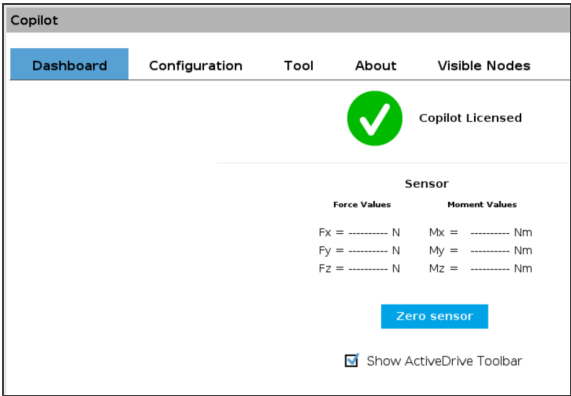
Fig. 5-1: Copilot License

3. Select the Palletizer model:

Tap **Installation** > **URCaps** > **Copilot** > **Configuration** > **PE Series** radio button.
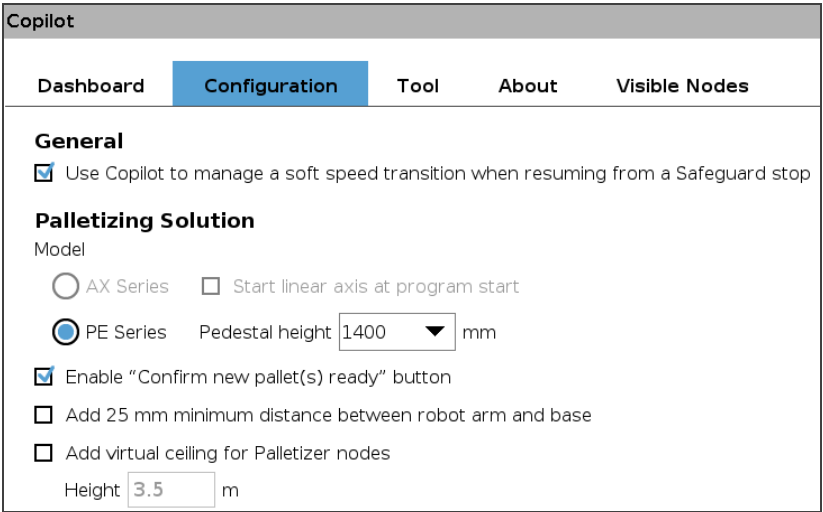
Fig. 5-2: Copilot Configuration Tab in the Installation Menu

	NOTICE- Speed Slider
📖	Robotiq recommends to keep Copilot activated at all times. However, if another URCap or PolyScope option (for instance, ProfiNET or Ethernet/IP) needs to take control of the speed slider, the option **Use Copilot to manage a soft speed transition when resuming from a Safeguard position** can be deactivated.

4. Select the pedestal height from the dropdown menu. The values available range from 950 mm to 1500 mm by increments of 50 mm.

	NOTICE
	Tip: Use the Robotiq Configurator to simulate the palletizing cell and obtain the exact height.

5. If required, select the **Enable "Confirm new pallet(s) ready" button** option. This feature allows the user to use the **Confirm new pallet(s) ready** button found on the push button enclosure. This 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.

6. If required, select the **Add 25 mm minimum distance between robot arm and base** option. When selected, this feature ensures a 25 mm clearance between the moving parts and the fundamental components of the base of the Solution (both control boxes, teach pendant holders and mounting zone for pneumatic accessories) during trajectory execution.

7. If required, select the **Add base height offset for Palletizer node** option. Note that only the base will be offset, and not the actual pallet(s). Only use this feature if recommended by Robotiq for the application at hand.

	CAUTION
	When adding moves other than those generated automatically by the Palletizer node, it is the responsibility of the user to observe the 25 mm minimum distance at all times.
	This option can influence box throughput and affect the furthest positions reachable by the robot end effector. It should only be used in situations where it is strictly necessary.

	CAUTION
	Make sure to observe sufficient clearance between any overhead equipment or ceiling, and the components of the Palletizing Solution.
	If required, activate the **Add virtual ceiling for Palletizer nodes** option.
	Enter the height limitation.
	This will prevent the components of the Palletizing Solution from extending beyond this limit when in motion.

5.3. Command Window

5.3.1. Palletizer Node

1. Tap **Program** > **URCaps** > **Palletizer** to add a Palletizer node in the robot program.

2. In the **Command** window, tap the **Start** button. The interface will display the Box, Pallet, Pattern and Settings blocks.
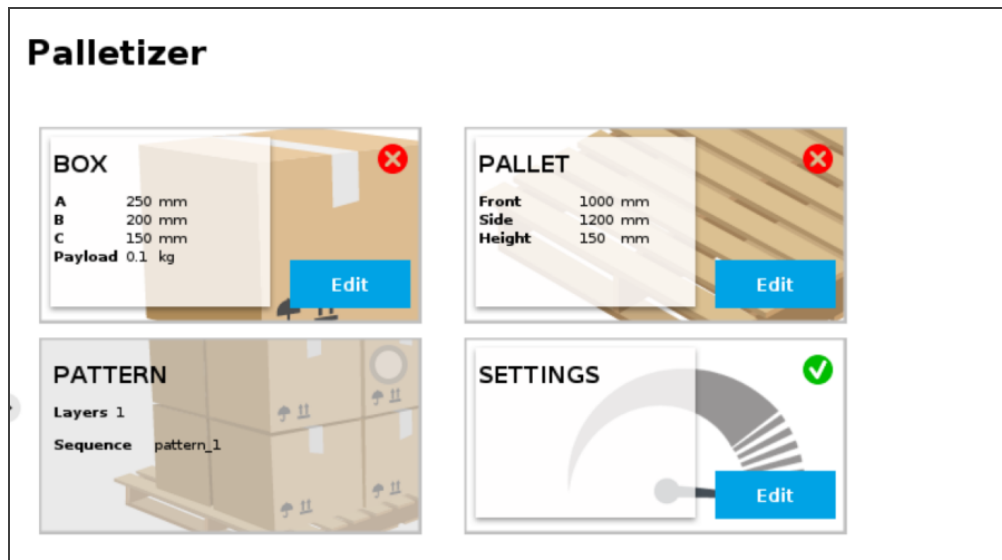
Fig. 5-3: Home View of a New Palletizer Node

3. Tap the **Edit** button in the **Settings** block.

Settings Block

Settings Menu

Fig. 5-4: Settings Menu of a Palletizer Node

1. **Palletizer mode**

Select the radio button that corresponds to the task to be performed, either **Palletizing** or **Depalletizin**g. The default value is Palletizing.

2. **Box and pallet display units**

Select the preferred measurement system, either **Metric** or **Imperial**. The default value is Metric.

3. **Enable multi-recipe**

Disabled by default.

Tick the box to enable multi-recipe.

The multi-recipe feature adds the ability to create one or more palletizing recipes within the same Palletizer node, each with its own layer sequence, number of layers, patterns, box types, and settings.

NOTICE
Once enabled, the multi-recipe feature applies to the entire Palletizer node.
The interface thus displays a visual indicator signaling the user that changes made to certain sections of the Settings menu will affect the entire Palletizer node.

Fig. 5-5: Settings Menu of a Palletizer Node - Global Settings

	NOTICE
	When enabled, the multi-recipe feature changes the home view of the Palletizer node and displays the list of palletizing recipes.

4. **Enable multi-pick (different boxes or box groups)**

Disabled by default.

The multi-pick feature allows for the configuration of different box types.

It can be used in contexts such as:

- Retrieving different box types from different picking locations;

- Retrieving multiple identical boxes simultaneously (i.e., at the same picking location) using one or several grippers.

	NOTICE
	- Boxes picked together are considered and handled as one unit by the system.
	- Boxes to be picked together must be right next to each other at the same picking location (e.g., at the end of a conveyor).
	- Boxes picked together must be dropped right next to each other at the same drop location (e.g., on a pallet layer).
	- Boxes picked together must have the **same dimensions**.

| | • Boxes picked together must have the **same payload**. |

Refer to the **Box Sensor (Multiple Box Types - Multi-Pick Feature)** section to perform the wiring procedure (hardware step) of the multi-pick feature, and to the **Palletizer Node With Multi-Pick Feature** section for information on how to program using the multi-pick feature (software steps).

5. **Validate pallet state at program startup**

Enabled by default.

When this option is activated, the system will bring up a pop-up window (i.e., the **Pallet viewer**) for each Palletizer node, and will prompt the user to confirm each pallet's state at the start of the program, either empty, full, absent or ignored.

Untick to deactivate if required. When this option is not selected, the system will not bring up a pop-up window to confirm each pallet's state at the start of the robot program.

- If the Palletizer is set in palletizing mode, the pallet will be considered empty.

- If the Palletizer is set in depalletizing mode, the pallet will be considered full.

- If the pallet sensors do not detect the presence of a pallet, the pallet will be considered absent.

⚠️	⚠️ **CAUTION**
	If, for whatever reason, the Pallet viewer indicates that a pallet is absent although it is materially present, it is the responsibility of the user to confirm the actual state of the pallet, either full, empty or ignored.

⚠️	⚠️ **CAUTION**
	When the user is not given the option to validate the pallet state at the start of the program: • If the program stops, the current state (i.e., number of boxes processed) of each pallet will be kept in memory. • Saving the robot program also saves the current state (i.e., number of boxes processed) of each pallet. Loading the program will also load the saved pallet state. • The Palletizer node will thus resume with the saved pallet state.

6. **Add virtual planes around pallet(s)**

Disabled by default.

When enabled, this option unlocks the **Distance** field to enter a numerical value. This value will add to the measurement of each pallet side to create a virtual plane around it. This prevents the robot holding boxes, and the actual boxes, from reaching beyond the limits of the virtual plane.

📖	**NOTICE**
	Robotiq recommends keeping a minimum distance of 50 mm (2 in) around all pallet sides.

7. **Tool speed** and **Tool acceleration**

Set the speed and acceleration of the end-of-arm tooling for:

- When it carries a load (**With box**)

- When it moves without carrying a load (**Without box**)

⚠️	**CAUTION**
	When the multi-recipe feature is enabled, the With box values are specific to the recipe being edited, and the **Without box values apply to the entire Palletizer node** (i.e., all recipes of the node). This way, the end-of-arm tooling will travel at different speeds and accelerations depending on the type of box it carries, but will always travel at the same speed and acceleration when not carrying a load.

Home View

Single Recipe

By default (**single recipe**), the home view of the Palletizer node displays the Box, Pallet, Pattern and Settings blocks of the only recipe available.
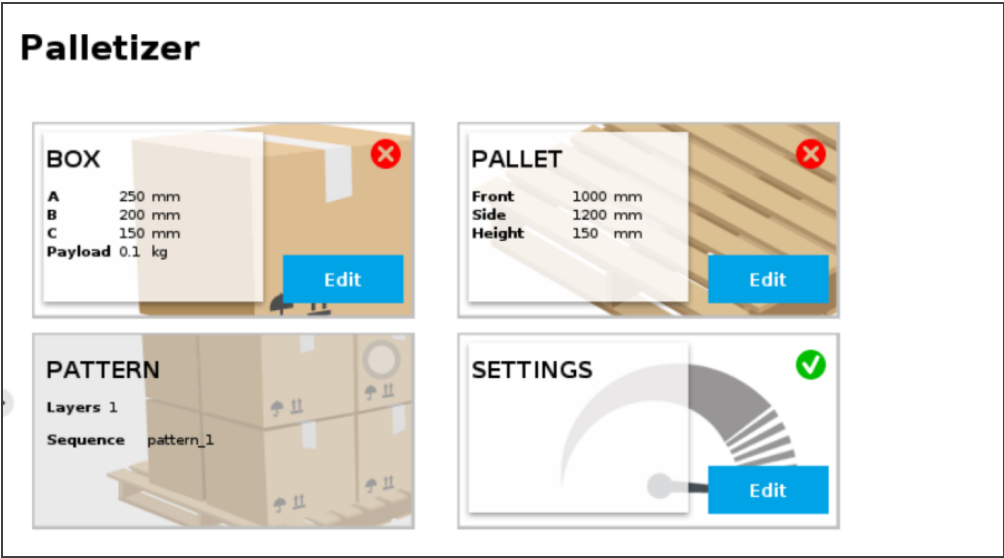
Fig. 5-6: Home View of a Single Recipe Palletizer Node (Dashboard)

Multi-Recipe

When the **multi-recipe** feature is enabled, the home view of the Palletizer node displays the list of recipes created.
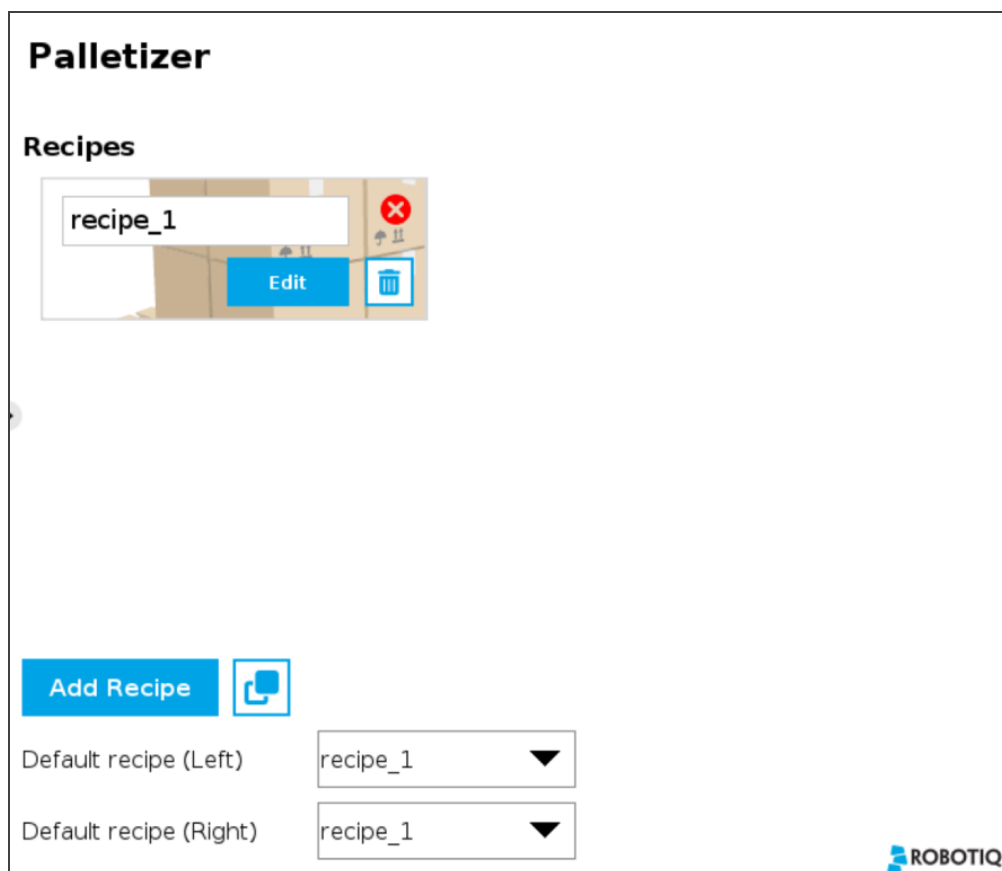
Fig. 5-7: Home View of a Multi-Recipe Palletizer Node

- Tap the **Add Recipe** button to create a new pallet recipe, yet to be configured.

- The **Default recipe dropdown menus** allow the user to select which recipes will be used at the start of the robot program.

- When starting the program, choose which recipe will be used for each pallet in the **Confirm current pallet state** popup window.

	NOTICE
	The recipe selected from the dropdown menu in the **upper right corner** will change the recipe for both pallets.
	The recipe selected from the dropdown menu in the **lower right corner** will change the recipe for the other pallet only.

