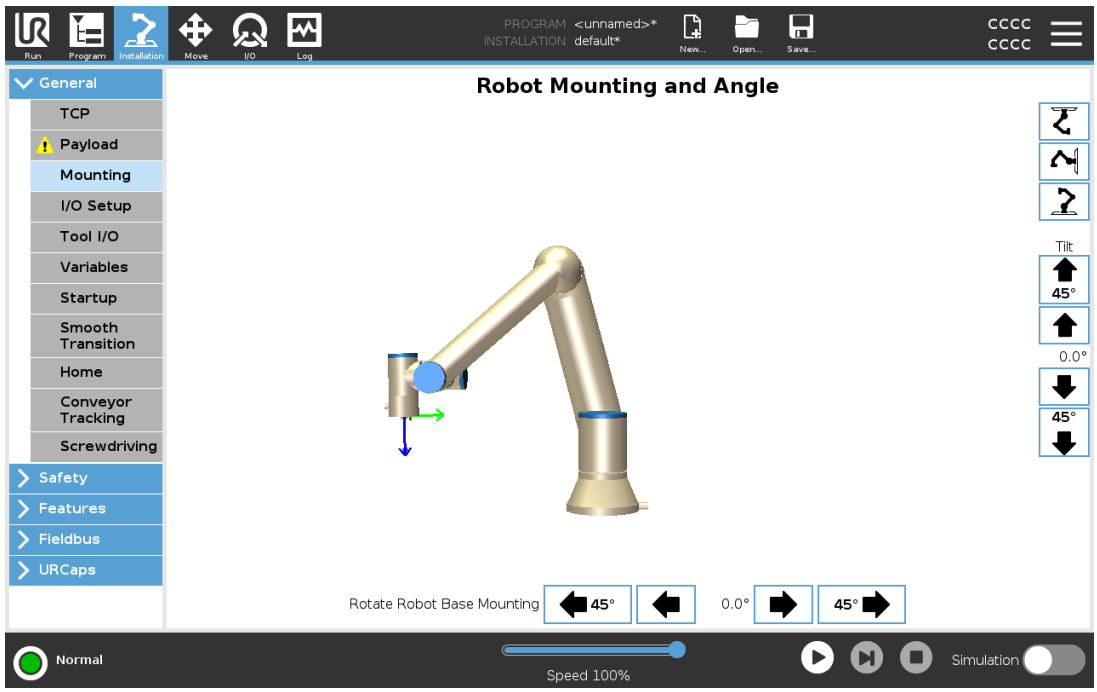
The buttons on the lower part of the screen are used to rotate the mounting of the Robot arm to match the actual mounting.

WARNING

Use the correct installation settings. Save and load the installation files with the program.



