ROBOTIQ

ROBOTIQ AX20/AX30 PALLETIZING *SOLUTION*

Original instructions (en)

Robotiq AX20/AX30 Palletizing Solution
for Universal Robots

User Manual

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Revisions

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

2025/04/19

Updated several sections:

- Update of the Safety section (Operation mode table)
- Update of the Installation section (Scope of delivery, required tools and equipment, environmental and operating conditions, unboxing, anchoring the solution)
- Update of the Operation section (Solution mobility)
- Update of the Specifications section (Mechanical Specifications of the Robotiq Palletizing Solution - Maximum payload)
- Update of the Periodic Inspection and Maintenance section (Maintenance procedures)

2024/08/22

Initial release

1. General Presentation

The terms "Palletizer", "Palletizing Solution", "Robotiq Palletizer", "Robotiq Palletizing Solution", "Solution" and "AX20/AX30" used in this manual all refer to the Robotiq AX20/AX30 Palletizing Solution for Universal Robots UR20 and UR30. The Robotiq AX20/AX30 Palletizing Solution is a hardware and software solution preconnected and ready to install. It is composed of a structure fully integrated with a linear axis, pallet sensors, and status lights. The delivery can also contain the Robotiq PowerPick20/30 Vacuum Gripper and Vacuum Generation Unit (optional module). 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

The main components of the AX20/AX30 Palletizing Solution are shown in Fig. 1-1.

The solution consists of two main components: the base and the column. The base is equipped with two photoelectric pallet sensors. The column supports a linear axis on which a carriage is mounted, used to extend the robot workspace. Two status lights are mounted on the top of the column.

The system can optionally be used in conjunction with PowerPick20/30 Vacuum Gripper, shown in Fig. 1-2.

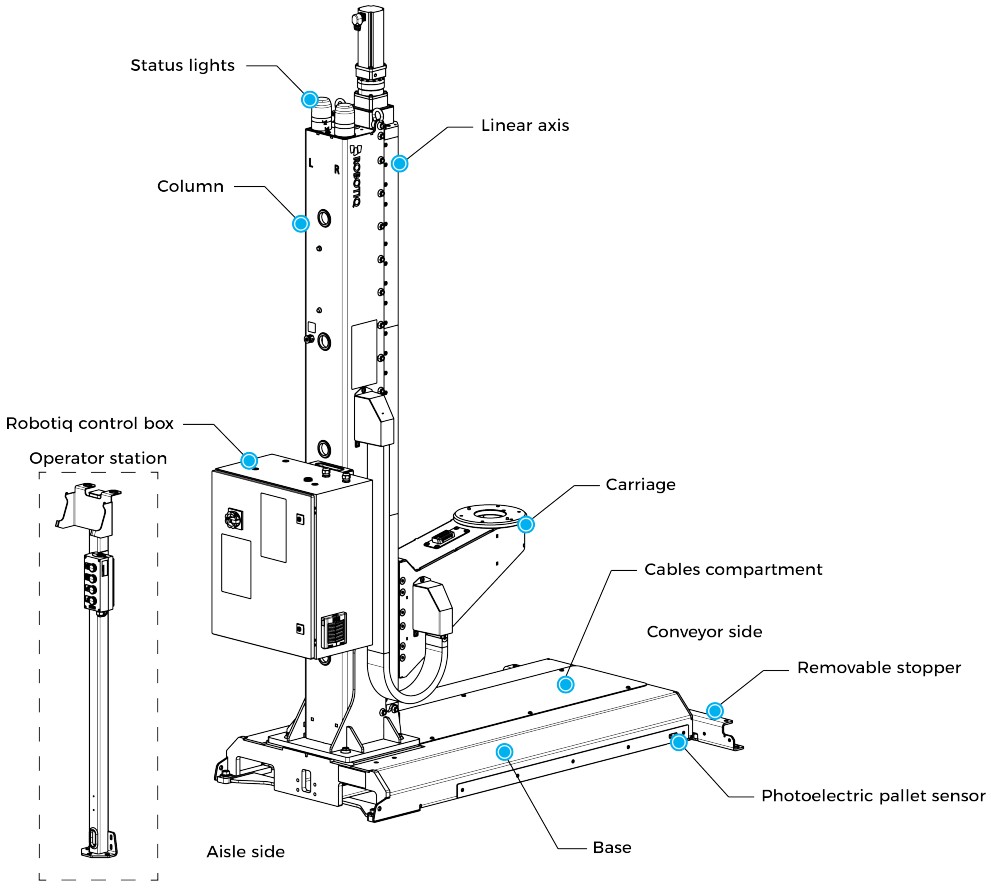


Fig. 1-1: Robotiq AX20/30 Palletizing Solution

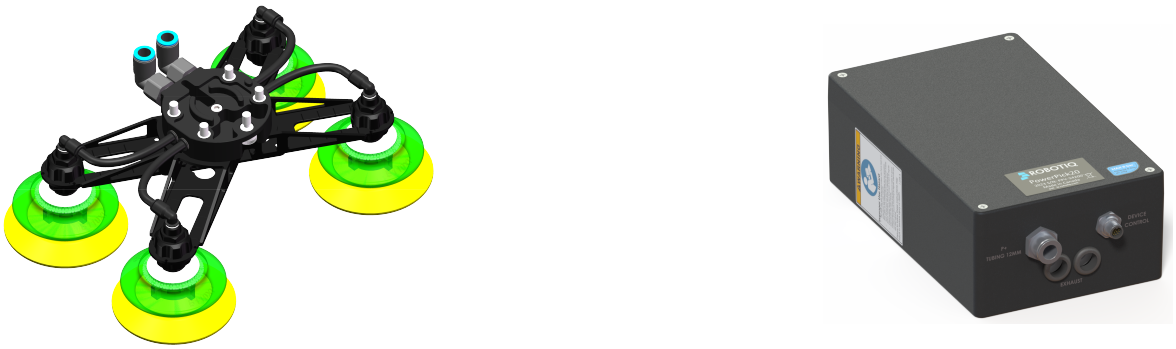


Fig. 1-2: PowerPick20/30 Gripper and Vacuum Generator

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.

The installer is also responsible for the proper design of the palletizing cell and its compliance to local regulation.

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, integrator* 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 PowerPick20/30 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.

The linear axis is NOT power and force limited. To prevent the operator from exposing themselves to the risk of contact, pinching, impacts or crushing with the axis or the robot, the vertical axis must be completely stopped when the operator is within a unsafe distance to the axis or the robot. Safety devices like safety laser scanner, light curtain or fences with interlock can be used to make sure the vertical axis is stopped when the operator is within an unsafe distance of the palletizing solution. To this end, ISO 13857 or any other applicable regional standard must be followed. The solution must be anchored as specified in this manual.

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 dropping or ejection resulting from loss of vacuum.
- Risk of pinching by any moving component of the Robotiq Palletizing Solution or the robot.
- Risk of damaged objects or injury resulting from a contact between an object and the robot, the gripper or the boxes.
- Risk of injury resulting from a contact between a person and the Solution.
- Risk of contact with a moving vehicle or equipment leading to breakage of the palletizer structure or anchors.

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 contact 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 safety devices like laser safety scanners, light curtains or fences with interlock are deployed to make sure at least the vertical axis is stopped when the operator is within an unsafe distance of the solution.
  - Make sure no one is within an unsafe distance of the Solution when the Solution's safeguard is reset or when the program is started, especially in zones where the presence of the operator cannot be detected (e.g., Pallet zone, palletizer base, etc.)
  - Make sure the solution is properly anchored according to installation instructions of this user manual.
  - Make sure that a situation where the operator is trapped between the robot and an object surrounding the Solution is not possible.
- The customer has to assess the risks of a person approaching the Solution on any sides of the solution.
- The linear axis is NOT power and force limited. Contact with the linear axis or the robot presents a high level of risk. Pinching, impacts or crushing risks must be considered.
- When the linear axis is moving while the robot is stopped, the force limitation safety feature of the robot is not effective. Therefore, even if the robot is force limited, contact with the robot presents a high level of risk.

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 gripper electrical 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 Box Supply (any 24 V 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 PowerPick20/30 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 PowerPick20/30 Gripper operating at the optimal pressure level, the noise level at the workstation is 79 dBA (refer to the **Specifications** section of the PowerPick20/30 Vacuum Gripper user manual, available at robotiq.com/support).

Hearing protection is recommended.

Make sure that all local safety measures and regulations are met.

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

Misinstallation

WARNING

Tip Over Hazard

Failure to anchor the Solution according to the Anchoring the Solution section of this manual may result in material damage, bodily injury or death.

Failure to follow screw tightening torque and threadlocker application to all screws specified in the current manual may result in material damage, bodily injury or death.

DANGER

Impact / Crush Hazard

Failure to implement a safety system like a safety laser scanner, light curtain or fence with interlock to prevent contact with the Solution in operation according to directions of the **Robot Installation Zone** section of the current manual may result in bodily injury or death.

CAUTION

It is strongly advised to avoid positioning areas where people frequently work or pass (e.g., workstations, corridors) within 2.5 meters of the palletizer. This measure enhances safety in the event that the palletizer column falls due to unforeseen events.

WARNING

Impact / Crush Hazard

Failure to properly set all the robot safety parameters according to the **Installation** sectionof the current manual may result in material damage, bodily injury or death.

Improper Moving of the Solution

WARNING

Tip Over Hazard

Failure to follow directions of the **Installation** section and/or the **Solution Mobility (Wash Down and Production Line Shifts)** section of the current manual may result in material damage, bodily injury or death.

Maintenance and Repair

WARNING

Failure to perform specified inspections, maintenance procedures or schedule specified in the current manual may result in material damage, bodily injury or death.

WARNING

During maintenance, inspection, cleaning and repair work, make sure that the Palletizing Solution electrical power and air supply are turned off and locked out.

- Inspection, 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.
- Never go under or near the axis carriage or robot arm when performing maintenance, service, inspection, cleaning or repair work.
- Position the vertical axis at the minimum height before entering the danger zone to perform, cleaning, maintenance, inspection or

service.

- Make sure that no one is in the danger zone before rearming the safeguarding.

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, service or 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, inspection 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

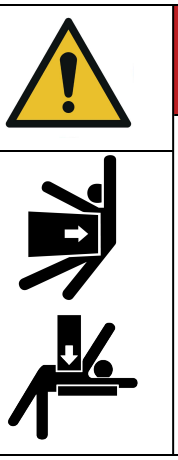
The vertical axis motor and the Robotiq control box generate heat during operation. Do not handle or touch the axis motor while in operation or immediately after operation as prolonged contact can cause discomfort or burn. You can cool down the components by powering it off and waiting one hour. Refer to UR20 / UR30 user manual for information related to Robot and robot controller hot surfaces.

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

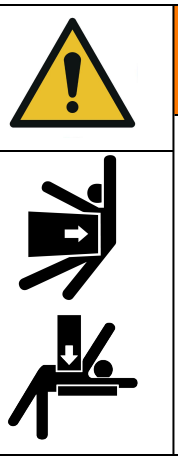
Manipulating or circumventing protective devices during the operation of the Solution is not permitted and must be avoided.



DANGER

Impact / Crush Hazard

Failure to implement a safety system like a safety laser scanner, light curtain, or fence with interlock to prevent contact with the Robotiq Palletizing Solution in operation may result in bodily injury or death.



WARNING

Impact / Crush Hazard

In the event of incorrectly installed, defective, or even missing protective devices, operating the machine is not permitted. Using the Robotiq Palletizing Solution under these conditions may result in bodily injury or death.

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

EMC Compliance

To fully comply with EMC regulations and mandatory standards, an additional phase and earth (PE) connection is required via an earthing screw, using 2,5 mm^2 (14 AWG) cable with an M6 cable lug (not provided).

Refer to the figure below for a visual representation.

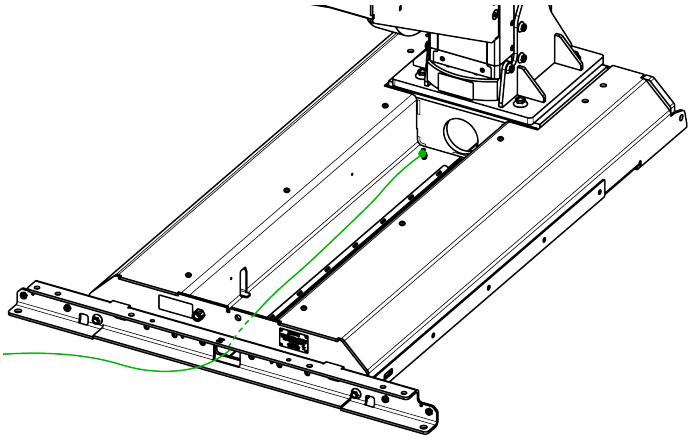


Fig. 2-1: Additional Phase and Earth Connection to the Base of the Palletizing Solution

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

DANGER

- 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 between the robot reach (or UR safety plane) and any stationary object like safety fences.
- To avoid being pinched or crushed between the robot (including the gripper) and walls or peripherals, always keep a minimum distance of 500 mm after the operation zone.
- 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.
- Never go under or near the axis carriage or robot arm. When a contact with the robot is required for teaching robot positions, keep your body as far as possible.
- Make sure that no one is in the danger zone before rearming the safeguarding (especially when teaching robot positions).
- When teaching positions, make sure to stay alert and keep clear of the robot. Always wear safety glasses.
- Proper safeguarding must be installed to prevent contact with the robot or the linear axis when the solution is in operation. Refer to the **Installation** section of this manual for details.

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. Entry into the work area is strictly prohibited unless you are in manual mode to teach points to the robot. During such activities, adherence to all safety instructions is mandatory.
- 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.

WARNING

Reducing the robot's speed or force is not an efficient way to reduce the risk of contact between the robot or the linear axis. 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 refer to UR robot manual for robot forced back-driving.

CAUTION

Moving the robot arm manually in back drive mode is intended for urgent/emergency procedures and service purposes only.

CAUTION

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

For more information, refer to the robot's user 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 UR20 or UR30 robot from Universal Robots. DO NOT install any robot other than the Universal Robots UR20 or UR30 on the solution.

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 UR20 or UR30.
- Use of a payload higher than the maximum payload specified in the Specification section of this user manual.
- Use of the Solution outside of the environmental and operating conditions.

Operational misuse:

- 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.

Please refer to the **Safety Devices** section for best practices on how to connect them to the Robotiq control box.

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 mode**: The system stops when a human operator enters the vicinity of the palletizing cell to manipulate a filled pallet, place pallets in an empty pallet slot, or troubleshoot the system or any other operations requiring human intervention. In such a state the robot will maintain a Category 2 stop and the linear axis will undergo a Category 1 stop. When the safeguards is reset, the system will resume operation in normal mode.

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

The following table indicates which stop category corresponds to each operation mode.

Operation mode	Robot			Linear Axis		
	Force (N)	Power (W)	Speed (mm/s)	Force (N)	Power (VA)	Speed (mm/s)
Normal mode (Up to safety limits)	Up to 400	Up to 1,000	Up to 5,000 (UR30) Up to 10,000 (UR20)	Up to 5000	700 (nominal)	225
Robot stop (Protective stop)	Stop Category 2					
Safeguard stop	Stop Category 2			Stop Category 1		
Emergency stop	Stop Category 1					
Reduced mode	Please refer to the Universal Robots user manual for more details.			Stop Category 1		

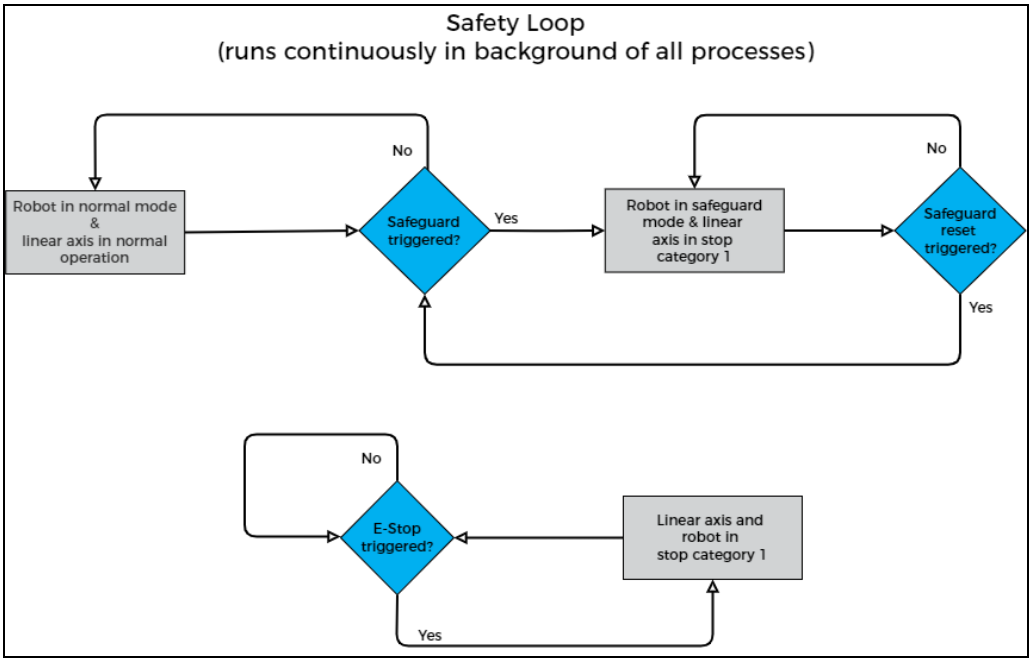


Fig. 2-2: Safety Logic Diagram in Automatic Mode

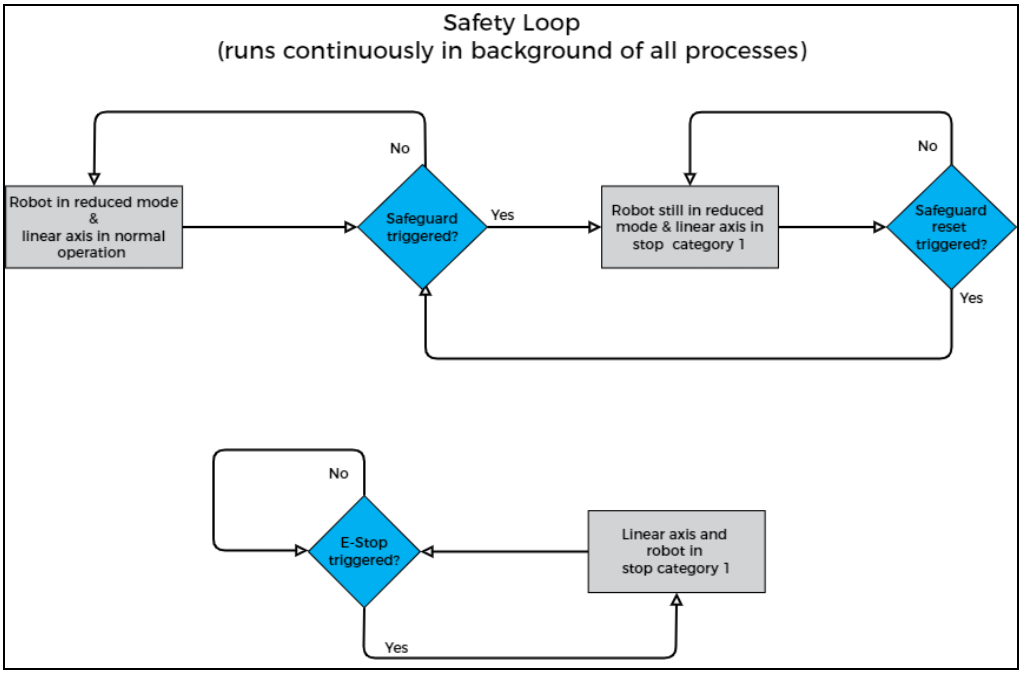


Fig. 2-3: Safety Logic Diagram in Manual Mode

WARNING

After a contact, an inspection of the Solution must be performed before resuming the use of the machine. Special attention must be given to the cable management system, and the gripper components. Please contact support@robotiq.com if any sign of damage is detected.

As depicted in the table below, when a safeguard or an emergency stop is detected, the linear axis initiates a Category 1 Stop.

Trigger	Linear Axis Reaction
Emergency Stop	Category 1 Stop
Safeguard Stop	Category 1 Stop

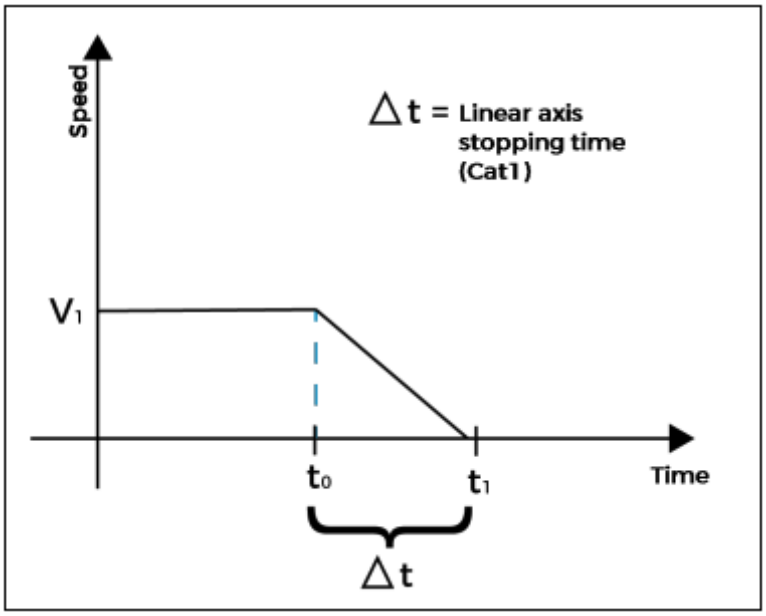
According to IEC 60204-1, a Category 1 Stop is when the device stops in an orderly, controlled manner, and the power is removed once the device is completely stopped.

The stopping time of the linear axis is depicted in the diagram below, where:

- t_0 corresponds to the moment at which the linear axis receives the stop signal
- t_1 corresponds to the complete stop of the linear axis
- Δt corresponds to the overall stopping time (linear axis only) for a Category 1 Stop.

- V_1 is the maximum linear axis speed of 225 mm/s.

And so, the worst case **stopping time for a Category 1 Stop of the linear axis is 450 ms** (safe stop 1 + safe torque off), which corresponds to the maximum travel distance of 51 mm.



WARNING

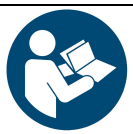
The reaction and response time of any sensing device that triggers the stop will add to and extend the overall stopping time and stopping distance.

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, servicing, 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 safely be lifted by a single person.

3.1. Scope of Delivery

- 1 x AX20/AX30 base
  - 2 x Photoelectric pallet sensors
- 1 x AX20/AX30 column
  - 1 x Linear axis (1600 mm stroke)
  - 1 x Linear axis motor
  - 2 x Status lights
- 1 x AX20/AX30 removable stopper for Palletizing Solution
- 1 x AX20/AX30 Series operator station:
  - 1 x Teach pendant rack
  - 1 x Push button enclosure
- 1 x Robotiq control box
- 1 x Motor cover
- 2 x Cable chain cover
- 1 x Box detection sensor kit
  - 1 x Box detection sensor
  - 1 x Box sensor bracket with screws
  - 1 x 5 m box sensor cable (already channeled through the column)
- 1 x Robot cable management kit
  - 3 x 500 mm cable clips
  - 1 x 1000 mm cable clip
  - 6 x 190 mm cable ties
- 1 x Installation hardware kit
  - 2 x 5/8 in x 7 in concrete wedge anchors with serrated flange nuts
  - 2 x 1/2 in x 5-1/2 in concrete wedge anchors with serrated flange nuts
  - 3 x 1/2 in x 3-3/4 in concrete wedge anchors with serrated flange nuts
  - 6 x M10 x 30 mm socket head cap screws with serrated Belleville washers
  - 4 x M16 x 40 mm hex head flange screws
  - 6 x M12 x 30 mm hex head flange screws
  - 2 x M8 x 10 mm socket head cap screws
  - 6 x M8 x 10 mm button head cap screw flanged
  - 4 x Single use, medium strength threadlocker

    - 8 x Shim washers (included but optional)
    - 12 x 190 mm cable ties
    - 2 x 360 mm cable ties
    - 1 x Pneumatic adapter 1/2 BSPP (1/2 G) to 1/2 NPT (included but optional)
- 1 x Material Handling Copilot software license dongle
- 1 x 4-port USB hub
- 1 x USB-to-Ethernet adapter
- 1 x Ethernet cable (300 mm)
- 1 x Installation tool kit
    - 1 x 1/2 in concrete drill bit
    - 1 x 5/8 in concrete drill bit
    - 1 x 15/16 socket, ½" square drive
    - 1 x 8 mm hex (allen) bit socket, ⅜" square drive
    - 1 x Allen L key 6 mm, Ball-End
- 1 x Robot installation plate kit
    - 1 x Robot installation plate
    - 6 x M10 x 40 mm socket head cap screws (blue dyed)
    - 1 x M10 spacer
- 1 x PowerPick20/30 Vacuum Gripper standard kit (optional)
    - 1 x PowerPick20/30 Vacuum Generation Unit
    - 1 x Mounting bracket and filter-regulator assembly
    - 1 x M12-12 pin I/O cable (3 m)
    - 1 x PowerPick20/30 Vacuum Gripper (default configuration)
    - 1 x Large suction cup bracket assembly
    - Air tubing
    - Tools and hardware for installation on AX20/30

3.2. Required Tools and Equipment

The following tools are not included, but required to install the Palletizing Solution:

- Forklift or pallet jack (minimum fork length of 1220 mm [48 in])
- Hoisting equipment (minimum payload capacity of 600 kg [1300 lb])
- Metric set of hex wrenches and / or ratchet wrench with socket set (up to 19 mm)

- Metric set of hex L-Key (Allen) (up to 6 mm)
- #2 Phillips screwdriver or #2 Phillips bit with Power screwdriver (recommended for uncrating)
- 2.5 mm slotted screwdriver
- Utility knife
- Torque wrench with 3/8 in and 1/2 in drive or adapter, minimum torque range of 20 - 150 Nm (14.8 ft-111 lb)
- Rotary hammer drill (compatible with 3/8 in and 1/2 in hex drill shanks)
- 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	40 °C [104 °F][1]
Humidity (non-condensing)	Palletizing solution: 20-90% RH PowerPick20/30 Gripper: 35-85% RH[2]
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]Contact support if the environment is between 40°C (104°F) and 50°C (122°F).
[2]Refer to the end effector manual for additional information on air requirements.

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.

3.4. Mounting and Installation

WARNING

- DO NOT install this equipment without having read and understood the Robotiq AX20/AX30 User Manual.
- DO NOT install this equipment without having the proper training and experience.
- DO NOT install any robot other than the Universal Robots UR20 and UR30.

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 645 kg (1420 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.

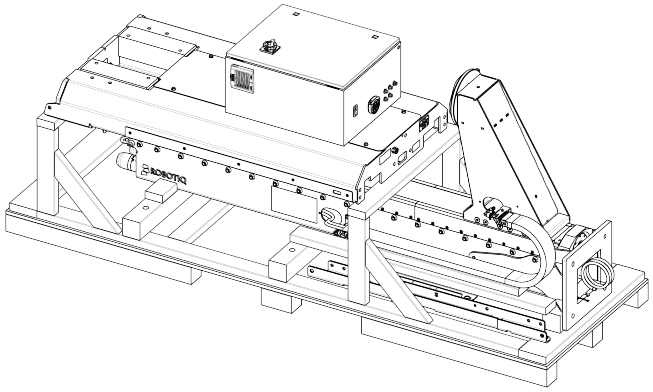
3.4.2. Unboxing

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

WARNING

- Crate must be moved carefully using appropriate equipment by properly trained personal.
- Make sure to follow all safety rules and regulations of your workplace. Always wear all recommended personal protective equipment in accordance with your workplace safety standards.
- People must be trained for transportation, handling and assembly.
- Proper handling and lifting equipment must be used.

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 Robotiq control box.

CAUTION

The control box weighs 33 kg (73 lb). Proceed with care and seek assistance to lift it if required.

Leave the screw caps on to prevent damage.

3. Using a 17 mm wrench, remove the four (4) lag screws securing the base inside the crate. Then, using a forklift, remove the base from the crate.

CAUTION

The base weighs 175 kg (385 lb). Proceed with care.

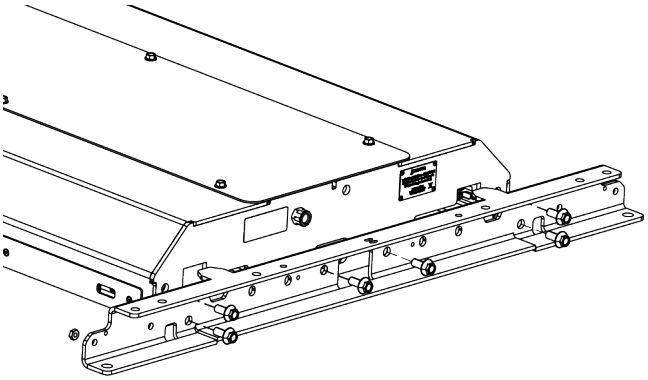
4. Remove the wood supports from the crate.

5. Place the base on shims with a thickness of at least 10 mm (⅜ in). You can use the wood supports for this purpose.

6. Remove the two (2) L-shaped aluminum brackets using a 16 mm wrench.

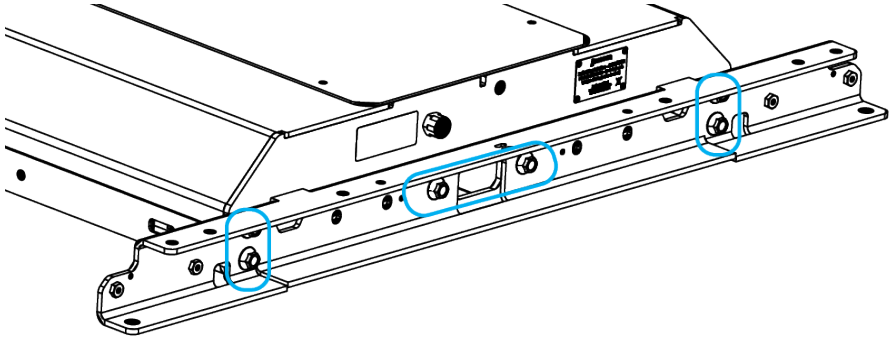
7. Remove all cardboard boxes and the operator station from the crate.

8. Remove the removable stopper from the crate and install it on the base using the six (6) M12 x 30 hex cap screws. Do not fully tighten the screws.



9. Use a forklift truck or pallet truck to lift the base and remove the shims underneath it and place the base directly on the ground.

10. Fully tighten the six (6) M12 x 30 hex cap screws to a torque of 110 Nm (81 lb-ft), making sure the tabs are in contact with the base, as shown in the figure below. If the removable stopper is to be left permanently attached to the base, add thread locking compound to the threads.

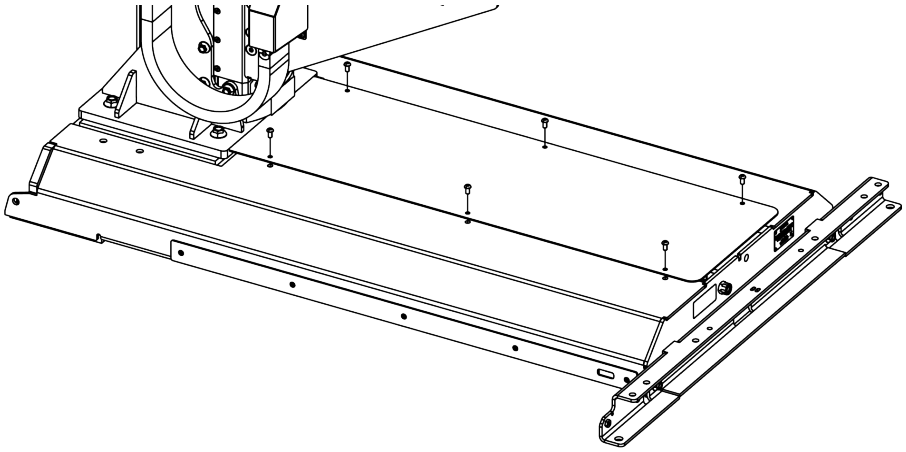


NOTICE

Should the removable stopper need to be removed in the future (i.e., for transportation), do not seal the fastener assembly using thread locking compounds.

Refer to **Solution Mobility (Wash Down and Production Line Shifts)** section for more information.

11. Remove the cover of the cables compartment.



12. Unscrew the two (2) screws that hold the column to the crate and remove the shipping straps.

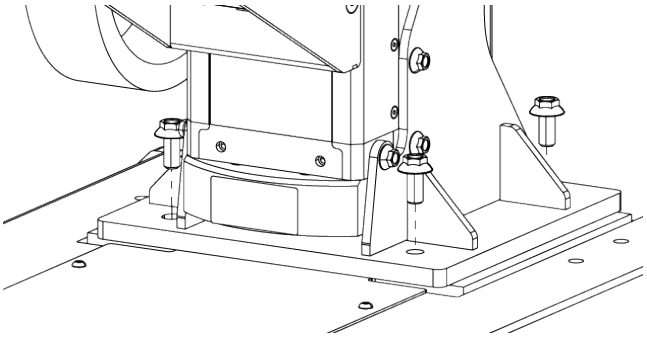
13. Using the sling attached at the top of the column, lift and place the column onto the base.

14. Make sure that the cables located inside the base of the column are not pinched during this operation.

CAUTION

The column weighs 262 kg (577 lb). Proceed with care.

15. Secure the column on the base using the four (4) M16 screws provided. Tighten to a torque of 150 Nm (111 lb-ft).



16. Once the column is in place, remove the sling and the shackles from the top of the column.

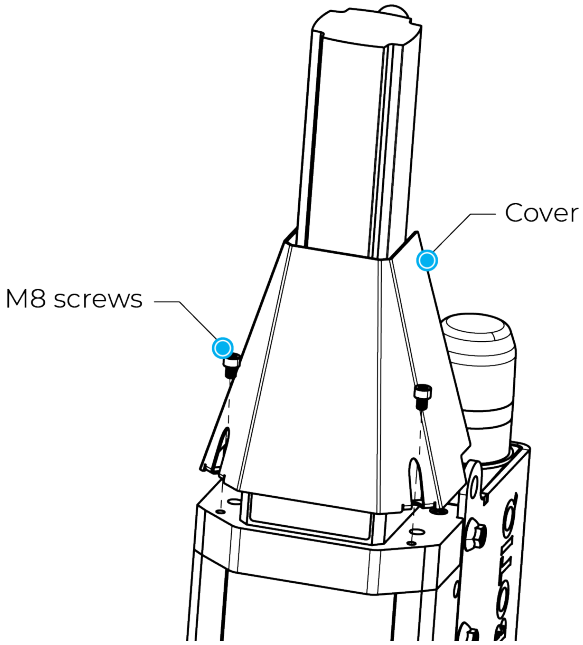
WARNING

Operating the solution with the sling and shackles still in place could result in collisions with the robot or cable management.

CAUTION

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

17. Install the motor cover using the two (2) M8 x 10 socket head cap screws using the provided Allen L Key 6mm, Ball-End.



3.4.3. Mechanical and Electrical Installation

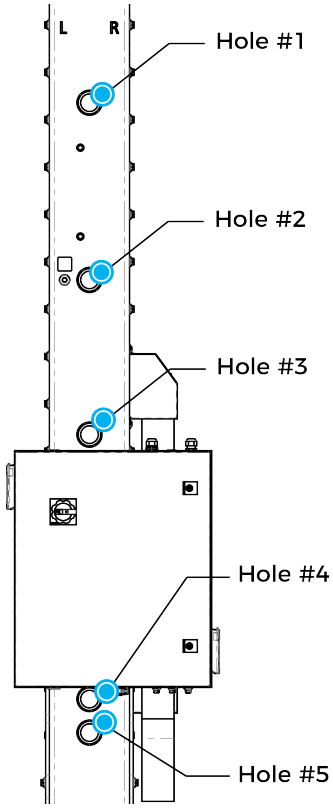
A minimum of two people is recommended to complete these steps.

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

	WARNING
	Use appropriate lifting equipment to lift the robot for the following operations.

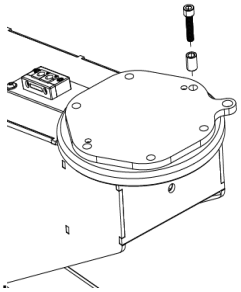
Robot Installation

The figure below indicates the location of the column holes.

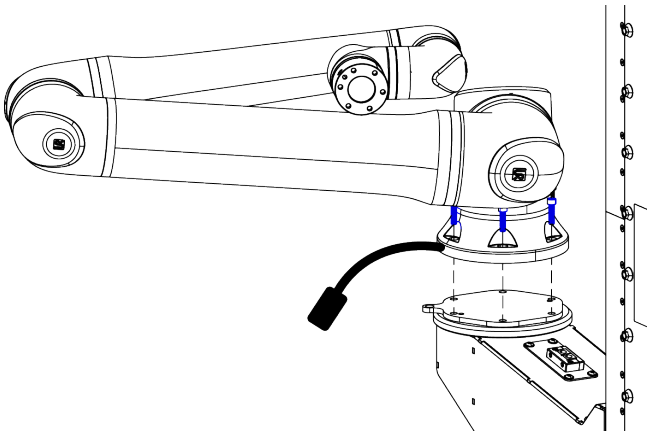


The robot is shipped in a pose that does not allow for installation directly on the AX20/AX30 palletizing solution. The following steps describe how to rotate the base joint in order to allow the robot to be properly mounted on the solution.

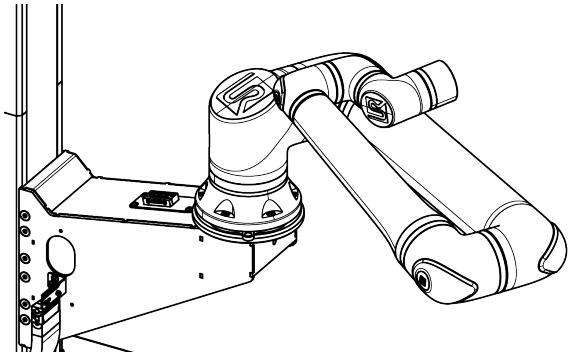
1. Using a 8 mm wrench, remove the blue M10 x 40 mm screw and spacer holding the robot installation plate on the flange of the carriage. Leave the plate in place and do not discard the screw. It will be needed to temporarily install the robot.



