



# USER MANUAL

## FOR UR ROBOTS

v1.17.0

*Original Instructions*

# Contents

<b>1. Introduction.....</b>	<b>6</b>
1.1. Important Safety Notice.....	6
1.2. Scope of the Manual.....	6
1.2.1. 2FGP20.....	6
1.2.2. HEX-E/H QC.....	6
1.2.3. Software and Firmware.....	6
1.2.3.1. URCap Software.....	6
1.2.3.2. Compute Box Software.....	6
1.2.3.3. HEX-E/H QC Firmware.....	7
1.3. Naming Convention.....	7
1.3.1. Compute Box/Eye Box.....	7
1.3.2. HEX-E QC/HEX-H QC.....	7
1.4. Copyright.....	7
<b>2. Safety.....</b>	<b>8</b>
2.1. Intended Use.....	8
2.2. General Safety Instructions.....	8
2.3. Risk Assessment.....	10
2.4. Environmental Safety.....	10
2.5. 2FGP20 Safety.....	11
<b>3. Operation Mode(s).....</b>	<b>12</b>
3.1. Operation via Compute Box.....	12
<b>4. HW Installation.....</b>	<b>13</b>
4.1. Robot Mount.....	13
4.1.1. Tools.....	13
4.1.1.1. Finger and Vacuum Cup System Mounting.....	13
4.1.1.2. 2FGP20.....	14
4.2. Compute Box Mount.....	14
4.2.1. Optional - Clip-on Bracket.....	14
4.3. Wiring via Tool Connector.....	15
4.4. Best practices - HEX-E/H QC.....	16
<b>5. SW Installation.....</b>	<b>17</b>
5.1. Robot Software Setup.....	17
5.1.1. URCap Setup.....	17
5.1.1.1. Device Info.....	17
5.1.1.2. 2FGP20.....	21
5.1.1.3. HEX.....	24
<b>6. Operation.....</b>	<b>28</b>
6.1. URCap Commands.....	28

6.1.1. 2FGP20.....	28
6.1.1.1. 2FGP20 Finger Grip.....	28
6.1.1.2. 2FGP20 Finger Release.....	30
6.1.1.3. 2FGP20 Vacuum Grip.....	31
6.1.1.4. 2FGP20 Vacuum Release.....	32
6.1.2. HEX-E/H QC.....	32
6.1.2.1. HEX-Zero.....	32
6.1.2.2. HEX-Insert Part.....	33
6.1.2.3. HEX-Force Control.....	37
6.1.2.4. HEX-Search.....	40
6.1.2.5. OnWaypoint.....	42
6.1.2.6. Trajectory.....	43
6.1.2.7. Path from Hand Guide.....	47
6.1.2.8. Path from OnWaypoints.....	50
6.1.2.9. Path from Shape.....	54
6.1.2.10. TCP.....	58
6.2. URCap Toolbar.....	59
6.2.1. 2FGP20.....	61
6.2.2. HEX-E/H QC.....	63
6.3. URScript Commands.....	65
6.3.1. 2FGP20.....	65
6.4. Feedback Variables.....	65
6.4.1. 2FGP20.....	65
6.4.2. HEX-E/H QC.....	66
<b>7. Additional Software Options.....</b>	<b>67</b>
7.1. Compute Box/Eye Box.....	67
7.1.1. Web Client.....	67
7.1.2. Web Client: Devices Menu.....	69
7.1.2.1. 2FGP20.....	70
7.1.2.2. HEX-E/H QC.....	73
7.1.3. Web Client: Configuration Menu.....	77
7.1.4. Web Client: Path Menu.....	78
7.1.5. Web Client: Update Menu.....	79
7.1.6. Web Client: TCP/CoG.....	80
7.1.7. Web Client: Account Settings.....	82
<b>8. Hardware Specification.....</b>	<b>85</b>
8.1. Technical Sheets.....	85
8.1.1. 2FGP20.....	85
8.1.2. HEX-E QC.....	94
8.1.3. HEX-H QC.....	95
8.1.4. HEX-E QC and HEX-H QC Comparison.....	96

8.1.5. Compute Box.....	97
8.1.5.1. With 6.25A Wall Adapter (150W).....	97
8.1.5.2. Compute Box I/O interface.....	98
8.2. Mechanical Drawings.....	99
8.2.1. Mountings.....	99
8.2.1.1. HEX-E/H QC.....	99
8.2.2. Tools.....	100
8.2.2.1. 2FGP20.....	100
8.2.2.2. Compute Box.....	101
8.3. TCP, CoG.....	101
8.3.1. 2FGP20.....	102
8.3.2. HEX-E/H QC.....	102
<b>9. Maintenance.....</b>	<b>103</b>
9.1. 2FGP20.....	103
<b>10. Troubleshooting.....</b>	<b>105</b>
10.1. Robot Has Not Obtained an IP Address.....	105
10.2. Changing the DIP Switch Does Not Take Effect.....	105
10.3. URCap Operation.....	105
10.4. Tool Functions Are Not Available.....	105
10.5. 2FGP20 Error Codes.....	106
10.5.1. Motor Not Calibrated.....	106
10.5.2. Solenoid Brake Not Calibrated.....	106
10.6. HEX-E/H QC Error Codes.....	106
10.6.1. No Sensor Connected.....	106
10.6.2. Sensor Is Not Responding.....	106
10.6.3. Sensor Failure.....	107
10.6.4. Sensor Power or EEPROM Error.....	107
10.6.5. Communication Error Between the Sensor and the Compute Box/Eye Box... 107	
10.6.6. Sensor Torque Overload Error.....	107
10.6.7. Unknown Error.....	107
10.7. URCap Pop-Up Messages.....	108
10.7.1. HEX-E/H QC.....	108
10.7.1.1. Force Overload Protection.....	108
10.7.1.2. Auto-calibration Warning.....	109
10.7.1.3. HEX Photodiode Failure Detection.....	109
10.8. Web Client Pop-Up Messages.....	110
10.8.1. HEX-E/H QC.....	110
10.8.1.1. Error 128.....	110
10.8.1.2. Error 4096.....	111
10.8.1.3. Error 2048.....	111

<b>11. Warranties.....</b>	<b>113</b>
11.1. Patents.....	113
11.2. Product Warranty.....	113
11.3. Disclaimer.....	113
<b>12. Certifications.....</b>	<b>114</b>
12.1. Manufacturer Test Certificate.....	115
12.2. EMC.....	116
12.3. 2FGP20 - Environment.....	117
12.4. Declaration of Incorporation.....	118
12.4.1. 2FGP20.....	118
12.4.2. HEX-E.....	119
12.4.3. HEX-H.....	120

# 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. 2FGP20

Tool	Version
2FGP20	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 [7.1.5. 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

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### 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.

## 1.4. Copyright

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The information contained herein is property of OnRobot A/S and shall not be reproduced in whole or in part without prior written approval of OnRobot A/S. The information herein is subject to change without notice and should not be construed as a commitment by OnRobot A/S. This manual is periodically reviewed and revised.

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## 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

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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

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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

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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. 2FGP20 Safety

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When setting the target force, be aware that the maximum permissible force on quasi-static contacts for collaborative applications is 140 N. For further details, please check the ISO/TS 15066 standard.

## 3. Operation Mode(s)

This document covers installation and operation for both:

- UR CB3 series robot controllers
- and UR e-Series robot controllers.

Since the two controllers have similar installation and operation screens in these cases only the e-Series screens are shown. Where the two requires different steps or screens it is highlighted and referred as:

- CB3 series
- e-Series.

### 3.1. Operation via Compute Box

---

The product(s) could be used on both UR series via Compute Box, which works with all products and product combinations. Different modes of operation require the same installation/operation steps. Where the via Compute Box mode requires different steps, it is highlighted and referred as via Compute Box.

## 4. HW Installation

### 4.1. Robot Mount

#### 4.1.1. Tools

##### 4.1.1.1. Finger and Vacuum Cup System Mounting

###### Finger Mounting

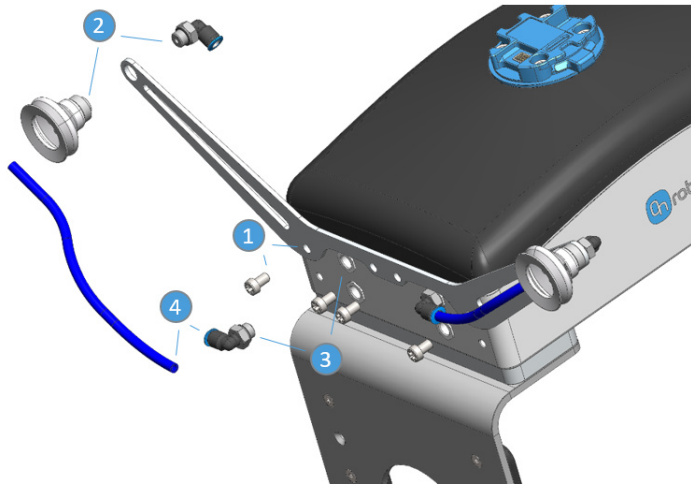
Mount the fingers by tightening the six M6x12 screws (per finger) with 3 Nm torque.



###### Vacuum Cup System Mounting

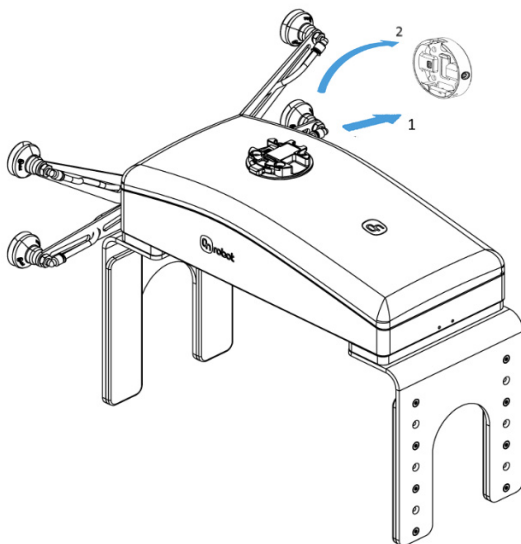
To mount the vacuum cup bracket, the vacuum cups and the tubes, follow the steps below:

1. Tighten four angle fittings to the gripper's air sources.
2. Tighten the vacuum cups to the angle fittings through the holes of the bracket with 0.4 Nm torque.
3. Place the desired bracket on the side of the gripper and tighten the six (2 if only row shape will be used) M6x12 screws with 1 Nm torque.
4. Connect the tubes to the angle fittings by pushing them inside. To ensure that the tubes are completely attached try to gently pull the tubes out. If a tube needs to be removed, simply press the blue part of the angle fitting and pull the tube.



For more information about the vacuum cups customization, go to the Vacuum cups section in the [Technical Sheet](#).

#### 4.1.1.2. 2FGP20



**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:**

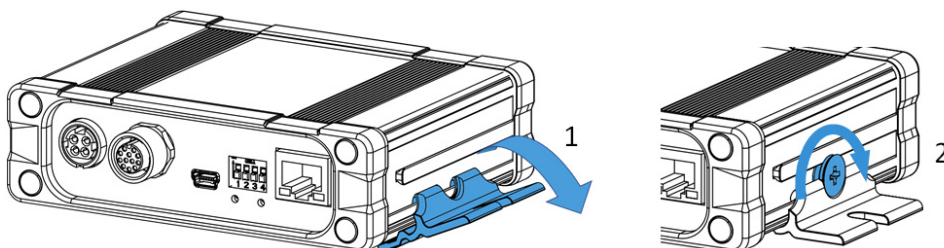
Flip the tool until it is fully mated, and you hear a clicking sound.