- If applicable, tap the **Duplicate** icon to open the duplication menu.

Fig. 5-8: Duplicate Recipe Menu

- If required, duplicate a recipe and tap the **OK** button, or tap **Cancel** to go back to the list of recipes.

- Tap the **Edit** button under the name of a recipe to bring up the Box, Pallet, Pattern and Settings blocks specific to the recipe to edit.

Box Block

Single Pick (Default Mode)

By default (single pick), the home view of the Palletizer node displays the Box, Pallet, Pattern and Settings blocks of the only recipe available.

Tap the **Edit** button in the Box block to bring up the **Box menu**.

Multi-Pick (Different Boxes or Box Groups)

By default, the multi-pick feature is disabled in the **Settings** menu.

When the multi-pick feature is enabled in the **Settings** menu, selecting the Box block brings up the Box Types menu (i.e., the list of box types created).
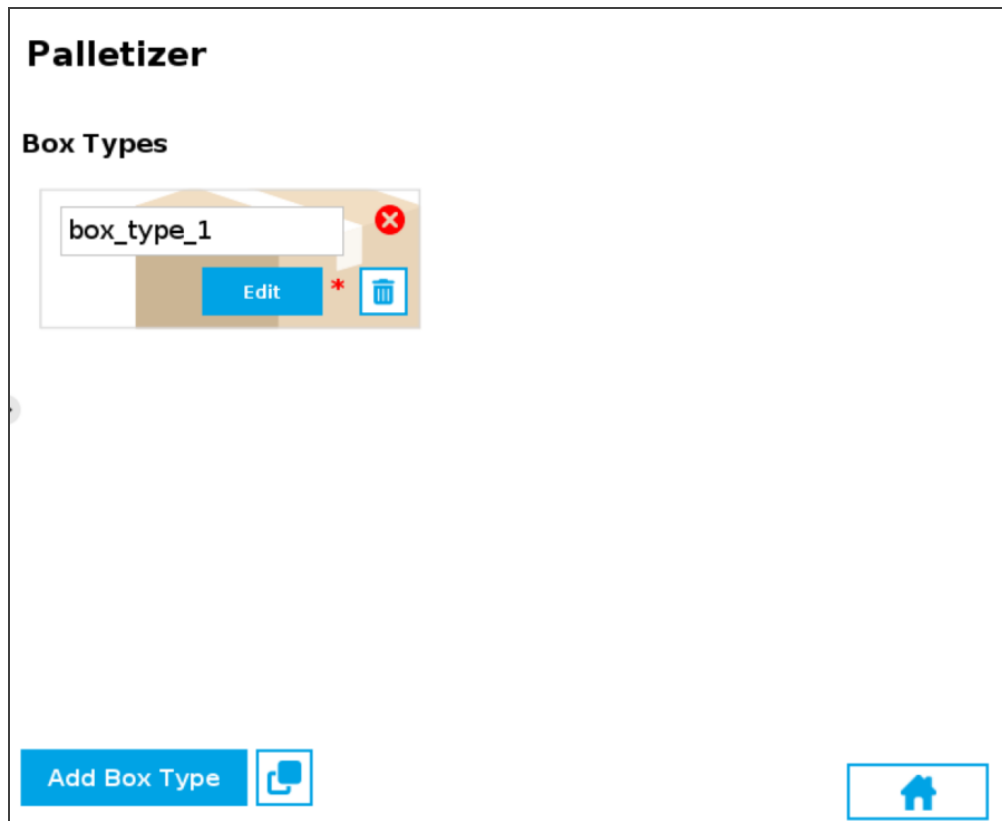
Fig. 5-9: Box Type Menu (Multi-Pick Feature)

- If applicable, tap the **Add Box Type** button to create a new box type, yet to be configured.

- If applicable, tap the **Duplicate** icon to open the duplication menu.
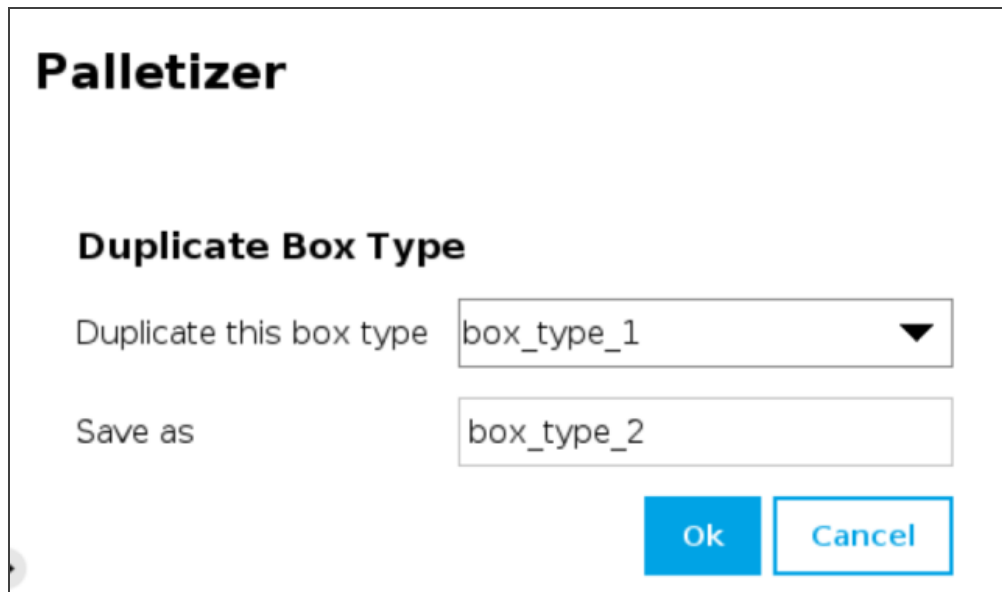
Fig. 5-10: Duplicate Box Type Menu

- Duplicate a box type and tap the **OK** button, or tap **Cancel** to go back to the Box Type menu.
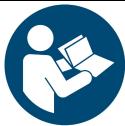
	NOTICE
	Rename the box types in a manner that will prevent confusion (e.g., single_box, double_box, triple_box).

	CAUTION
	Make sure the box type name you enter is devoid of spaces; failing to do so will prevent the program tree from calling the box type.

- Tap the **Edit** button under the name of a box type to bring up the **Box menu**.

Box Menu

Fig. 5-11: Box Menu of a Palletizer Node

1. **Box type name (Multi-Pick)**

If the multi-pick feature has been enabled in the Settings menu, the Box menu will display the name of the selected box type above the Box attributes.

2. **Box type toggle (Multi-Pick)**

If the multi-pick feature has been enabled in the Settings menu, and if more than one box type has been created, the user will have the option to toggle between box types using the left and right arrows.

3. **Box attributes**
   - Refer to the diagram and enter the length, width and height of the box in the corresponding fields.
   - Enter the payload of the box in the corresponding field.

	NOTICE

	Best Practice - Multi-Pick Feature
	
	Should the user need to pick **several identical boxes** using one or several grippers, Robotiq recommends the following:
	
	• Create a first box type (i.e., standard box type) that corresponds to a single box unit.
	
	• Duplicate the first box type.
	
	• Edit the new box type:
	
	    • Adjust the length or width so that it matches a multiple of that attribute (i.e., X2 for double the length OR width of the standard box, X3 for triple the length OR width of the standard box, and so on);
	
	    • Adjust the payload so that it matches a multiple of that attribute (i.e., X2 for double the payload of the standard box, X3 for triple the payload of the standard box, and so on).

4. **Set label orientation**

If applicable, tick the **Set label orientation** box.

Doing so will display a label placeholder directly on one side of the box.
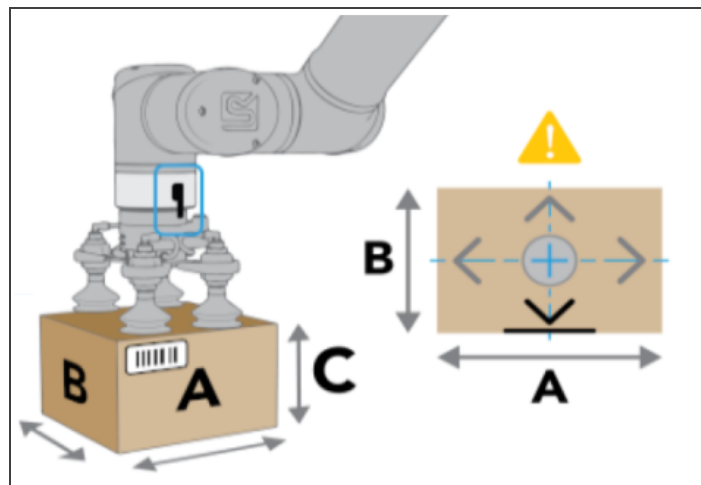
Fig. 5-12: Label Positioning on the "A" Side of the Box.

Tap the **Rotate 90°** button to change the box side on which the label can be found in the actual production process.

Fig. 5-13: Different Label Positions

5. **Box position**

- **Set Grip Position / Set Drop Position**

Tap the **Set Grip Position** button (palletizing mode) or **Set Drop Position** button (depalletizing mode) to open the UR Move menu

Move the TCP to the position at which the gripper will pick up or drop the boxes (e.g., from/on a conveyor).

The TCP should be positioned **at the center of the top of the box** that needs to be picked or dropped.

	CAUTION
⚠️	Position the robot wrist connector so that it is aligned with side A.

- Once the grip/drop position is defined, the Box menu will display the option to move to that position with the robot.

6. **Advanced settings - Multi-Pick Feature**

	NOTICE
📖	**Multi-Pick Feature** The advanced settings are also available in the Settings menu, only if the multi-pick feature has already been enabled in the **Settings** menu. - Single recipe > Settings Block > Edit - Multi-recipe > Select Recipe > Edit > Settings Block > Edit

a. **Box presence input dropdown menu**

Select the digital input to which the box presence sensor has been connected beforehand.

b. **Box center offset from TCP (multi-pick feature only)**

	NOTICE
📖	**Best Practice - Multi-Pick Feature** Should the user want the gripper to offset the box center based on whther it picks a single box or a multiple of the single box: - Measure the X and Y distances from the TCP to the target center on top of the box(es). - Example 1: The TCP has been set at the center on top of two boxes combined; the robot can be instructed to offset the box center so that it corresponds to the target center on top of a single box. - Example 2: The TCP has been set at the center on top of a single box; the robot can be instructed to offset the box center so that it corresponds to the target center on top of two boxes combined. - Enter the X and Y values in the corresponding fields.

Fig. 5-14: Examples of Box Center Offset from TCP

c. **Allow gripper to pick the box at different angles**

In order to optimize the trajectory and travel of the robot arm during the palletizing or depalletizing process, the user can allow or prevent the gripper to pick up the boxes from different angles.

Tick or untick either box to allow or prevent the gripper from picking the boxes as if the robot wrist had performed a 90- or 180-degree rotation on the Z-axis.

When the multi-pick feature is disabled in the Settings menu, the System **defaults** to allowing the gripper to pick the boxes as if the robot wrist had performed a 90- or 180-degree rotation on the Z-axis.

When the multi-pick feature is enabled in the Settings menu, the system **defaults** to allowing the gripper to pick the boxes as if the robot wrist had performed a 180-degree rotation on the Z-axis.
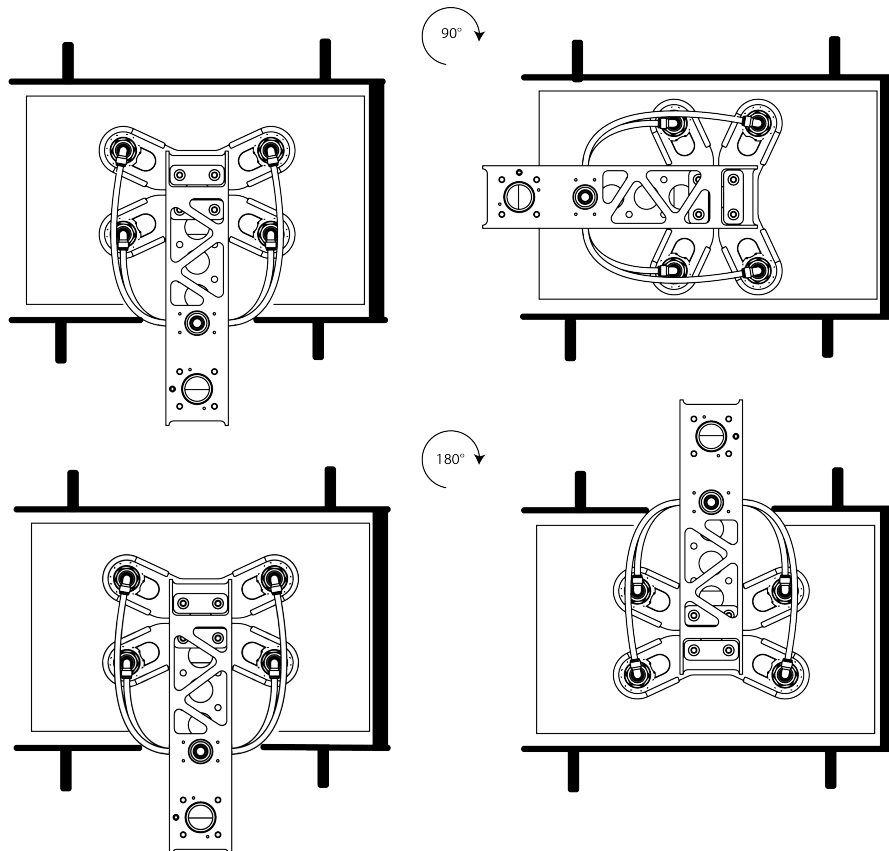
Fig. 5-15: Depiction of Gripper Rotations Based on the Option to Pick Up Boxes From Different Angles

d. **Define conveyor to avoid collisions**

Unticked by default.

Tick the box to unlock the **Configure** button.

Tapping the **Configure** button will bring up the **Conveyor** menu.

Conveyor Menu

Tick the radio button that corresponds to the palletizing cell (Perpendicular, Parallel, Custom).

