USER MANUAL

FOR USING ONROBOT SANDER WITH HEX ON UR ROBOTS

v1.17.0

Original Instructions

Contents

1. Introduction

1.1. Important Safety Notice

DANGER:

You must read, understand, and follow all safety information in this manual, and the robot manual and all associated equipment before initiating robot motion. Failure to comply with safety information could result in serious injury or death.

1.2. Scope of the Manual

The manual covers the following OnRobot products and their components:

1.2.1. Sander

Tool	Version
OnRobot Sander	v1

1.2.2. HEX-E/H QC

Sensors	Version
HEX-E QC	v3
HEX-H QC	v3

NOTE:

Generally, the products without the Quick Changer v2 interface, are not in the scope of this manual.

1.2.3. Software and Firmware

1.2.3.1. URCap Software

The manual covers the following software versions:

Software	Version
URCap	v5.17.0

1.2.3.2. Compute Box Software

The manual covers the following Compute Box software version:

Software	Version
Compute Box	v5.17.0

NOTE:

When the used Compute Box has lower software/firmware version, update the Compute Box. For detailed instructions, see 7.1.6. Web Client: Update Menu.

1.2.3.3. HEX-E/H QC Firmware

Firmware	Version
HEX-E/H QC	v2.22

1.3. Naming Convention

1.3.1. Compute Box/Eye Box

Eye Box and Compute Box are used interchangeably.

1.3.2. HEX-E QC/HEX-H QC

The HEX-E QC and HEX-H QC names as model variants are used separately or together as HEX-E/H QC if the information is relevant for both variants.

1.3.3. Sander

In this user manual, the OnRobot Sander is called SDR or Sander only.

1.4. Copyright

2. Safety

The robot integrators are responsible for ensuring that the applicable safety laws and regulations in the country concerned are observed and that any significant hazards in the complete robot application are eliminated. This includes, but is not limited to:

- Performing a risk assessment for the complete robot system
- Interfacing other machines and additional safety devices if defined by the risk assessment
- Setting up the appropriate safety settings in the robot software
- Ensuring that the user will not modify any safety measures
- Validating that the total robot system is designed and installed correctly
- Specifying instructions for use
- Marking the robot installation with relevant signs and contact information of the integrator
- Collecting all documentation in a technical file; including the risk assessment and this manual

2.1. Intended Use

OnRobot tools and accessories are intended to be used on collaborative robots and light industrial robots with different payloads depending on the end-of-arm tooling specifications. OnRobot tools and accessories are normally used in pick-and-place, palletizing, machine tending, assembly, quality testing and inspection and surface finishing applications.

The end-of-arm tooling and the accessories should only operate under conditions noted in **8.1. Technical Sheets** section.

Any use or application deviating from intended use is deemed to be impermissible misuse. This includes, but is not limited to:

- Use in potentially explosive atmospheres
- Use in medical and life critical applications
- Use before performing a risk assessment
- Use outside the permissible operational conditions and specifications
- Use close to a human's head, face and eye area
- Use as a climbing aid

2.2. General Safety Instructions

Generally, all national regulations, legislations and laws in the country of installation must be observed. Integration and use of the product must be done in compliance with precautions in this manual. Particular attention must be paid to the following warnings:

DANGER:

You must read, understand, and follow all safety information in this manual, and the robot manual and all associated equipment before initiating robot motion. Failure to comply with safety information could result in death or serious injury.

The information in this manual does not cover designing, installing, and operating a complete robot application, nor does it cover other peripheral equipment that can influence the safety of the complete system. The complete system must be designed and installed in accordance with the safety requirements set forth in the standards and regulations of the country where the robot is installed.

Any safety information provided in this manual must not be construed as a warranty, by OnRobot A/S, that the robot application will not cause injury or damage, even if robot application complies with all safety instructions.

OnRobot A/S disclaims any and all liability if any of OnRobot tools tooling are damaged, changed or modified in any way. OnRobot A/S cannot be held responsible for any damages caused to any of OnRobot tools tooling, the robot, or any other equipment due to programming errors or malfunctioning of any of OnRobot tools.

WARNING:

OnRobot tools are not allowed to be exposed to condensing conditions when power is on or when connected to a robot. If condensing conditions appear during transport or storage, the product must be placed between 20 and 40 Celsius degrees for 24 hours before power is applied or before connected to a robot.

It is recommended that OnRobot tools are integrated in compliance with the following guides and standards:

- ISO 10218-2
- ISO 12100
- ISO/TR 20218-1
- ISO/TS 15066

WARNING:

- The tools have to be properly secured before operating the robot.
- Keep fingers, clothes and hair away from the tool while the power is on.
- Always use protective glasses when working with sharp objects.
- Always ensure complete shutdown of the robot when working on the system for maintenance or inspection.
- Do not use the tools on people or animals.
- Do not perform any modification to the tooling.
- If the robot supports a bounded workspace/ speed/ force limit, make sure to use those features.
- Select robot trajectories that minimize risks of internal clamping between robot joints and tooling.

2.3. Risk Assessment

The robot integrator must perform a risk assessment on the complete robot application. OnRobot tools are only components in a robot application and therefore they can be only safely operated if the integrator has considered the safety aspects of the whole application. OnRobot tools are designed with relatively smooth and round design with a limited amount of sharp edges and pinch points

In collaborative applications, the trajectory of the robot can play a significant safety role. The integrator must consider the angle of contact with a human body, e.g. orientate OnRobot tools and workpieces so that the contact surface in the direction of movement is as large as possible. It is recommended that the tool connectors are pointed in the direction opposite to the movement.

OnRobot A/S have identified the potential hazards listed below as significant hazards that must be considered by the integrator:

- Objects flying from OnRobot tools due to loss of grip
- Objects falling down from OnRobot tools due to loss of grip
- Injuries due to collisions between humans and workpieces, OnRobot tools tooling, robot or other obstacles
- Consequences due to loosen of bolts
- Consequences if OnRobot tools cable gets stuck to something
- Workpiece itself represents a hazard

2.4. Environmental Safety

OnRobot A/S products must be disposed of in accordance with the applicable national laws, regulations and standards.

The product is produced with restricted use of hazardous substances to protect the environment; as defined by the EU RoHS Directive 2011/65/EU. These substances include mercury, cadmium, lead, chromium VI, polybrominated biphenyls and polybrominated diphenyl ethers.

Observe national **registration** requirements for importers according to EU WEEE Directive 2012/19/EU.

2.5. Sander

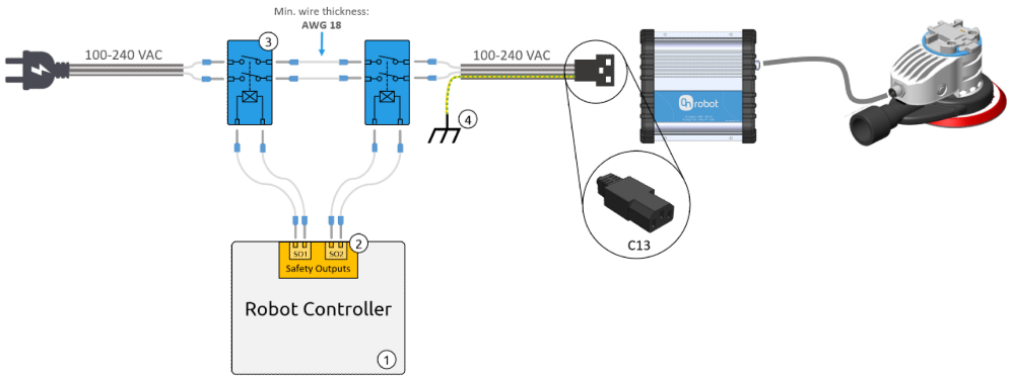
WARNING:

If the Emergency Stop is activated and the robot stops, the Sander will not stop automatically, which could be a safety risk.

If, due to safety reasons, the Sander needs to be stopped, interrupt the Sander power supply with relays. If this function is part of the Cell Safety System, please make sure to use a safety relay with force guided contacts or a solution which comply with the safety standard requirements.

Please note that the Sander will not stop immediately, due to the stored electrical and mechanical energy in the system.

This wiring has to be performed only by a trained electrician, as this modification is made on the 110-240 V supply side.



1. Robot Controller
2. Safety Outputs
3. Standard two-pole relay
4. Grounding (earth potential)

CAUTION:

The OnRobot Sander is not ATEX certified, therefore, make sure that the dust extraction is sufficient.

3. HW Installation

3.1. Overview

For a successful installation the following steps will be required:

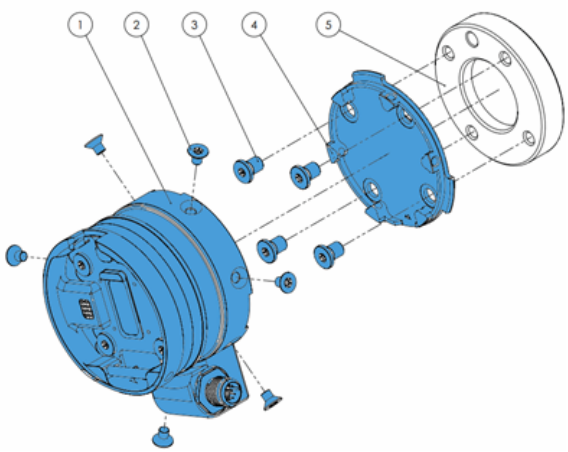
- Mount the components
- Setup the software

In the following sections, these installation steps will be described.

3.2. Robot Mount

1. Mount the robot-specific adapter (if applicable)
2. Mount any optional accessories
3. Mount the Quick Changer option
4. Mount the tool(s) (if applicable)

3.2.1. HEX-E/H QC



HEX-E/H QC

1. HEX-E/H QC sensor
2. M4x6mm (ISO14581 A2)
3. M6x8mm (DIN7984LT A2)
4. HEX-E/H QC adapter
5. Adapter/ Robot tool flange (ISO 9409-1-50-4-M6)

Use 1.5 Nm tightening torque for M4x6mm

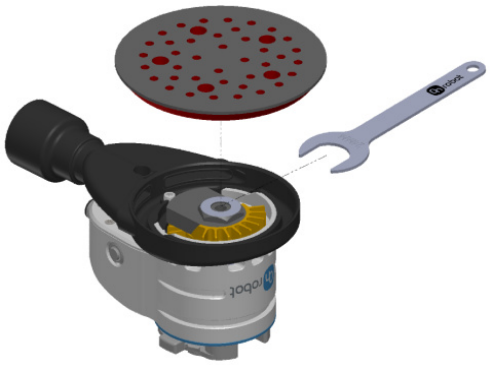
Use 3.8 Nm tightening torque for M6x8mm

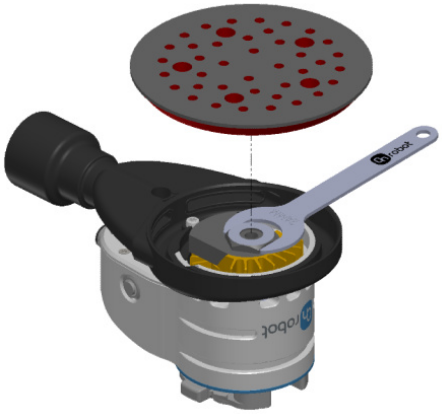
3.2.2. Tools

3.2.2.1. Sander

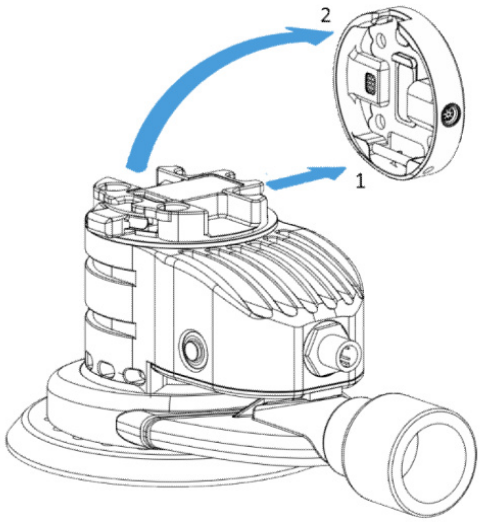
Pad Mounting

Mount the pad to be used on the Sander.





Sander Mounting



Step 1:

Move the tool close to the Quick Changer as illustrated.

The hook mechanism (rod and hook tongue) will keep the lower part locked once mounted.

Step 2:

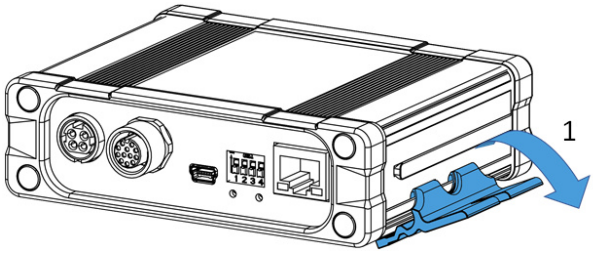
Flip the tool until it is fully mated, and you hear a clicking sound.

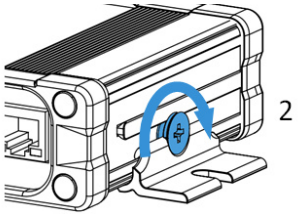
To unmount the tool, press the aluminum button on the Quick Changer and repeat the steps in the reverse order.

3.3. Compute Box Mount

3.3.1. Optional - Clip-on Bracket

Optionally, fix the Compute Box to a surface using the provided Clip-on Brackets (included only from 17th December 2020).





Do the following on both sides of the Compute Box:

1. Hook the Clip-on Bracket to the rail on the side of the Compute Box and then flip it down.
2. Fasten the Clip-on Bracket with the plastic srew.

3.4. Wiring

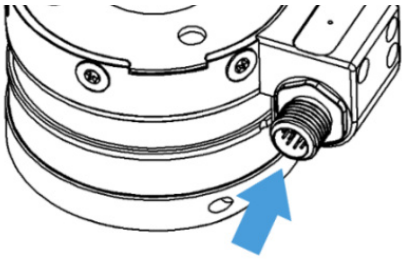
Three cables need to be connected to wire the system properly:

- Tool data cable between the HEX and the Compute Box
- Ethernet cable between the robot controller and the Compute Box
- Power supply of the Sander

3.4.1. Tool Data Cable

3.4.1.1. Cable to HEX-E/H QC

First connect the data cable to the tool.



Use the marked M12-12pin connector on the HEX-E/H QC.

3.4.1.2. Cable to Compute Box

Then route the Tool data cable to the Compute Box (CB) and use the supplied Velcro tape (black) to fix it.

NOTE:

Make sure that during the routing some extra length is used at the joints so that cable is not pulled when the robot moves.

Also make sure that the cable bending radius is minimum 40mm (for the HEX-E/H QC it is 70mm).

Finally, connect the other end of the Tool data cable to the Compute Box's DEVICES connector.

CAUTION:

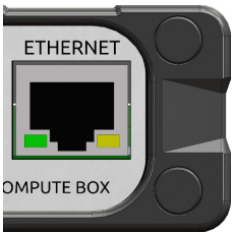
Quick Changer and Dual Quick Changer can only be used to power OnRobot tools.

3.4.2. Ethernet Cable

Connect one end of the supplied Ethernet Cat 5e cable to the robot controller's Ethernet (LAN) port.

NOTE:

If the robot controller's Ethernet port is in use, use a standard 4-port Ethernet switch to be able to use two network devices at the same time.



Connect the other end of the supplied cable to the Compute Box's ETHERNET connector.

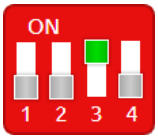
It is recommended to use Ethernet cables that are shorter than 3 m.

WARNING:

Check and make sure that the Compute Box enclosure (metal) and the robot controller enclosure (metal) are not connected (no galvanic connection between the two).

3.4.3. Compute Box DIP Switch Settings

Set the DIP switches of the Compute Box as follows:

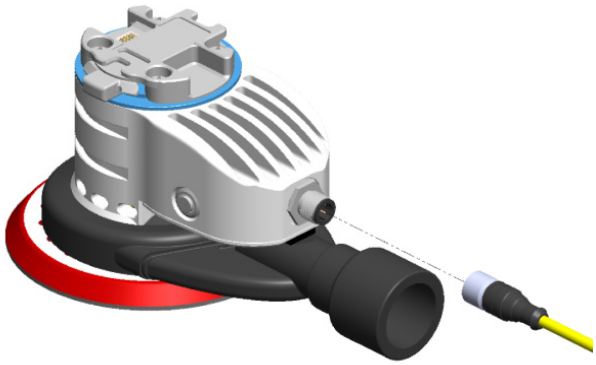


Set the DIP switch 3 to ON and the DIP switch 4 to OFF position.

For more information about the Ethernet interface settings, see 7.1.1. Ethernet Interface Setup.

3.4.4. Power Supply: Sander

Connect the Sander and the Sander power supply with the power cable.



3.4.5. Power Supply: Compute Box

Connect the supplied power supply to the Compute Box 24V connector.

NOTE:

To disconnect the power connector, make sure to pull the connector housing (where the arrows are shown) and not the cable.

CAUTION:

Use only original OnRobot power supplies.

Finally, power up the power supply that will power the Compute Box and the connected Tool(s).

3.4.5.1. HEX-E/H QC

Power Supply	
1.5 A	✓
5 A	✓
6.25 A	✓

3.4.5.2. Sander

Power Supply	
1.5 A	✓

Power Supply	
5 A	✓
6.25 A	✓

3.5. Best practices - HEX-E/H QC

Best practices to maintain the calibrated device:

- Power off the HEX sensor when it is not used for a longer period of time.
- Remove any dead weight from the sensor when it is not used for a longer period of time.

4. SW Installation

4.1. Robot Software Setup

4.1.1. Install URCap

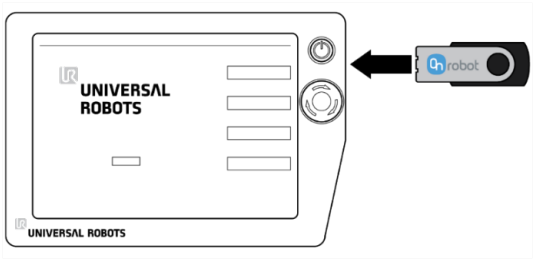
UR CB3

NOTE:

The minimum UR PolyScope version is **3.11**. Please remove all previous OnRobot URCap version(s) before the installation. The controller version must be CB3.1.

For the HEX-E/H QC products the **3.12** is not recommended.

1. Insert the OnRobot USB drive in the USB slot on the right side of the Teach Pendant.



2. Select the **Setup Robot** option from the main menu, then the **URCaps** option.

3. Tap on the + sign to browse for the OnRobot URCap file. It can be found in the usbdisk/UR/URCAP folder. Tap on **Open**.

UR e-Series

NOTE:

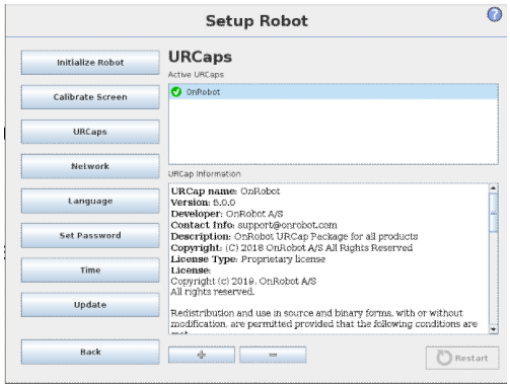
The minimum UR PolyScope version is **5.5**. Please remove all previous OnRobot URCap version(s) before the installation.

For the HEX-E/H QC products the **5.6** is not recommended, instead please use the **5.7**.

1. Insert the OnRobot USB drive in the USB slot on the top right side of the Teach Pendant.

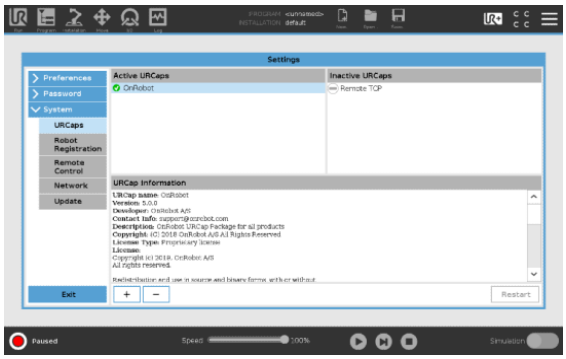
2. Then tap on the menu (top right corner of the screen), then from the **System** section tap on the **URCaps** menu.
3. Tap on the + sign to browse for the OnRobot URCap file. It can be found in the usbdisk/UR/URCAP folder. Tap on **Open**.

4. The system needs to be restarted for the changes to take effect. Tap on the **Restart** button and then wait for the system to be restarted.



5. Initialize the robot.

4. Then the system needs to be restarted for the changes to take effect. Tap on the **Restart** button and then wait for the system to be restarted.



5. Initialize the robot.

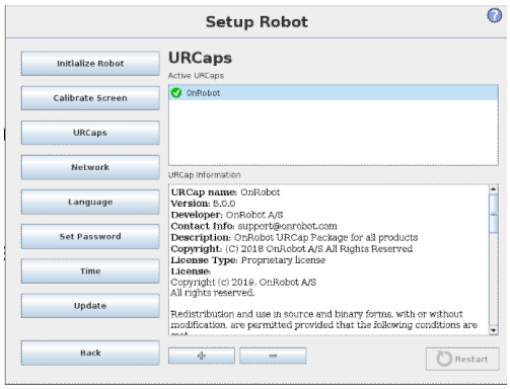
NOTE:

For more information on the URCap installation please refer to UR documentation.

4.1.2. Uninstall Software

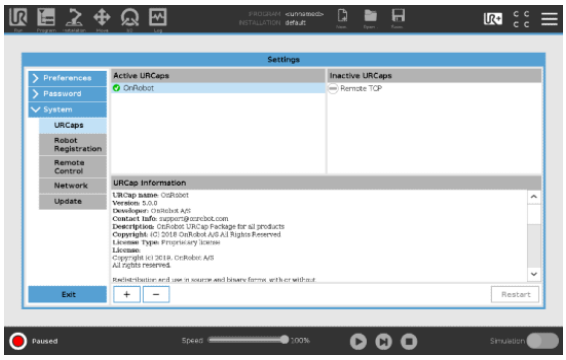
UR CB3

1. Select the **Setup Robot** option from the main menu, then the **URCaps** option.
2. Select the OnRobot URCap file.
3. Tap on the - sign.
4. Then the system needs to be restarted for the changes to take effect. Tap on the **Restart** button and then wait for the system to be restarted.



UR e-Series

1. Tap on the ☰ menu (top right corner of the screen), then from the **System** section tap on the **URCaps** menu.
2. Select the OnRobot URCap file.
3. Tap on the - sign.
4. Then the system needs to be restarted for the changes to take effect. Tap on the **Restart** button and then wait for the system to be restarted.



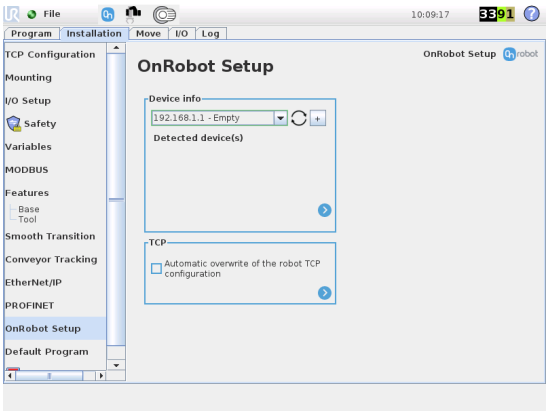
5. Initialize the robot.

5. Initialize the robot.

4.1.3. URCap Setup

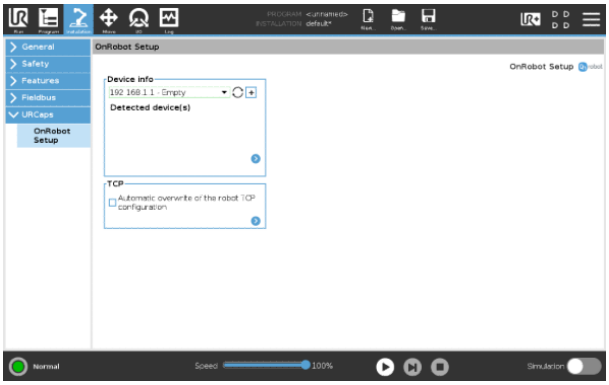
UR CB3

Select the **Installation** tab, then select **OnRobot Setup**. The following screen is shown:



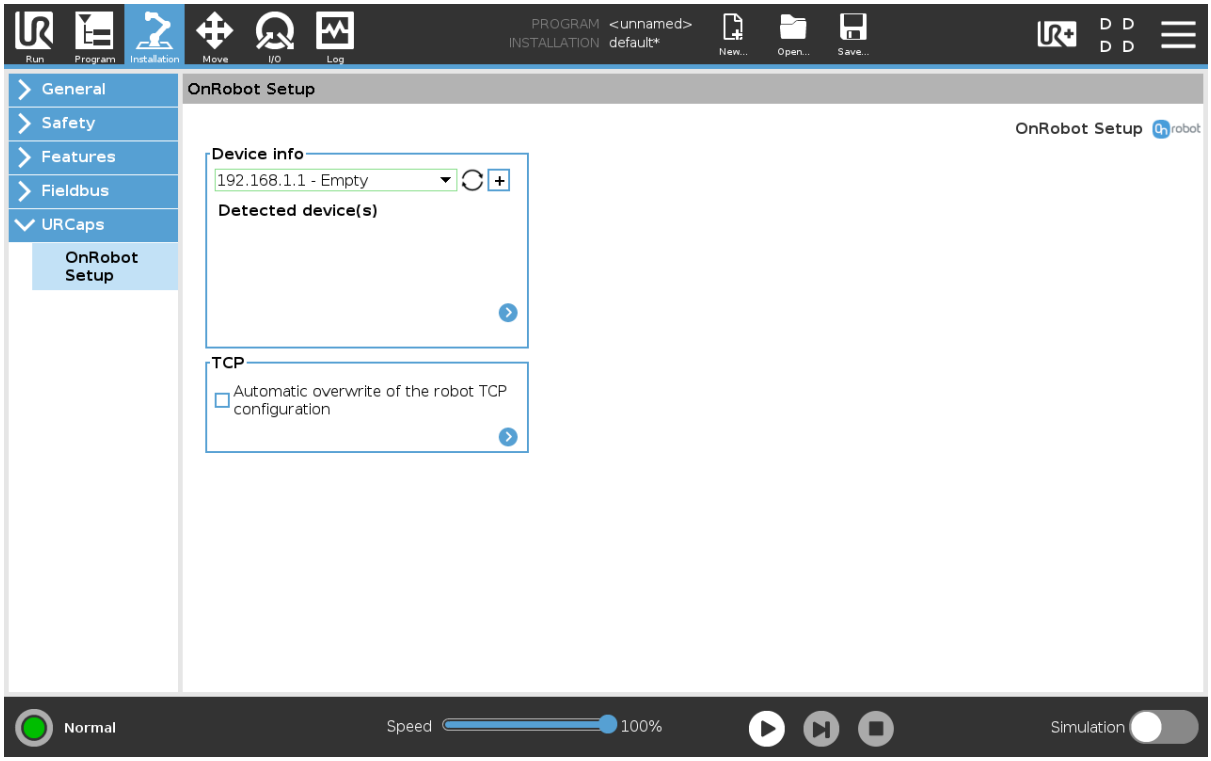
UR e-Series

Tap on the **Installation** tab in the top menu. Then tap on the **URCaps**.



4.1.3.1. Device Info

In the normal view of the panel, the available functions are shown below:



Device info

Dropdown menu to select a device-robot communication channel: Discover the connected devices.

Use the reload button to find new available devices.

NOTE:

After setting up the device the changes need to be saved to be part of the current installation.

For the e-Series UR robots tap on the **Save** button (from the top menu and use the **Save Installation** button .

For the CB3 UR robots use the **Save** button .

NOTE:

To use the newly discovered devices you might need to restart PolyScope. To do that simply press the **Restart now** button. Remember to save it before, if there are any unsaved changes in your program or settings.

NOTE:

OnRobot products are checked after the robot is restarted and the saved settings are restored while loading a program. That check could take up to 5 seconds via the Quick Changer for I/O. Therefore make sure to wait at least 5 seconds before you start your program. To make sure that the device is connected check the **Device info**.

If the connected OnRobot product is changed, always go to the **Device info** to check if the change was successful.

CAUTION:

After any error message is shown that is related to the connection to our devices, please go to the **Device info** to make sure that the right settings (e.g.: TCP) are used.

Load multiple devices: The automatically loads the selected devices to the UR environment, even if the device is not connected to the robot. When you change between loaded devices, the robot does not require a restart but you should press the reload button to refresh the detected devices.

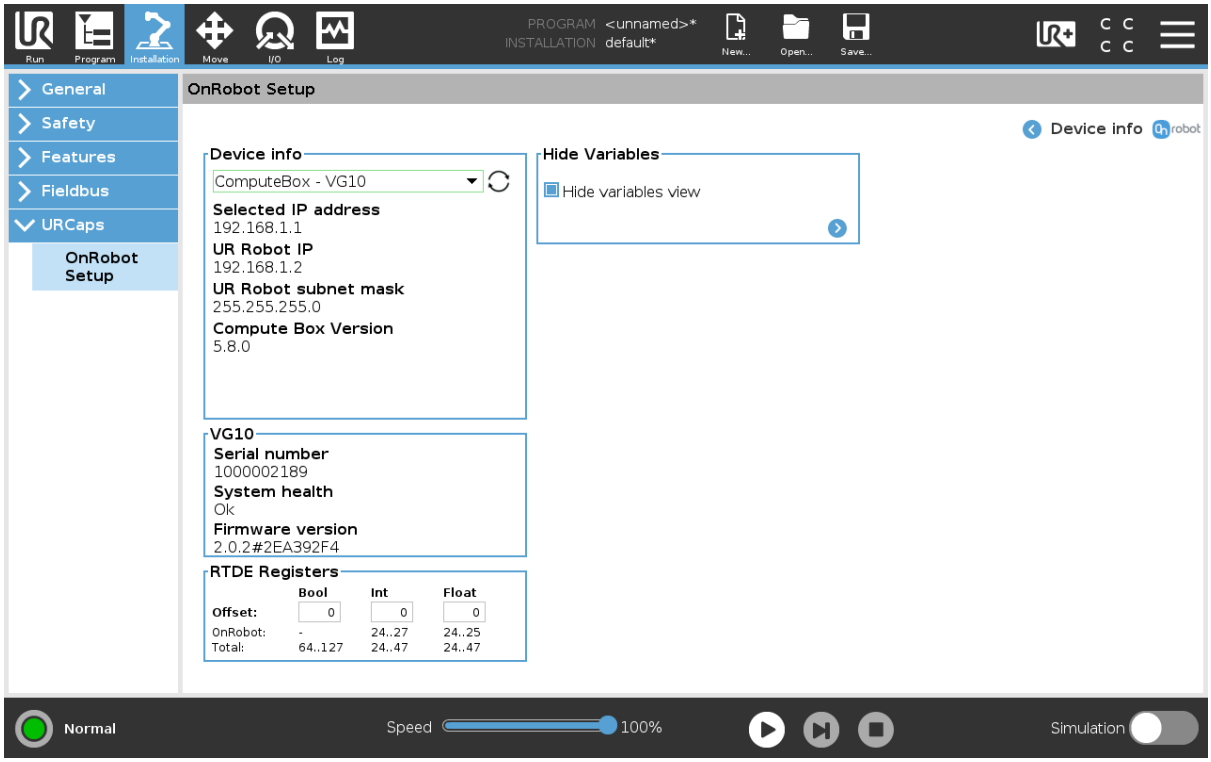
WARNING:

When multiple devices are activated, you may experience slow URCap operation. In this case, activate only the devices that you use. It is recommended to activate up to two devices at the same time.

For each loaded device, the appropriate URCaps commands and Toolbar will be visible, hence load only the devices that you will change frequently.

Detailed parameters of the Device Info

To get more information about the devices press on and the following screen will show:



Device info

The **Selected IP address**, **Compute Box Version**, **UR Robot IP** and **UR Robot subnet mask** are shown.

Errors

This displays information about the errors if there is any.

Device name

The **Serial number**, **System health** and **Firmware version** are shown.
Update: this will update the firmware if an update is available.

Depending on the selected devices, different panels will become available to configure the devices.

RTDE Registers

OnRobot uses RTDE registers to communicate with UR. Real-Time Data Exchange (RTDE) is an interface that can be used to send data for the robots through registers. For more information about RTDE registers, see UR's **Real-Time Data Exchange (RTDE) Guide**.

You need this option if you use OnRobot devices with other vendors' devices and OnRobot registers might overlap other vendors' registers.

OnRobot uses three different types of registers: **Bool**, **Int** and **Float**.

Offset: Offsets the registers by the amount that is written in the certain field.

OnRobot: Shows the number of registers that OnRobot uses of the certain type.

Total: Shows the maximum number of registers of the certain type that is available in UR.

Check other vendors' registers to make sure that the registers that you are using are not used by other vendors. If your registers overlap other vendors' registers, offset them by writing a certain value in the **Offset** fields. If the offset value is too high, the number of OnRobot registers can exceed the number of **Total** registers. In this case the values will turn red in the **OnRobot** row.