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

## 4.2. Compute Box Mount

### 4.2.1. 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 screw.

### 4.3. Wiring via Tool Connector

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**DANGER:**

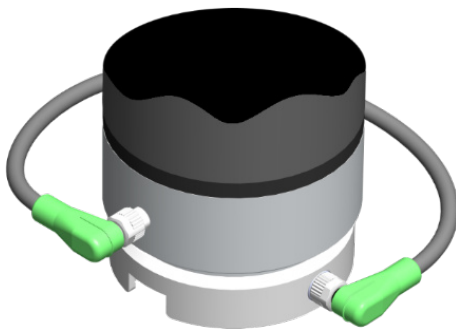
Use only original OnRobot tool data cables.

The following devices are supported in the operation mode via tool connector:

- 2FG7
- 2FGP20
- 3FG15 (Only for e-Series)
- MG10
- RG2 / RG6
- SG
- VG10 / VGC10

#### For e-Series

Connect the Quick Changer to the UR's tool connector.



**DANGER:**

Never connect the Quick Changer for I/O to an e-Series UR robot's Tool Connector.



**NOTE:**

VG10 / VGC10 can only be attached when the UR controller is started (not in IDLE mode) and no program is running or completely powered off.

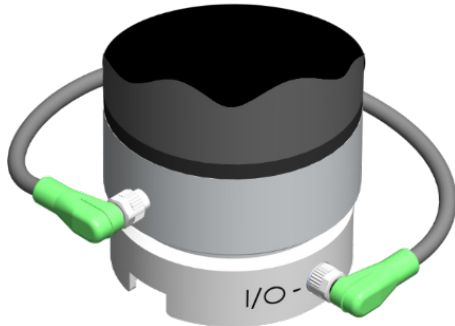


**CAUTION:**

Dual Quick Changer cannot be connected to the Tool Connector, it must be used via Compute Box.

### For CB3

Connect the Quick Changer for I/O to the UR's tool connector.



**DANGER:**

Never connect the Quick Changer or Dual Quick Changer to a CB3 UR robot's tool connector.

Wiring via Tool Connector is finished.

## 4.4. Best practices - HEX-E/H QC

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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.



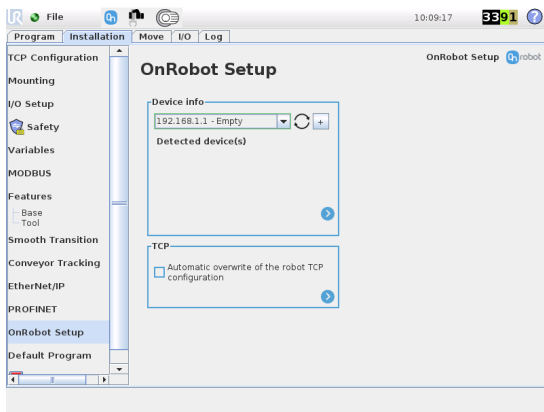
# 5. SW Installation

## 5.1. Robot Software Setup

### 5.1.1. URCap Setup

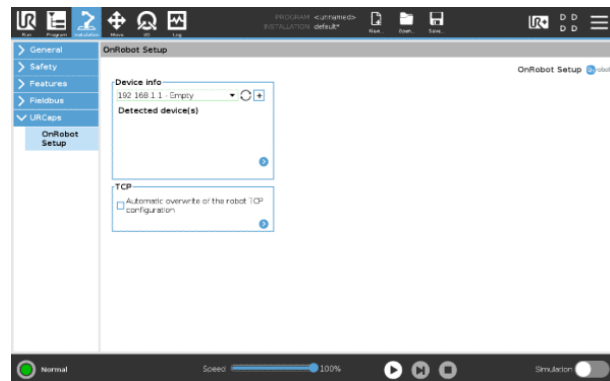
#### UR CB3

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



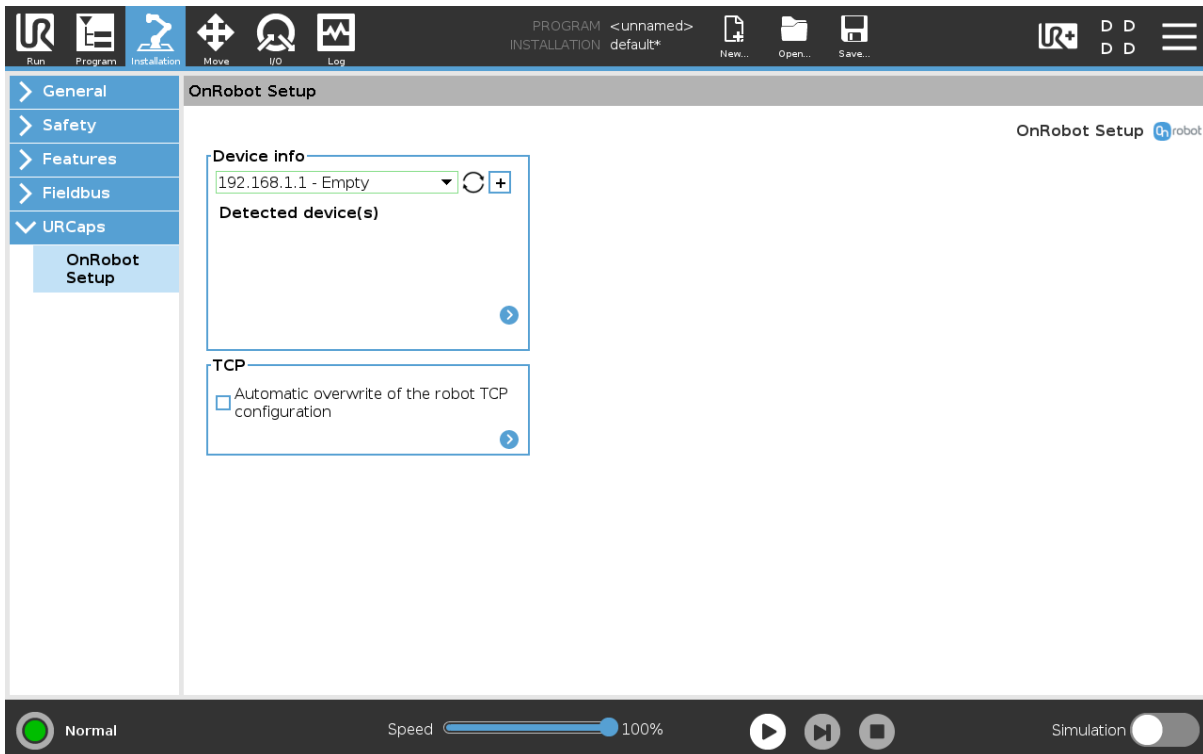
#### UR e-Series

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




#### 5.1.1.1. 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.

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.

**No connection:** If you want to use OnRobot URcap and there are no connected devices, select **No connection** from the dropdown menu and no error message will show up.

**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.



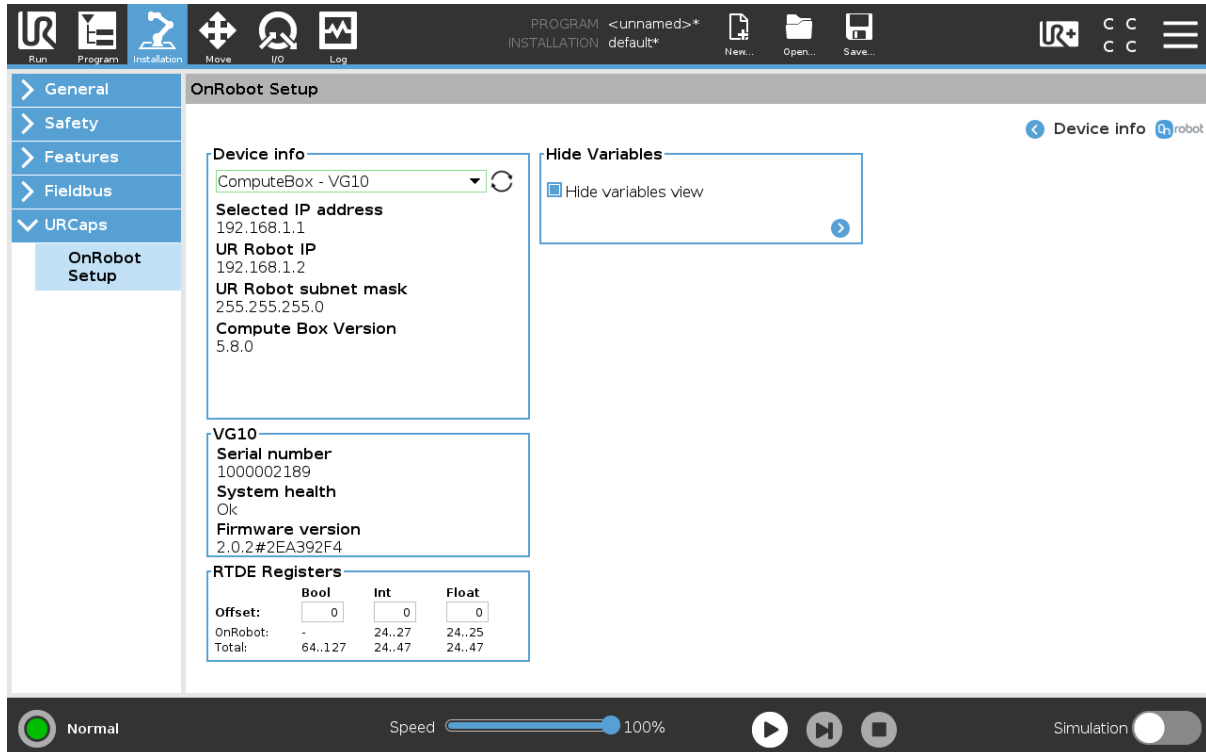
### WARNING:

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.