Refer to the diagram on the interface and enter the corresponding values.
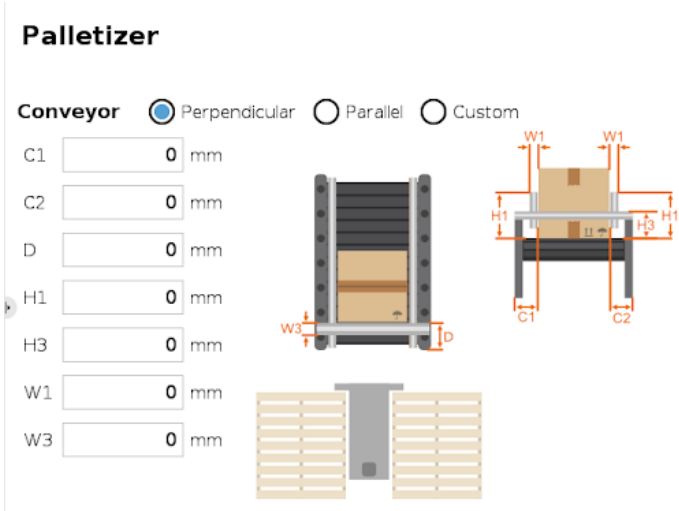
Fig. 5-16: Perpendicular Conveyor Configuration

Fig. 5-17: Custom Conveyor Configuration
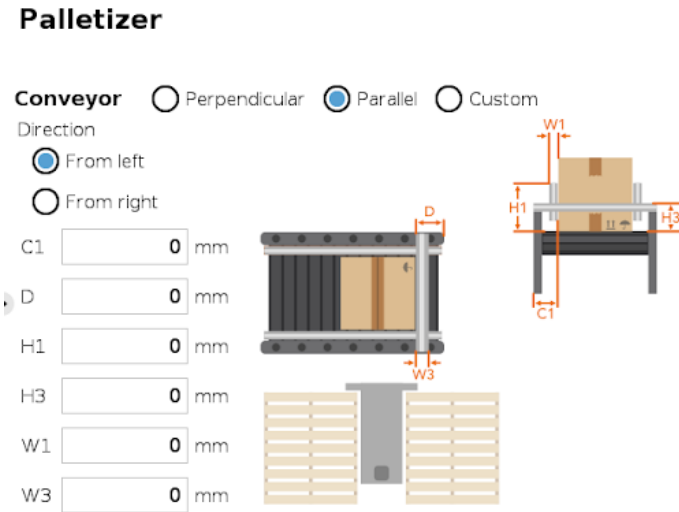
Fig. 5-18: Left-to-Right Parallel Conveyor Configuration
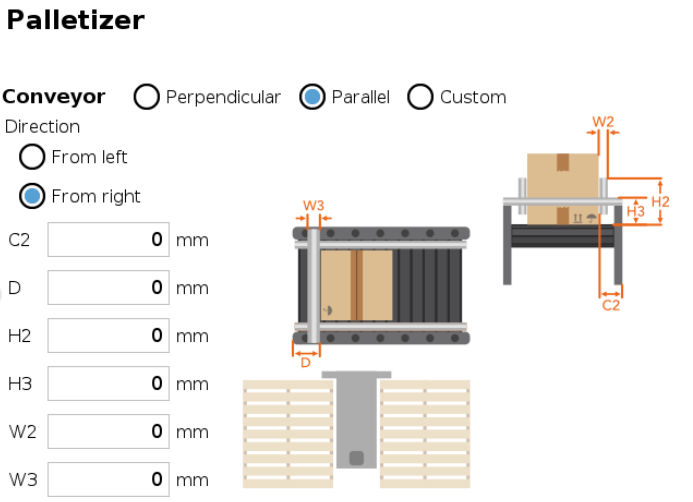
Fig. 5-19: Right-to-Left Parallel Conveyor Configuration

Pallet Block

Single Recipe

By default (**single recipe**), the home view of the Palletizer node displays the Box, Pallet, Pattern and Settings blocks of the only recipe available.
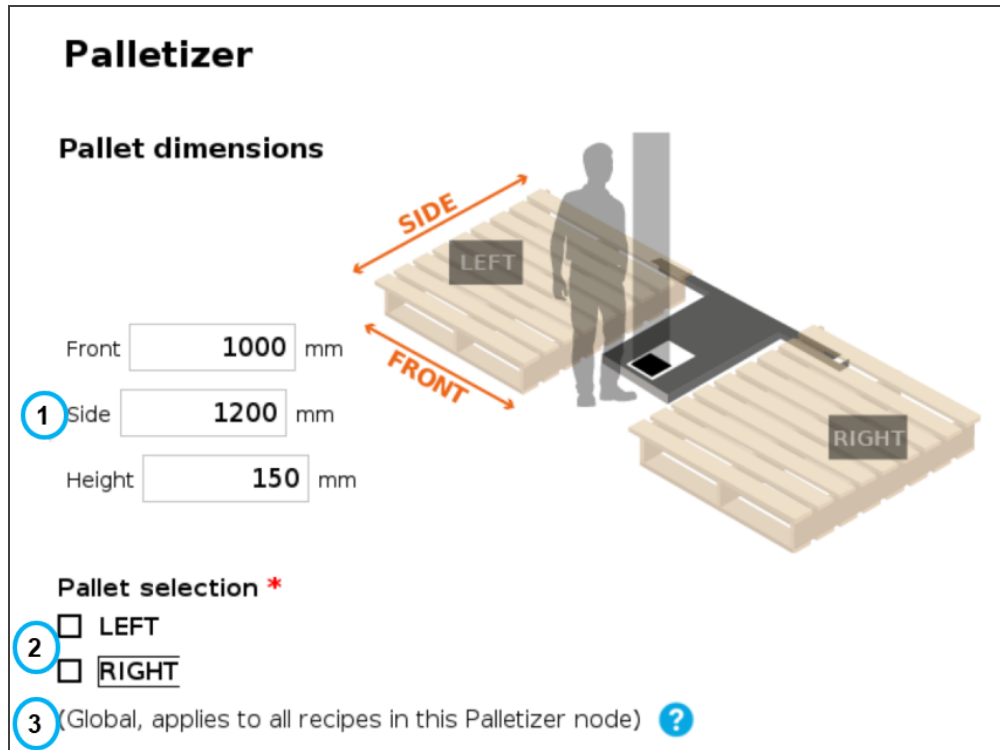
Tap the **Edit** button of the Pallet block to open the **Pallet menu**.

Multi-Recipe

When the **multi-recipe** feature is enabled, the home view of the Palletizer node displays the list of recipes created. Tap the **Edit** button under the name of a recipe to bring up the Box, Pallet, Pattern and Settings blocks specific to the recipe to edit.

Tap the **Edit** button of the Pallet block to open the **Pallet menu**.

Pallet Menu

Fig. 5-20: Pallet Menu

1. **Pallet dimensions**

Refer to the diagram and enter the front, side and height dimensions of the pallet.

2. **Pallet selection**

Both boxes are unticked by default.

It is the responsibility of the user to select the pallet(s) to process based on the application and layout of the palletizing cell.

Refer to the diagram and select which pallet (left and/or right) you want to palletize or depalletize. Tick both boxes to process both the left and right pallets.

	NOTICE
	Should the user unselect a pallet side (either left or right), that pallet will be ignored by the system (i.e., considered as if there was no pallet present, even if a pallet is detected by the pallet sensors.

3. **Global callout (multi-recipe only)**

If the multi-recipe feature has been enabled in the Settings menu, this callout will be shown.

It informs the user of the fact that the pallet(s) selected will be processed in all recipes of the Palletizer node.

Pattern Block

	CAUTION
	In order to edit pallet layer patterns, at least one pallet side has to be selected in the Pallet menu.

Single Recipe

By default (**single recipe**), the home view of the Palletizer node displays the Box, Pallet, Pattern and Settings blocks of the only recipe available.

Tap the **Edit** button of the Pattern block to open the **Pattern menu**.

Multi-Recipe

If the **multi-recipe** feature has been enabled in the Settings menu, the home view of the Palletizer node displays the list of recipes created.

Tap the **Edit** button under the name of a recipe to bring up the Box, Pallet, Pattern and Settings blocks specific to the recipe to edit.

Tap the **Edit** button of the Pattern block to open the **Pattern menu**.

Pattern Menu
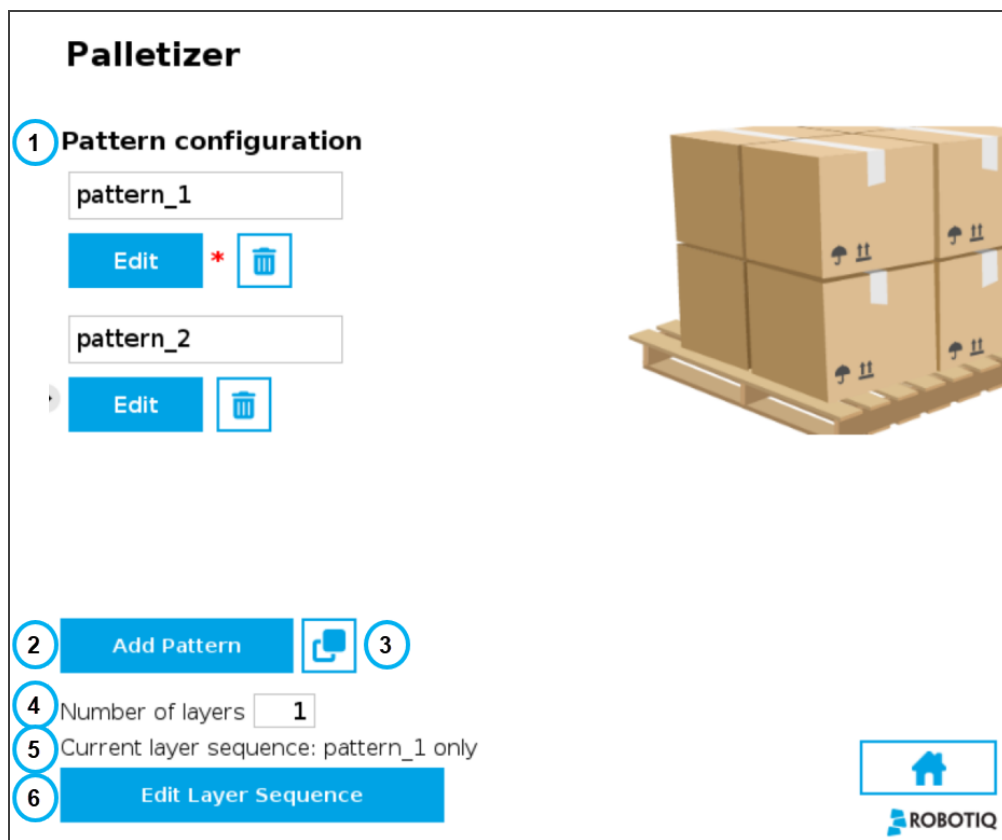
Fig. 5-21: Pattern Menu

1. **Pattern configuration**

This shows a list of available layer patterns.

By default, two (2) empty layer patterns are available (i.e., pattern_1 and pattern_2), yet to be configured.

Tap the **Edit** button under the name of a layer pattern to bring up the **Pattern editing menu**.

2. **Add Pattern**

Tap the **Add Pattern** button to add a layer pattern to the list.

3. **Duplicate Pattern**

If applicable, tap the **Duplicate** icon to open the duplication menu.

Palletizer

Duplicate Pattern

Duplicate this pattern   `pattern_1` ▼

Save as   `pattern_3`
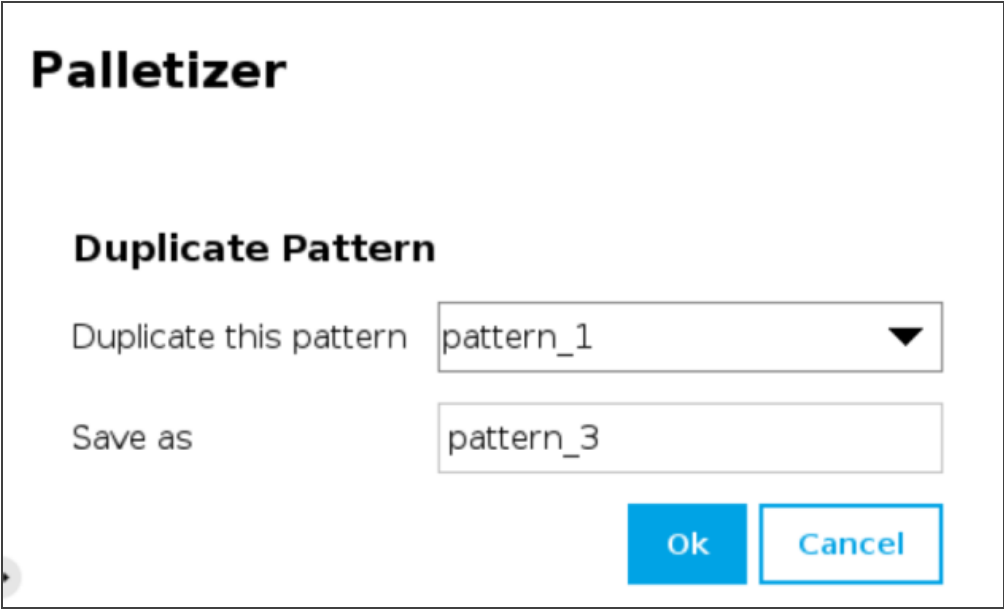
Ok   **Cancel**

Fig. 5-22: Duplicate Pattern Menu

- Duplicate a pattern and tap the **OK** button, or tap **Cancel** to go back to the Pattern menu.

4. **Number of layers**

Fill in this field with an integer to set the number of layers that will make up the pallet.

5. **Current layer sequence**

This preview indicates the layer sequence of the pallet pattern:

- A single layer pattern will display the actual name of the pattern.

- A multi-layer pattern will display "Mixed."

6. **Edit Layer Sequence**

Tap the **Edit Layer Sequence** button to bring up the Layer Sequence menu.

	NOTICE
	Patterns are specific to recipes, meaning that two distinct recipes can each be composed of patterns that are named identically.

Pattern Editing Menu

This interface includes a representation of a pallet.

The user can use the controls on the screen to fill the virtual pallet layer in the most efficient manner possible.

	NOTICE
	What can be called the **origin** (0,0) in the pallet diagram is actually the top left corner of the pallet.
	And so, since the user can modify the coordinates of the active box, going left to right increases the X

	value, and going top to bottom increases the Y value.

	NOTICE
	• A **light blue box** is a **box that has been placed**. It can be selected by tapping on it.
	• The **dark blue box** is the **active box**. It can be moved around using the arrows on the screen.
	• A **red box** is an **"overlapping box."**
	• **Multi-pick feature**: Boxes that are part of the active box type are shown in light blue (including the active box, in dark blue); boxes that are not part of the active box type are shown in **grey**.
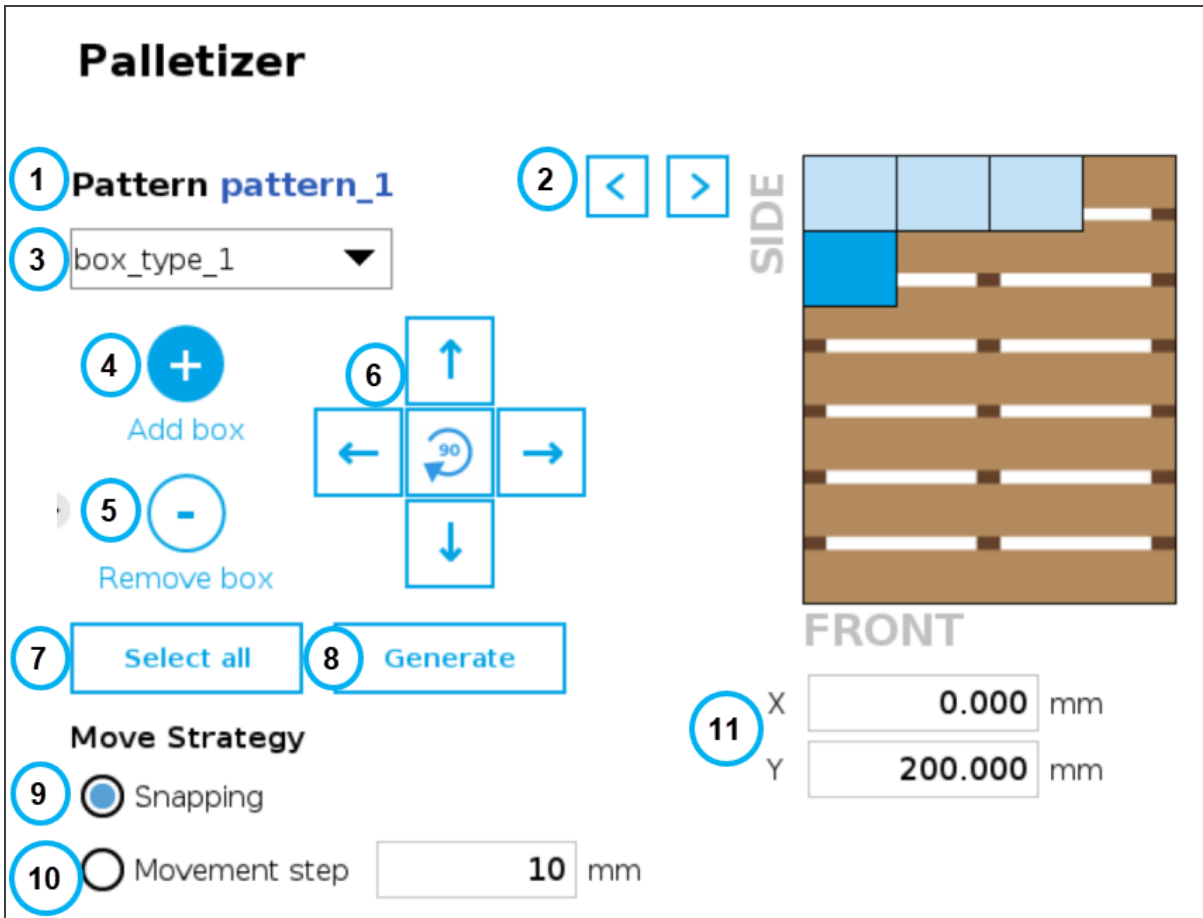
Fig. 5-23: Pattern Menu

1. **Pattern name**

This section displays the name of the layer pattern being edited.