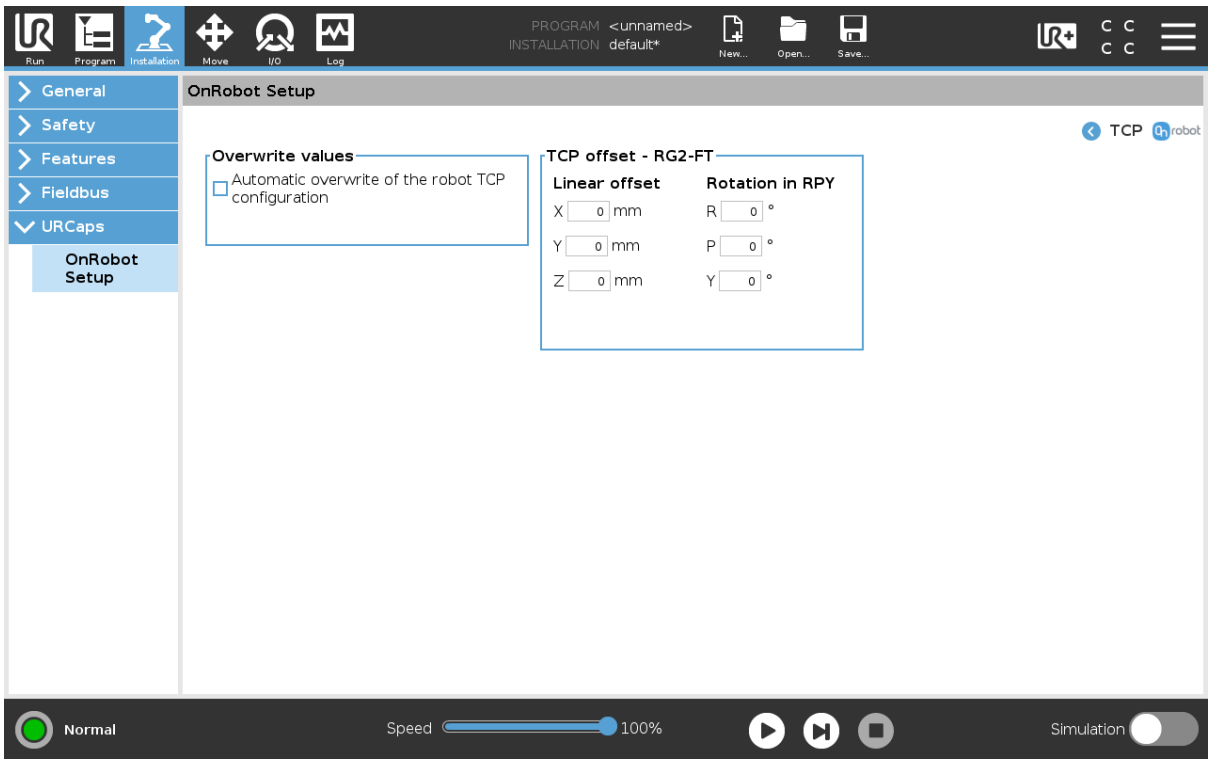
Hide Variables

A list of selectable variables. When a variable is selected to hide, it will not appear on the configuration panel.

TCP

In the normal view of the panel the TCP of the robot can be overwritten by the TCP of the tool by pressing the **Automatic overwrite of the robot TCP configuration** checkbox.

To see more options press on and the following screen will show:



Overwrite values

Automatic overwrite of the robot TCP configuration: when checked, the UR's TCP configuration is automatically overwritten (Dynamic TCP mode). When unchecked the TCP is left unchanged (Static TCP mode).

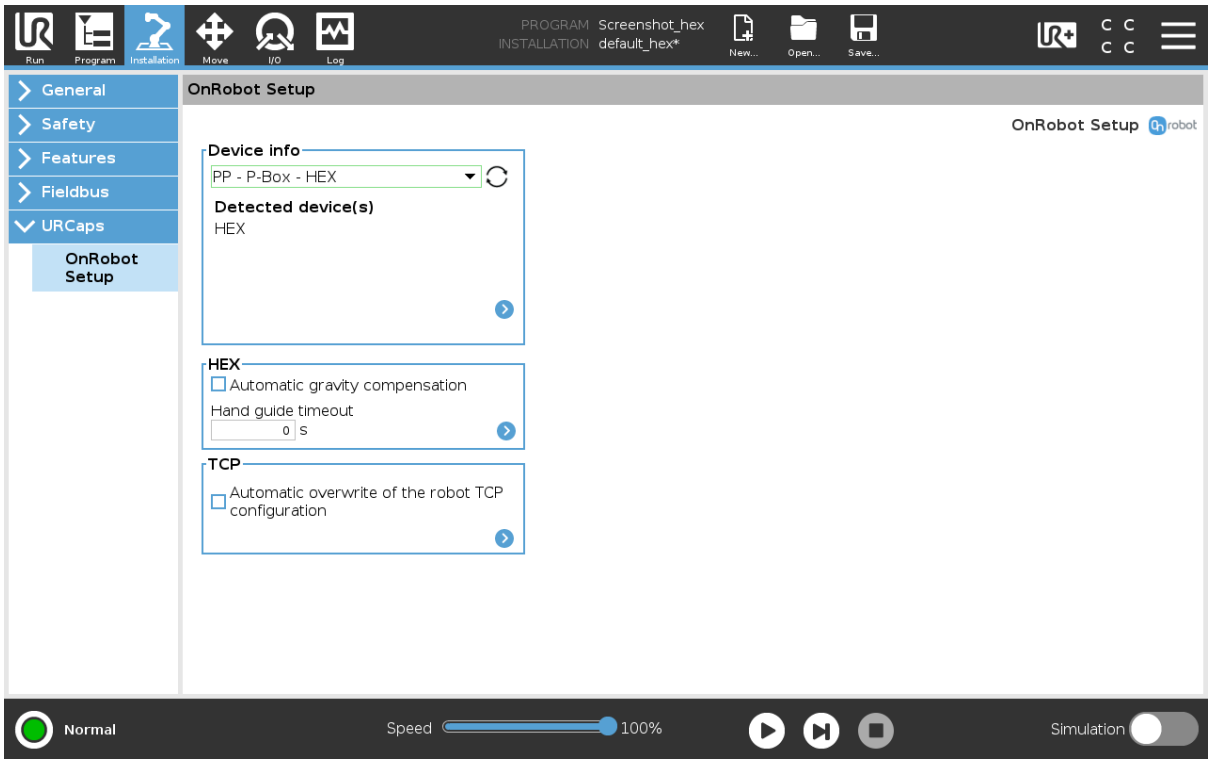
For further information and best practices on the TCP setting see 5.5. TCP Configuration section.

TCP offset

Set the **Linear offset** (X,Y,Z) and the **Rotation in RPY** (Roll-Pitch-Yaw) values to adjust the OnRobot device dependent calculated TCP.

4.1.3.2. HEX

The configuration panels for the HEX are shown in the image below:



HEX

Automatic gravity compensation: If enabled, the weight of the tool and the part will be compensated while the robot orientation is changed.
Make sure that the weight and the Center of Gravity is set correctly.
Gravity compensation is only available for the following operations:

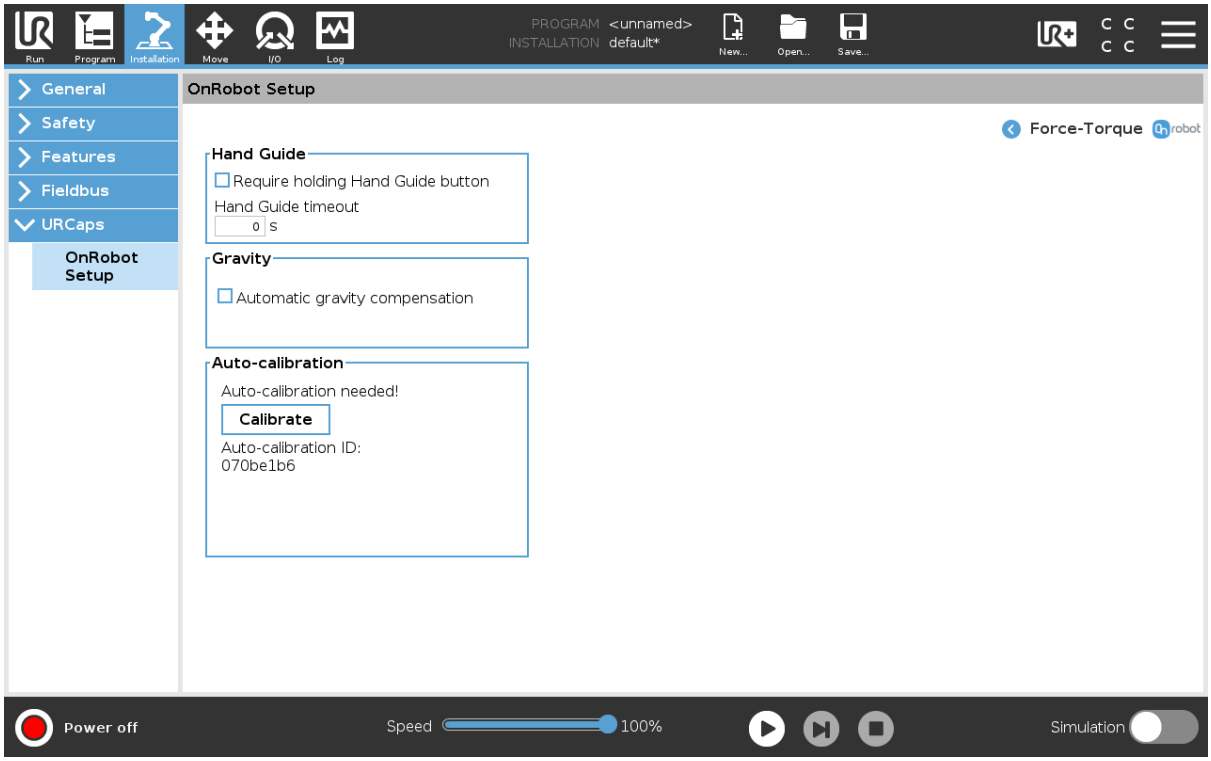
- Force Control
- Pin insertion
- Hand Guiding
- Sanding

WARNING:

The robot cannot be tilted when you use gravity compensation.

Timeout: After the set timeout value, the hand guiding will be stopped automatically. The default value is 0 that sets the timeout to infinite.

Press to see more options:



Hand Guide

Require holding Hand Guide button: If checked (recommended), press the Hand Guide enable button constantly during the hand guiding. If unchecked, you can start the hand guiding by pressing the enable button and can stop it by pressing the enable button again.

Timeout: After the set timeout value, the hand guiding will be stopped automatically. The default value is 0 that sets the timeout to infinite.

Gravity

Automatic gravity compensation: If enabled, the weight of the tool and the part will be compensated while the robot orientation is changed.
Make sure that the weight and the Center of Gravity is set correctly.
Gravity compensation is only available for the following operations:

- Force Control
- Pin insertion
- Hand Guiding
- Sanding

WARNING:

The robot cannot be tilted when you use gravity compensation.

Auto-calibration

Auto-calibration is an option to prolong the time the sensor is in service before it is sent back for OnRobot factory re-calibration. Auto-calibration can be done onsite, and it takes only a couple of minutes.

To see the required steps for the Auto-calibration process, go to the **7.1.3.1. Web Client: Devices Menu** section. Follow the required steps on the URCap.

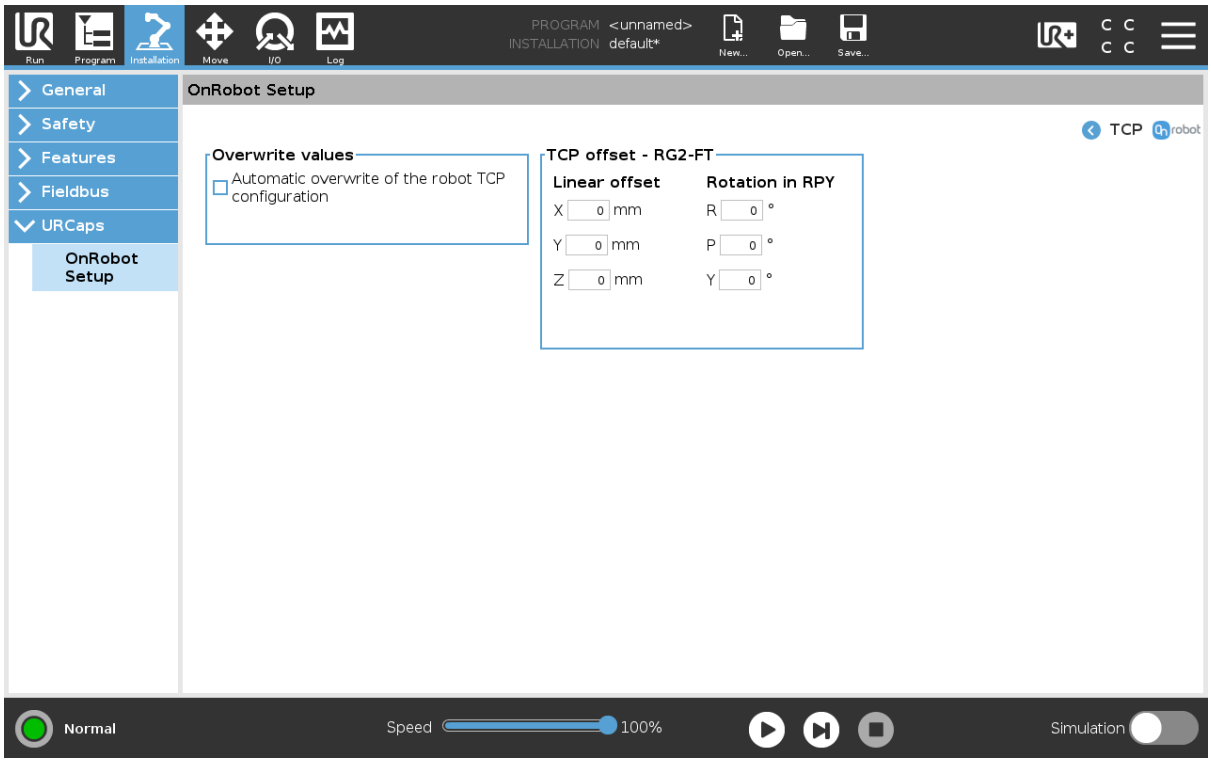
WARNING:

It is recommended to perform the Auto-calibration process when instructed. If the Auto-calibration process is not possible, schedule your sensor to be sent back to the OnRobot factory for a re-calibration.

TCP

In the normal view of the panel the TCP of the robot can be overwritten by the TCP of the tool by pressing the **Automatic overwrite of the robot TCP configuration** checkbox.

To see more options press on and the following screen will show:



Overwrite values

Automatic overwrite of the robot TCP configuration: when checked, the UR's TCP configuration is automatically overwritten (Dynamic TCP mode). When unchecked the TCP is left unchanged (Static TCP mode).

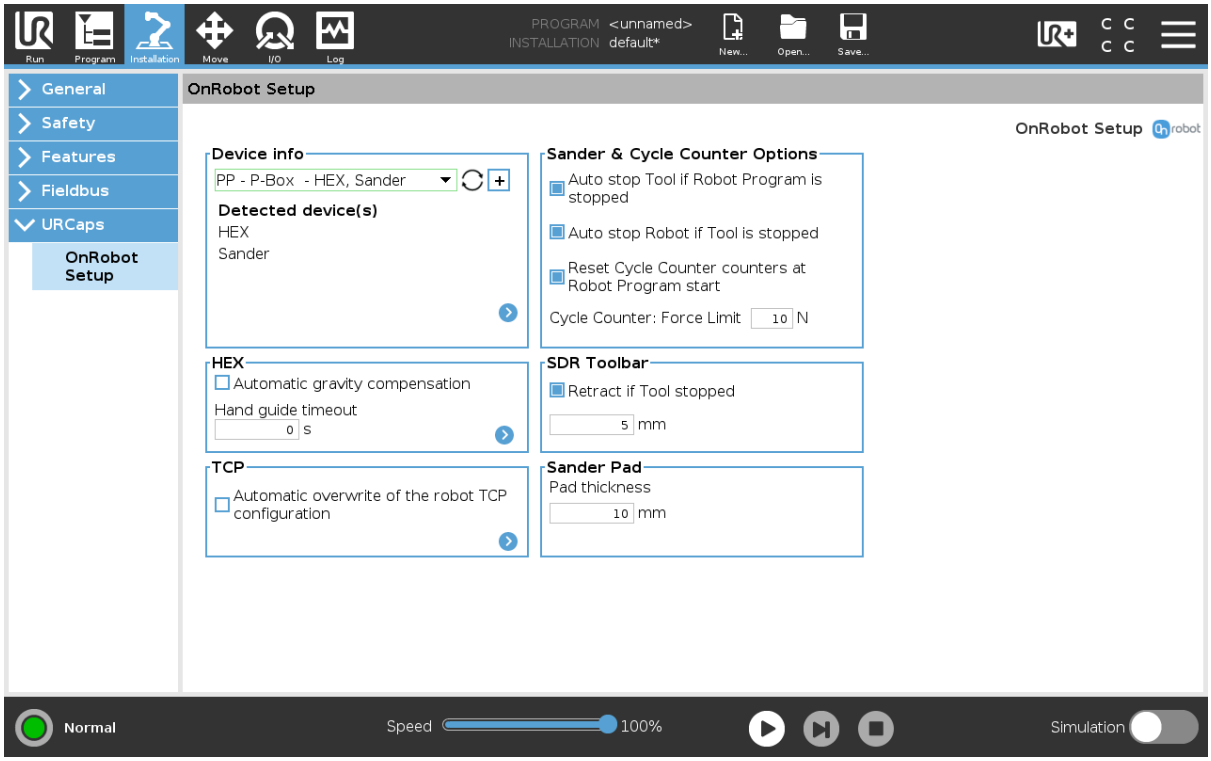
For further information and best practices on the TCP setting see **5.5. TCP Configuration** section.

TCP offset

Set the **Linear offset** (X,Y,Z) and the **Rotation in RPY** (Roll-Pitch-Yaw) values to adjust the OnRobot device dependent calculated TCP.

4.1.3.3. Sander

The configuration panels of the Sander are shown in the image below:



HEX

Automatic gravity compensation: If enabled, the weight of the tool and the part will be compensated while the robot orientation is changed.
Make sure that the weight and the Center of Gravity is set correctly.
Gravity compensation is only available for the following operations:

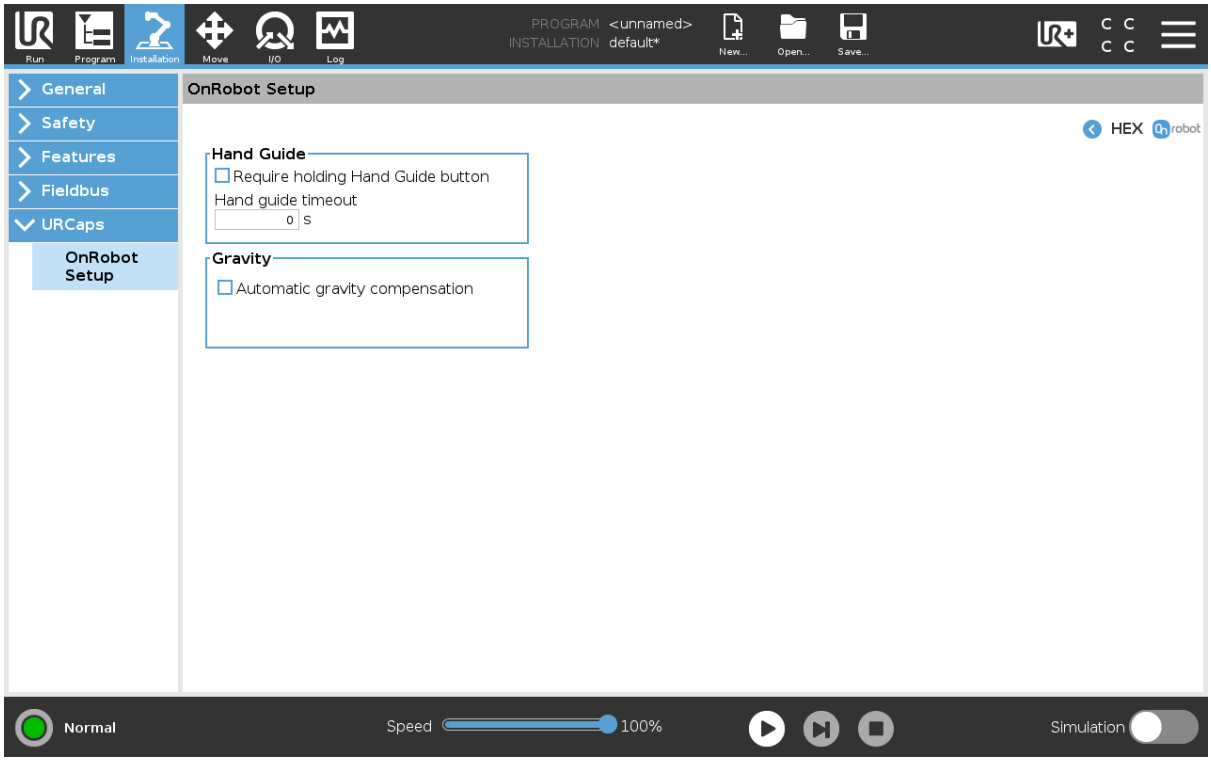
- Force Control
- Pin insertion
- Hand Guiding
- Sanding

WARNING:

The robot cannot be tilted when you use gravity compensation.

Timeout: After the set timeout value, the hand guiding will be stopped automatically. The default value is 0 that sets the timeout to infinite.

Press to see more options:



Hand Guide

Require holding Hand Guide button: If checked (recommended), press the Hand Guide enable button constantly during the hand guiding. If unchecked, you can start the hand guiding by pressing the enable button and can stop it by pressing the enable button again.

Timeout: After the set timeout value, the hand guiding will be stopped automatically. The default value is 0 that sets the timeout to infinite.

Gravity

Automatic gravity compensation: If enabled, the weight of the tool and the part will be compensated while the robot orientation is changed.
Make sure that the weight and the Center of Gravity is set correctly.
Gravity compensation is only available for the following operations:

- Force Control
- Pin insertion
- Hand Guiding
- Sanding

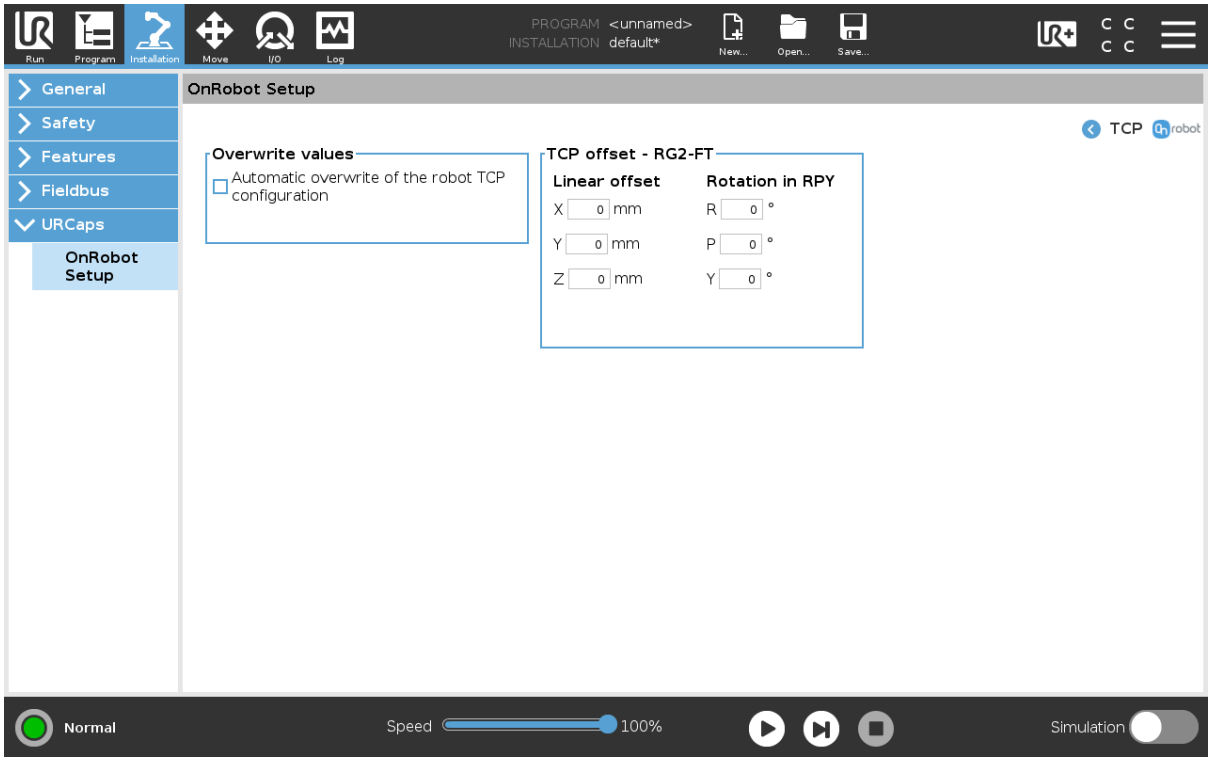
WARNING:

The robot cannot be tilted when you use gravity compensation.

TCP

In the normal view of the panel the TCP of the robot can be overwritten by the TCP of the tool by pressing the **Automatic overwrite of the robot TCP configuration** checkbox.

To see more options press on and the following screen will show:



Overwrite values

Automatic overwrite of the robot TCP configuration: when checked, the UR's TCP configuration is automatically overwritten (Dynamic TCP mode). When unchecked the TCP is left unchanged (Static TCP mode).

TCP offset

Set the **Linear offset** (X,Y,Z) and the **Rotation in RPY** (Roll-Pitch-Yaw) values to adjust the OnRobot device dependent calculated TCP.

Sander & Cycle Counter Options

Auto stop Tool if Robot Program is stopped: when checked, the system automatically stops the Sander when the robot program is stopped.

Auto stop Robot if Tool is stopped: when checked, the system stops the robot when the Sander is stopped because of external reasons, for example, power loss, over-temperature, or the vibration limit is reached.

Reset Cycle Counter counters at Robot Program start: when checked, the system resets the global counters of the Cycle Counter (such as, Run-time and Robot Program cycle) at each program start.

Cycle Counter: Force Limit: sets the global force value in N. The system starts to count the Sander running time when the Sander applies at least the set force value to the object.

SDR Toolbar

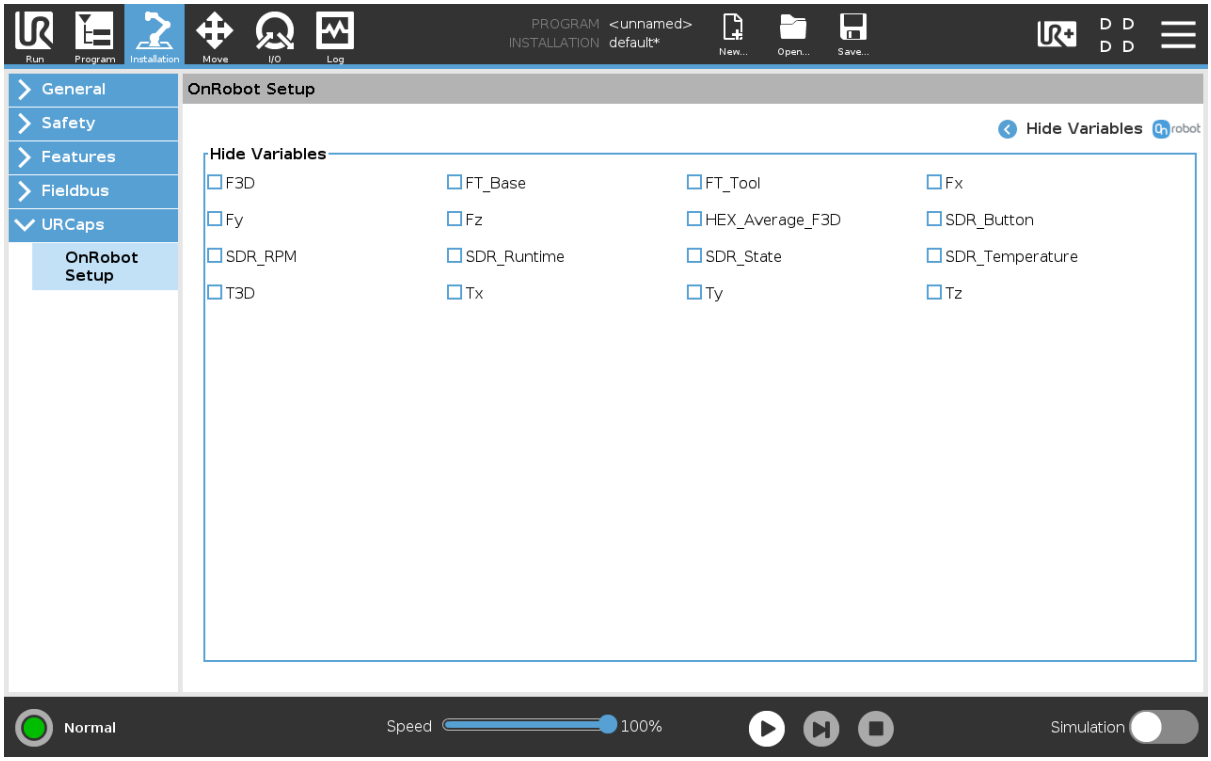
Retract if Tool stopped: when checked, the system retracts the Sander when it is stopped.

Distance for retraction: sets the distance in mm to what the system has to retract the Sander when the Sander is stopped.

Sander Pad

Pad thickness: sets the thickness of the Sander pad in mm.

To see more options, press on and the following screen is shown:



Hide Variables

A list of selectable variables. When a variable is selected to hide, it will not appear on the configuration panel.

5. Operation

NOTE:

It is assumed that the Installation has finished successfully. If not, first do the installation steps in the previous section.

5.1. Sander Application Guideline

To achieve good Sander setup, consider the following parameters and their relations:

Material properties – Push force – Grit size – Tool RPM – Tool speed and Robot parameters

Material Properties

The softer the object is, the more material gets removed with a given grit paper. Consequently, more power is required from the Sander to perform one rotation.

Push Force / Grit Size / Tool RPM

The higher the push force / used grit size / requested RPM, the higher Sander power is needed to perform one rotation.

Tool Speed

The faster the robot goes, the less time the Sander spends on a given area and the less material is removed.

Robot parameters

Compared to manual sanding, the robot is more rigid. When the sanding paper gets in contact with the surface or gets more into the sanding material, the contact causes a higher friction force on the robot joints.

A smaller payload robot can detect this sudden force deviation and can perform a protective stop. Use lower push force, grit size, right Sander RPM, or lower Sander speed to resolve the issue.

Cable routing

The vacuum hose and cable routing can directly affect the force measuring. Make sure that during the sanding process the pulling/pushing force of the cables and the hose is minimalized and is the same at every robot position.

5.2. URCap Commands

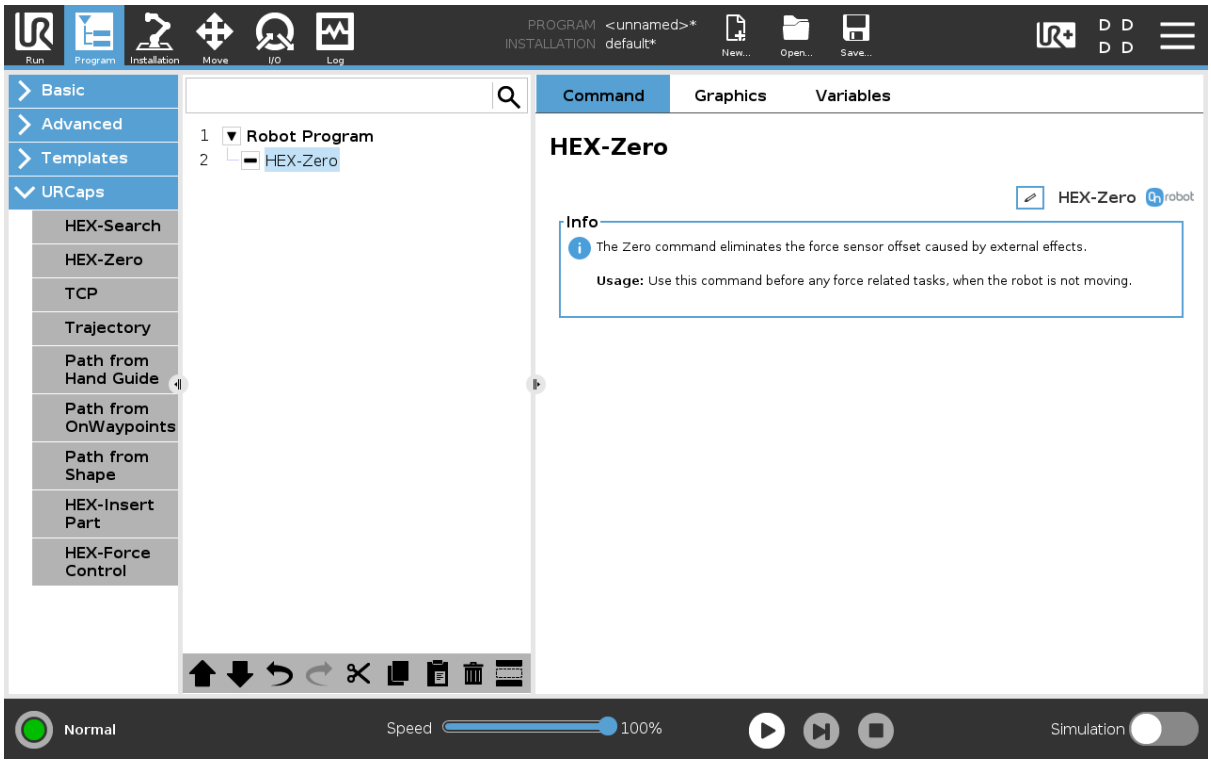
URCap commands provide an easy way to program an application.

5.2.1. HEX-E/H QC

5.2.1.1. HEX-Zero

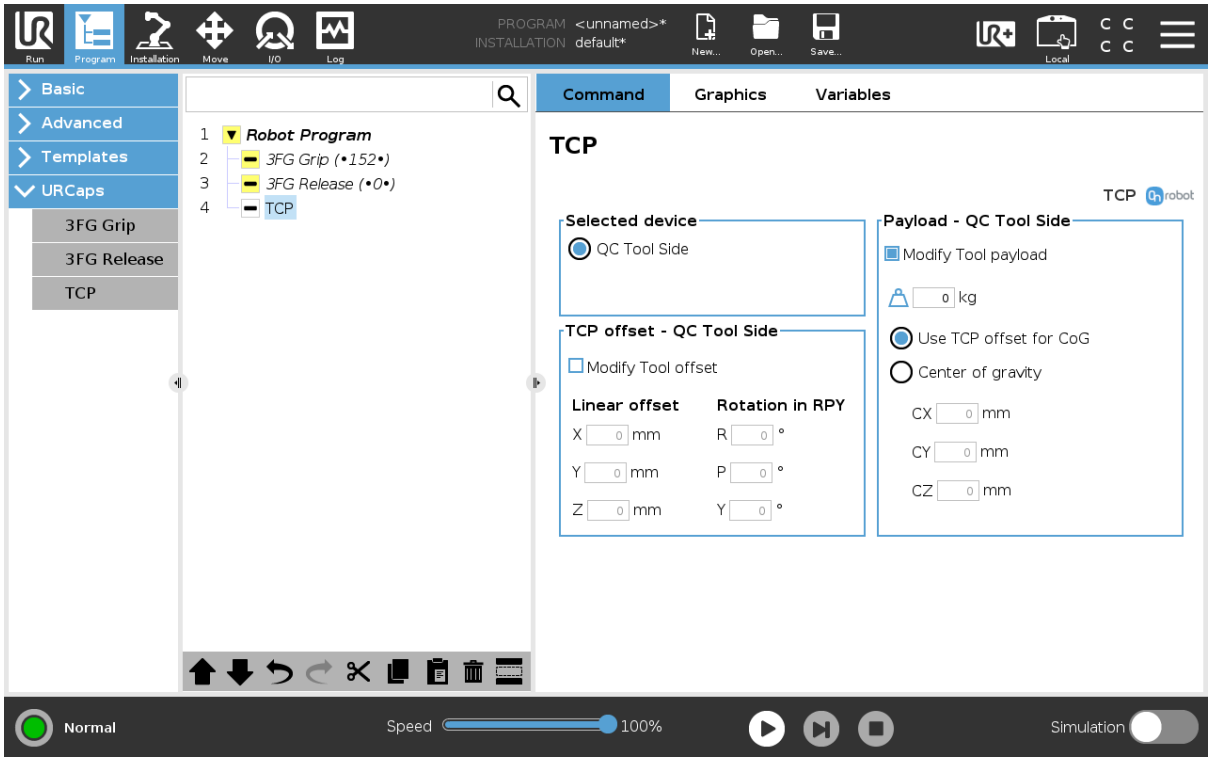
The `HEX-Zero` command eleminates the HEX sensor offset caused by external effects.