2. Snap the robot cable inside the opening on the side of the robot base and place the robot as shown in the figure below using suitable lifting equipment. There should be enough space to perform a rotation of the base joint from 90 to 0°. When looking at the robot from the top, the rotation will be performed clockwise.



3. Secure the robot using the six (6) blue M10 x 40 mm screws provided. Do not add the Belleville washers. Tighten it according to the robot specifications. Make sure that the sling will not prevent the rotation of the base joint, but do not remove it as it will be used to reinstall the robot in a few steps.
4. Temporarily connect the robot to its control box, and the control box to an outlet. Then, power it up.
5. Slowly rotate the base joint clockwise to 0°. Afterwards, the robot should be in the pose shown in the next figure.

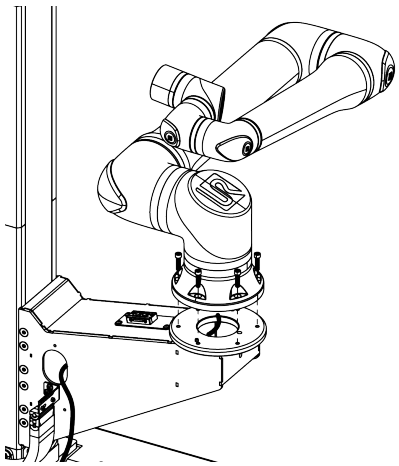


NOTICE

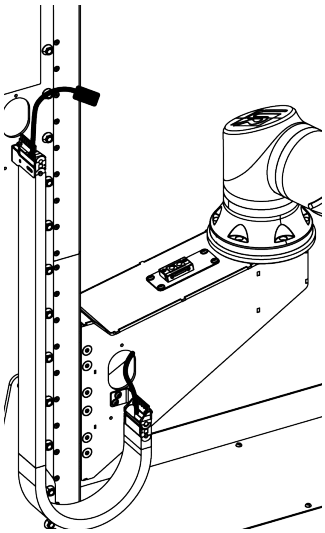
If you ever need to remove the robot, keeping it in this position will ensure that this step does not need to be repeated. This position is also pre programmed into the URCap so it can be retrieved here: ***Put robot into a box*** (**Installation** tab -> **URCaps** -> **Copilot** -> **Installation positions**).

6. Power off the robot, disconnect the controller and disconnect the robot cable on both ends.
7. If the original UR power cable provided with the robot was used to connect the control box to the outlet, put it aside. Do not use it to power the whole palletizing solution.
8. Dismount the robot using suitable lifting equipment by unscrewing the blue M10 x 40 screws.

9. Remove the robot installation plate and keep it, along with the screws, for future use.
10. Unsnap the robot cable from the opening on the side of the robot base and use the rubber plug provided with the robot to plug this opening.
11. Insert the robot cable through both openings of the carriage. Then, connect the robot.
12. Reinstall the robot so that the hole that was previously plugged is oriented towards the column.
13. Use the six (6) M10 x 30 mm screws and Belleville washers to secure the robot. Tighten it according to the robot specifications.



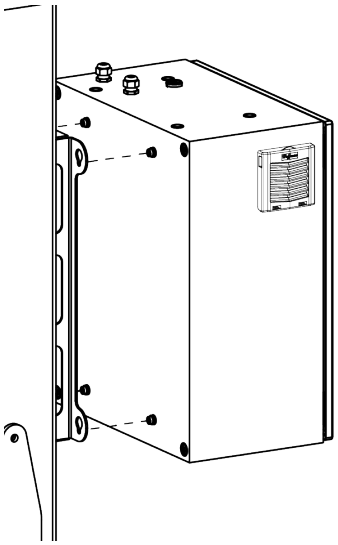
14. Open all the lids of the cable carrier using a flat screwdriver, starting with the lid that is the closest to the opening on the carriage. If some lids fall off completely, make sure to reinstall them in the correct orientation.
15. Run the robot cable all the way through the cable carrier. Leave the cable carrier open for now.
16. Attach the robot cable to each end of the cable carrier using two (2) 190 mm cable ties. Do not tighten the cable ties completely.



Control Boxes Installation

1. Remove the four (4) screw caps on the Robotiq control box.
2. Partially unscrew (approximately 3 mm) each screw at the back of the Robotiq control box.

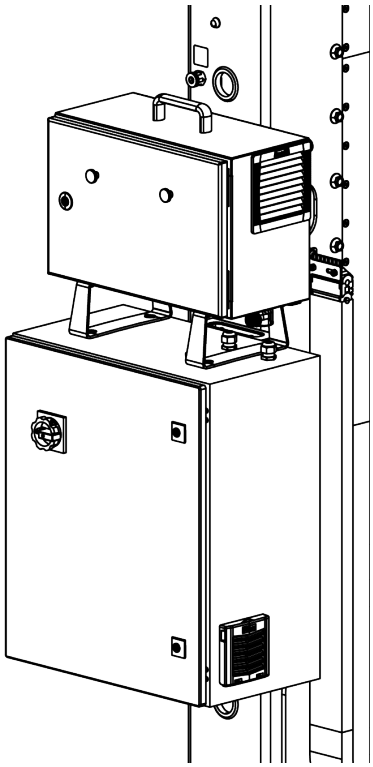
3. Align the four screws with the mounting slots of the controller bracket at the back of the column.
4. Lower the Robotiq control box slowly and carefully.
5. Tighten the screws to secure the controller to the controller bracket to a torque of 15 Nm (11lb-ft).



6. Place the UR control box on top of the Robotiq control box and secure it with four (4) M12 screws.

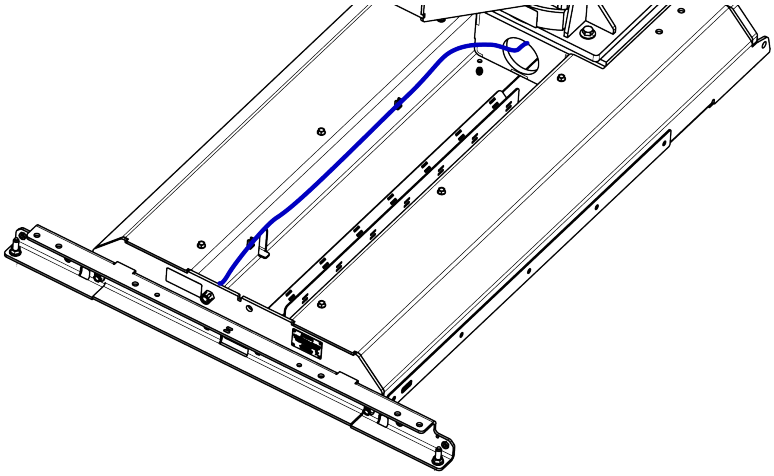
CAUTION

Do NOT connect the UR control box's power cable to the UR control box. The original UR control box's power cable should never be used when using the AX20/AX30.



Pneumatic Tubing Installation

1. Take the 12 mm pneumatic tubing out of the base of the column.
2. Connect the free end of the pneumatic cable to the push-to-connect bulkhead inside the base on the conveyor side
3. Secure the tube to the 2 holders using 190mm cable ties.



Grounding

Three (3) components should be grounded: 1) the Robotiq control box, 2) the column, and 3) the operator station.

Upon delivery, the ground wire of the Robotiq control box is already connected at one end, the ground wire of the column is only connected at one end (i.e., to the ground stud inside the column), and the ground wire of the operator station is also only connected at one end (i.e., to the ground stud inside the base of the palletizer).

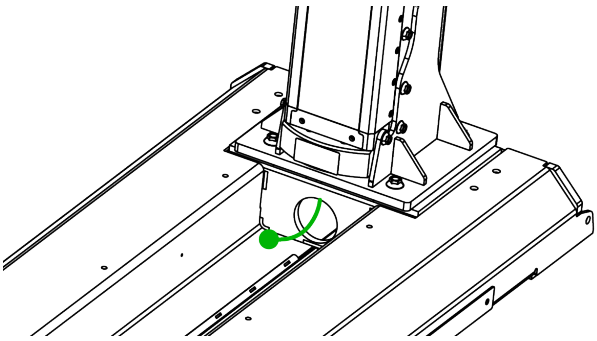
WARNING

Electrical Hazard - Misinstallation

Failure to follow electrical grounding of components instructions of the current manual may result in material damage, bodily injury or death.

Column

1. Using a 10 mm wrench, remove the M6 nut and the top lock washer from the main ground stud inside the Robotiq cables compartment.
2. Take the ground wire (green) out of the column base.
3. Slide the eyelet connector of the column's ground wire on the ground stud.

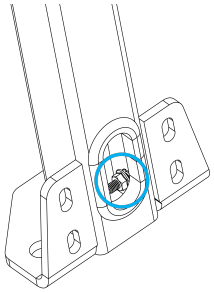


Robotiq Control Box

1. Push the grounding cable (green) of the Robotiq control box into the column via hole #5 and connect it to the ground stud inside the base.
2. Make sure that the eyelet connectors of all three (3) components are on the ground stud, in between the two lock washers and reinstall the lock washer and M6 nut.
3. Tighten the M6 nut to a torque of 5 Nm (3.7 lb-ft).

AX20/AX30 Operator Station

1. Route the third ground wire to the base of the operator station post.
2. Using a 10 mm wrench, remove the M6 nut and one (1) lock washer from the ground stud inside the base of the operator station post.
3. Slide the eyelet connector of the third ground wire on the ground stud inside the base of the operator station post.
4. Reinstall the lock washer and the M6 nut.
5. Tighten the M6 nut to a torque of 5 Nm (3.7 lb-ft).

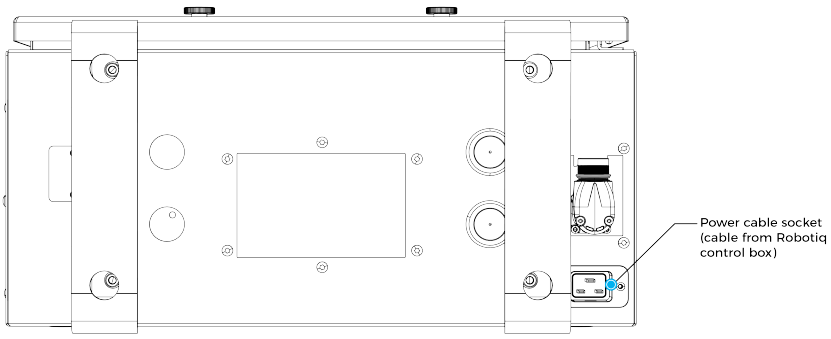


Power and Control Connections

CAUTION

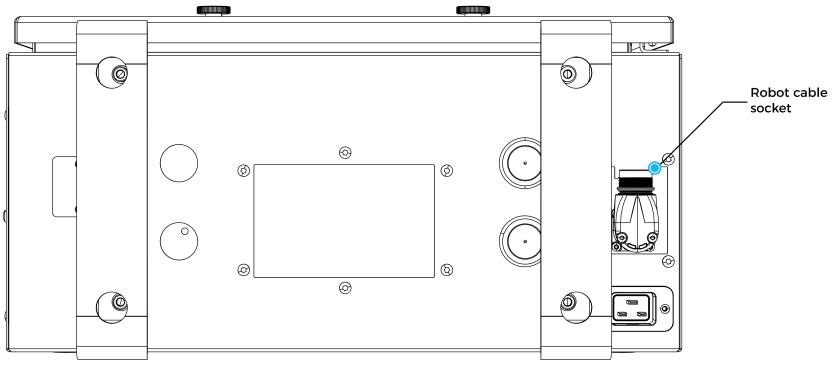
The Solution should only be connected to a power source once all connections have been made and completed.

1. Connect the output of the Robotiq control box power supply to the UR control box.



UR Controller - Bottom view

2. Push the robot cable into the column via the hole on the side and bring it out through hole #3.
3. Connect the robot cable to the UR control box.



UR controller - Bottom view

4. Connect the power cable included with the solution, or a cable that matches the required specifications, to the the Robotiq Control Box. Do not use the original UR power cable.

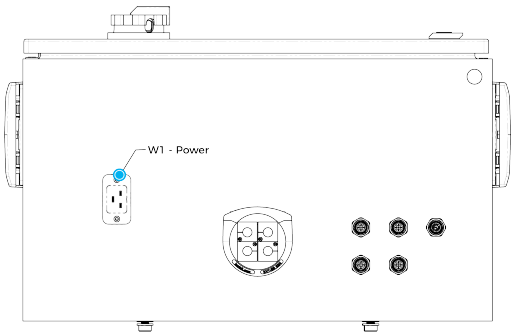
List of available power cable from Robotiq (provided by default for these regions):

Location	Robotiq Order Number
Euro plug	X-990133-A
North America plug	R-00062 + R-00063
United Kingdom plug	x-990132-A

DANGER

Make sure to use a power cable that has the proper minimum current rating depending on the supply voltage. Failure to do so could result in injuries and fire hazards.

Supply voltage	Minimum current rating of the power cable
100 - 199 VAC	20 A
200 - 229 VAC	16 A
230-240 VAC	13 A



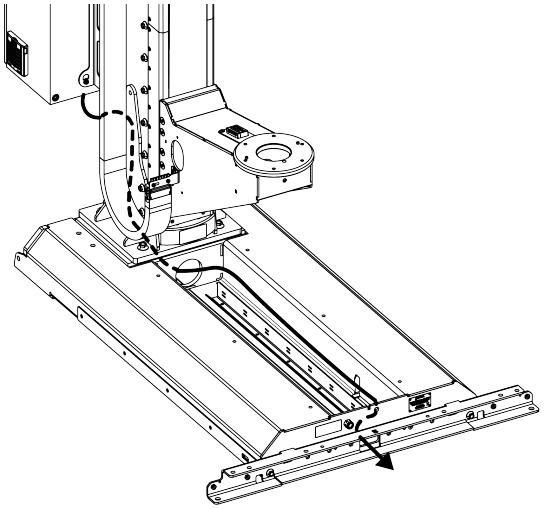
5. Insert the power cable through hole #5.
6. Continue to channel the cable through the column and the base, and bring the cable out from the other end of the base, through the rectangular hole. Route the cable through the left side (smaller side) of the base gutter. **Do not connect the power cable to a power source yet.**

WARNING

Electrical Hazard

The power supply cable should be protected in such a way that prevents any risk of pinching, cutting or otherwise damaging the sheathing or sleeve of the cable.

Failure to follow these instructions may result in material damage, serious injury or death.



Inter-Controller Connections

1. Open the UR control box.
2. Connect the USB hub to a USB port.
3. Connect the Copilot license dongle to one of the ports of the USB hub.
4. Connect the provided USB-to-Ethernet adapter directly to a USB port of the Robotiq control box.
5. Connect the Ethernet cable into the Ethernet socket on top of the Robotiq control box.
6. Push the other end of the Ethernet cable through the hole under the UR control box and connect it to the USB-to-Ethernet adapter cable that is already connected.

	NOTICE
	Follow cable management good practices. Drill a hole in the hole plug or use a grommet (not included).

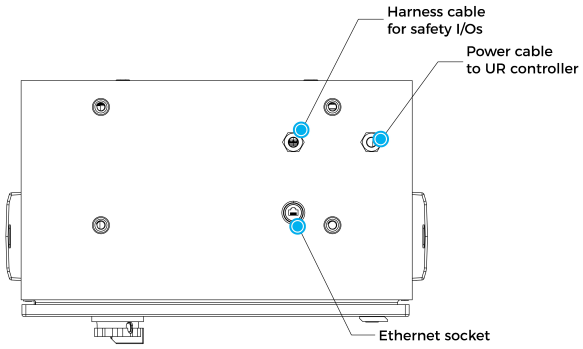
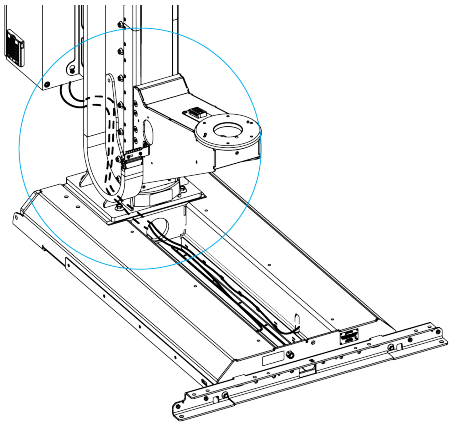
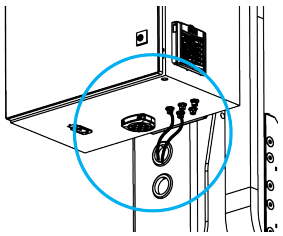


Fig. 3-1: Robotiq Control Box Cable Summary

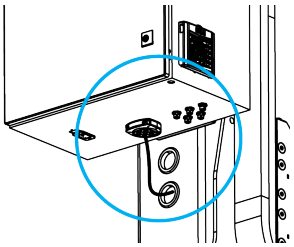
7. Connect both status lights cables (W70 and W80) to the Robotiq control box. Follow cable labeling and connector identification.
8. Channel the pallet sensor cables (W50 and W60) through the column and pull them out via hole #4.



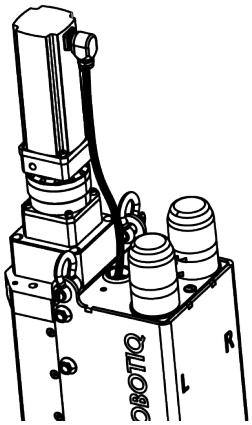
9. Connect the pallet sensor cables to the Robotiq control box. Follow cable labeling and connector identification.



10. Push the linear axis cable into the column via hole #5 and bring it out at the top of the column. You may use the preinstalled fishing line to pull the cable through.



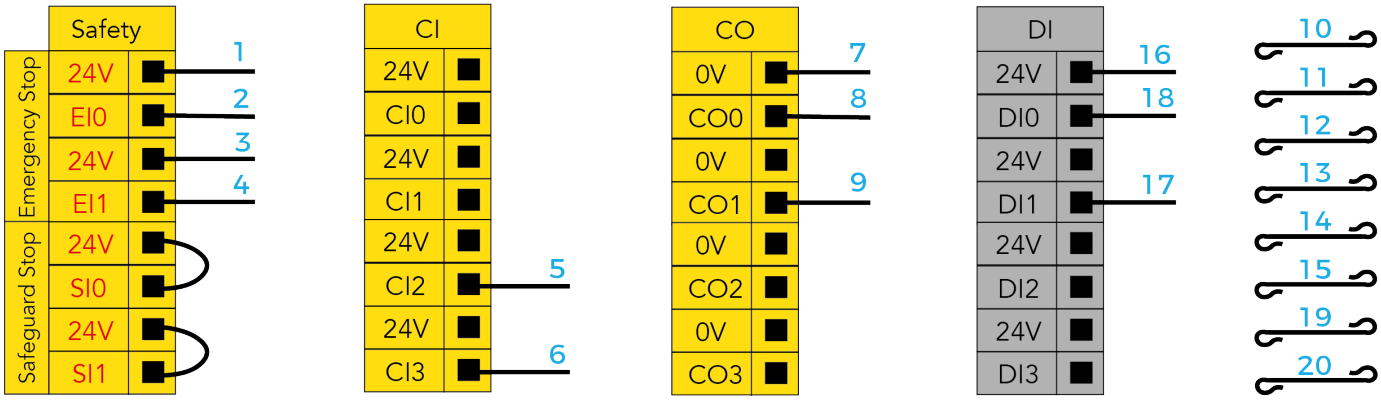
11. Connect the motor cable to the motor on the top of the linear axis.



12. Connect the linear axis brake cable to the W126 cable on the Robotiq control box.

Safety Signal Connections

1. Run the safety I/O cable harness (W103) through an opening under the UR Control box.
2. Connect the wires following the diagram and table below.



Wire #	Function	Description
1	24 V	24 V supply
2	UR e-Stop Status 1	e-Stop status signal when an emergency signal is applied to EI0
3	24 V	24 V supply
4	UR e-Stop Status 2	e-Stop status signal when an emergency signal is applied to EI1
5	UR Automatic Safeguard input 1	Automatic Safeguard status signal when a safeguard signal is applied to CI2
6	UR Automatic Safeguard input 2	Automatic Safeguard status signal when a safeguard signal is applied to CI3
7	0 V	0 V supply
8	Emergency Stop	Emergency stop status signal (from robot) to safety relay input of Robotiq control box (signal #1)
9	Emergency Stop	Emergency stop status signal (from robot) to safety relay input of Robotiq control box (signal #2)
10	Reserved	

Wire #	Function	Description
11	Reserved	
12	Reserved	24 V supply
13	Reserved	
14	Reserved	
15	Reserved	
16	24 V	
17	Pause	Pause the palletizing program
18	Start	Start or resume the palletizing program
19	Reserved	
20	Reserved	
GNYE	Ground	

NOTICE

As seen in the diagram and table above, digital inputs 1 and 0 (DI1 and DI0) are already in use.

Use other digital inputs to interface with other devices, and configure them via the robot user interface.

AX20/AX30 Operator Station Installation

By default, the operator station (i.e., the post holding the teach pendant rack and push button enclosure) is anchored to the ground. If the solution needs to be moved frequently, the operator station needs to be located accordingly. Make sure that the operator station is located so that opening the control box door is still possible.

As an example, if the operator station is anchored too close to the solution, but not directly installed on the base, there must be sufficient space left to access the solution using a pallet truck or forklift.

If the operator station needs to be located further away from the solution, cable extensions kits are available as an option. Please contact support@robotiq.com to add them to the scope of delivery.

The operator station needs to be anchored to the ground. Use the three (3) provided concrete wedge anchors. Refer to the **Anchoring the Solution** section for more information on how to install the wedge anchors.

Tighten the nut of each anchor to 70 Nm (52 lb-ft).

Centering the Solution

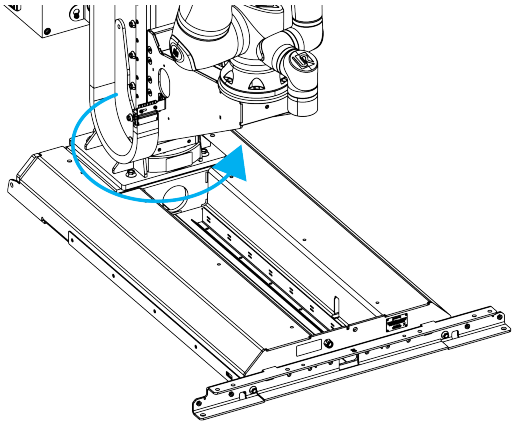
This procedure needs to be performed before installing the vacuum gripper. It will ensure the proper functioning of the Solution. The goal is to properly align the column with the base by placing the robot wrist at a specific position when the latter is in contact with the side of the base.

1. Connect the power supply cable to a power outlet.
2. Power on the robot.
3. Before continuing, you must install the URCap Package (refer to the **URCap Package** section).
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.

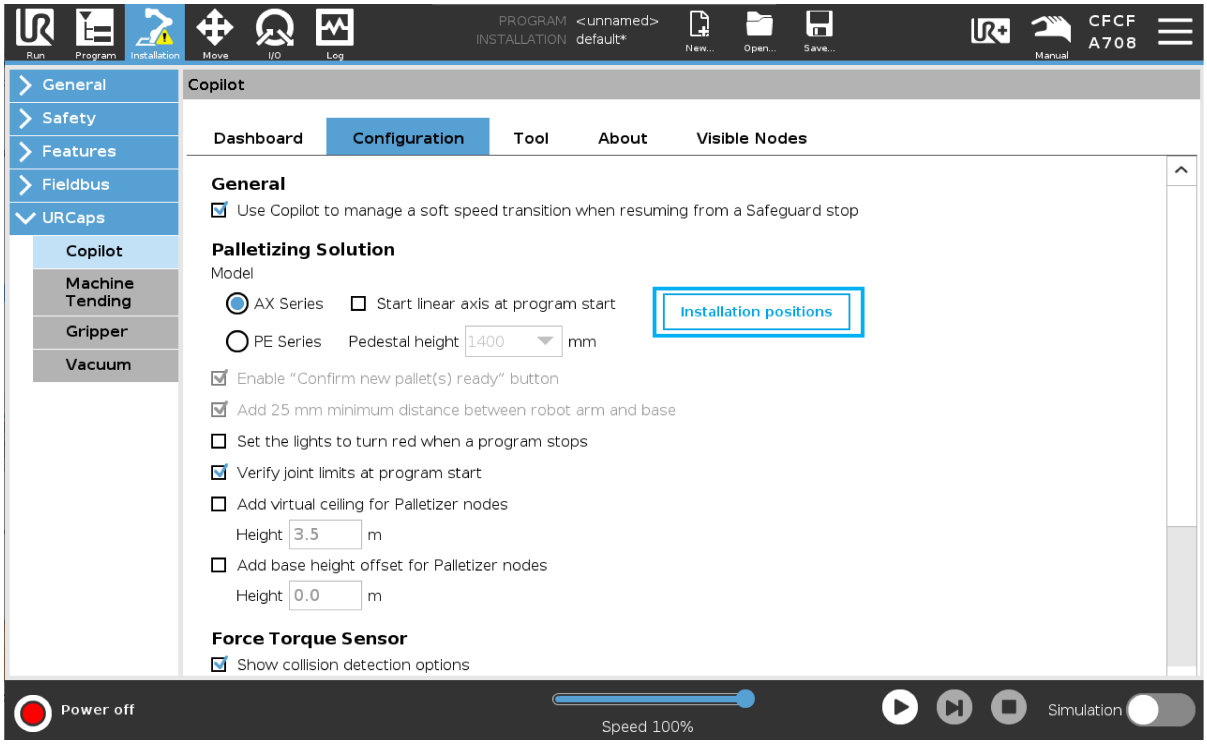
WARNING

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.

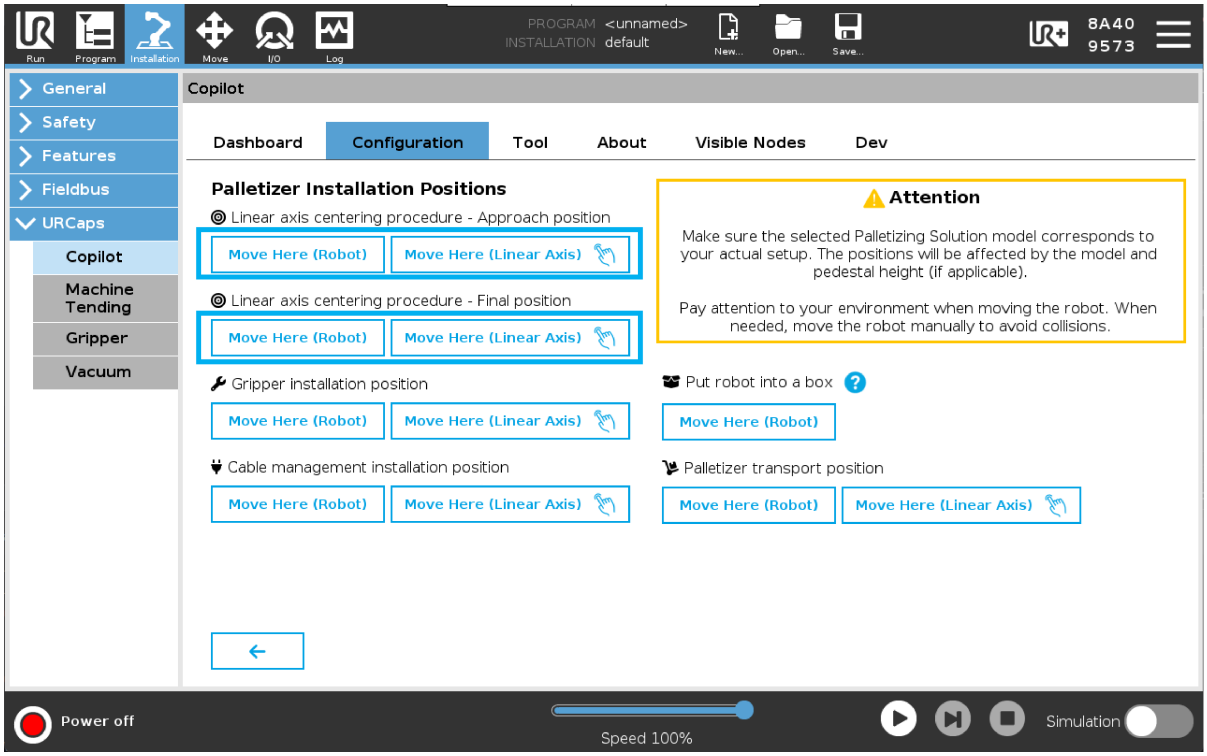
5. Rotate the column counterclockwise as much as possible.



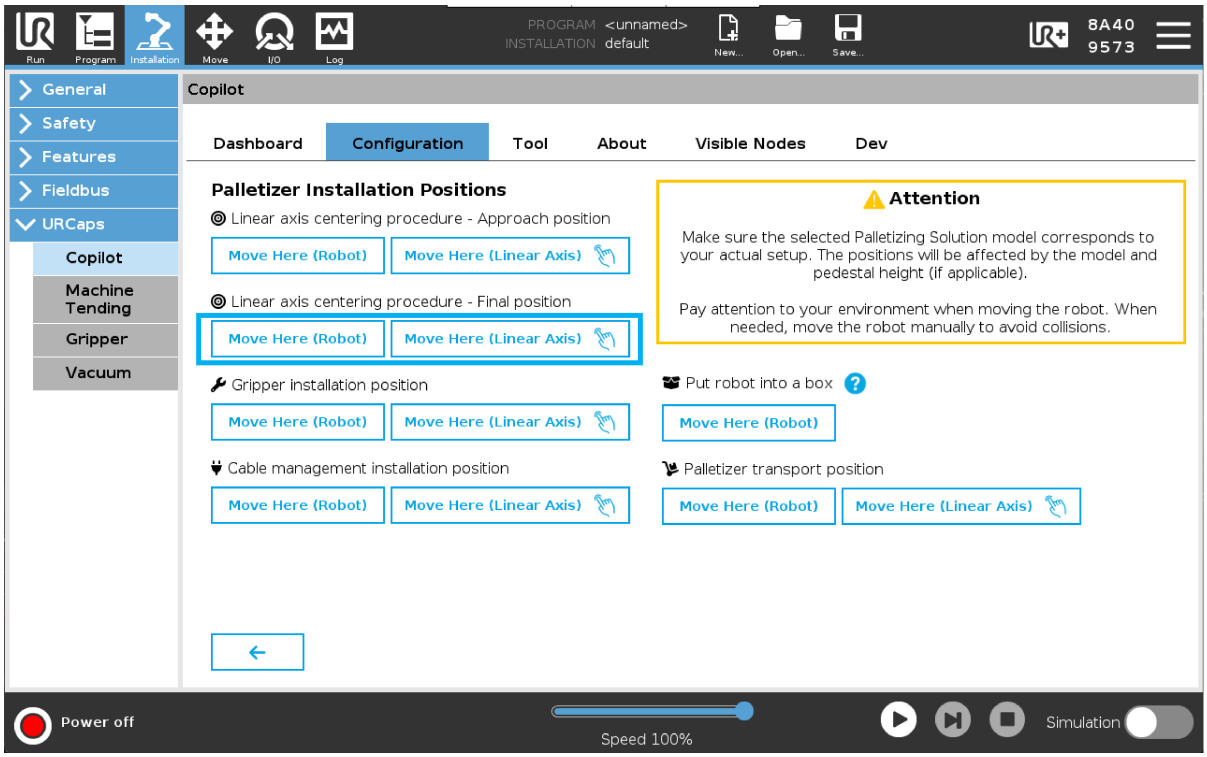
6. In the **Installation** tab, expand **URCaps** and open the **Copilot** menu. Then, access the **Configuration** tab and open **Installation positions**.



7. Move the robot to the following pose: *Linear axis centering procedure - Approach position*.



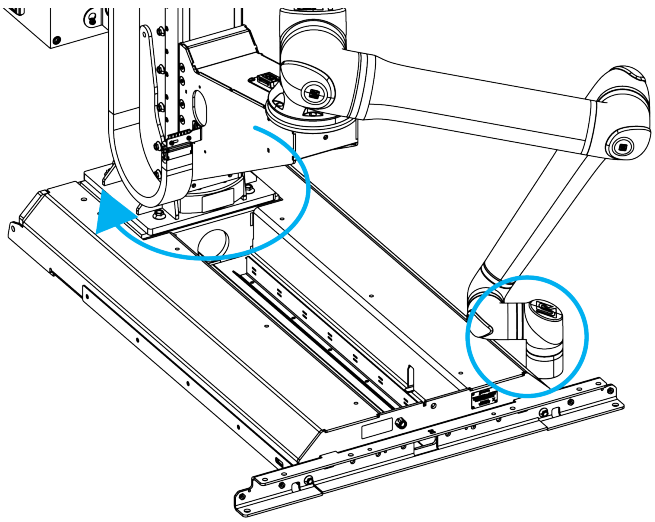
8. Move the robot to the following pose: *Linear axis centering procedure - Final position*.



CAUTION

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

9. Rotate the column clockwise so that the side of the robot wrist touches the painted surface on the side of the base, as depicted in the figure below.



10. Remove the M16 x 40 screws, one at a time, apply threadlocker on the threaded part of the screws, and retighten to 150 Nm.
11. Confirm that the wrist is still in contact with the painted surface on the side of the base.
12. 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 move it to the following pre-programmed position: Gripper installation position (**Installation** tab -> **URCaps** -> **Copilot** -> **Installation positions**).

If the PowerPick20/30 is not to be used with the solution, use the following parts provided to mount another generic vacuum gripper on the Palletizing Solution:

- 1 x 1/2 BSPP female threaded bulkhead fitting on the side of the pedestal, connected to the 12 mm pneumatic tubing coming out of the base (conveyor side)

CAUTION

The maximum pressure allowed is 10 bar (145 psi).

- 3 x 0.5 m and 1 x 1 m cable clips for cable management
- 2 x M8 x 20 hex head cap screws (for the installation of a control box and accessories on the column)

PowerPick20/30 Gripper Installation (optional)

Upon receipt, the PowerPick20/30 Gripper is pre-assembled with the following components:

- 1 x PowerPick20/30 Gripper, default configuration
  - 1 x Manifold assembly
  - 1 x Small suction cup bracket assembly
  - 4 x 110 mm suction cups
- 4 x 8 mm air tubes (275 mm)
- 1 x Large suction cup bracket assembly

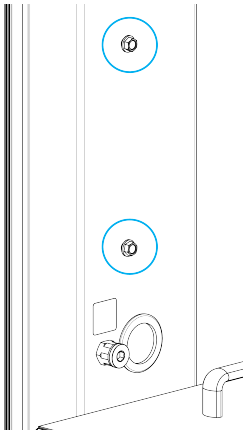
For more information on how to install the PowerPick20/30 Vacuum Gripper, please refer to the **Mechanical Installation** section of the PowerPick20/30 user manual available at robotiq.com/support.

WARNING

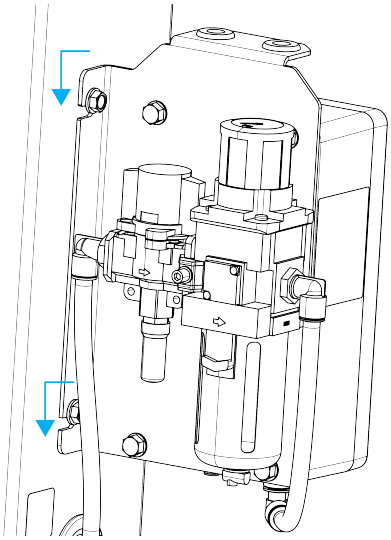
Object picking causes the compression of the suction cup(s), which can result in pinching points between the gripper and the load. Avoid presence of body part in this zone during operation.

PowerPick20/30 Vacuum Generation Unit Installation (optional)

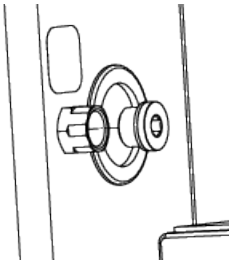
1. Loosen the two (2) M8 x 20 hex head cap screws intended to hold the Vacuum Generation Unit until their head is at a distance of approximately 4 mm (3/16 in) from the surface.



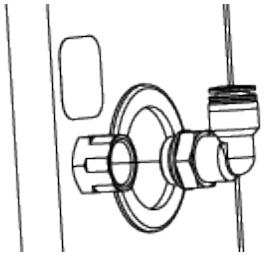
2. Slide the Vacuum Generation Unit onto the two (2) M8 x 20 hex head cap screws.
3. Tighten the screws using the provided 13 mm socket. **The required torque is 5 Nm**.



4. Using the provided 10 mm hex key, remove the pneumatic plug from the bulkhead fitting located on the column.



5. On the bulkhead fitting, install the 1/2 BSPP to 12 mm tube pneumatic elbow fitting provided using the 21 mm / 24 mm double ended wrench. **The required torque is 26 Nm**.



6. Insert the end of the 12 mm air tube (providing pneumatic pressure to the Vacuum Generation Unit) into the elbow fitting.
7. Push the air tube until it stops.
8. Remove the grommet on hole #2 and discard it.
9. Run the open end of the M12-12 pin I/O cable through hole #2.
10. Pull the M12-12 pin I/O cable out via hole #3.
11. Route the M12-12 pin I/O cable inside the UR control box.
12. Plug hole #2 using the pre-perforated grommet attached to the I/O cable.
13. Tuck any excess cable inside the column.

	NOTICE
	To complete the electrical connection of the PowerPick20/30 Vacuum Generation Unit, please refer to the **Electrical Installation** section of the PowerPick20/30 user manual available at robotiq.com/support.

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 PowerPick20/30 Vacuum Gripper can be found at section **Tool Center Point and Center of Mass** of the PowerPick20/30 user manual available at robotiq.com/support.