2. **Pattern toggle**

Tap the left or right arrow to change the layer pattern being edited.

3. **Box type dropdown menu (multi-pick feature)**

If the **multi-pick feature** has been enabled in the **Settings** menu, and if more than one box type has been created in the **Box Type** menu, the Pattern editing menu will allow the user to select the box type to palletize, and to toggle between box types while building the layer pattern.

4. **Add box**

Tap the plus (**+**) button to add a box.

The first box will automatically be placed at the origin (0,0) of the layer (i.e., top left corner on the pallet).

The newly added box will feature a dark blue color, meaning it is the active box.

	NOTICE
	The user can select any box placed on the virtual pallet by tapping on it.
	The selected box thus becomes the active box.

Any box added afterwards will feature a red color, meaning it overlaps a box.

Using the arrows on the screen, the user can move it around so that it does not overlap other boxes, and ultimately place it where it belongs on the pallet.

	NOTICE
	If the Set label orientation option has been selected in the Box menu, the boxes placed on the virtual pallet will each display an arrow pointing at the side of the box on which the label is affixed.
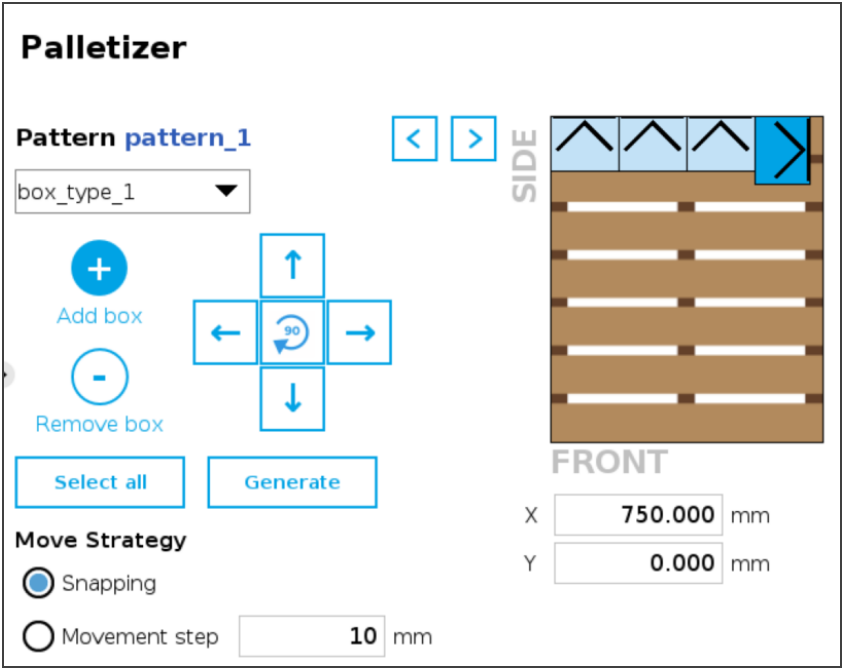
Fig. 5-24: Pattern Menu With Boxes Showing Label Orientation

5. **Remove box**

Tap the minus (**-**) button to remove the active box.

6. **On-Screen movement pad**

Tap the directional button that corresponds to the direction in which the box needs to move (up, down, left, right).

Use the middle button to turn the active box 90 degrees clockwise.

7. **Select all**

Tap the **Select all button** to highlight all the boxes placed on the virtual pallet.

The user can then move the box group altogether using the on-screen movement pad or clear the layer by tapping the minus (**-**) button.

8. **Generate**

Tap the **Generate** button to let the system fill the entire pallet layer.

NOTICE
Multi-Pick Feature
If the **multi-pick feature** has been enabled in the **Settings** menu, tapping the **Generate** button will fill the pallet using the box type selected in the dropdown menu at the top of the interface.

9. **Move Strategy - Snapping**

The snapping movement mode consists in using the directional buttons to move the active box in a manner that will make it settle against the closest side of an adjacent box or against the corresponding side of the virtual pallet.

10. **Move Strategy - Movement Step**

The movement step mode consists in using the directional buttons to move the active box by increments of the value set in the field.

11. **Box coordinates**

The numbers in the fields correspond to the coordinates of the top-left corner of the active box.

The user can enter numbers to position the active box on the pallet, and ultimately place it where it belongs.

Layer Sequence Menu

The Layer Sequence menu is best described as being the interface used to set the order of layer patterns that will be stacked one on top of the other.

On the left-hand side of the screen, the lowest number is the closest to the pallet while the highest number is the farthest from the pallet.

NOTICE
In the example below, there are five (5) layers and two (2) patterns, but bear in mind that there can be a greater number of both depending on the palletizing application at hand.

The user can toggle between the different layer patterns created using the corresponding radio buttons.
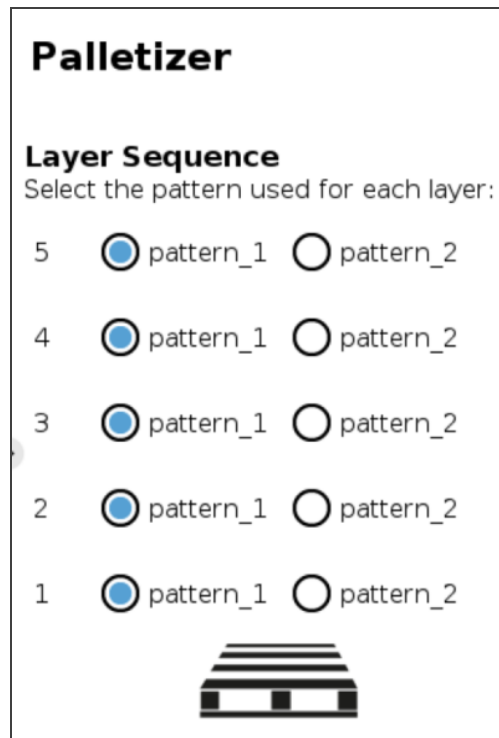
Fig. 5-25: Layer Sequence Menu

5.4. Program Tree

5.4.1. Standard Palletizer Node

Robotiq's Palletizer node provides a quick, versatile, adaptable and efficient way to program palletizing and depalletizing movements and actions.

Fig. 5-26: Standard Palletizer Node in a Program Tree

In its most basic form, the Palletizer node allows the user to insert "before pallet" instructions, grip and release actions, "between layer" instructions, and "after pallet" instructions.

The actual instructions that make the robot arm and end effector go to and fro are managed by the URCap based on the settings of the single or multiple recipes chosen by the user. Please refer to the **Command Window** section for more information on the settings of the Palletizer node.

5.4.2. Palletizer Node With Multi-Pick Feature

The multi-pick feature is designed to allow for the processing of box groups and different box types, for instance, a double box type that corresponds to a single box doubled in size and payload.

The difference between the picking of a single box and the picking of multiple boxes lies in the detection of different box types via the box sensors. Please refer to the **Box Sensor (Multiple Box Types - Multi-Pick Feature)** section to install and connect multiple box sensors in order to properly use the multi-pick feature.

Grouped boxes should travel and end at the pick position, where the box sensors should be positioned (e.g., at the end of a conveyor).

Whereas the single box type will be detected by the single box sensor only, the double box type must be detected by two separate box sensors simultaneously.

The simultaneous signaling of each individual sensor will then combine into one signal that will be interpreted by the robot as an instruction to pick the grouped boxes (i.e., the double box type).


```
1   ▼ Robot Program
2   ▼ Palletizer
3     ▼ Add before pallet
4         'Before pallet instructions'
5         'Use the rq_is_left_pallet variable (boolean) to know on which side the palletizer is currently working'
6     ▼ Grip
7       ▼ If "single_box"=rq_get_current_box_type()
8           Set DO[1]=On
9       ↳ Else
10          Set DO[1]=On
11          Set DO[2]=On
12    ▼ Release
13        Set DO[1]=Off
14        Set DO[2]=On
15    ▼ Add between layer
16        'Between layer instructions'
17        'Use the rq_is_left_pallet variable (boolean) to know on which side the palletizer is currently working'
18    ▼ Add after pallet
19        'After pallet instructions'
20        'Use the rq_is_left_pallet variable (boolean) to know on which side the palletizer is currently working'
```

Fig. 5-27: Palletizer Node With Multi-Pick Feature

Thread Node

The following is an example of how to integrate the multi-pick feature in the robot program using script functions.

NOTICE
Tip: This approach can be used to accommodate special situations such as the need to add a wait time between the sensor signal and the ready-to-palletize signal to ensure that the boxes are at the exact pick position.

1. In the program tree, tap **Robot Program** at the very top.

2. Go to **Program** > **Advanced** and select **Thread**.

3. Tick the **Loops Forever** box at the bottom of the Thread screen (if not already ticked).

	NOTICE
	Thread nodes display at the end of the program tree; they work in parallel of the main program.
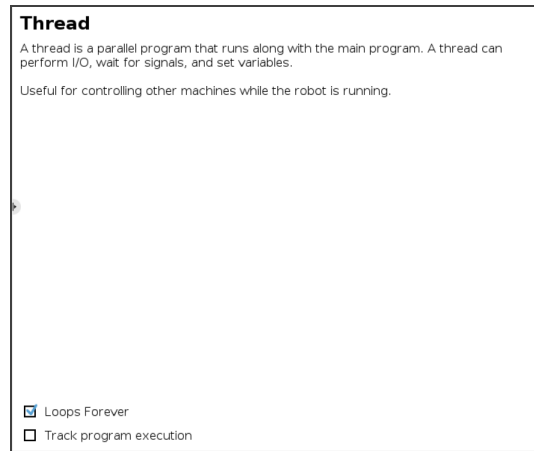
Fig. 5-28: Thread node

4. Insert a child **Set** node in the Thread parent node (**Program** > **Basic**).

5. Select the **Set** node, then tick the fourth radio button from the top

6. In the dropdown menu, select the **digital output** that has been connected to a **digital input** (please refer to the **Box Sensor (Multiple Box Types - Multi-Pick Feature)** section if this step has not been completed yet).
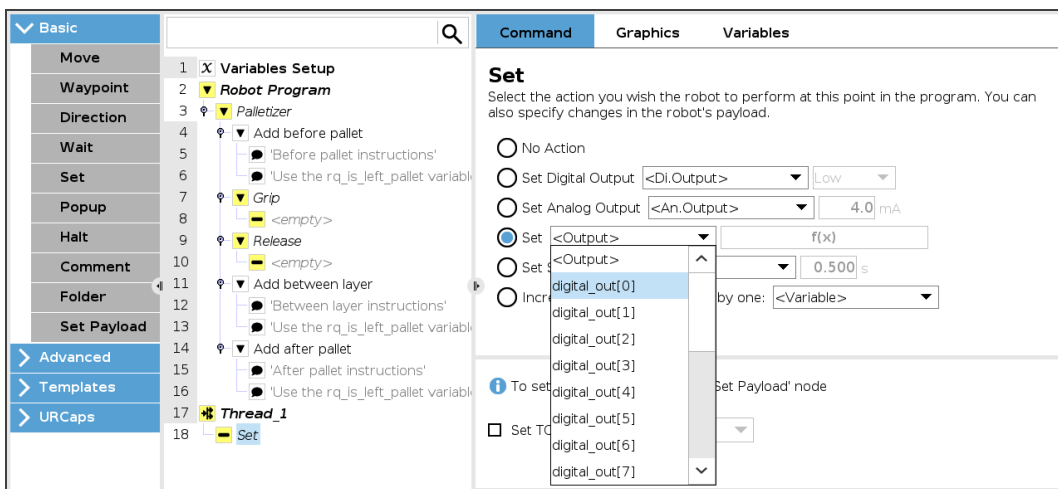
Fig. 5-29: Set Node in the Thread Node

7. Tap the **f(x)** button adjacent to the dropdown menu.

8. In the panel that just opened, expand the **Input** dropdown menu.

9. Select the digital input that corresponds to box sensor #1 (digital_in[0], in this example). Go through the **Box Sensor (Multiple Box Types - Multi-Pick Feature)** section to determine the digital input to select at this point.

10. Without inserting any space character, enter the word **and** or tap the **and** button on the panel.

11. Expand the **Input** dropdown menu.

12. Select the digital input that corresponds to box sensor #2 (digital_in[1], in this example). Go through the **Box Sensor (Multiple Box Types - Multi-Pick Feature)** section to determine the digital input to select at this point.

The result in the program tree should resemble this:
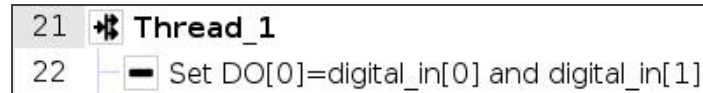
13. Go to **Program** > **Advanced** and insert a **Script** node.

14. In the **Script** node, tap the **f(x)** box.

15. In the dialog box, enter **sync()** and tap **Submit**.
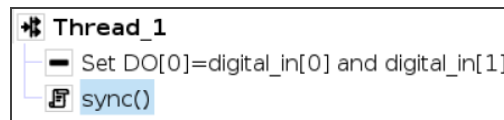
Fig. 5-30: Complete Thread Node in Program Tree

Gripper Activation

The following steps explain how to activate the right gripper for each box type.

NOTICE
Grippers are linked to digital outputs.
In the example below, there are two grippers: one linked to **digital_out[1]** and the other to **digital_out[2]**.
The link between box type and gripper-to-activate can vary depending on the configuration.

1. In the program tree, nest an **If** node within the **Grip** node (**Program** > **Advanced**).

2. Select the **If** node, tap the **f(x)** box in the Command window (leave the **Check expression continuously** box unticked).
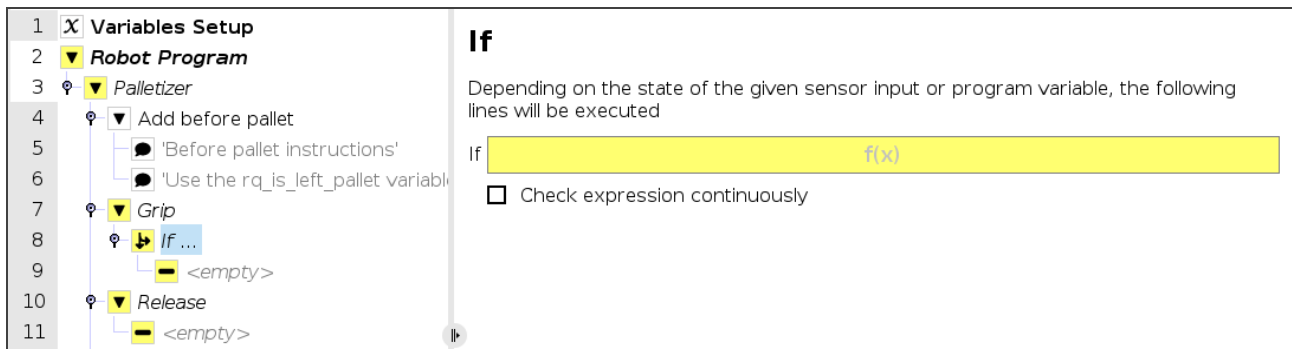
Fig. 5-31: If node in the Grip node

3. In the panel that opens:

    a. Enter the name of the first box type between quotation marks.

    b. Enter the **questioned equal to** symbol (≟) (use the keyboard in the panel to enter the appropriate symbol).

    c. Open the **Function** dropdown menu

    d. Select **rq_get_current_box_type()**.

    e. Tap **Submit**.