This command needs to be used when the robot is not moving and before executing any force related tasks.



5.2.1.2. TCP

The `TCP` command is used to set the current TCP and/or payload for the robot.



TCP offset

Set the **Linear offset** (X,Y,Z) and the **Rotation in RPY** (Roll-Pitch-Yaw) values to adjust the OnRobot device dependent calculated TCP.

Payload

Modify Tool payload: If enabled the UR's payload will be overwritten.

enter the workpiece mass that is attached to the device. The device own mass is added automatically.

Use TCP offset for CoG: set the center of gravity of the workpiece at the active TCP position.

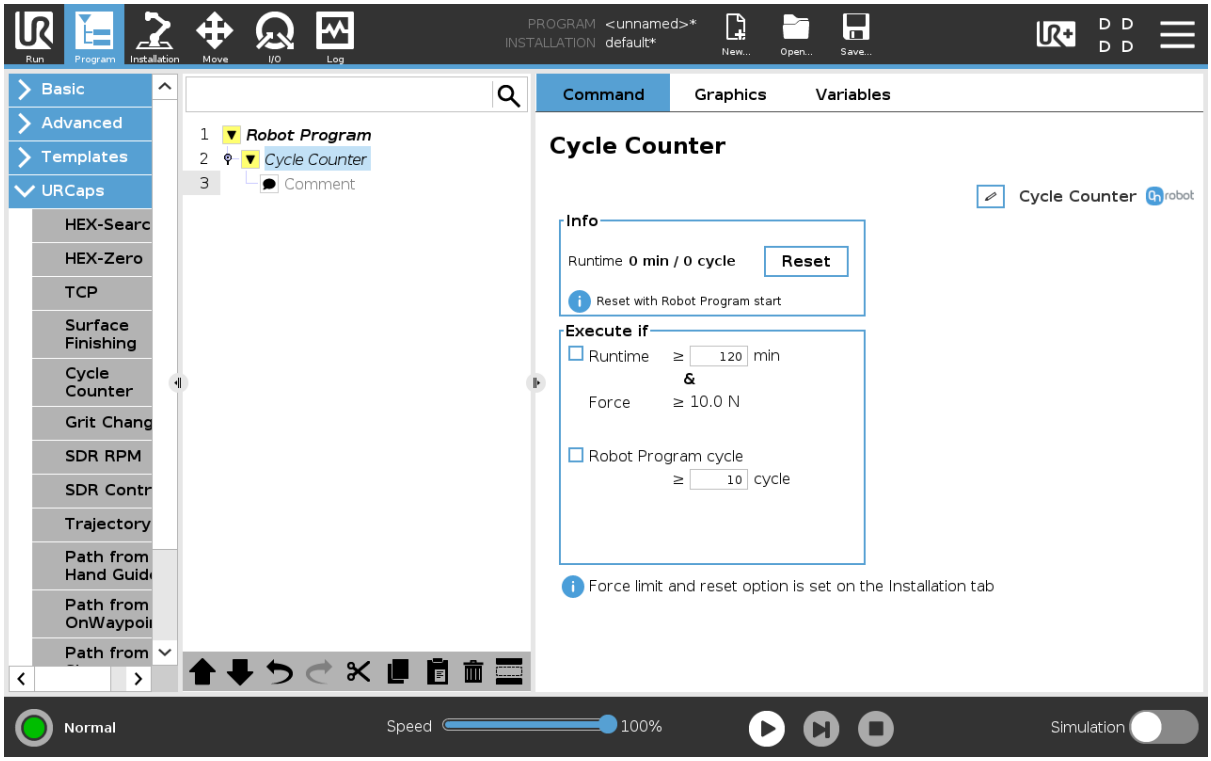
Center of gravity CX, CY, CZ: set the location of the center of gravity of the workpiece.

5.2.2. Sander

5.2.2.1. Cycle Counter

The `Cycle Counter` command provides the continuous monitoring of the Sander by creating a node where you can execute actions based on robot cycle counter or elapsed time.

You can create multiple **Cycle Counter** nodes with different conditions and different actions for the Sander.



: shows the name of the node. It can be edited and saved.

Info

Runtime: shows the elapsed time since the robot program has been started and the number of program cycles (based on how many times the `Cycle Counter` has been called).

NOTE:

The current value is lost if the Compute Box is reset or the Sander is changed.

Reset: resets the Runtime value to zero.

Execute if

Select at least one of the conditions. The child nodes will be executed if one of the conditions are met.

Runtime: when checked, the system monitors if the set time value is exceeded.
The system only counts it as exceeded when the Force Limit value is also reached.

Force: shows the Force Limit value, which is set on the installation tab.

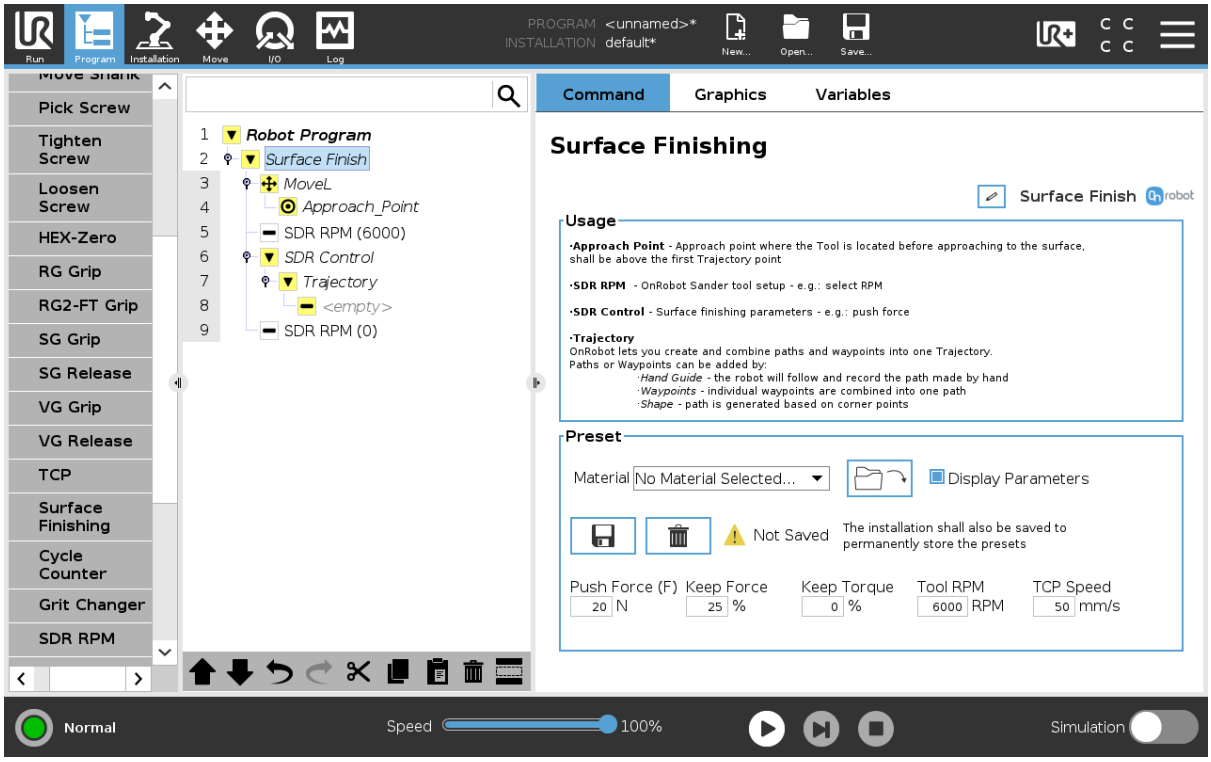
Robot Program cycle: when checked, the system monitors if the number of the program cycles are higher or equal than the set value.

5.2.2.2. Surface Finishing

The `Surface Finishing` command is a set of commands which is generally used during surface treatment.

The following structure is created when the `Surface Finishing` command is executed:

- Approach_Point
- SDR RPM (6000)
- SDR Control
  - Trajectory
- SDR RPM (0)



: shows the name of the node. It can be edited and saved.

Usage

Approach Point: sets the location where the Sander shall be positioned before touching the object, see section **5.2.2.3. Approach Point**.

SDR RPM: sets Sander RPM, see section **5.2.2.4. SDR RPM**.

SDR Control: sets force control related parameters, for example Force Limit, see section **5.2.2.5. SDR Control**.

Trajectory: sets single or multiple path definition for the required trajectory, see section **5.2.2.7. Trajectory**.

Preset

Preset values provide material specific settings for the Sander.

Material: use this option to select the material to be used during the operation.
The default preset material is **OnRobot - General**.

NOTE:

You cannot overwrite or delete OnRobot presets.

 : opens a file with saved preset values, which can be edited and saved later, from the Compute Box.

Display Parameters checkbox: when checked, the detailed view is shown.

 : saves the values to a file and to the Compute Box.

 : deletes the set values, both from the file and from the Compute Box.

Push Force (F): sets the push force value, between 5-100 N, that the Sander applies to the object.

Keep Force: sets the percentage of the force value, between 10-100%, to be kept during operation.

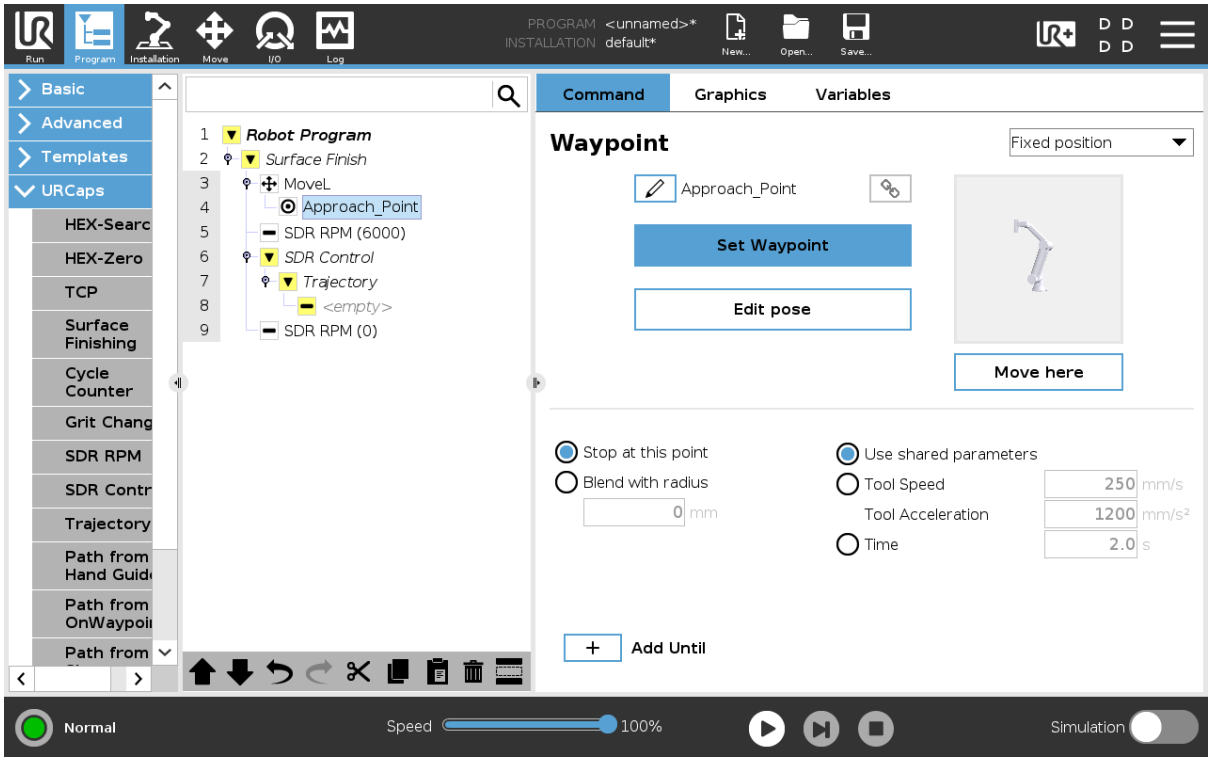
Keep Torque: sets the percentage of the torque value, between 10-100%, to be kept during operation.

Tool RPM: sets the Sander RPM value between 1,000-10,000 RPM.

TCP Speed: sets the TCP speed value of the Sander between 1-500 mm/s.

5.2.2.3. Approach Point

The `Approach Point` command specifies the position of the Sander before the Sander touches the object.



Place the `Approach Point` ~1 cm over the first point in the trajectory.

- If the `Approach Point` is not aligned, the edge of the disk may come in contact first.
- If the `Approach Point` is far (>50 cm) from the first point, in a given configuration, the Sander might tilt due to the weight of the hose.

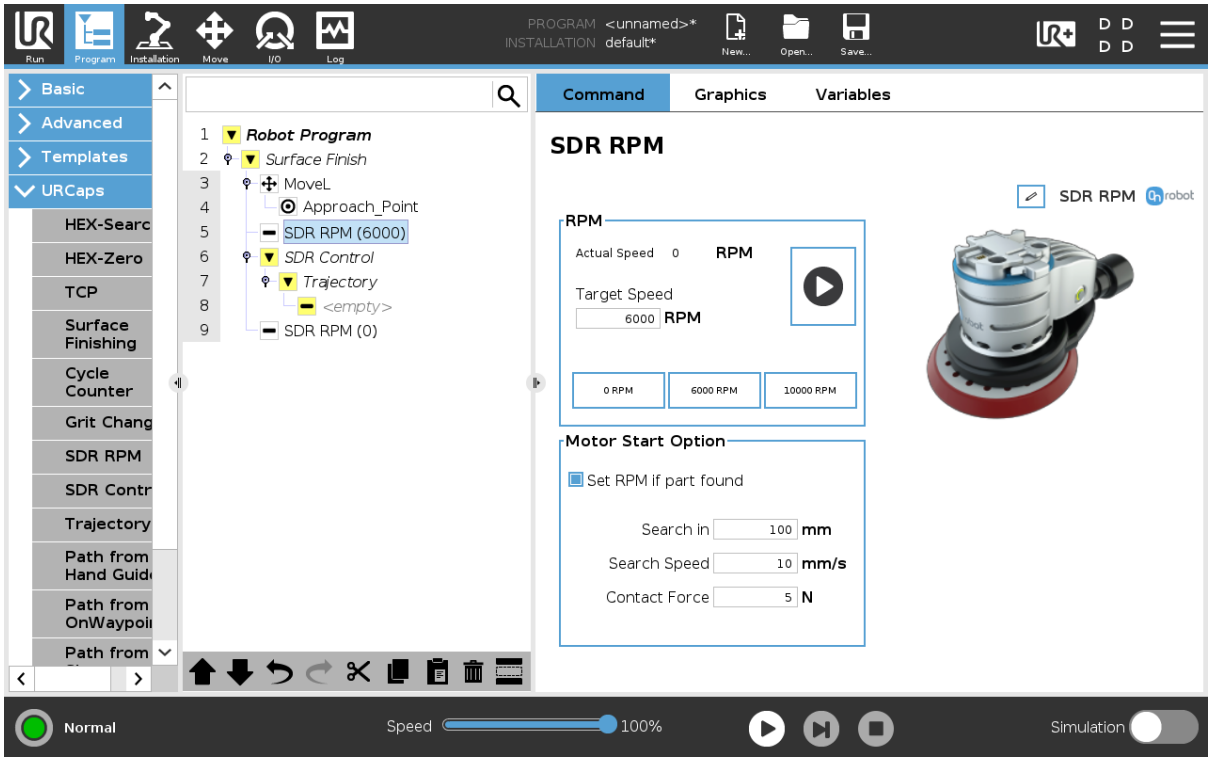
The orientation of the Sander must be the same as the orientation of the sanding, which is the orientation of the first point in the `Trajectory`.

For detailed instructions, see the UR robot manual.

5.2.2.4. SDR RPM

The `SDR RPM` command creates a node which provides the following functions:

- Starting the motor of the Sander
- Approaching the object to be treated
- Changing the RPM value
- Stopping the motor after robot retraction



 : shows the name of the node. It can be edited and saved.

RPM

Actual Speed: shows the current speed of the Sander.

Target Speed: sets the RPM value of the Sander.

: shows a list of preset speed values.
When you select a preset speed value, it will appear in the **Target Speed** field.

 : starts the Sander with the set **Target Speed**.
Then the icon changes to a Stop icon.

Motor Start Option

Set RPM if part found: when checked, the system only starts the Sander when the robot gets in contact with the object.

- **Search in**: sets the distance in mm in which the robot searches for the object.
- **Search Speed**: sets the speed of the searching process.
- **Contact Force**: sets the contact force at which the object is considered as found.

Motor Stop Option

This option becomes available after the Sander has been started.

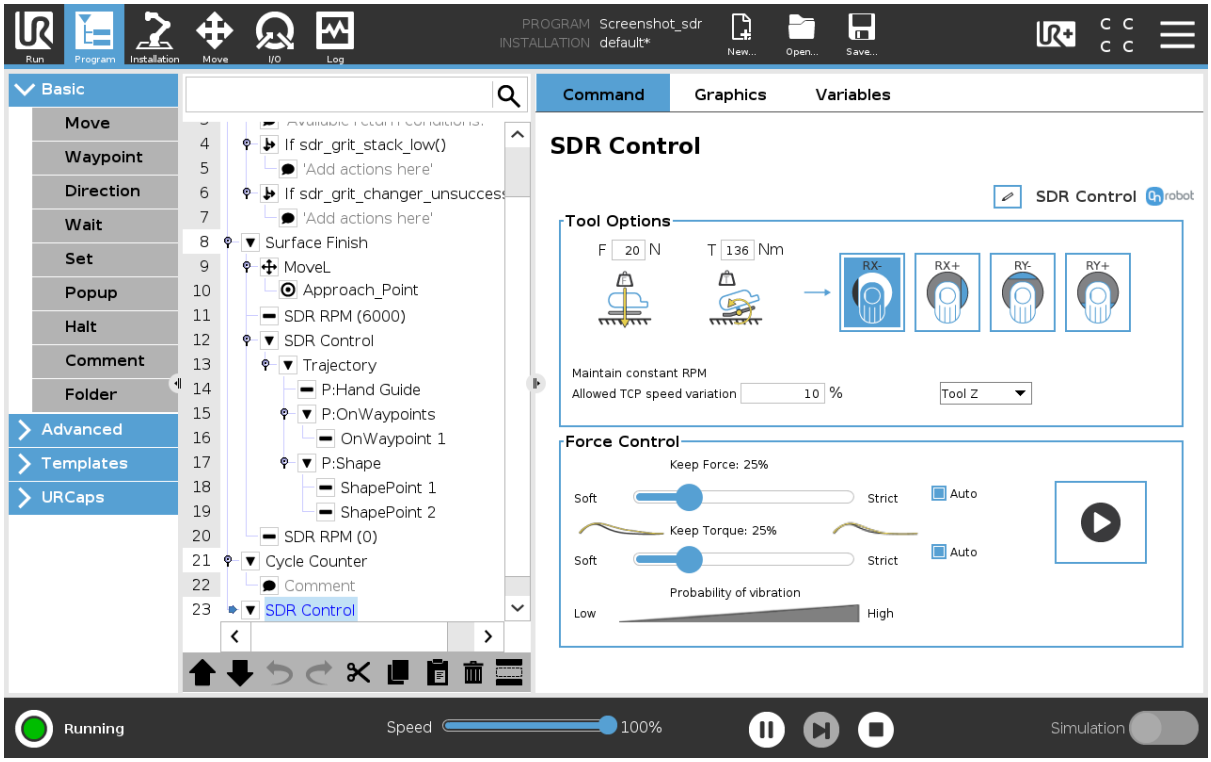
Retract before STOP: when checked, the Sander retracts before it stops.

Retraction distance: sets the retraction distance in mm.

5.2.2.5. SDR Control

The `SDR Control` command controls the work settings of the Sander.

The insertion of the **SDR Control** node automatically inserts a **Trajectory** child node under the **SDR Control** node. The set SDR Control parameters only affect the child nodes of the **SDR Control** node.



: shows the name of the node. It can be edited and saved.

Tool Options

Pushing force (F): sets the push force value that the Sander applies to the object.

Torque (T): sets the torque value that the Sander applies to the object.
When the **T** value is higher than 0, the following icons are shown:

: sets the **Rx+**, **Rx-**, **Ry+**, and **Ry-** options, respectively, for the Sander.

Maintain constant RPM: use this option when dramatic change can occur in the roughness of the surface. The device will try to maintain constant RPM by slowing down the tool with the percentage defined by the **Allowed TCP speed variation** parameter.

Allowed TCP speed variation: sets the percentage of the TCP speed that can vary during the operation.

Force Control

Keep Force: sets the percentage of the force value for the Sander to keep during operation.

Press the  button to test the set value.
At a higher percentage value the Sander can follow the object more precisely but it can cause more vibration.
Setting the slider to 0 (OFF position) deactivates the force control.

Keep Torque: sets the percentage of the torque value for the Sander to keep during operation.

Press the  button to test the set value.
At a higher percentage value the Sander can follow the object more precisely but it can cause more vibration.
Setting the slider to 0 (OFF position) deactivates the torque control.

Auto checkbox: enables the system to slightly modify the **Keep Force** and **Keep Torque** parameters during operation to minimize the vibration but maintain the required force and torque value.
By default, the checkboxes are selected.

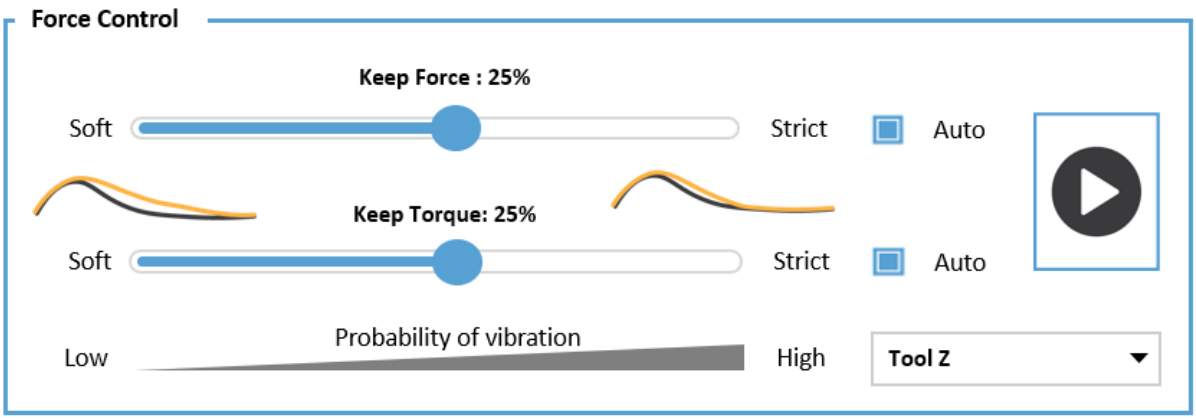

: the Play button has the following functions:

- Testing the SDR Control parameters on the robot, that is, initiating robot motion.
- Being independent from the Sander Tool settings in the SDR RPM node, see **5.2.2.4. SDR RPM**.
- Not starting the motor, the motor can be started via the toolbar, see **Sander**.
- Turning to a Stop button.

When the **Torque (T)** value is higher than 0, the following dropdown menu is shown:
Coordinate system: use this option to select the coordinate system in which you want to sand.

- Tool Z+
- Base Z+

5.2.2.6. Setup the Keep Force and Keep Torque Parameters



To obtain the best surface finishing result the robot path must be well defined. **Force Control** should only adjust for small deviation on the parts, but advanced control can overcome greater deviations. The closer the given path to the actual part is, the better surface finishing can be achieved.

Always verify the path on the workpiece before adjusting the **Force Control**.

In order to obtain the best **Keep Force** and **Keep Torque** parameter settings, follow these guidelines.

Path definition tips

- The path should be close to and at an even distance from the part. High and uneven path distance might result in an uneven result, since at some points the **Force Control** needs to compensate for higher distances.
- The tool should always be perpendicular to the surface. High angular deviation at given points demands higher rotational compensation from the **Force Control**.

- Verify your path on the workpiece. Before adjusting the **Force Control** parameters, check if the recorded path covers the workpiece as required, and the robot follows the part surface as planned.

Force Control setup tips

- Try playing the path with disabled Force Control and verify that the workpiece is followed by the tool correctly. For this both the **Keep Force** and **Keep Torque** parameters should be 0% (OFF).
- If the path hits the surface, you can still test the path, if the **Trajectory** type is set to **Relative** and the **SDR Motor Start Option** is disabled. In this case the path playback starts from the **Approach Point**.
- Gradually increase the **Keep Force** parameter in 5-10% increments. The value of 25% should be suitable in most applications.
- If oscillation occurs either decrease the TCP speed or make sure that the tool slides well on the surface (For example: the polishing pad does not slide well without the polishing fluid).

- If the **Keep Force** parameter is set and the path is well defined, the **Keep Torque** parameter can be 0% (OFF) in most cases. If it is required to apply torque, for example, when the torque is reduced by the workpiece deviation, the **Keep Torque** parameter should also be gradually increased and checked for result.
- It can happen that the tool overturns. In this case check if the tool slides well on the surface or decrease the **T(Torque)** level and/or the **Keep Torque** value.

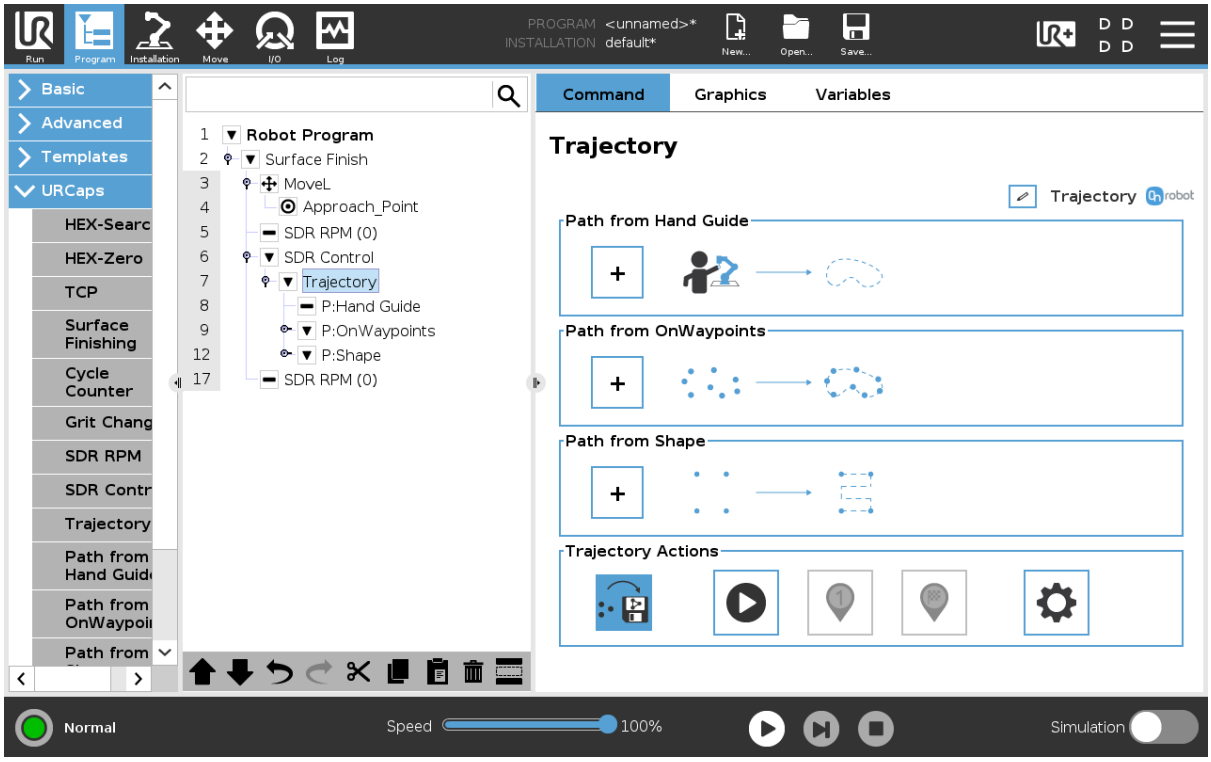
5.2.2.7. Trajectory

The `Trajectory` command specifies the trajectory for the Sander, which is used to follow the object.

The parameters that are set on this page affect the robot motion properties, such as **Speed**, **Acceleration**, and so on.

A complete trajectory can be composed of several paths obtained from a hand guide learning, specified independent waypoints or shapes, or a combination of these.

The generated trajectory is stored on the Compute Box.

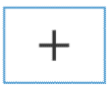


 : shows the name of the node. It can be edited and saved.

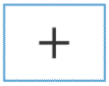
Path from Hand Guide

 : inserts a new **Path from Hand Guide** child node.

Path from OnWaypoints

 : inserts a new **Path from OnWaypoints** child node.

Path from Shape

 : inserts a new **Path from Shape** child node. Automatically adds waypoints depending on the selected shape.

Trajectory Actions

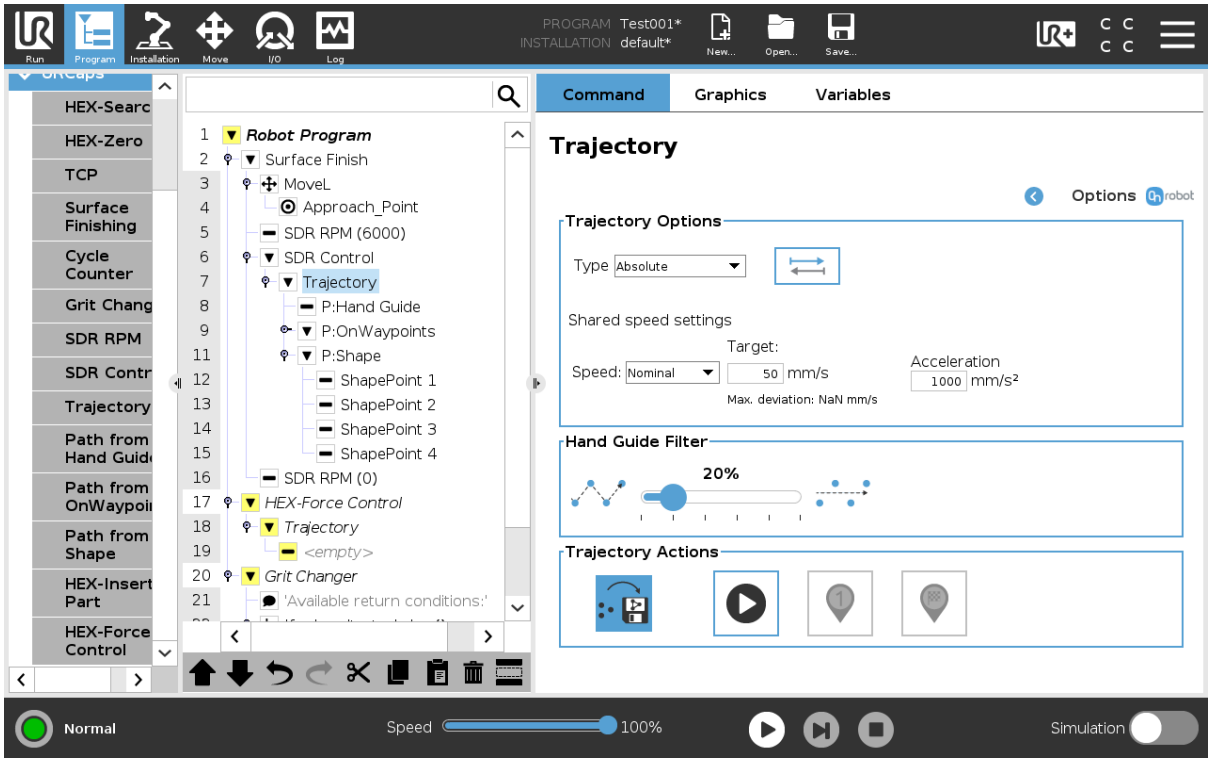
 : generates a trajectory from the previously set paths. The generated trajectory is stored on the Compute Box.
When the button is pressed again, the system regenerates only the changed paths.

 : starts playing the generated trajectory.

 : jumps to the starting point of the trajectory.

 : jumps to the endpoint of the trajectory.

 : opens the **Trajectory Options** page.



Trajectory Options

Type: sets the trajectory type. The following values can be selected:

- **Relative**: the trajectory is started from the actual position of the TCP.

  It is recommended to use **Relative** mode as trajectory type because the height of the object can vary. When **Relative** mode is selected, the defined `Trajectory` is executed with respect to the first contact point where the sanding will start. Consequently, the OR-Sander will follow the surface of the object more accurately.

- **Absolute**: the Sander moves to the original starting point and the trajectory is started from there.
  When you change the **Type**, a pop-up window informs you that the change affects all child nodes.

 : when checked, the system reverses the direction of the trajectory.

Shared speed settings: these settings are got from the preset values, set on the **5.2.2.2. Surface Finishing** page. You can also define the settings on this page.

Speed: sets the speed type of the trajectory. The following values can be selected:

- **Nominal**: use this option is you want to have even TCP speed but can accept speed changes in some cases, for example, in the corners of the object.
- **Constant**: use this option if you want to keep exactly the same speed on the whole surface.
- **As recorded**
  When you specify only hand guide paths, the speed can only be **As recorded**.

Target: sets the target speed value.

Max. deviation: when the **Speed** type is set to **Nominal**, it shows the maximum deviation value which can occur during playback.

Calc. maximum: when the **Speed** type is set to **Constant**, it shows the maximum suggested speed for the trajectory which the robot can execute.