Cable Management System

Cable Management with Generic Gripper

If the PowerPick20/30 Vacuum Gripper is not part of the scope of delivery along with the AX20/AX30, the following components are provided for the cable management of a generic gripper:

- 3 x cable clips + 0.5 m hook and loop (VELCRO®) fastener
- 1 x cable clip + 1 m hook and loop (VELCRO®) fastener
- 8 x 190 mm cable ties

Cable management with PowerPick20/30 Vacuum Gripper (optional)

When mounting a Robotiq PowerPick20/30 Vacuum Gripper on the AX20/AX30 Palletizing Solution, the following components are provided for the cable management system:

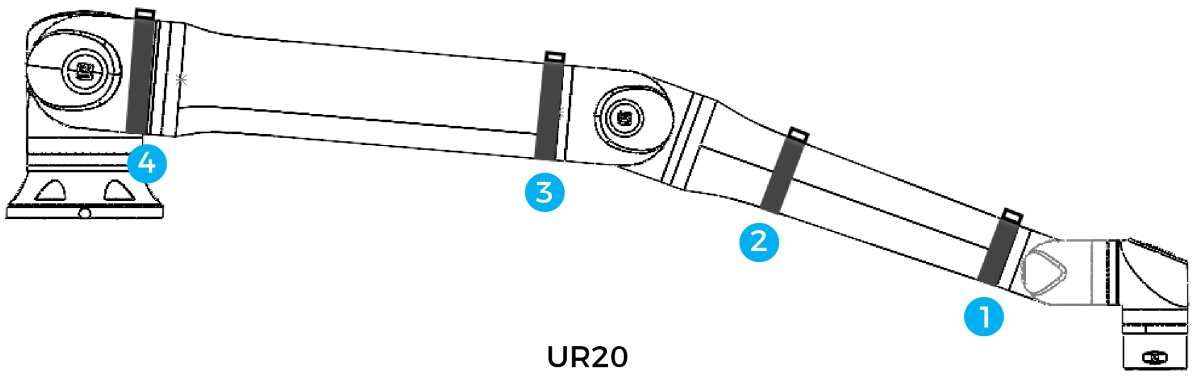
- 3 x cable clips + 0.5 m hook and loop (VELCRO®) fastener
- 1 x cable clip + 1 m hook and loop (VELCRO®) fastener
- 1 x tubing curler
- 1 x 12 mm double air tube (4~m length)
- 10 x 190 mm cable ties

1. **Gripper Mounting**
   - Mount the Gripper on the tool flange.

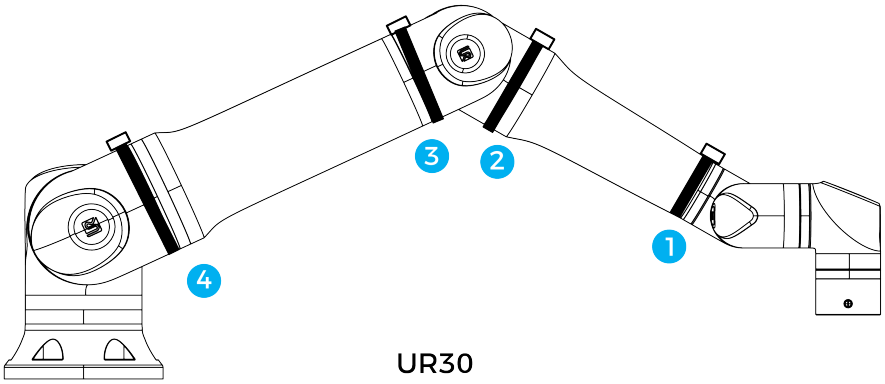
	NOTICE
	For more information on how to install the PowerPick20/30 Vacuum Gripper, please refer to the **Mechanical Installation** section of the PowerPick20/30 user manual available at robotiq.com/support.

2. **Robot Positioning**
   - Move it to the following pre-programmed position: *Cable management installation position* (**Installation** tab -> **URCaps** -> **Copilot** -> **Installation positions**).

3. **Cable Clip Installation**



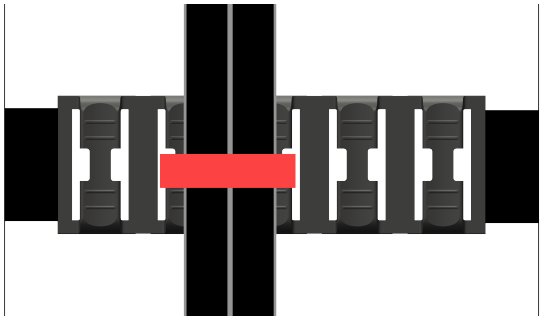
UR20



UR30

- Install the three (3) cable clips with a 0.5 m hook and loop fastener at positions #1, #2 and #3 as shown in the figure above, depending on the robot you are using.
- Install the cable clip with a 1 m hook and loop fastener at position #4 (dark gray section of the shoulder joint) as shown in the figure above.
- If applicable, rotate all cable clips so that the plastic mount is facing up; this will ensure the good positioning of the tubing.

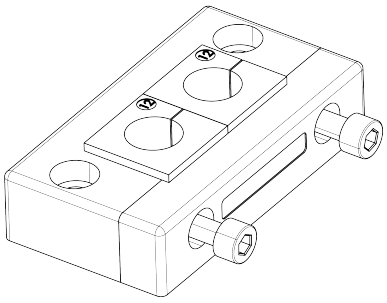
4. **Tubing Installation**
   - Connect the end of the 12 mm double air tube labeled TOOL SIDE to the pneumatic elbow fittings of the PowerPick20/30 Vacuum Gripper's manifold at the end of the robot arm.
   - Push the air tube until fully seated.
   - Find the metallic mark on the tubing that is closest to the gripper (there are five (5) metallic marks in total on the tubing).
   - At the metallic mark, tightly attach the tubing to the cable clip using a cable tie (red component in the figure below).



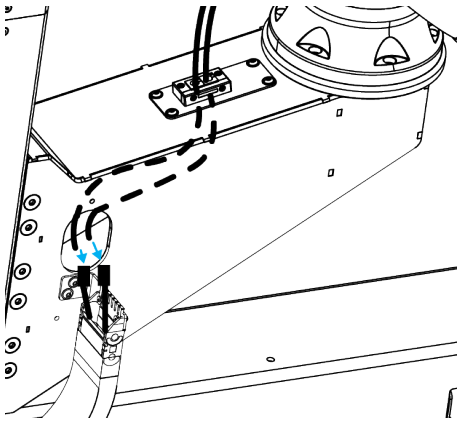
NOTICE

The cable tie should go through 2 hoops, and the tubing should be laying flat approximately at the center of the plastic mount.

- Attach the tubing to a cable clip for the next three (3) metallic marks.
- Open the cable entry frame by unscrewing the two screws on the side of the frame.

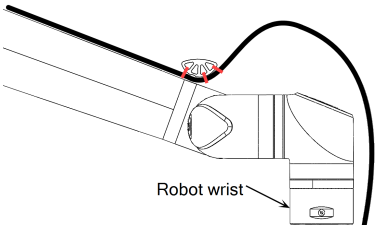


- Run the end of the 12 mm air tubes through the two 12 mm grommets and pull them out of the hole on the side of the carriage.
- Align the last metallic mark on the 12 mm air tubes with the top surface of the cable entry frame.
- Assemble the cable entry frame with the side piece and two (2) screws and tighten the screws.
- Remove the 2 pneumatic plugs from the union fittings at the end of the cable carrier.
- Connect the end of the 12 mm air tubes labeled BASE SIDE to the union fittings.



- Push the air tube until fully seated.
- Back at the top of the column, remove the two (2) pneumatic plugs from the end of the 12 mm pneumatic tubes coming out of hole #1.
- Connect both 12 mm pneumatic tubes to the fittings labeled P1- and P2- on top of the PowerPick20/30 Vacuum Generation Unit.
- Push the air tubes until fully seated.
- Tuck any excess tubing and cable inside the carriage or inside the column.

5. **Tubing Curler Installation**

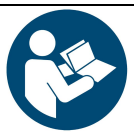


- Place the tubing curler on top of the tubing, as depicted in the figure above.
- Align the tubing curler's notch with the cable tie attached to the cable clip (#1) (the longer section of the tube curler should point towards the wrist of the robot).
- Use the three provided cable ties (red component in the figure above) to secure the tubing to the tubing curler, and make the tubing follow the arch of the tubing curler.

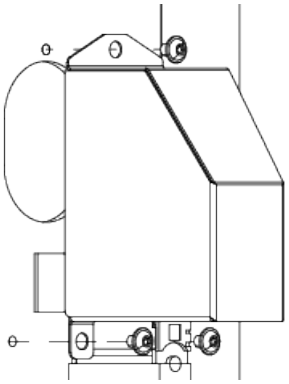
6. **Finalization**

- Verify that the tubing travels along each straight section of the robot.
- Rotate the tubes to remove twists in the tubing, if any.
- Verify each hook and loop fastener and tighten them until the cable clips cannot move when being pulled or pushed.
- Cut the excess length from the hook and loop fasteners.
- Verify that the robot cable and air tubes sit on the bottom of the cable carrier through its entire length.
- Verify each cable tie on the cable carrier and on the robot, and tighten them to prevent the tubing or cable from sliding.

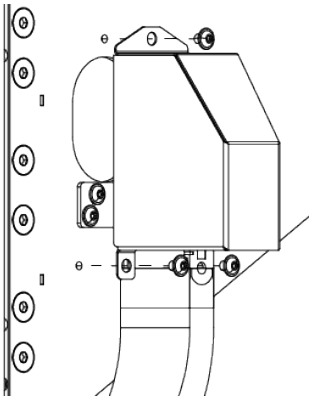
- Cut the excess length from all cable ties.
- Close all the lids of the cable carrier, starting with the lid that is closest to the opening on the column.

	**NOTICE**
	Please refer to the installation instructions of the igus E2 energy chain system for more details.

- Install the cover on the side of the column with three (3) of the provided screws.



- Install the cover on the side of the carriage with three (3) of the provided screws.

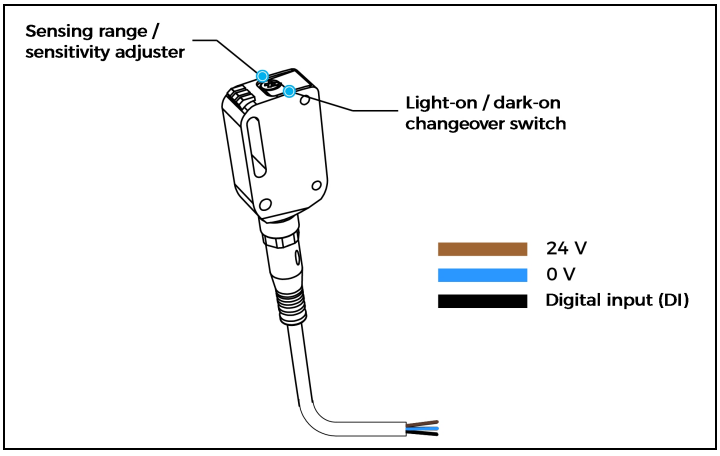


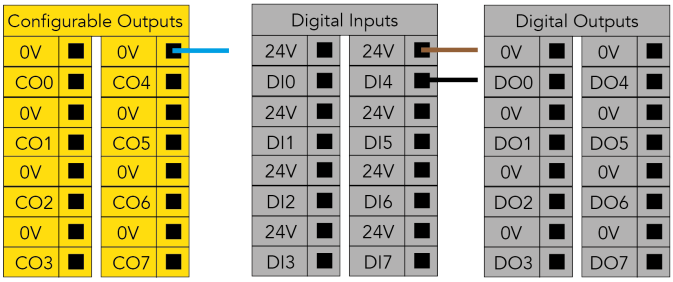
Box Sensor (Single Box Type)

1. Connect the wires of the box sensor to the terminal blocks of the UR 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)
2. Run the box sensor cable through a hole under the robot control box.
3. Secure each connection using a 2 mm flat head screwdriver.

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

4. Install the box sensor on a bracket using the provided screws.
5. Position the box sensor bracket so it can detect the box to be picked.
6. Connect the box sensor's M8 connector cable to the corresponding sensor.





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 above.
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 DI2, and the digital input terminal for box sensor #2 is DI3.

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 DO4 will activate digital input DI4.

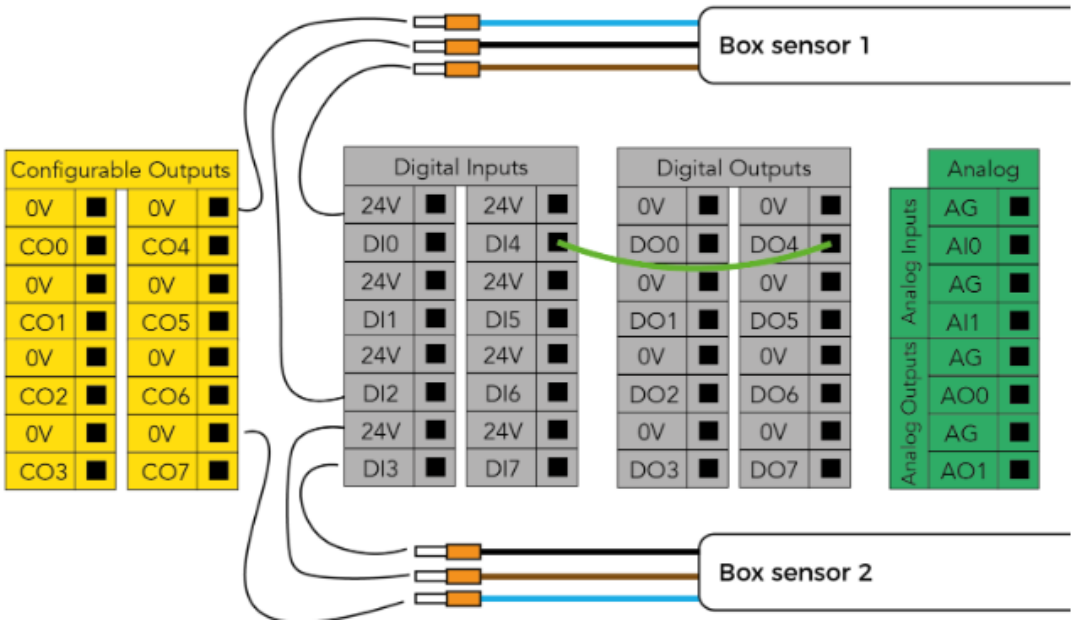


Fig. 3-2: Wiring Box Sensors for Multiple Box Types

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.

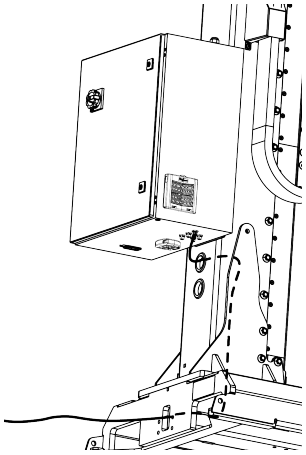
The end result of this wiring procedure is for the robot to receive a combined signal indicating that both box sensors have been activated simultaneously, and that it can pick up the group of boxes altogether.

And so, when both box sensors detect a box, the digital output (DO4 in the above figure) will send that combined signal to the robot.

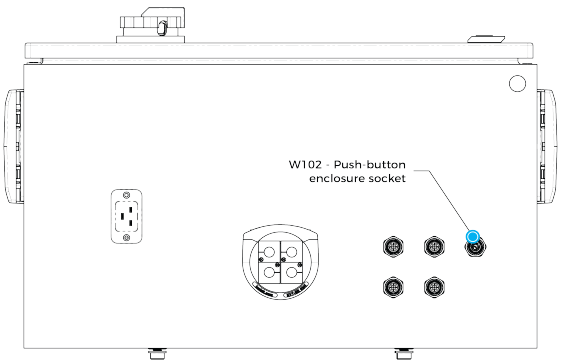
For that reason, the digital output must be connected to digital input (DI4 in the above figure) for it to be usable in the robot program.

Push-button Enclosure Connections

1. Run the push-button enclosure cable harness (W102) from the teach pendant post to the bottom of the Robotiq control box.



2. Connect the push-button enclosure cable plug to the push-button enclosure socket (W102) located under the Robotiq control box.



NOTICE

Follow good cable management practices. Using a pedestrian cable protector is recommended.

Moving and Positioning the Solution

WARNING

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

The warranty will not cover material damage resulting from an installation that does 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 material damage, bodily injury or death.

The Palletizing Solution can be moved and repositioned using a pallet truck or forklift truck. There are two fork entry openings on the aisle side of the palletizer base for use with a lifting device.

The transport, lifting, and moving of the Palletizing Solution should be done by qualified and authorized personnel.

Failure to do so may result in material damage, bodily injury or death.

WARNING

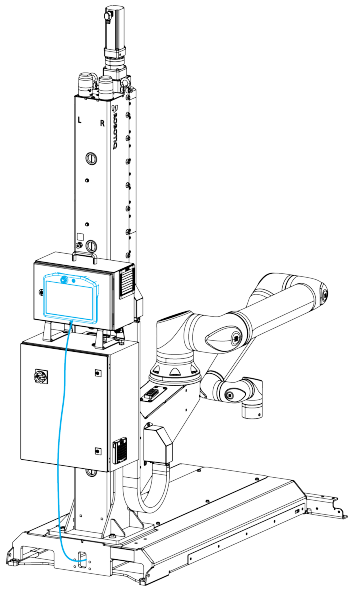
Tip Over Hazard

- The forks of the pallet truck or forklift truck must be at least 1220 mm (48 in) in length.
- The weight capacity of the pallet truck or forklift truck must be at least 1000 kg (2,200 lb).
- **The Solution must be transported on a level, even and solid concrete surface using a pallet truck or forklift truck.**
- **The robot should be positioned as per the instructions.**
- **The cabling and tubing must be disconnected before transportation.**
- **The Solution should be lifted as little as possible, and attention must be paid to the center of gravity to reduce the risk of tip over.**
- It is the responsibility of the user to determine a safe and stable course of action for the moving of the Solution using rigging and hoisting equipment.
- Employees should be qualified and properly trained on how to use the lifting / hoisting / rigging equipment as well as the Solution.
- The Solution should be secured and stable prior to its moving and lifting.

Failure to account for these factors may result in material damage, bodily injury or death.

Although the Solution can be assembled where needed, it may need to be moved to its final location afterwards.

1. Set the robot to the following pre-programmed transport position: Palletizer transport position (**Installation** tab -> **URCaps** -> **Copilot** -> **Installation positions**).
2. Disconnect the power and pneumatic supplies as well as any other cabling that may interfere with the movement of the Solution
3. Place the teach pendant on the support rack of the robot's control box.



4. Slightly raise the forks so that the Solution remains close to the ground for transport.
5. Slowly and carefully move the Solution to its final location.

Anchoring the Solution

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

Contact Robotiq if anchoring is not possible.

WARNING

Tip Over Hazard

- The solution must be anchored at all corners.
- The anchors provided with the Solution are Hilti - Kwik Bolt 1 (KB1) size KB1 1/2 x 5-½ and KB1 5/8 x 7 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). The installer is responsible for validating that the anchors provided comply with local regulations and can withstand the loads in the following table. If the installer determines that the anchors provided do not comply with local regulations or cannot resist the loads, it is their responsibility to select alternative anchors designed to resist the loads in the following table.

Minimum AX20/AX30 required anchors strength (static and fatigue loading)			
Anchors Group	**Loading Condition**	**Shear (N)**	**Tension (N)**
Alley side	Static load	23963	11818
	Fatigue 10M cycles	2711	3079
Conveyor side	Static load	15424	393
	Fatigue 10M cycles	1193	315

Failure to account for these factors may result in material damage, bodily injury or death.

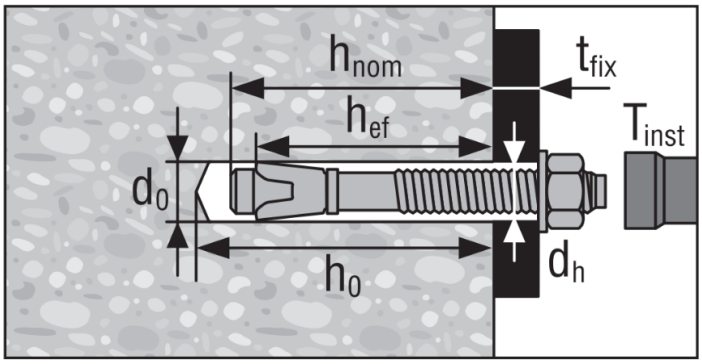
WARNING

Appropriate personal protective equipment as required by safe work practices must be worn when anchoring the Solution, namely safety glasses, masks, steel-toe boots.

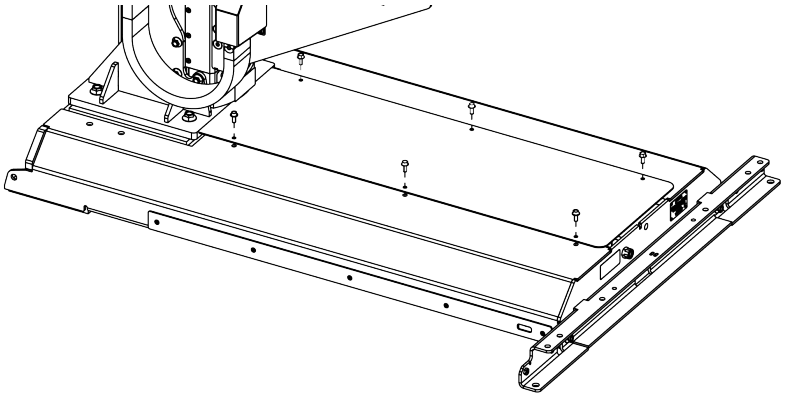
If the anchors provided with the Solution comply with local rules, regulations, and standards, and the concrete and geometry meet the requirements of the table below, you may install the two 5/8” anchors on the aisle side and the two 1/2” anchors on the conveyor side. Follow the Hilti KB1 Operating Instructions (see **Appendix** section steps 1a, 2, and 3a). Before step 2, clean the dust around and inside the holes. Install the anchors to the depth indicated in the following table using the supplied drill bits and a 15/16” socket.

If the gap between the anchoring points (the bottom of the steel frame) and the concrete is larger than 2 mm (0.08 in) shims must be used to fill the gap (the provided shim washers can be used). It is recommended to retighten the anchors nut after 1 or 2 days.

Hilti Kwik Bolt 1 (KB1) Installation parameters in normal weight concrete				
Setting information	**Symbol**	**Units**	**Anchor Type**	
			Conveyor side KB1 1/2x5-1/2	Aisle side KB1 5/8x7
Nominal drill bit diameter	d_o	in	1/2 complying with ANSI B212.15-1994	5/8 complying with ANSI B212.15-1994
Effective minimum embedment	h_{ef}	mm (in)	83 (3-1/4)	102 (4)
Nominal minimum embedment	h_{nom}	mm (in)	92 (3-5/8)	114 (4-1/2)
Minimum hole depth	h_o	mm (in)	108 (4-1/4)	121 (4-3/4)
Installation Torque	T_{inst}	Nm (ft-lb)	54 (40)	81 (60)
Minimum concrete thickness	-	mm (in)	152 (6)	152 (6)
Minimum anchors spacing	-	mm (in)	254 (10)	305 (12)
Minimum edge distance	-	mm (in)	254 (10)	305 (12)
Minimum concrete strength	-	MPa (psi)	17.2 (2500)	
Concrete condition	-	-	cracked or uncracked Normal Weight Concrete	



Finalization and Power On



If pneumatic power is needed, or if a PowerPick Vacuum Gripper is used, compressed air should be supplied at the inlet port on the conveyor side of the base. The port thread size is BSPP 1/2 (G 1/2). A BSPP 1/2 (G 1/2) to NPT 1/2 adapter is provided with the kit.

Should the Solution need to be moved occasionally, a quick connect adapter can be installed.

1. Reinstall the cable compartment cover using the 6 provided screws.
2. Connect the power cable to the power outlet.
3. Pressurize the system using the shut-off valve if needed.
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.

3.4.4. Atypical and Custom-Sized Pallets

By default, the AX20/AX30 Palletizing Solution is designed to be used with a wide range of standard-sized pallets.

If it is used in conjunction with atypical- or custom-sized pallets, it may be necessary to adjust the pallet sensors so that they trigger properly and accurately. If the application requires such a configuration, please contact the Robotiq support team.

Certain pallet types may prove difficult to detect relative to the base of the Solution (i.e., if the top of pallet does not rest against the base of the Solution, which is often the case with stackable plastic pallets). In such cases, Robotiq recommends installing offset spacers and to make them rest against the pallet blocks, legs or feet. Please refer to the Overhang Spacers in the **Appendix** section for more information.

3.4.5. Palletizing Cell Layout Guidance and Requirements

DANGER

Impact / Crush Hazard

Failure to implement a safety system like a safety laser scanner, light curtain or fence with interlock to prevent contact with the Solution in operation according to directions of the current section of the current manual may result in bodily injury or death.

The linear axis is NOT power and force limited. To prevent the operator from exposing themselves to the risk of contact, pinching, impacts, or crushing with the axis or the robot, the palletizing solution must be completely stopped when the operator is within an unsafe distance to the axis or the robot. Safety devices like safety laser scanners, light curtains, or fences with interlocks can be used to make sure the palletizing solution is stopped when the operator is within an unsafe distance of the palletizing solution. To this end, ISO 13857 or any other applicable regional standard must be followed. The solution must be anchored as specified in this manual.

When the linear axis is moving while the robot is stopped, the force limitation safety feature of the robot is not effective. Therefore, even if the robot is force limited, contact with the robot presents a high level of risk.

Whenever possible, choosing a pick position that is located closer than 87% of the maximum reach of the robot will ensure maximum lifespan of the linear axis and avoid degrading the box throughput.

3.4.6. Robot Operation Zone

In order to properly place the equipment within the cell and establish the layout, the robot operation zone has to be identified.

The linear axis is NOT power and force limited. To prevent the operator from exposing themselves to the risk of contact, pinching, impacts or crushing with the axis or the robot, the vertical linear axis must be completely stopped when the operator is within an unsafe distance to the axis or the robot. Safety devices like safety laser scanner, light curtain or fences with interlock can be used to make sure the linear axis is stopped when the operator is within an unsafe distance of the palletizing solution.

When the linear axis is moving while the robot is stopped, the force limitation safety feature of the robot is not effective. Therefore, even if the robot is force limited, contact with the robot presents a high level of risk.

This robot operation zone is a source of danger. The danger related to the robot operation zone is not limited to the operation zone, it extends around the zone with risks such as risk of contact and risk of box projection. Risks related to the operation can be handled following guidelines of ISO 13857 or any other applicable regional standard.

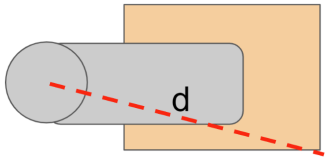
In standard palletizing operation, the computed trajectories allow the boxes or the robot to overrun the edges of the pallet.

The approximative pallet overrun can be determined by the following equations:

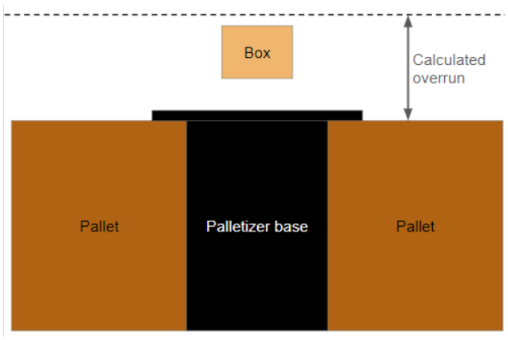
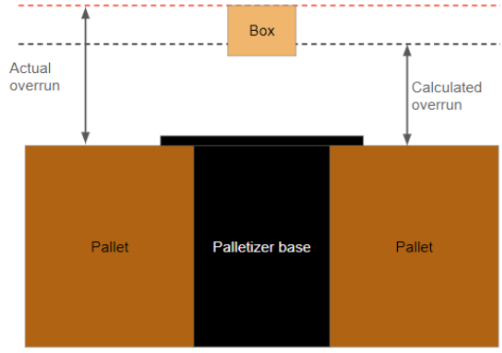
Pick pallet overrun (mm) = 2 x d + 50*

*recommended buffer

d: Distance between the robot tool flange and the more distant corner of the box on XY. Use the box picking orientation which gives the maximum distance.



If the box position is further than the calculated pick pallet overrun, the maximum pick pallet overrun corresponds to the most distant side of the box.

	
Case where the box pick position is located within the calculated pick pallet overrun limit. The calculated pick pallet overrun limit is representative.	Case where the box pick position is located outside of the calculated pick pallet overrun limit. The calculated pick pallet overrun limit is not representative. The actual pick pallet overrun limit is located at the farthest box face.

To avoid interference between obstacles and the robot in operation, do not place other obstacles than the conveyor inside the pick pallet overrun limit.

In addition, use the option “define conveyor to avoid collision” of palletizer node settings to make sure the robot avoids collision with the conveyor.

Approach pallet overrun (mm) = 0.1 * H + sqrt((L/2)²+ (W/2)²) -(W/2) +50*

*recommended buffer

Result of this calculation is a value in millimeters.

- L: length of the box
- W: width of the box
- H: height of the box

To avoid interference between obstacles and the robot in operation, do not place any obstacles inside the approach pallet overrun limit.

DANGER

- To safely contain the robot within its operation zone, it is necessary to surround the operation zone with Universal Robot safety planes.
- Proper safeguarding must be installed to prevent access to the dangerous zone when the vertical axis is powered.
- It is strongly advised to avoid positioning areas where people frequently work or pass (e.g., workstations, corridors) within 2.5 meters of the palletizer. This measure enhances safety in the event that the palletizer column falls due to unforeseen events.
- The linear axis is NOT power and force limited. See **Safety** section for safety details.

The robot operation zone is the space used by the system to do the palletizing. This zone is considered a source of danger. The danger related to the robot operation zone is not limited to the operation zone, it extends around the operation zone with risk such as risk of contact and risk of box projection. Risk related to the operation can be handle following guidelines of ISO 13857 or any other applicable regional standard. Proper safeguarding must be installed to prevent access to the dangerous zone when the vertical axis is powered. It is strongly advised to avoid positioning areas where people frequently work or pass (e.g., workstations, corridors) within 2.5 meters of the palletizer. This measure enhances safety in the event that the palletizer column falls due to unforeseen events. In standard palletizing operation, the computed trajectories allow the boxes or the robot to overrun the edges of the pallet. Mitigation measures must be put in place to prevent a transient or quasi-static impact between a box or the robot itself and an operator at all times. Below are some examples:

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 UR20 or UR30, the potential collision zone is represented by a cylinder with a radius of 1000 mm for the UR20 and 705 mm for the UR30.

Floor marking

Floor marking to delimitate the working zone should be added.

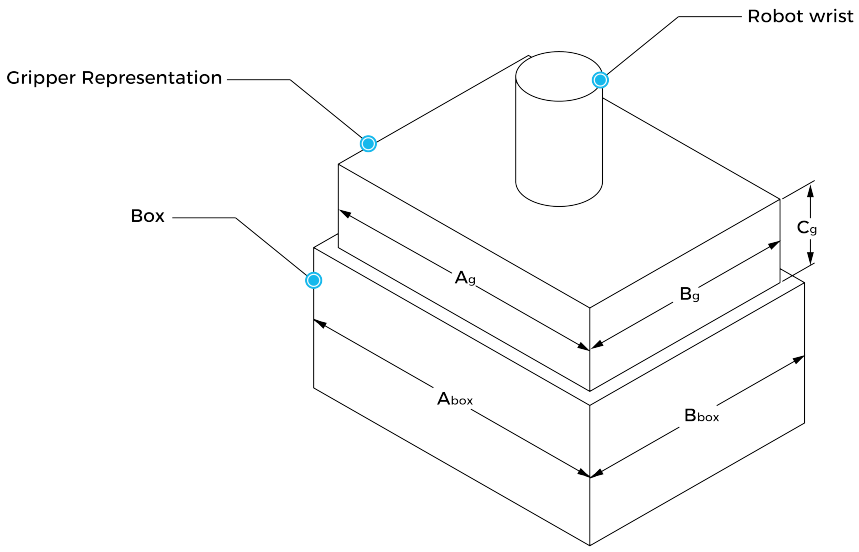
3.5. Other Grippers

It is possible to use a gripper other than the PowerPick20/30 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:

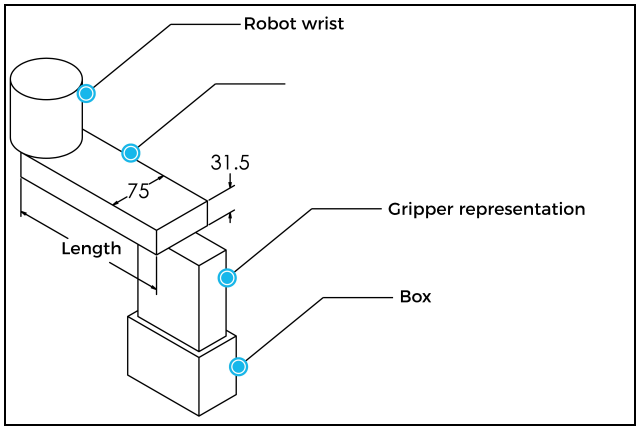
Box Footprint (A_{box} X B_{box})	Gripper Footprint[1] (A_g X B_g)	Gripper Height (C_g)
A_{box} < 250 mm	$A_g = A_{box}$ - 1 mm	118.9 mm
A_{box} ≥ 250 mm	$A_g = A_{box}$ - 40 mm	
B_{box} < 250 mm	$B_g = B_{box}$ - 1 mm	
B_{box} ≥ 250 mm	$B_g = B_{box}$ - 40 mm	

Case where the box pick position is located outside of the calculated potential overrun limit. The calculated potential overrun is not representative. The actual possible overrun limit is located at the farthest box face.



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.

Make sure the Robotiq Palletizing 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, Software and Robotiq URCaps.

If a PowerPick gripper is used, download the latest version of the Gripper URCap, refer to the Robotiq support website at robotiq.com/support under the sections Vacuum Grippers, Universal Robots, Software and Gripper Software.

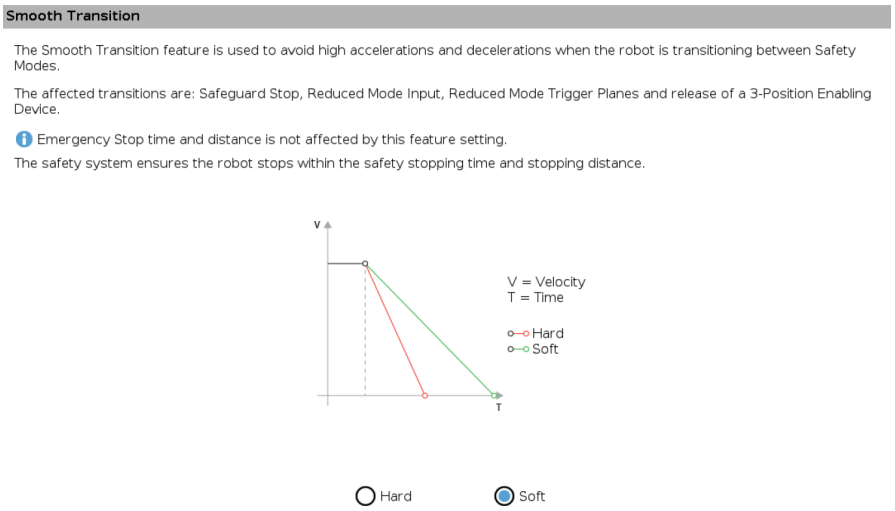
- Download the Copilot URCap / Gripper URCap and extract it or them on the root of a blank USB storage device.
- Insert the USB storage device in the UR teach pendant or robot control box.
- On the teach pendant, tap the **triple bar icon** in the upper right corner of the screen.
- Tap **Settings**.
- 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.

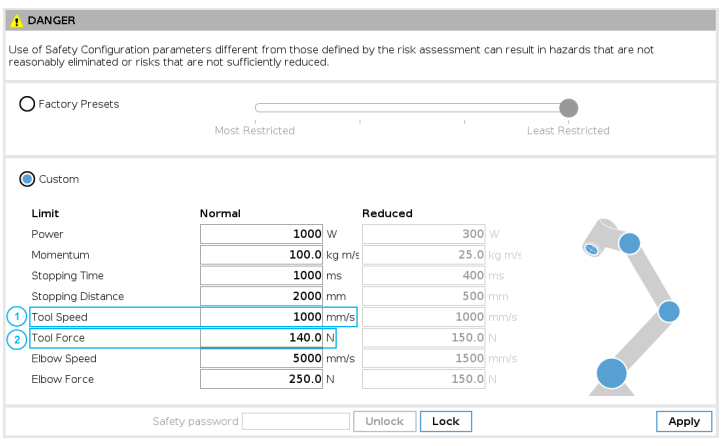
3.7.1. Smooth Transition

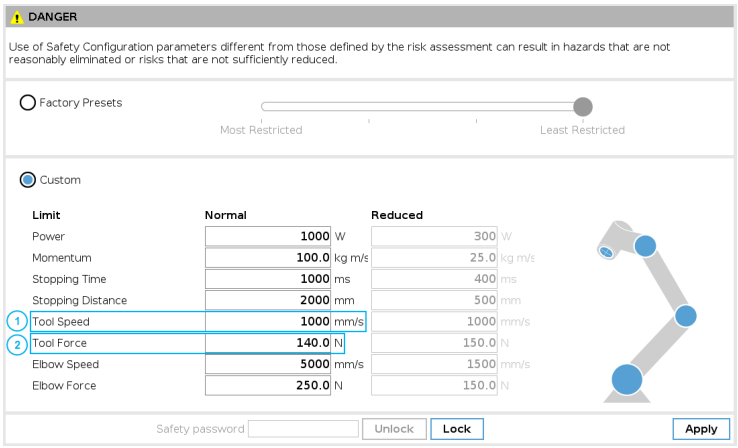
To minimize wear to the Solution, under the Smooth Transition tab (**Installation** tab > **General** > **Smooth Transition**), make sure to select the "Soft" option (default).



3.7.2. Robot Limits

To ensure the effective operation of the Solution, Robot Limits should stay at the Least Restrictive setting. Tool speed (1) should be less than 3000 mm/s. Tool force (2) can be adjusted as required. Please note that overlimiting these settings will reduce the Solution's cycle time.