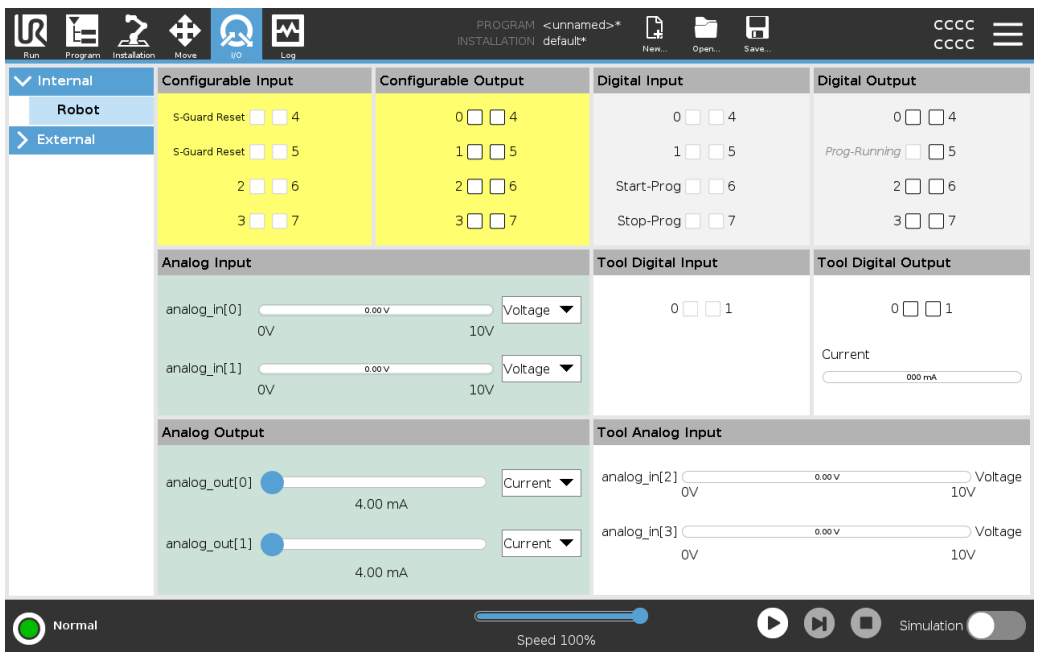
10.5.12. Using the I/O Tab

Description

Use the I/O Tab screen to monitor and set the live I/O signals from/to the Control Box.

The screen displays the current state of the I/O, including during program execution. The program stops if anything is changed during execution. At program stop, all output signals retain their states. The screen updates at 10Hz, so a very fast signal might not display properly.

Configurable I/Os can be reserved for special safety settings defined in the safety I/O configuration section of the installation (see I/O); those which are reserved will have the name of the safety function in place of the default or user defined name.
Configurable outputs that are reserved for safety settings are not togglable and will be displayed as LED's only.



Voltage

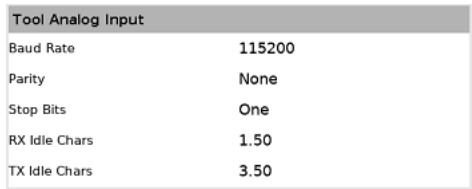
When the Tool Output is controlled by the user, you can configure Voltage. Selecting a URCap removes access to Voltage.

Analog Domain Settings

The analog I/O's can be set to either current [4-20mA] or voltage [0-10V] output. These settings are persistent over restarts of the robot controller and saved in the installation. Control over the tool I/Os could be assigned to a URCap in **Tool I/O** of the **Installation** tab. Selecting a URCap removes user's control over tool's analog I/O.

Tool Communication Interface

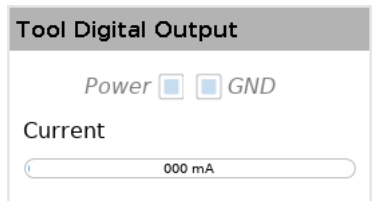
When the **Tool Communication Interface TCI** is enabled, the tool analog input becomes unavailable. On the **I/O** screen, the **Tool Input** field appears as shown.



Dual Pin power

When **Dual Pin Power** is enabled, the tool digital outputs must be named as follows:

- tool_out[0] (Power)
- tool_out[1] (GND)



10.5.13. Analog Input: Communication Interface

Description

The Tool Communication Interface (TCI) enables the robot to communicate with an attached tool via the robot tool analog input. This removes the need for external cabling. Once the Tool Communication Interface is enabled, all tool analog inputs are unavailable

Tool Communication Interface

1. Tap the Installation tab and under General tap Tool I/O.
2. Select Communication Interface to edit TCI settings.
   Once the TCI is enabled, the tool analog input is unavailable for the I/O Setup of the Installation and does not appear in the input list. Tool analog input is also unavailable for programs as Wait For options and expressions.
3. In the drop-down menus under Communication Interface, select required values. Any changes in values are immediately sent to the tool. If any installation values differ from what the tool is using, a warning appears.