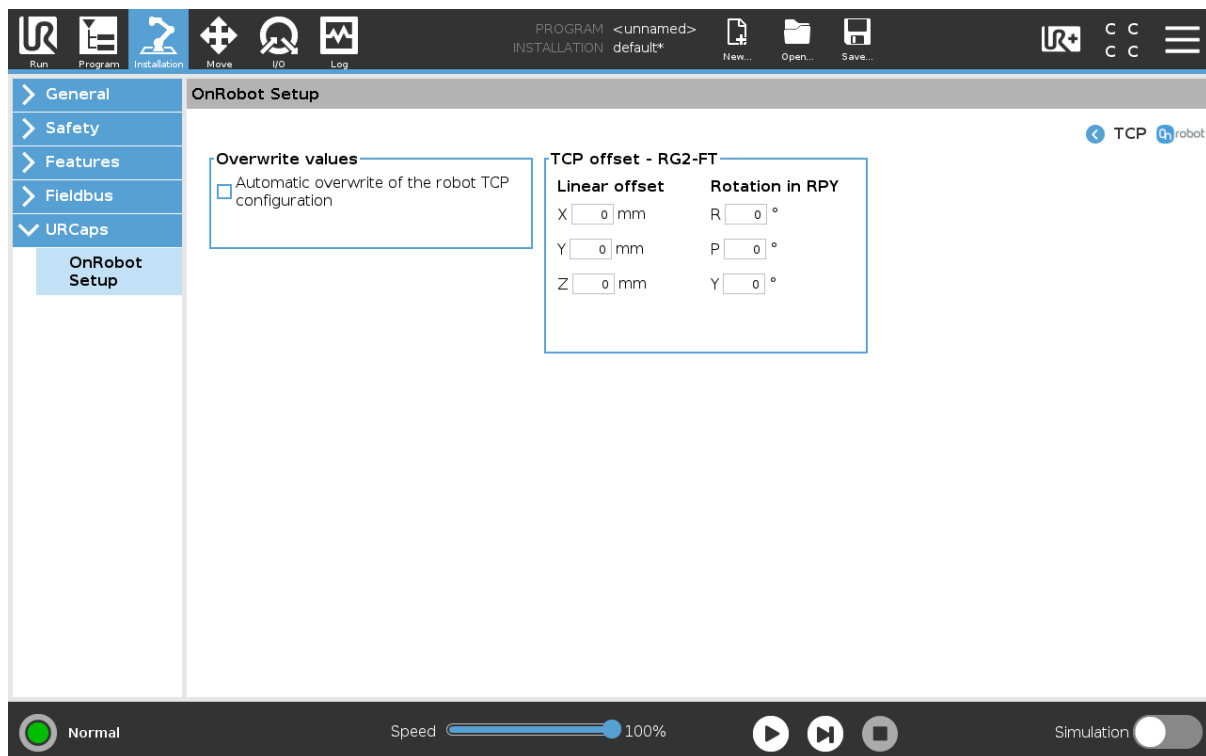
## Hide Variables

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).

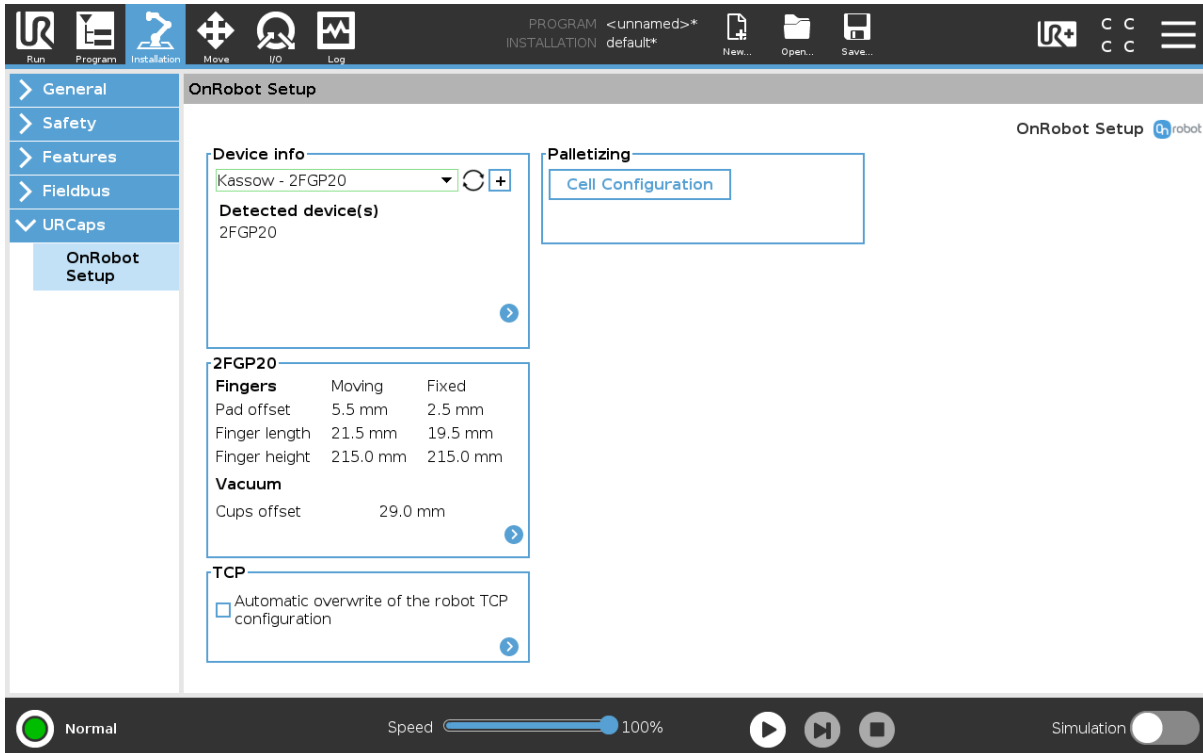
For further information and best practices on the TCP setting see [TCP Configuration](#) section.

### 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.

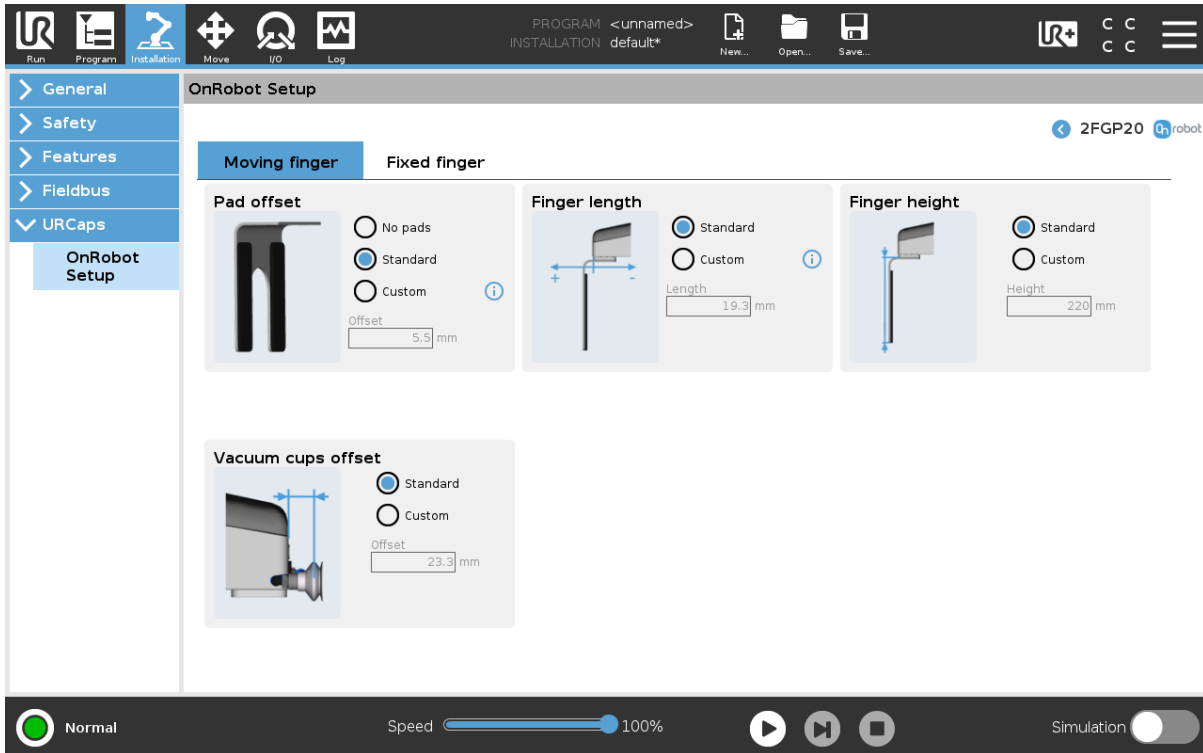
### 5.1.1.2. 2FGP20

The configuration panels for the 2FGP20 are shown in the images below:



### 2FGP20

In the normal view of the panel, the selected **Pad offset**, **Finger length**, **Finger height** and **Vacuum cups offset** are shown. These values can be set for both the Moving finger and the Fixed finger.

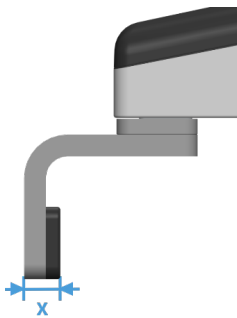


### Pad offset

Select one of the pad offsets:

- No pads
- Standard pads
- Custom pads

To input the right custom pad offset value, measure the width of the finger and the pad together and divide that value by two. Custom pad offset value =  $x/2$ .

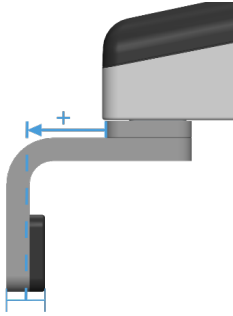


### Finger length

Select one of the finger lengths:

- Standard finger
- Custom finger

To input the right custom finger length value, measure the distance from the outer part of the finger base to the pad offset position (middle between the outer part of the finger and the outer part of the pad).



### Finger height

Select one of the finger heights:

- Standard finger
- Custom finger  
Add the custom finger height value to the input field.

### Vacuum cups offset

Select one of the vacuum cup offsets:

- Standard vacuum cups  
Shows the value when the OnRobot vacuum cups and brackets are used.
- Custom vacuum cups  
Add the custom vacuum cups offset value to the input field.



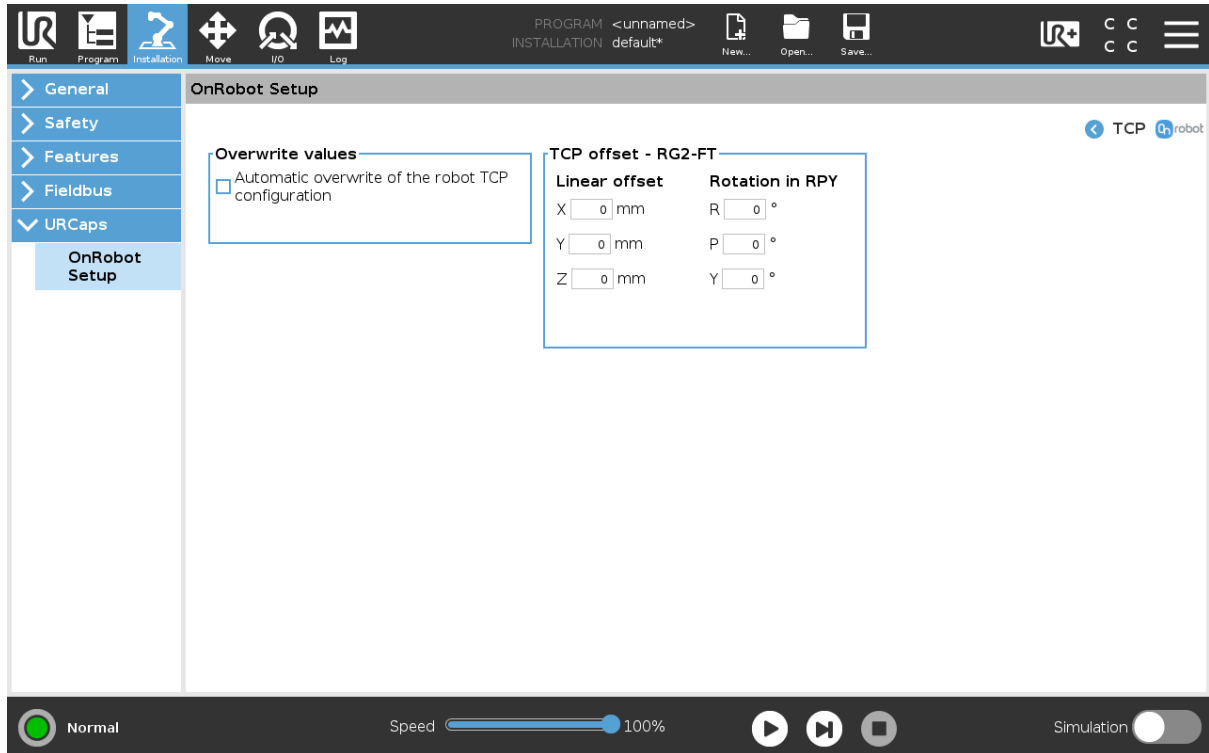
#### NOTE:

The changes in the 2FGP20 Setup settings are saved to the gripper and not to the installation file. Therefore, if the gripper is moved to another robot, the settings will remain the same. However, if another gripper is used in the same robot, the settings might need to be reset again.