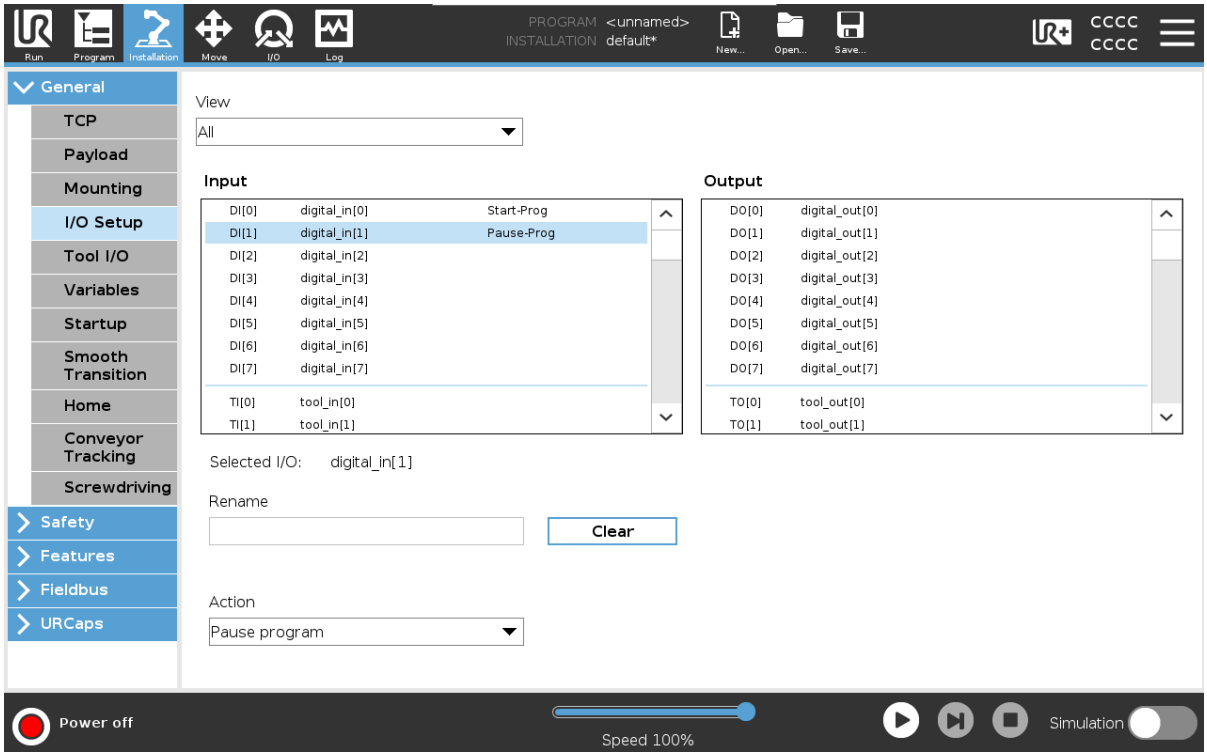




3.7.3. Joint Limits

Joint limits must be configured:

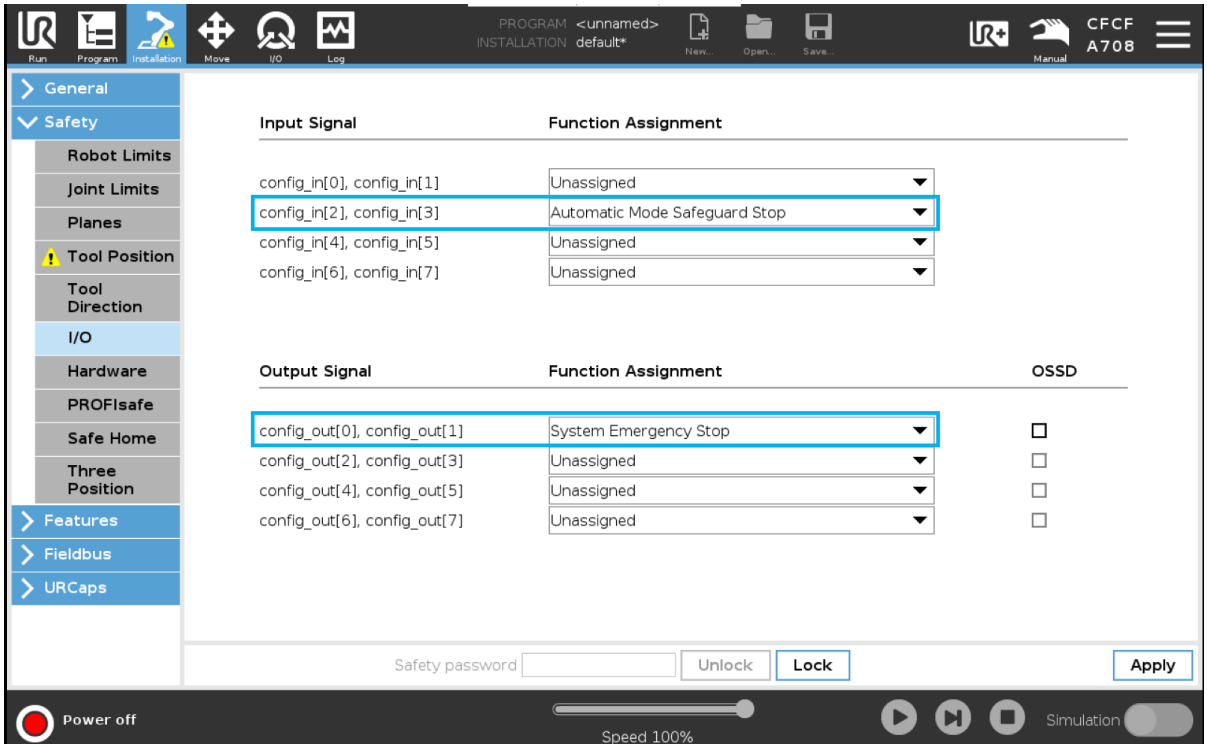
1. Tap **Installation→ Safety → Joint Limits**
2. Unlock the section with the password and change the values:
   - The minimum and maximum values for the Elbow are -167° and 3°.
   - The minimum and maximum values for the Wrist #3 are -273° and 273°.
3. Make sure that the same joint limits are set for both the normal and reduced modes of operation.



3.7.4. Configurable IOs

Some configurable IO must be set:

1. Tap **Installation**→ **Safety** → **I/O** .
2. Unlock the section with the proper password
3. Set the **Output Signal config_out[0]**, **config_out[1]** at System Emergency Stopped.
4. Set the Output Signal config_in[2], config_in[3] to Automatic Mode Safeguard Stop.
5. Press the **Apply** button.



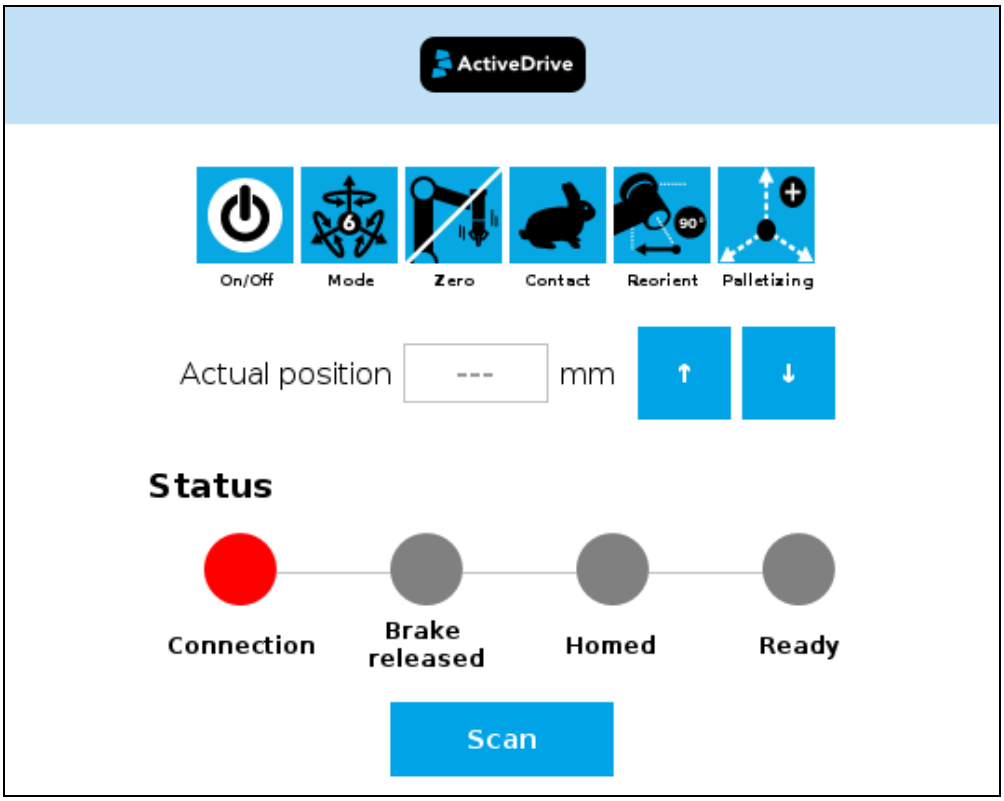
4. Operation

	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 **URCap Package** section the for more information.
2. Configure the TCP. Use the appropriate values based on the gripper configuration. Please refer to the **Specifications** 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.
5. Activate and test the linear axis: Tap the **UR+** icon → **ActiveDrive** toolbar→ **Palletizing**→ **Scan** (you may have to press the **Start** button). Use the arrows to test the linear axis action.



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.

6. Once the program is selected:
    1. Tap the **Play** button on the robot teach pendant.
        1. 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.

7. If an accident occurs, an emergency stop button is present on the robot teach pendant.

8. Once a pallet is full:
    a. 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).

9. To safely resume the solution after a robot stop (protective stop):
    a. Ensure the work area is clear and safe.

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

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

10. To safely resume after an emergency stop:
    a. Ensure the work area is clear and safe.

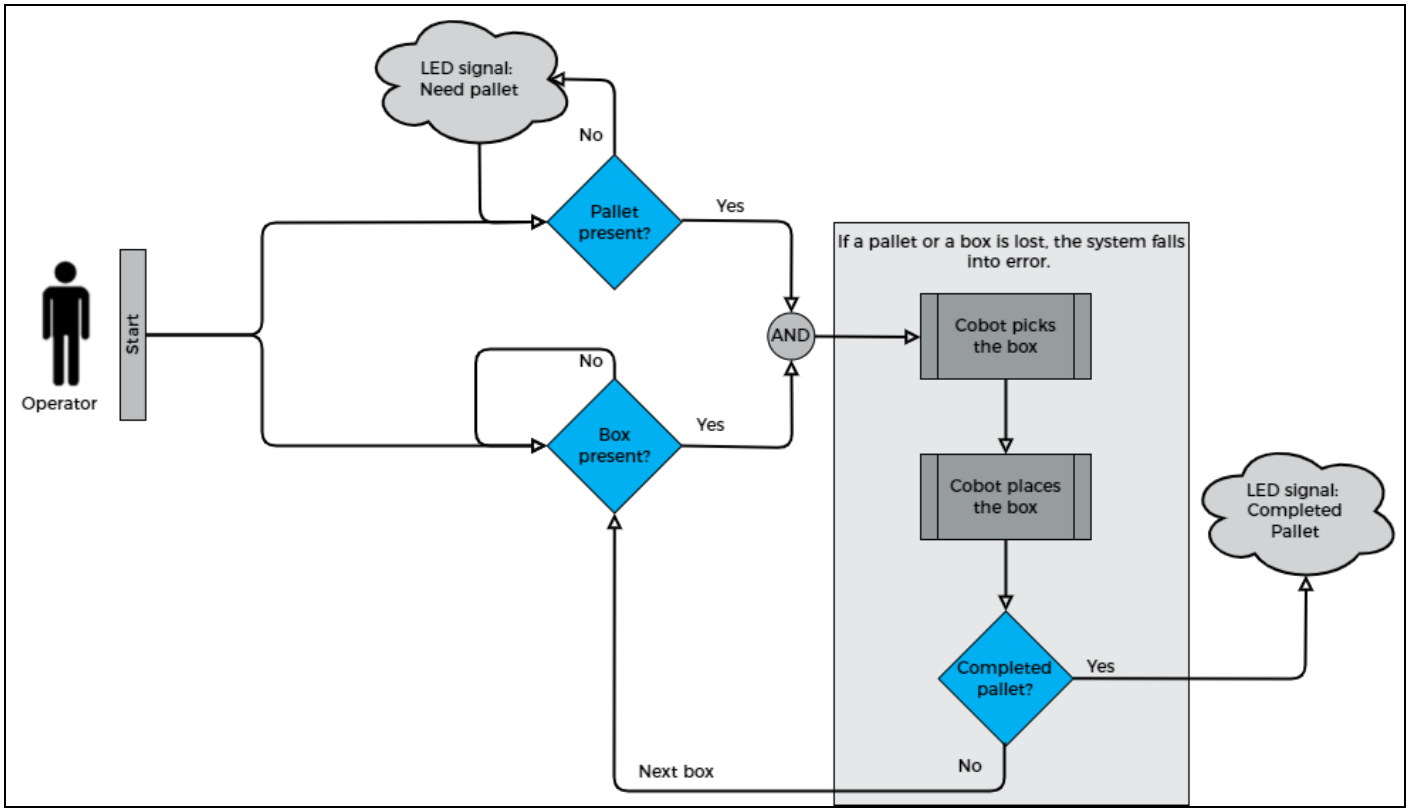
    b. Release the emergency stop button and validate the emergency stop window.

    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.



Please refer to the **Status Light States** section for further information about light states.

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 connected: the LED on the Ethernet adapter should be ON. • Make sure that the PLC, the robot controller (via the Ethernet/USB adapter), and the linear axis drive, are all properly connected to the Ethernet switch. • Try pressing the **Scan** button in the **ActiveDrive** tab: Tap **UR+** → **ActiveDrive** → **Palletizing**, then the **Scan** button. • Try powering off the system (both the robot and theRobotiq control box). Wait 1 minute. Power up the system again.
RED Slow blink	Communication between the robot and the Robotiq control box (PLC) is established, but Copilot has not established the communication yet with the Robotiq control box.	• Tap **UR+** → **ActiveDrive** → **Palletizing**, then the **Scan** button.
RED Solid	An axis error happened.	• Tap **Installation** → **URCaps** → **Copilot** → **Linear Axis**. Then, check the error message and act accordingly.
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 Solid	• When the Scan has succeeded, but the axis brakes are not released. (Start not done yet.) • Program running without Palletizer node.	• Tap **UR+** → **ActiveDrive** → **Palletizing**, then the **Start** button. You may need to press the safeguard reset button.
YELLOW Slow blink	A Safeguard Stop has occurred.	Press the safeguard reset button.

Color and signal type	Condition status	Cause or action needed
BLUE Solid	• Pallet is complete or missing; AND • The system is palletizing on the other side.	Place a new pallet
BLUE Fast blink	• Pallet is complete, system is idle; OR • Pallet is not detected, system is idle.	Place a new pallet
WHITE Solid	• The Robotiq control box (PLC) is connected to the robot control box. • Program running without Palletizer node.	N/A
GREEN Solid	A program with a Palletizer node is running but the pallet present is not completed.	N/A

4.5. Solution Mobility (Wash Down and Production Line Shifts)

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 damages 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.

WARNING

Tip Over Hazard

- The forks of the pallet truck or forklift truck must be at least 1220 mm (48 in) in length.
- The weight capacity of the pallet truck or forklift truck must be at least 1000 kg (2200 lb).
- The Solution must be transported on a level, even and solid concrete surface using a pallet truck or forklift truck.
- It is the responsibility of the user to perform a risk assessment to account for the potential regular repositioning of the Solution.
- The cabling and tubing must be disconnected before transportation.
- The Solution should be lifted as little as possible, and attention must be paid to the center of gravity to reduce the risk of tip over.
- It is the responsibility of the user to determine a safe and stable course of action for the moving of the Solution using rigging and hoisting equipment.
- Employees should be qualified and properly trained on how to use the lifting/hoisting/rigging equipment as well as the Solution.
- The Solution should be secured and stable prior to its moving and lifting

Failure to do so may result in material damage, bodily injury or death.

DANGER

If the solution must be transported, a minimal amount of dead weight must be added to the solution at specific positions. Contact Robotiq to purchase the optional dead weight kit for transportation of the AX20/AX30.

Moving the solution without the Robotiq AX20/AX30 transportation dead weight may result in material damage, bodily injury or death.

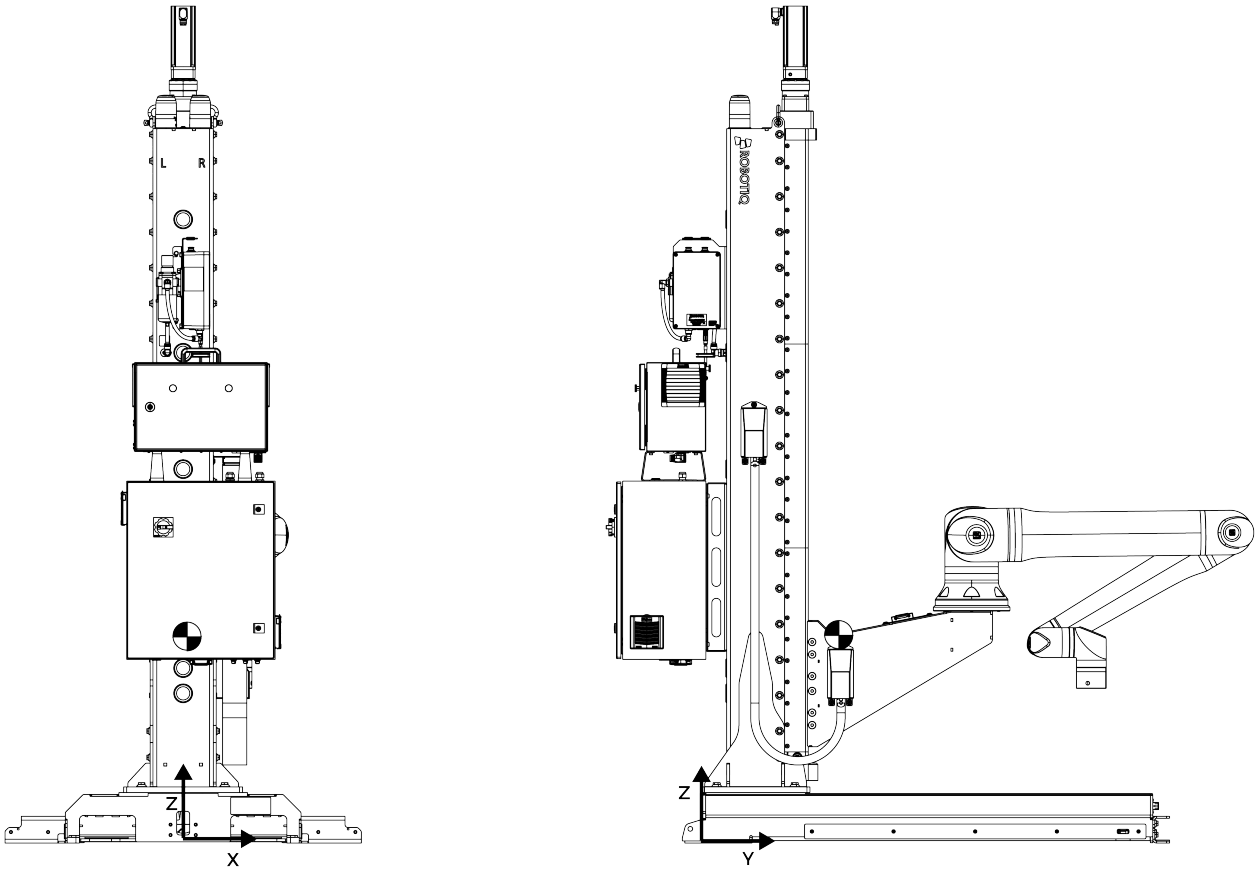
NOTICE

If external cables are connected to the Solution (i.e., external I/Os, safety devices, etc.), it is recommended to add connectors close to the base of the Solution. This will allow for an easier and quicker moving operation, and prevent the user from managing long segments of cable, and potentially damage them along the way.

The Palletizing Solution can be moved and repositioned using a pallet truck or forklift truck. There are two fork entry openings on the aisle side of the palletizer base for use with a lifting device.

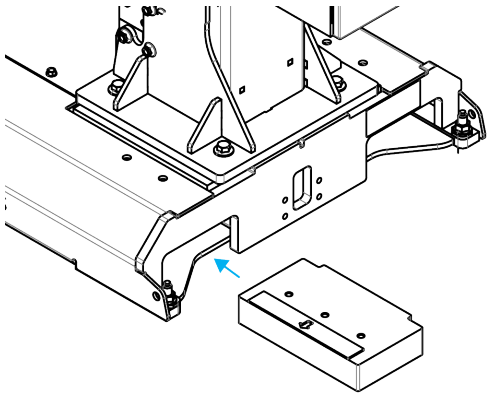
4.5.1. Installation of the AX20/AX30 anchorless kit

The installation of the Robotiq anchorless kit is required to transport the AX20/AX30 solution on a regular basis. The following steps describe how to perform this operation.

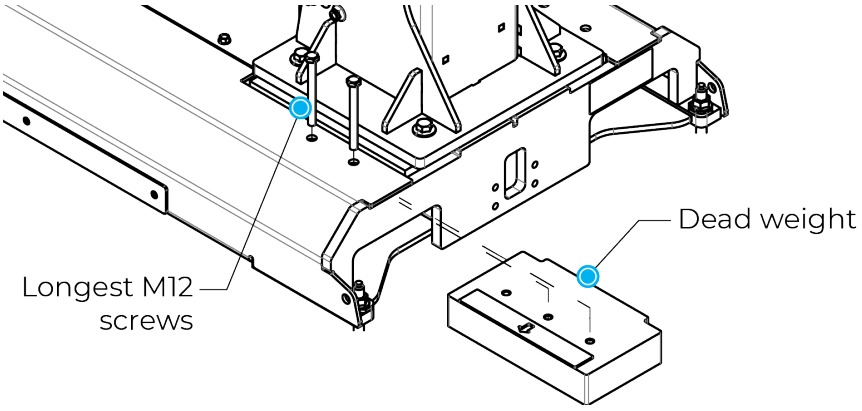


1. Make sure that the unit is completely assembled and placed on a flat and level surface.

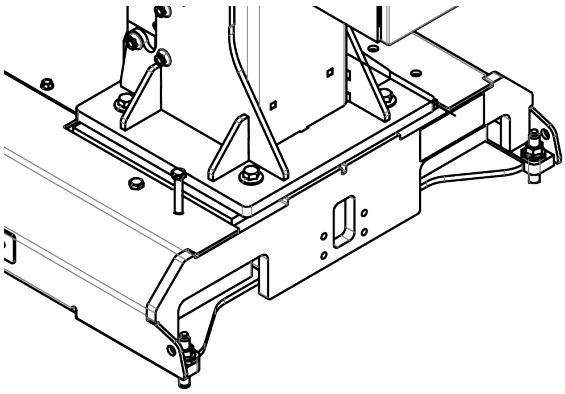
2. Place one weight inside a pallet fork opening and align the threaded holes with the holes on the top of the base. The arrow on the top of the weight must point towards the outside of the base. The weight must also be entirely located inside the fork opening.



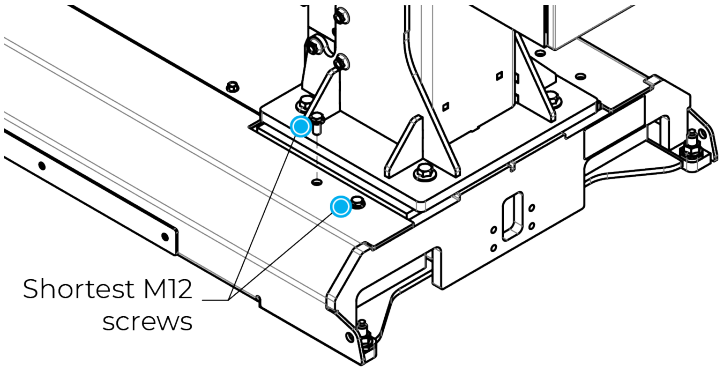
3. Use the two longest M12 screws and insert them inside the holes on the top of the base. Make sure to engage the threads properly and rotate each screw until the head is almost in contact with the top of the base.



4. To lift the weight into place, only rotate the screw located the furthest away from the alley side until fully tightened. This screw is used to lift the weight into place while the other one prevents the weight from spinning. Make sure that the weight is completely lifted up.



5. Starting with the screw that is now raised above the top of the base, remove the two screws and replace them one at a time with the two M12 x 25 mm screws. Tighten both screws to 110 Nm [81 lb-ft].



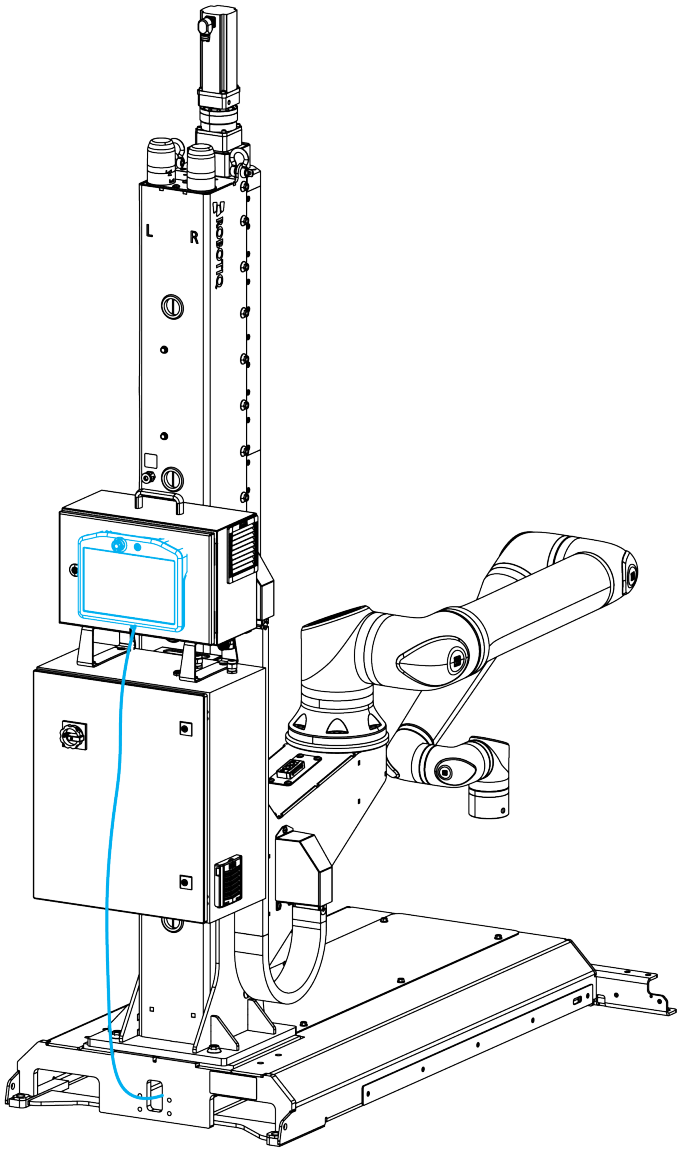
6. Repeat the steps to install the second weight inside the remaining fork opening.

4.5.2. Approximate Repositioning of the Solution

The following method does not guarantee a precise repositioning of the Solution.

Robot movements should be performed, tested, and validated after each repositioning process to ensure accuracy.

1. Set the robot in a transport position by using the following preprogrammed position: **Palletizer transport position** (**Installation** tab -> **URCaps** -> **Copilot** -> **Installation positions**).
2. Disconnect the power and pneumatic supplies as well as any other cabling that may interfere with the movement of the Solution.
3. Place the teach pendant on the support rack of the robot's control box.



4. Unscrew the four (4) anchor nuts and keep them for future use.
5. If the Solution is attached to a conveyor, disassemble the attachment.
6. Insert the forks of the pallet truck or forklift truck in the fork entry openings until they stop. Make sure that the teach pendant

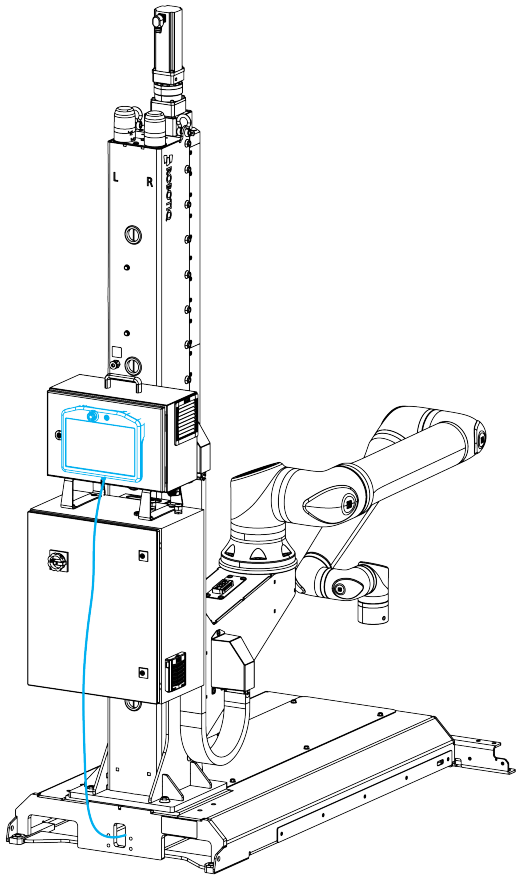
cable or any other cable located at the front of the solution is not pinched during this operation.

7. Slightly raise the forks so that the Solution is freed from the anchors.
8. Slowly and carefully move the Solution, making sure the Solution remains close to the ground.
9. Perform the steps backwards to reposition the Solution. Refer to **Installation** section to apply the right torque.

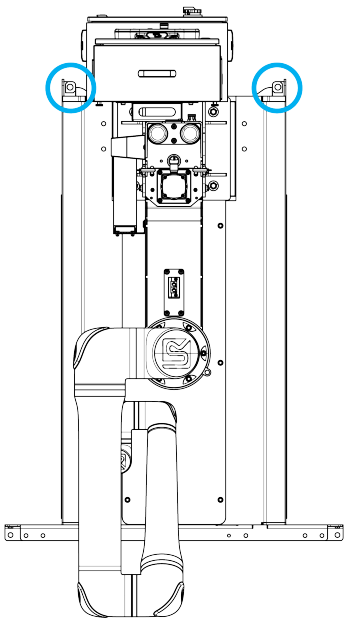
	TIP
	To perform an accurate repositioning using this method, use the clearance holes located on the removable stopper to attach the Solution to a conveyor or another piece of equipment. Refer to the **Conveyor Positioning Holes** section for hole dimensions.

4.5.3. Accurate Repositioning (Against Anchored Down Removable Stopper)

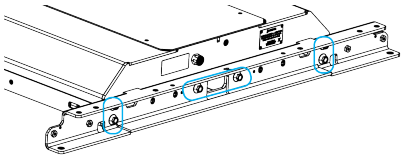
1. Set the robot in a transport position by using the following preprogrammed position: **Palletizer transport position** (**Installation** tab -> **URCaps** -> **Copilot** -> **Installation positions**).
2. Disconnect the power and pneumatic supplies as well as any other cabling that may interfere with the movement of the Solution.
3. Place the teach pendant on the support rack of the robot's control box.



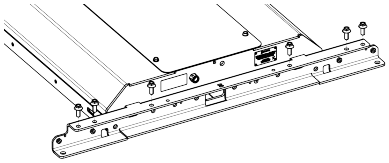
4. Unscrew the two (2) anchor nuts on the aisle side and keep them for future use.



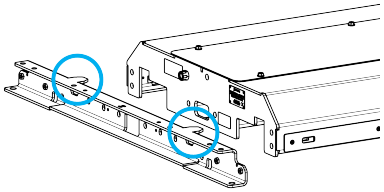
5. Insert the forks of the pallet truck or forklift truck in the fork entry openings until they stop. Make sure that the teach pendant cable or any other cable located at the front of the solution is not pinched during this operation.
6. Unscrew the six (6) screws that hold the removable stopper to the base of the Solution.



7. Insert the six (6) screws in the clearance holes on the top surface of the removable stopper.



8. Slightly raise the forks so that the Solution is freed from the anchors.
9. Slowly and carefully move the Solution, making sure the Solution remains close to the ground.
10. Reposition the Solution back to its original place using the tabs of the removable stopper as guides.



11. Perform steps 1 to 8 backwards (8 to 1) to secure the Solution. Refer to the **Installation** section to apply the correct torque to the nuts of the aisle side anchors and the screws of the removable stopper.

5. URCap Software

5.1. License Agreement

END-USER LICENSE AGREEMENT

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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.

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13. Miscellaneous.
    1. This Agreement constitutes the entire understanding and agreement between the Licensor and the End-User and replaces any prior agreement relating to the same subject matter.

    2. This Agreement shall be governed and construed in accordance with the laws of the province of Quebec and the federal laws of Canada applicable therein. Any legal action or proceeding between the Licensor and the End-User for any purpose concerning this Agreement or the parties' obligations hereunder shall be brought exclusively in a court of competent jurisdiction sitting in the judicial district of Trois-Rivières, Quebec.

    3. The Licensor's failure to insist upon or enforce strict performance of any provision of this Agreement shall not be construed as a waiver of any provision or right. Neither the course of conduct between the parties nor trade practice shall act to modify any provision of this Agreement.

    4. The Licensor may assign its rights and duties under this Agreement to any party at any time without notice to the End-User. The End-User may not assign this Agreement without the prior written consent of the Licensor.

    5. If any part of this Agreement is null, illegal or non-enforceable, this Agreement shall be interpreted as if this part was never part of this Agreement.

    6. The provisions of this Agreement are for the benefit of the Licensor and its officers, directors, employees, agents, licensors and suppliers. Each of these individuals or entities shall have the right to assert and enforce those provisions directly against the End-User on its own behalf. This Agreement is also for the benefit of, and binds, the End-User and its heirs, successors, legal representatives and permitted assigns.

    7. Any rights not expressly granted herein are reserved.

    8. The parties confirm that they have agreed that this Agreement and all related documents be drafted in English only. Les parties aux présentes confirment qu'elles ont accepté que la présente convention et tous les documents y afférents soient rédigés en anglais seulement.

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.

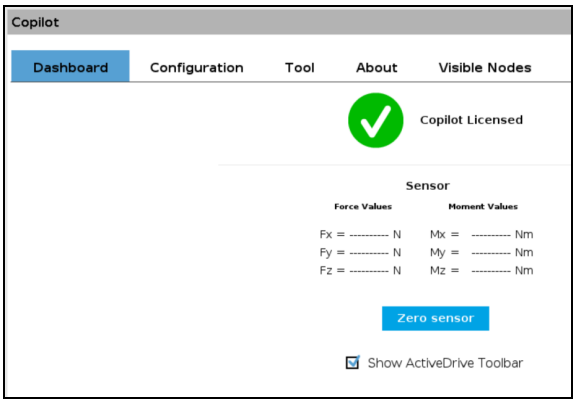


Fig. 5-1: Copilot License

3. Select the Palletizer model:

   Tap **Installation** > **URCaps** > **Copilot** > **Configuration** > **AX Series** radio button.

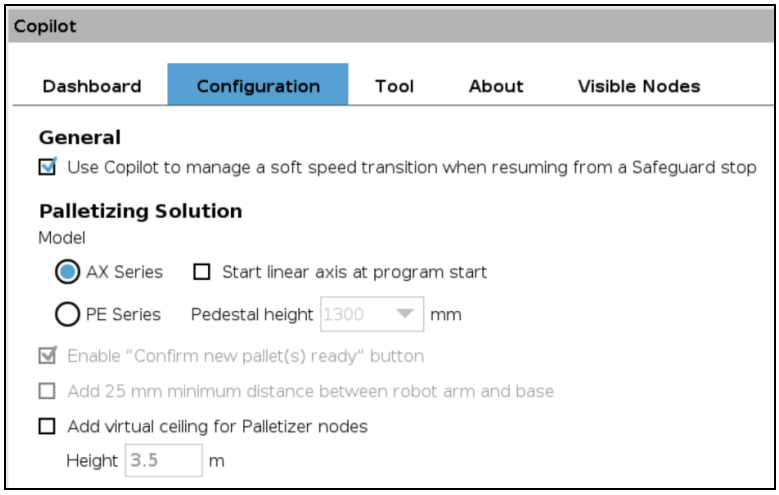


Fig. 5-2: Copilot Configuration Tab in the Installation Menu

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.

NOTICE

If required, select the **Start linear axis at program start** option.

WARNING

Activating the **Add virtual ceiling for Palletizer nodes** option **does not** limit the range of the linear axis when operating outside of the Palletizer node.

Caution must thus be observed when operating the linear axis using the **ActiveDrive toolbar** or the **Linear Axis move** node.

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.

4. Open the **ActiveDrive** toolbar, tap **Palletizing**, **Scan**, then **Start**. Make sure your linear axis is ready.

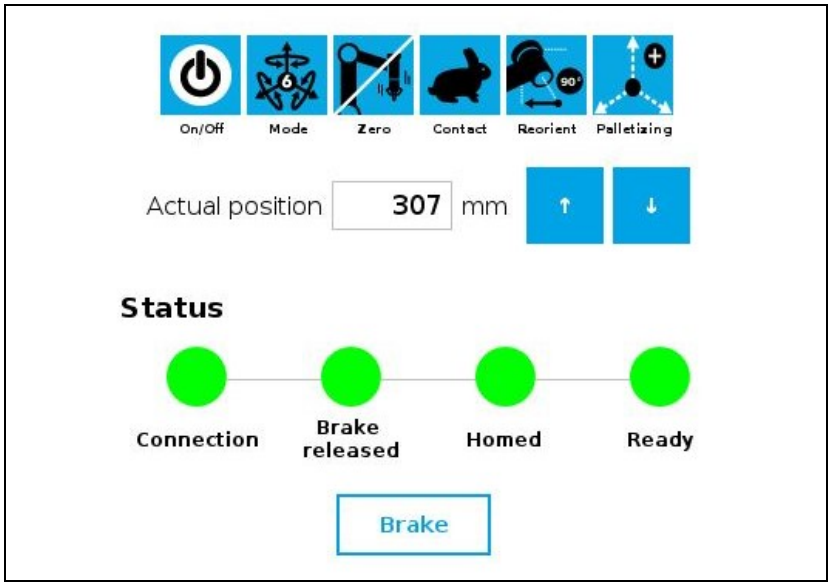


Fig. 5-3: ActiveDrive Toolbar Showing the Palletizer and Linear Axis Are Ready

5.3. Command Window

5.3.1. Palletizer Node

CAUTION

To ensure the safe operation of the Solution, the linear axis and robot motions should be generated using the palletizer node. If robot moveJ or moveL commands are required, the following limits should be respected.

- For a moveJ node: limit joint accelerations under 165 deg/s^2
- For a moveL node: limit tool linear acceleration under 2500 mm/s^2

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.