Acceleration: sets the target acceleration value.

Hand Guide Filter

Filter Slider: sets the smoothness of the hand guide path.

Remove pauses: removes unwanted pauses (parts where the robot motion is less than 1 mm) from the path where the robot does not move. The following values can be selected:

- **None**: does not remove any pauses from the path.
- **All**: removes all unwanted pauses from the path.
- **Start**: removes unwanted pauses from the beginning of the path.
- **End**: removes unwanted pauses from the end of the path.
- **Start & End**: removes unwanted pauses from beginning and from the end of the path.

Only visible when **Speed** is set to **As recorded**.

Trajectory Actions

 : generates a trajectory from the previously set paths. The generated trajectory is stored on the Compute Box.
When the button is pressed again, the system regenerates only the changed paths.

 : starts playing the generated trajectory.

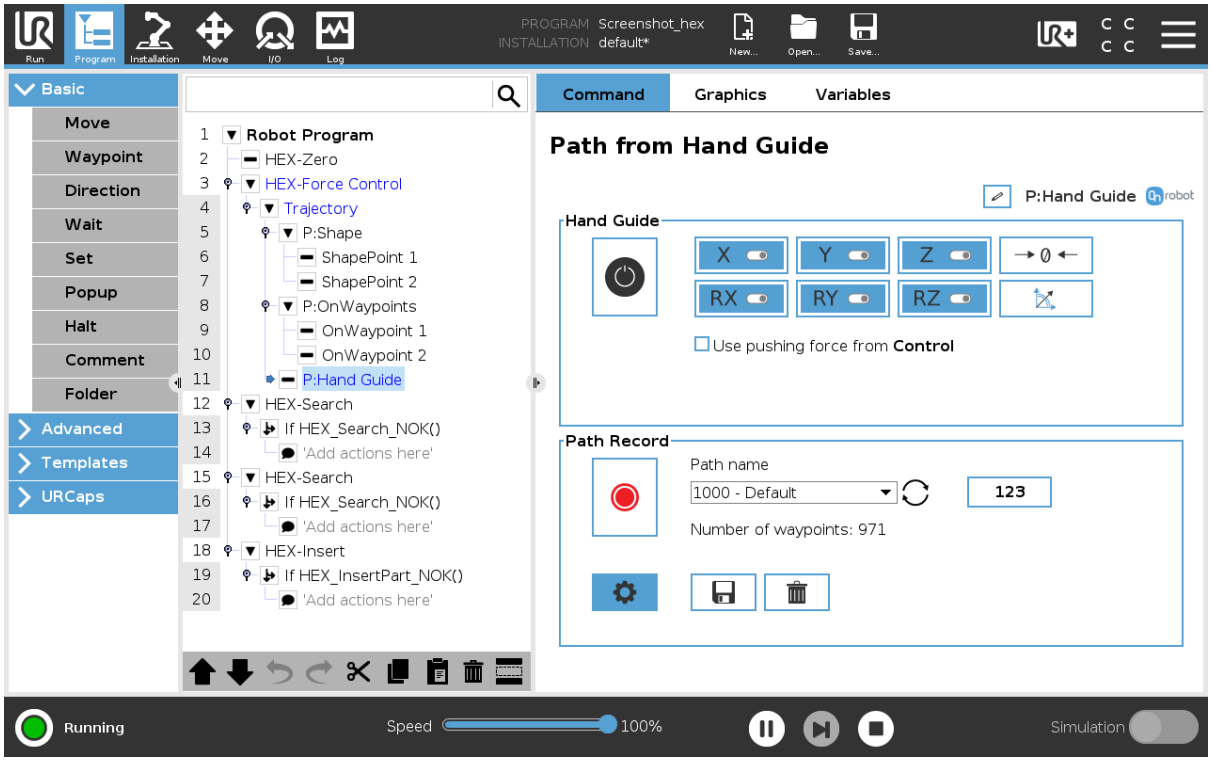
 : jumps to the starting point of the trajectory.

 : jumps to the endpoint of the trajectory.

5.2.2.8. Path from Hand Guide

The `Path from Hand Guide` command generates a path using hand guide.

The color of the node is yellow until the path is saved.



 : shows the name of the node. It can be edited and saved.

Hand Guide

 : enables or disables hand guiding.

Use pushing force from **SDR Control**: uses the **Push Force (F)** value set for the **SDR Control** node, see **5.2.2.5. SDR Control**.
Only visible if an **SDR Control** node exists.

The **Hand Guide** shows which axes are enabled for movement, the zero button →0← and the snap to axes button .

To toggle on or off on an axis, tap the button. An axis is enabled if it turns from white to blue and enables movement along the axis.

In the following example, the X, Y, Z, RX, RY, RZ items are selected:

NOTE:

The used coordinate system is the Tool.

It is possible to activate or deactivate axes during hand guiding.

To start hand guiding the UR robot, make sure that you do not touch the tool and then press and hold the enable button  . Wait until the enable button turns blue and drive the robot by hand with the help of the OnRobot sensor.

NOTE:

Make sure that you do not touch the tool before the hand guiding is activated, otherwise the robot can behave abnormally (e.g..: the robot could move without any external force exerted). In this case, press the zero →0← button, while you are not touching the tool.

Make sure that you do not use the zero →0← button while touching the tool.

To stop hand guiding the UR Robot, tap the enable button  .

The zero →0← button is intended to be used when the tool orientation is changed during hand guiding, so that the effects of gravity or changes in the load of the robot can be neutralized.

The snap to axes button rotates the axes of the tool coordinate system to align with the closest axes of the base coordinate system, disregarding negative or positive directions. This allows the user to set the tool to face precisely horizontally, or vertically, after guiding by hand.

NOTE:

If you are experiencing vibration, grab and guide the tool at the Center of Gravity (roughly it is at the center).

Path Record

: starts the recording of the waypoints.

Path name: selects a path from the drop-down list.

: reloads the list of saved paths.

Number of waypoints: shows the number of waypoints.
When you add a new waypoint, the number increases.

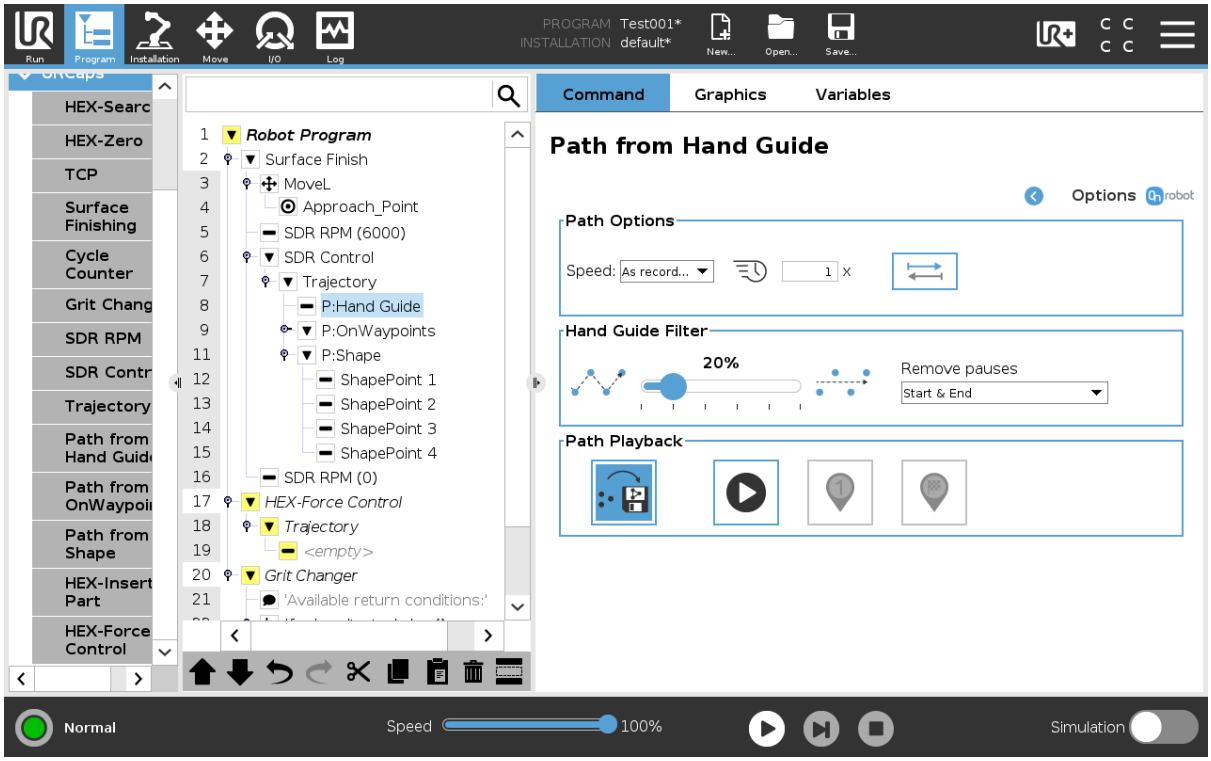
123/ABC : changes the order of the path name list. The order can be numeric or alphabetical.

Not saved: indicates that the path is not saved and it is not empty.

: saves the path.

: deletes the opened path.

: opens the **Path Options** page.



Path Options

By default, the **Speed** settings are got from the preset values, set on the 5.2.2.7. Trajectory page. By selecting another speed type, the input fields become visible.

Speed: sets the speed type of the movement. The following values can be selected:

- **Use shared**: use this option if you want to use the same settings as you set on the 5.2.2.7. Trajectory page.
  This is the default setting.
- **Nominal**: use this option is you want to have even TCP speed but can accept speed changes in some cases, for example, in the corners of the object.
- **Constant**: use this option if you want to keep exactly the same speed on the whole surface.
- **As recorded**
  When you specify only hand guide paths, the speed can only be **As recorded**.

 : use this option to speed up or slow down the recorded path.

 : press to reverse the direction of the path.

Acceleration: sets the target acceleration value.

Hand Guide Filter

Filter Slider: sets the smoothness of the hand guide path.

Remove pauses: removes unwanted pauses (parts where the robot motion is less than 1 mm) from the path where the robot does not move. The following values can be selected:

- **None**: does not remove any pauses from the path.
- **All**: removes all unwanted pauses from the path.
- **Start**: removes unwanted pauses from the beginning of the path.
- **End**: removes unwanted pauses from the end of the path.
- **Start & End**: removes unwanted pauses from beginning and from the end of the path.

Only visible when **Speed** is set to **As recorded**.

Path Playback

 : generates a trajectory from the previously set paths. The generated trajectory is stored on the Compute Box.
When the button is pressed again, the system regenerates only the changed paths.

 : starts playing the hand guide path.

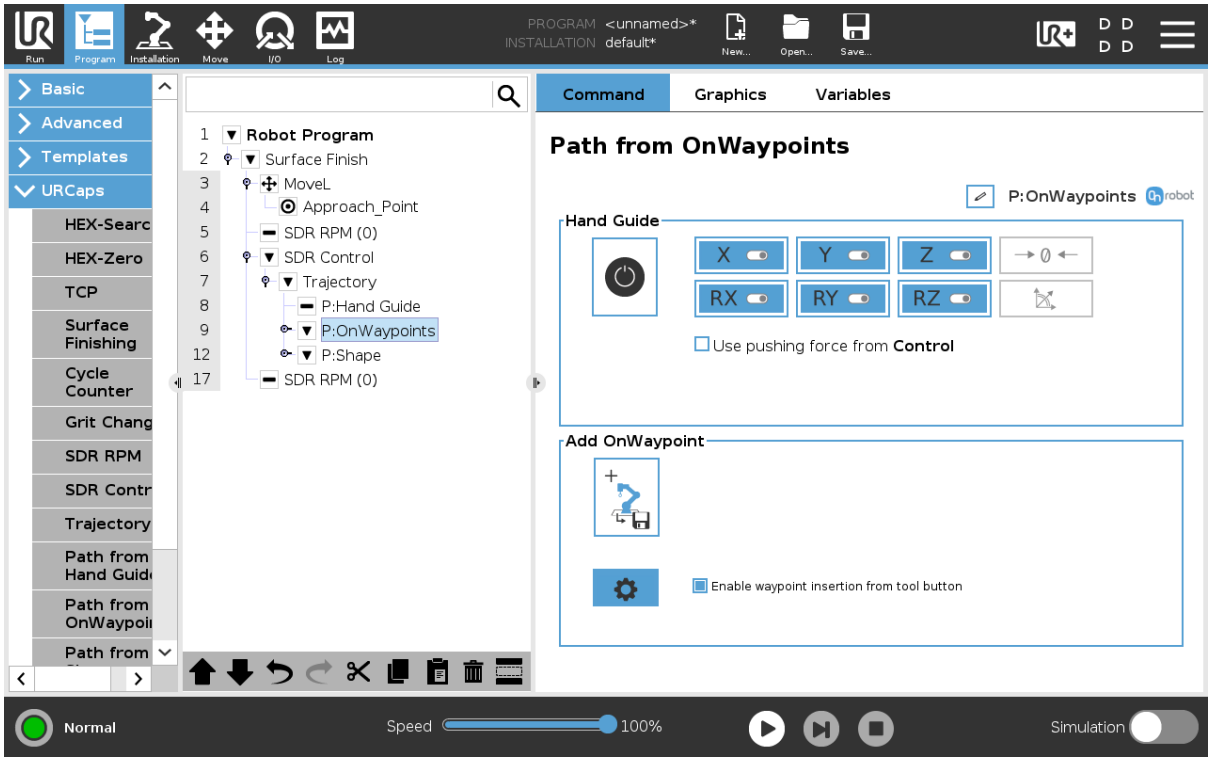
 : jumps to the first element of the path.


: jumps to the last element of the path.

5.2.2.9. Path from OnWaypoints

The `Path from OnWaypoints` command generates a path using specified waypoints.

The color of the node is yellow until the path is saved.




: shows the name of the node. It can be edited and saved.

Hand Guide


: enables or disables hand guiding.

Use pushing force from **SDR Control**: uses the **Push Force (F)** value set for the **SDR Control** node, see **5.2.2.5. SDR Control**.
Only visible if an **SDR Control** node exists.

The **Hand Guide** shows which axes are enabled for movement, the zero button  and the snap to axes button  .

To toggle on or off on an axis, tap the button. An axis is enabled if it turns from white to blue and enables movement along the axis.

In the following example, the X, Y, Z, RX, RY, RZ items are selected:

NOTE:

The used coordinate system is the Tool.

It is possible to activate or deactivate axes during hand guiding.

To start hand guiding the UR robot, make sure that you do not touch the tool and then press and hold the enable button  . Wait until the enable button turns blue and drive the robot by hand with the help of the OnRobot sensor.

NOTE:

Make sure that you do not touch the tool before the hand guiding is activated, otherwise the robot can behave abnormally (e.g..: the robot could move without any external force exerted). In this case, press the zero  button, while you are not touching the tool.

Make sure that you do not use the zero  button while touching the tool.

To stop hand guiding the UR Robot, tap the enable button  .

The zero  button is intended to be used when the tool orientation is changed during hand guiding, so that the effects of gravity or changes in the load of the robot can be neutralized.

The snap to axes button  rotates the axes of the tool coordinate system to align with the closest axes of the base coordinate system, disregarding negative or positive directions. This allows the user to set the tool to face precisely horizontally, or vertically, after guiding by hand.

NOTE:

If you are experiencing vibration, grab and guide the tool at the Center of Gravity (roughly it is at the center).

Add OnWaypoint

 : when the hand guide is not started, press the button to add new OnWaypoint nodes to the program.

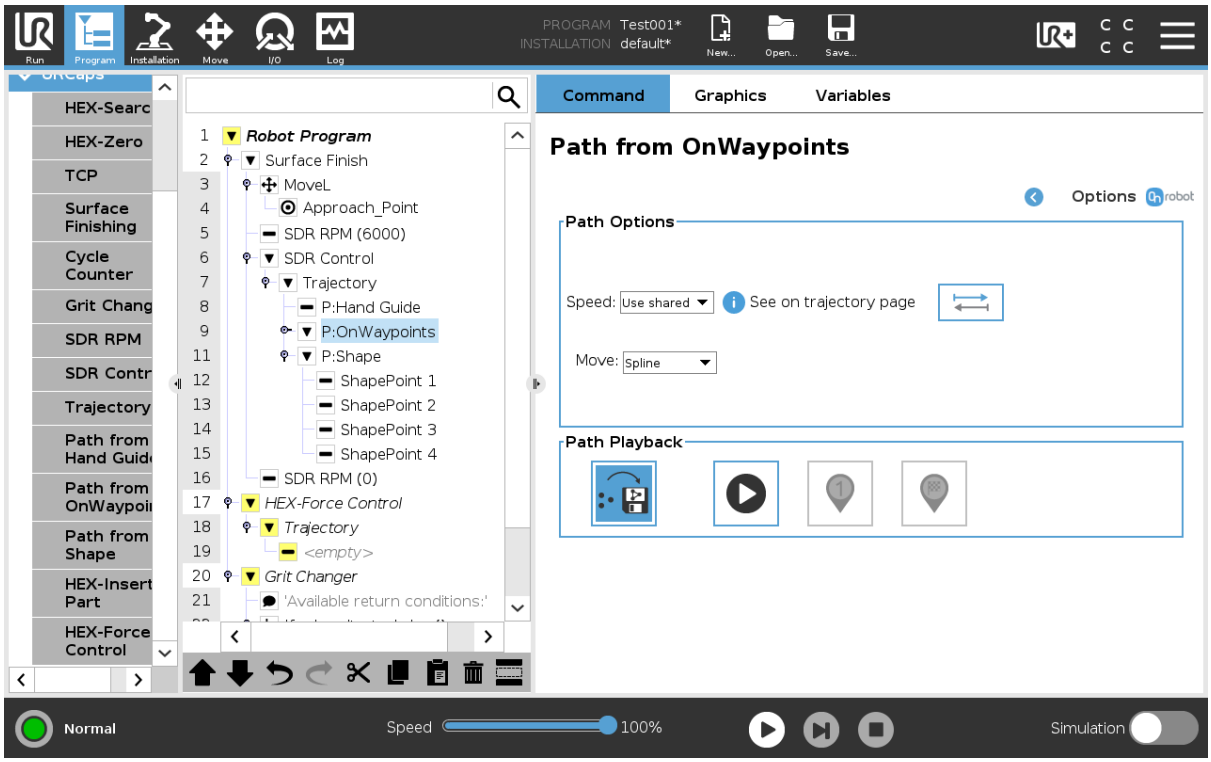
 : when the hand guide is started, press the button to save the actual position of the actual TCP.
When the hand guide is stopped, the OnWaypoint nodes are automatically added to the program.

List of the last waypoints: shows the last waypoints added to the program.

Only visible when the  button is pressed.

Enable waypoint insertion from tool button: when checked, a new **OnWaypoint** node can be added by pressing the button on the Sander. In this case, the LED of the Tool button turns to steady green.

 : opens the **Path Options** page.



Path Options

By default, the **Speed** settings are got from the preset values, set on the 5.2.2.7. Trajectory page. By selecting another speed type, the input fields become visible.

Speed: sets the speed type of the movement. The following values can be selected:

- **Use shared**: use this option if you want to use the same settings as you set on the 5.2.2.7. Trajectory page.
  This is the default setting.
- **Nominal**: use this option if you want to have even TCP speed but can accept speed changes in some cases, for example, in the corners of the object.

- **Constant**: use this option if you want to keep exactly the same speed on the whole surface.
- **As recorded**
  When you specify only hand guide paths, the speed can only be **As recorded**.

Target: sets the target speed value.

Max. deviation: when the **Speed** type is set to **Nominal**, it shows the maximum deviation value.

 : press to reverse the direction of the path.

Acceleration: sets the target acceleration value.

Move: sets the type of the movement. The following values can be selected:

- **Spline**: the path points are connected with a spline. It ensures a faster path.
- **Linear**: the path points are connected with linear lines using the **Blend** parameter as the minimum radius. It ensures a more accurate path.

Blend: sets the blending value, only in case of **Linear** movement.

Path Playback

 : generates a trajectory from the previously set paths. The generated trajectory is stored on the Compute Box.
When the button is pressed again, the system regenerates only the changed paths.

 : starts playing the waypoint path.

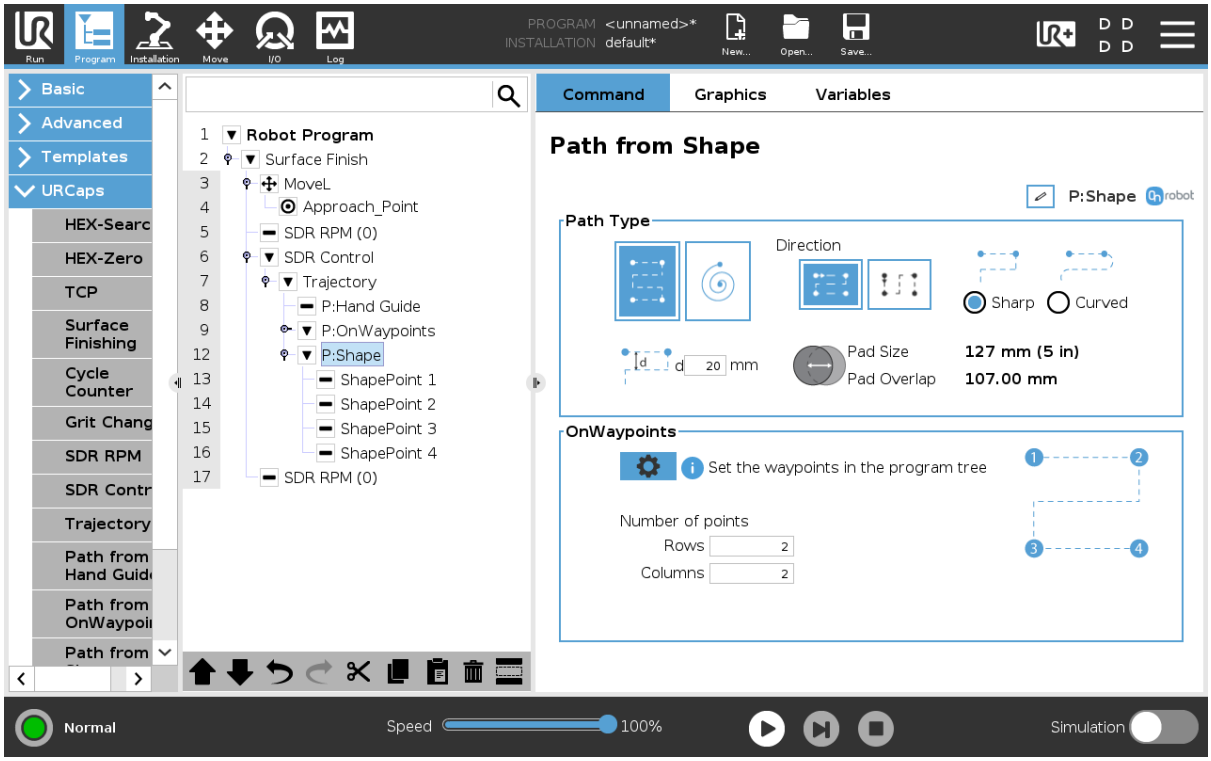
 : jumps to the first element of the path.

 : jumps to the last element of the path.

5.2.2.10. Path from Shape

The `Path from Shape` command generates a path using different corner point of the part.

The color of the node is yellow until the path is saved.



: shows the name of the node. It can be edited and saved.

Path Type

: select this option to use a squared path.

d: sets the overlap distance between two parallel running of the Sander.

Direction

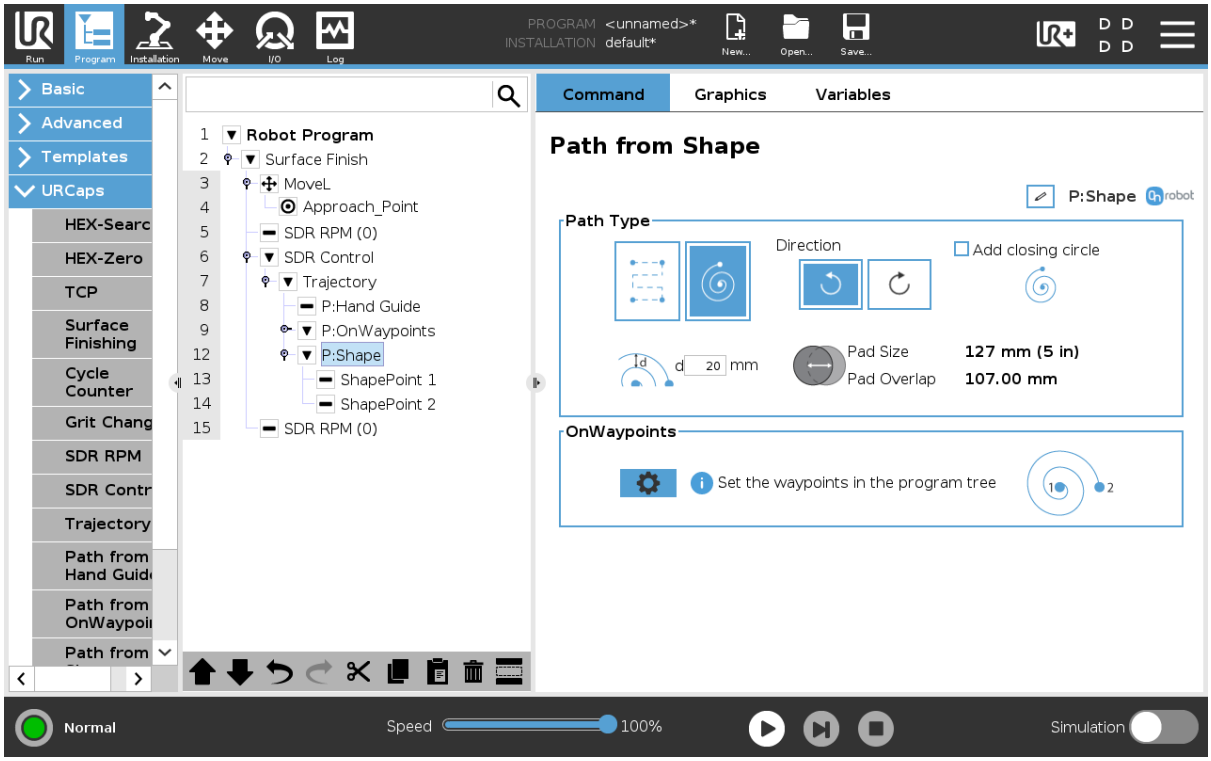
: sets the direction of the path.

Sharp: when checked, the path follows sharp edges.

Curved: when checked, the path follows curved edges.

Pad Size: shows the size of the pad.

Pad Overlap: shows the overlap distance during pad movement.



Path Type

 : select this option to use a spiral path.

d: sets the overlap distance between two parallel running of the Sander.

Direction

 : sets the direction of the path clockwise or counterclockwise.

Add closing circle: when checked, the spiral path is closed.

Pad Size: shows the size of the pad.

Pad Overlap: shows the overlap distance during pad movement.

OnWaypoints

Displays the point that you set on the path. The number of points is added automatically based on the selected shape type.

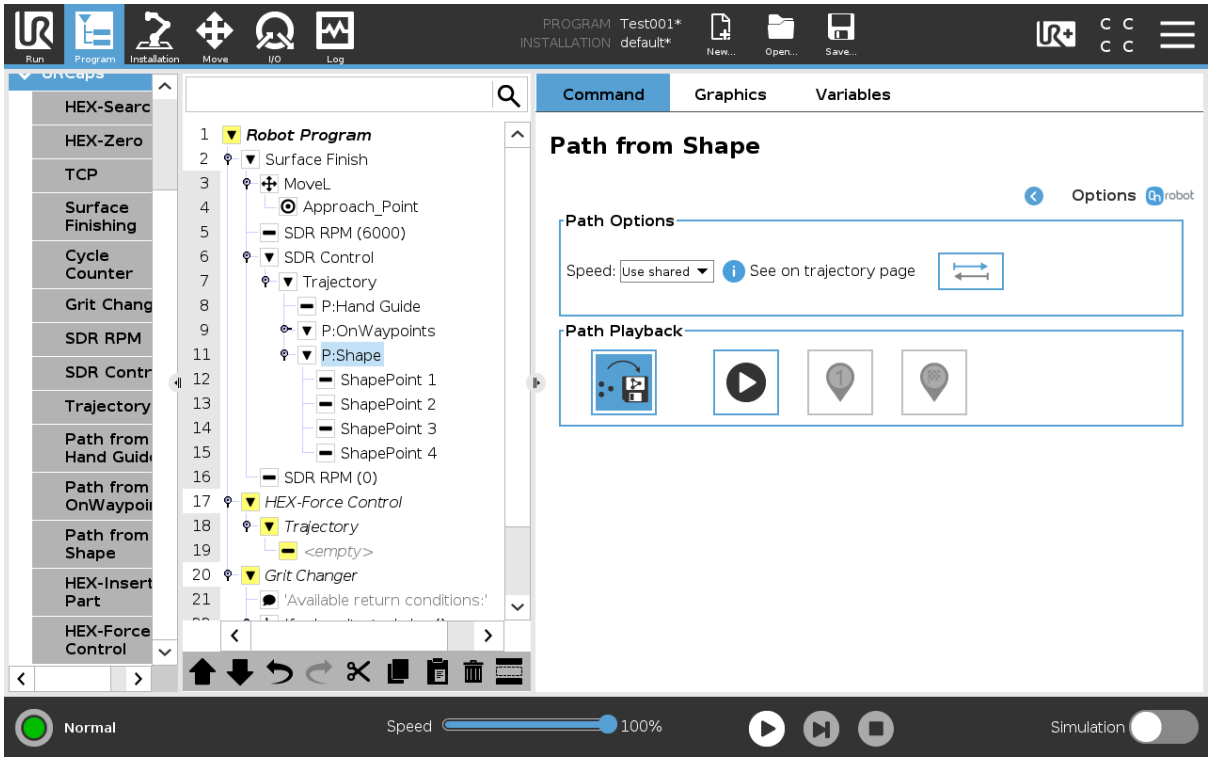
 : opens the **Path Options** page.

Number of points
This option is only displayed when squared path is selected.

NOTE:

Minimum 2x2, maximum 3x5 points can be configured.

- **Rows**: sets the number of rows in the shape.
- **Columns**: sets the number of columns in the shape.



Path Options

By default, the **Speed** settings are got from the preset values, set on the 5.2.2.7. Trajectory page. By selecting another speed type, the input fields become visible.

Speed: sets the speed type of the movement. The following values can be selected:

- **Use shared**: use this option if you want to use the same settings as you set on the 5.2.2.7. Trajectory page.
  This is the default setting.
- **Nominal**: use this option is you want to have even TCP speed but can accept speed changes in some cases, for example, in the corners of the object.
- **Constant**: use this option if you want to keep exactly the same speed on the whole surface.
- **As recorded**
  When you specify only hand guide paths, the speed can only be **As recorded**.

Target: sets the target speed value.

Max. deviation: when the **Speed** type is set to **Nominal**, it shows the maximum deviation value.

 : press to reverse the direction of the path.

Acceleration: sets the target acceleration value.

Path Playback

 : generates a trajectory from the previously set paths. The generated trajectory is stored on the Compute Box.
When the button is pressed again, the system regenerates only the changed paths.

 : starts playing the shape path.

 : jumps to the first element of the path.

 : jumps to the last element of the path.

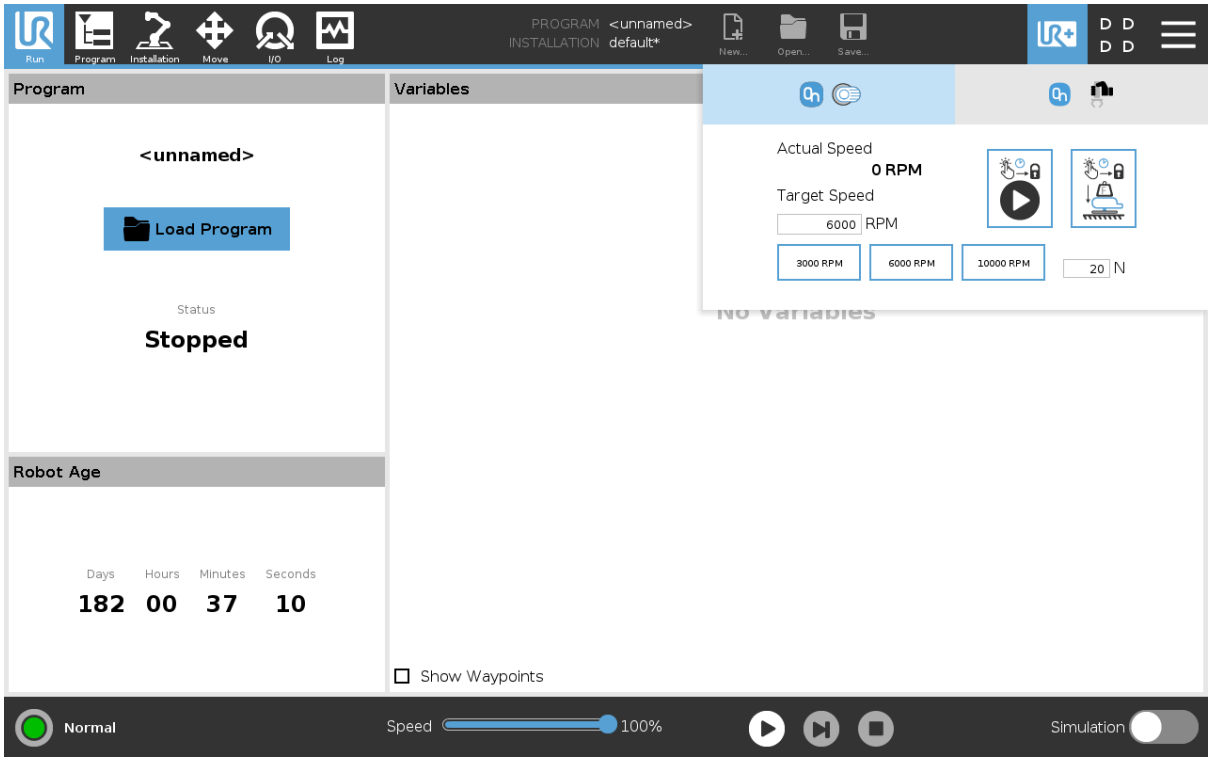
5.3. URCap Toolbar

The Toolbar makes it simple to operate the tools while you are programming or during runtime.

How to Access the Toolbar

The way how the toolbar can be accessed is different on the e-Series and the CB3 UR robots, but the functionality is the same.