The result in the Command window should resemble this:
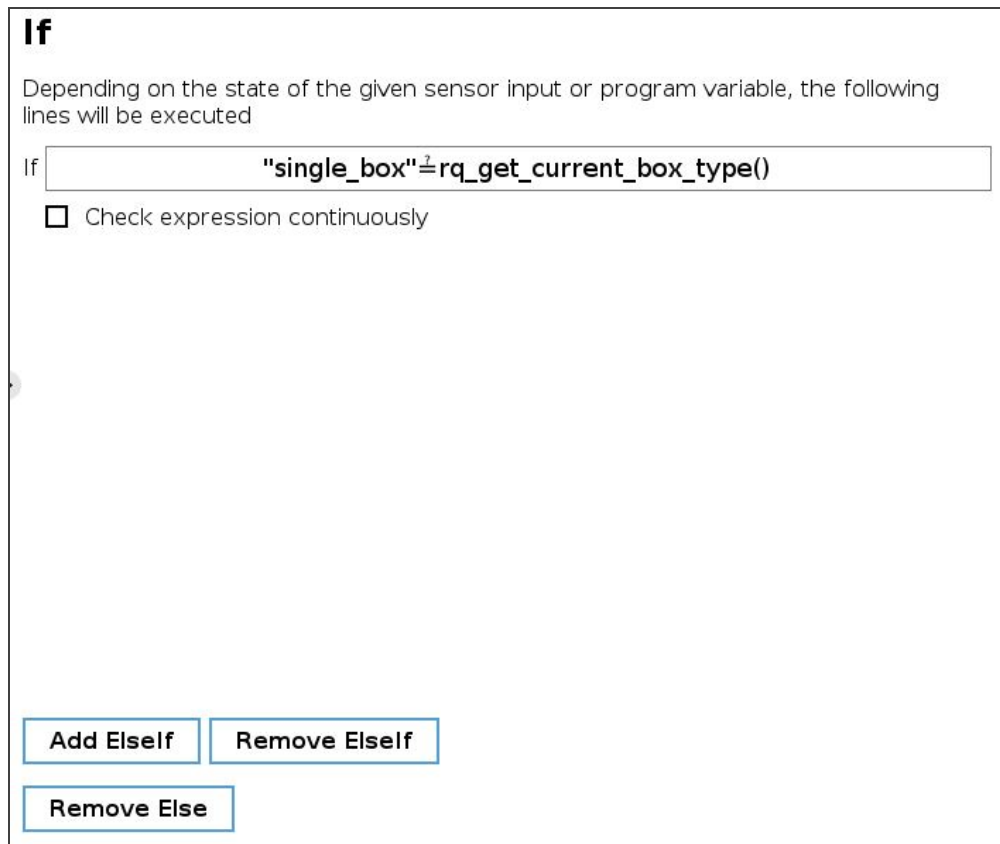
	CAUTION
⚠️	• The name of the first box type must **absolutely be between quotation marks**. • The **questioned equal to** symbol (≟) **must** be entered using the keyboard in the panel.

4. In the program tree, select the **<empty>** node in the **If** node.

5. Go to **Program** > **Basic** and insert a **Set** node.

6. Select the **Set** node and tick the **Set Digital Output** radio button in the Command window.

7. Expand the dropdown menu.

8. Select the digital output to which the gripper in the **If** node is assigned.

9. Expand the adjacent dropdown menu.

10. Select **High**.

The result in the program tree and Command window should resemble this:
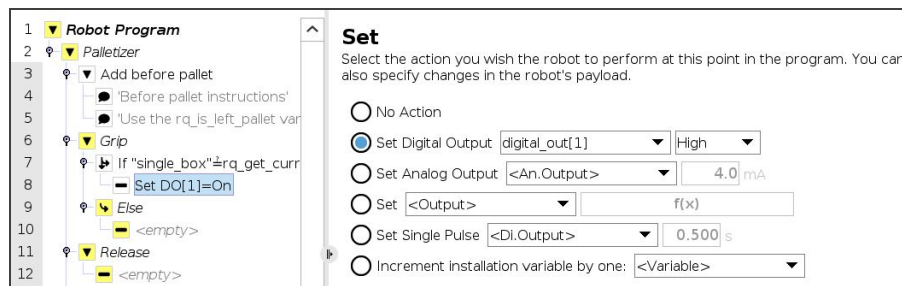
Fig. 5-32: Set Node in the If node

11. Select the parent **If** node and tap the **Add Else** button at the bottom of the screen.

12. In the program tree, tap the **<empty>** node in the **Else** node.

13. Go to **Program** > **Basic** and insert two **Set** nodes.

14. In the first **Set** node, tick the **Set Digital Output** radio button.

15. Expand the dropdown menu.

16. Select a digital output to which one of the grippers is assigned.

17. Expand the adjacent dropdown menu.

18. Select **High**.

19. Repeat steps 15 to 18 with the other **Set** node, but select the digital output to which the other gripper is assigned.

In doing so, both grippers will activate when the robot will be instructed to pick up grouped boxes.

The result in the program tree should resemble this:
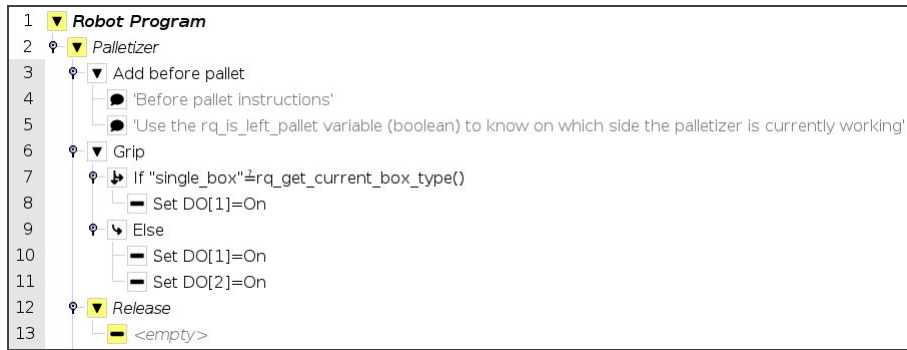
Fig. 5-33: Set Nodes in the Else node

20. In the program tree, select the **<empty>** node in the **Release** node.

21. Go to **Program** > **Basic** and insert two **Set** nodes.

22. In the first **Set** node, tick the **Set Digital Output** radio button

23. Expand the dropdown menu.

24. Select a digital output to which one of the grippers is assigned.

25. Expand the adjacent dropdown menu.

26. Select **Low**.

27. Repeat steps 23 to 26 with the other **Set** node, but select the digital output to which the other gripper is assigned.

In doing so, the system will release the vacuum action in both grippers, even if only one gripper was activated.

The result in the program tree should resemble this:
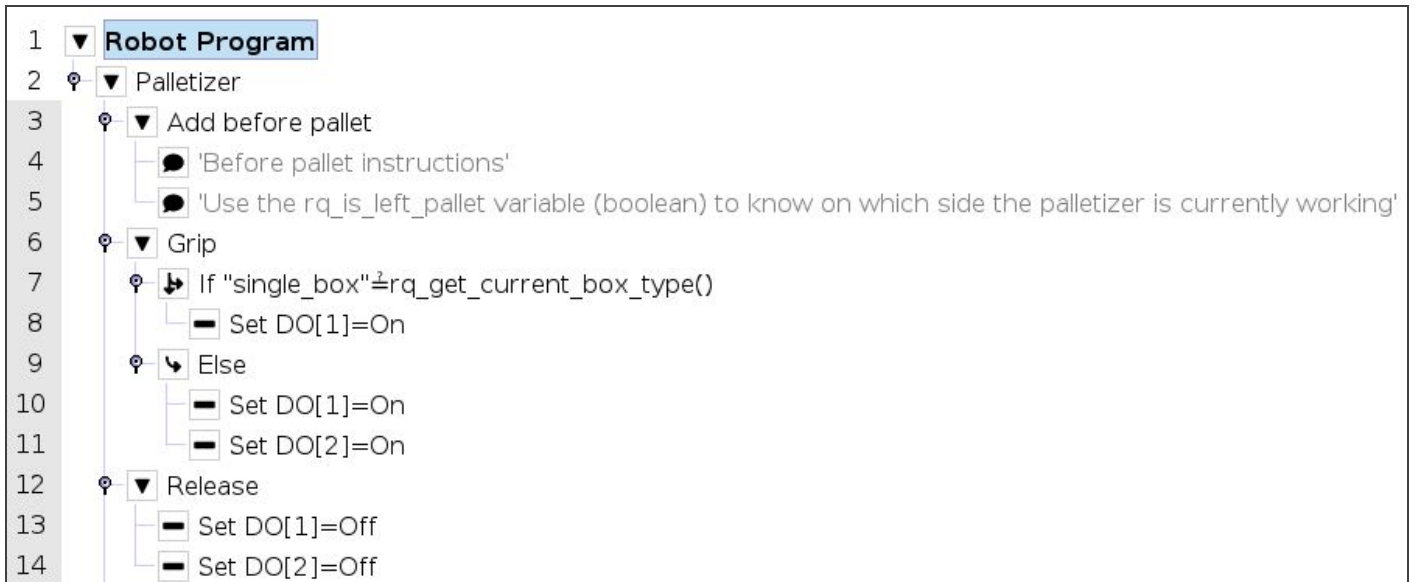
Fig. 5-34: Set Nodes in the Release node

5.4.3. Program Start - Pallet Viewer

If the option to **Validate pallet state at program startup** has been selected in the **Settings Menu** section of the Palletizer node, a Pallet viewer pop-up will display upon the start of the robot program for the user to confirm the state of the pallet.

If the multi-recipe feature has been enabled in the Settings menu of the Palletizer node, the Pallet viewer will automatically use and display the default recipes selected in the **Home View** section of the multi-recipe Palletizer node.
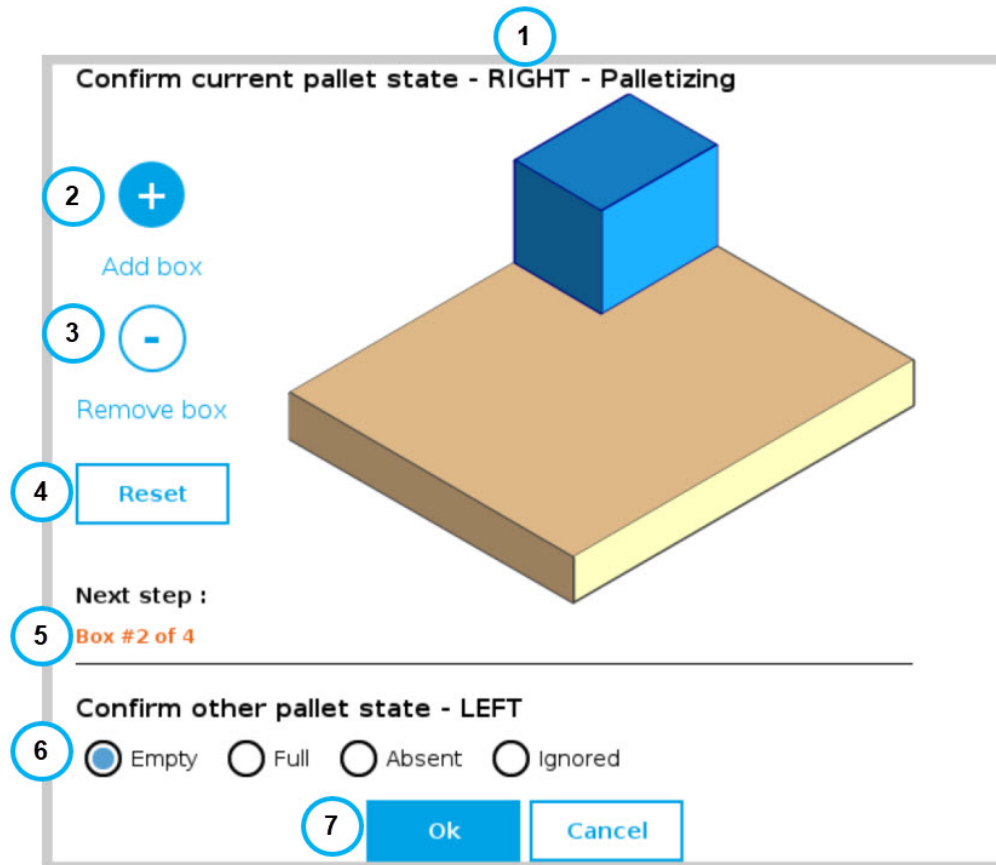
1. This callout shows the pallet on which the robot is currently working.

2. The **Add box** button is represented by a plus (**+**) symbol; tap the button to add a box to the pallet.

NOTICE
Should the Pallet viewer not display the current state of the pallet, the user can tap this button to add boxes so that it represents the exact state of the pallet prior to the start of the program.

3. The **Remove** box button is represented by a minus (**-**) symbol; tap the button to remove a box from the pallet.

NOTICE
Should the Pallet viewer not display the current state of the pallet, the user can tap this button to remove boxes so that it represents the exact state of the pallet prior to the start of the program.

4. The **Reset** button can be tapped to clear the pallet of any and all boxes; the Pallet viewer will then reflect the empty state of the physical pallet, provided that the physical pallet is actually empty.

5. This indicates the step that will occur next in the palletizing workflow.

6. The **Confirm other pallet state** section prompts the user to select the state of the other pallet (LEFT if the current pallet is the RIGHT one, or RIGHT if the current pallet is the LEFT one).

- **Empty**
  - In palletizing mode, the **Empty** state instructs the robot to process the pallet as if it were ready to be palletized from the very beginning.

  - In depalletizing mode, the **Empty** state indicates that the pallet should be replaced by a full pallet.

- **Full**
  - In palletizing mode, the **Full** state indicates that the pallet should be replaced by an empty pallet.

  - In depalletizing mode, the **Full** state instructs the robot to process the pallet as if it were ready to be depalletized from the top down.

- **Absent**
  - The **Absent** state is selected if no pallet is being detected by the pallet sensors on the corresponding side of the Palletizer at the start of the robot program, or if the pallet had been removed prior to the last time the robot program was stopped.

  - This radio button can be selected even though the pallet sensors have effectively detected the presence of a pallet. And so, even if deemed absent, the pallet will be processed by the Palletizer if it has been detected by the pallet sensors.

  - It is the responsibility of the user to select the current, actual state of the pallet at the start of the program.

- **Ignored**
  - The **Ignored** state can be selected to instruct the robot not to process the pallet.

  - Even if the user chose to palletize both the left and right pallets in the **Pallet Menu** section, ticking this radio button will prevent the Palletizer from processing the corresponding pallet.

7. The OK button will start the robot program based on the pallet states validated by the user. The Cancel button will close the Pallet viewer pop-up, and the robot program will not start.