10.5.14. Digital Output

Description

The tool communication interface allows two digital outputs to be independently configured. In PolyScope, each pin has a drop-down menu that allows the output mode to be set. The following options are available:

- Sinking: This allows the pin to be configured in an NPN or Sinking configuration. When the output is off, the pin allows a current to flow to the ground. This can be used in conjunction with the PWR pin to create a full circuit.
- Sourcing: This allows the pin to be configured in a PNP or Sourcing configuration. When the output is on, the pin provides a positive voltage source (configurable in the IO Tab). This can be used in conjunction with the GND pin to create a full circuit.
- Push / Pull: This allows the pin to be configured in a Push / Pull configuration. When the output is on, the pin provides a positive voltage source (configurable in IO Tab). This can be used in conjunction with the GND pin to create a full circuit When the output is off, the pin allows a current to flow to the ground.

After selecting a new output configuration, the changes take effect. The currently loaded installation is modified to reflect the new configuration. After verifying the tool outputs are working as intended, make sure to save the installation to prevent losing changes.

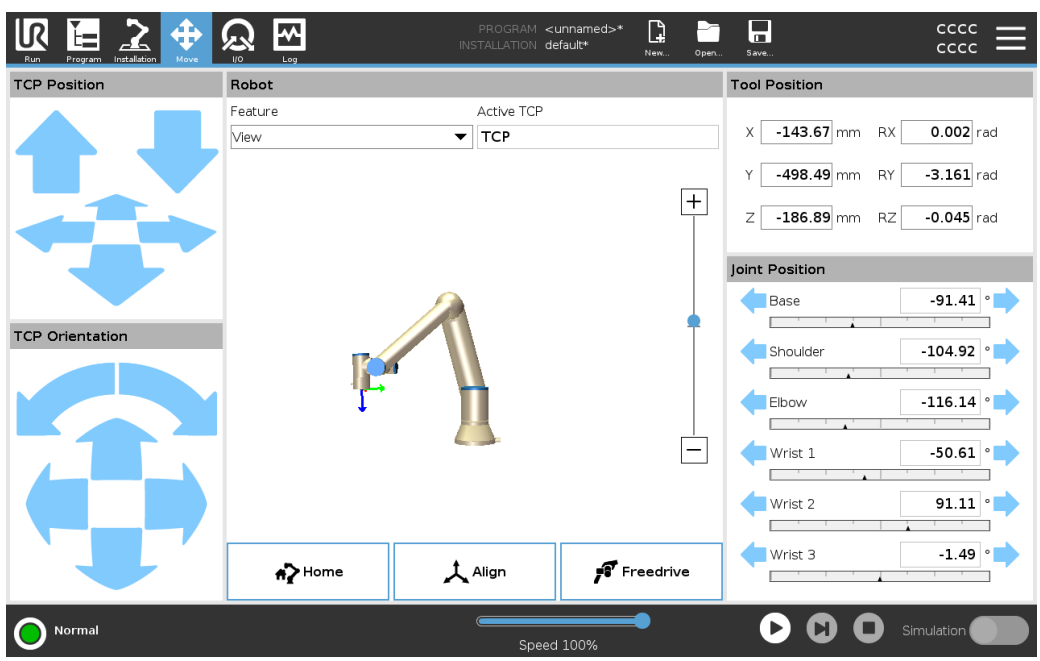
Dual Pin Power

Dual Pin Power is used as a source of power for the tool. Enabling Dual Pin Power disables default tool digital outputs.

10.5.15. Using the Move Tab

Description

Use the Move Tab screen to move (jog) the robot arm directly, either by translating/rotating the robot tool, or by moving robot joints individually.



To use the Move Tool arrows

Hold down any of the **Move Tool** arrows to move the robot arm in the corresponding direction.

- The **Translate arrows** (upper) move the tool flange in the direction indicated.
- The **Rotate arrows** (lower) change the orientation of the tool in the indicated direction. The rotation point is the Tool Center Point (TCP), i.e.the point at the end of the robot arm that gives a characteristic point on the tool. The TCP is shown as a small blue ball.

Robot

If the current position of the TCP approaches a safety plane, a trigger plane, or the orientation of robot tool is near the tool orientation boundary limit , a 3D representation of the proximate boundary limit is shown. The visualization of boundary limits is disabled during program execution.