### 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 [TCP Configuration](#) section.

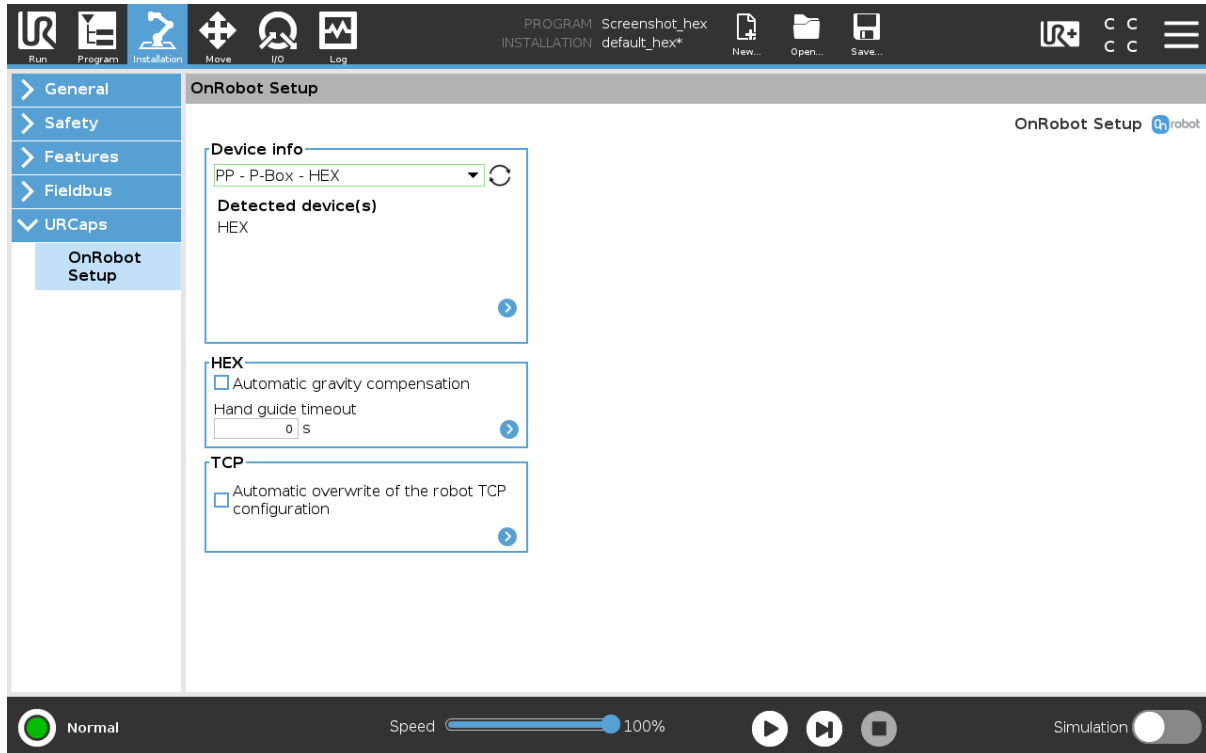
### TCP offset

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

#### 5.1.1.3. 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

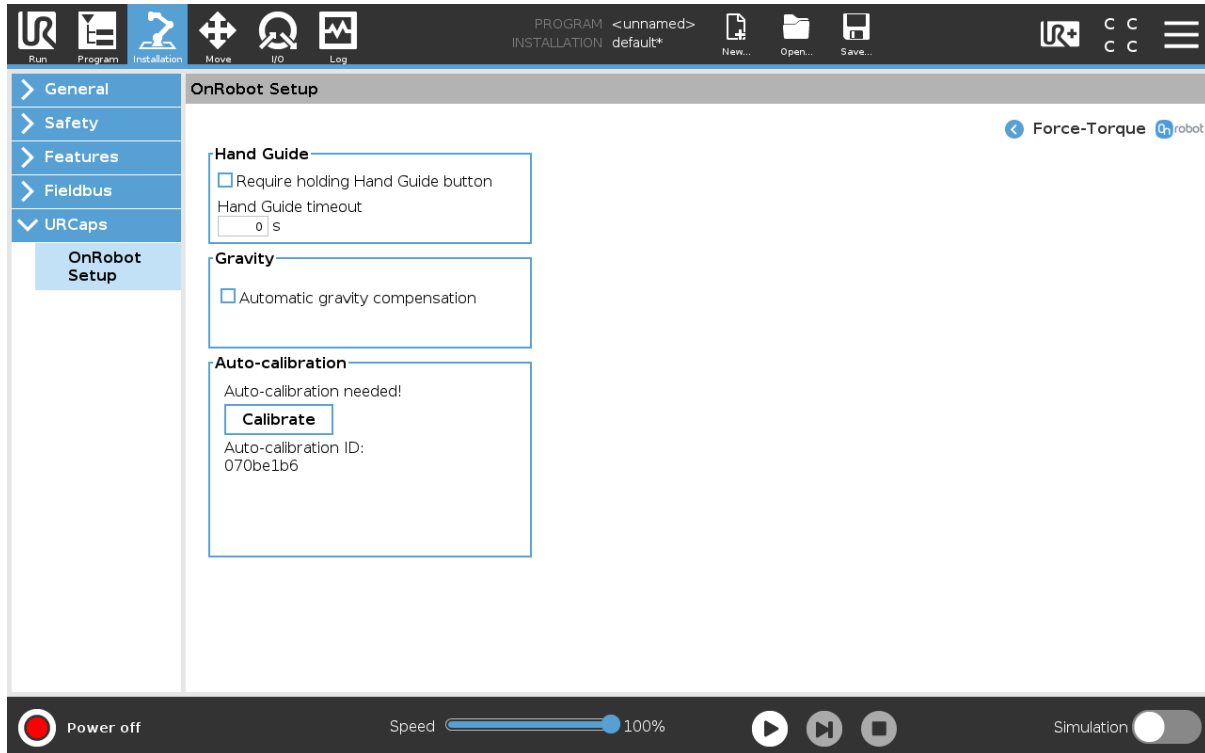


### WARNING:

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 [7.1.2.2. Web Client: Devices Menu](#) section. Follow the required steps on the URcap.



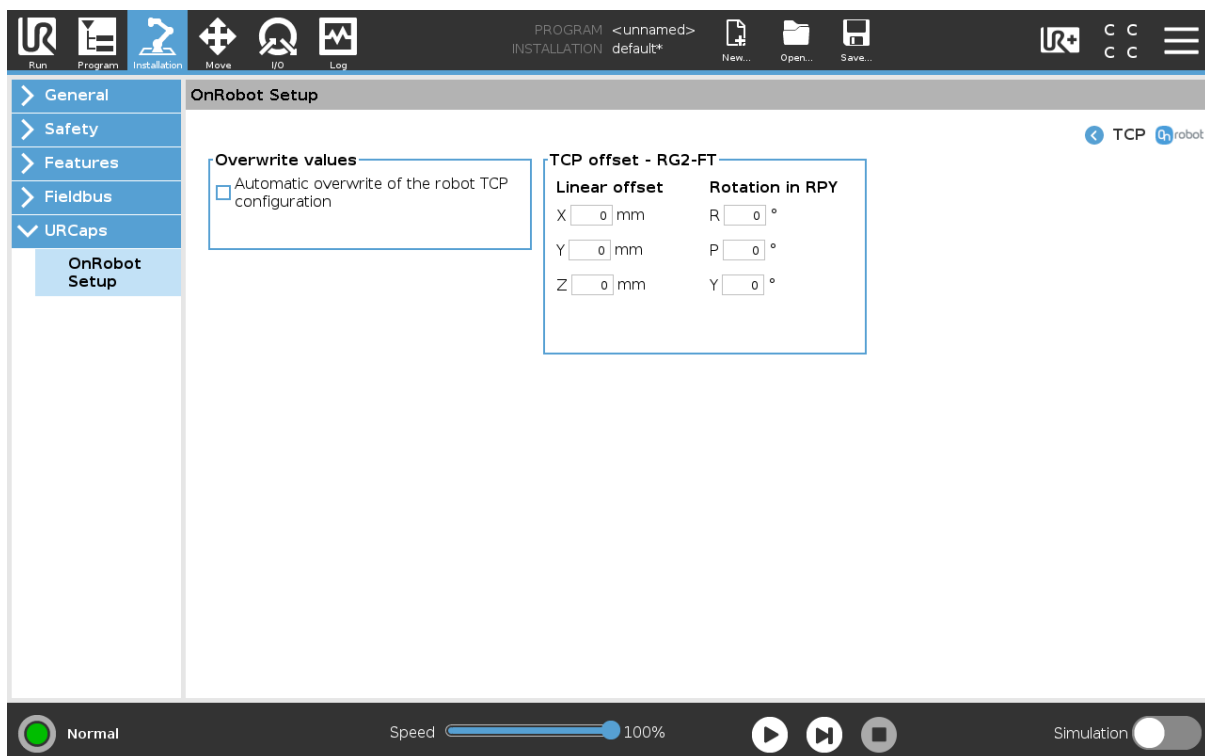
### WARNING:

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:



### Override 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 [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.