5.5. Palletizing Script Functions

Palletizing functions are made available in the **Script** dropdown menu.
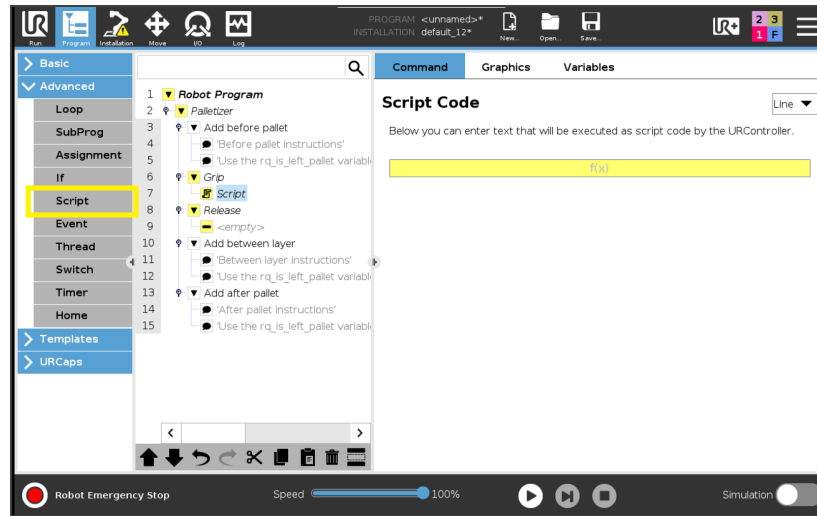
Fig. 5-35: Script node

Tap the Script Code textbox (**f(x)**), then on the **Function** dropdown menu.

Select the script function from the list.
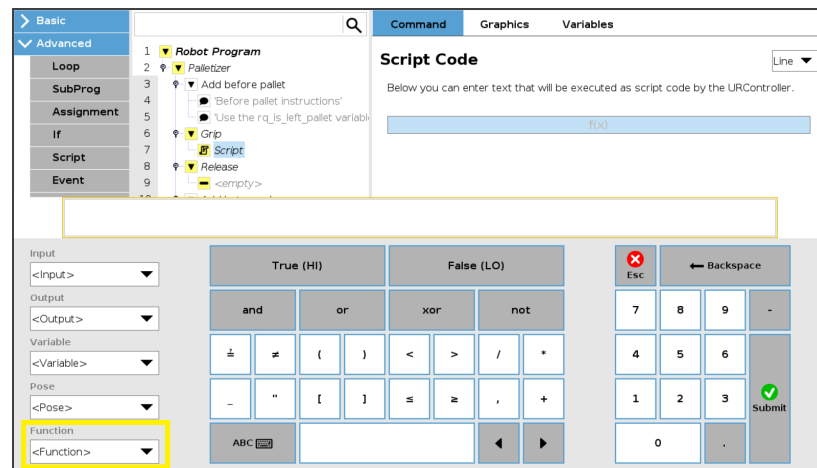
Fig. 5-36: Function dropdown menu in Script node

5.5.1. Number of Processed Boxes

Description

This function returns the number of processed boxes. It must be used inside the palletizer node in order to work properly.

Declaration

rq_get_nb_processed_boxes( )

Returned value

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

5.5.2. Set Pallet Completed

Description

This function allows to partially fill the pallets. 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.

Use this function inside a **Grip** or **Release** folder.

Declaration

rq_set_pallet_completed( )

Returned value

There is no return value with this function.

5.5.3. Get Pallet State

Description

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

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.

Returned 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).

5.5.4. Set Palletizer State

Description

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

Declaration

rq_set_palletizer_state(palletizer_index, processed_boxes, next_step, other_pallet_state="ABSENT", current_pallet="CURRENT", left_recipe="", right_recipe="")

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.
  - "IGNORED": The Palletizer node will disregard the other pallet, even if it is detected.

- **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.

- **left_recipe**: Corresponds to the recipe to process on the left side of the Palletizer. The user can leave this argument blank to continue processing the left pallet with the same recipe. The user can also enter the exact name of a specific recipe to replace the current recipe.

- **right_recipe**: Corresponds to the recipe to process on the right side of the Palletizer. The user can leave this argument blank to continue processing the right pallet with the same recipe. The user can also enter the exact name of a specific recipe to replace the current recipe.

Returned value

There is no return value with this function.

5.5.5. Get Current Box Type

Description

This function returns the box type being processed when multiple box types are enabled. It must be used inside the palletizer node in order to work properly.

Declaration

rq_get_current_box_type()

Returned value

This function returns a string which is the name of the box type currently being processed. The string is case-sensitive

5.5.6. Get Current Pallet Recipe

Description

This function returns the pallet recipe being processed when the multi-recipe feature is enabled. It has to be used inside the Palletizer node in order to work properly.

To use this script function in a condition (e.g., if(rq_get_current_box_type()≟"recipe_1")), the name of the recipe has to be entered exactly as it has been initially named in the list of recipes available.

Declaration

rq_get_current_pal_recipe()

Returned value

This function returns a string which is the name of the recipe being processed. The string is case-sensitive.

5.5.7. Use Payload with Box

Description

This function can be used in the Palletizer Grip or Release folder for the robot to act as if the actual payload and center of gravity values were the values set via the **Box Menu** or the Set Box Payload function. Generally used to manage high payloads.

Declaration

rq_use_payload_with_box(ratio)

Parameters

ratio: Percentage of the box payload. Must be between 0 and 1 (0 to 100%)

Returned value

There is no return value with this function.

5.5.8. Use Payload No Box

Description

This function can be used in the Palletizer Grip or Release folder for the robot to act as if the actual payload and center of gravity values were the same as if there was no box present. Generally used to manage high payloads.

Declaration

rq_use_payload_no_box()

Returned value

No value is returned

5.5.9. Set Box Payload

Description

This function can be used to set or change the payload values of the box. It is to be noted that this function does not change the active payload of the robot. It applies to all boxes of the current box type. Generally used to manage high payloads.

Declaration

rq_set_box_payload(box_payload)

Parameters

box_payload: The mass of the box in kg.

Returned value

There is no return value with this function.

6. Specifications

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

6.1. Technical Dimensions

6.1.1. Base with Pedestal, Robotiq Control Box and Operator Station
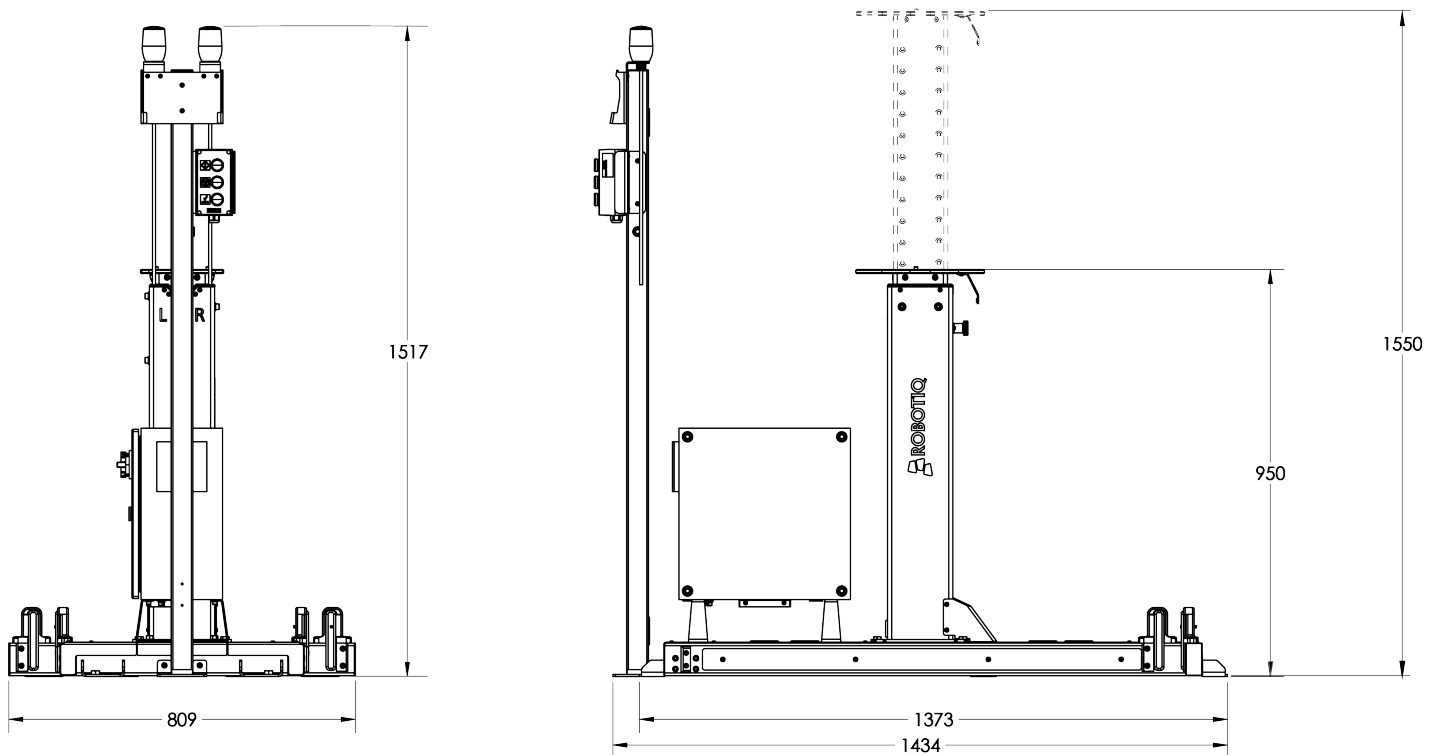
Fig. 6-1: Base with Pedestal, Robotiq Control box and Operator Station - technical dimensions

6.1.2. PowerPick Controller
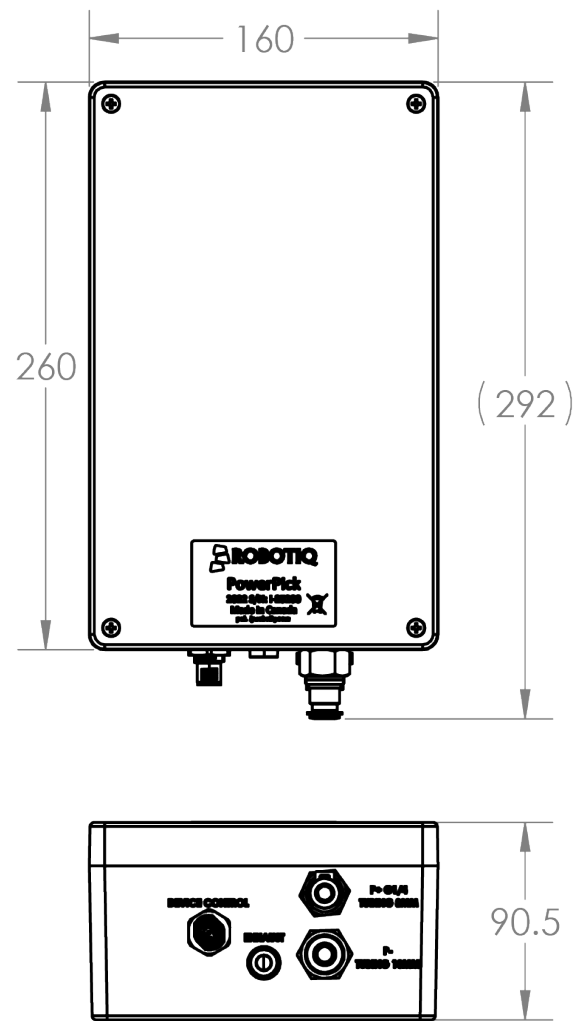
Fig. 6-2: Technical Dimensions of PowerPick Controller

6.1.3. 0 mm Offset Plate
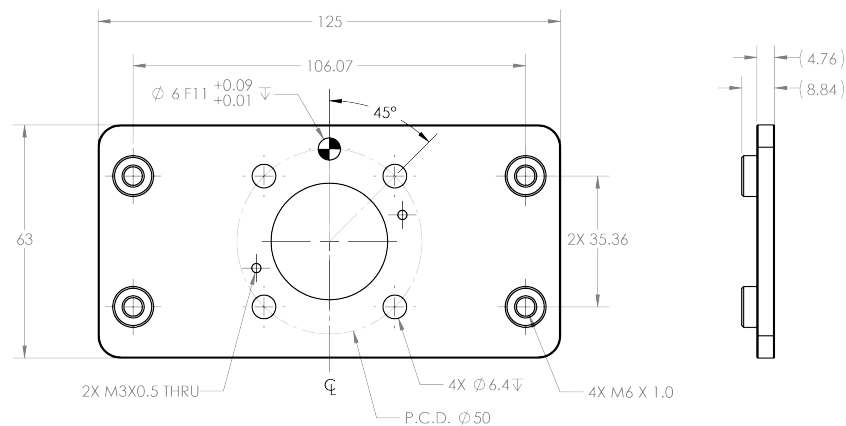
Fig. 6-3: Technical Dimensions of 0 mm Offset Plate

6.1.4. 100 mm Hollow Offset Link
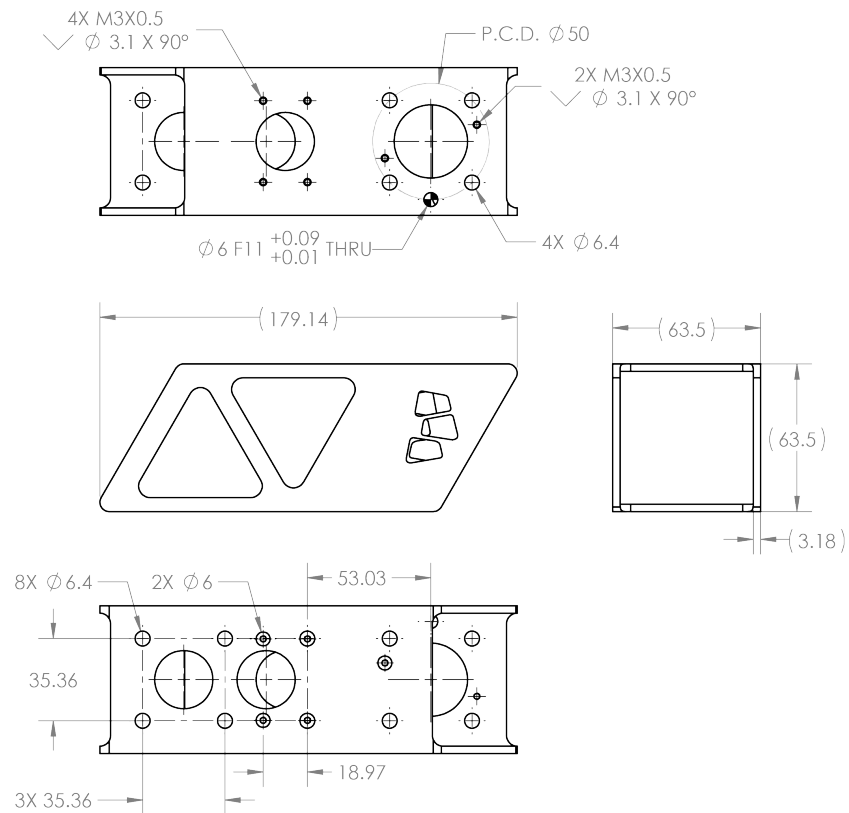
Fig. 6-4: Technical Dimensions of 100 mm Hollow Offset Link