Safety planes display in yellow and black with an arrow indicating which side of the plane, the robot TCP is allowed to be positioned.

Trigger planes display in blue and green with an arrow indicating the side of the plane, where the **Normal** mode limits are active.

The tool orientation boundary limit is visualized with a spherical cone together with a vector indicating the current orientation of the robot tool. The inside of the cone represents the allowed area for the tool orientation (vector).
When the robot TCP is no longer in proximity of the limit, the 3D representation disappears. If the TCP is in violation or very close to violating a boundary limit, the visualization of the limit turns red.

Feature

Under **Feature**, you can define how to control the robot arm relative to **View**, **Base** or **Tool** features. For the best feel for controlling the robot arm you can select the **View** feature, then use **Rotate arrows** to change the viewing angle of the 3D image to match your view of the real robot arm.

Active TCP

In the **Robot** field, under **Active TCP**, the name of the current active Tool Center Point (TCP) is displayed.

Home

The **Home** button accesses the **Move Robot into Position** screen, where you can hold down the **Auto** button to move robot into position previously defined under Installation. The Home button's default setting returns the Robo Arm to an upright position .

Freedrive

The on-screen **Freedrive** button allows the Robot Arm to be pulled into desired positions/poses.

Align

The **Align** button allows the Z axis of the active TCP to align to a selected feature.

Tool Position

The text boxes display the full coordinate values of the TCP relative to the selected feature. You can configure several named TCPs (see). You can also tap **Edit pose** to access the **Pose Editor** screen.

Joint Position

The **Joint Position** field allows you to directly control individual joints. Each joint moves along a default joint limit range from − 360° to + 360°, defined by a horizontal bar. Once the limit is reached you cannot move a joint any further. You can configure joints with a position range different from the default, this new range is indicated with red zone inside the horizontal bar.

Using Freedrive in the Move tab

The **Freedrive** button shall only be used in applications if allowed by the risk assessment.

WARNING

Failure to correctly configure the mounting setting can result in unwanted robot arm movement when you use the **Freedrive** button.

- Payload settings and robot mounting settings shall be set correctly before using Freedrive.
- All personnel shall remain outside the reach of the robot arm, when **Freedrive** is in use.

WARNING

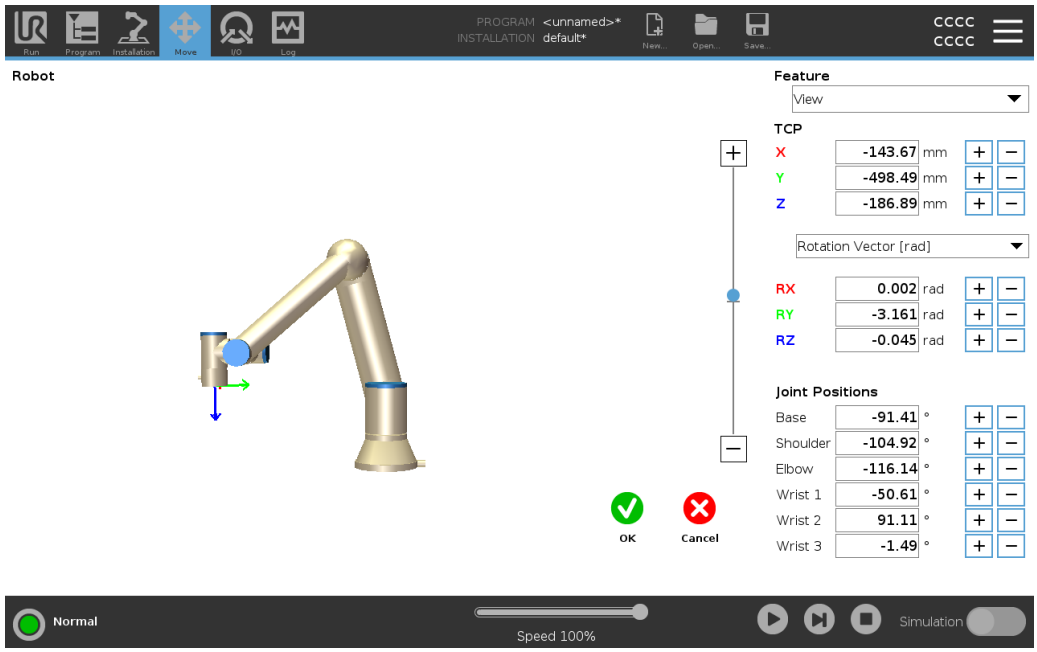
Failure to correctly configure the installation settings, can increase the risk of the robot arm falling during **Freedrive**, due to payload errors.