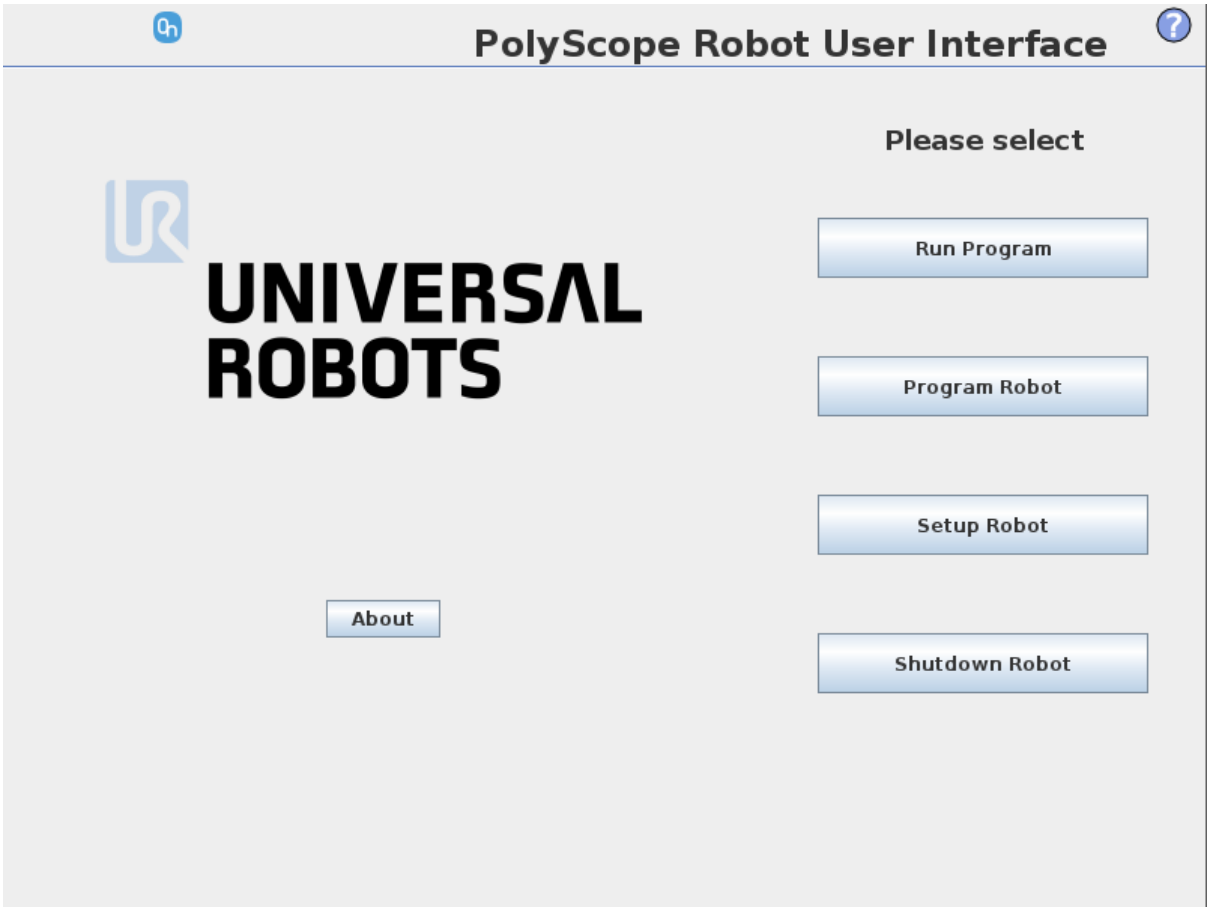
To open up the toolbar in the e-Series, press on the UR+ icon  on the top right side. Then press on the OnRobot icon  .



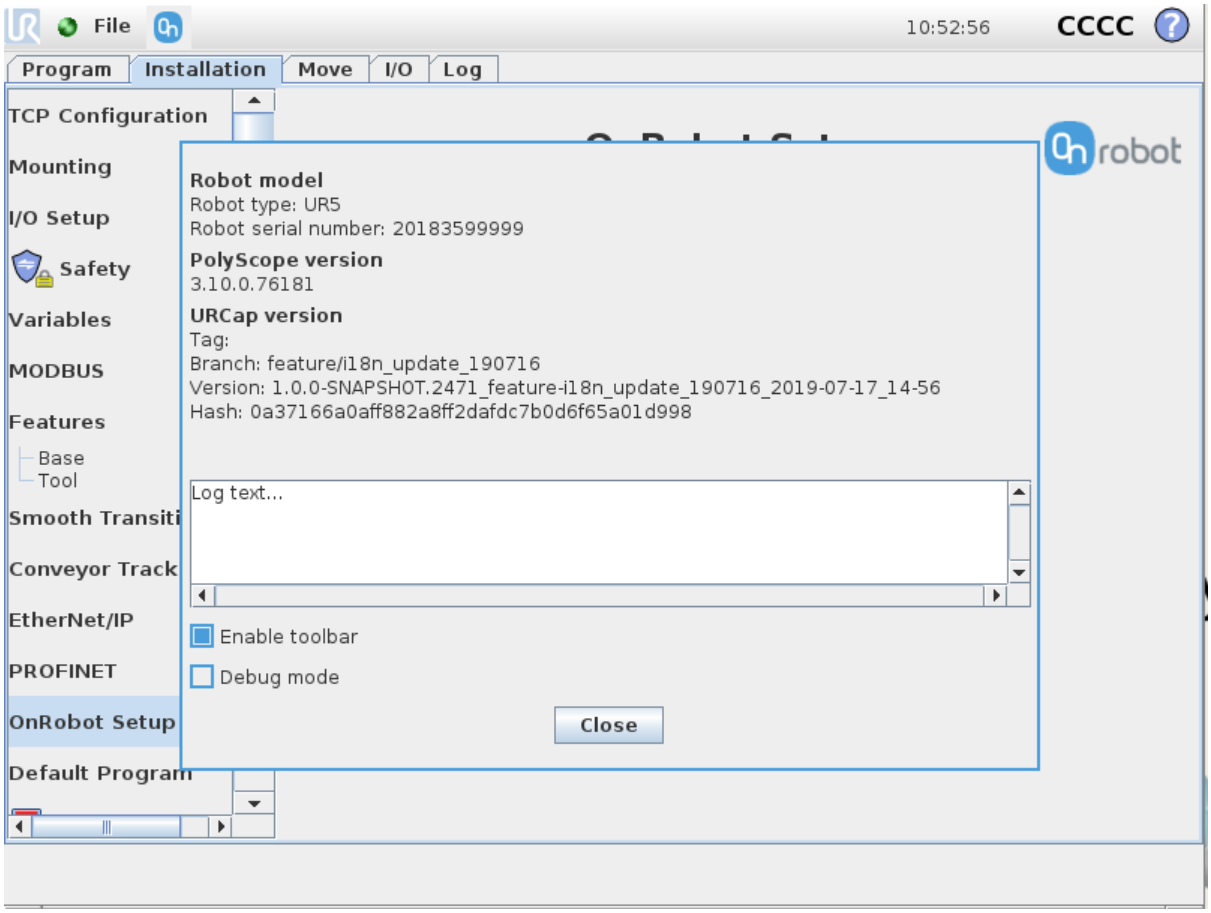
To open up the toolbar in the CB3, press on the OnRobot icon on the top left side. The icon might take around 20 seconds to appear after robot power up.

NOTE:

All toolbars are disabled while any robot program is running. Some toolbars are also disabled and cannot be used while the robot is not initialized.



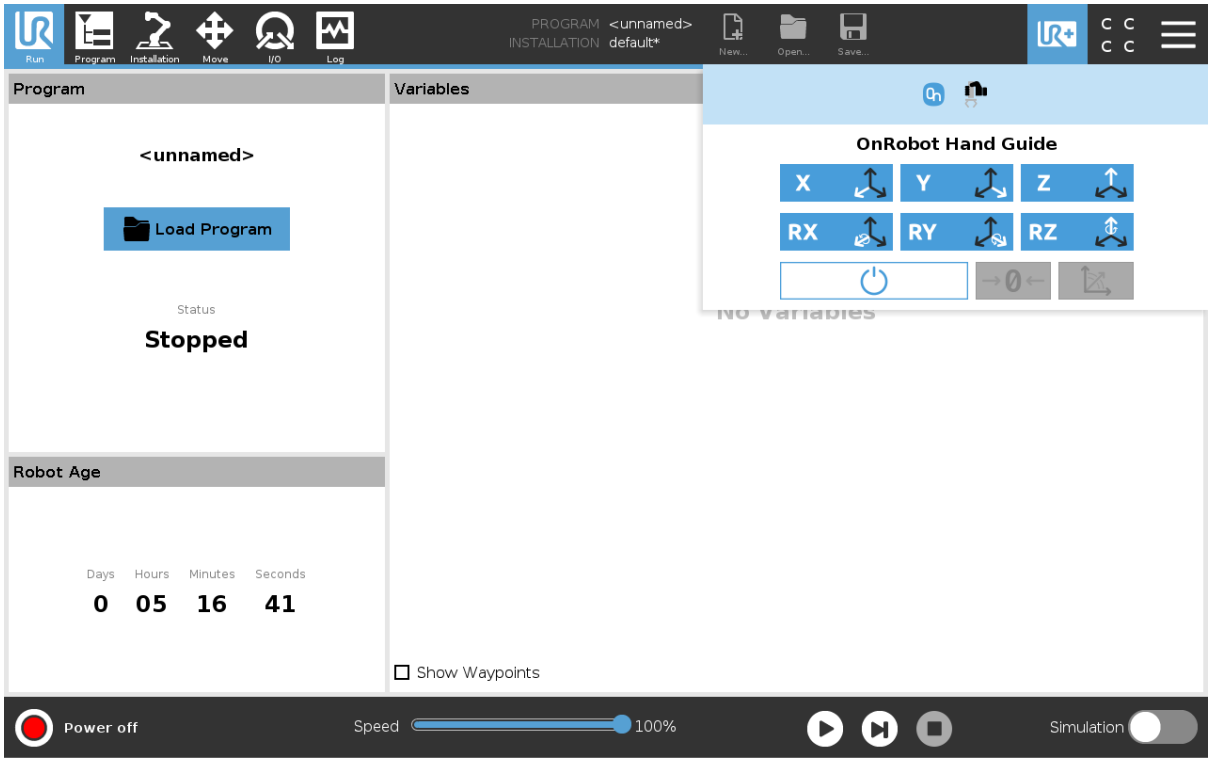
To enable/disable the toolbar, press on the OnRobot logo on the top right corner and check/uncheck the Enable toolbar checkbox.



5.3.1. HEX-E/H QC

To open up the toolbar, follow the instructions under **How to Access the Toolbar** in the **5.3. URCap Toolbar** section.

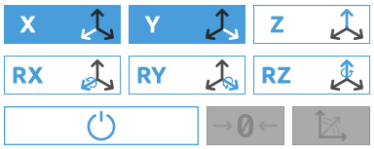
The toolbar for the HEX is called Hand Guide and it is shown below. This toolbar is used to hand guide the robot by holding the End of Arm Tooling with your hand. It is possible to lock some of the axes to reduce the degrees of freedom.



The toolbar contains the available axes, the enable button  , the zero button  and the snap to axes button  .

To select an axis, tap on the appropriate item. An axis is selected if it turns from white to blue  .

In the following example, the X and the Y items are selected to limit the movement along the X and Y axis (planar):



NOTE:

The used coordinate system is the Tool.

To deactivate any axis that has been selected, tap on the item again.

NOTE:

It is possible to activate or deactivate axes during hand guiding.

To start hand guiding the UR robot, first make sure that you do not touch the tool and then press and hold the enable button  . The button turns to an hourglass  icon

while the hand guiding is being initiated. Wait until the enable button turns blue  and drive the robot by hand with the help of the OnRobot sensor.

NOTE:

Make sure that you do not touch the tool before the hand guiding is activated (enable button turned to blue ), otherwise the robot can behave abnormally (e.g..: the robot could move without any external force exerted). In this case, press the zero  button, while you are not touching the tool.

Make sure that you do not use the zero  button while touching the tool.

To stop hand guiding the UR Robot, press the enable button  .

NOTE:

The hand guiding could be configured (in the OnRobot installation page) to be enabled with a single tap on the enable button  (instead of holding) and stopped with a second tap. However, the holding behavior is recommended for increased safety.

NOTE:

Please always set the speed slider of the robot to 100% while using the hand guiding to have an optimal user experience.

The zero  button is intended to be used when the tool orientation is changed during hand guiding, so that the effects of gravity or changes in the load of the robot can be neutralized.

The snap to axes button  rotates the axes of the tool coordinate system to align with the closest axes of the base coordinate system, disregarding negative or positive directions. This allows the user to set the tool to face precisely horizontally, or vertically, after guiding by hand.

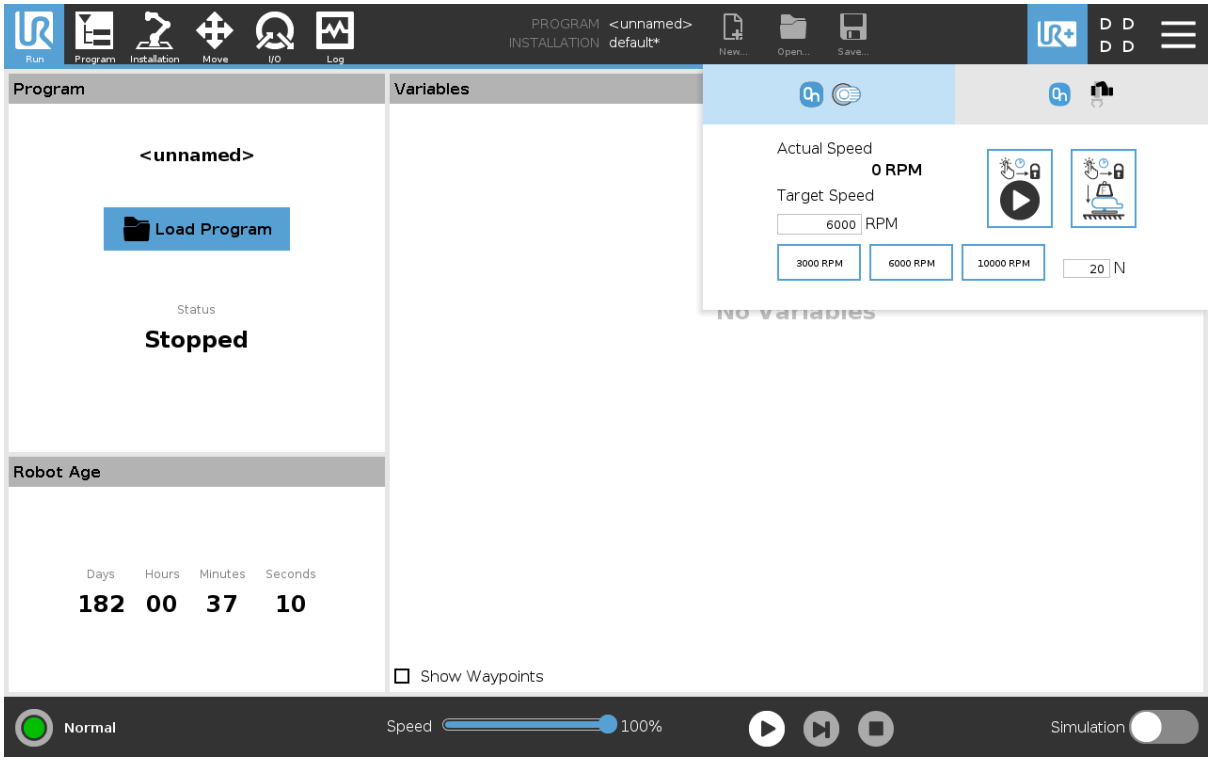
NOTE:

If you are experiencing vibration, grab and guide the tool at the Center of Gravity (roughly it is at the center).

5.3.2. Sander

To open up the toolbar, follow the instructions under **How to Access the Toolbar** in the **5.3. URCap Toolbar** section.

The toolbar for the Sander is shown below.



Actual Speed: shows the current speed of the Sander.

Target Speed: sets the speed of the Sander.

: shows a list of preset speed values.
When you select a preset speed value, it will appear in the **Target Speed** field.

: starts the Sander with the **Target Speed** or stops the Sander.

NOTE:

The button must be held for three seconds to start the Sander.

After the Sander starts, the button changes and it can be be pressed to stop the Sander immediately.

: initiates robot motion in the Tool Z+ coordinate and keeps the defined force value. The Sander retracts from the object when it is stopped.

NOTE:

If the tool button is pressed on the Sander, a green light is shown on the icon.

Set force: sets the push force value to be applied on the object.

5.4. URScript Commands

URScript commands can be used alongside other scripts.

5.4.1. Sander

Not applicable for Sander.

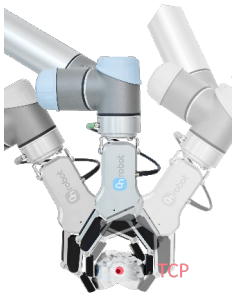
5.5. TCP Configuration

TCP is the abbreviation of the Tool Center Point.

TCP is a point that is in the beginning (by default) located at the middle point of the UR's tool flange. This is an important point during robot programming since UR's Move commands are always referenced to a given TCP point and rotations could only be carried out about these points.

If a tool is attached to the robot, it makes easier for the user to change that point to the tool's “end” point (see illustration on the left).

In this way it is easy to rotate the tool while the workpiece is being stationary in space (see illustration on the right).



More than one TCP point could be defined but at a given time only one TCP can be active. In UR, it is called the Active TCP.

By default, UR's Move commands are always recording the Waypoints according to the Active TCP.

For further info about the UR's TCP handling read the UR's Manual.

How “far” the TCP needs to be moved to be at the “end” of the OnRobot tools could be found in the **8.3. TCP, COG** section.

Since, it could be hard to enter these values by hand, OnRobot provides two ways to get these parameters configured for you:

- Static TCP mode - Recommended to be used
- Dynamic TCP mode

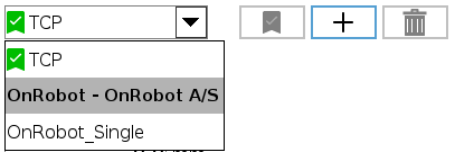
The mode could be selected on the TCP panel in the OnRobot Installation (see in the **4.1.3. URCap Setup** setup section).

In the following these two modes will be described.

Static TCP Mode

In this mode the user can manually change the Active TCP based on the predefined OnRobot TCP options:

- **OnRobot_Single**
  If no Dual Quick Changer is detected, so only one tool is used.
- **OnRobot_Dual_1** and **OnRobot_Dual_2**



If a Dual Quick Changer is detected, so two tools are used.

NOTE:

OnRobot_Dual_1 belongs to the tool that is attached to the Primary side of the Dual Quick Changer.

The TCP values are created and precalculated based on the detected tool(s). So, if the RG2 is mounted in 30° (with the built-in tilting mechanism) the precise TCP is defined accordingly.

The calculation is only carried out when a new device is detected or when the mounting angle is changed (only for RG2/6 and RG2-FT).

The calculated values are static parameters and do not change during program execution.

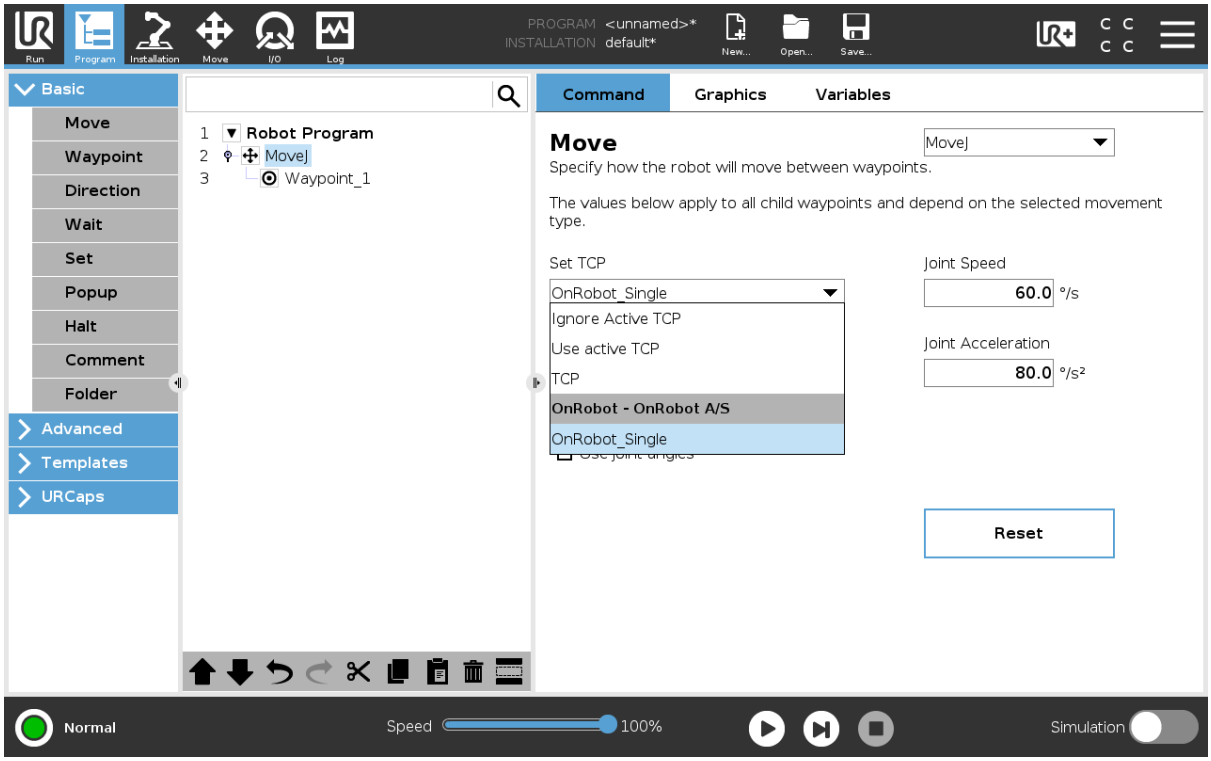
NOTE:

For the RG2, RG6 and RG2-FT grippers the TCP is calculated always assuming that the gripper is fully closed.

It is a good practice to set the used TCP option as the Default TCP ( ) in the UR's TCP Configuration, but it is not mandatory.

However, it is highly recommended to create the Waypoints in the UR's Move command in a way that the referencing TCP is set first.

So, if only a single OnRobot device is used, before the Waypoints are defined, set the UR's Move command's TCP to use the **OnRobot_Single**.



If two OnRobot devices are used, select **OnRobot_Dual_1** or **OnRobot_Dual_2** accordingly.

If not the UR's Move command but the OnRobot `F/T Move` command is used (for HEX-E/H QC or RG2-FT only):

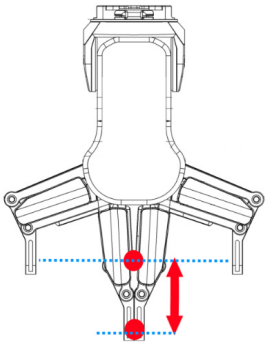
- Use the OnRobot TCP command just before the `F/T Move` to set the Active TCP to the right value

As summary here is a code example:

Single	Dual
Not mandatory to set OnRobot TCP as Default TCP	Not mandatory to set OnRobot TCP as Default TCP

`Robot program`
 	
`MoveJ (Set TCP = OnRobot_Single)`
 	
`#Alternatively`
`TCP`
`F/T Move`
	`Robot program`
	
	`MoveJ (Set TCP = OnRobot_Dual_1)`
	
	`MoveJ (Set TCP = OnRobot_Dual_2)`

Dynamic TCP Mode



In this mode the UR's Active TCP is set automatically according to the detected OnRobot device.

This mode is useful when the TCP effect of the width value of the gripper (RG2, RG6 or RG2-FT only) is needed to be considered.

During the robot program execution if the `RG Grip` commands are used to open or close the gripper TCP is automatically set accordingly.

Furthermore, if the OnRobot Toolbar is used to open or close the gripper the Active TCP is adjusted immediately.

However, the Active TCP is overwritten directly, there is also an OnRobot defined TCP, that is called:

- **OnRobot_Default**
  This is the name in both the Single and Dual device case.

It is recommended to set the **OnRobot_Default** option as the Default TCP ( ) in the UR's TCP Configuration.

To let the system to automatically update the TCP during the program execution the UR's Move commands needs to be left at its default setting of **Set as Active TCP**. (Compared to the Static TCP mode where it is needed to be changed to a predefined TCP).

In case when two grippers are used, the Active TCP needs to be selected to which gripper to belong to:

- first use an OnRobot `TCP` command and select from Gripper 1 and Gripper 2 which one to be used
- then the UR's Move will have an updated Active TCP that could be used for multiple Move commands
- when it will be necessary to change to the other gripper just use another TCP and select the other gripper.

Before you teach any Waypoint make sure to set the Active TCP beforehand:

- for Single device go to the OnRobot Installation panel
- for Dual devices go to the OnRobot Installation panel and Select the Device (1 or 2) that you are using at the time of the teaching

As summary here is a code example:

Single	Dual
Recommended to set **OnRobot_Default** TCP as the UR's Default TCP	Recommended to set **OnRobot_Default** TCP as the UR's Default TCP
	Before each program execution make sure to select on the OnRobot Installation panel the right gripper that will be the first used in the program

Single	Dual
Robot program TCP (Optional) MoveJ (Set TCP = Active TCP)	Robot program TCP (Select Gripper 1) MoveJ (Set TCP = Active TCP) TCP (Select Gripper 2) MoveJ (Set TCP = OnRobot_Dual_2)

5.6. Feedback Variables

5.6.1. HEX-E/H QC

Feedback Variable	Unit	Description
on_return		The return value for the OnRobot commands
F3D	[N]	Length of the 3D force vector $F3D = \sqrt{Fx^2 + Fy^2 + Fz^2}$
HEX_Average_F3D	[N]	Low-pass filtered (1Hz) F3D that can be used to have a noise-free signal.
FT_Base	[3xN,3xNm]	Force and torque values calculated in the Base Coordinate system, in an array
FT_Tool	[3xN,3xNm]	Force and torque values calculated in the Tool Coordinate system, in an array
Fx	[N]	Force value along the X axis
Fy	[N]	Force value along the Y axis
Fz	[N]	Force value along the Z axis
T3D	[Nm]	Length of the 3D torque vector $T3D = \sqrt{Tx^2 + Ty^2 + Tz^2}$
Tx	[Nm]	Torque value about the X axis
Ty	[Nm]	Torque value about the Y axis
Tz	[Nm]	Torque value about the Z axis

5.6.2. Sander

Feedback Variable	Unit	Description
SDR_Button	-	0 - The button on the Sander is pressed 1 - The button on the Sander is not pressed
SDR_RPM	[RPM]	The current speed of the Sander.
SDR_Runtime	[minute]	The elapsed time since the Sander has been started. The elapsed time is only counted when the pushforce reaches the **Cycle Counter: Force Limit**.
SDR_State	-	0 - No error 1 - RPM deviation limit exceeded 2 - Motor voltage limit exceeded 4 - Motor current limit exceeded 8 - Temperature limit exceeded 10 - Vibration limit exceeded 20 - 30V level failure 40 - 24V level failure 80 - 12V level failure 100 - 5V level failure
SDR_Temperature	[°C]	The temperature of the Sander.
on_return		The return value of the OnRobot commands.

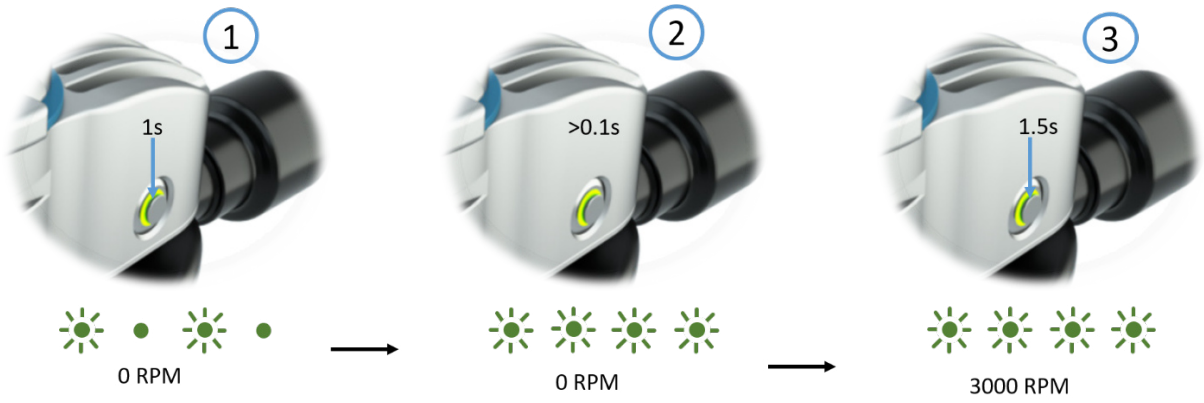
6. Operation without Compute Box Connection

The Sander can be turned on manually if it is not connected to a Compute Box via a Quick Changer.

To turn on the Sander manually:

0 Connect the Sander power cable. The button on the Sander flashes green.

1. Press and hold the button, at least for 1 s. The button on the Sander becomes steady green.
2. Release the button.
3. Press and hold the button, at least for 1.5 s. The Sander will turn on, and rotate at 3000 RPM.



During manual operation, the default (first) rotation speed is set to 3000 RPM. Press the button repeatedly to change the RPM to 6000 RPM, 10000 RPM, and Stop.

To stop the Sander, either cycle the RPM, or hold the button for 1s.

7. Additional Software Options

7.1. Compute Box/Eye Box

7.1.1. Ethernet Interface Setup

A proper IP address must be set for the Compute Box/Eye Box and the robot/computer to be able to use the Ethernet interface. The IP address can be configured using DIP switches 3 and 4.

WARNING:

Stop the robot program before you change any Ethernet interface settings.

NOTE:

Configuring DIP switch 3 will remove any previously set static IP address.

To change between modes, first change the DIP switches and then cycle the Compute Box/Eye Box power so the changes will take effect.

DIP 3 - sets the Compute Box / Eye Box IP address

- **ON**: Fixed IP (192.168.1.1)
- **OFF**: Dynamic or Static IP *(can be configured via the Web Client)*

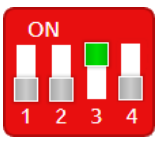
DIP 4 - sets whether the connected robot or laptop will receive IP address from the Compute Box / Eye Box

- **ON**: DHCP server is disabled
- **OFF**:DHCP server is enabled

We recommend to set the DIP switches according to either of the two options below:

- **Fix IP/Auto mode** - in simple installations (no external network and/or no PLC connected)
- **Advanced mode** - in more complex installations (external network and/or PLC are used)

Fix IP/Auto mode (factory default)

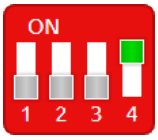


Set the DIP switch 3 to ON and the DIP switch 4 to OFF position and cycle the power so the changes will take effect.

IP Address of the Compute Box/Eye Box	IP Address of the Robot/Computer
The IP address of the Compute Box/Eye Box is fixed 192.168.1.1. This IP address cannot be changed.	The Compute Box/Eye Box will automatically assign an IP address to the connected robot/computer if it was configured to obtain an IP address automatically. **NOTE:** The assigned IP address range is 192.168.1.100-105 (with subnet mask 255.255.255.0). If the Compute Box/Eye Box is used in a company network where a DHCP server is already in use, it is recommended to use Advanced mode.

In this mode, the DHCP server of the Compute Box/Eye Box is enabled.

Advanced mode (any static or dynamic IP/subnet mask)



Set the DIP switch 3 to OFF and the DIP switch 4 to ON position and cycle the power so the changes will take effect.

IP Address of the Compute Box/Eye box	IP Address of the Robot/Computer
Case 1: Static IP address The IP address 192.168.1.1 is already in use in your network or a different subnet needs to be configured.	The Compute Box/Eye Box will not assign an IP address to the robot/computer. Set the IP address of the robot/computer manually. Make sure to have a matching IP setting to your robot/computer network for a proper communication. Use the same subnet but different IP address.
Case 2: Dynamic IP address *	The IP address of the robot/computer is set dynamically. An external DHCP server assigns the IP address to the robot/computer.

* By default, the IP address of the Compute Box/Eye Box is set to Dynamic IP.

The IP address of the Compute Box/Eye Box can be set to any value by using the Web Client. For more details, see section Web Client: Configuration Menu. Under **Network settings**, set the **Network mode** to either **Static IP** or **Dynamic IP**.

In this mode, the DHCP server of the Compute Box/Eye Box is disabled.

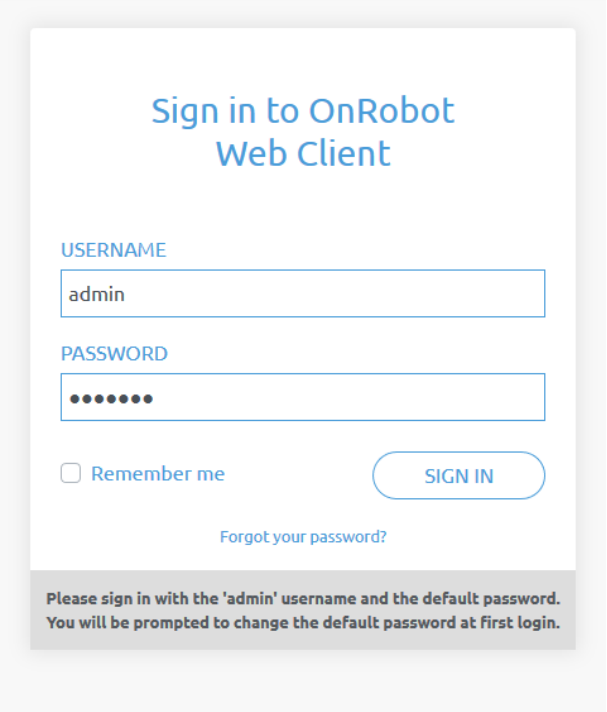
7.1.2. Web Client

To access the Web Client on your computer first the Ethernet interface needs to be set up to have a proper communication between your computer and the Compute Box. It is recommended to use the factory default DIP switch settings (DIP 3 On and DIP 4 Off) (for further details see section 7.1.1. Ethernet Interface Setup).

Then do the following steps:

- Connect the Compute Box to your computer with the supplied UTP cable.
- Power the Compute Box with the supplied power supply
- Wait one minute for the Compute Box LED to turn from blue to green.
- Open a web browser on your computer and type in the IP address of the Compute Box (factory default is 192.168.1.1).