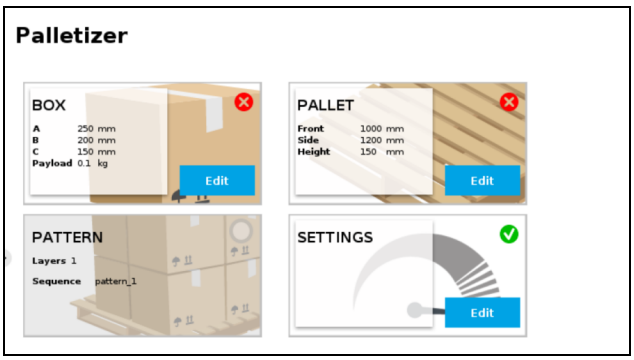
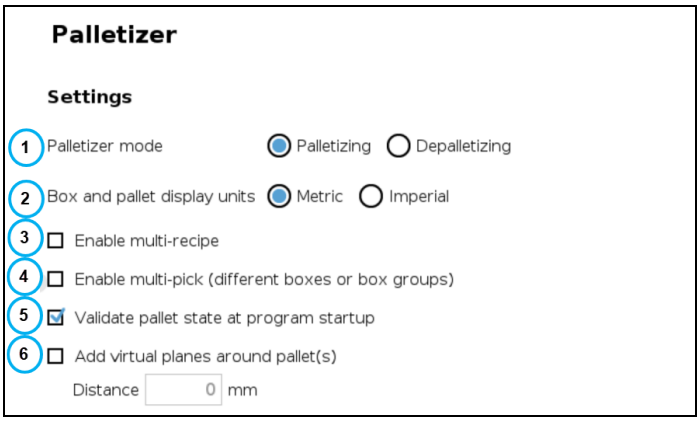


Fig. 5-4: Home View of a New Palletizer Node

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

Settings Block

Settings Menu



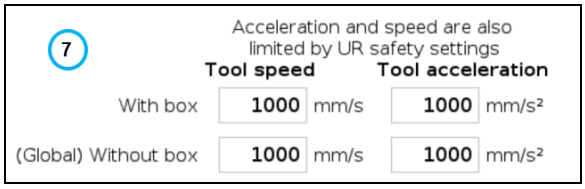


Fig. 5-5: Settings Menu of a Palletizer Node

1. **Palletizer mode**

Select the radio button that corresponds to the task to be performed, either **Palletizing** or **Depalletizing**. 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.

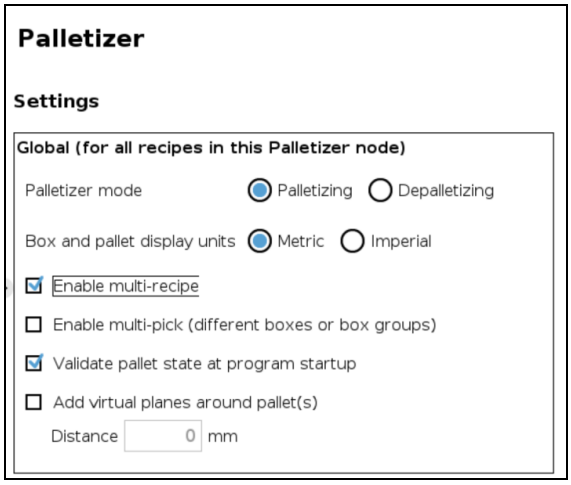


Fig. 5-6: Settings Menu of a Palletizer Node - Global Settings

	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 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.

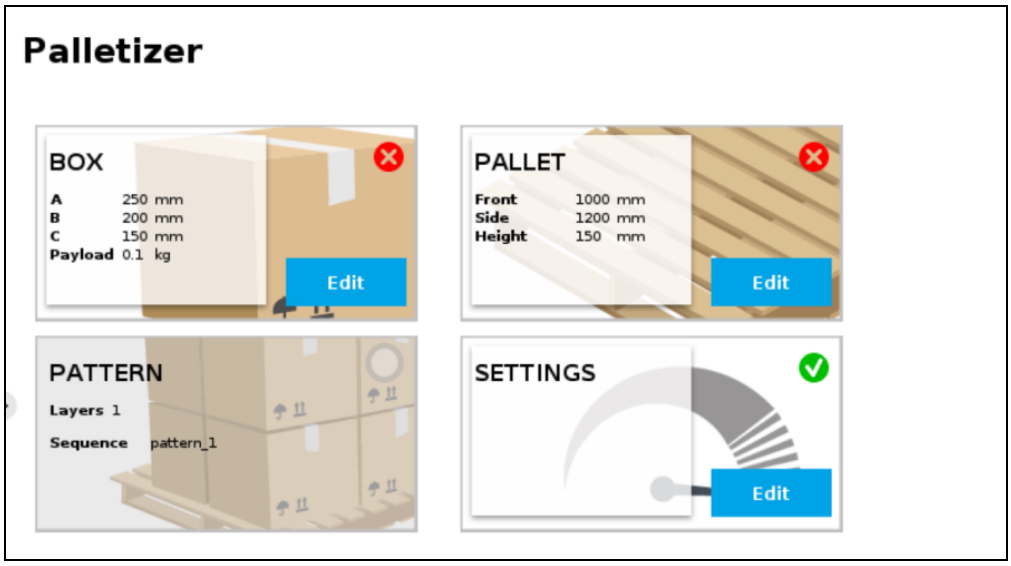


Fig. 5-7: Home View of a Single Recipe Palletizer Node (Dashboard)

Multi-Recipe

When the **multi-recipe** feature is enabled, the home view of the Palletizer node displays the list of recipes created.

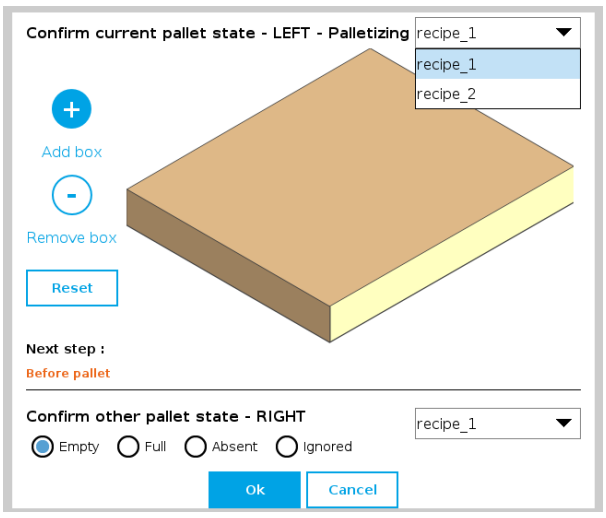
Fig. 5-8: Home View of a Multi-Recipe Palletizer Node

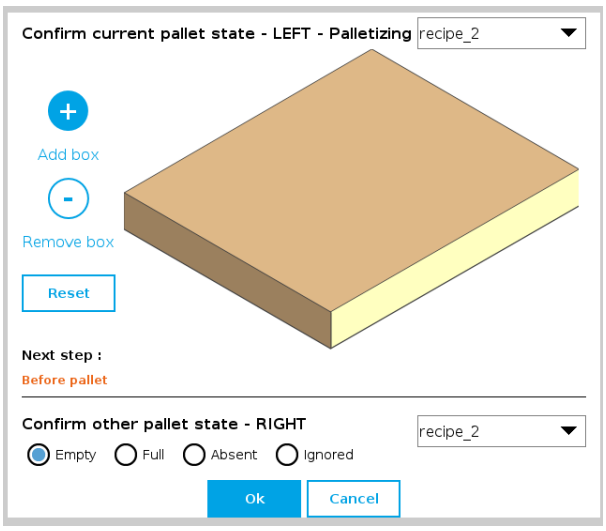
- Tap the **Add Recipe** button to create a new pallet recipe, yet to be configured.
- The **Default recipe dropdown menus** allow the user to select which recipes will be used at the start of the robot program.
- When starting the program, choose which recipe will be used for each pallet in the **Confirm current pallet state** popup window.

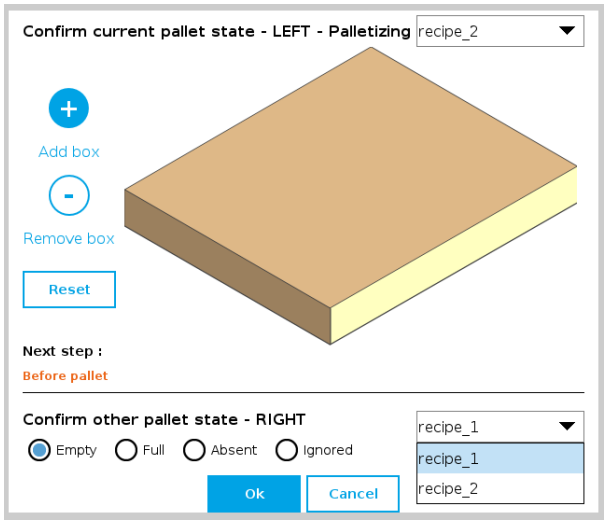
NOTICE

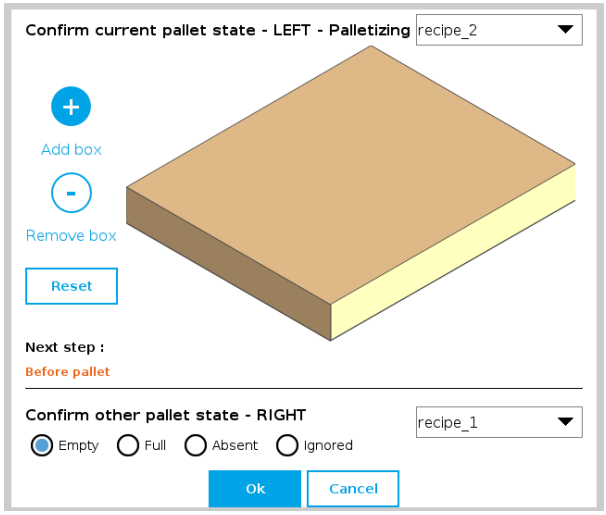
The recipe selected from the dropdown menu in the **upper right corner** will change the recipe for both pallets.

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.

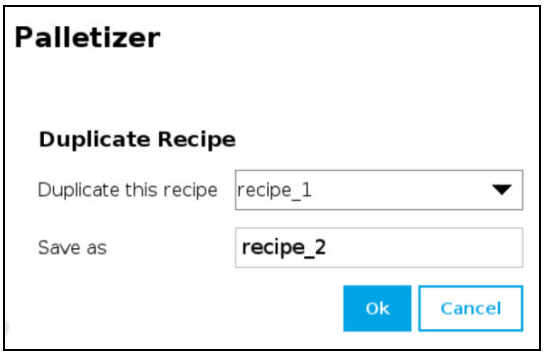


Fig. 5-9: Duplicate Recipe Menu

- 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).

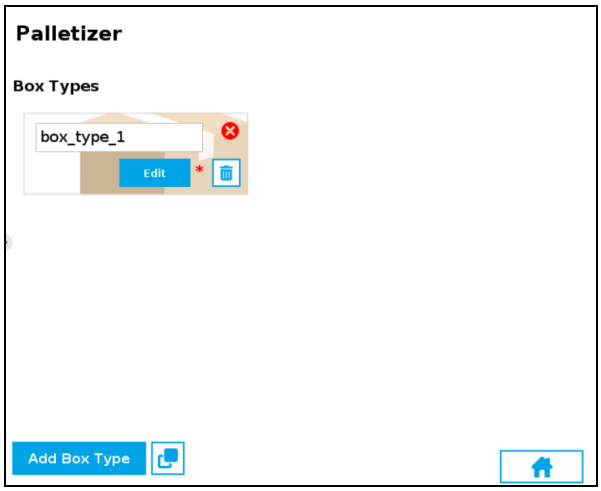


Fig. 5-10: Box Type Menu (Multi-Pick Feature)

- 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.

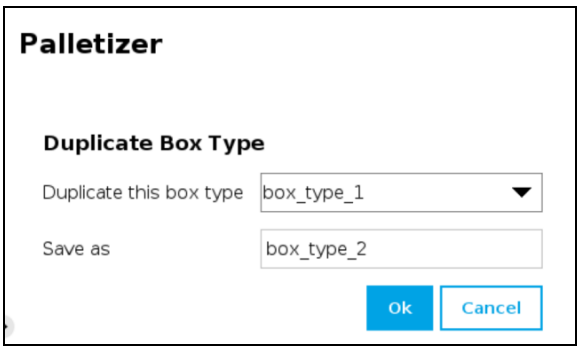


Fig. 5-11: Duplicate Box Type Menu

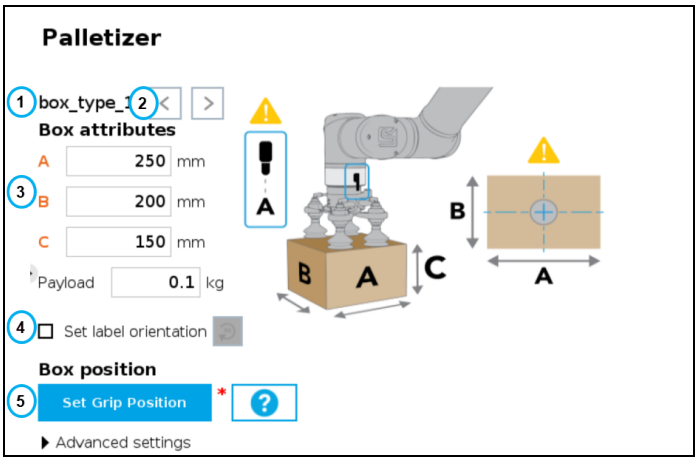
- Duplicate a box type and tap the **OK** button, or tap **Cancel** to go back to the Box Type menu.

	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



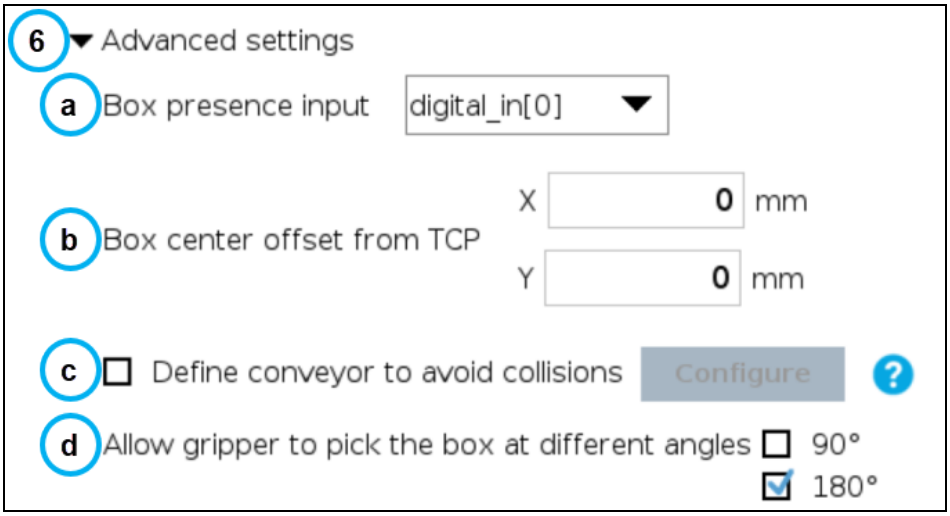


Fig. 5-12: Box Menu of a Palletizer Node

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.

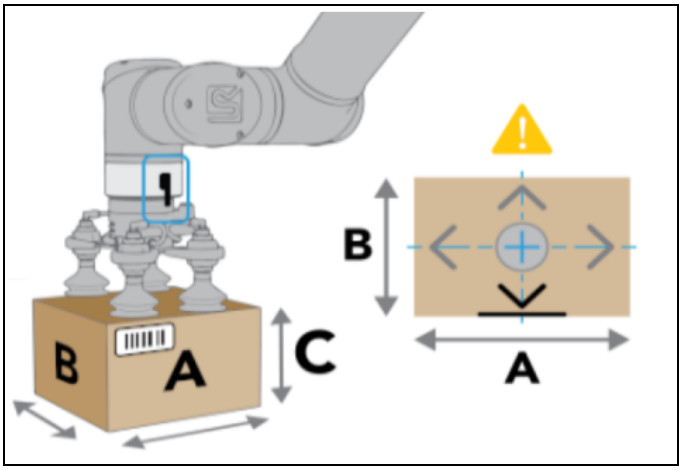


Fig. 5-13: Label Positioning on the "A" Side of the Box.

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

Fig. 5-14: 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

Whenever possible, choosing a box position that is located closer than 87% of the reach of the robot will ensure maximum lifespan of the linear axis and avoid degrading the box throughput.

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 whether 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.

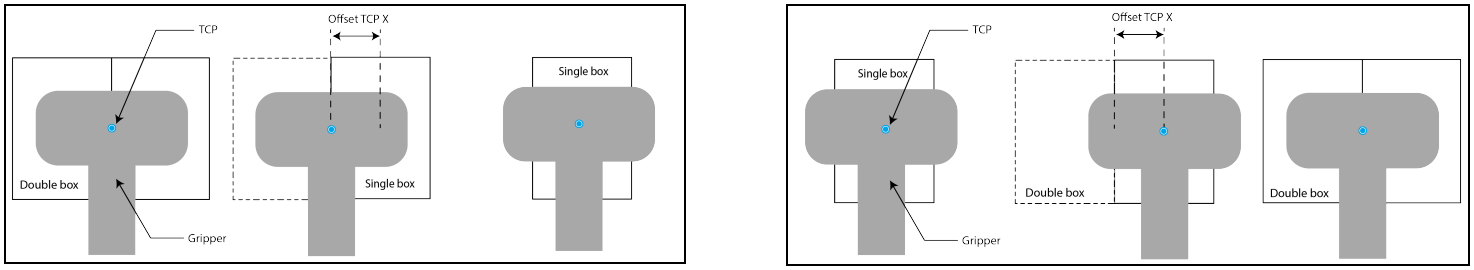


Fig. 5-15: Examples of Box Center Offset from TCP

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.

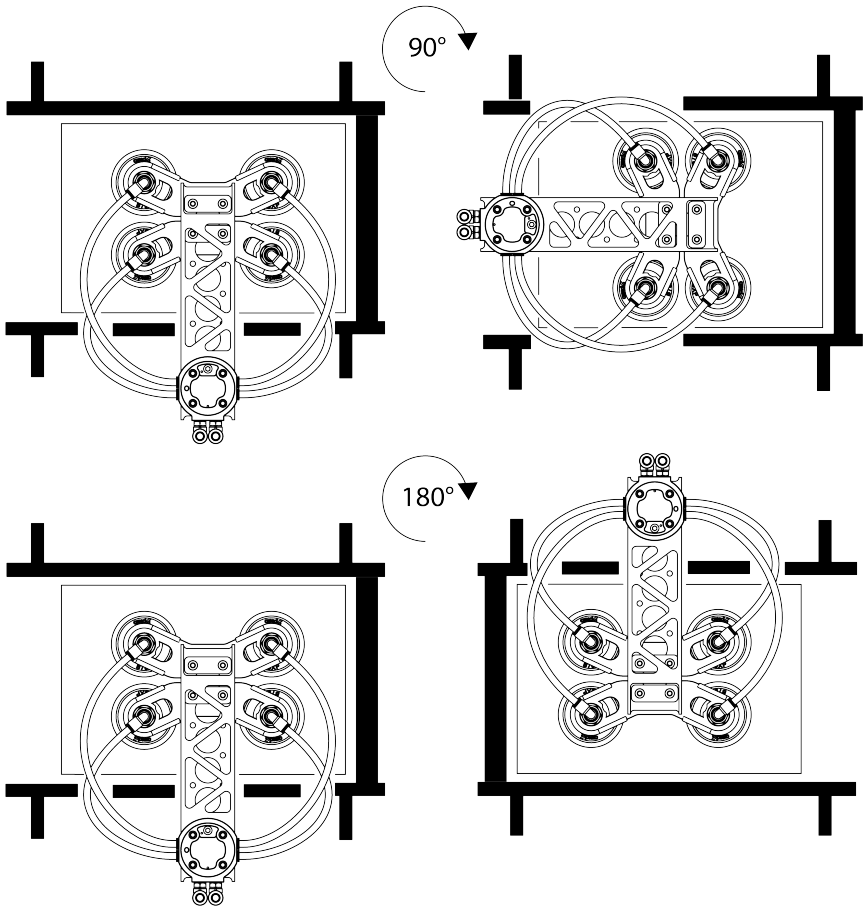


Fig. 5-16: Depiction of Gripper Rotations Based on the Option to Pick Up Boxes From Different Angles

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.

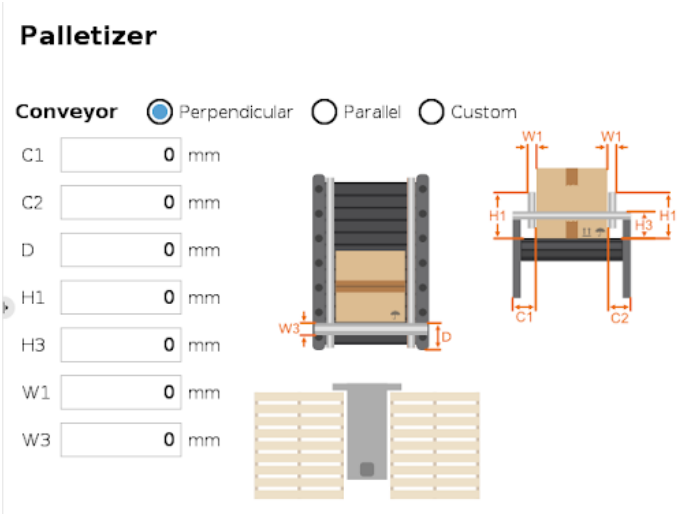


Fig. 5-17: Perpendicular Conveyor Configuration

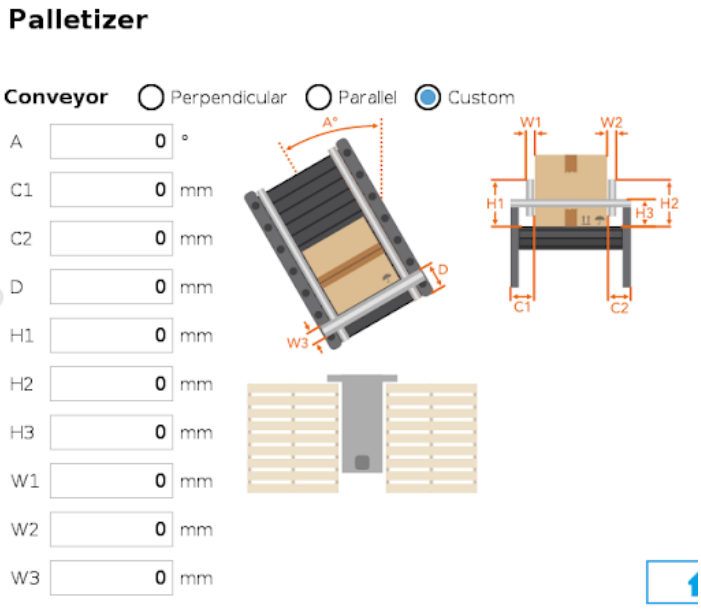


Fig. 5-18: Custom Conveyor Configuration

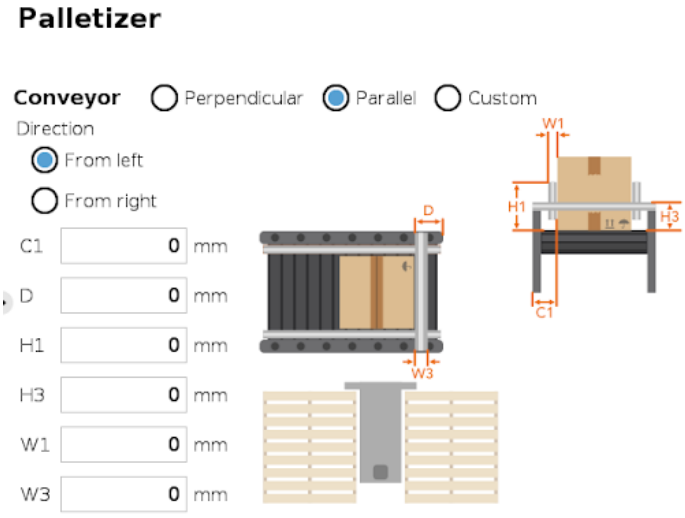


Fig. 5-19: Left-to-Right Parallel Conveyor Configuration

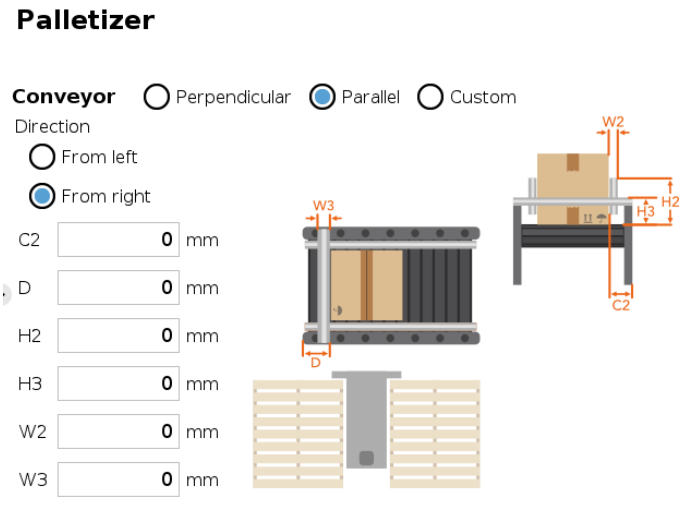


Fig. 5-20: Right-to-Left Parallel Conveyor Configuration

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

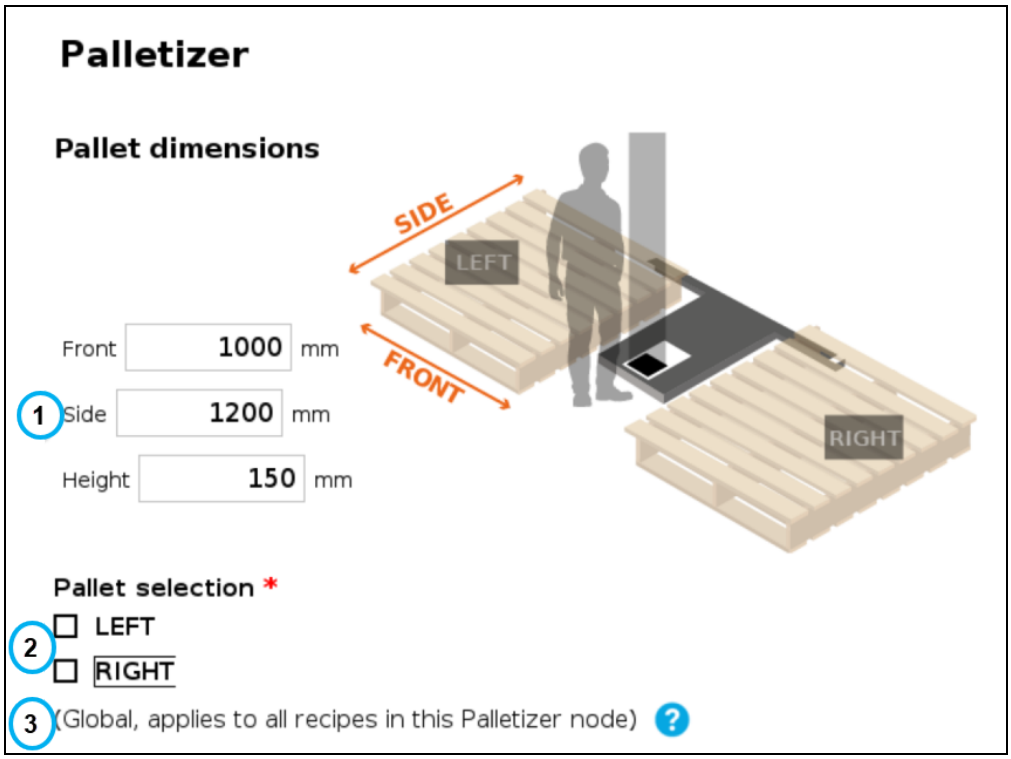


Fig. 5-21: Pallet Menu

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

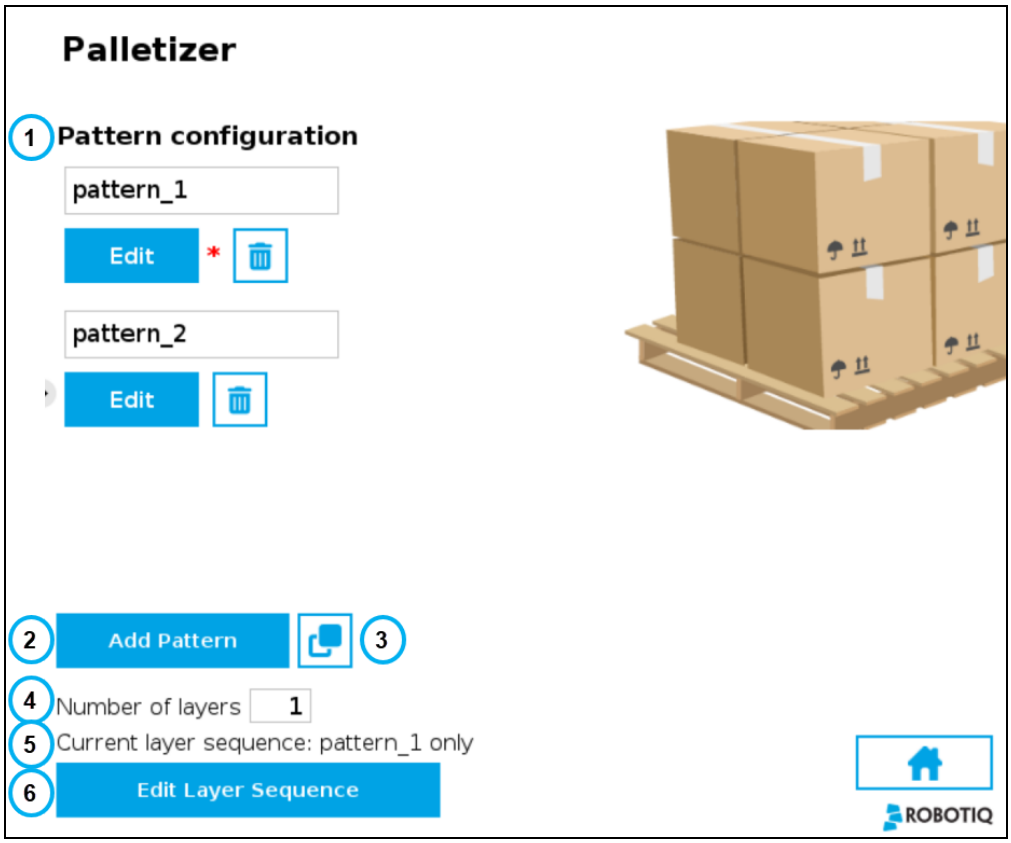


Fig. 5-22: Pattern Menu

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.

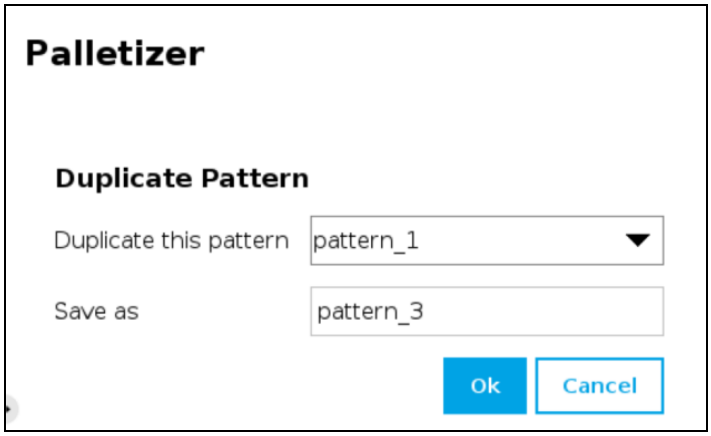


Fig. 5-23: Duplicate Pattern Menu

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**.

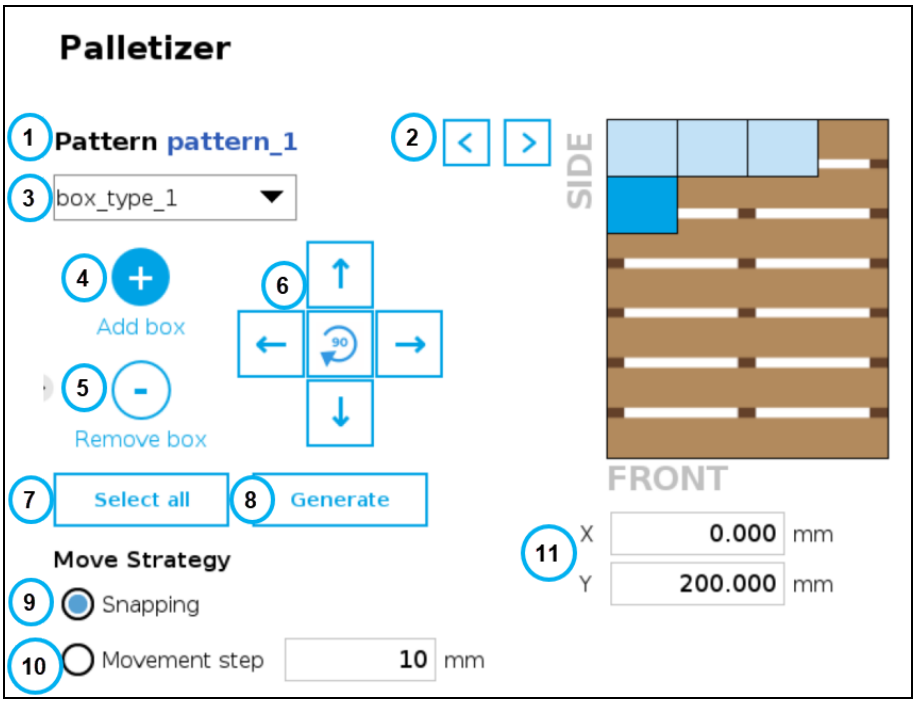


Fig. 5-24: Pattern Menu

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.

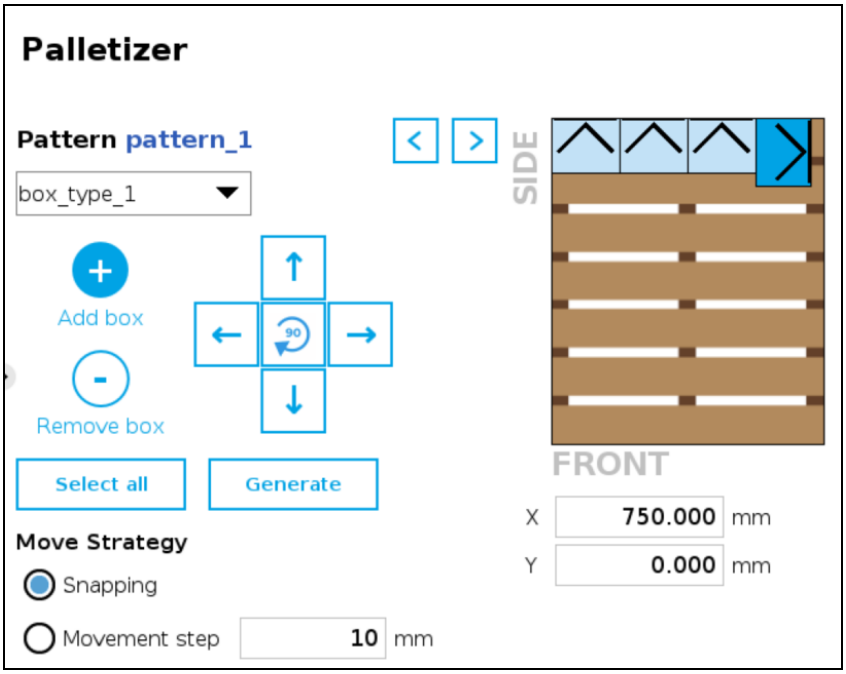


Fig. 5-25: Pattern Menu With Boxes Showing Label Orientation

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**

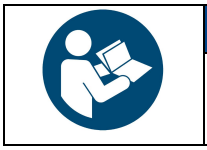
    The numbers in the fields correspond to the coordinates of the top-left corner of the active box.

    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.

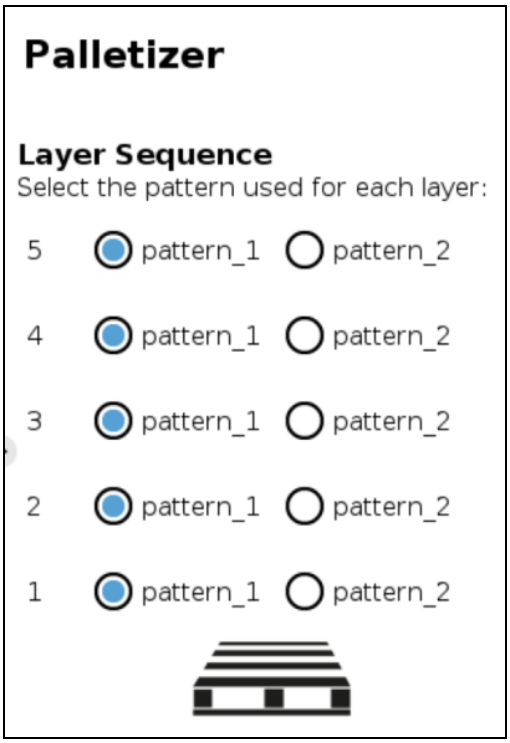


Fig. 5-26: Layer Sequence Menu

5.3.2. Linear Axis Move Node

Tap **Program** > **URCaps** > **Linear axis move** to add a **Linear axis move** node in the robot program.

The **Linear axis move** node can be used to move the linear axis to a specific position.

It can be used inside or outside the Palletizer node.