## 6. Operation



### NOTE:

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

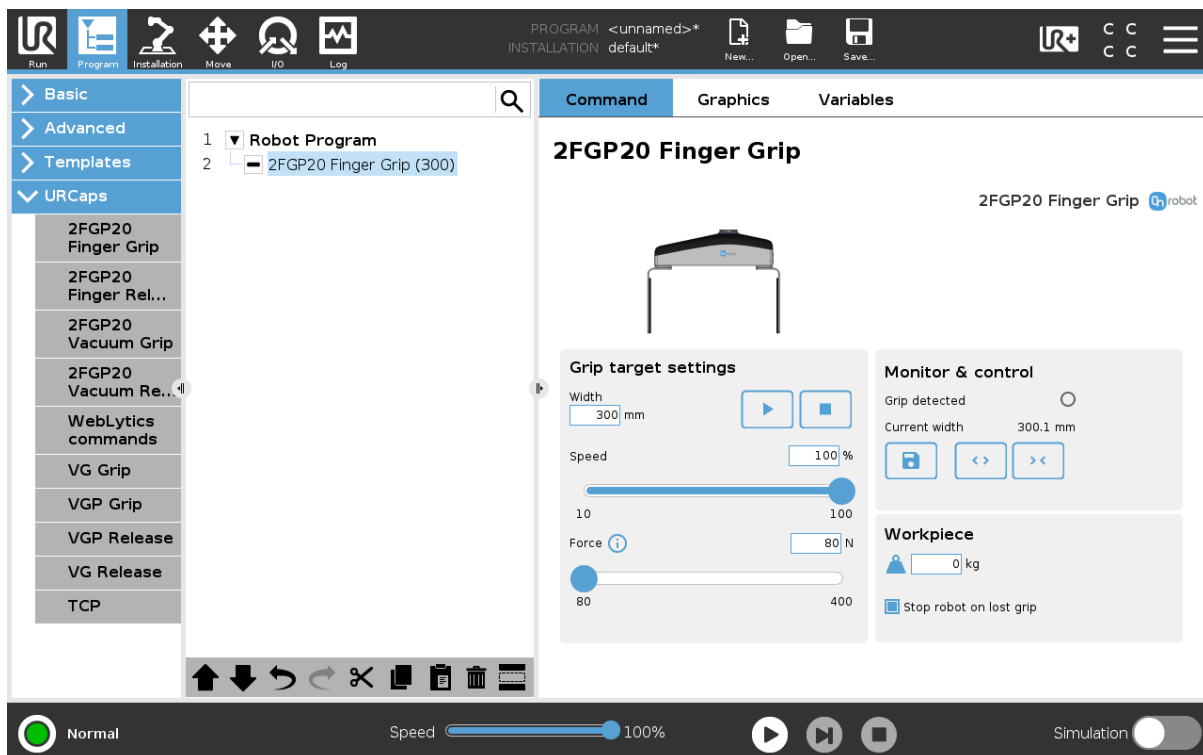
### 6.1. URCap Commands

URCap commands provide an easy way to program an application.


#### 6.1.1. 2FGP20

##### 6.1.1.1. 2FGP20 Finger Grip

When the 2FGP20 Finger Grip command is executed, the gripper tries to reach the specified target parameters (**Width**, **Force**, and **Speed**). The different functions are explained below.



#### Grip target settings

**Width:** Sets the target gripping width. The width can be set by using the Save as Target  button (recommended) or by typing it manually.

**Speed:** Sets the target gripping speed.

Robot Type	Speed Range	Speed Resolution
eSeries robots or CB3 robots that are connected to a Compute Box	10-100%	1%
CB3 robots that are connected to the tool connector	10-100%	10%

**Force:** Sets the target gripping force.

Robot Type	Force Range	Force Resolution
eSeries robots or CB3 robots that are connected to a Compute Box	80-400 N	1 N
CB3 robots that are connected to the tool connector	80-130 N	5 N



Executes the command.

### Monitor & Control

**Grip detected:** The gripper detects that a workpiece is gripped with the fingers.

**Current width:** Shows the current width value.



**NOTE:**

When the tool is connected to a CB3 robot via the tool connector, the precision of the displayed **Current width** value is valid up to 1 mm resolution.



Will set the **Target width** = **Current width** – 5 mm, when the workpiece is gripped and grip detection occurs.



Buttons to open and close the gripper.



**NOTE:**

To enhance **Width** precision, the **Target force** is not applied when you use the buttons under **Current width**.

### Workpiece

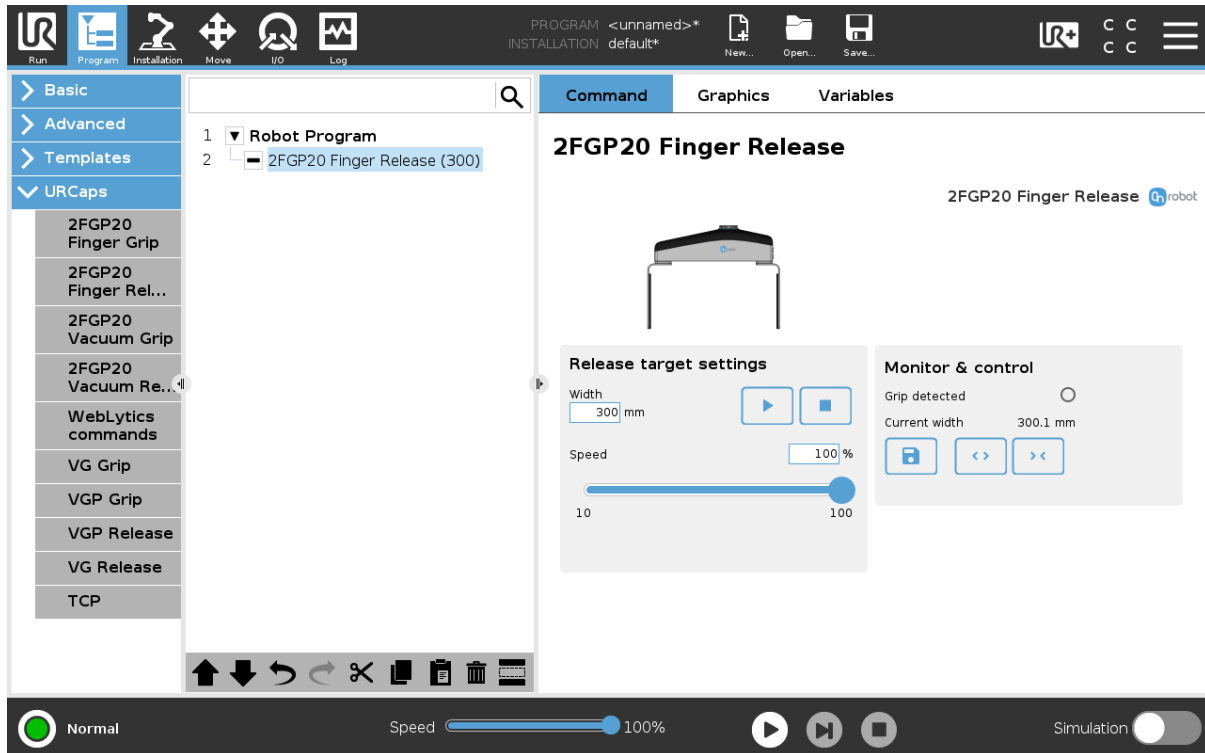


Sets the workpiece weight. Then the URcap software calculates the resulting payload mass considering the gripper, the Quick Changer, and the workpiece mass.


**Stop robot on lost grip:** When this option is selected, the vacuum is monitored continuously. If the vacuum disappears unexpectedly, the robot will stop the movement and displays a popup window.

### 6.1.1.2. 2FGP20 Finger Release

When the 2FGP20 Finger Release command is executed, the gripper tries to reach the specified target parameters (**Width** and **Speed**). The different functions are explained below.



#### Release target settings

**Width:** Sets the target release width. The width can be set by using the Save as Target  button (recommended) or by typing it manually.

**Speed:** Sets the target release speed.



Executes the command.

#### Monitor & Control

**Grip detected:** The gripper detects that a workpiece is gripped with the fingers.

**Current width:** The number shows the current width value.



#### NOTE:

When the tool is connected to a CB3 robot via the tool connector, the precision of the displayed **Current width** value is valid up to 1 mm resolution.



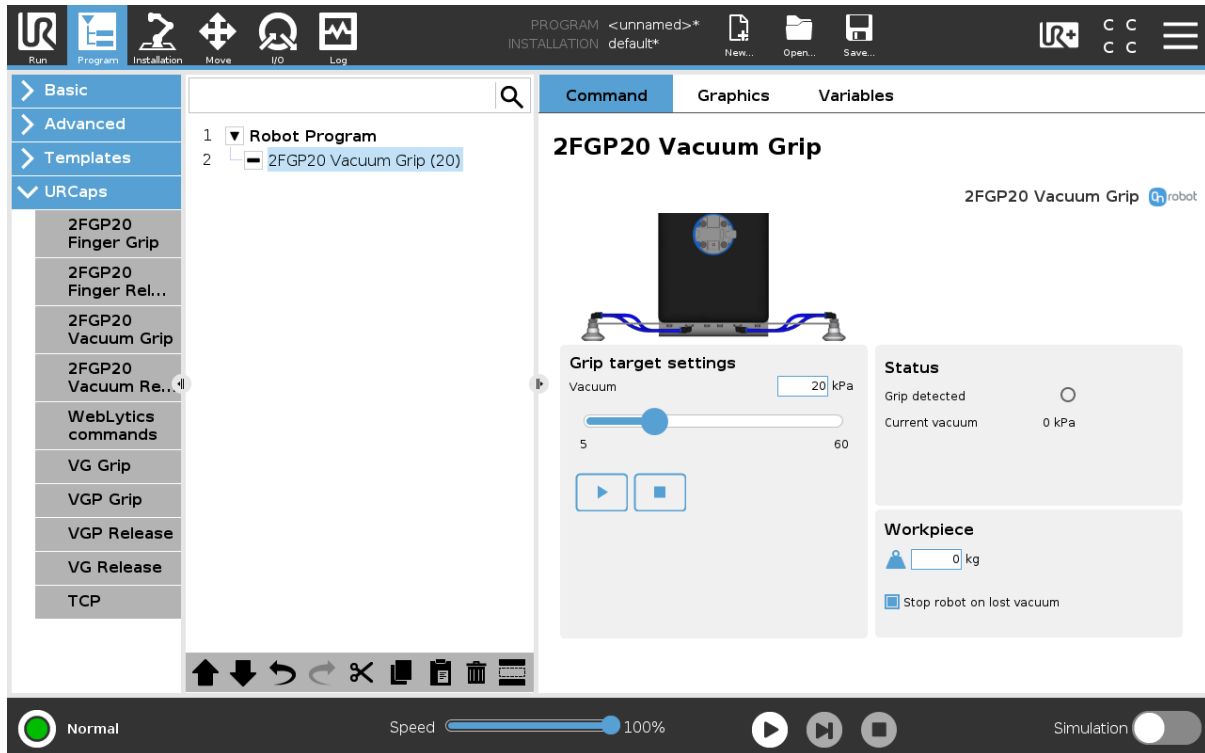
Will set the **Current width** as **Target width**.



Buttons to open and close the gripper.

### 6.1.1.3. 2FGP20 Vacuum Grip

The 2FGP20 Vacuum Grip command is used to activate the pump and generate vacuum to grip a workpiece.



#### Grip target settings

**Vacuum:** Use the slider to set the target vacuum level. The default value is 20 kPa. The higher the achieved vacuum (from 5 kPa up to 60 kPa), the more the lifting power is. This is dependent of the surface of the workpiece, see [Technical Sheets](#) section for more guidance on vacuum settings.



Executes the command.



Releases the vacuum.



#### NOTE:

Setting a lower vacuum gives a faster grip with less wear on the vacuum cups. It also reduces the risk of leaving suction marks on delicate workpieces.


It can take a few seconds when pressing **Play** or **Test** before the robot program starts.