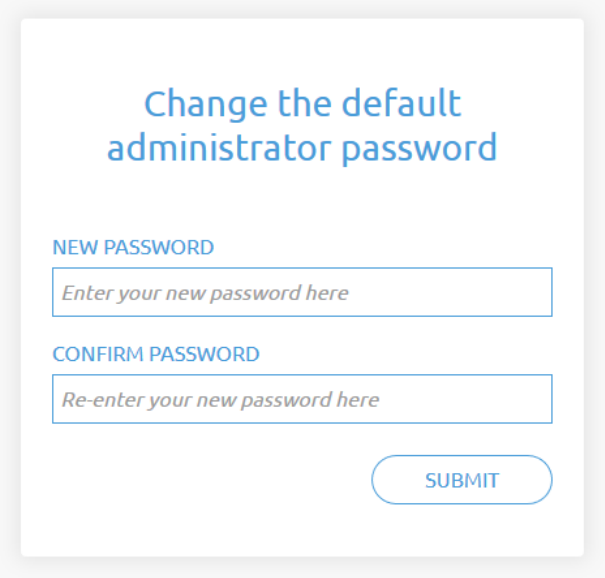
The Sign-in page opens:



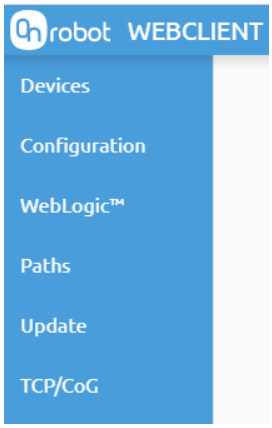
The factory default administrator login is:

Username: admin
Password: OnRobot

For the first login a new password needs to be entered: (password must be at least 8 characters long)



Once signed in the following menus will appear on the left side of the screen:



- **Devices** - Monitor and control the connected devices (e.g.: grippers)
- **Configuration** - Change the Compute Box's settings
- **WebLogic**™ - Program the Digital I/O interface through OnRobot WebLogic™
- **Paths** - Import/export the recorded Paths (not available to all robots)
- **Update** - Update the Compute Box and the devices
- **TCP/CoG** - Calculate the TCP (Tool Center Point) and CoG (Center of Gravity) values for your OnRobot product combination.

The following menus will appear in the top right corner of the screen:

-  Select the language of the Web Client
-  Account settings (e.g.: change password, add new user)

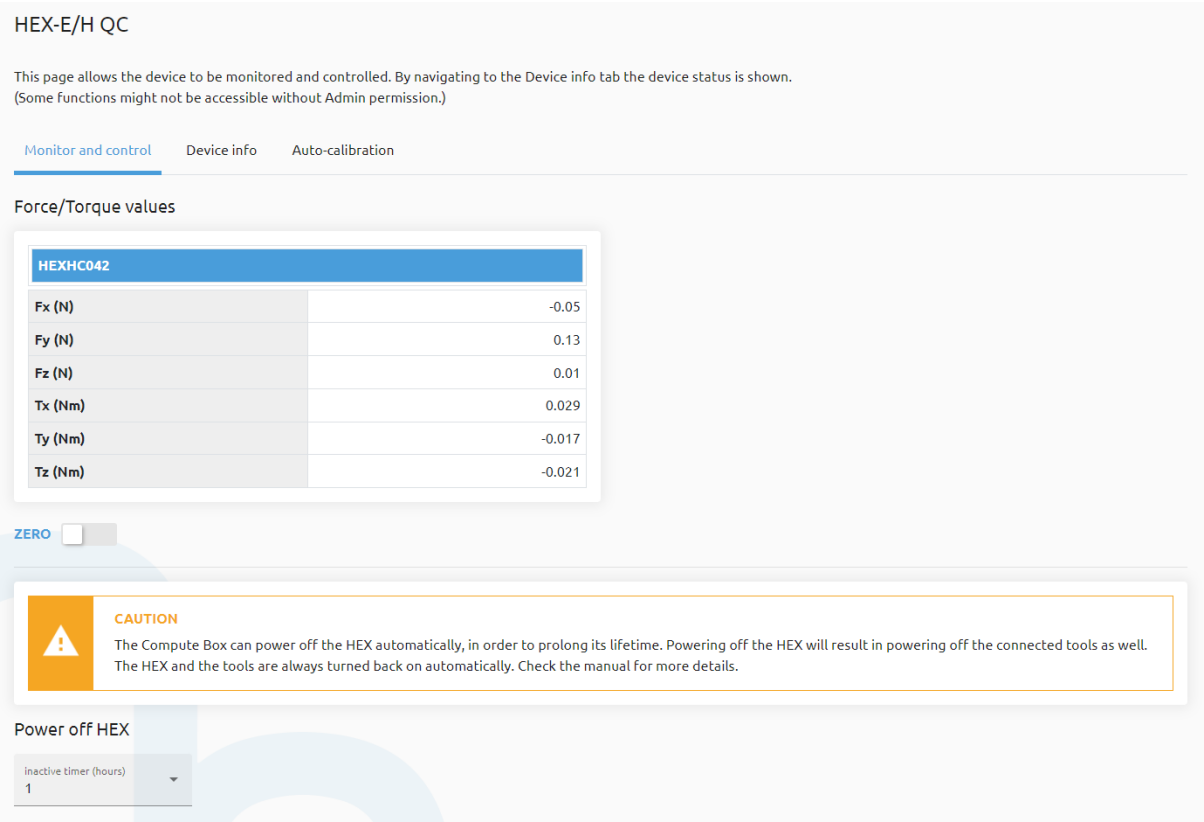
In the following, these menus will be described.

7.1.3. Web Client: Device Menu

To control/monitor a device click on the **Select** button.

7.1.3.1. HEX-E/H QC

Monitor and control



The force and torque values (**Fx,Fy,Fz** and **Tx,Ty,Tz**) are shown in N/Nm.

The **Zero** toggle switch can be used to zero the force and torque reading.

NOTE:

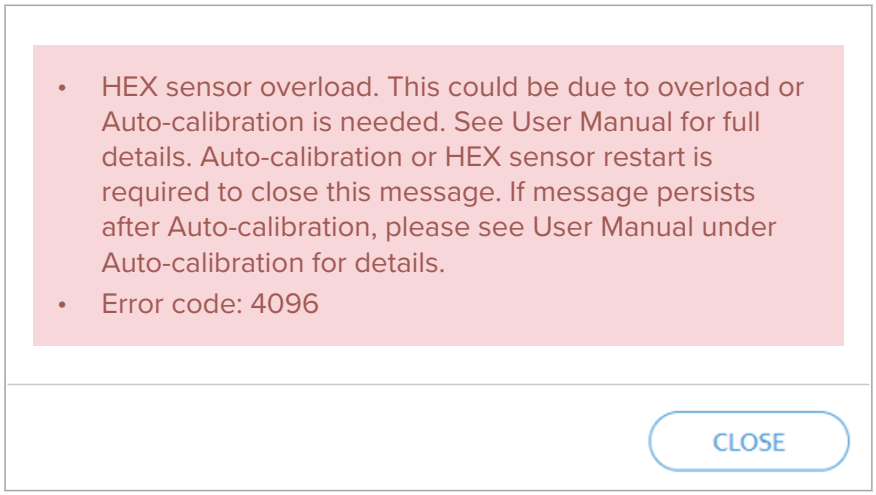
Zero value set on this page is not stored permanently and are restored to the default values on power reset.

The Compute Box can power off the HEX automatically, in order to prolong its lifetime. Powering off the HEX will result in powering off the tools connected to it. Under **Power off HEX**, the inactive timer is 1 hour by default, and can be set for 4, 8, 16 or 24 hours or even to never power off.

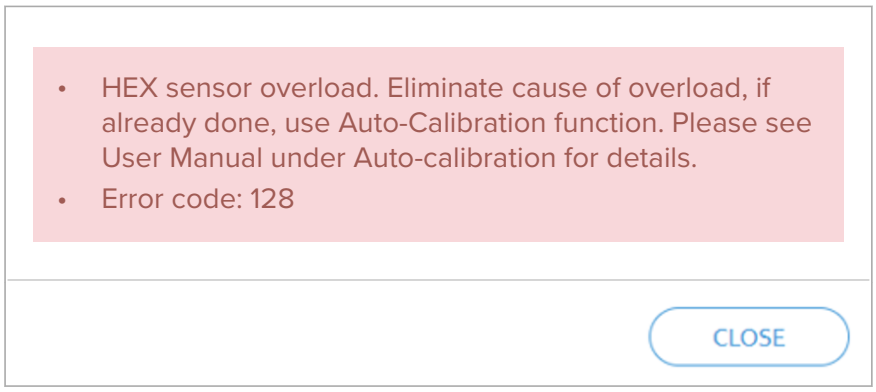
The Compute Box turns the power back on automatically when a robot program starts or when any OnRobot feature is called. Although the HEX and the tools are always turned back on automatically, it is possible to turn them back on manually, too. To manually turn on the HEX and the tools, go to the Devices Menu on the Web Client and click on the **Power on** button.

Device info

On the **Device info** tab, the firmware gives **Faulty** sensor if the drift is too high and displays the following message:



or this message, if no Auto-Calibration has been performed yet:



To eliminate the **Faulty** sensor status, initiate an auto-calibration.

NOTE:

When you use the HEX-E/H QC for a longer period of time, the force can be drifting in the **Fz** direction.

Auto-calibration

Auto-calibration is an option to prolong the time the sensor is in service before it is sent back for OnRobot factory re-calibration. Auto-calibration can be done onsite, and it takes only a couple of minutes.

NOTE:

Auto-calibration tab does not appear if the firmware version of the HEX sensor is lower than 2.15. If your firmware version is higher than 2.09 please go to the **Web Client: Update Menu** and update your firmware. For firmware versions lower than 2.09 please contact your distributor.

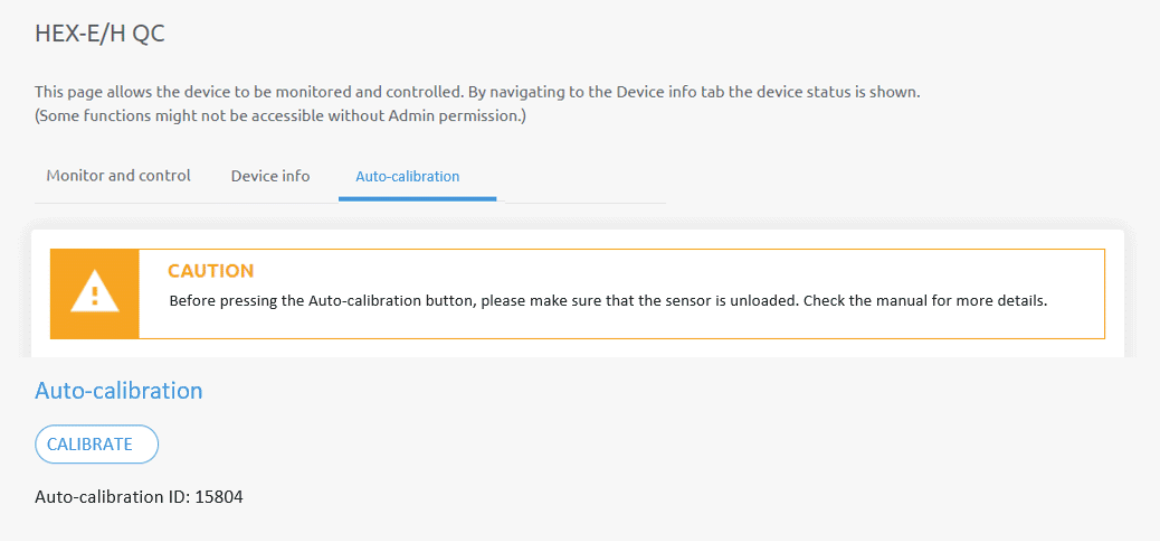
Required steps to do an auto-calibration:

1. Stop the robot.

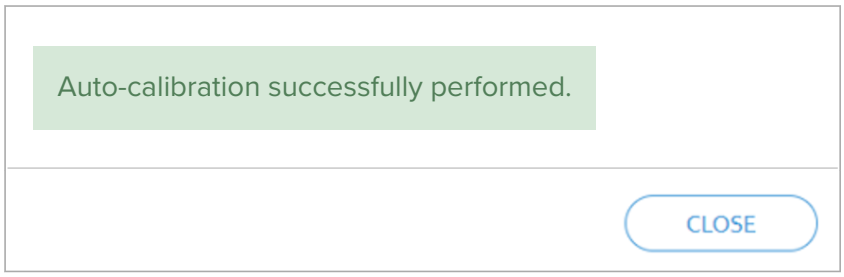
NOTE:

Make sure that the HEX is mounted on the robot during the auto-calibration. The measured offset value can differ when the HEX is not mounted on the robot.

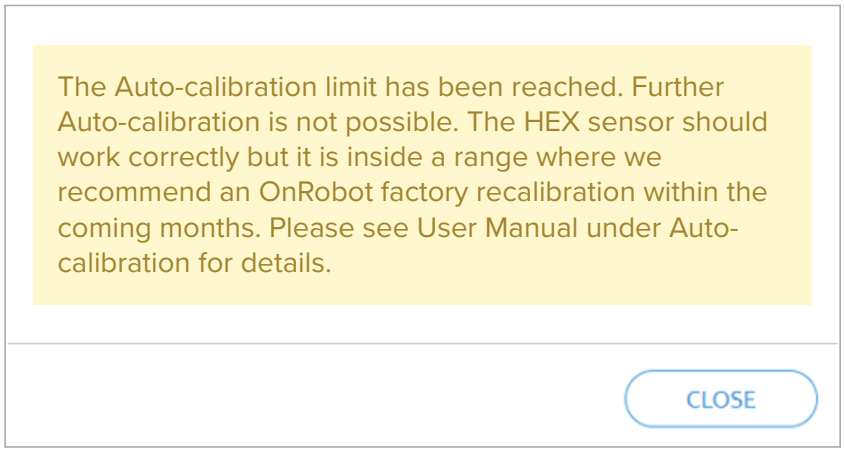
2. The sensor's tool side should face upward (robot side facing downward) to get the most accurate result.
3. Note how the tool(s) are connected to the sensor. After the calibration, the tools need to be re-attached to the sensor the same way to prevent any disturbance in your application (for example re-teaching waypoints)
4. Detach any tool connected to the sensor and put it aside, it must be completely unloaded during the auto-calibration.
5. Under **Auto-calibration**, press **Calibrate**.



6. Confirm the process in the popup window.
7. If the auto-calibration was successful, the following message is shown:



If the auto-calibration was carried out but the result indicates that a recalibration at the OnRobot factory is recommended, then the following message is shown:

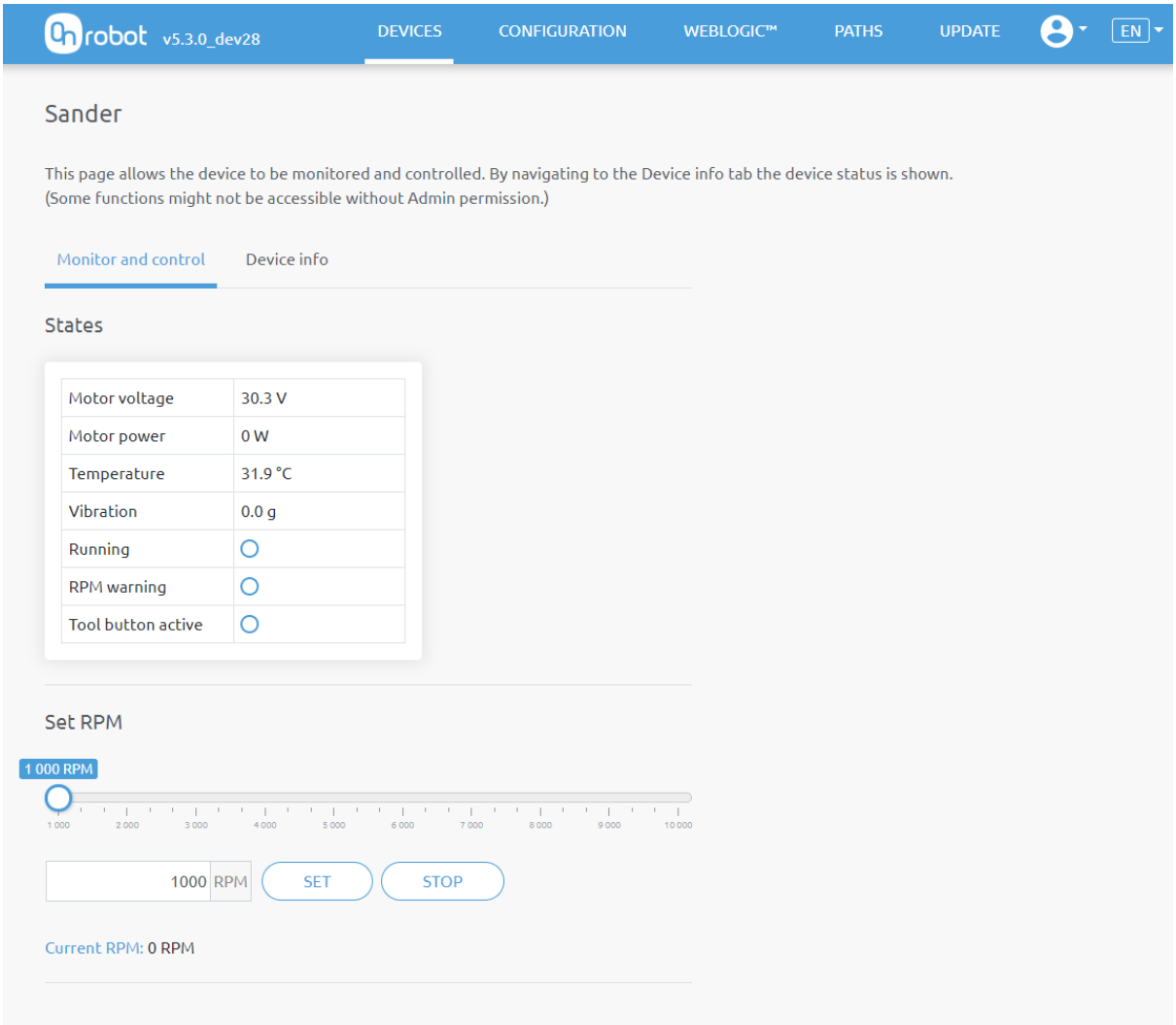


8. Re-attach the tool(s) to the sensor the same way as it was.
9. Start your robot and validate your application.
10. Auto-calibration is finished.

Considerations for the auto-calibration:

- It is recommended to make an auto-calibration every 2-3 months.
- If the auto-calibration process detects that an OnRobot factory re-calibration is needed, schedule your sensor to be sent back to the OnRobot factory for a re-calibration within the coming months.

7.1.3.2. Sander



States

Motor voltage - Displays the voltage usage of the Sander in V.

Motor power - Displays the power consumption of the Sander in W.

Temperature - Displays the temperature of the Sander in °C.

Vibration - Displays the vibration of the Sander.

Running - Display the state of the Sander if the motor is running.

RPM warning - Display if the **RPM deviation** parameter is reached or exceeded.

Tool button active - Displays the state of the Sander button.

Set RPM

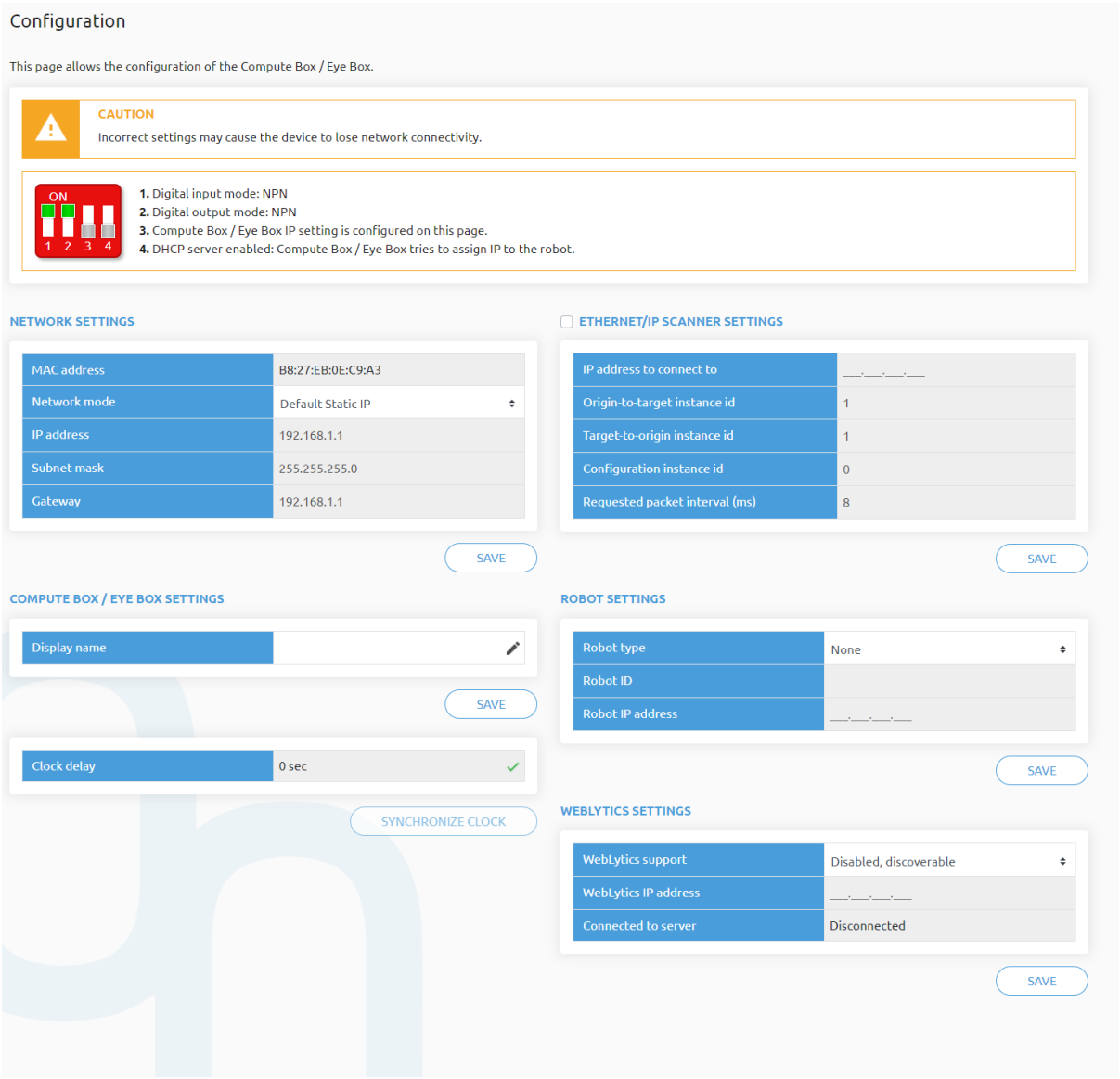
Use the **Set RPM** slider to control the RPM value.

Set - Sets a new RPM value.

Stop - Stops the motor.

Current RPM - Displays the current RPM value.

7.1.4. Web Client: Configuration Menu



Network settings:

The **MAC address** is a world-wide unique identifier that is fixed for the device.

The **Network mode** drop-down menu can be used to decide if the Compute Box will have a static or a dynamic IP address:

- If it is set to **Dynamic IP**, the Compute Box expects an IP address from a DHCP server. If the network that the device is connected to has no DHCP server, the Compute Box will not obtain an IP address and its LED is lighting in blue.
- If it is set to **Static IP**, then a fixed IP address and subnet mask must be set.
- If it is set to **Default Static IP**, the fixed IP revert to the factory default and cannot be changed.

After all parameters are set, click on the **Save** button to store the new values permanently. Wait 1 minute and reconnect to the device using the new settings.

Compute Box / Eye Box settings:

In case, more than one Compute Box is used within the same network, for identification purpose any user specific name can be entered to the **Display name**.

If the **Clock delay** field shows a difference, click **Synchronize clock** to synchronize the Compute Box's time with your computer.

EtherNet/IP scanner settings:

NOTE:

This is a special option of the EtherNet/IP connection for some robots.

In case when the robot is the Adapter and the Compute Box needs to be the Scanner the following addition information is required for the communication:

- **IP address to connect to** - the robot IP address
- **Origin-to-target instance id** - refer to the robot's EtherNet/IP manual (Scanner mode)
- **Target-to-origin instance id** - refer to the robot's EtherNet/IP manual (Scanner mode)
- **Configuration instance id** - refer to the robot's EtherNet/IP manual (Scanner mode)
- **Requested packet interval (ms)** - RPI value in ms (minimum 4)

Check the checkbox and the Compute Box will try to automatically connect to the robot (via the given IP address).

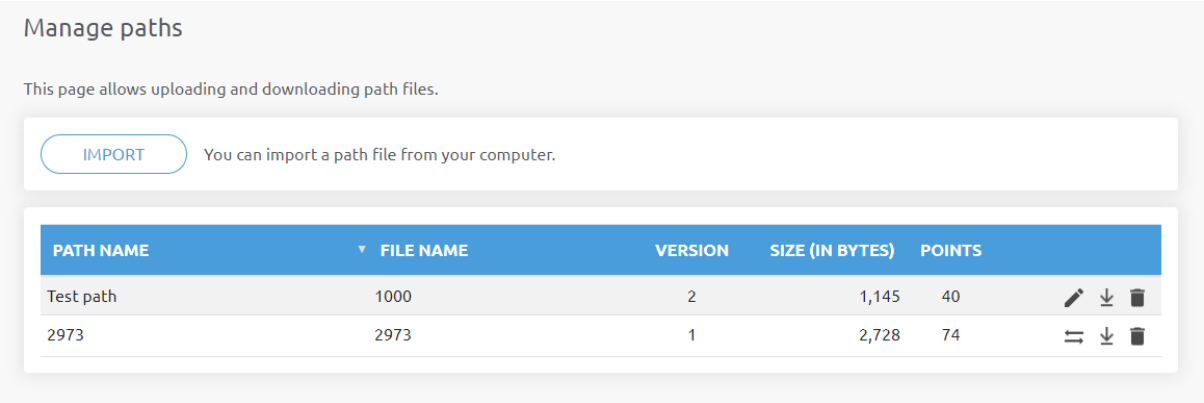
For information on the **Robot settings** and the **WebLytics settings**, see the WebLytics Manual.

7.1.5. Web Client: Path Menu

NOTE:

The Path feature may not be available to your robot type.

This page can be used to import, export, and delete the previously recorded paths. In this way a Path can be copied to a different Compute Box.



The paths are recorded as .orp files.

Previously recorded paths with .ofp extension must be converted to .orp files. Use the path converter button ⇆ to convert the files.

To change the name of a path, use the ✎ icon.

To import a previously exported path, click on **Import** and browse for the file.

The available paths are listed at the end of the page. Any paths can be exported and downloaded as an .orp file or permanently deleted to free up the list if a path is not needed anymore.

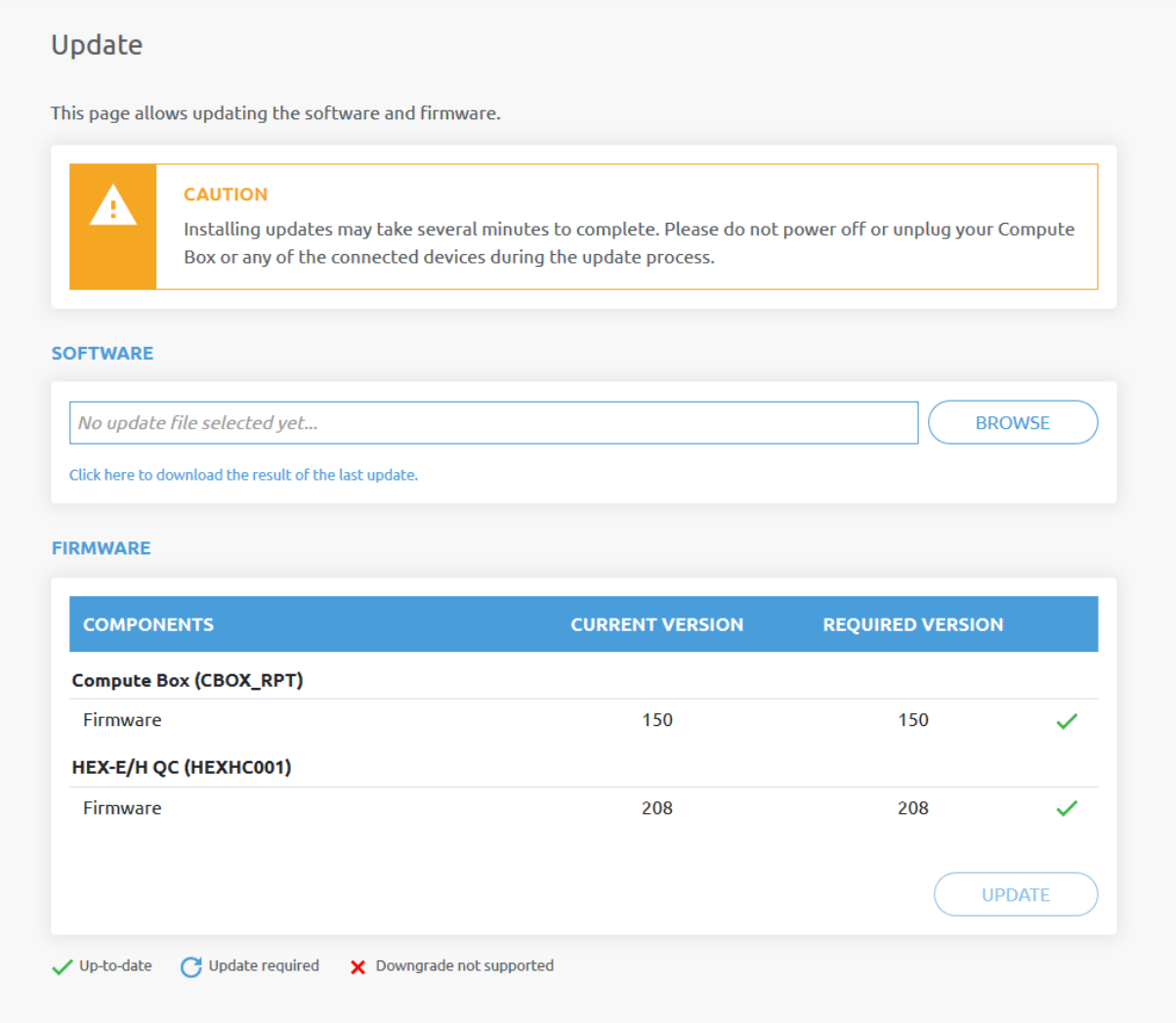
NOTE:

Always make sure that you do not delete any path that is currently in use in any of your robot programs. Otherwise the path will need to be re-recorded, since the delete operation cannot be undone.

The Compute Box can store up to 100 Mbytes of paths that is roughly equal to 1000 hours of recordings.

7.1.6. Web Client: Update Menu

This page can be used to update the software on the Compute Box and the firmware on the devices.



CAUTION:

During the update process (takes about 5-10 minutes) DO NOT unplug any device or close the browser window. Otherwise the updated device could be damaged.

The loading screens during the update process are the same for the software and the firmware updates.

Software Update

Download the latest `.cbu` file from the **Downloads** menu on the website.

Click on **Browse** to search for the `.cbu` software update file. The **Browse** button will turn to **Update**.

Click on **Update** to start the software update process.

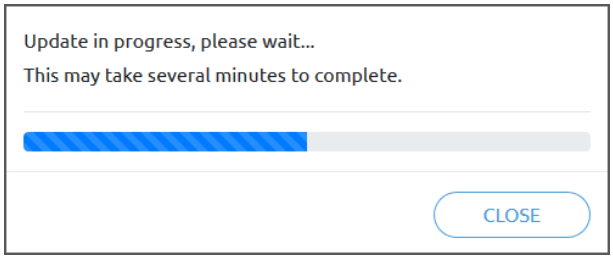
If the update is finished and was successful, the message below is shown.

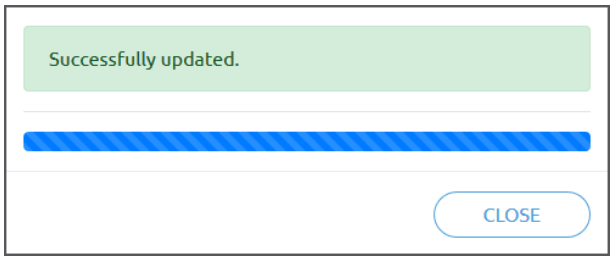
Firmware Update

Update required: A firmware update is required because one of the components is out of date.

Click on **Update** in the firmware section of the page to start the firmware update process.

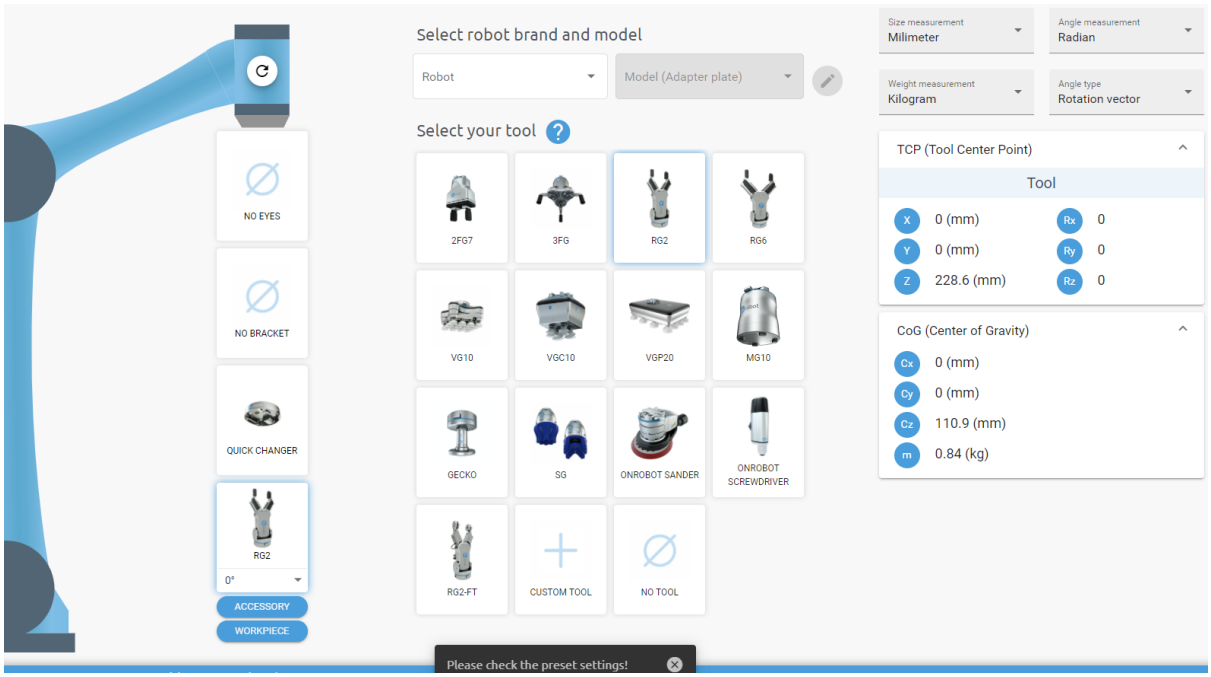
If the update is finished and was successful, the message below is shown.