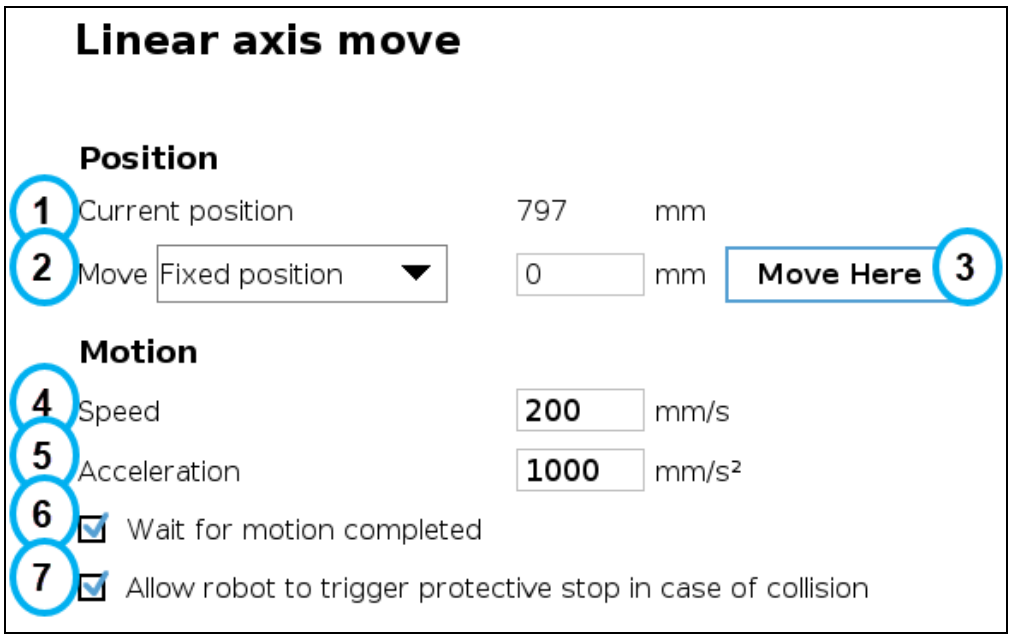


Fig. 5-27: Linear Axis Move Node - Command Window

1. The **Current position** field shows the height at which the linear axis is currently positioned.
2. The **Move** dropdown menu reveals three options:
   - **Fixed position**: corresponds to the value entered in the field.
   - **Relative position**: corresponds to a position relative to the current position. The value entered can be positive or negative.
   - **Variable position**: corresponds to a position defined by a local or global variable.
3. The **Move Here** button is used to move the linear axis to the position defined at the Move step. Tap and hold the button to move the linear axis until it reaches the position defined.
4. **Motion - Speed**

   The speed at which the linear axis will move corresponds to the integer value entered in the field.
5. **Motion - Acceleration**

   The acceleration of the linear axis when in movement corresponds to the integer value entered in the field.
6. When ticked, the **Wait for motion completed** box instructs the program to wait until the linear axis has completed its move before executing the following instruction.
7. When ticked, this box instructs the robot to make a robot stop (protective stop) should there be a collision.

5.3.3. Use of force sensing for heavy payloads

To enhance the efficiency of palletizing operations while minimizing P-stops during box placement, this feature utilizes force sensing for a soft box placement. By default, this functionality is deactivated to maintain optimal palletizing speed. This feature should be activated only in scenarios where issues are encountered with payload transitions, as it may reduce the palletizing throughput.

When activated, this advanced feature enables the robot to execute a precise placement strategy. Initially, the robot will move horizontally towards the designated box position. This horizontal approach continues until the specified location is reached or until the robot detects contact with adjacent boxes. Subsequently, the robot lowers the box vertically until it either reaches the target position or establishes contact with the pallet.

This approach is designed to address and compensate for inaccuracies in both the grip of the box and its placement, ensuring a more reliable and efficient palletizing process.

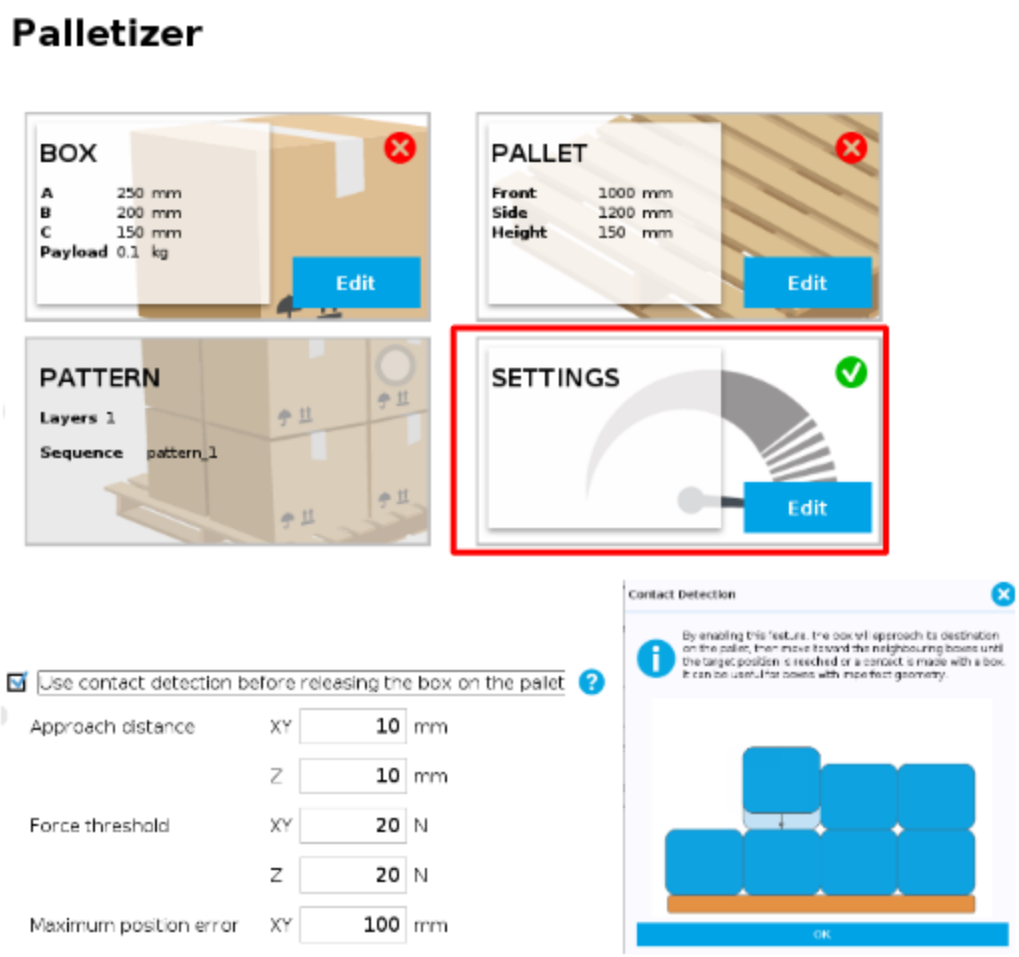


Fig. 5-28: Force sensing parameters

Parameters:

- Approach distance
  - These parameters define the distances from the target box position at which force sensing activation should start. Setting a greater approach distance enhances robustness at the expense of process speed. The XY parameter applies independently to each horizontal direction.

- Forces threshold
  - These thresholds determine the point at which the system recognizes a contact has been detected. Adjusting these thresholds allows for fine-tuning of the sensitivity to ensure optimal operations.

- Maximum position error
  - Specifies the maximum allowable deviation between the box's final position and its target. Should the discrepancy exceed this value, the system will generate an error message to alert the operator of the positioning issue.

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.

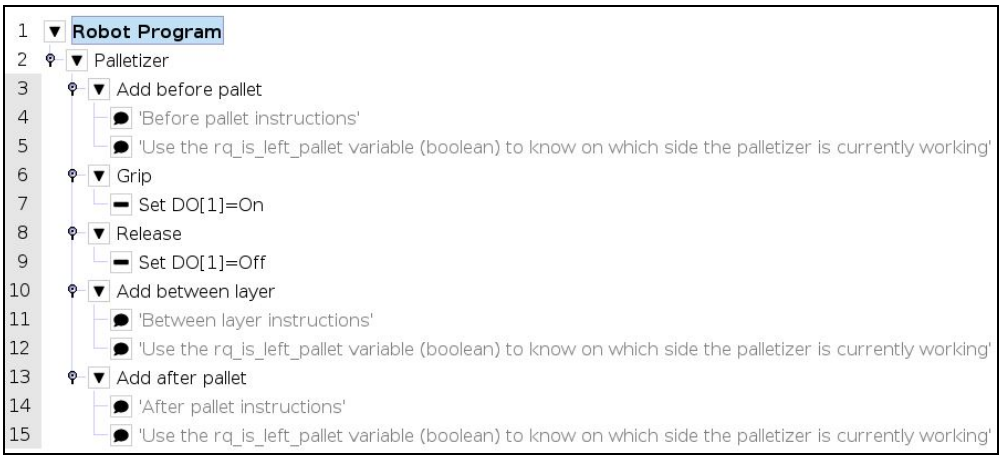


Fig. 5-29: Standard Palletizer Node in a Program Tree

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 from 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 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).

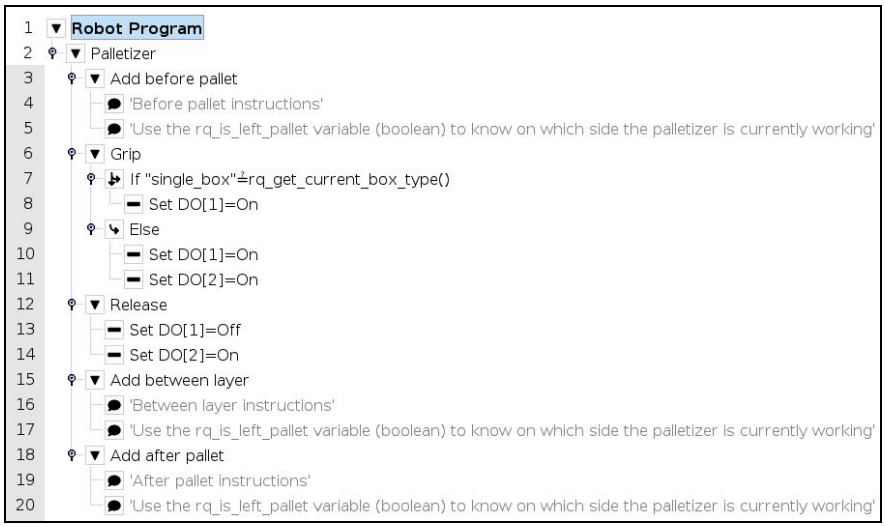


Fig. 5-30: Palletizer Node With Multi-Pick Feature

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.

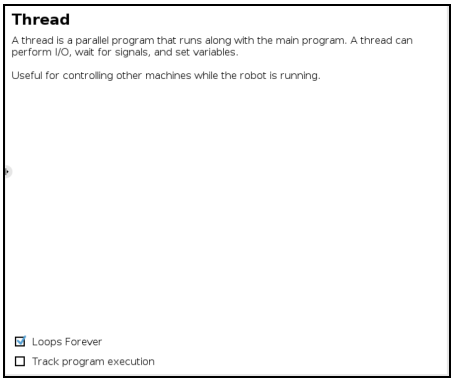


Fig. 5-31: Thread node

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 if this step has not been completed yet).

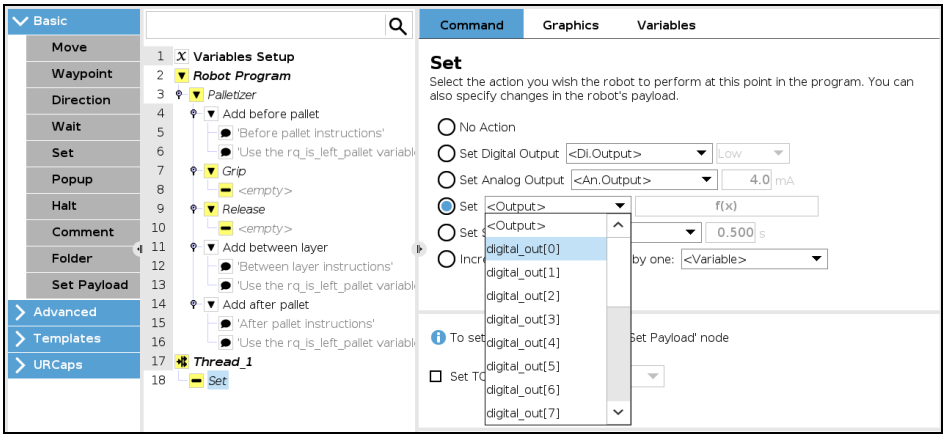
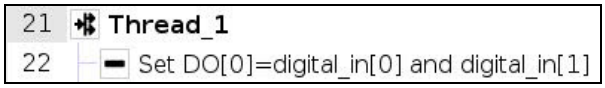


Fig. 5-32: Set Node in the Thread Node

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 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 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**.

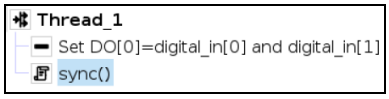


Fig. 5-33: Complete Thread Node in Program Tree

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).

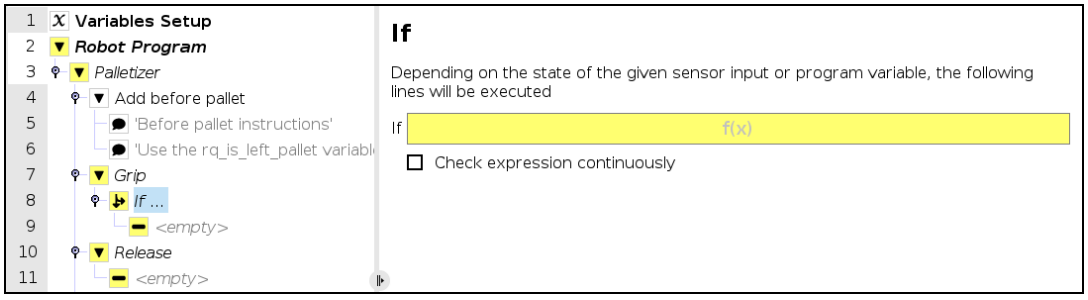
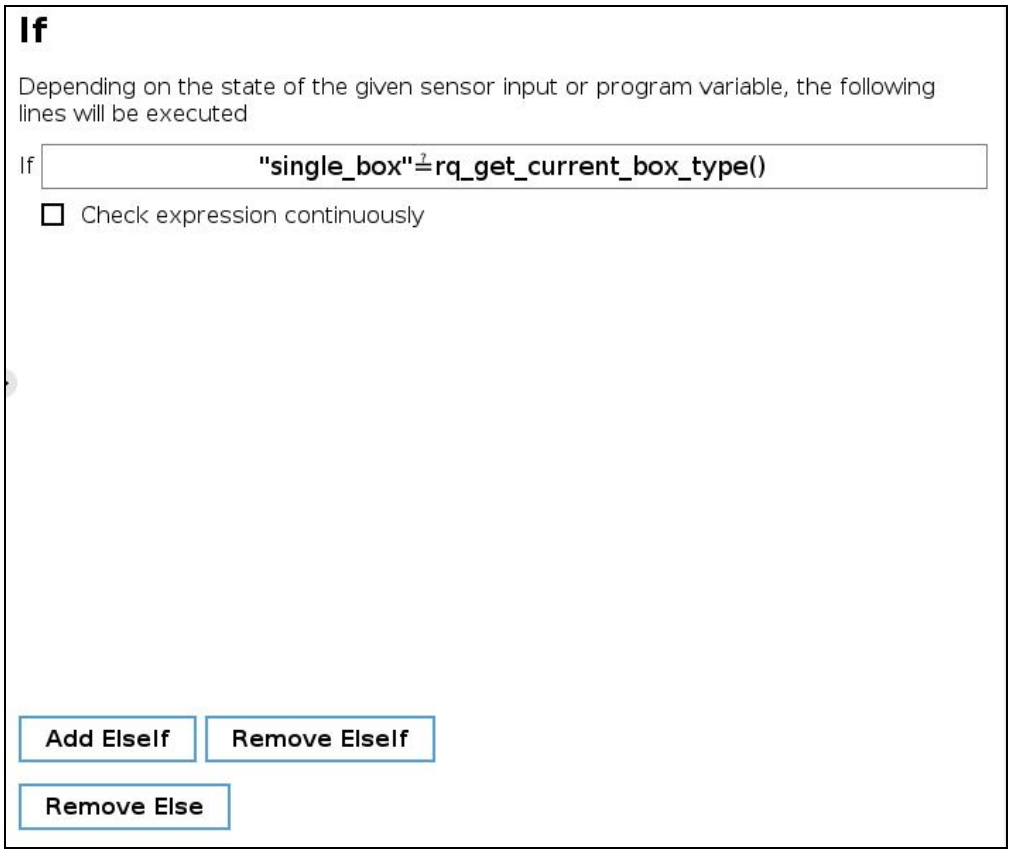


Fig. 5-34: If node in the Grip node

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:

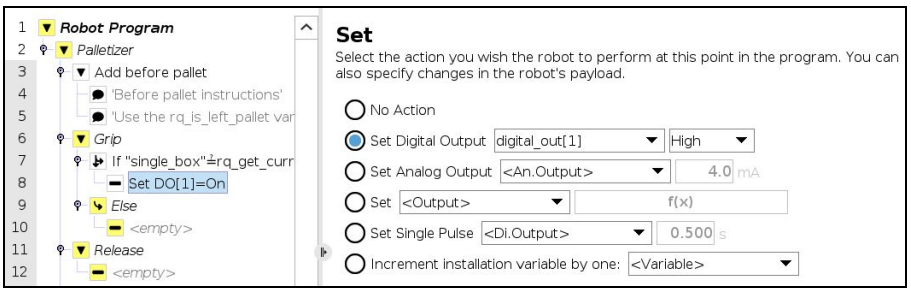


Fig. 5-35: Set Node in the If node

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:

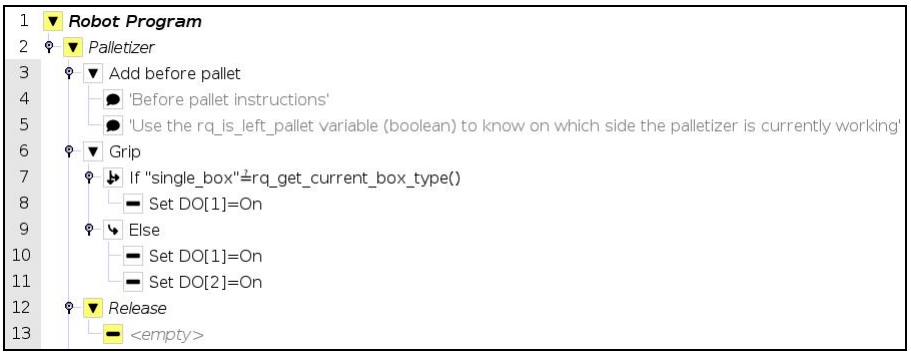


Fig. 5-36: Set Nodes in the Else node

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:

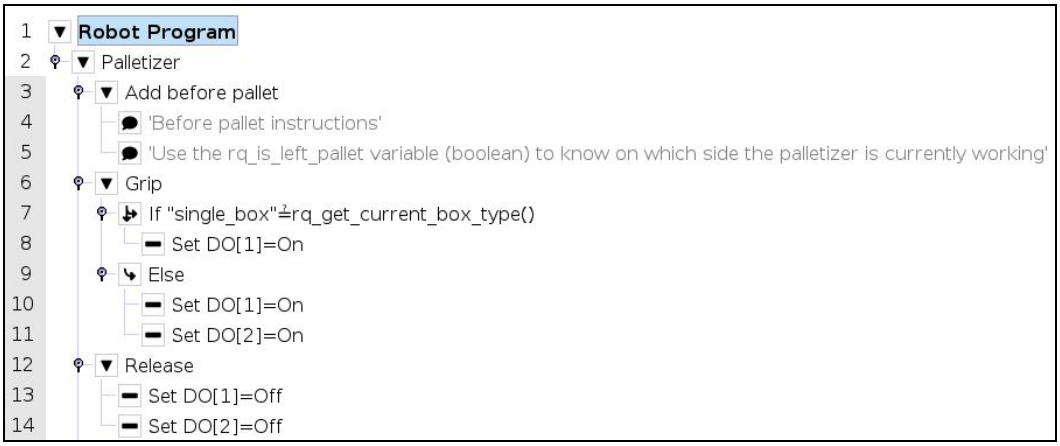
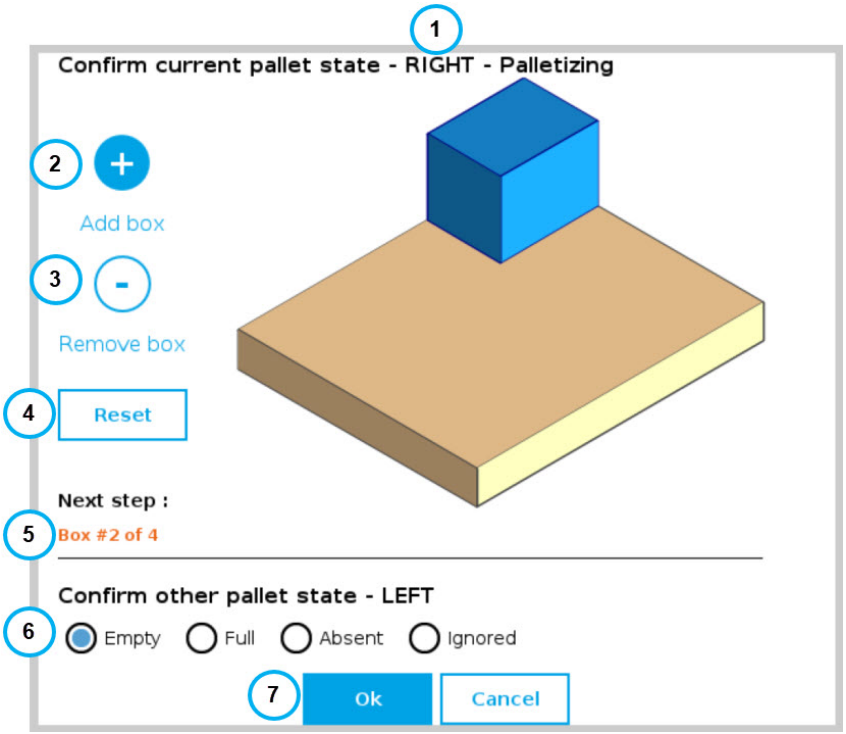


Fig. 5-37: Set Nodes in the Release node

5.4.3. Program Start - Pallet Viewer

If the option to **Validate pallet state at program startup** has been selected in the **URCap Software** 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 **URCap Software** 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.

Tip: You can hold down the plus (+) symbol to quickly skip through boxes.

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.

Tip: You can hold down the minus (-) symbol to quickly skip through boxes.

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 **URCap Software** 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 for Advanced Users

Palletizing functions are made available in the **Script** dropdown menu.

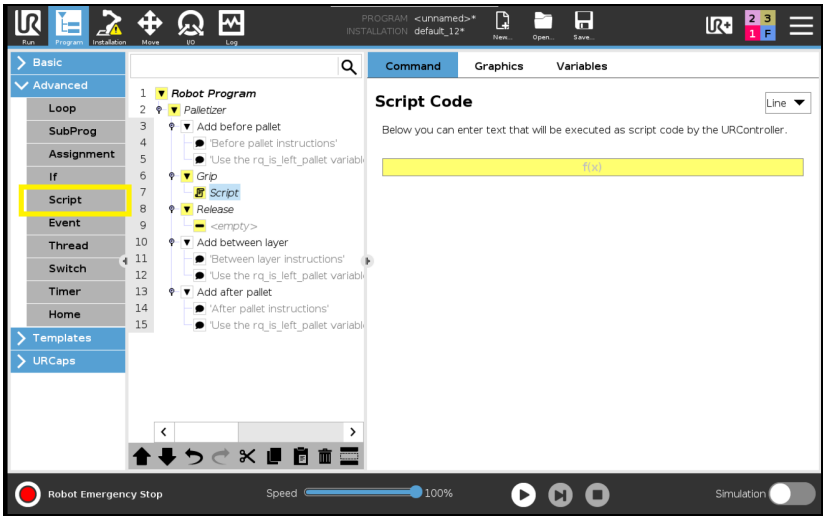


Fig. 5-38: Script node

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

Select the script function from the list.

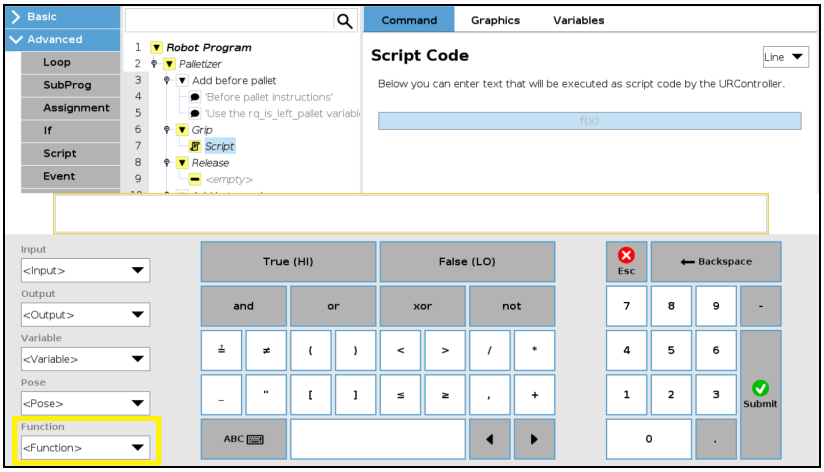


Fig. 5-39: Function dropdown menu in Script node

A complete description of every available function is available in a PDF file named *PalAdvancedProgrammingFunctions.pdf*. It is packaged in the same compressed folder (ZIP) as the Copilot URCap which can be downloaded from the Robotiq support website.

6. Safety Devices

6.1. General Operation

The Robotiq control box is designed to accommodate various safety devices.

Once every condition is met, the safety relay, through its outputs, authorizes the robot (via safeguard signals) and the linear axis drive (via safe torque off (STO) signals and safe brake control (SBC) signals) to function properly.

6.2. Nomenclature

6.2.1. Controller Overview

The figure below is a configuration diagram of the Robotiq control box. The portion in the red frame is where the safety connections will be made in the following subsections.

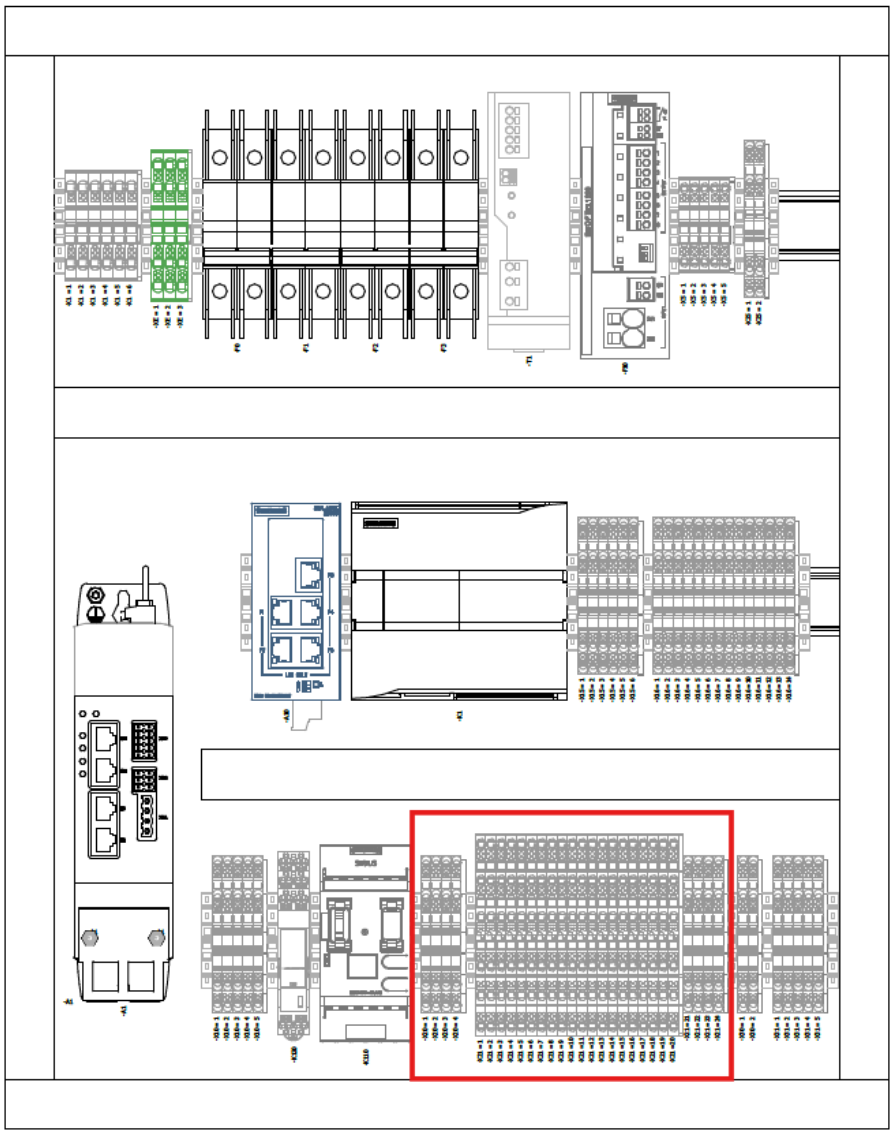


Fig. 6-1: Configuration Diagram of the Robotiq Control Box with the Safety Connection Section Highlighted (Red)

6.2.2. Terminal Bank

The safety connections of the Palletizing Solution are made in terminal banks -X20 and -X21, as depicted in the figure below.

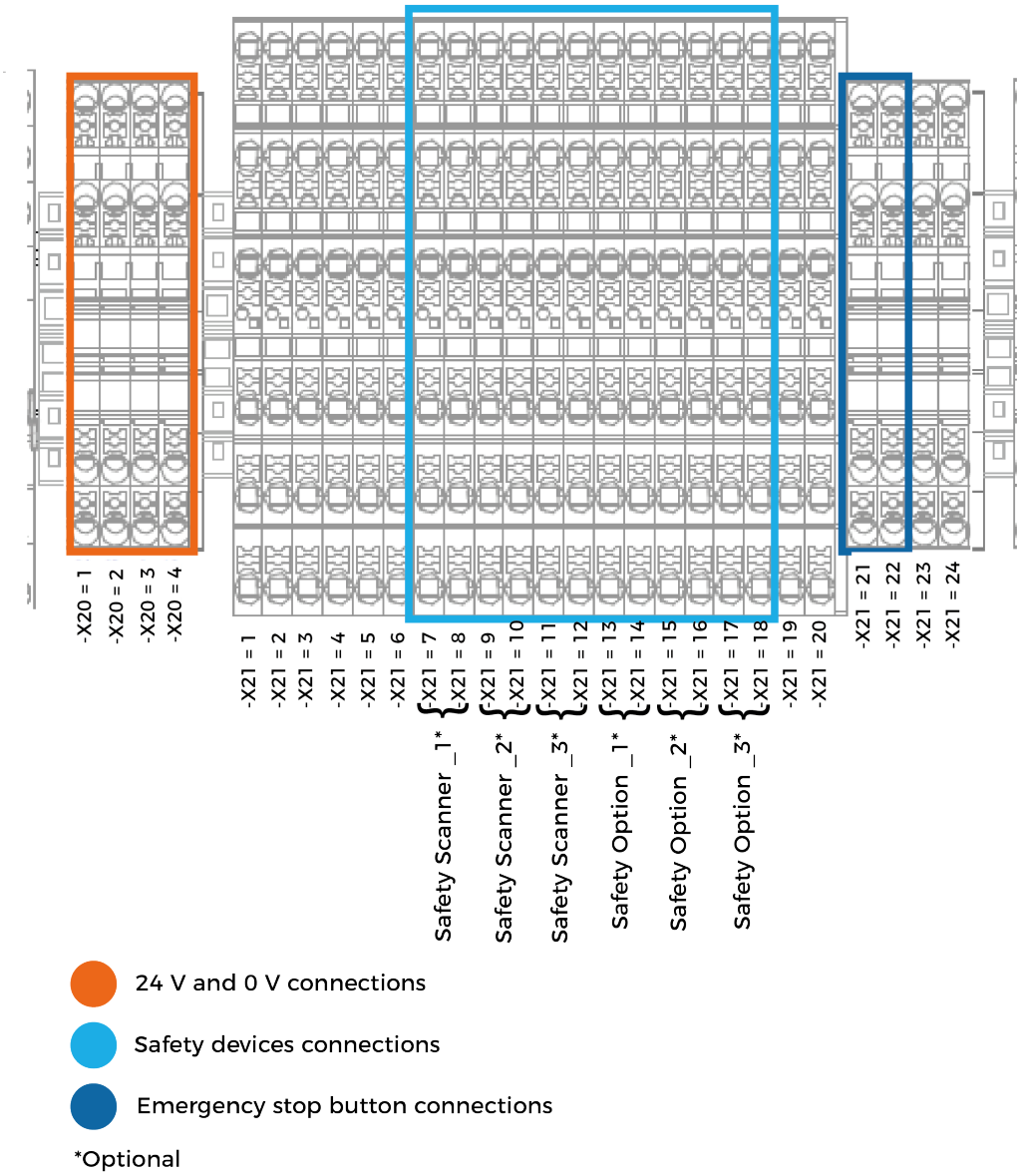


Fig. 6-2: Terminal Banks -X20 and -X21 Used for Safety Connections

The portions of each terminal bank (orange, light blue and navy blue frames) indicate the terminal blocks to which safety devices can be connected, whether they use OSSD contacts or 24 V power supply.

6.2.3. Terminal Block

Each terminal bank includes several terminal blocks. Each terminal block has its contact points (or connectors).

Terminal bank -X20 is built with two-level terminal blocks.

Terminal bank -X21 is built with a combination of two-level terminal blocks and three-level terminal blocks.

The figure below depicts the allocated connection of two-level and three-level terminal blocks.

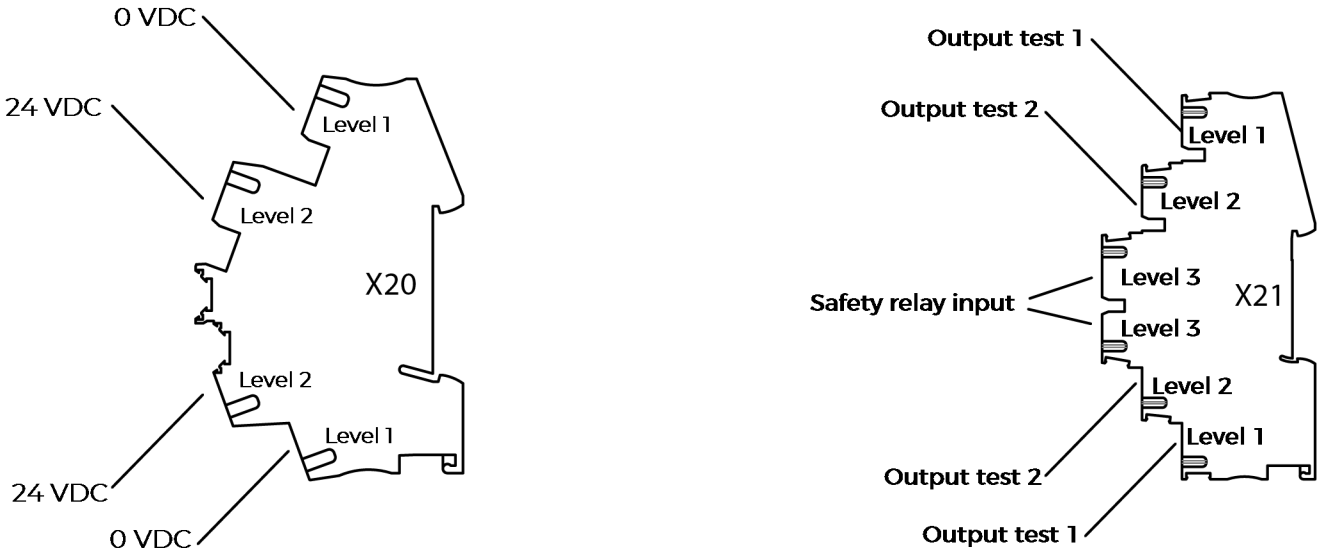


Fig. 6-3: Allocated Connection of Two-Level and Three-Level Terminal Blocks

6.3. Connections

NOTICE

The information in this section is valid for the PAL-AE07-1.1.0 Robotiq control box. The version of the Robotiq control box is displayed on its nameplate. If the version differs, refer to the electrical schematics available at support.robotiq.com.

6.3.1. Safety Devices With OSSD Signals

CAUTION

Shut down the robot and power off the Robotiq control box before making inter-controller and safety signal connections.

1. Open the Robotiq control box.
2. Run the safety device cable inside via the cable gland under the controller.

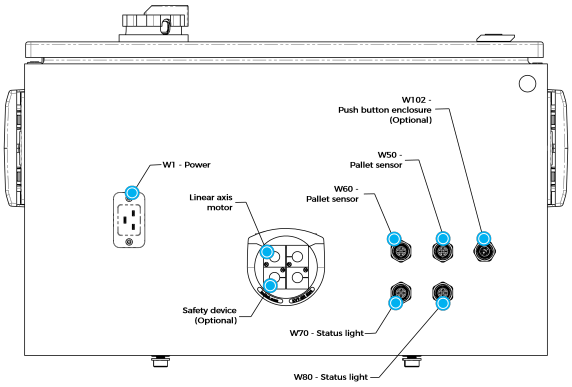


Fig. 6-4: Robotiq Control Box Connections

3. On terminal bank -X21, locate the two (2) jumpers that correspond to one of the safety options.
    a. In this example, the first jumper goes from -X21.7.1 to -X21.7.3. The 7th terminal block (IN7) is allocated to Safety Scanner_1 (1).
    b. In this example, the second jumper goes from -X21.8.2 to -X21.8.3. The 8th terminal block (IN8) is allocated to Safety Scanner_1 (2).

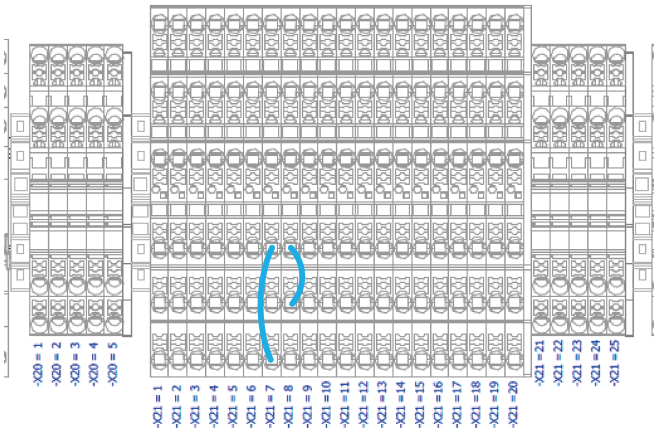


Fig. 6-5: Example of Jumper Connections

4. Remove the first jumper (-X21.7.1 to -X21.7.3).
5. Connect the end of the first OSSD wire (OSSD1) to -X21.7.3.
6. Remove the second jumper (-X21.8.2 to -X21.8.3).
7. Connect the end of the second OSSD wire (OSSD2) to -X21.8.3.
8. Connect the 24 V wire to an empty connection on terminal bank -X20, level 2 (e.g., -X20.1.2).
9. Connect the 0 V wire to an empty connection on terminal bank -X20, level 1 (e.g., -X20.1.1). The result should like the figure below.