#### Status

**Grip detected:** The gripper detects that a workpiece is gripped with the vacuum cups.

**Current vacuum:** Displays the current vacuum level.

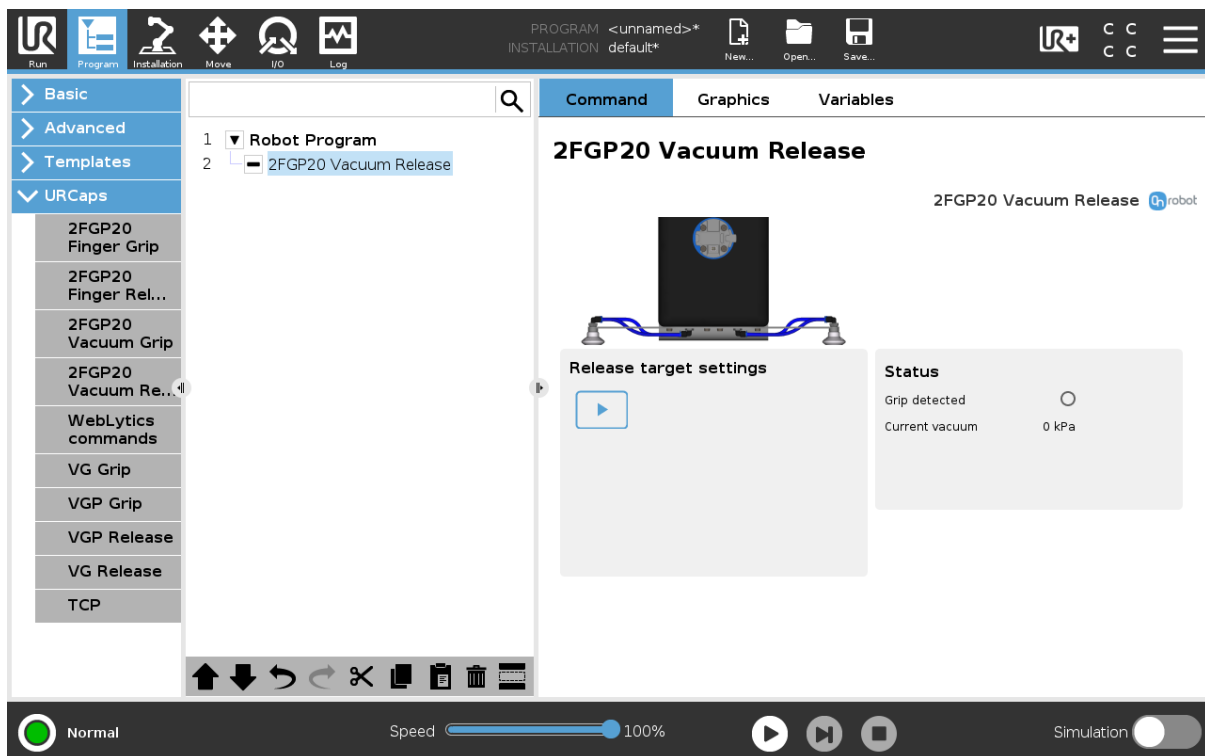
## Workpiece

 Enter the workpiece weight. Then the URcap software calculates the resulting payload mass considering the gripper, the Quick Changer, and the workpiece mass.


**Stop robot on lost vacuum:** When this option is selected, the vacuum is monitored continuously. If the vacuum disappears unexpectedly, the robot will stop the movement and displays a popup window.

### 6.1.1.4. 2FGP20 Vacuum Release

The `2FGP20 Vacuum Release` command is used to release the grip of the workpiece by removing the vacuum.



#### Release target settings

 Executes the command.

#### Status

**Grip detected:** The gripper detects that a workpiece is gripped with the vacuum cups.

**Current vacuum:** Displays the current vacuum level.

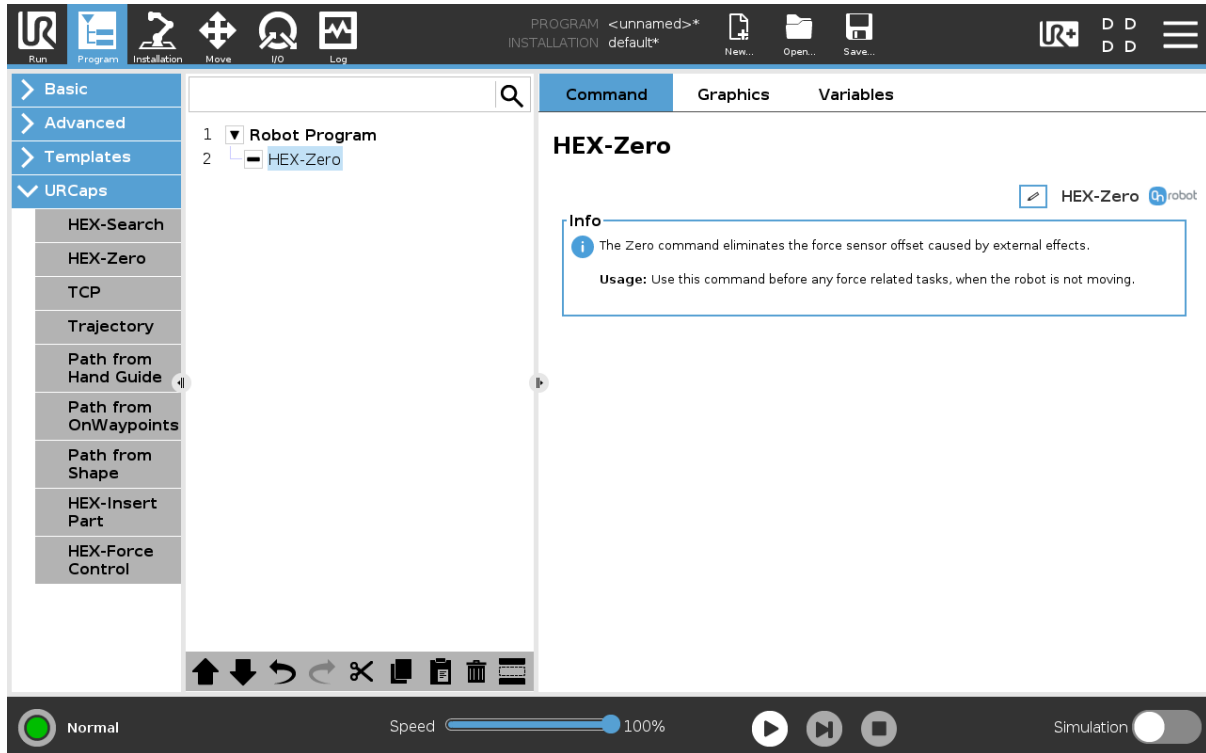
## 6.1.2. HEX-E/H QC

### 6.1.2.1. HEX-Zero

The `HEX-zero` command eliminates 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.





### 6.1.2.2. HEX-Insert Part

The `HEX-Insert Part` command can be used to insert a part into a hole.

The part needs to be pointing in the right direction and needs to be close to the hole entrance. You can choose between two hole entrance finding methods. Then the robot tries to insert the part with the predefined force limit. The final position and orientation will be corrected by the `HEX-Insert Part` command.



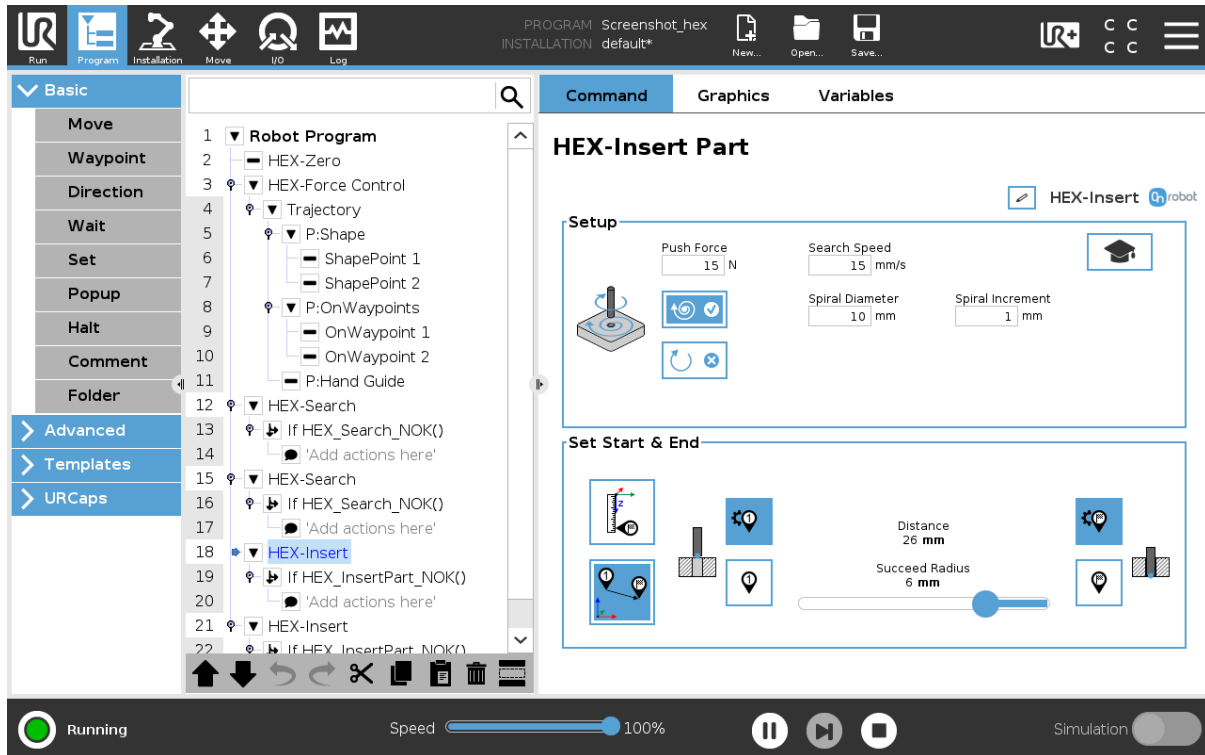
#### NOTE:

Make sure that the tool is not in contact with any object before starting the program.

Setup the `HEX-Insert Part` command:

1. Choose a hole entrance finding method - optional
2. Set the part insertion parameters

## 1. Set the hole entrance finding method



### Setup



These settings are applicable for both absolute and relative movements.

**Push Force:** The force target value, which defines how big force can be used during the insertion. It is also used during the hole entrance finding to limit the contact force. The force is measured along the Tool Z axis.

**Search Speed:** The movement speed of the tool, during the hole entrance finding.

#### Hole entrance finding method:

None, one or both method can be enabled.

- **None** - The robot is already in position, no need to find the hole entrance or the right orientation. **Spiral** and **Rotate** options needs to be disabled.
- **Spiral**  - The robot approaches the surface and starts a spiral motion to find the hole entrance. The maximum **Spiral Diameter** and the **Spiral Increment** can be set. If the maximum **Spiral Diameter** is reached, the insertion is unsuccessful.
- **Rotate**  - The tool rotates the part to fit it into the hole. The rotation angle and the torque value can be set. The rotation direction uses the right-hand rule. This can be used, for example when inserting gears. If the maximum **Angle** is reached, the insertion is unsuccessful.





## 2. Set the part insertion parameters



Select the image to use either **Absolute**  or **Relative**  movement for the part insertion.