6.1.5. 200 mm Hollow Offset Link
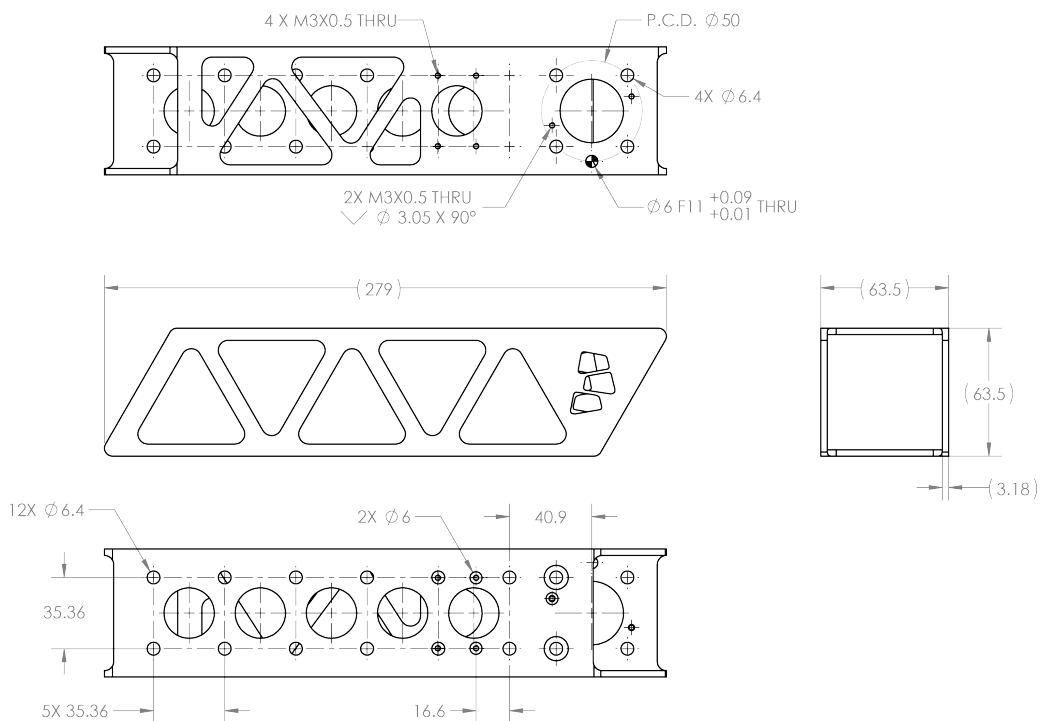
Fig. 6-5: Technical Dimensions of 200 mm Hollow Offset Link

6.1.6. Small Bracket for Suction Cups
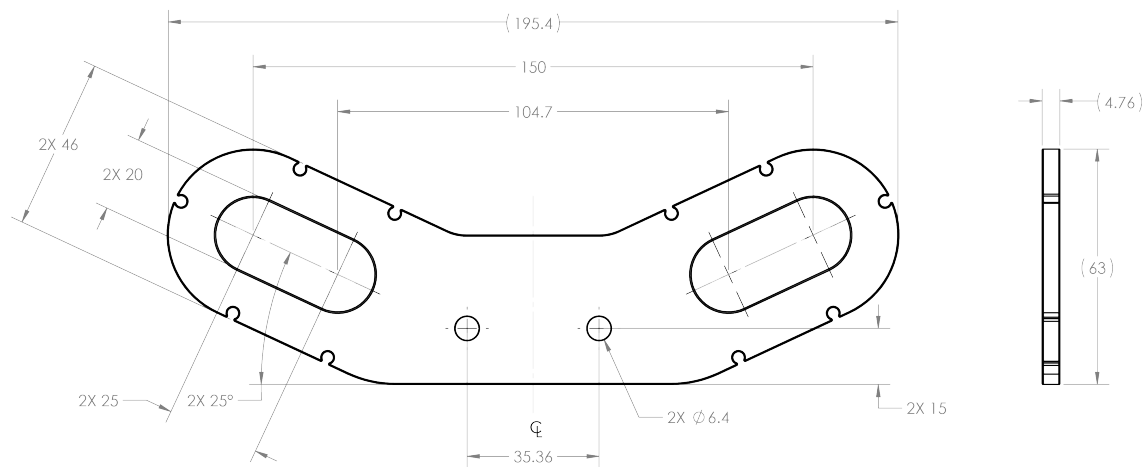
Fig. 6-6: Technical Dimensions of Small Bracket for Suction Cups

6.1.7. Large Bracket for Suction Cups
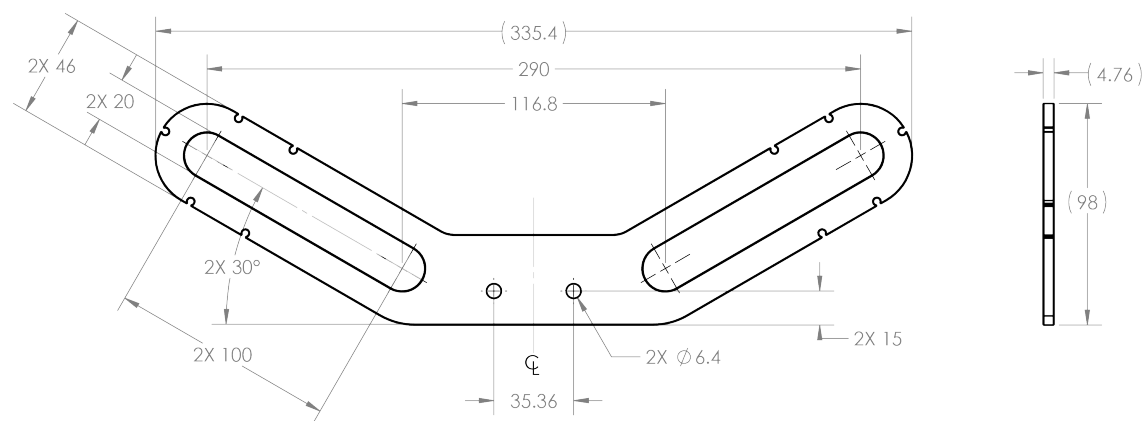
Fig. 6-7: Technical Dimensions of Large Bracket for Suction Cups

6.1.8. Air Node
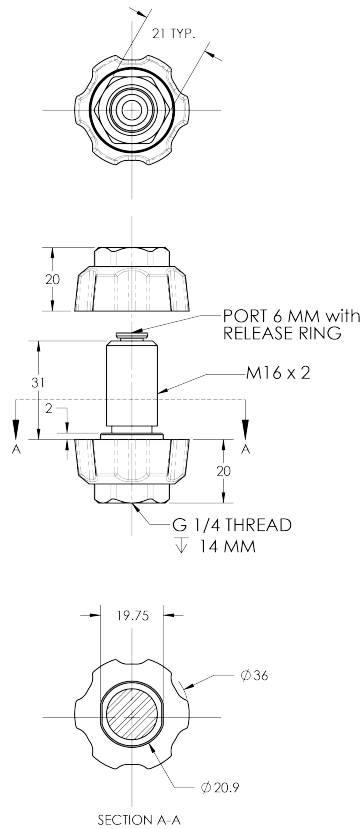
Fig. 6-8: Technical Dimensions of Air Node

6.1.9. Tubular Wrist Extension
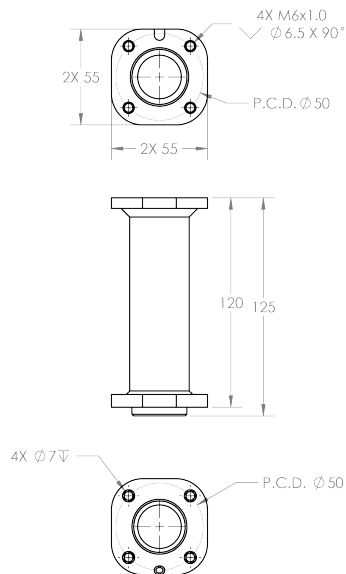
Fig. 6-9: Technical Dimensions of Tubular Wrist Extension

6.2. Mechanical Specifications

6.2.1. Palletizing Solution (Without Robot and End-of-Arm Tooling)

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
Payload (without gripper)[1]	Up to 12.5 kg	Up to 27.5 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	59 in
Shipping crate dimensions	1500, 950, 810 mm (L, W, H)	59, 37.5, 32 in (L, W, H)
Gross shipping weight	199 kg	438 lb
Maximum acceleration in operating conditions	2 g	
Maximum supply pressure[4]	8 bar	116 psi
Maximum throughput	Up to 13 cycles/min[5]	
Maximum number of box patterns	No constraint	
Energy source	Electricity	

Table 6-1: Robotiq Palletizing Solution mechanical specifications

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

[2] Minimum box dimensions depend on pallet dimensions. Use the Robotiq Configurator to validate the combination

[3] Maximum pallet dimensions depend on your box dimensions and pallet configuration. Use the Robotiq Configurator to validate the combination

[4] Please refer to the pneumatic diagram.

[5] Maximum box throughput depends on box weight, box dimensions, box surface, pallet dimensions, and pallet layout.
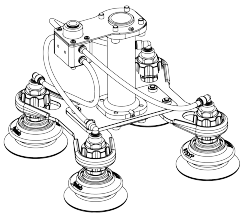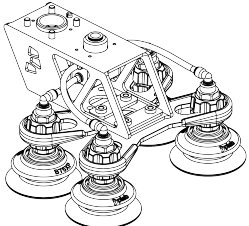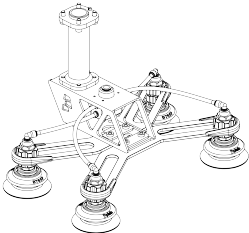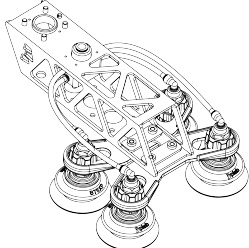
6.2.2. PowerPick Vacuum Gripper

Specification	Value
Energy source	Electricity and compressed air
Gripper mass (mounted to 200 mm hollow offset link)	1030 g
Minimum feed pressure	3 bar
Maximum feed pressure	8 bar
Optimal feed pressure for low noise (<80 dBa)	4 bar
Optimal feed pressure for compressed air consumption	5.5 bar
Optimal feed pressure for maximum payload	7 bar
Air consumption at low noise pressure	161.4 SLPM
Air consumption at maximum payload pressure	281.7 SLPM
Air consumption at optimal pressure	221.6 SLPM
Air supply connection type	8 mm OD tube
PowerPick Gripper noise level (at 5.5 bar)	82 dBa
Maximum vacuum level at 5.5 bar	67%
Maximum acceleration in operating conditions	1.5 g
Contaminants and purity class	ISO 8573-1 class 7.4.4
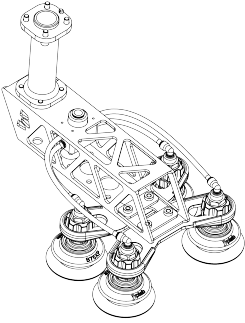
Table 6-2: Mechanical Specifications of PowerPick Vacuum Gripper

6.2.3. Center of Mass, Tool Center Point (TCP)

Configuration	Offset Link	Bracket for Suction Cups	Tubular Wrist Extension	Center of mass (mm)			TCP (mm)			Mass (g)
				X	Y	Z	X	Y	Z	
	0 mm	Small	Yes	5	0	108	0	0	183	1066
	100 mm	Small	No	85	0	57	106	0	122	954
	100 mm	Large	Yes	71	0	155	106	0	242	1289
	200 mm	Small	No	151	0	57	200	0	122	1020

Configuration	Offset Link	Bracket for Suction Cups	Tubular Wrist Extension	Center of mass (mm)			TCP (mm)			Mass (g)
				X	Y	Z	X	Y	Z	
	200 mm	Small	Yes	151	0	154	200	0	242	1244

6.3. Electrical Specifications

6.3.1. PowerPick Vacuum Gripper (Optional)

For more information about PowerPick Vacuum Gripper specifications, refer to the instruction manual of the product available available at support.robotiq.com.

6.3.2. Universal Robots Controller

Refer to the Installation section for more details about connections to the UR control box.

6.3.3. Robotiq Control Box

Parameter	Specification
Operating supply voltage	100 VAC to 240 VAC 60/50 Hz
Current consumption (excluding robot)	2.2 A (100 VAC) 1.9 A (120 VAC) 1.1 A (230 VAC) 1.1 A (240 VAC)

Measured values; may depend on modifications made by Universal Robots.

Table 6-3: Electrical specifications of the Robotiq control box.

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

⚠️	**WARNING**
	The Robotiq control box is CE marked and cCSAus certified. Any modification will void the certification.

The following diagram illustrates the basic connections of the Robotiq control box. For more information, download the electrical package on the Robotiq support website. Do not modify the wiring of the Robotiq control box unless it can be recertified in accordance with local rules, regulations and standards.

📖	**NOTICE**
	The direct input (DI) terminals to which the Pause and Restart wires need to be connected are at the user's choice.

UR CONTROLLER

-U10

-U11

Safety
24V
EI0
24V
EI1
24V
SI0
24V
SI1

Pause Button*

-W103

3
4

Configurable Inputs
24V
CI0
24V
CI1
24V
CI2
24V
CI3

Restart Button*

1
2

-S10 E---
White
Restart Button

-S11 E---
Black
Pause Button

-S12 E---
Blue
Confirm Pallet(s)
Ready Button

OPTIONAL

-W100

-W101

-W102

-W200

*Wiring of Pause and Restart buttons. To use the actual Pause and Restart functions, follow the wiring diagram above. Please note that the wiring will differ depending on whether or not additional safety devices have to be connected to UR controller safety IOs. Customize the wiring according to your needs.

-W50

-W60

-W70

-W80

-W51

-W61

-W71

-W81

OPTIONAL

-W72

-W82

S1   S2   S3   S4

-W63 -W62

-S2   -S1   -S4   -S3

-H1 (Left)   -H2 (Right)

Palletizing Solution - PE Series -

7. Periodic Inspection and Maintenance

⚠️	⚠️ **CAUTION**
	Maintenance operations are for the average normal use of the Robotiq Palletizing Solution. Maintenance intervals should be adjusted according to the environmental conditions.

Following maintenance intervals will ensure:

- The correct functioning of the equipment

- The validity of the warranty

- The prescribed lifetime of the equipment.

- The safe operation of the equipment

⚠️	⚠️ **WARNING**
	Take all safety measures during maintenance operations on the Robotiq Palletizing Solution. Please refer to the **Safety** section for additional information.

⚠️	⚠️ **CAUTION**
	- Always turn off the Palletizing Solution and depressurize the air supply tube before performing any maintenance operation. For more details about the depressurization, please refer to the **Depressurizing the Supply Line** section. - The Palletizing Solution is not waterproof or water resistant without additional protection. Clean the equipment with a dry towel. - Maintenance operators must be grounded to prevent electrostatic discharge that could damage electronic equipments.

7.1. Power Off and Lock Off Procedure

⚠️	⚠️ **WARNING**
	The power off and lock out procedure must be followed before performing any maintenance or inspection operation on the equipment.

Pneumatic power should be shut off and locked out upstream of the solution, or completely disconnected.

The system must be depressurized before performing maintenance operations on the solution. The way the system is depressurized will depend on the gripper used.

When using the PowerPick Vacuum Gripper, simply activate the vacuum or blow off output, and wait for the pressure to drop completely.

PowerPick also includes a shut off valve that can alternatively depressurize the system downstream and be locked in the exhaust position. In the latter case, the upstream section remains pressurized.

To turn off the electrical power downstream of the Robotiq Control Box, switch the main isolator off and lock it in the off position. It is also possible to unplug the main power cable from the power outlet.

⚠	**CAUTION**
	Follow these 4 electrical engineering safety rules when working on electrical equipment: • Disconnect completely • Secure against reconnection • Make sure there is no voltage • Provide protection against adjacent live components

Inspect all cabling and tubing.

- Examine the pneumatic tubing for signs of wear, tear, cracking, crushing or bending.

- Verify that the pneumatic tubing is firmly attached to the cable clips and curler, and, in turn, to the robot arm.

- Examine the cable ties, cable clips and curler for signs of wear, tear or cracking.

- Examine the cables and wires for signs of wear, damage or pinching.

- Examine the sheath of cables and wires for signs of tear or cracking.

7.2. Fastener Specifications

Inspect all screws and bolts periodically to make sure they are tightened to the appropriate torque, as represented in the table below.

Diameter / TPI	Location	Torque	
		[Nm]	**[lb-ft]**
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 Values - Palletizing Solution

7.3. PowerPick 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).

- Gripper cleaning:
  - Daily under dirty conditions
  - Monthly under normal conditions

- Periodic inspection: after 1 M cycles or 1000 hours, whichever comes first.