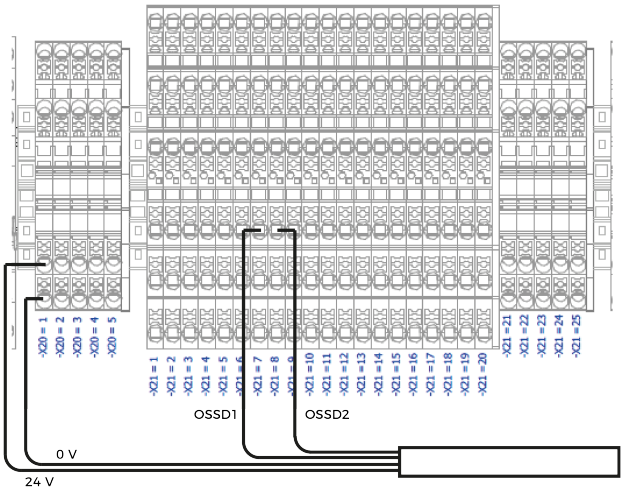


Fig. 6-6: Example of OSSD Signals Connections

10. Close the Robotiq control box.

6.3.2. Safety Devices with Dry Contacts

Follow the instructions below to integrate safeguard devices using 24 V power supply (e.g., door switch, limit switch).

CAUTION

Shut down the robot and power off the Robotiq control box before making inter-controller and safety signal connections.

1. Open the Robotiq control box.
2. Run the safety device cable inside via the cable gland under the Robotiq control box.

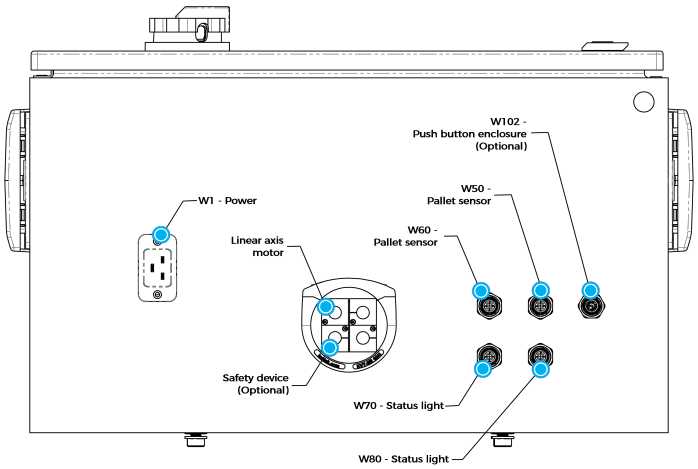


Fig. 6-7: Robotiq Control Box Connections

3. On terminal bank -X21, locate the two (2) jumpers that correspond to the safety feature to implement.
   a. In this example, the first jumper goes from -X21.13.1 to -X21.13.3. The 13th terminal block (IN13) is allocated to Safety Option 1 (1).
   b. In this example, the second jumper goes from -X21.14.2 to -X21.14.3. The 14th terminal block (IN14) is allocated to Safety Option 1 (2).

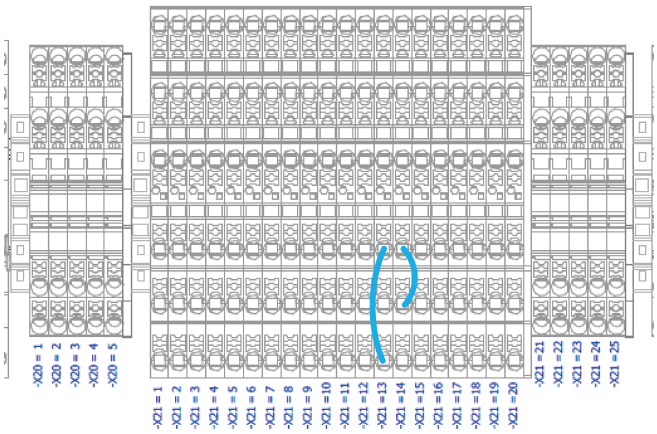


Fig. 6-8: Example of Jumpers Connections

4. Remove the first jumper (-X21.13.1 to -X21.13.3).
5. Connect the ends of the first pair of wires (contact #1), each to a contact point, i.e., where one end of the jumper was initially located (-X21.13.1 and -X21.13.3).
6. Remove the second jumper (-X21.14.2 to -X21.14.3).
7. Connect the ends of the second pair of wires (contact #2), each to a contact point, i.e., where one end of the jumper was initially located (-X21.14.2 to -X21.14.3). The result should look like the figure below.

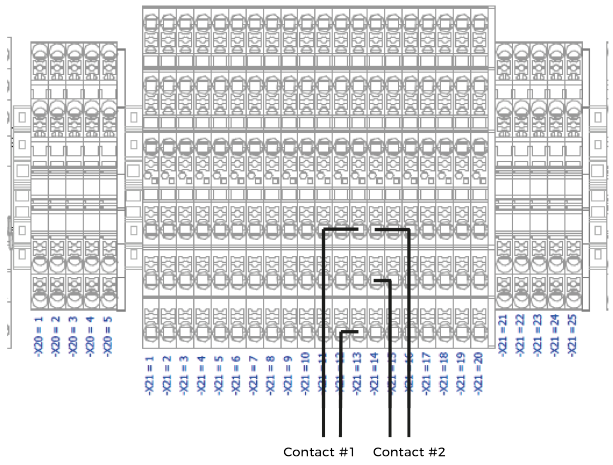


Fig. 6-9: Example of 24V Safety Device (Dry Contact) Connections

8. Close the Robotiq control box.

External Emergency Stop Button

CAUTION

Shut down the robot and power off the Robotiq control box before making inter-controller and safety signal connections.

1. Open the Robotiq control box.
2. Run the safety device cable inside via the cable gland under the Robotiq control box.

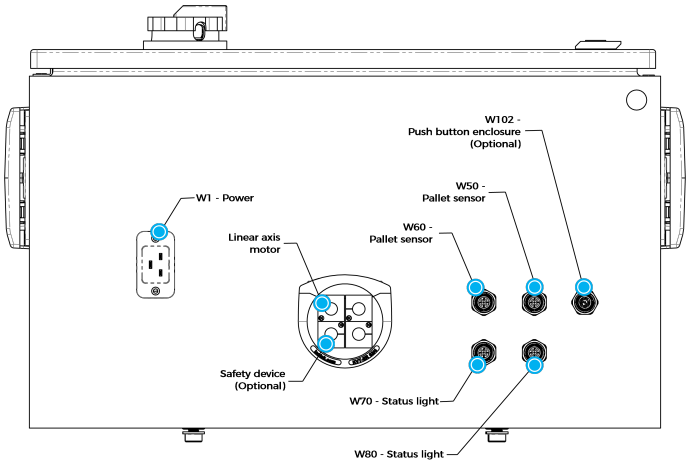


Fig. 6-10: Robotiq Control Box Connections

3. On terminal bank -X21, locate the two (2) jumpers that correspond to the E-stop contact points. The 21st and 22nd terminal blocks (IN21 and IN22) are allocated to E-Stop Button.

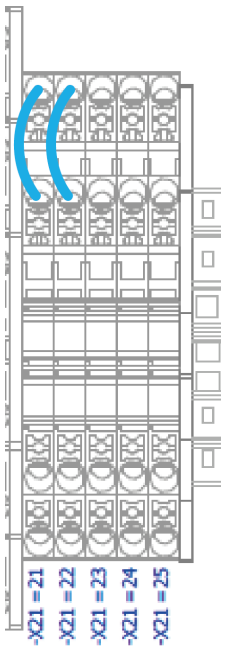


Fig. 6-11: Example of Jumpers Connections

4. Remove the first jumper (-X21.21.1 and -X21.21.2).
5. Connect the ends of the first pair of wires (contact #1), each to a contact point, i.e., where the ends of the first jumper were initially located (-X21.21.1 and -X21.21.2).
6. Remove the second jumper (-X21.22.1 to -X21.22.2).
7. Connect the ends of the second pair of wires (contact #2), each to a contact point, i.e., where the ends of the second jumper were initially located (-X21.22.1 and -X21.22.2). The result should look like the figure below.

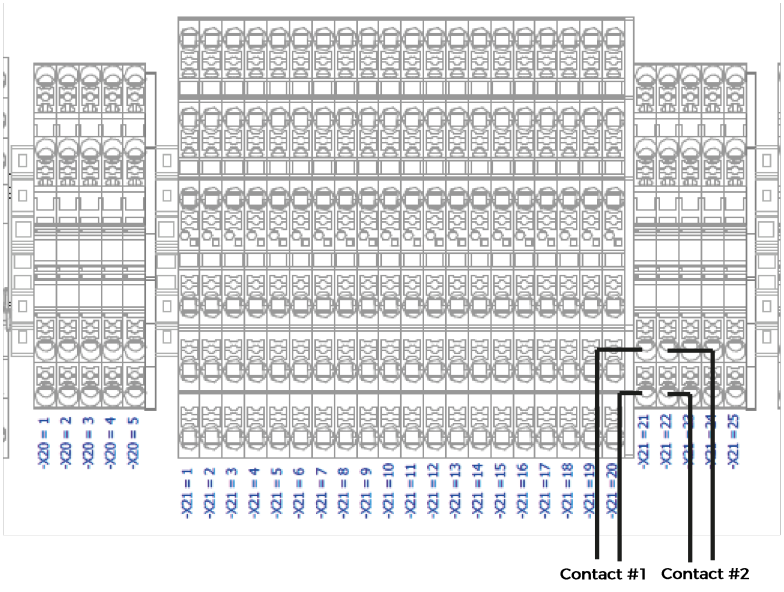


Fig. 6-12: Example of External Emergency Stop Button Connections

8. Close the Robotiq control box.

External Safeguard Reset Button

CAUTION

Shut down the robot and power off the Robotiq control box before making inter-controller and safety signal connections.

1. Open the Robotiq control box.
2. Run the External Safeguard Reset Button cable inside via the cable gland under the Robotiq control box.

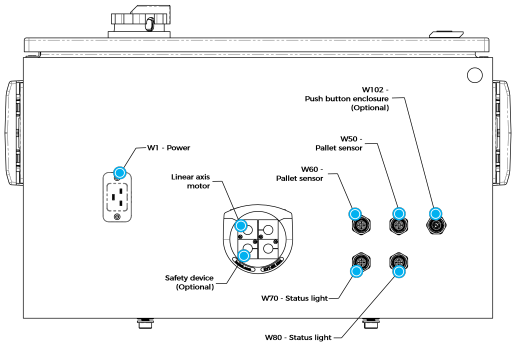


Fig. 6-13: Robotiq Control Box Connections

3. On terminal bank -X21, locate the terminal block that corresponds to the External Safeguard Reset Button. The 5th terminal block (Safety relay IN5) is allocated to the Robotiq push-button enclosure Safeguard Reset Button. The 6th terminal block (Safety relay IN6) is allocated to an optional 2nd Safeguard Reset button. The 6th terminal block can also be used as an automatic reset.
4. Connect the ends of the pair of wires, each to a contact point of the allocated terminal block (reset contact #1 to -X21.6.1 and reset contact #2 to -X21.6.3). The result should look like the figure below.

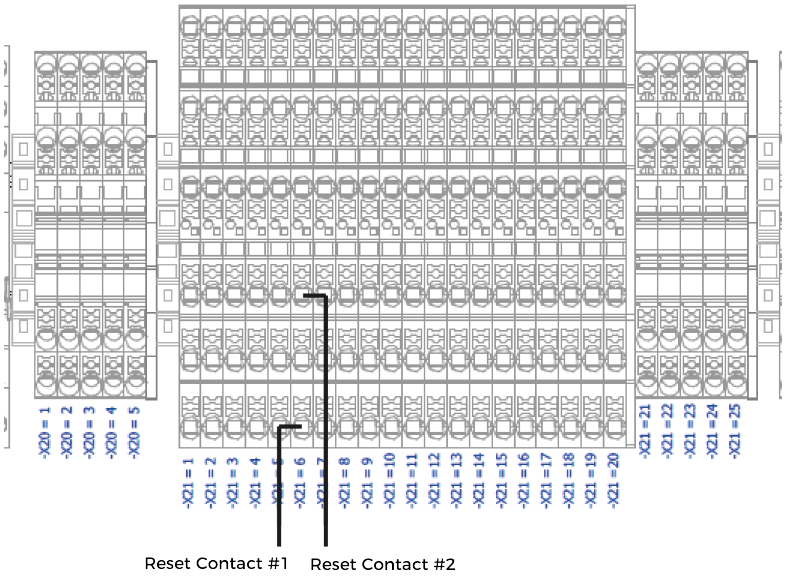


Fig. 6-14: Example of 2nd Safeguard Reset Button Connections

5. Close the Robotiq control box.

7. Specifications

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

7.1. Technical Dimensions

7.1.1. Linear Axis Base with Control Box

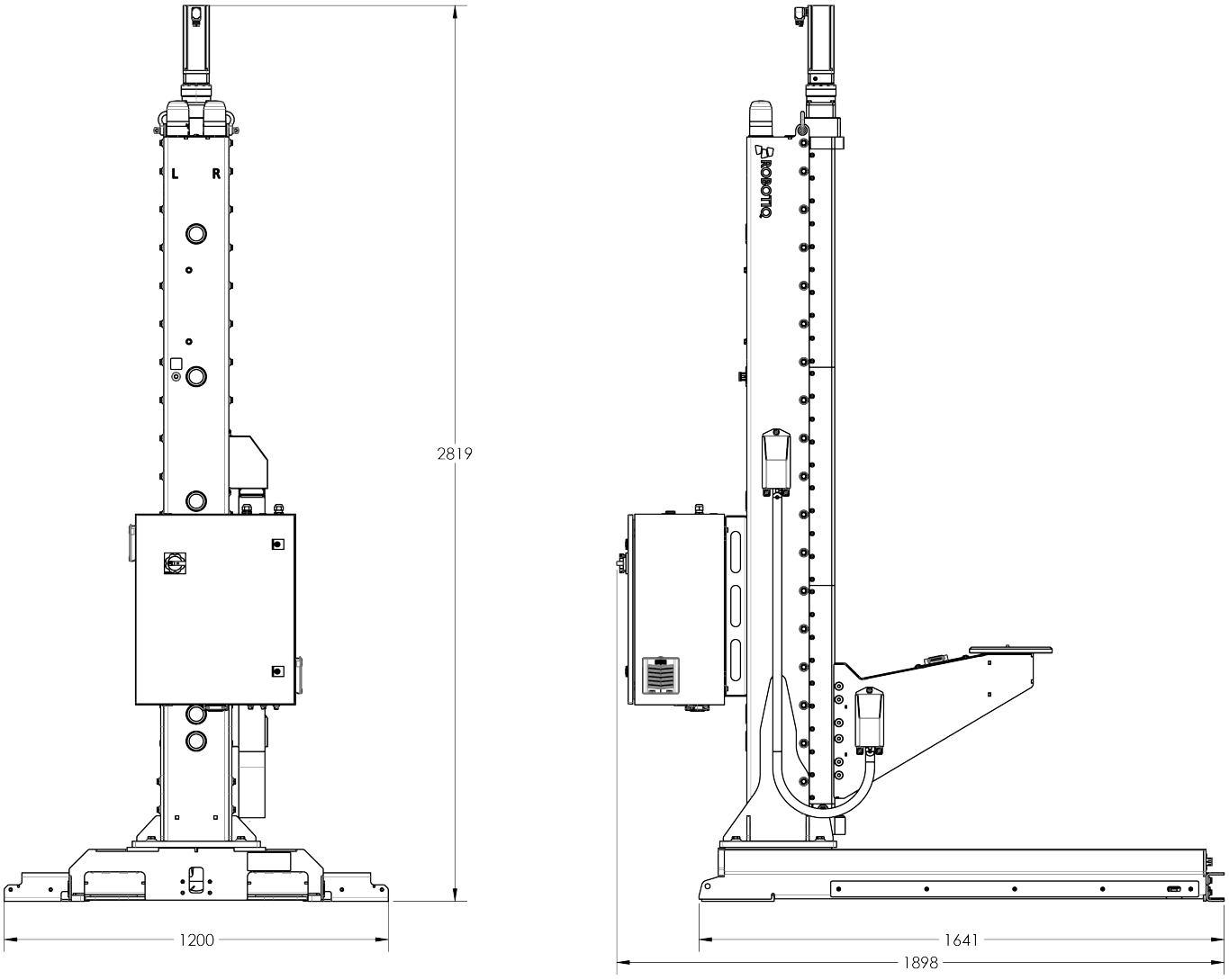


Fig. 7-1: Linear Axis Base with Control Box- Technical Dimensions

7.1.2. PowerPick20/30 Vacuum Gripper (Optional)

For the technical dimensions of the PowerPick20/30 Vacuum Gripper, please refer to the Technical Dimensions section of the PowerPick20/30 user manual, available at support.robotiq.com.

7.2. Mechanical Specifications

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

Parameter	Specification	
	Metric	Imperial
Net product weight (without robot and gripper)	470 kg	1035 lb
Base weight	175 kg	385 lb
Column weight	262 kg	577 lb
Maximum payload (including gripper)[1]	25 kg (UR20) 35 kg (UR30)	55 lb 77 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)	90 mm	3.5 in
Maximum pallet height (filled)[4]	Up to 3200 mm (UR20) Up to 2750 mm (UR30)	Up to 126 in (UR20) Up to 108 in (UR30)
Shipping crate dimensions	2740, 890, 1220 mm (L, W, H)	108, 35, 48 in (L, W, H)
Gross shipping weight	645 kg	1420 lb
Maximum supply pressure[5]	10 bar	145 psi
Maximum vacuum lines pressure[5]	5 bar	73 psi
Maximum throughput	Up to 13 cycles/min[6]	
Maximum number of box patterns	No constraint	
Energy source	Electricity	

Table 7-1: Mechanical Specifications of the Robotiq Palletizing Solution

[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]Maximum pallet height (filled) depend on your box dimensions and pallet configuration. Use the Robotiq Configurator to validate the combination.

[5]Refer to the pneumatic diagram.

[6]Maximum box throughput depends on box weight, box dimensions, box surface, pallet dimensions, and pallet layout. Use the Robotiq Configurator to validate the combination.

7.2.2. PowerPick20/30 Vacuum Gripper (Optional)

For the mechanical specifications of the PowerPick20/30 Vacuum Gripper, refer to the **Mechanical Specifications** section of the PowerPick20/30 user manual, available at support.robotiq.com.

7.3. Electrical Specifications

7.3.1. PowerPick20/30 Vacuum Gripper (Optional)

For the electrical specifications of the PowerPick20/30 Vacuum Gripper, please refer to the **Electrical Specifications** section of the PowerPick20/30 user manual, available at support.robotiq.com.

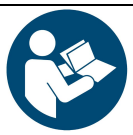
7.3.2. Universal Robots Control Box

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

7.3.3. Robotiq Control Box

Parameter	Specification
Operating supply voltage	100 VAC to 240 VAC single-phase 60/50 Hz
Quiescent power (minimum power consumption)	290 Wmax 205 Wrms
Peak current	15 A at 120 VAC

Table 7-2: 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.

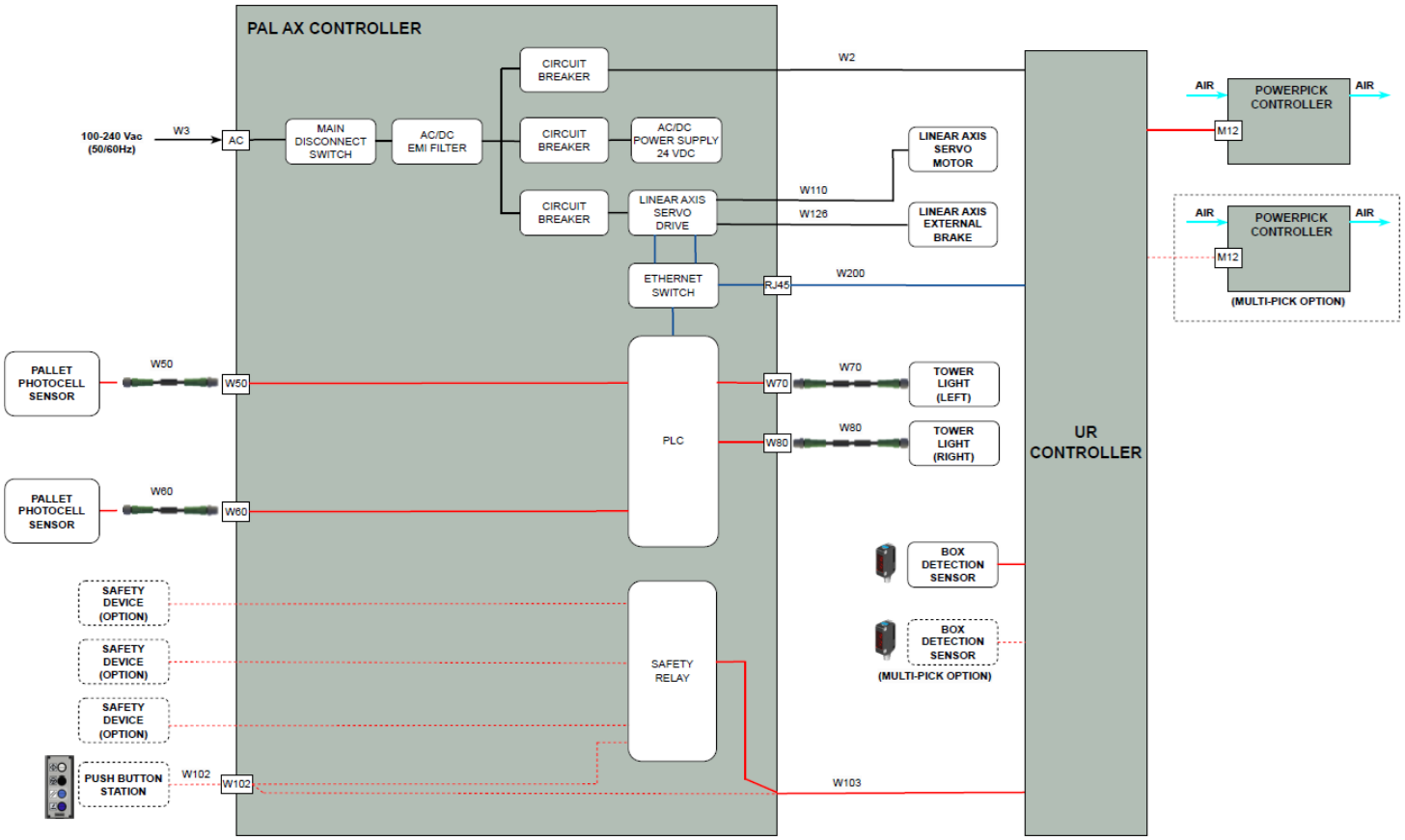


Fig. 7-2: System Overview - High Level

8. Periodic Inspection and Maintenance

WARNING

Failure to perform the following inspection, maintenance and servicing at the specified interval can result in material damage, death or serious injury.

Failure to repair defective items before putting the equipment back into operation may result in material damage, death or serious injury.

Before performing the inspection, maintenance and servicing of the equipment, the power off and lock out procedure must be followed. Please refer to the **Power Off and Lock Out Procedure section** section for more information.

Following inspection and 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 **Power Off and Lock Out Procedure** 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 equipment.
- Maintenance / repair / service on electrical equipment must only be carried by qualified and authorized electrical personnel.
- Maintenance / repair / service of equipment must only be carried by qualified and authorized personnel.

NOTICE

For information about the inspection, maintenance and cleaning of the PowerPick20/30 Vacuum Gripper, please refer to the Maintenance section of the PowerPick20/30 user manual available at support.robotiq.com.

8.1. Inspection, Maintenance and Service Schedule Information

Make sure to perform proper inspection, maintenance and service at recommended intervals as indicated in the table.

Maintenance should be carried out as soon as the first of the following triggers is encountered:

- Calendar time
- Operation hours
- Axis travel

WARNING

The following tables show the appropriate maintenance intervals, every time the interval is reached the associated inspection, maintenance or service must be performed.

TIP

Keep a calendar for maintenance schedules. Keep track of when, total operation hours and total axis travel of each inspection, maintenance or service was last performed, so you never forget any of the necessary steps.

Detailed maintenance procedures are presented in the section Maintenance Procedures.

Inspection / Service / Maintenance Intervals Table			
Maintenance Procedures	Intervals - Whichever comes first		
	Calendar Time (Every)	Hours of Operation (Every)	Axis Travel (Every)
8.3.1. Regular Inspection / Maintenance	3 months	350 hrs	N/A
8.3.2. Linear Axis Lubrication	6 months	1000 hrs	100 km
8.3.3. Linear Axis Internal Components Inspection	1 year	4000 hrs	1000 km
8.3.4. Linear Axis Replacement / Complete Rebuild	10 years	40000 hrs	10000 km

8.2. Power Off and Lock Out Procedure

WARNING

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

Position the linear axis to the minimum height before shutting off the power. If it is not possible to position the linear axis to its minimum height before shutting off the power, the carriage must be safely supported in accordance with local regulations to prevent unintended descent during inspection, maintenance, servicing, cleaning or other purposes.

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 PowerPick20/30 Vacuum Gripper, simply activate the vacuum or blow off output, and wait for the pressure to drop completely.

PowerPick20/30 also includes a shut off valve that can alternatively depressurize the system downstream and be locked in the exhaust position.

To turn off the electrical power downstream of the Robotiq control box, switch the main isolator off and lock it in the off position. Note that the upstream section remains energized.

It is also possible to unplug the main power cable from the power outlet, but make sure to secure against reconnection.

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

8.3. Maintenance Procedures

This section includes instructions for basic maintenance procedures. Due to the complexity of some of the maintenance procedures, good mechanical skills are required. The following procedures must only be carried by qualified and authorized personnel.

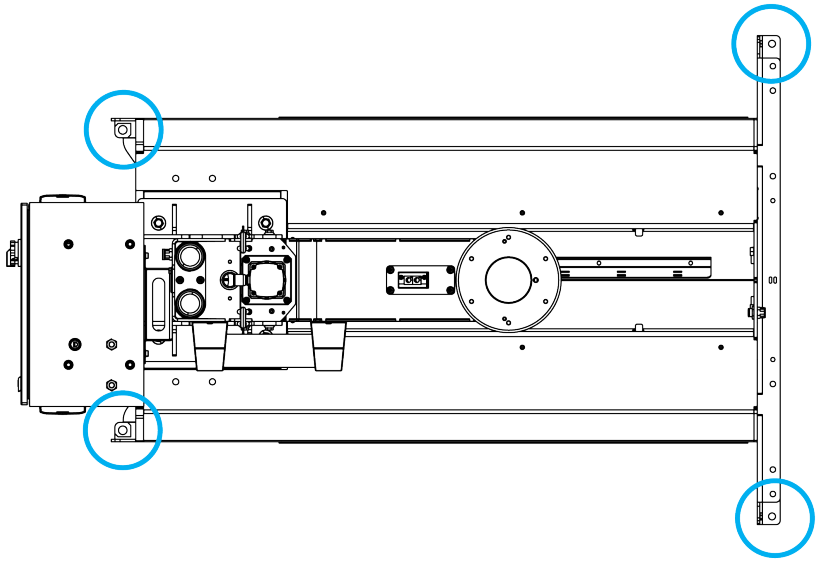
If issues are identified during the inspection procedure, the damaged or otherwise worn elements must be replaced or repaired before putting the equipment back into operation.

The torque required for all fasteners mentioned in this section is specified in **Fastener Specifications** section.

8.3.1. Regular Inspection / Maintenance

Anchor Points

- Inspect the four (4) anchor points at each corner of the Solution.
- Make sure the fasteners are present and tightened to the appropriate torque.



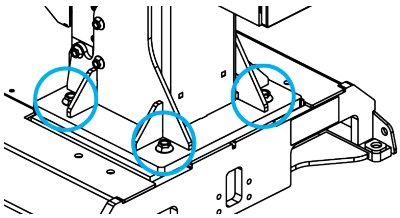
- Inspect the concrete around the four (4) anchor points at each corner of the Solution.
- Make sure the concrete is in good condition with no cracks, chips or other hazards.

Palletizer Structure

- Inspect the metallic structure of the base of the palletizer.
- Make sure the base does not display cracks, bends, surface damage or other signs of failure on sheet metal and welding spots or beads.
- Verify that the six (6) screws used to mount the removable stopper to the base are present and tightened to the appropriate torque.

Column

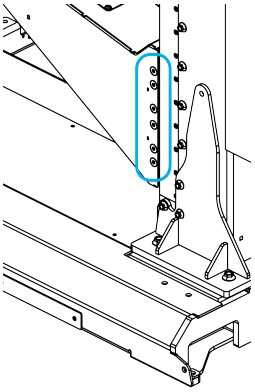
- Inspect the column.
- Verify that the four (4) screws holding the column to the base of the Solution are present and tightened to the appropriate torque.



- By lightly pressing on it, check that the cable chain cannot touch the screws on the column. Adjust the cable chain if necessary.

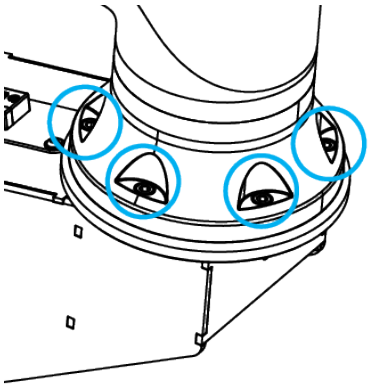
Carriage

Verify that the twelve (12) screws holding the carriage to the moving part of the linear axis are present and tightened to the appropriate torque.



Robot

- Inspect the flange joint between the robot's base and the carriage.
- Verify that the six (6) bolts at the base of the robot are present and tightened to the appropriate torque.



Cabling and Tubing

- Inspect all cabling and tubing, replace components presenting any defect.
- 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 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.

Linear Axis Brakes Test

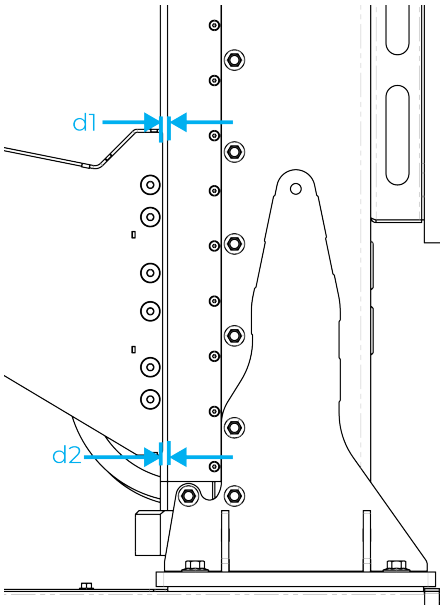
The system must be rebooted so that the brake test is performed.

Linear Axis

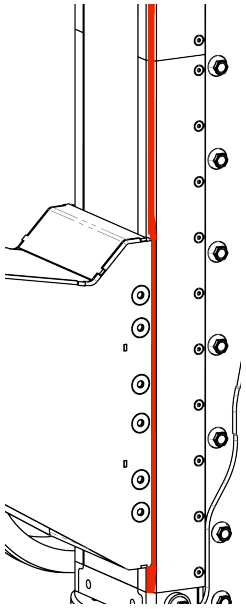
Listen for any unusual noises like grinding, squealing or clicking during operation. These can indicate wear or damage to the linears or ball screw bearings. If any unusual noise is present, the maintenance procedure **Linear Axis Internal Components Inspection section** must be performed.

Observe the movement of the carriage, it should be smooth and consistent. Any jerky, sticky or hesitant movement can suggest wear. If any unusual behavior is present, the maintenance procedure Linear Axis Internal Components Inspection must be performed.

Verify that the space between the carriage and the axis is constant. Measure the distances d1 and d2. If d1 > d2 + 0.7mm the maintenance procedure **Linear Axis Internal Components Inspection section** must be performed.



Verify if there are signs of wear on the chamfers on both sides of the linear axis (red area in the picture below). **If any sign of wear is present,** the maintenance procedure Linear Axis Internal Components Inspection must be performed.



8.3.2. Linear Axis Lubrication

In order to lubricate the linear axis, perform the following steps:

1. Follow the steps of the **Power Off and Lock Out Procedure**, making sure that the carriage is lowered to its minimum height.
2. Locate the two (2) axis covers located in the middle of the height of the axis. There is one cover on the right side and another on the left.
3. On both sides, remove the ten (10) M6 screws. Then, remove the covers. (use the set screws located at both ends of the covers as pullers to extract the covers).
4. Using a proper brush, apply a moderate quantity of grease (Magnalub-G) on the accessible portion of the ball screw.
5. Make sure that the area around the robot is clear. Then, power up the robot and move the carriage up so the grease fittings located on the linear bearings are accessible.
6. Follow the steps of the **Power Off and Lock Out Procedure** but this time, leave the carriage at its current position (do not lower it).
7. Secure the carriage at the current height according to local laws and regulations.
8. Use a grease gun to apply 2-4 cm^3 (0,06-0,14oz) of grease (Shell Gadus S2 V220 00) on the zerk located on each of the four (4) bearing blocks.
9. Power up the solution and bring the carriage back to its lower position. Power it off by following the steps of the **Power Off and Lock Out Procedure**.
10. Reinstall the two (2) side covers using the ten (10) M6 screws securing each cover. Then, tighten the screws.
11. Power up the solution and manually jog the axis on all its travel, then bring it back down. Repeat twice to ensure proper distribution of the lubricant.

8.3.3. Linear Axis Internal Components Inspection

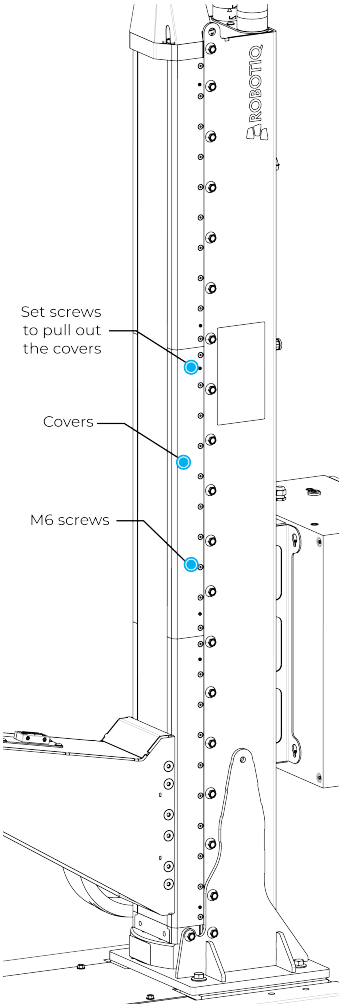
In order to visually inspect the internal components of the linear axis and verify the perpendicular play of linear bearings, perform the following steps:

1. Follow the steps of the **Power Off and Lock Out Procedure**, making sure that the carriage is lowered to its minimum height.

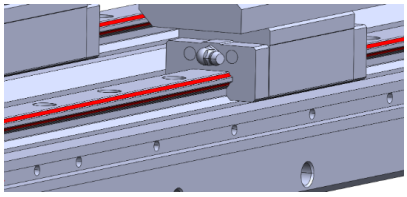
2. On both sides, remove the 60 M6 screws holding the 6 side covers.

3. Remove the 6 axis side covers located on the right side (3x) and on the left side (3x). (use the set screws located at both ends of the covers as pullers to extract the covers).

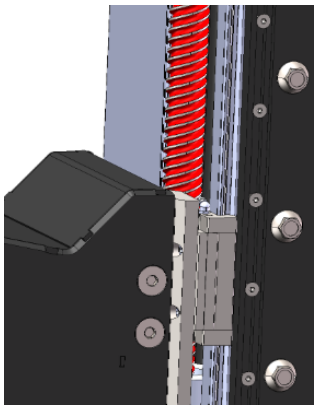
Along steps 4 to 8, special attention must be paid to any debris, dirt, metal fragment or metal shaving. These can indicate severe wear or damage and/or accelerate wear and damage the bearings. If the contaminants come from the environment they must be completely cleaned and the lubrication procedure must be performed after cleaning and inspection. If the contaminants originate from the bearings components, the linear axis must be replaced or repaired.



4. Inspect the rails raceways (red surfaces on the image below) for any signs of wear, damage or contamination. The raceways must be free of any scratch, rust, spalling (chipping, flaking or pitting on the surfaces) or grooving (wear tracks or grooves caused by the rolling elements). If any of these defects are detected, the linear axis must be replaced or repaired before restarting the palletizer. (A small inspection mirror could be used to inspect the internal raceways.).



5. Inspect the ball grooves of the ball screw (red surfaces on image) for any signs of wear, damage or contamination. The grooves must be free of any scratch, notch, rust, spalling (chipping, flaking or pitting on the surfaces) or grooving (wear tracks or grooves caused by the rolling elements). If any of these defects are detected, the linear axis must be replaced or repaired before restarting the palletizer.