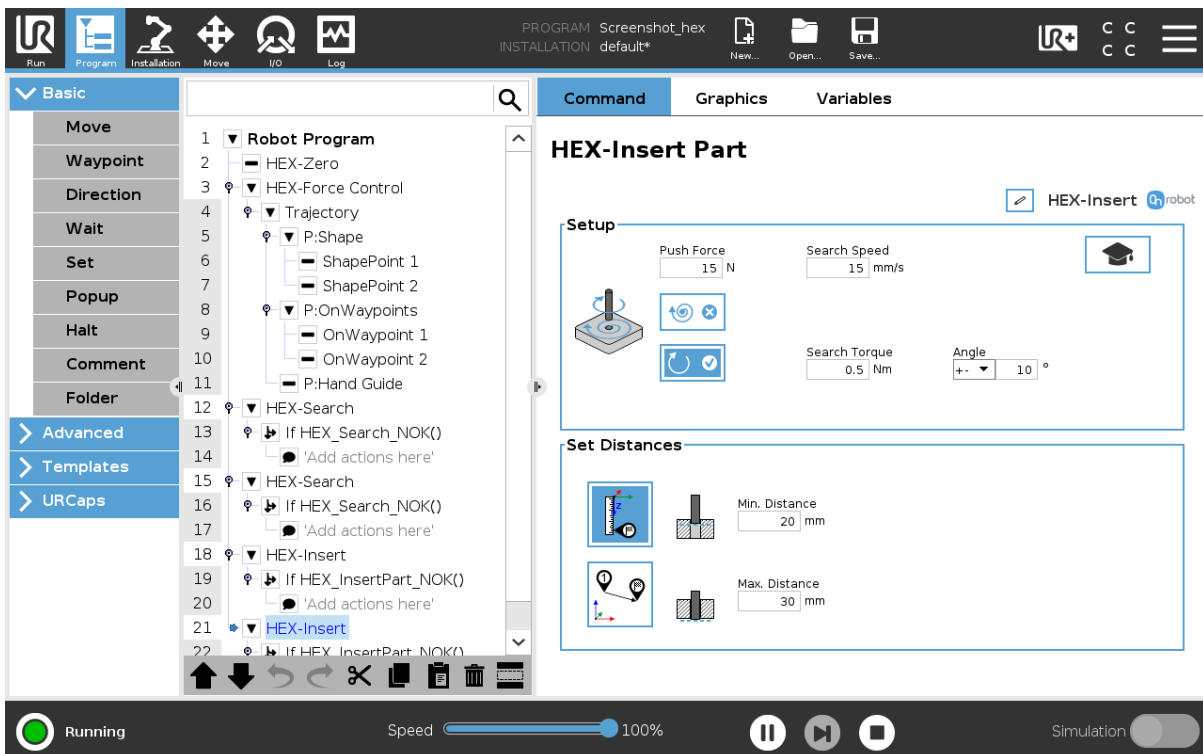
By default, **Absolute** movement is selected.

### Set Start & End

These settings are applicable for absolute movement.

Set the start  and the end  positions of the operation. The start position will be approached with the **Approach Speed** and the hole entrance finding (if selected) is started from that position.

The  and  buttons move the robot to the saved start and end points, respectively. In some cases the exact end position cannot be given. In this case, define a range around the end position using the **Succeed Radius** slider. When the robot reaches this radius, the operation is considered successful.



## Set Distances

These settings are applicable for relative movement.

The robot starts the insertion process (and the optional hole entrance finding) from its actual position.

**Min. Distance:** The minimum distance of the insertion. The insertion is successful, if the **Push Force** is reached and this distance is reached.

**Max. Distance:** The maximum distance of the insertion. The insertion is successful, if this distance is reached.

## Advanced Settings



Pressing the advanced settings icon  displays additional options.

**Gain of Force:** The proportional gain parameter of the force control for the pushing force, and the side forces.

**Gain of Torque:** The proportional gain parameter of the torque control.



### NOTE:

High gain values can result in vibration and protective stop. Higher mass and bigger distance can be vibrating more easily.

**Approach Speed:** The speed of the movement with which the robot approaches the start position. Only applicable for absolute movement.

**Timeout:** The time of the whole insertion operation. If it is set to zero, this exit criterium is neglected.

## Exit conditions

The `HEX-Insert Part` command is successful, if one of the following statements are true:

- The robot reaches the end position (absolute movement) or the maximum distance (relative movement).
- After the robot reached or passed the radius (absolute movement) or the minimum distance (relative movement) and the contact force reached the **Push Force** defined in **Setup**.

The `HEX-Insert Part` command is unsuccessful, if one of the following statements are true:

- The time defined in **Timeout** is elapsed.
- The robot is not moving for a second while the contact force reaches the **Push Force** defined in **Setup**.
- The maximum **Spiral Diameter** is reached during Spiral movement (hole entrance finding).
- The maximum **Angle** is reached during Rotation movement (hole entrance finding).

If the command is unsuccessful it enters into the `If HEX_InsertPart_NOK()` node of the program.

### 6.1.2.3. HEX-Force Control

Applications such as deburring, sanding or grinding may require holding constant force/torque to a defined direction during movements.

The `HEX-Force Control` command alters the trajectory of its child nodes in order to keep the force and torque values constant along the selected axis. The `HEX-Force Control` command does not control forces in the direction that the tool is moving using the `Trajectory`, and the `HEX-Search` commands.

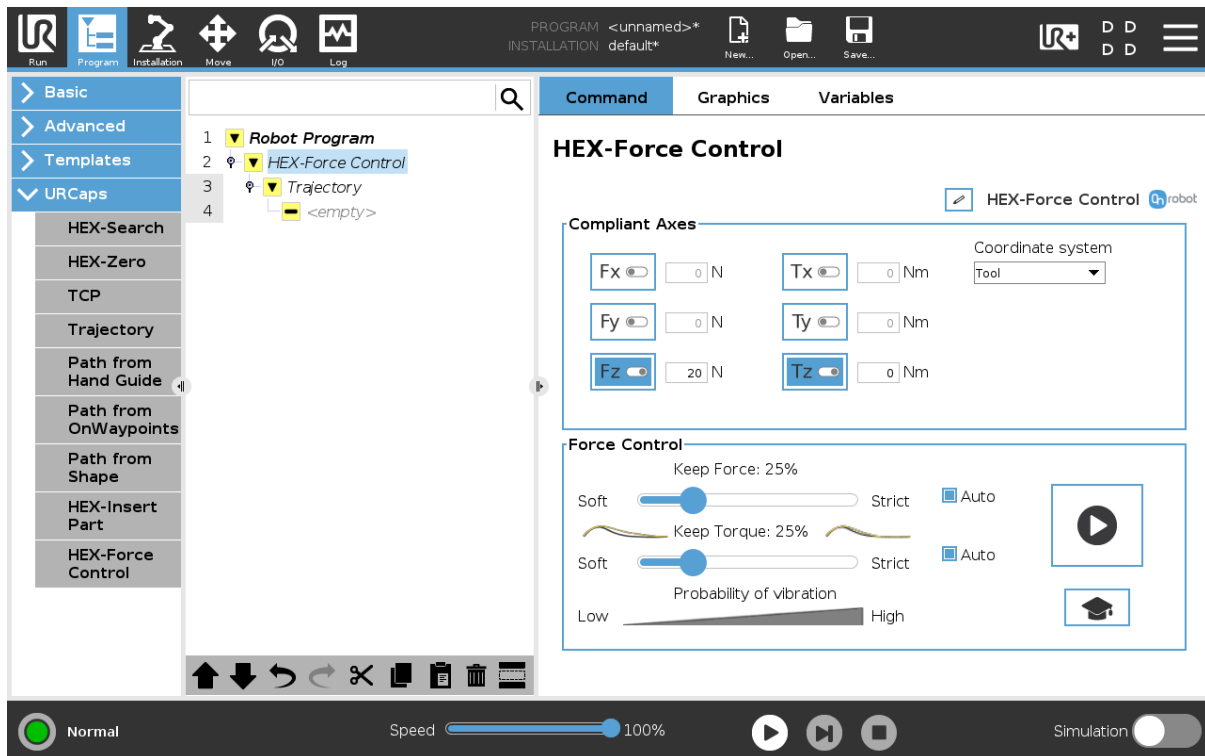
The following commands can be used as child nodes:

- `HEX-Search`
- `Trajectory`



#### NOTE:

To cancel any force or torque offset, execute a `HEX-Zero` command at the beginning of the `HEX-Force Control` command.



The screenshot shows the Ohrobot software interface. The top bar includes icons for Run, Program, Installation, Move, I/O, and Log, along with file management options (New..., Open..., Save...). The main window is divided into a left sidebar with a tree view and a right main panel. The tree view shows a hierarchy: Robot Program (expanded) -> HEX-Force Control (expanded) -> Trajectory (expanded) -> <empty>. The main panel is titled 'HEX-Force Control' and contains several sections:

- Compliant Axes:** A grid of six force/torque controls for axes Fx, Tx, Fy, Ty, Fz, and Tz. Each control has a toggle switch and a numerical input field. Fz is set to 20 N, while others are 0. A 'Coordinate system' dropdown is set to 'Tool'.
- Force Control:** Two rows of sliders for 'Keep Force: 25%' and 'Keep Torque: 25%'. Each row has a 'Soft' slider, a 'Strict' checkbox (checked), and an 'Auto' checkbox (checked). Below these is a 'Probability of vibration' slider ranging from 'Low' to 'High'.
- Buttons:** A play button and a graduation cap icon.

The bottom status bar shows 'Normal' mode, a 'Speed' slider at 100%, and simulation controls (play, stop, simulation toggle).



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

#### Compliant Axes

Fx, Fy, Fz, Tx, Ty, Tz axis selection. If an axis is enabled (compliant) the movement along that axis is force and torque controlled. The enabled axis is controlled to keep the set force and torque value constant.

**Coordinate system:** The coordinate system used for the movement. It can be set to Base or Tool.

## Force Control

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



Press the button to test the set value.

At a higher percentage value the tool can follow the object more precisely.

Setting the slider to 0 (OFF position) deactivates the force control.

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



Press the button to test the set value.

At a higher percentage value the tool can follow the object more precisely.

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.