⚠️	⚠️ **CAUTION**
	Unless specified, any repairs performed on the Vacuum Gripper should be done by Robotiq.

7.3.1. Air Filter Kit

Regularly inspect the air filter kit. If water is present, it must be drained.

	NOTICE
	For more details about the maintenance of the PowerPick Vacuum Gripper, please refer to its instruction manual available at robotiq.com/support.

7.4. Cleaning

7.4.1. Palletizing Solution

The solution should be cleaned at regular intervals depending on the environment in which it is located.

Clean the mechanical components with a soft cloth, as required.

Use non-abrasive cleaning agents and media.

Periodically clean the Robotiq control box air filters and replace them when necessary.

Gently clean the photoelectric pallet sensor window using a soft cloth as needed.

7.5. Storage

Choose cool, dry and well-shaded environments.

8. Spare Parts, Kits and Accessories

	NOTICE
	The following list is deemed up to date based on the moment at which this document was built. It is subject to change. Please check online for updates.

Item	Description	Ordering Number
52 mm Suction Cups	4 x Suction Cups - Piab 52 mm (1.5 Bellows)	VAC-CUP-PIAB-52MM-KIT-4
75 mm Suction Cups	4 x Suction Cups - Piab 75 mm (1.5 Bellows)	VAC-CUP-PIAB-75MM-KIT-4
78 mm Suction Cups	4 x Suction Cups - Coval 78 mm (1.5 Bellows)	VAC-CUP-COVAL-78MM-KIT-4
Status Light for Palletizing Solution	1 x Status Light for the Robotiq Palletizing Solution	PAL-STAT-LIGHT
Type A Pallet Sensor Kit - Palletizing Solution	• 1 x Type A Pallet Sensor • 1 x Screw kit Used for: • Left pallet, back sensor • Right pallet, side sensor	PAL-SENS-A
Type B Pallet Sensor Kit - Palletizing Solution	• 1 x Type B Pallet Sensor • 1 x Screw kit Used for: • Left pallet, side sensor • Right pallet, back sensor	PAL-SENS-B
Box Sensor Kit - Palletizing Solution	• 1 x Box Sensor • 1 x Cable • 1 x Mounting Bracket	PAL-BOX-SENS-KIT
Air Filter for PE Series Control Box	Replacement air filters for Robotiq control box (pack of 5)	PAL-CTRL-BOX-FILTER-PE

9. Troubleshooting

9.1. Palletizing Solution (excluding the PowerPick Vacuum Gripper)

Symptom / Issue	Cause	Solution
Robot comes to a protective stop after palletizing 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.	Increase 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.
Robot drops boxes from great heights	Minor palletizing error carried over from previous layers.	Decrease the box height value.
	Incorrect TCP.	Confirm TCP is located above the box, at the picking position.
	Pallet height value is too low.	Increase pallet height value.
Robot collides with palletized box	A collision occurred between the gripped box and a box on the pallet. A minor palletizing error carried over from previous layers.	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 box width and/or box length value.
	Pallet viewer does display actual pallet state.	Inspect Pallet viewer at program start and confirm the virtual layout matches the actual layout.
	Pallet height value is too high.	Decrease the pallet height value.
Protective stop triggered by robot placing a box on first layer	Box height value is too high.	Verify the box height value.
	Pallet height value is too high.	Verify the pallet height value.
	Incorrect TCP.	Confirm that the TCP has been set correctly.

Inconsistent box positioning	Unstable picking position.	On the conveyor, make sure the stop consistently positions the boxes correctly.
	Incorrect picking position.	Make sure that the vacuum gripper is squared and centered with the box at the picking position.
"Collision detected" error message during trajectory	Pallet viewer layout does not correspond to actual physical layout. The robot detected a collision with an object that is not physically present.	- Restart the program and select the corresponding box step. - Verify the TCP position and orientation values.
"Discontinuous path / joint solution impossible detected, please change your starting point" error message	Singularity occurred on planned trajectory.	- Go to the PolyScope 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 the 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 close 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 support@robotiq.com.
The box layer shows a rotational offset relative to the surface of the pallet. Collisions can occur with the pallet sensor on one side, but not on the other.	Pedestal not centered on the base.	Execute the centering procedure found in the Installation section.

	Incorrect TCP.	Confirm that the TCP has been configured correctly
	TCP does not account for the bracket used.	Configure the TCP correctly.
A collision occurred	Gripper size extends beyond 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.
	Current pedestal height does not correspond to pedestal height value entered in Installation tab.	Adjust the pedestal height so that it corresponds to the configuration displayed in the Installation tab.
Robot waits indefinitely over picking position	Box presence sensor is misused or not connected.	- 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.
Robot comes to a protective stop during palletizing	Joint limit exceeded.	- Verify that the joint speed and position limits 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.
Robot does not restart after pallet changeover	"Confirm pallet(s) ready" feature is enabled.	Press the "Confirm pallet(s) ready" button after pallet changeover.
Error message: "RTDE interface cannot initialize. Make sure that Ethernet/IP adapter and Profinet are disabled, and that no other URCap uses the RTDE interface."	Registers cannot be used in conjunction with Ethernet/IP or PROFINET when the following function checkbox is ticked: Installation > URCaps > Copilot > Configuration > General: "Use Copilot to manage a soft speed transition when resuming from a Safeguard stop"	- 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. PowerPick Vacuum Gripper (Optional)

If the desired vacuum level cannot be reached or if a loss of vacuum occurs:

- Verify the feed pressure level; adjust accordingly

- Inspect the condition of the suction cups; replace if necessary

- Make sure that the air path, including the manifold, is clean and unobstructed

- Inspect the air filter; clean if necessary

9. Warranty

Robotiq covers 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**
	The warranty applies under the following conditions:
	• Usage is made in accordance with the operating and storage conditions specified in the Environmental and Operating Conditions section.
	• The product and all its components have been properly installed as specified in the Installation section and following subsections.
	• Maintenance is performed in accordance with the conditions specified in the Maintenance section.
	• Usage complies with the recommended payload, force, acceleration and speed values specified in the Mechanical Specifications section.
	The warranty will come to an end when one of the following conditions is reached, whichever comes first:
	• 1 year
	• 2 000 000 cycles (boxes or objects manipulated, PowerPick only)

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 to 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 proper functioning of the robot program is not accessible.

- The component cannot be controlled from the robot teach pendant.

	CAUTION
⚠️	Should one of the following events occur, the warranty will become null and void. • The unit has been tampered with, repaired or worked on by unauthorized individuals. • Screws, other than as explained in this manual, have been removed. • The unit has been opened or disassembled other than as explained in this manual. • The unit's serial number has been altered, erased, or removed. • The unit has been misused, neglected, or damaged by accident. • The component experienced wear and tear due to direct contact with a workpiece or an obstacle.

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.

10. Harmonized Standards

10.1. EC Declaration of Incorporation

10.1.1. Robotiq Palletizing Solution

ROBOTIQ

EC Declaration of Incorporation (Original)
In accordance with the EC Machinery Directive 2006/42/EC, Annex II, 1., Section B.

We, the manufacturer:

Robotiq Inc.
966 Chemin Olivier, Suite 500
Lévis, Québec, Canada, G7A 2N1

hereby declares, under sole responsibility, that the product:

Robotiq Palletizing Solution – PE Series (PE10 & PE20)
All serial number
(and accessories)

complies with the following essential requirements of the European Directive 2006/42/EC on machinery:

1.1.2, 1.1.3, 1.1.5, 1.2.1, 1.2.3, 1.2.6, 1.3.1, 1.3.2, 1.3.4, 1.5.1, 1.5.5, 1.5.6, 1.6.1, 1.7.2.

The product is considered as partly completed machinery and has been evaluated in accordance with the following harmonised standards:

- *EN ISO 12100:2010*
- *ISO 4414:2010.*

The product must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the Directive 2006/42/EC, including amendments.

The manufacturer declares that the product complies with the following European Directives and harmonised standards:

- **2014/35/EU (Low Voltage Directive)**
  - *EN 60204-1:2018*
- **2011/65/EU + 2015/863 (RoHS Directive)**
  - *EN 50581:2012*
- **2012/19/EU (WEEE Directive)**
  - *EN 50419:2005.*

The manufacturer also declares the use of these other technical standards, as far as applicable:

ISO 9409-1:2004.

Name and address of the person authorised to compile the relevant technical documentation:

Leif Möller,
9 Blvd. des Droits de l'Homme,
69120 Vaulx-en-Velin, France

The relevant technical documentation is compiled in accordance with part B of Annex VII of Directive 2006/42/EC and will be presented electronically by the manufacturer to competent national authorities, if required with a substantiated reason.

Signed in Lévis on 2023-09-07.

Louis-Alexis Allen Demers, ing., Eng., Ph. D.
Technical Director

10.1.2. PowerPick Vacuum Gripper (Optional)

ROBOTIQ

EC Declaration of Incorporation (Original)

In accordance with the EC Machinery Directive 2006/42/EC, Annex II, 1., Section B.

We, the manufacturer:

Robotiq Inc.
966 Chemin Olivier, Suite 500
Lévis, Québec, Canada, G7A 2N1

hereby declares, under sole responsibility, that the product:

PowerPick Vacuum Gripper (PowerPick10 & PowerPick20)
All serial number
(and accessories)

complies with the following essential requirements of the European Directive 2006/42/EC on machinery:

1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4, 1.5.1, 1.5.2, 1.5.3, 1.5.4, 1.5.8, 1.5.10, 1.5.11, 1.7.2.

The product is considered as partly completed machinery and has been evaluated in accordance with the following harmonised standards:

- *EN ISO 12100:2010*
- *ISO 4414:2010*

The product must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the Directive 2006/42/EC, including amendments.

The manufacturer declares that the product complies with the following European Directives and harmonised standards:

- **2014/30/EU (EMC Directive)**
  - *EN 61000-6-2:2016*
  - *EN 61000-6-4:2007 + A1:2011*
- **2011/65/EU + 2015/863 (RoHS Directive)**
  - *EN 50581:2012*
- **2012/19/EU (WEEE Directive)**
  - *EN 50419:2005.*

The manufacturer also declares the use of these other technical standards, as far as applicable:

ISO 9409-1:2004.

Name and address of the person authorised to compile the relevant technical documentation:

Leif Möller,
9 Blvd. des Droits de l'Homme,
69120 Vaulx-en-Velin, France

The relevant technical documentation is compiled in accordance with part B of Annex VII of Directive 2006/42/EC and will be presented electronically by the manufacturer to competent national authorities, if required with a substantiated reason.
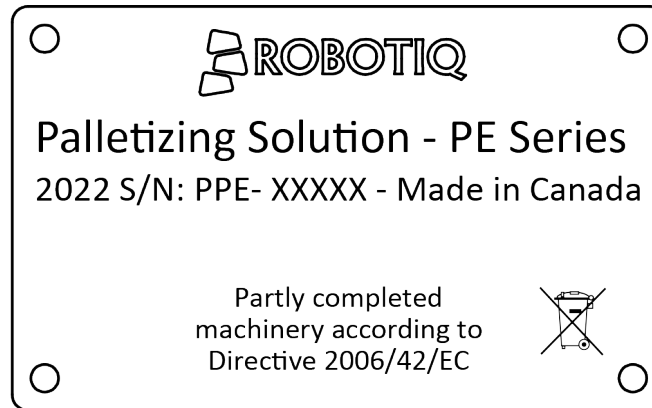
Signed in Lévis on 2023-09-07.

Louis-Alexis Allen Demers, ing., Eng., Ph. D.
Technical Director

10.2. Identification plate

The following identification plate is riveted to the bottom of the Solution's base, conveyor side.

11. Appendix
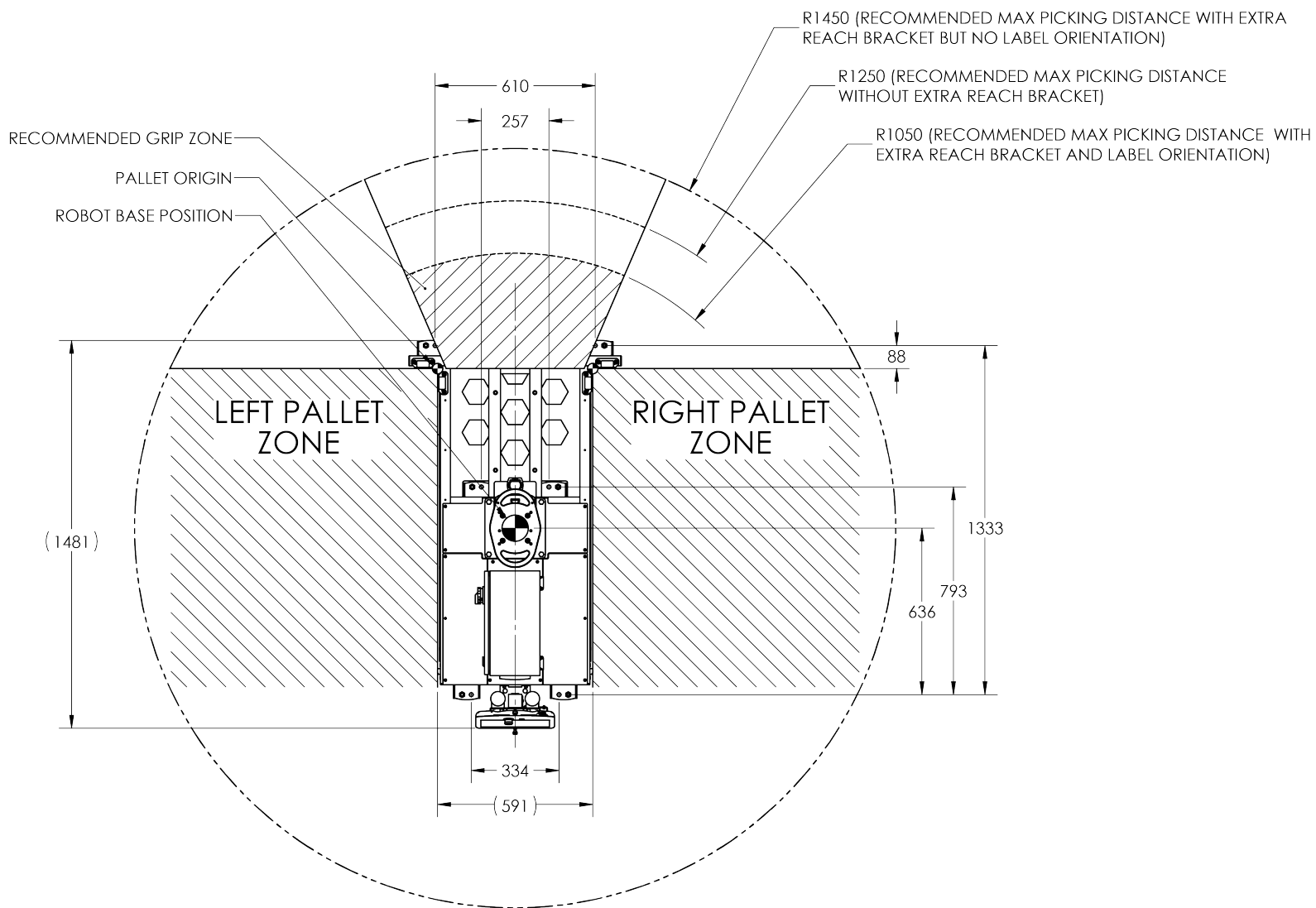
11.1. Palletizing Cell Layout

Fig. 11-1: Palletizing Work Zones Schema for UR10

12. Contact

Robotiq
www.robotiq.com
Contact Us
Phone
1-888-ROBOTIQ (762-6847) (01) 418-380-2788 Outside US and Canada
Technical support and engineering
option 3
Sales
option 2
Head office
Robotiq: 966, chemin Olivier Suite 500 St-Nicolas, Québec G7A 2N1 Canada

ROBOTIQ eLearning

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