7.1.7. Web Client: TCP/COG

Use the TCP/COG calculator to calculate the TCP (Tool Center Point) and COG (Center of Gravity) values for your OnRobot product combination.



The TCP/COG calculator will show the automatically detected settings.

NOTE:

Make sure to check the preset settings before calculating the TCP and COG values.

1. Select the robot brand and the model you are using from the **Robot** and **Model (Adapter plate)** dropdown menus.

   Click on  to set custom Adapter plate settings.
2. Click on the **No eyes** card to modify the Eyes preset settings.
3. Click on the **No bracket** card to modify the Angle Bracket preset settings.
4. Select mounting type.
5. Select tool.

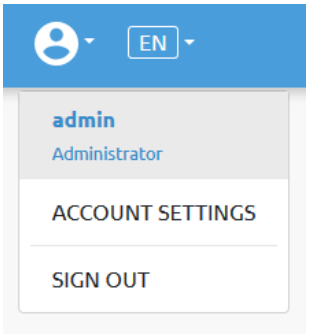
   Click on  to get help about how to enter the values.
6. Click on **Accessory** to select any OnRobot accessories.
7. Click on **Workpiece** to enter the workpiece weight. Then the calculator calculates the resulting payload mass considering the gripper, the mounting, and the workpiece mass.
8. Choose the unit of measure for the values you want to enter from the **Size measurement**, **Angle measurement**, **Weight measurement** and **Angle type** dropdown menus.

The calculator calculates the values which you can see in the **TCP (Tool Center Point)** and **CoG (Center of Gravity)** boxes. These values can be entered into the robot.

7.1.8. Web Client: Account Settings

This menu can be used to:

- See the currently sign-id user
- Go to **Account settings**
- Sign-out

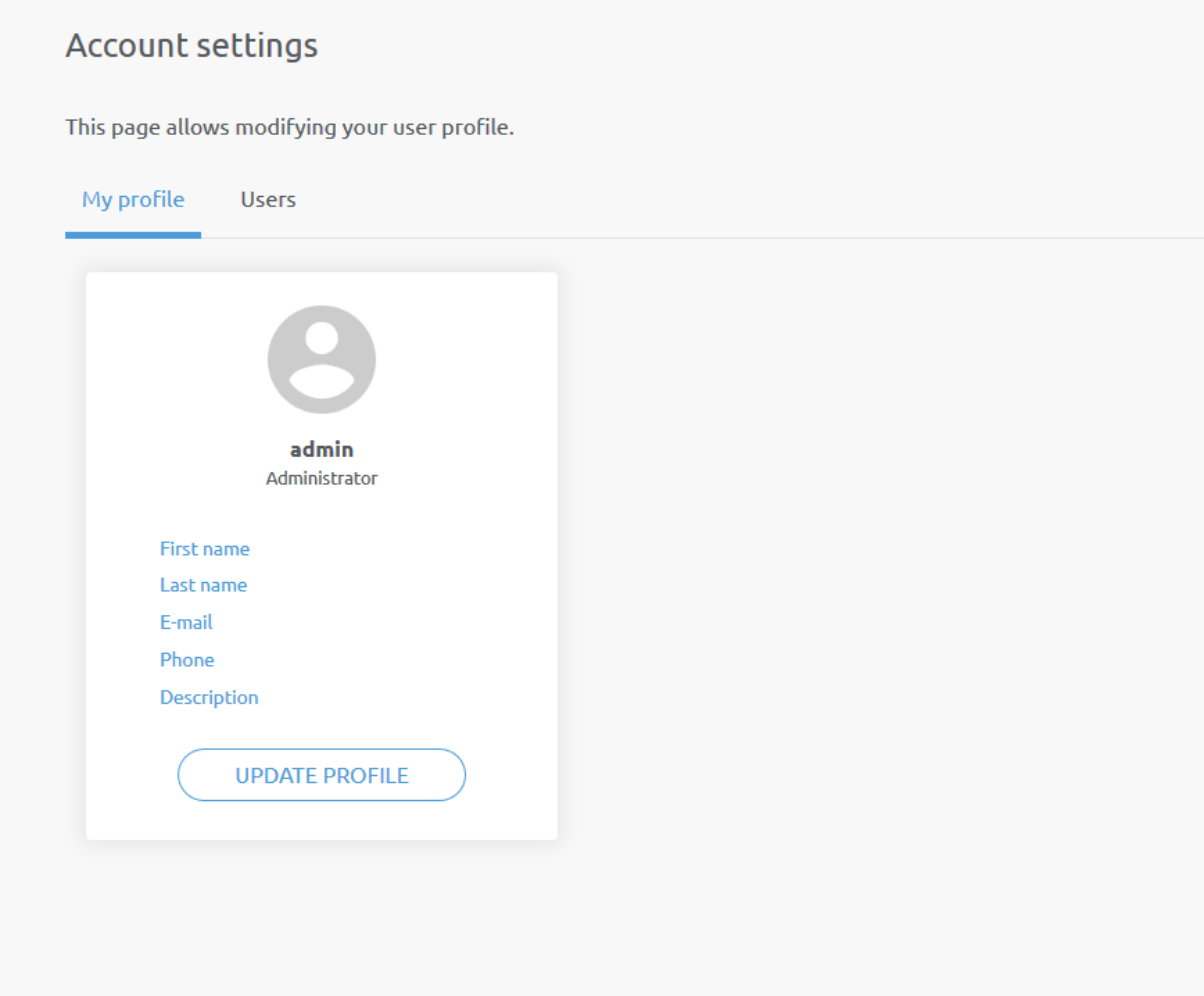


Account settings:

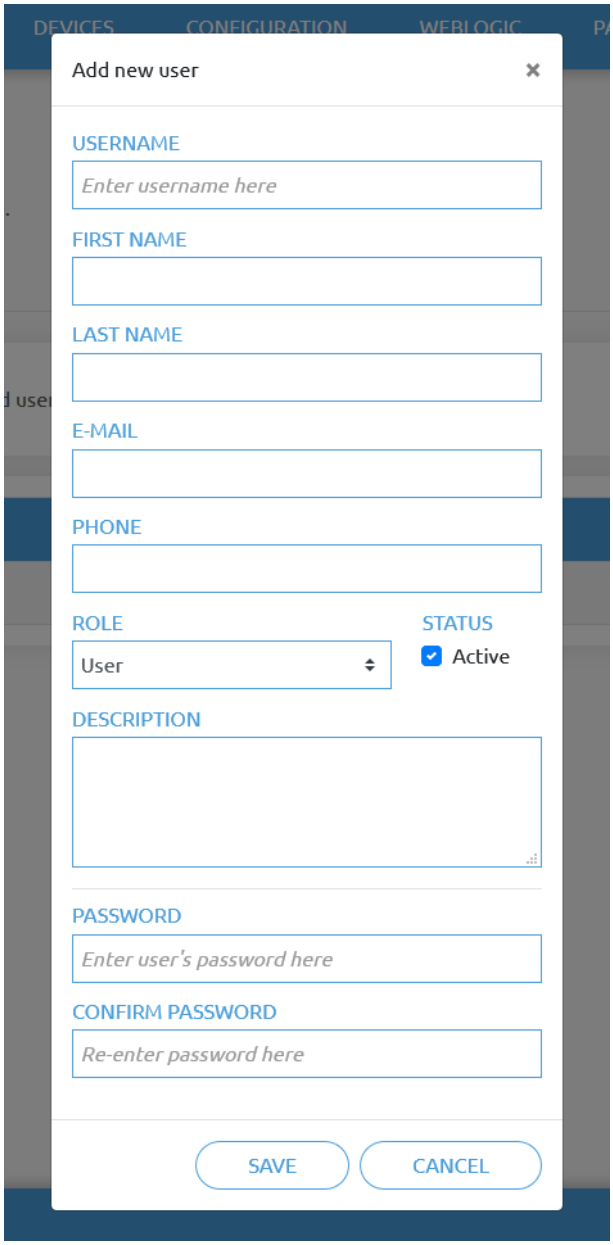
This page has two tabs:

- **My profile** - to see and update the currently logged in users' profile (e.g.: change password)
- **Users** - to manage users (e.g.: add/remove/edit)

On the **My profile** tab to change any profile data (e.g.: password) click on the **Update profile** button.



On the **Users** tab click on the **Add new user** button to add more users:

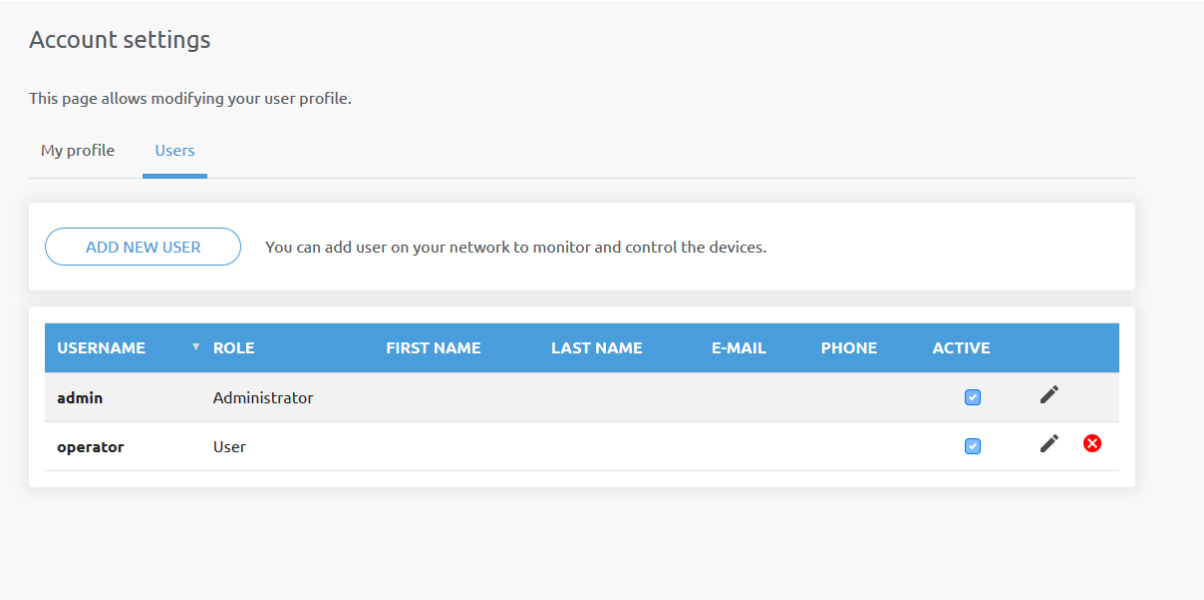


There are three user levels:

- Administrator
- Operator
- User

Fill in the user information and click **Save**.

Later on to change any user information just click on the edit icon.



To prevent a user to sign-in either could be:

- deactivated by changing its **Active** status in the edit mode
- or removed by clicking the delete icon.

8. Hardware Specification

8.1. Technical Sheets

8.1.1. HEX-E QC

General Properties	6-Axis Force/Torque Sensor				Unit
	Fxy	**Fz**	**Txy**	**Tz**	
Nominal Capacity (N.C)	200	200	10	6.5	[N] [Nm]
Single axis deformation at N.C (typical)	± 1.7 ± 0.067	± 0.3 ± 0.011	± 2.5 ± 2.5	± 5 ± 5	[mm] [°] [inch] [°]
Single axis overload	500	500	500	500	[%]
Signal noise* (typical)	0.035	0.15	0.002	0.001	[N] [Nm]
Noise-free resolution (typical)	0.2	0.8	0.01	0.002	[N] [Nm]
Full scale nonlinearity	< 2	< 2	< 2	< 2	[%]
Hysteresis (measured on Fz axis , typical)	< 2	< 2	< 2	< 2	[%]
Crosstalk (typical)	< 5	< 5	< 5	< 5	[%]
IP Classification	67				
Dimensions (H x W x L)	50 x 71 x 93 1.97 x 2.79 x 3.66				[mm] [inch]
Weight (with built-in adapter plates)	0.347 0.76				[kg] [lb]

* Signal noise is defined as the standard deviation (1 σ) of a typical one second no-load signal.

Operating Conditions	Minimum	Typical	Maximum	Unit
Power supply	7	-	24	[V]
Power consumption	-	-	0.8	[W]
Operating temperature	0 32	- -	55 131	[°C] [°F]
Relative humidity (non-condensing)	0	-	95	[%]
Calculated operation life	30 000	-	-	[Hours]
Re-calibration period*	-	15 000**	-	[Hours]

*Notification is provided when factory re-calibration is recommended.

**Based on energized hours.

Best practice for maintaining your calibrated device:

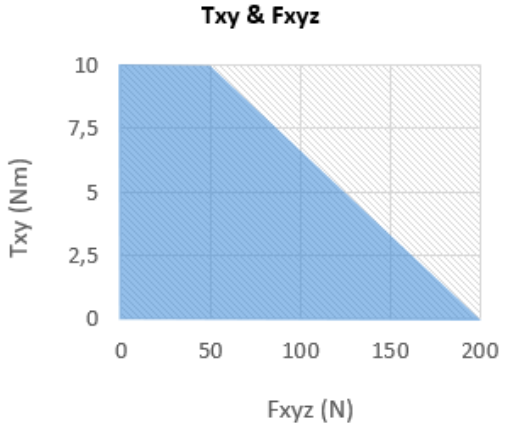
- Turn off the HEX sensor when not in use for a longer period.
- Offload the HEX sensor when not used for a longer period.
- The Auto-calibration software feature is recommended every 2-3 month or when needed.

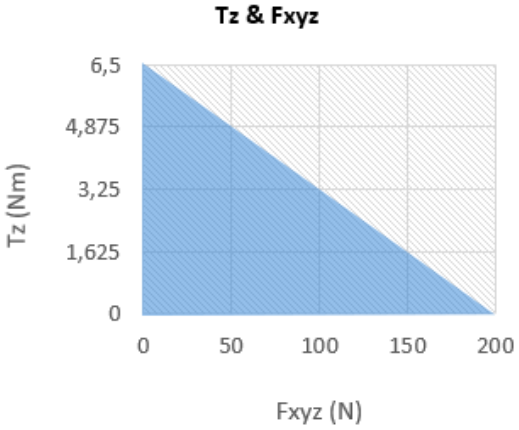
Complex Loading

During single-axis loading, the sensor can be operated up to its nominal capacity. Above the nominal capacity the reading is inaccurate and invalid.

During complex loading (when more than one axis is loaded) the nominal capacities are reduced. The following diagrams show the complex loading scenarios.

The sensor cannot be operated outside of the Normal Operating Area (marked with blue on the diagrams below).





8.1.2. HEX-H QC

General Properties	6-Axis Force/Torque Sensor				Unit
	Fxy	**Fz**	**Txy**	**Tz**	
Nominal Capacity (N.C)	200	200	20	13	[N] [Nm]
Single axis deformation at N.C (typical)	± 0.6 ± 0.023	± 0.25 ± 0.009	± 2 ± 2	± 3.5 ± 3.5	[mm] [°] [inch] [°]
Single axis overload	500	400	300	300	[%]
Signal noise* (typical)	0.1	0.2	0.006	0.002	[N] [Nm]
Noise-free resolution (typical)	0.5	1	0.036	0.008	[N] [Nm]
Full scale nonlinearity	< 2	< 2	< 2	< 2	[%]
Hysteresis (measured on Fz axis , typical)	< 2	< 2	< 2	< 2	[%]
Crosstalk (typical)	< 5	< 5	< 5	< 5	[%]
IP Classification	67				
Dimensions (H x W x L)	50 x 71 x 93 1.97 x 2.79 x 3.66				[mm] [inch]
Weight (with built-in adapter plates)	0.35 0.77				[kg] [lb]

* Signal noise is defined as the standard deviation (1 σ) of a typical one second no-load signal.

Operating Conditions	Minimum	Typical	Maximum	Unit
Power supply	7	-	24	[V]
Power consumption	-	-	0.8	[W]
Operating temperature	0 32	- -	55 131	[°C] [°F]
Relative humidity (non-condensing)	0	-	95	[%]
Calculated operation life	30 000	-	-	[Hours]
Re-calibration period*	-	7 500**	-	[Hours]

*Notification is provided when factory re-calibration is recommended.

**Based on energized hours.

Best practice for maintaining your calibrated device:

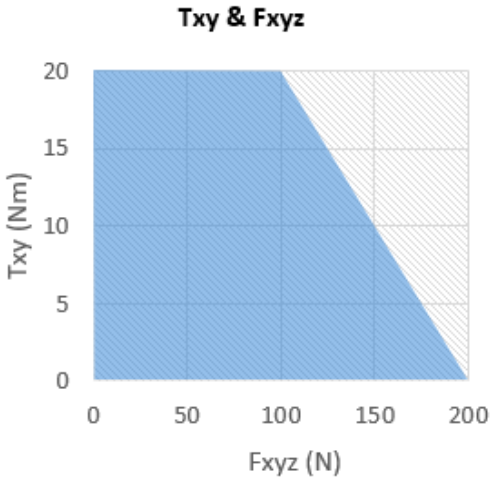
- Turn off the HEX sensor when not in use for a longer period.
- Offload the HEX sensor when not used for a longer period.
- The Auto-calibration software feature is recommended every 2-3 month or when needed.

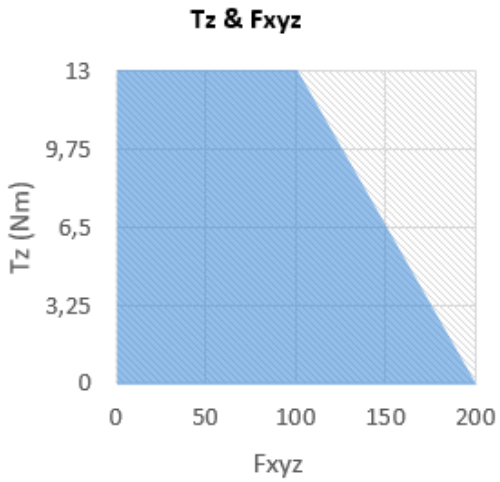
Complex Loading

During single-axis loading, the sensor can be operated up to its nominal capacity. Above the nominal capacity the reading is inaccurate and invalid.

During complex loading (when more than one axis is loaded) the nominal capacities are reduced. The following diagrams show the complex loading scenarios.

The sensor cannot be operated outside of the Normal Operating Area (marked with blue on the diagrams below).



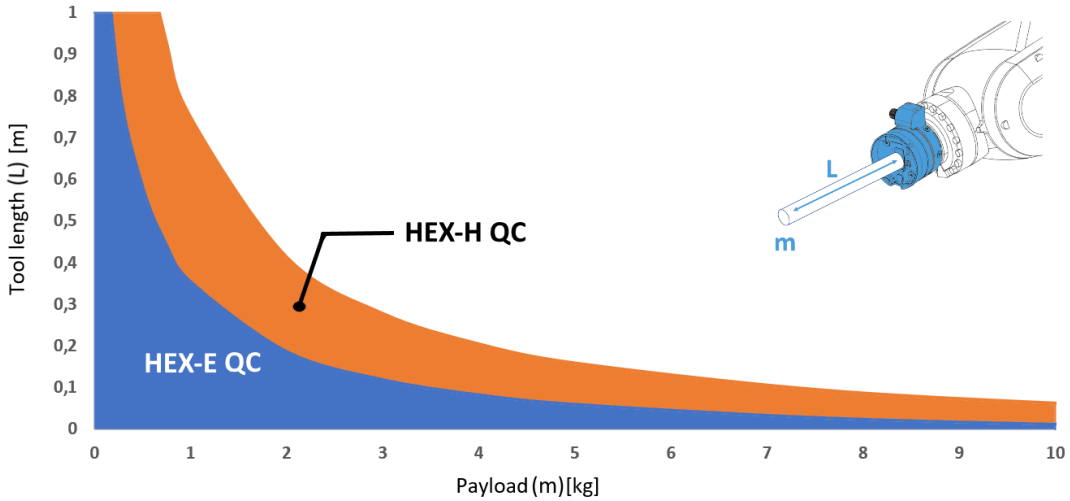


8.1.3. HEX-E QC and HEX-H QC Comparison

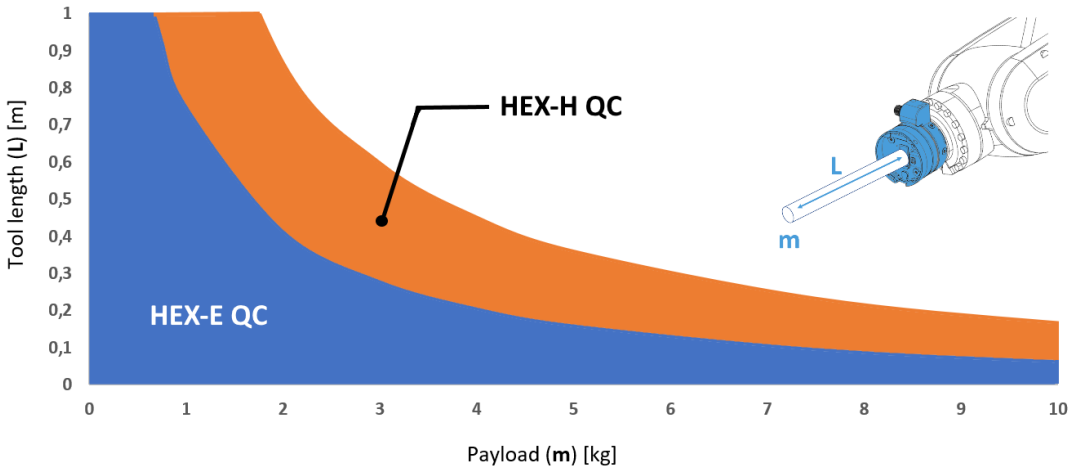
When the sensor is used in applications where higher sensitivity is needed HEX-E QC is recommended, where higher payload or tool length is needed HEX-H QC is recommended.

The following graphs show the extent of the payload and the tool length that you can use together with the HEX-E and the HEX-H sensors in case of applications requiring high or moderate precision.

Applications requiring high precision (e.g.: force control based applications like Sanding and Pin Insertion)



Other applications (e.g.: part detection, force monitoring)



In the blue region it is recommened to use only the HEX-E QC.

8.1.4. Sander

General Properties	Minimum	Typical	Maximum	Unit
Pad diameter	-	-	127 [5]	mm [inch]
Pad height	-	-	9.5 [0.37]	mm [inch]
Orbit size	-	-	5 [3/16]	mm [inch]
Rotation speed - RPM	1,000	-	10,000	RPM
Pad type (3M: 20353)	Clean Sanding Disc Pad			

General Properties	Minimum	Typical	Maximum	Unit
Pad media type(1)	Hookit™			
Pad weight(1)	0.1 [0.22]			kg [lb]
Weight (with pad)(1)	1.2 [2.645]			kg [lb]
IP rating	IP54			
Dimensions (outer)	87 x 123 x 214 [3.42 x 4.84 x 8.42]			mm [inch]

(1)

WARNING:

Using different pad weight may cause increased vibration. Increase the speed gradually upon pad replacement to ensure correct balancing.

Operating Conditions		Minimum	Typical	Maximum	Unit
Sanding power		-	150	-	W
Operation voltage	External voltage	-	30	-	V
	External power	-	150	-	W
	Tool connector voltage	-	24	-	V
	Tool connector power	-	2.4	-	W
Operation temperature		0 [32]	-	50 [122]	°C [°F]
Noise level at 10,000 RPM (3,000 RPM)		-	74 (44)	-	[dB]
Calculated operation life		30 000	-	-	[Hours]

8.1.5. Compute Box

8.1.5.1. With 1.5A Wall Adapter (36W)

Supplied Wall Adapter	Minimum	Typical	Maximum	Unit
Input voltage (AC)	100	-	240	[V]
Input current	-	-	1	[A]
Output voltage	-	24	-	[V]
Output current	-	1.5	-	[A]

Compute Box Power input (24V connector)	Minimum	Typical	Maximum	Unit
Supply voltage	-	24	25	[V]
Supply current	-	1.5	-	[A]

Compute Box Power output (Device connector)	Minimum	Typical	Maximum	Unit
Output voltage	-	24	25	[V]
Output current	-	1.5	-	[A]

8.1.5.2. With 6.25A Wall Adapter (150W)

Supplied Wall Adapter	Minimum	Typical	Maximum	Unit
Input voltage (AC)	100	-	240	[V]
Input current	-	-	2.1	[A]
Output voltage	-	24	-	[V]
Output current	-	6.25	-	[A]

Compute Box Power input (24V connector)	Minimum	Typical	Maximum	Unit
Supply voltage	-	24	25	[V]
Supply current	-	6.25	-	[A]

Compute Box Power output (Device connector)	Minimum	Typical	Maximum	Unit
Output voltage	-	24	25	[V]
Output current	-	4.5	4.5*	[A]

* Peak currents

8.1.5.3. Compute Box I/O interface

Power Reference (24V, GND)	Minimum	Typical	Maximum	Unit
Reference output voltage	-	24	25	[V]
Reference output current	-	-	100	[mA]

Output (DO1-DO8)	Minimum	Typical	Maximum	Unit
Output current - altogether	-	-	100	[mA]
Output resistance (active state)	-	24	-	[Ω]

Input (DI1-DI8) as PNP	Minimum	Typical	Maximum	Unit
Voltage level - TRUE	18	24	30	[V]
Voltage level - FALSE	-0.5	0	2.5	[V]
Input current	-	-	6	[mA]
Input resistance	-	5	-	[kΩ]

Input (DI1-DI8) as NPN	Minimum	Typical	Maximum	Unit
Voltage level - TRUE	-0.5	0	5	[V]
Voltage level - FALSE	18	24	30	[V]
Input current	-	-	6	[mA]
Input resistance	-	5	-	[kΩ]

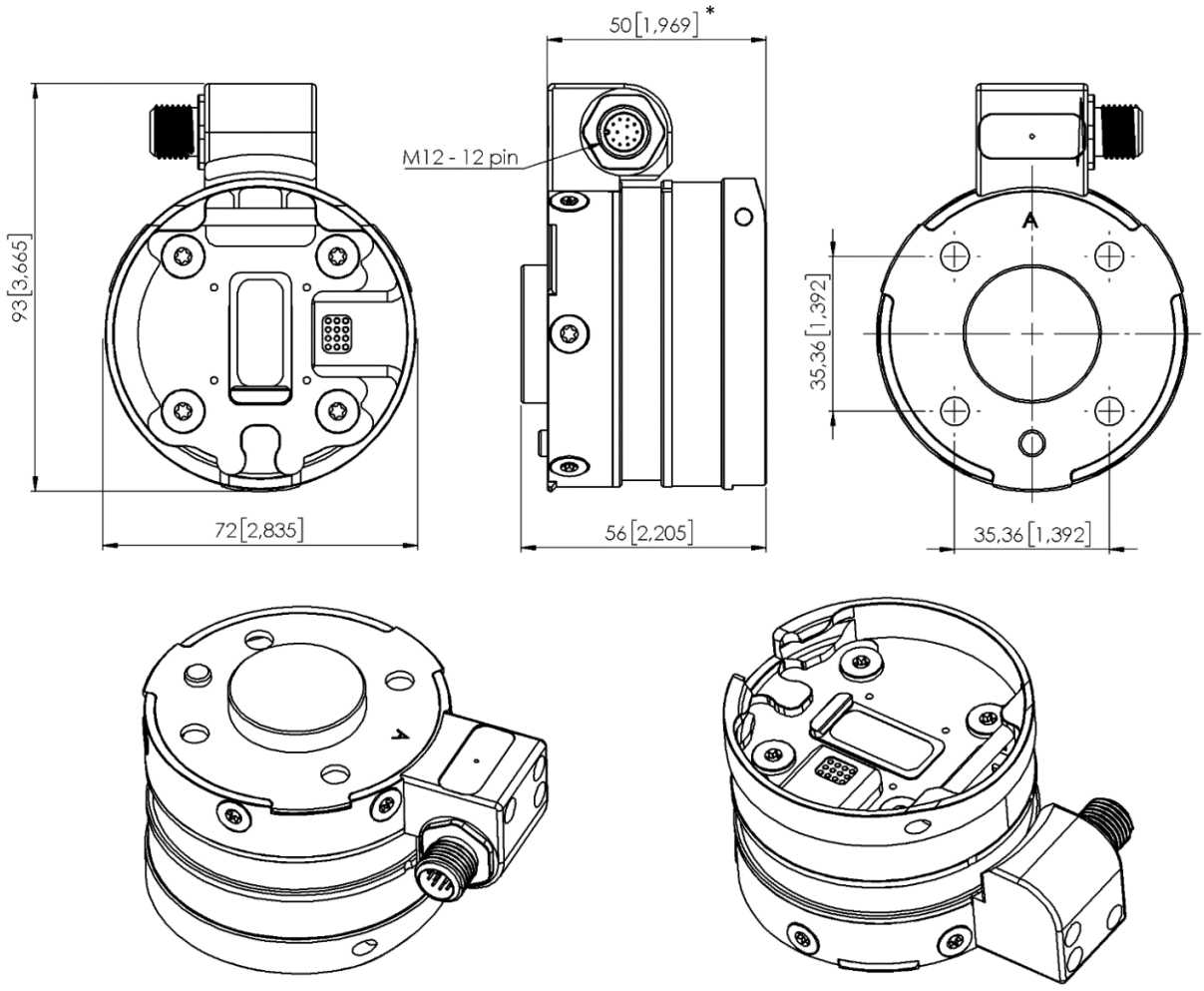
8.2. Mechanical Drawings

8.2.1. Adapter Plate

No adapter plate is required.

8.2.2. Mountings

8.2.2.1. HEX-E/H QC

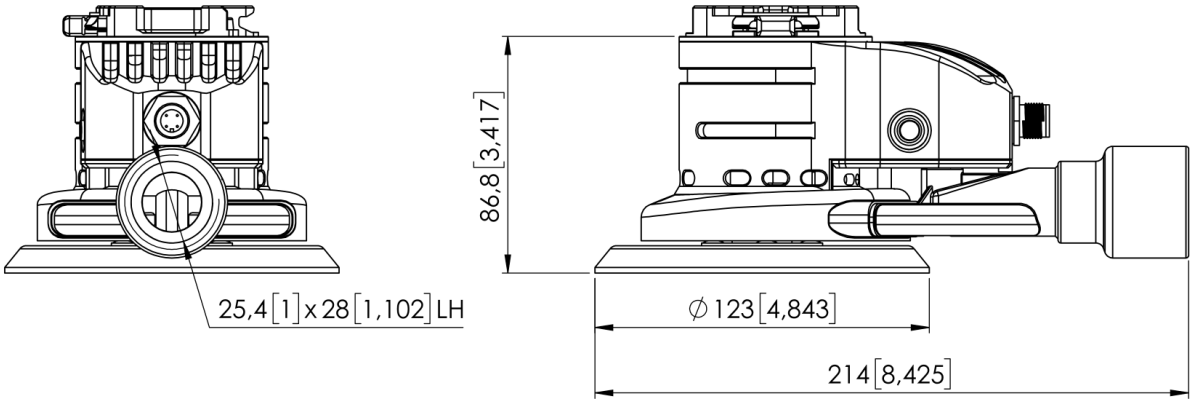


* Distance from Robot flange interface to OnRobot tool

All dimensions are in mm and [inches].

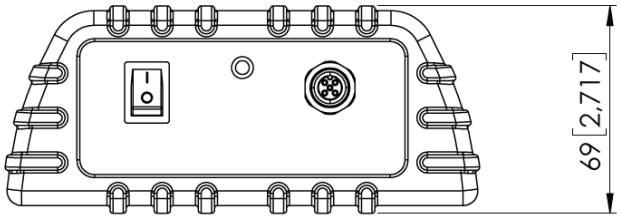
8.2.3. Tools

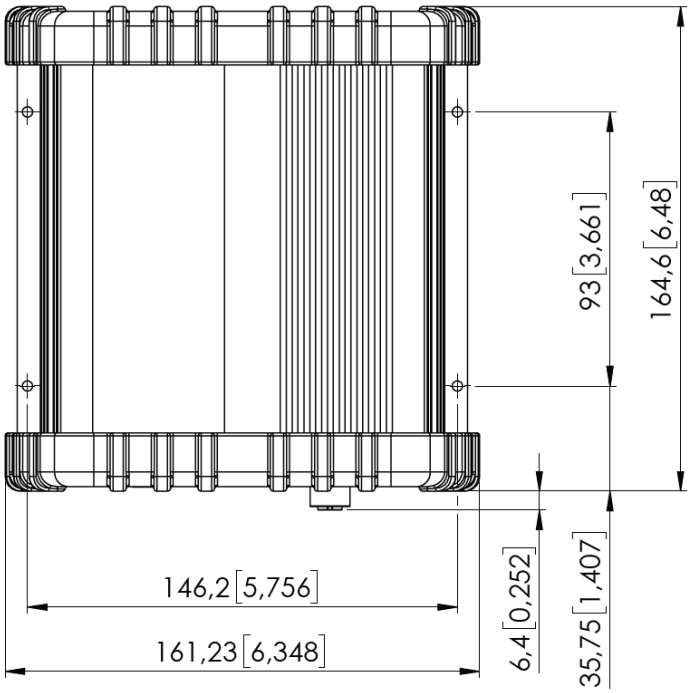
8.2.3.1. Sander



All dimensions are in mm and [inches].