- Verify the installation settings are correct (e.g. Robot mounting angle, payload mass and payload center of gravity offset) . Save and load the installation files along with the program.
- Save and load the installation files along with the program.

10.5.16. Pose Editor

Description

Once you access the **Pose Editor** screen, you can precisely configure a target joint positions, or a target pose (position and orientation) for the TCP. Note: This screen is **offline** and does not control the Robot Arm directly.



Robot

The 3D image shows the current Robot Arm position. The **shadow** shows the Robot Arm target position controlled by the specified values on the screen. Press the magnifying glass icons to zoom in/out or drag a finger across it to change the view.
If the specified target position of the robot TCP is close to a safety or trigger plane, or the orientation of robot tool is near the tool orientation boundary limit, a 3D representation of the proximate boundary limit is shown. Safety planes are visualized in yellow and black with a small arrow representing the plane normal, which indicates the side of the plane on which the robot TCP is allowed to be positioned. Trigger planes are displayed in blue and green and a small arrow pointing to the side of the plane, where the **Normal** mode limits are active. The tool orientation boundary limit is visualized with a spherical cone together with a vector indicating the current orientation of the robot tool. The inside of the cone represents the allowed area for the tool orientation (vector). When the target robot TCP is no longer in proximity of the limit, the 3D representation disappears. If the target TCP is in violation or very close to violating a boundary limit, the visualization of the limit turns red.

Feature and Tool Position

The active TCP and coordinate values of the selected feature are displayed. The **X**, **Y**, **Z** coordinates specify tool position. The **RX**, **RY**, **RZ** coordinates specify orientation.
Use the drop down menu above the **RX**, **RY** and **RZ** boxes to choose the orientation representation type:

- **Rotation Vector `[rad]`** The orientation is given as a *rotation vector*. The length of the axis is the angle to be rotated in radians, and the vector itself gives the axis about which to rotate. This is the default setting.
- **Rotation Vector `[°]`** The orientation is given as a *rotation vector*, where the length of the vector is the angle to be rotated in degrees.
- **RPY `[rad]`** *Roll*, *pitch* and *yaw* (*RPY*) angles, where the angles are in radians. The RPY-rotation matrix (X, Y', Z" rotation) is given by:
  $R_{rpy}(\gamma, \beta, \alpha) = R_Z(\alpha) \cdot R_Y(\beta) \cdot R_X(\gamma)$
- **RPY `[°]`** *Roll*, *pitch* and *yaw* (*RPY*) angles, where angles are in degrees.

You can tap the values to edit the coordinates. You can also tap the **+** or **-** buttons to the right of a box to add/subtract an amount to/from the current value. Or you can hold down a button to directly increase/decrease the value.

Joint Positions

Individual joint positions are specified directly. Each joint position can have Joint Limit range from $-360°$ to $+360°$. You can configure Joint Positions as follows:

- Tap the joint position to edit the values.
- Tap the **+** or **-** buttons to the right of a box to add or subtract an amount to/from the current value.
- Hold down a button to directly increase/decrease the value.

OK Button

If you activate this screen from the **Move** screen (see), tap the **OK** button to return to the **Move** screen. The Robot Arm moves to the specified target. If the last specified value was a tool coordinate, the Robot Arm moves to the target position using movement type **MoveL**; or it uses movement type **MoveJ** if a joint position was specified last.

Cancel Button

The **Cancel** button exits the screen discarding all changes.