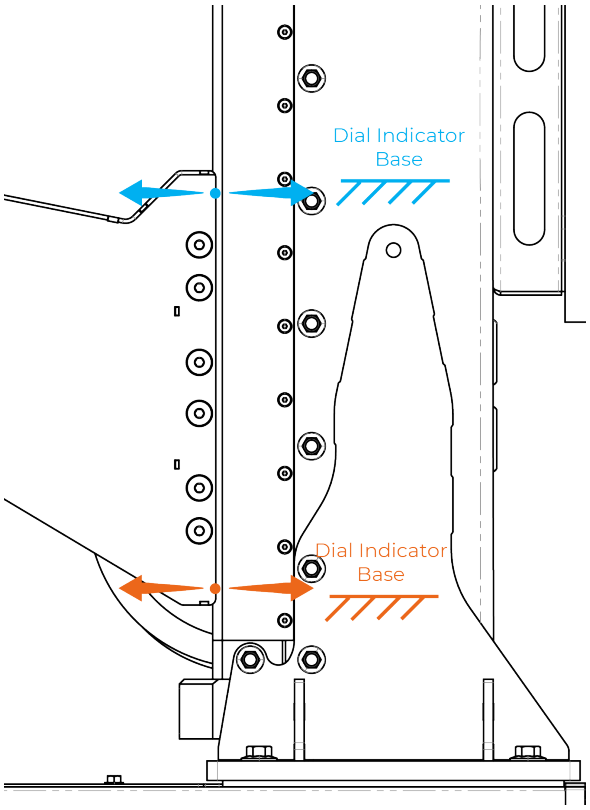


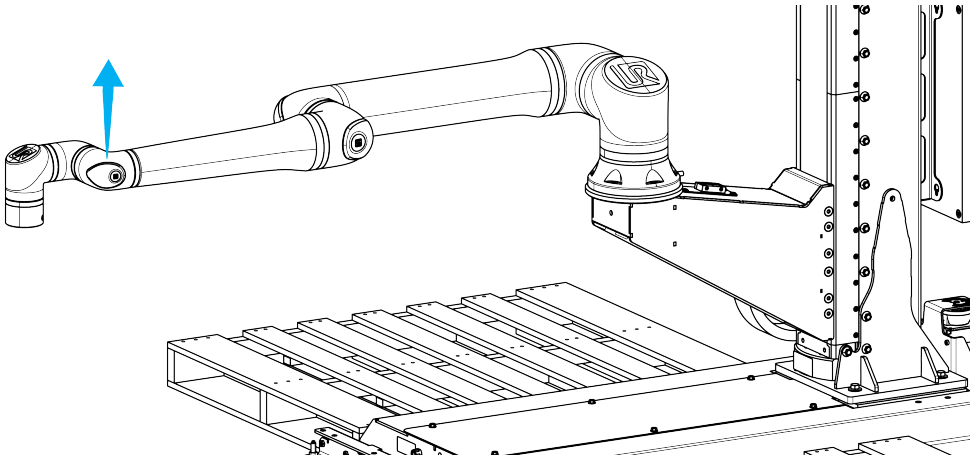
6. To inspect the entire length of the screw and rails, once the visible area has been inspected with the carriage in the lowest position, the carriage must be raised to allow inspection of the remaining sections hidden by the carriage. Power off the solution by following the appropriate steps of the **Power Off and Lock Out Procedure** section. The carriage must be safely supported in accordance with local regulations to prevent unintended descent during this procedure. Steps 4 and 5 must be repeated for inspection of the hidden sections.

7. Power up the solution and bring the carriage back to its lower position. Do not forget to remove the carriage support before moving it. Power it off by following the steps of the Power Off and Lock Out Procedure.

8. Inspect the 4 linear motion guides for any grease leak or any deformation of the end caps. If any of these defects are detected, the linear axis must be replaced or repaired.

9. Check the backlash of the linear bearings perpendicular to the movement. Using a dial gauge indicator, measure the axial backlash of the top and bottom bearings on the right and left sides (see picture **below). In order to measure the backlash, fully extend the robot toward the conveyor side, power it off** and apply an upward force of 600N to the first wrist joint (as shown in the picture below). If the resulting backlash is over 0,25mm at any of the four bearings locations, the linear axis must be replaced or repaired before restarting the palletizer.





10. Perform the axis lubrication procedure.
11. Reinstall the 6 side covers using the ten (10) M6 screws securing each cover.

8.3.4. Linear Axis Replacement / Complete Rebuild

Contact Robotiq support to obtain the procedure for the linear axis replacement or complete rebuild.

8.4. Fastener Specifications

Table 8-1 presents the tightening torque for screws and anchors.

Threads size	Location	Torque	
		[Nm]	[lb-ft]
1/2"-13	Conveyor side Wedge anchors (2x)	54	40.0
5/8"-11	Alley side Wedge anchors (2x)	81	60.0
M12	Removable Stopper (6x)	110[1]	81[1]
M16	Column base (4x)	150[1]	111[1]
M12	Column-Axis interface (40x)	80[1]	59[1]
M12	Axis-Carriage interface (12x)	95[1]	70[1]
M10	Robot-Carriage interface (6x)	Refer to UR20 or UR30 User Manual[2]	Refer to UR20 or UR30 User Manual[2]
M5	Electric motor flange (4x)	5.5[1]	4[1]
M6	Electric motor shaft-gearbox coupling (1x)	15[1]	11[1]
M6	Linear Axis side covers (60x)	8.5	6.3

Table 8-1: Torque Values - Palletizing Solution

[1] Medium strength threadlocker must be applied (loctite 243 or equivalent).
[2] Use serrated Belleville washers.

8.5. Cleaning

The solution should be cleaned at regular intervals depending on the environment in which it is located. Cleaning must only be performed once the solution is powered down and all energy sources are locked out according to the **Power Off and Lock Out Procedure section** section.

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.

8.6. Storage

Ensure short storage times. Choose cool, dry and well-shaded environments.

8.6.1. PowerPick20/30 Vacuum Gripper (Optional)

For more information about the inspection guidelines for the Vacuum Gripper, please refer to the **Maintenance** section of the PowerPick20/30 user manual available at support.robotiq.com.

9. 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
Tower Light for Palletizing Solution	1 x Tower Light for the Robotiq Palletizing Solution	TOWER-LIGHT
Replacement Pallet Sensor for AX20/AX30	• 1 x photoelectric sensor • 1 x mounting bracket • 1 x screw kit	PAL-SENS-PHOTOELEC
Box Sensor Kit - Palletizing Solution	• 1 x Box Sensor • 1 x Cable • 1 x Mounting Bracket	PAL-BOX-SENS-KIT

9.1. PowerPick20/30 (Optional Gripper) Spare Parts & Accessories

Refer to the **Spare Parts, Kits and Accessories** section of the PowerPick User Manual (support.robotiq.com) for more information.

10. Troubleshooting

10.1. Palletizing Solution (excluding the PowerPick20/30 Vacuum Gripper)

Symptom / Issue	Cause	Solution
Robot comes to a robot stop (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 high.	Decrease 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 low.	Increase the pallet height value.
Robot stop (protective stop) triggered by robot placing a box on first layer	Box height value is too low.	Verify the box height value.
	Pallet height value is too low.	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. • If 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.	Pedestal not centered on the base.	Execute the centering procedure found in the .

A collision occurred	Incorrect TCP.	Confirm that the TCP has been configured correctly
	TCP does not account for the bracket used.	Configure the TCP correctly.
	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 for more details.
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 box presence input is active when a box is at the picking position.
"Please use the Safeguard reset before starting the linear axis" error message	Multiple possible causes.	Power off the Robotiq control box, then back on.
	The Robotiq box to UR controller cable is not properly connected.	Inspect the connections. Please refer to the Safety Connections section.
	"Safety configuration" and/or "System Emergency Stopped" functions are not configured correctly.	Make sure the "System Emergency Stopped" function is configured correctly (Installation tab > Safety > I/O).
	Safety devices or reset button misconnection.	Inspect the safety relay inputs states to confirm the safety devices signals are active.
	Safety relay is not functioning properly.	See the safety relay LED state.
Robot comes to a robot stop (protective stop) during palletizing	Joint limit exceeded.	• Verify that the joint speed and position limits have been configured correctly. Please refer to the for more information. • Decrease the value of the acceleration parameter in the Palletizer node.

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.
"org.apache.xmlrpc.CmlRpcExecption: One parameter is invalid in the fromjson request" error message	Linear axis may be below home position (0 mm).	• Bring the linear axis above home position (0 mm) before starting the program. • Update to the latest version of the Copilot software.

10.2. PowerPick20/30 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

CAUTION

Unless specified, any repairs performed on the Vacuum Gripper or Vacuum Generator should be done by Robotiq, otherwise the warranty will be void.

For more information on troubleshooting the PowerPick20/30 Vacuum Gripper, please refer to the **Troubleshooting** section of the PowerPick20/30 user manual, available at support.robotiq.com. If necessary, send an inquiry to the support team at : support@robotiq.com.

11. 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 **Specifications** 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, PowerPick20/30 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.

12. Harmonized Standards

12.1. EC Declaration of Incorporation

12.1.1. 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 – AX Series (AX10 & AX20/AX30)
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, 1.2.4.3, 1.2.6, 1.3.1, 1.3.2, 1.3.4, 1.3.8.1, 1.3.9, 1.5.1, 1.5.5, 1.5.6, 1.6.1, 1.6.3, 1.7.1, 1.7.2, 4.1.2.3

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*
- **2014/30/EU (EMC Directive)**
  - *EN 61000-6-2:2016*
  - *EN 61000-6-4:2007 + A1:2011.*

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 2024-07-12.

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

12.1.2. PowerPick20/30 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 & PowerPick20/30)
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

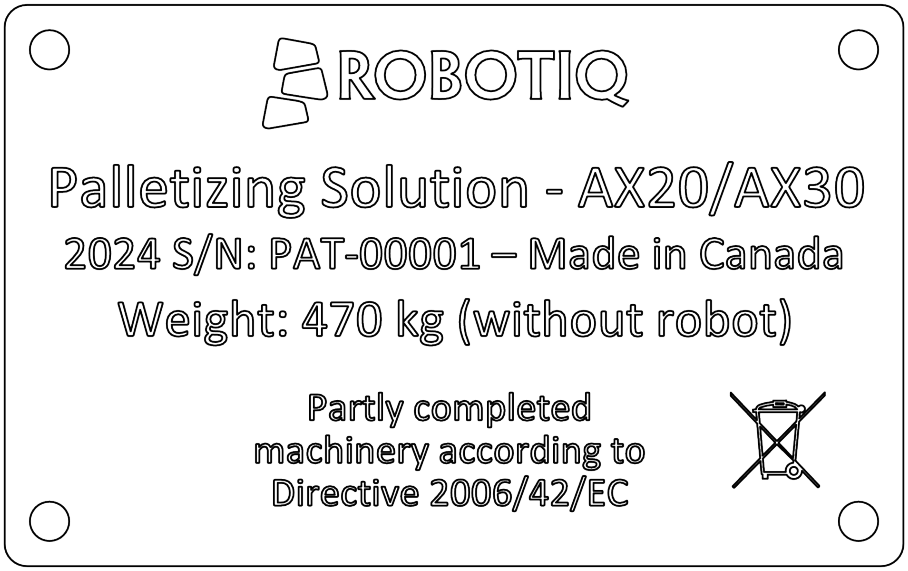
The relevant technical documentation is compiled in accordance with part B of Annex VII of Directive 2006/42/EC and will be presented electronically by the manufacturer to competent national authorities, if required with a substantiated reason.

Signed in Lévis on 2024-07-12.

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

12.2. Identification plate

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



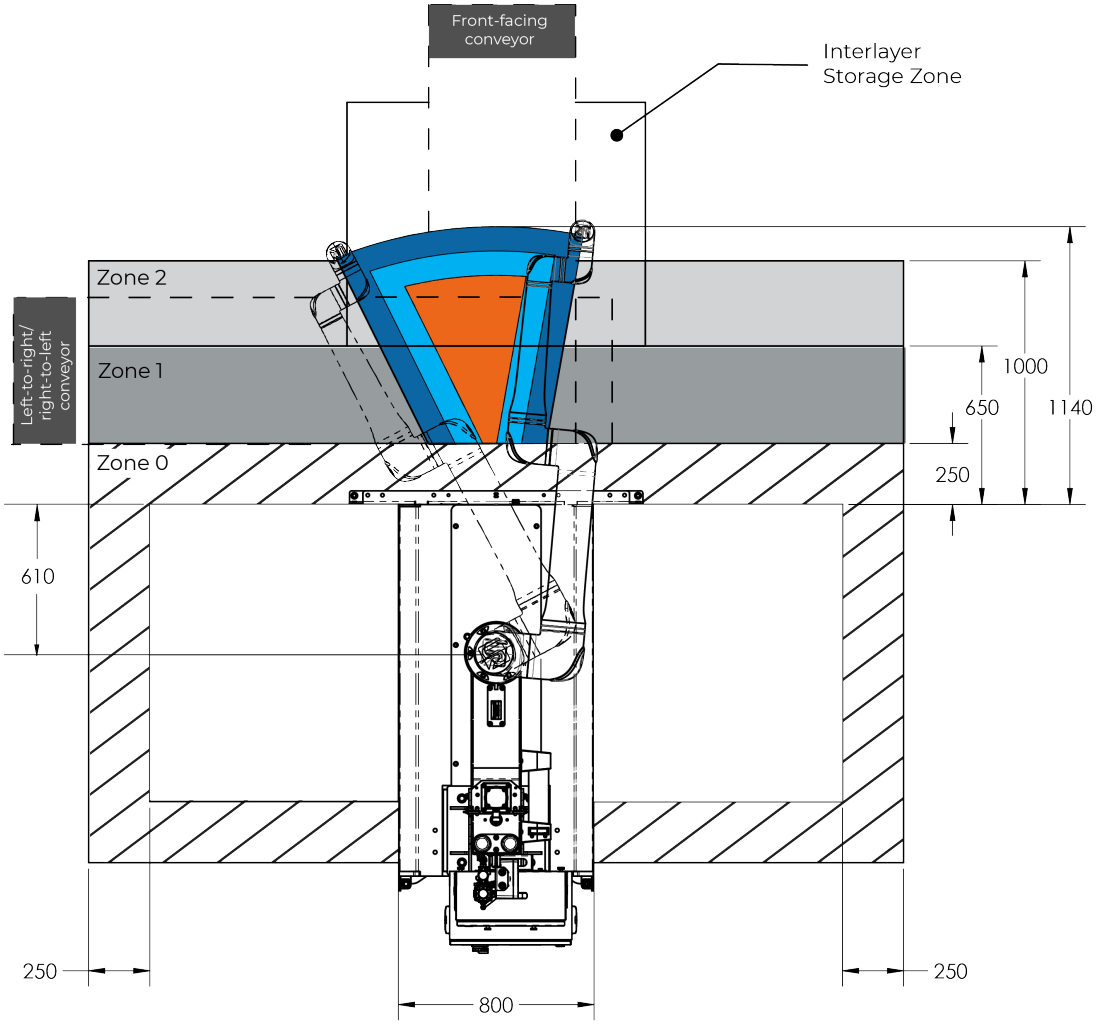
12.3. EtherCAT® Master

The Robotiq Copilot URCap hosts an EtherCAT® master to control the linear axis drive.

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

13. Appendix

13.1. Palletizing Cell Layout



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

Fig. 13-1: AX20 Palletizing Cell Layout - Top View

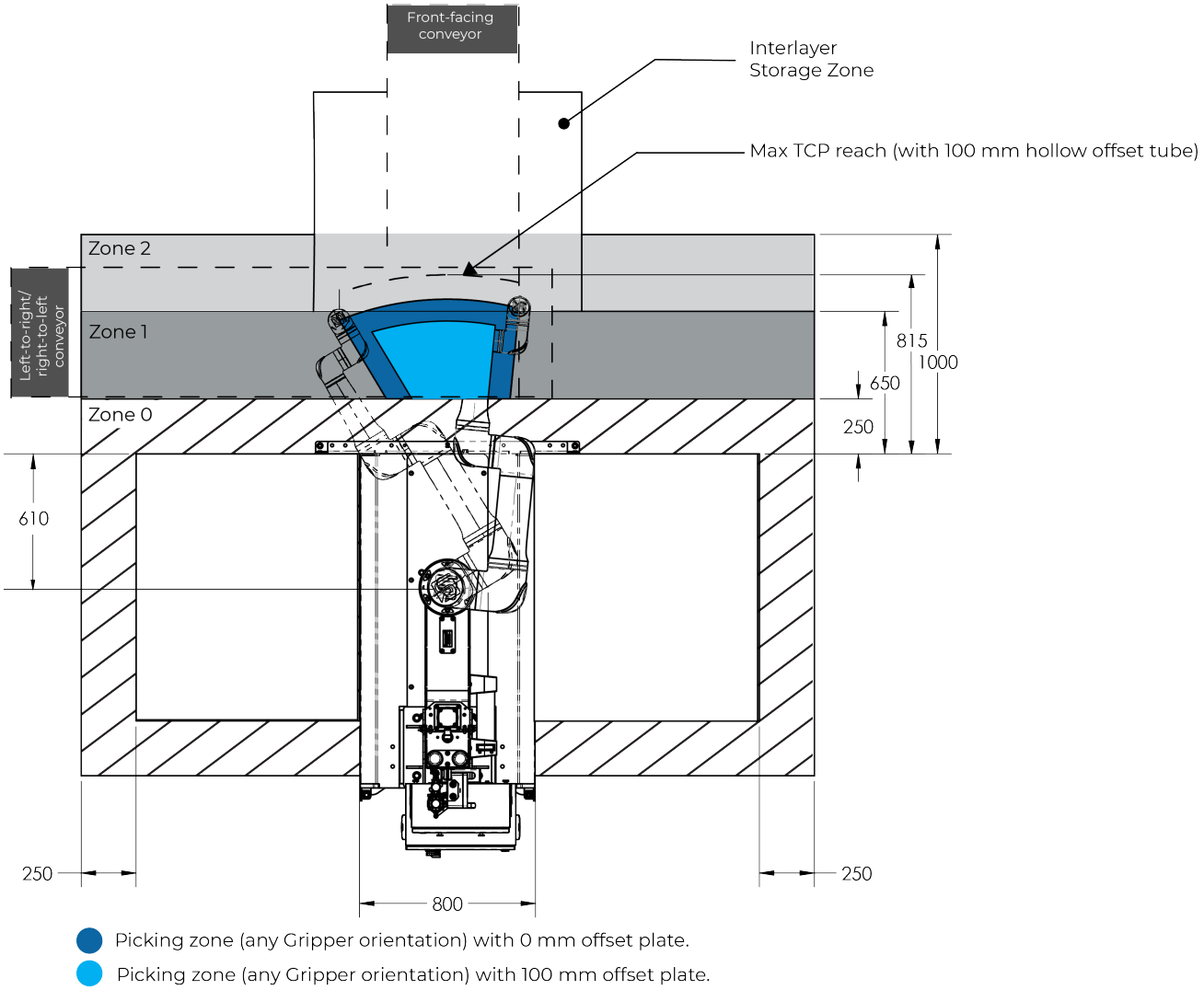


Fig. 13-2: AX30 Palletizing Cell Layout - Top View

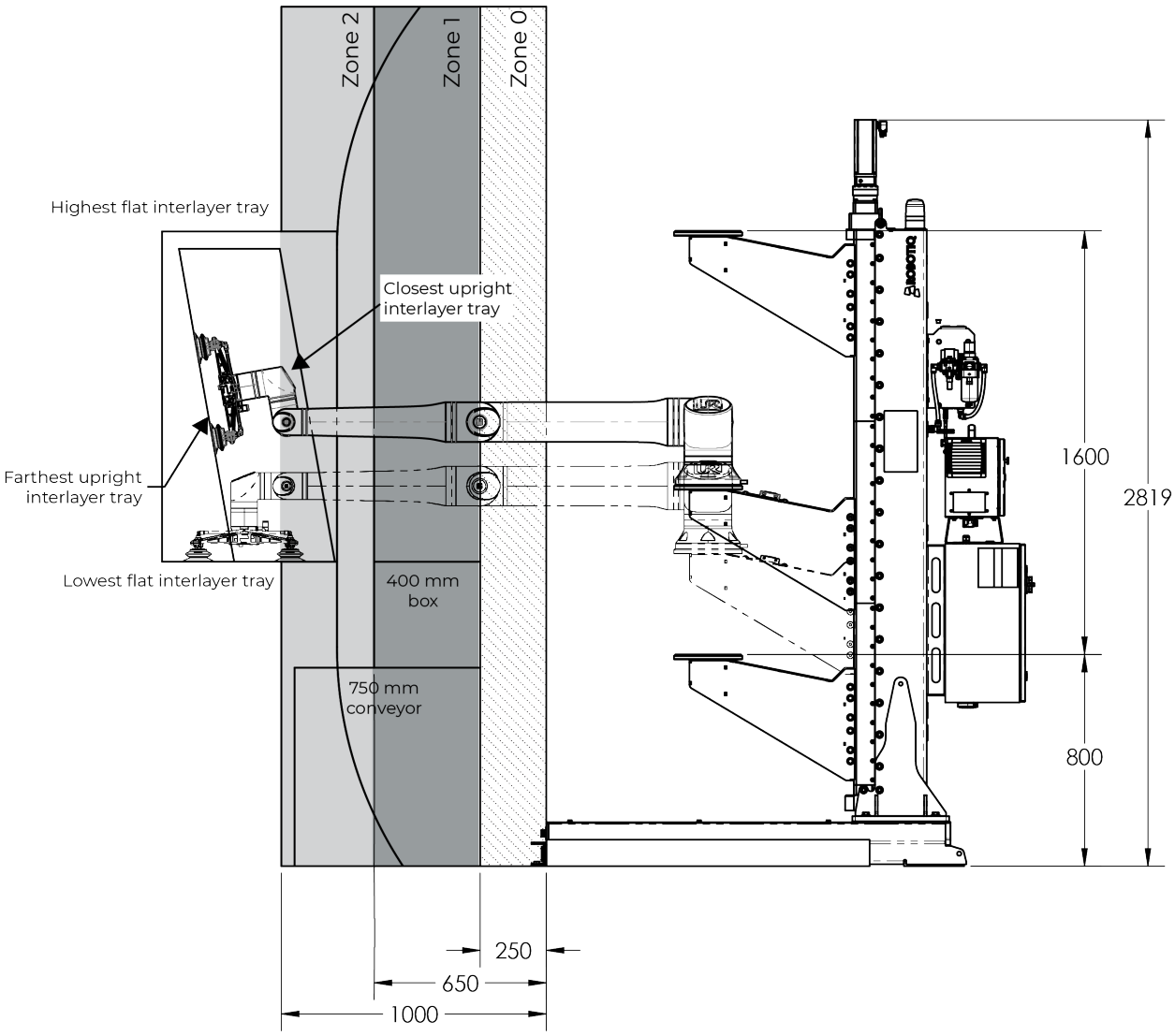


Fig. 13-3: AX20 Palletizing Cell Layout - Side View

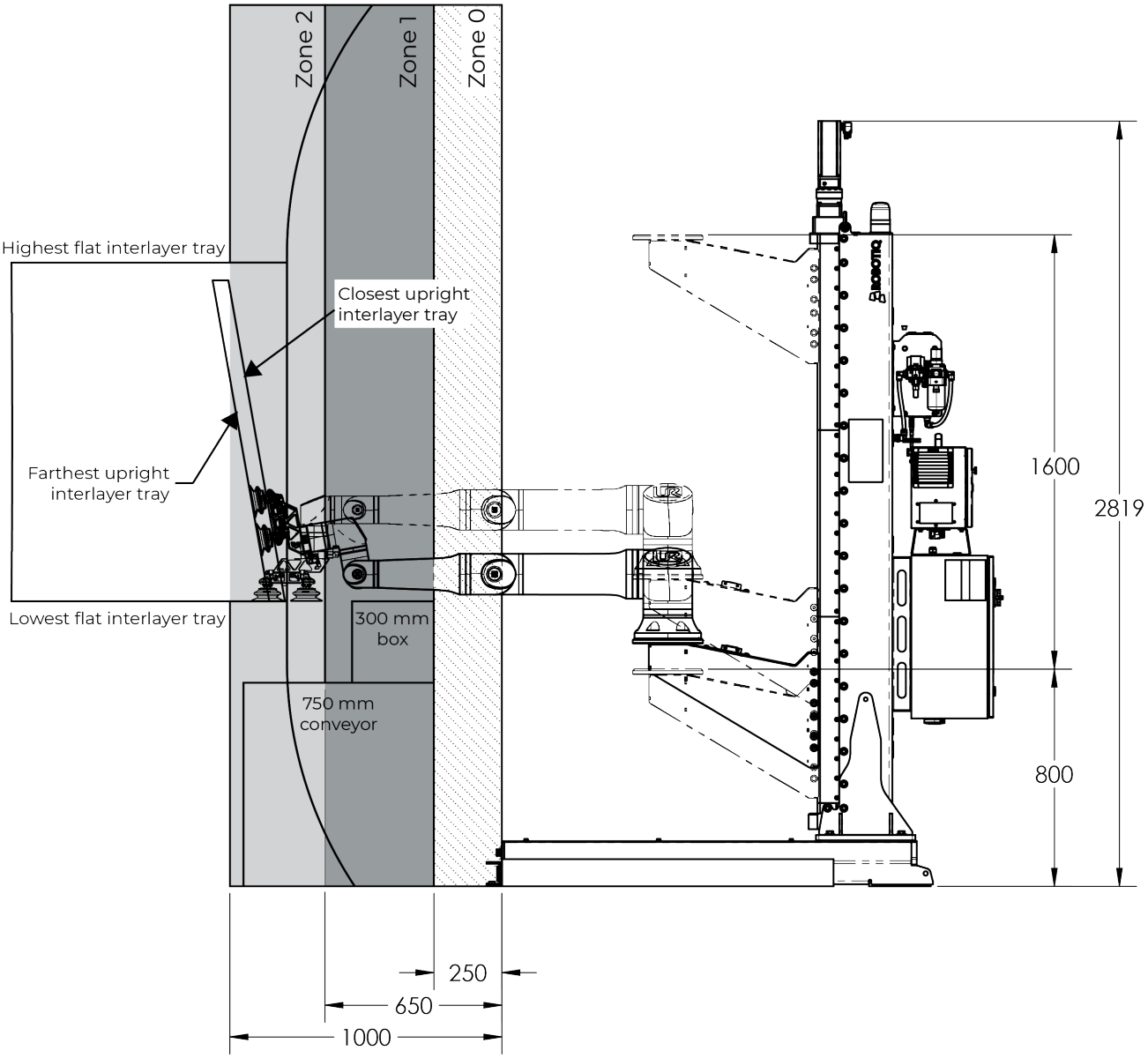


Fig. 13-4: AX30 Palletizing Cell Layout - Side View

ID	PURPOSE
ZONE 0	**Approach Zone** Zone reserved for approach motion during the box placement process. Keep this zone free of obstacles. Conveyors, safety features and other physical devices should not enter this zone. A distance of 250 mm corresponds to the approach distance for boxes of 600 x 400 x 400 mm.

ID	PURPOSE
ZONE 1	**Presentation and Transport Zone** Zone used for box presentation (usually via conveyor) and transport to Zone 0 and to the pallet. Physical devices/obstacles can only be present in this zone if they are found at a position lower than the top of the conveyor, and part of the conveyor dimensions defined in the Palletizer node settings Such devices/obstacles may force the robot to take longer trajectories and lower the palletizing speed.
ZONE 2	**Extension Zone** Same characteristics as Zone 1: • For AX30, if the box is less than 300 mm obstacles can be present. • For AX20, if the box is less than 400 mm obstacles can be present.
ZONE 3	**Interlayer Storage Zone** Suggested location for the storage of interlayer material. This suggested location is acceptable only if obstacles can be present in zone 2. Please note that based on this configuration, the robot and gripper can only reach the end of the interlayer zone/material that is closest to the Solution.

CAUTION

Failure to follow this recommended layout may result in the inability to operate the Solution.

The dimensions found in the figure are conservative.

If for any reason it is impossible for the user to implement this layout, please contact Robotiq's application experts for assistance and support.

Please be aware that the layout design must incorporate the designated safeguard zones surrounding the system. These zones should be accounted for in the layout.

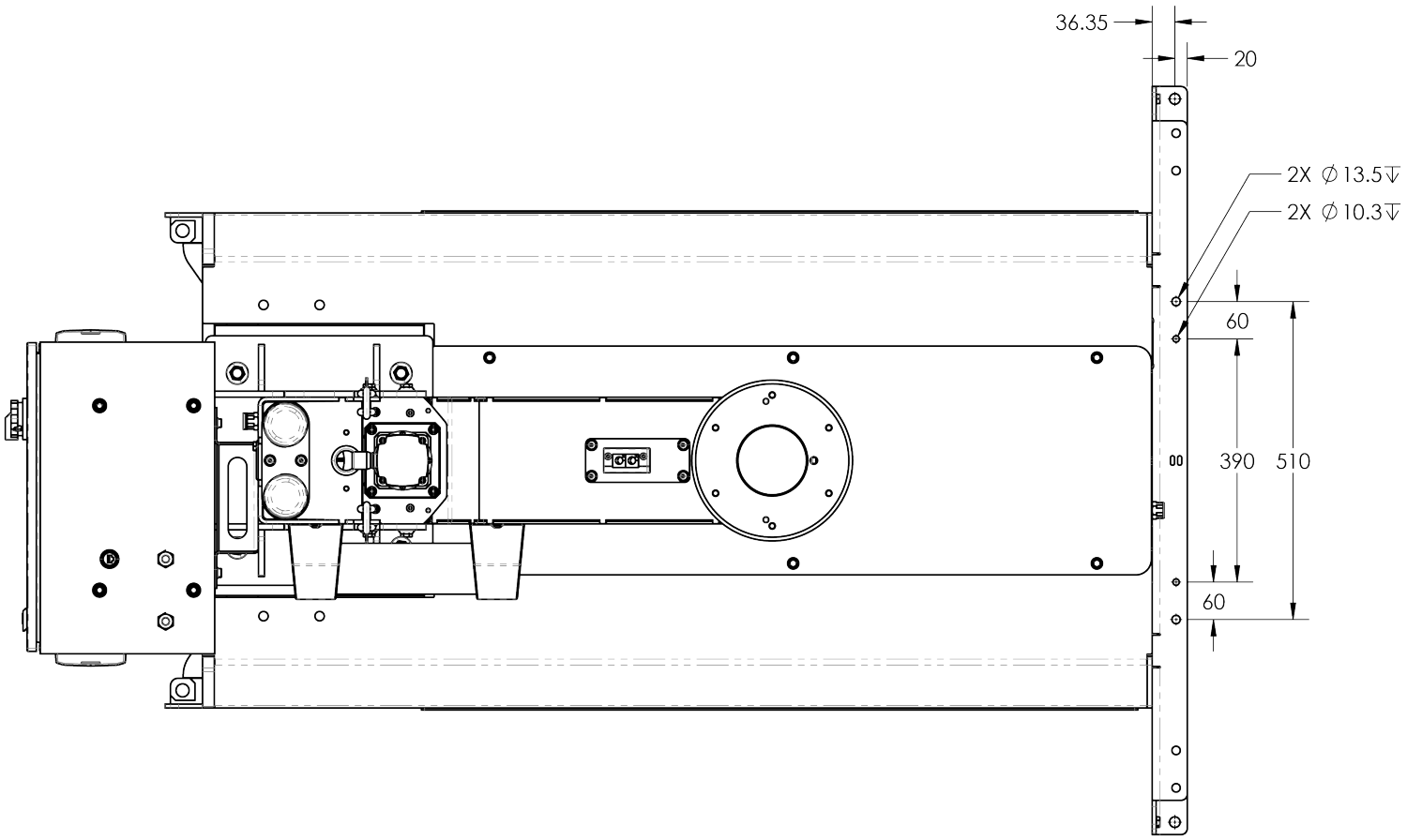
13.2. Conveyor Positioning Holes

Some holes are present on the removable stopper and can be used to attach the conveyor to the palletizer.

NOTICE

The mounting component of the conveyor should be placed directly under the upper lip of the

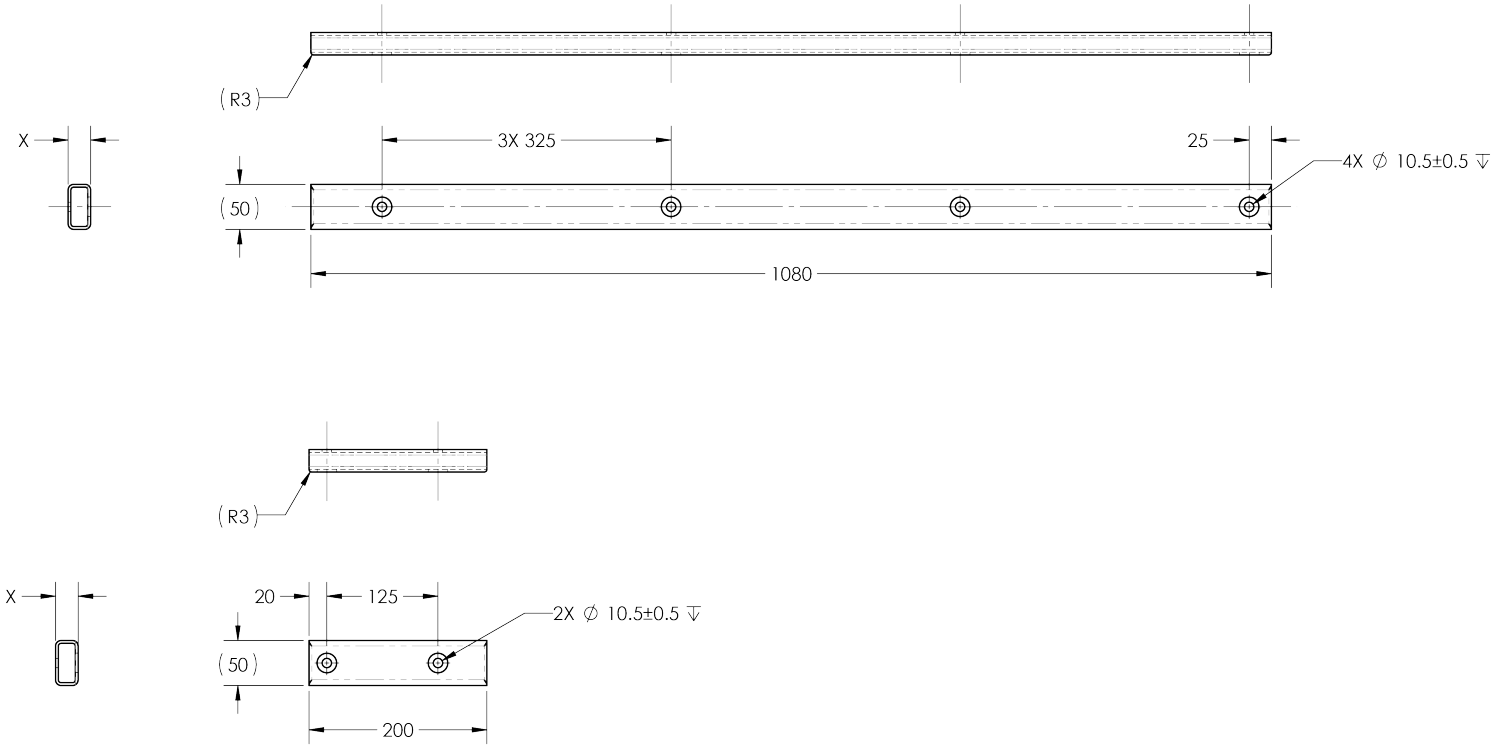
removable stopper to facilitate the removal of the Solution from the anchors.


36.35
20
2X ∅13.5↧
2X ∅10.3↧
60
390
510
60

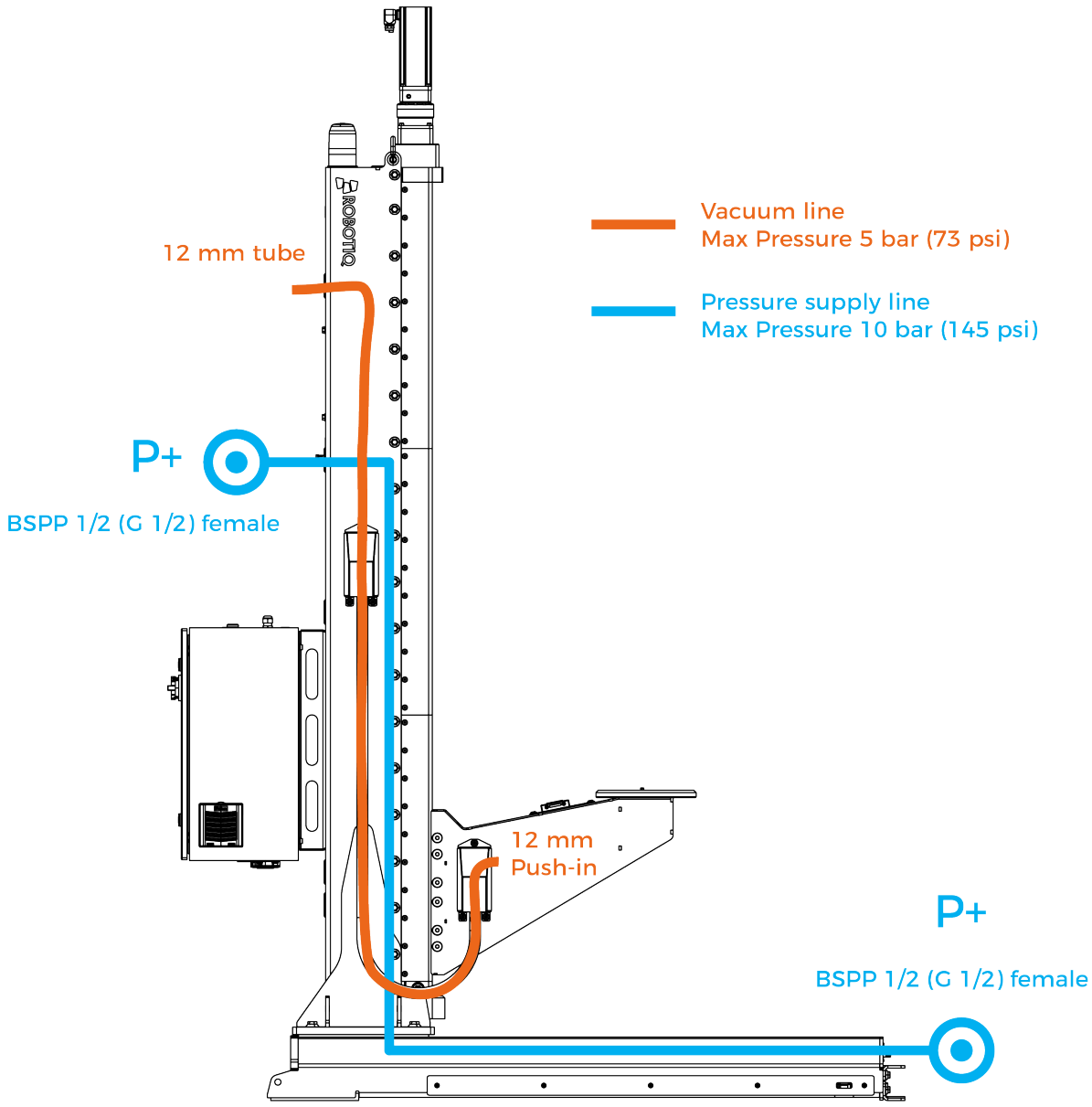
13.3. Overhang Spacers

NOTES:

1. THE RESULTING OVERHANG (ON ONE SIDE OF THE PALLET) WILL BE 3 MM LOWER THAN THE VALUE OF X.
2. THE DRAWING SHOWS THE TWO OVERHANG SPACERS FOR THE RIGHT (R) PALLET.
3. THE TWO SPACERS FOR THE LEFT (L) PALLET MUST BE MIRRORED ALONG A VERTICAL AXIS.



13.4. Pneumatic Diagram



14. 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