8.2.3.2. Power Supply of the Sander

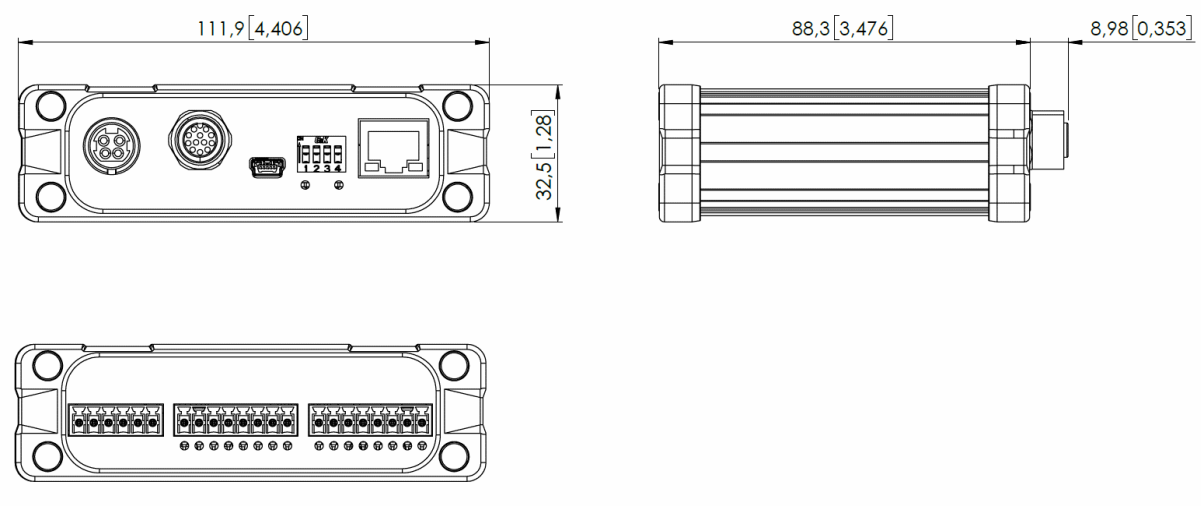




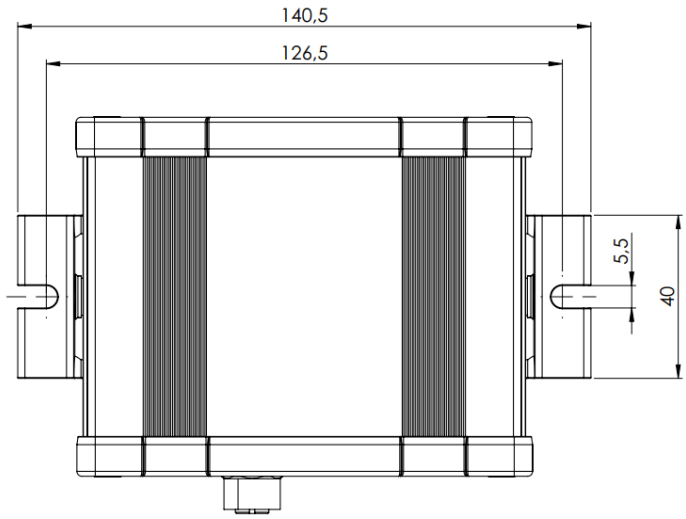
All dimensions are in mm and [inches].

8.2.3.3. Compute Box

Compute Box



Clip-on Bracket (optional)



All dimensions are in mm and [inches].

8.3. TCP, COG

Using Tool Connection

Use the TCP/COG calculator to calculate the TCP and COG values for your OnRobot product combination.

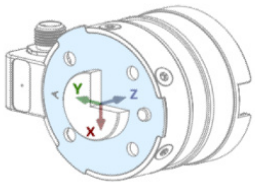
The TCP/COG calculator can be downloaded from **www.onrobot.com/downloads**.

Using Compute Box/Eye Box

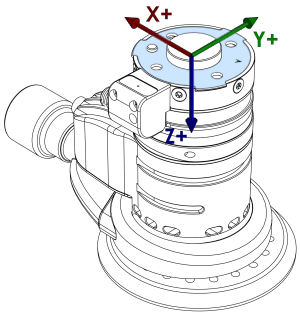
For more information, see the **7.1.7. Web Client: TCP, COG** section.

TCP, COG, and weight parameters of the single devices (without any mounting/adapter):

8.3.1. HEX-E/H QC

Coordinate system	TCP [mm]	Center of Gravity [mm]	Weight
	X=0 Y=0 Z=50	cX=0 cY=5 cZ=20	0.35 kg 0.77 lb

8.3.2. Sander with HEX

Coordinate System	TCP [mm]	Center of Gravity [mm]	Weight
	X = 0 Y = 0 Z = 137.1	cX = 10.60 cY = -0.98 cZ = 70.26	1.494 kg 3.2937 lb

9. Maintenance

WARNING:

An overall inspection of OnRobot's end-of-arm tooling and accessories must be performed regularly and at least once every 6 months. This inspection must include but is not limited to check for defective material and clean gripping surfaces.

Use original spare parts, and original service instructions for OnRobot's end-of-arm tooling, accessories and the robot. Failure to comply with this precaution can cause unexpected risks, resulting in severe injury.

If you have questions regarding spare parts and repair, please visit our website **www.onrobot.com** to contact us.

10. Troubleshooting

10.1. Robot Has Not Obtained an IP Address

If the Compute Box has not assigned an IP address to the robot, do the following:

Assign a static IP address to the robot that matches your current IP settings on your Compute Box. The default IP address of the Compute Box is 192.168.1.1.

NOTE:

Change the last number in the IP address (if using 255.255.255.0 subnet mask) to avoid an IP conflict with the Compute Box.

Example

If the default fixed (192.168.1.1) IP address is used on the Compute Box, then use the following values:

- IP address: 192.168.1.2
- Subnet Mask: 255.255.255.0

10.2. Error During Operation

If an error occurs during operation, try the following:

1. Restart the robot and check the functionality.
2. If the error is still present, contact the distributor from where the product has been purchased.

10.3. Changing the DIP Switch Does Not Take Effect

To change the DIP switch network settings, first change the DIP switches and then cycle the Compute Box/Eye Box power so the changes will take effect.

If the changes still do not take effect, wait one minute and then cycle the Compute Box/Eye Box power once again.

10.4. URCap Operation

CAUTION:

Installed URCaps from different vendors may affect the OnRobot URCaps operation.

If you experience slow GUI response, performance issue, slow program start, error pop-ups, or function loss, make sure that only the OnRobot URCap is installed on the robot.

10.5. Tool Functions Are Not Available

If the tool functions are not available (grayed out) in the program, return to the **Installation** tab > **URCaps** > **Device info** and then back to the program.

10.6. Sander

Problem	Cause and Solution
The Sander does not start on the surface, but works from Toolbar.	• Change the **Pushing Force** - it might be too high. • Change the grit size or the Sander speed – is might be too high. • Check the sanding path – the sanding pad might hit on an edge, which results in a very high non-axial force and results in motor stop. • Check the **Approach Point** relation to the first point in the trajectory – the Sander might not be parallel with the surface (during startup), which may result a high non-axial force. • Use the **Motor start Option** – it switches on the motor while a constant force is applied thus compensating any surface or media unevenness.
The Sander stops (somewhere) on the part.	
The sanding result is uneven, or one side is more sanded.	• Check or replace the sanding media – it might be damaged or filled with dust. • Check the cabling and the hose (if any) – the pushing/pulling force caused by the cabling/hose can introduce additional torque on the Sander (which will result in asymmetrical loading).
The Sander is jumping on the surface.	• The Sander RPM is low, thus the disk does not slide well on the surface. Increase the RPM. • The **Force Control** parameters (**Keep Force** or **Keep Torque**) are too high. Lower the **Force Control** parameters.
The robot stops and reports joint deviation.	• Change the **Pushing Force** or **Contact Force** limit – it might be too high.
The actual RPM is lower than the requested RPM.	• Change the **Pushing Force** - it might be too high. • Change the grit size or the Sander speed – is might be too high. • The dust collector might be full and blocking the motor. Empty the dust collector.

Problem	Cause and Solution
Unexpected vibration (which may cause robot stop).	• Check the pad condition, replace if needed – a damaged pad will create an unbalanced load on the orbital sander which will result in higher vibration. • Check the applied media – if the polishing pad is not centered on the pad, it will create higher vibration. • Lower the RPM – uneven load will cause vibration on orbital units. Lowering the RPM will lower the vibration. • Check the **SDR Control Force** and **Torque** control parameters – higher values may result in higher vibration. Make sure that the **Auto** function is enabled in the **SDR Control** node.
Path from Shape does not follow the requested path.	• Check the order of the points. • Make sure that the Sander orientation (rotation) change is minimal.
During Trajectory playback, the robot does not follow the requested path.	• Verify that the robot is not close to a singularity point on the given Trajectory. • Divide long pathes (~40m) into two or more shorter pathes.

10.7. Sander Error Codes

10.7.1. RPM Deviation Limit Exceeded

Error code (on the Web Client and in the robot scripts): 1

Description: RPM deviation limit exceeded.

Suggestion(s) to solve the error:

- Too much pressure is being applied against the work item. Ensure that less pressure is applied.
- Ensure that the correct sandpaper is used for the workpiece.

10.7.2. Motor Voltage Limit Exceeded

Error code (on the Web Client and in the robot scripts): 2

Description: Motor voltage limit exceeded.

Suggestion(s) to solve the error:

- Unplug and replug the power supply of the Sander.
- If the error occures more often, the external (30V) power supply is faulty and needs a replacement.

10.7.3. Motor Current Limit Exceeded

Error code (on the Web Client and in the robot scripts): 4

Description: Motor current limit exceeded.

Suggestion(s) to solve the error:

- The motor requires much higher energy to move. This could be due to accumulated dust or mechanical blockage. Clean the Sander even under the pad.
- If the error is still present, check the applied force on the Sander through the entire application.
- If the error appears when the Sander is not moving, it could be indicating a faulty motor unit. Restart the application and send the device to OnRobot for repair.

10.7.4. Temperature Limit Exceeded

Error code (on the Web Client and in the robot scripts): 8

Description: Temperature limit exceeded.

Suggestion(s) to solve the error:

- Too much pressure is being applied against the work item. Ensure that less pressure is applied.
- Ensure that the correct sandpaper is used for the workpiece.

10.7.5. Vibration Limit Exceeded

Error code (on the Web Client and in the robot scripts): 16

Description: Vibration limit exceeded.

Suggestion(s) to solve the error:

- Too much pressure is being applied against the work item. Ensure that less pressure is applied.
- Ensure that the correct sandpaper is used for the workpiece.

10.7.6. Power: 30V Error

Error code (on the Web Client and in the robot scripts): 32

Description: Power: 30V error.

Suggestion(s) to solve the error:

- Unplug and replug the power supply of the Sander.
- If the error occures more often, the external (30V) power supply is faulty and needs a replacement.

10.7.7. Power: 24V Error

Error code (on the Web Client and in the robot scripts): 64

Description: Power: 24V error.

Suggestion(s) to solve the error: The tool cable is not connected. Check the connection between the tool and the Compute Box.

10.7.8. Power: 12V Error

Error code (on the Web Client and in the robot scripts): 128

Description: Power: 12V error.

Suggestion(s) to solve the error:

- Disconnect and reconnect the Sander. Make sure that the housing temperature is below the limit.

- If the error is still present, it could indicate an internal power supply issue. Return the device to OnRobot for repair.

10.7.9. Power: 5V Error

Error code (on the Web Client and in the robot scripts): 256

Description: Power: 5V error.

Suggestion(s) to solve the error:

- Disconnect and reconnect the Sander. Make sure that the housing temperature is below the limit.
- If the error is still present, it could indicate an internal power supply issue. Return the device to OnRobot for repair.

10.8. HEX-E/H QC Error Codes

10.8.1. No Sensor Connected

Error code (on the Web Client and in the robot scripts): 1

Description: No sensor is connected.

Suggestion(s) to solve the error:

- Check the cable connection between the tool and the Compute Box.
- Power cycle the HEX.
- Ensure that the Compute Box software and the HEX firmware are updated.
- If the error is still present, return the HEX to OnRobot for repair. Contact your local distributor for more information.

10.8.2. Sensor Is Not Responding

Error code (on the Web Client and in the robot scripts): 2

Description: Sensor is not responding.

Suggestion(s) to solve the error:

- Check the cable connection between the tool and the Compute Box.
- Power cycle the HEX.
- Ensure that the Compute Box software and the HEX firmware are updated.
- If the error is still present, return the HEX to OnRobot for repair. Contact your local distributor for more information.

10.8.3. Sensor Failure

Error code (on the Web Client and in the robot scripts): 4

Description: Sensor failure.

Suggestion(s) to solve the error:

- Check the cable connection between the tool and the Compute Box.
- Power cycle the HEX.
- Ensure that the Compute Box software and the HEX firmware are updated.

- If the error is still present, return the HEX to OnRobot for repair. Contact your local distributor for more information.

10.8.4. Sensor Power or EEPROM Error

Error code (on the Web Client and in the robot scripts): 8

Description: Sensor power or EEPROM error.

Suggestion(s) to solve the error:

- Check the cable connection between the tool and the Compute Box.
- Power cycle the HEX.
- Ensure that the Compute Box software and the HEX firmware are updated.

10.8.5. Communication Error Between the Sensor and the Compute Box/Eye Box

Error code (on the Web Client and in the robot scripts): 16

Description: Communication error between the sensor and the Compute Box/Eye Box.

Suggestion(s) to solve the error:

- Check the cable connection between the tool and the Compute Box.
- Power cycle the HEX.
- Ensure that the Compute Box software and the HEX firmware are updated.

10.8.6. Sensor Torque Overload Error

Error code (on the Web Client and in the robot scripts): 64

Description: Sensor torque overload error.

Suggestion(s) to solve the error:

- Decrease the load on the sensor.
- Use the Auto-calibration function as described in the **Auto-calibration** section.
- Power cycle the HEX.
- If the error is still present, return the HEX to OnRobot for repair/calibration. Contact your local distributor for more information.

10.8.7. Unknown Error

Error code (on the Web Client and in the robot scripts): 512

Description: Unknown error.

Suggestion(s) to solve the error:

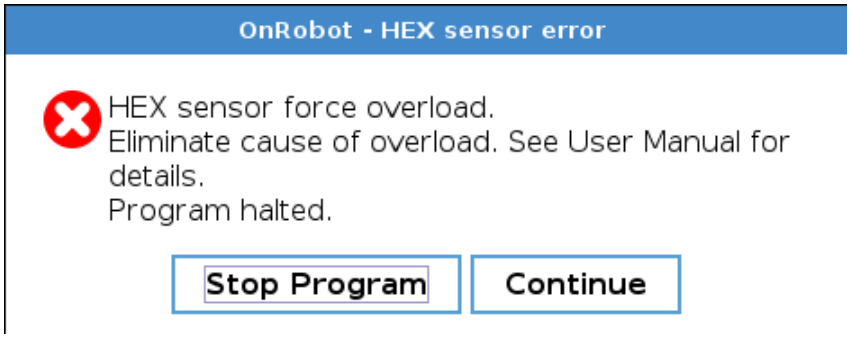
- Check the cable connection between the tool and the Compute Box.
- Power cycle the HEX.
- Ensure that the Compute Box software and the HEX firmware are updated.

10.9. URCap Pop-Up Messages

10.9.1. HEX-E/H QC

10.9.1.1. Force Overload Protection

Displayed pop-up message



Error code (on the Web Client): 128

Description: The HEX sensor is overloaded because of:

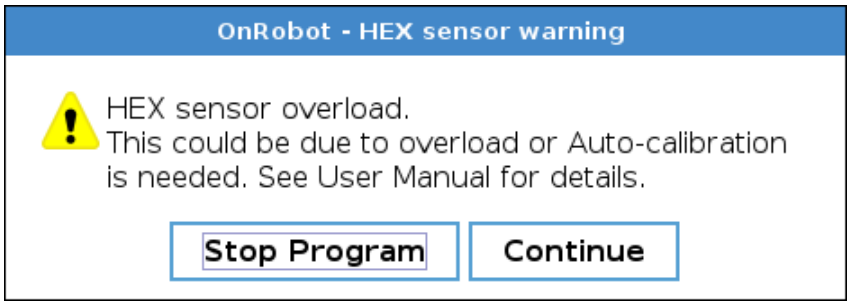
- **Case 1.** Too much payload has been put on the robot.
  or
- **Case 2.** The payload on the robot is within limit and high force drifting occurs in the Fz direction.

How to solve and clear the error:

	Solution	Error Clearance
Case 1.	Remove the payload from the robot.	Acknowledge the message in the pop-up dialog. Removing the payload will clear the error message.
Case 2.	Use the Auto-calibration function. See 7.1.3.1. HEX-E/H QC section.	Acknowledge the message in the pop-up dialog. Using Auto-calibration will clear the error message.

10.9.1.2. Auto-calibration Warning

Displayed pop-up message



Error code (on the Web Client): 4096

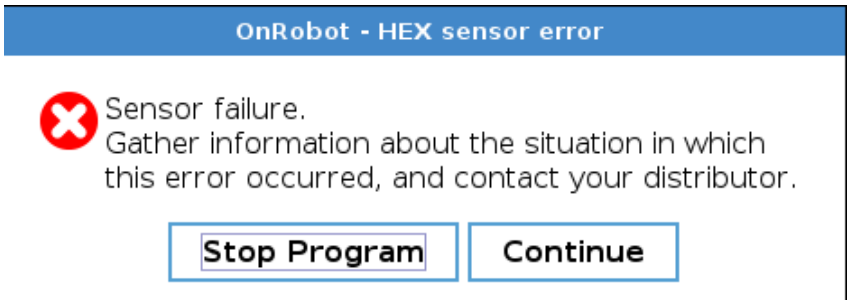
Description: The HEX sensor requires Auto-calibration.

How to solve and clear the error:

Solution	Error Clearance
Use the Auto-calibration function. See 7.1.3.1. HEX-E/H QC section.	Acknowledge the message in the pop-up dialog. Perform the Auto-calibration process if possible. If the Auto-calibration process cannot be performed, go to the **Auto-calibration** part of the URCap Setup - HEX section to supress future warnings.

10.9.1.3. HEX Photodiode Failure Detection

Displayed pop-up message



Error code (on the Web Client): 2048

Description: The HEX photodiode failure detection feature identifies if an overload issue is caused by photodiode failure.

How to solve and clear the error:

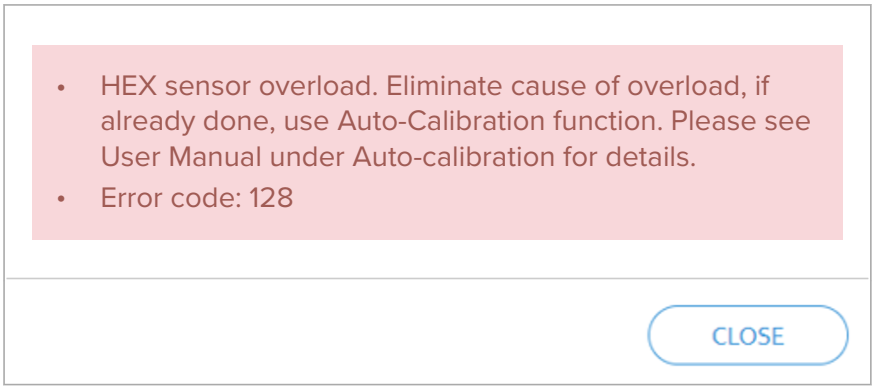
	Solution	Error Clearance
Case	Hardware replacement is needed.	This is not a repairable issue. Contact your distributor.

10.10. Web Client Pop-Up Messages

10.10.1. HEX-E/H QC

10.10.1.1. Error 128

Displayed pop-up message



Error code: 128

Description: The HEX sensor is overloaded because of:

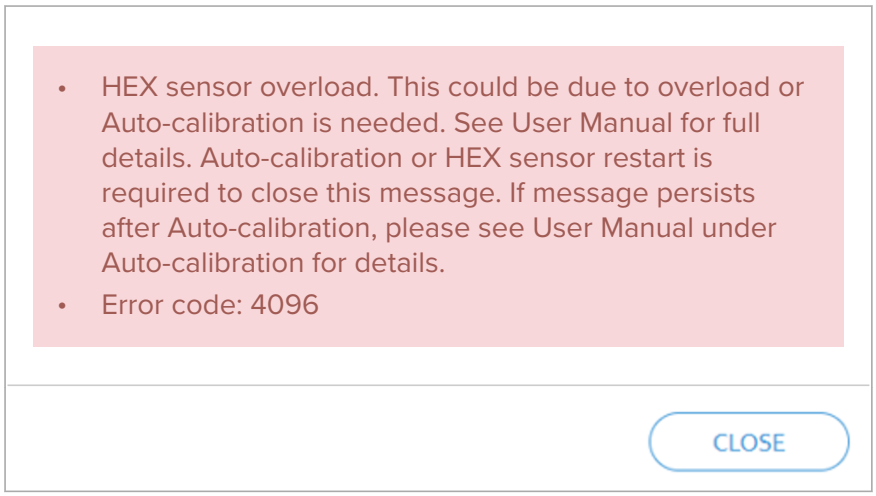
- **Case 1.** Too much payload has been put on the robot.
  or
- **Case 2.** The payload on the robot is within limit and high force drifting occurs in the Fz direction.

How to solve and clear the error:

	Solution	**Error Clearance**
Case 1.	Remove the payload from the robot.	Click **Close**. Removing the payload will clear the error message.
Case 2.	Use the Auto-calibration function. See 7.1.3.1. HEX-E/H QC section.	Click **Close**. Using Auto-calibration will clear the error message.

10.10.1.2. Error 4096

Displayed pop-up message



Error code: 4096

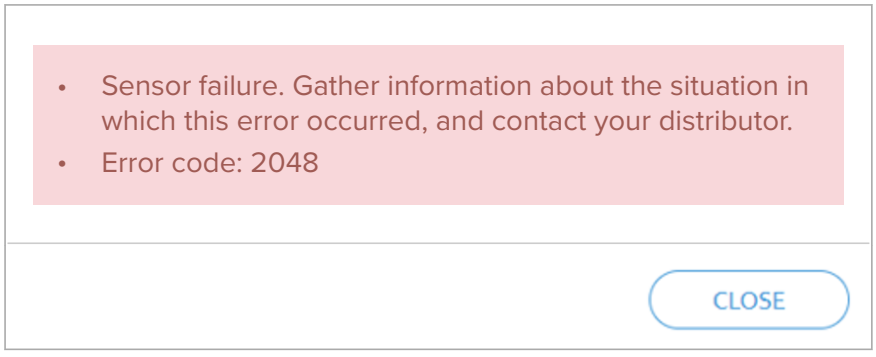
Description: The HEX sensor requires Auto-calibration.

How to solve and clear the error:

Solution	Error Clearance
Use the Auto-calibration function. See 7.1.3.1. HEX-E/H QC section.	Click **Close**. Using Auto-calibration or restarting the HEX sensor will clear the error message.

10.10.1.3. Error 2048

Displayed pop-up message



Error code: 2048

Description: The HEX photodiode failure detection feature identifies if an overload issue is caused by photodiode failure.

How to solve and clear the error:

	Solution	Error Clearance
Case	Hardware replacement is needed.	This is not a repairable issue. Contact your distributor.

11. Warranties

11.1. Patents

Products of OnRobot A/S are protected by several patents; some still in global publication process (Patents pending). All manufacturers of copies and similar products violating any patent claims will be prosecuted.

11.2. Product Warranty

Without prejudice to any claim the user (customer) may have in relation to the dealer or retailer, the customer shall be granted a manufacturer's warranty under the conditions set out below:

In the case of new devices and their components exhibiting defects resulting from manufacturing and/or material faults within 12 months of entry into service (maximum of 15 months from shipment), OnRobot A/S shall provide the necessary spare parts, while the customer (user) shall provide working hours to replace the spare parts, either replace the part with another part reflecting the current state of the art, or repair the said part. This warranty shall be invalid if the device defect is attributable to improper treatment and/or failure to comply with information contained in the user guides. This warranty shall not apply to or extend to services performed by the authorized dealer or the customer themselves (e.g. installation, configuration, software downloads). The purchase receipt, together with the date of purchase, shall be required as evidence for invoking the warranty. Claims under the warranty must be submitted within two months of the warranty default becoming evident. Ownership of devices or components replaced by and returned to OnRobot A/S shall vest in OnRobot A/S. Any other claims resulting out of or in connection with the device shall be excluded from this warranty. Nothing in this warranty shall attempt to limit or exclude a customer's statutory rights nor the manufacturer's liability for death or personal injury resulting from its negligence. The duration of the warranty shall not be extended by services rendered under the terms of the warranty. Insofar as no warranty default exists, OnRobot A/S reserves the right to charge the customer for replacement or repair. The above provisions do not imply a change in the burden of proof to the detriment of the customer. In case of a device exhibiting defects, OnRobot A/S shall not be liable for any indirect, incidental, special or consequential damages, including but not limited to, lost profits, loss of use, loss of production or damage to other production equipment.

In case of a device exhibiting defects, OnRobot A/S shall not cover any consequential damage or loss, such as loss of production or damage to other production equipment.

11.3. Disclaimer

OnRobot A/S continues to improve reliability and performance of its products, and therefore reserves the right to upgrade the product without prior warning. OnRobot A/S ensures that the content of this manual is precise and correct but takes no responsibility for any errors or missing information.

12. Certifications

intertek
Total Quality. Assured.

CERTIFICATE OF REGISTRATION

This is to certify that the management system of:

OnRobot A/S

Main Site: Teglværksvej 47 H, 5220 Odense SØ, Denmark
Chamber of Commerce: 36492449

Additional Site: OnRobot A/S, Cikorievej 44, 5220 Odense SØ, Denmark

has been registered by Intertek as conforming to the requirements of

ISO 9001:2015

The management system is applicable to:

Development and sales of End-of-Arms tools for industrial customers worldwide.

Certificate Number:
0096721

Initial Certification Date:
26 November 2019

Date of Certification Decision:
26 November 2019

Issuing Date:
26 November 2019

Valid Until:
25 November 2022

ISO 9001:2015 CERTIFICATION ™
Intertek

SWEDAC ACKREDITERING
Accred. no. 1639
Certification of Management Systems
ISO/IEC 17021-1

Carl-Johan von Plomgren
MD, Business Assurance Nordics

Intertek Certification AB
P.O. Box 1103, SE-164 22 Kista, Sweden

12.1. Manufacturer Test Certificate

All OnRobot products are tested according to OnRobot test specification for the individual product that follows the ISO 9001 standard procedure. OnRobot testing procedure undergoes continuous review and improvement.

12.2. EMC

Attestation of Conformity no. 121-31033-A1

FORCE Technology has performed compliance testing on electrical products since 1967. FORCE Technology is an accredited test house according to EN17025 and participates in international standardization with organizations such as CEN/CENELEC, IEC/CISPR and ETSI. This attestation of conformity with the below mentioned standards and/or normative documents is based on accredited tests and/or technical assessments carried out at FORCE Technology.

Attestation holder
OnRobot A/S, Teglværksvej 47H, 5220 Odense SØ, Denmark

Product identification - Name (Part no.)
Power Supplies: PSU (104788), VER36U240-JA, VES120PS24, VES150PS24 (106034).
Controllers: UR Kit with Compute Box (102344), Doosan Robot kit (102345), Techman/OMRON TM Robot Kit (102359), KUKA-A Robot kit (102360), KUKA-B Robot kit (102361), FANUC Robot kit (102362), Kawasaki-B Robot kit (102363), Kawasaki-C Robot kit (102364), Kawasaki-D Robot kit (102365), Kawasaki-E Robot kit (102366), Yaskawa-F Robot kit (102367), Yaskawa-G Robot kit (102368), Yaskawa-H Robot kit (102369), NACHI-I Robot kit (102370), NACHI-J Robot kit (102371), Hanwha Robot Kit (103208), Eye Box (103707).
Mountings: Dual Quick Changer (101788), Quick Changer Robot side (102037), HEX-E QC (102111), Quick Changer Kit (102277), HEX-H QC (102376), Quick Changer Robot side 4,5A (104277), Dual Quick Changer 4,5A (104293), Quick Changer Kit 4,5A (104388).
Tools: 2FG7 (106376), 3FG15 (103666), 2FGP20 Palettizing Gripper (108585), Dispense Tool (106816), Eyes Lighting Kit (107080), Lift100 Lifting robot (108800), MG10 (105202), OnRobot Eyes (103903), Pallet Station (109401), RG2 (102012), RG2-FT (102075), RG6 (102021), Sander (106376), Screwdriver (103961), SG Base Part (103546), VG10 (101661), VGC10 (102844), VGP20 (107242).

Manufacturer
OnRobot A/S

Technical documentation
FORCE Technology Assessment no. 121-31033-A1

Standards/Normative documents

IEC 61000-3-2:2018	EMC Directive 2014/30/EU, Article 6
IEC 61000-3-3:2013/AMD1:2017	EN 61000-3-2:2014
IEC 61000-6-2:2016	EN IEC 61000-3-2:2019
IEC 61000-6-4:2018	EN 61000-3-3:2013/A1:2019
	EN 61000-6-2:2005/AC:2005
	EN IEC 61000-6-2:2019
	EN 61000-6-4:2007/A1:2011
	EN IEC 61000-6-4:2019

Additionally, for RG2 (102012), RG6 (102021), 2FGP20 Palettizing Gripper (108585) and Lift100 Lifting robot (108800):
IEC 61326-3-1:2017, Industry locations, SIL 2

The product identified above has been assessed and complies with the specified standards/normative documents. The attestation does not include any market surveillance. It is the responsibility of the manufacturer that mass-produced apparatus have the same properties and quality. This attestation does not contain any statements pertaining to the requirements pursuant to other standards, directives or laws other than the above mentioned.

Signature Knud A. Baltsen
Digitally signed by Knud A. Baltsen
Date: 2022.03.23 17:16:22 +01'00'
Signed by: Knud A. Baltsen, Senior Specialist, Product Compliance

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+45 43 25 00 10
info@forcetechnology.dk

12.3. Sander - Environment

Attestation of Conformity no. 120-29666

Assessment holder

OnRobot A/S
Teglværksvej 47H
5220 Odense SØ
Denmark

Product identification

Sander Tool

FORCE Technology test reports

Environmental tests of Sander Tool, project no.: 120-29666, report no.: 120-29666-1 dated 17 August 2020

Other technical documentation

Conclusion

The Sander Tool have been tested according to the standards listed below. The test results are given in the Force report listed above. All tests were carried out as specified in the relevant specifications including special test criteria's stated by the client.

IEC 60529:2013	IP5X - Dust protection
IEC 60529:2013	IPX4 – Enclosure protection

Nordborg 2021-14-05

Signature

GTS ADVANCED TECHNOLOGY GROUP

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12.4. Declaration of Incorporation

12.4.1. HEX-E

CE/EU Declaration of Incorporation (Original)

According to European Machinery Directive 2006/42/EC annex II 1.B.

The manufacturer:

OnRobot A/S
Teglværskvej 47H
DK-5220, Odense SØ
DENMARK

declares that the product:

Type:	Industrial Force/Torque Sensor
Model:	HEX-E QC
Generation:	V3
Serial:	1000000000-1009999999

may not be put into service before the machinery in which it will be incorporated is declared in conformity with the provisions of Directive 2006/42/EC, including amendments, and with the regulations transposing it into national law.

The product is prepared for compliance with all essential requirements of Directive 2006/42/EC under the correct incorporation conditions, see instructions and guidance in this manual. The following essential requirements of Directive 2006/42/EC are fulfilled: 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4, 1.5.1, 1.5.2, 1.5.4, 1.5.5, 1.5.10, 1.5.11, 1.5.12, 1.6.1. Compliance with all essential requirements of Directive 2006/42/EC relies on the specific robot installation and the final risk assessment.

Technical documentation is compiled according to Directive 2006/42/EC annex VII part B and available in electronic form to national authorities upon legitimate request. Undersigned is based on the manufacturer address and authorized to compile this documentation.

Additionally, the product declares in conformity with the following directives, according to which the product is CE marked:

2014/30/EU — Electromagnetic Compatibility Directive (EMC)
2011/65/EU — Restriction of the use of certain hazardous substances (RoHS)

Relevant essential health and safety requirements of the following EU directives are also applied:

2014/35/EU — Low Voltage Directive (LVD)
2012/19/EU — Waste of Electrical and Electronic Equipment (WEEE)

A list of applied harmonized standards, including associated specifications, is provided in this manual.

Budapest, November 11th, 2020

Group Management

Beskid Vilmos

Vilmos Beskid
CTO

12.4.2. HEX-H

CE/EU Declaration of Incorporation (Original)

According to European Machinery Directive 2006/42/EC annex II 1.B.

The manufacturer:

OnRobot A/S
Teglværskvej 47H
DK-5220, Odense SØ
DENMARK

declares that the product:

Type:	Industrial Force/Torque Sensor
Model:	HEX-H QC
Generation:	V3
Serial:	1000000000-1009999999

may not be put into service before the machinery in which it will be incorporated is declared in conformity with the provisions of Directive 2006/42/EC, including amendments, and with the regulations transposing it into national law.

The product is prepared for compliance with all essential requirements of Directive 2006/42/EC under the correct incorporation conditions, see instructions and guidance in this manual. The following essential requirements of Directive 2006/42/EC are fulfilled: 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4, 1.5.1, 1.5.2, 1.5.4, 1.5.5, 1.5.10, 1.5.11, 1.5.12, 1.6.1. Compliance with all essential requirements of Directive 2006/42/EC relies on the specific robot installation and the final risk assessment.

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2011/65/EU — Restriction of the use of certain hazardous substances (RoHS)

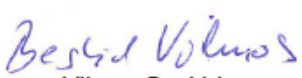
Relevant essential health and safety requirements of the following EU directives are also applied:

2014/35/EU — Low Voltage Directive (LVD)
2012/19/EU — Waste of Electrical and Electronic Equipment (WEEE)

A list of applied harmonized standards, including associated specifications, is provided in this manual.

Budapest, November 11th, 2020

Group Management



Vilmos Beskid
CTO

12.4.3. Sander

CE/EU Declaration of Incorporation (Original)

According to European Machinery Directive 2006/42/EC annex II 1.B.

The manufacturer:

OnRobot A/S
Teglværskvej 47H
DK-5220, Odense SØ
DENMARK

declares that the product:

Type:	Industrial Robot Sander
Model:	OnRobot Sander
Generation:	V1
Serial:	1000000000-1009999999

may not be put into service before the machinery in which it will be incorporated is declared in conformity with the provisions of Directive 2006/42/EC, including amendments, and with the regulations transposing it into national law.

The product is prepared for compliance with all essential requirements of Directive 2006/42/EC under the correct incorporation conditions, see instructions and guidance in this manual. The following essential requirements of Directive 2006/42/EC are fulfilled: 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4, 1.5.1, 1.5.2, 1.5.4, 1.5.5, 1.5.10, 1.5.11, 1.5.12, 1.6.1. Compliance with all essential requirements of Directive 2006/42/EC relies on the specific robot installation and the final risk assessment.

Technical documentation is compiled according to Directive 2006/42/EC annex VII part B and available in electronic form to national authorities upon legitimate request. Undersigned is based on the manufacturer address and authorized to compile this documentation.

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Budapest, November 11th, 2020

Group Management

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