## Force Control Advanced Settings

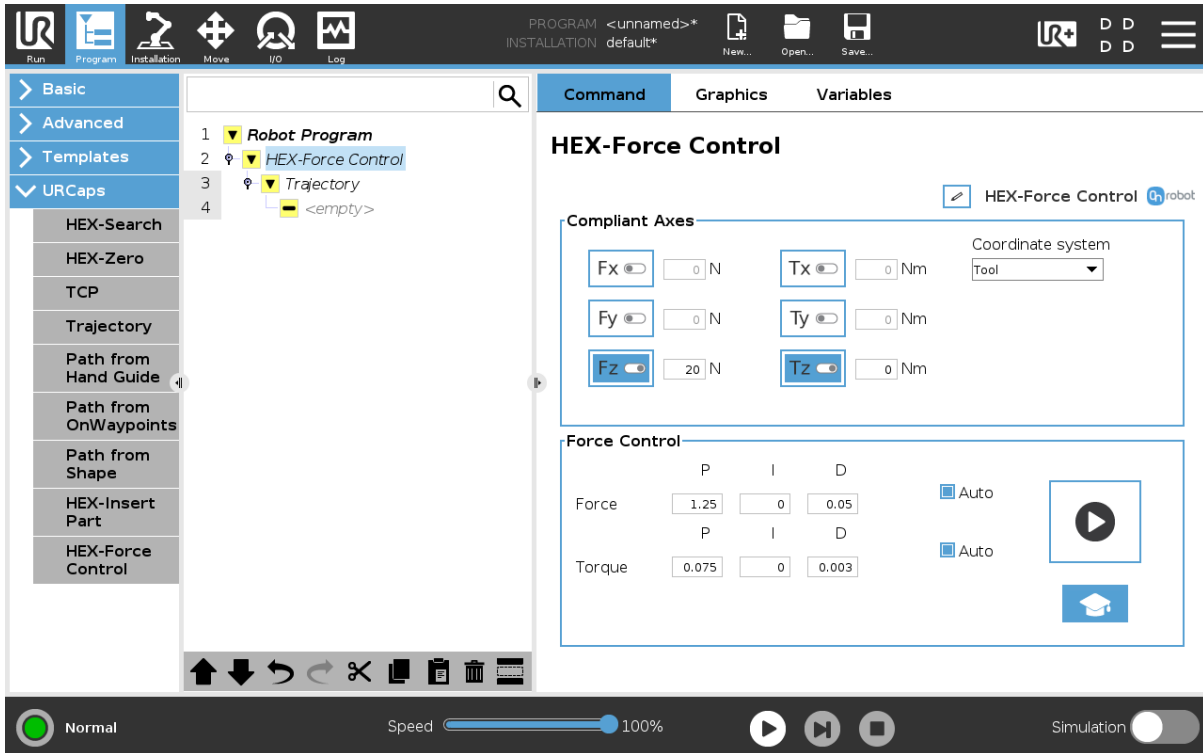


Pressing the advanced settings icon displays additional options and allows fine-tuning the force and torque settings.

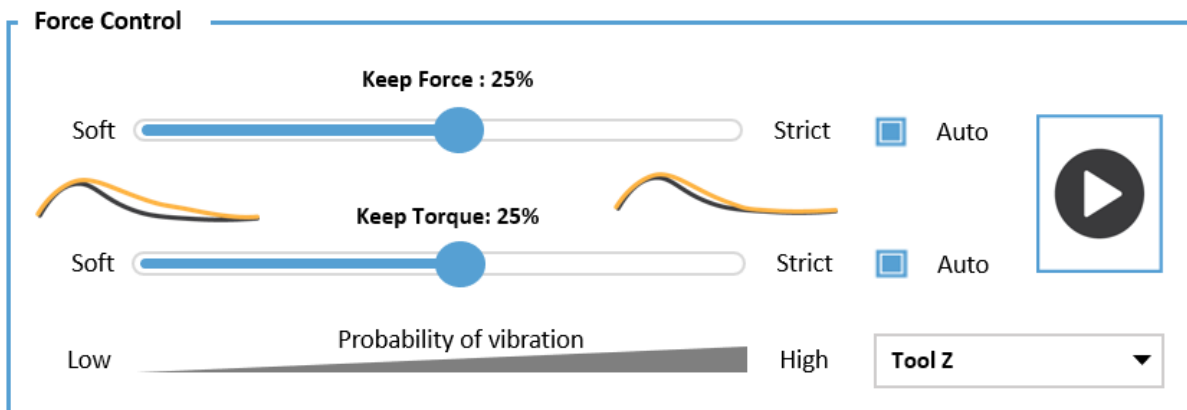
**P:** The force and torque controller can be tuned with this proportional gain parameter. If any overshoots or vibrations occur, try lowering the gain value (For example: 0.5).

**I:** The force and torque controller can be tuned with this integral gain parameter. If any overshoots or vibrations occur, try lowering the gain value.

**D:** The force and torque controller can be tuned with this derivative gain parameter. If any overshoots or vibrations occur, try lowering the gain value.



### Setup the Keep Force and Keep Torque Parameters



To obtain the best 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**.



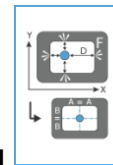
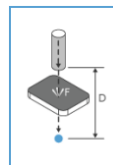
- Verify your path on the workpiece. Before adjusting the **Force Control** parameters, check if the recorded path covers the workpiece as required, and the robot follows the part surface as planned.

**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).
- Gradually increase the **Keep Force** parameter in 5-10% increments. The value of 25% should be suitable in most applications.
- 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.

**6.1.2.4. HEX-Search**

The **HEX-Search** command is used to move the robot along a route and detect contact with an object. If the movement reaches the defined maximum distance, rotation, or moves all the way along the set trajectory without any contact, the search is not successful (the object is not found).

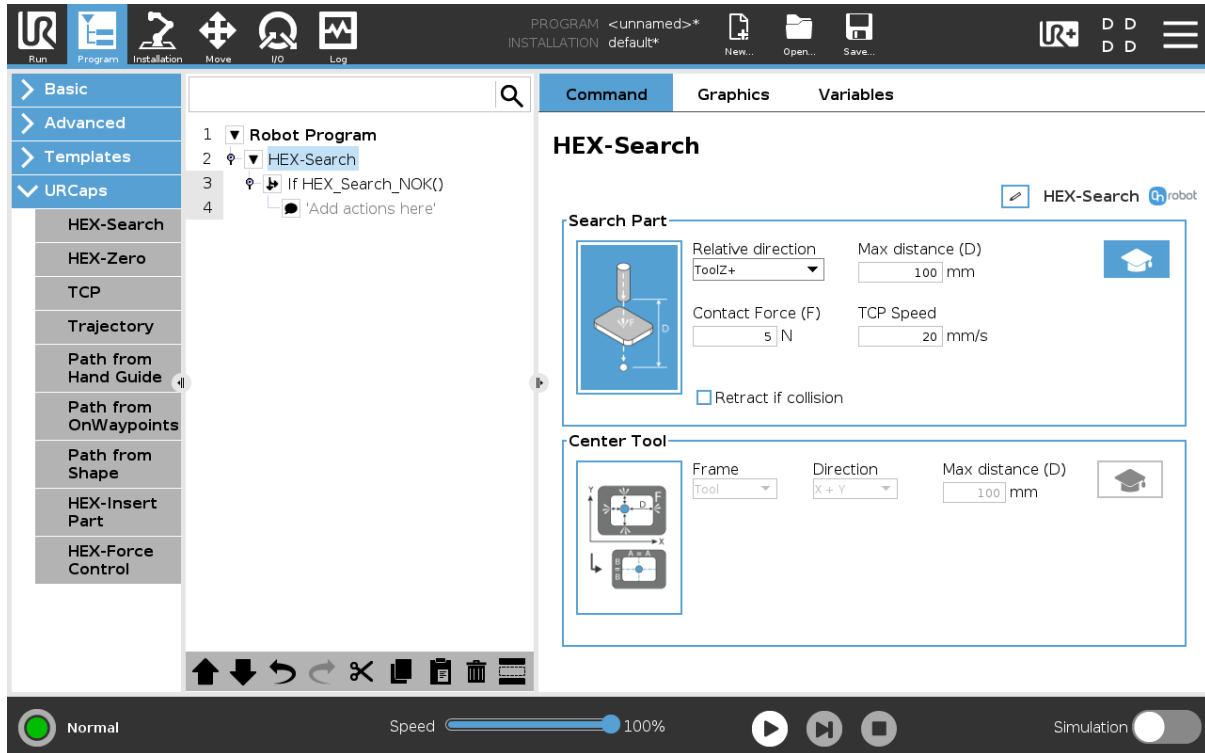


Select the image to use either the **Search Part** or the **Center Tool** options.

**Search Part**

The **Search Part** option can be used, for example to find and remove the top object from a stack. If no more objects are found the stack is empty, therefore the search is unsuccessful.





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

This option searches in a specified direction, distance, rotation or along a trajectory for an object.

**Relative direction:** The direction in which the search is carried out. This can be set in a direction relative to the tool, to the base or on a trajectory.



**NOTE:**

If this setting is changed back from Trajectory to a different setting, the Trajectory node is deleted from the program and the data is lost.

**Max distance (D):** The maximum distance that the tool is going to move during the search operation.

**Max rotation:** The maximum rotation that the tool is going to execute during the search operation. The rotation direction uses the right-hand rule.

### Search Part Advanced Settings

Pressing the advanced settings icon  displays additional options.

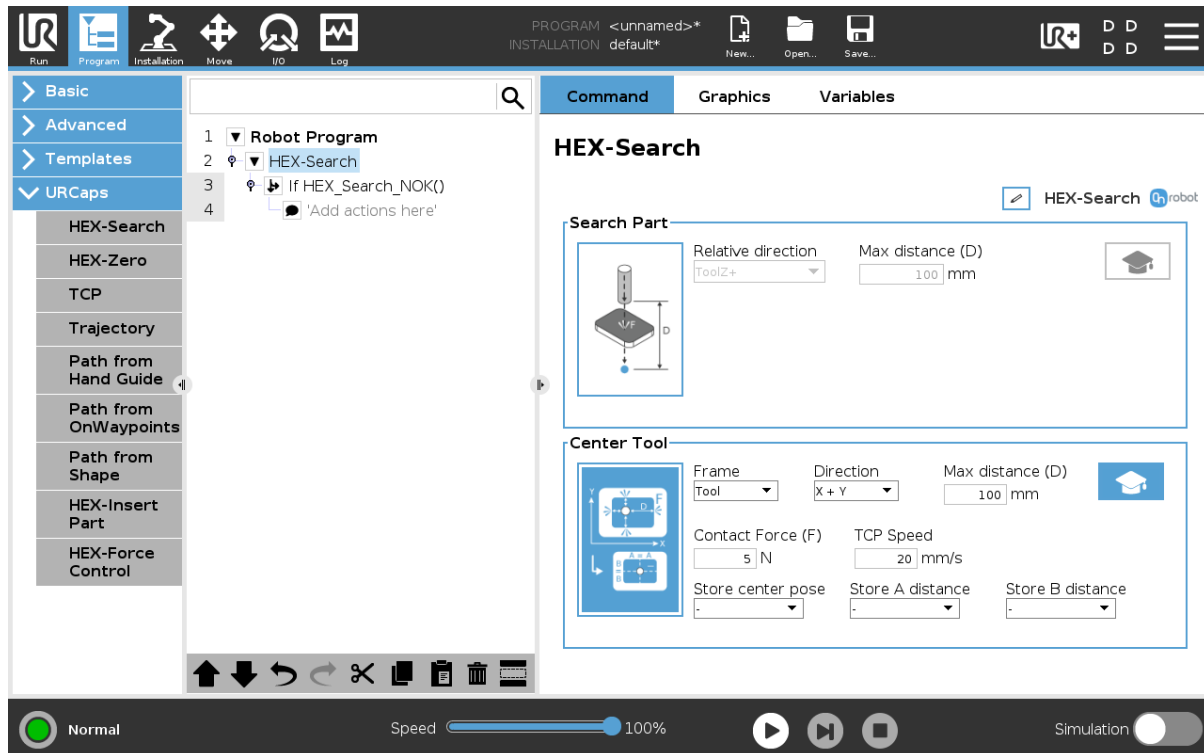
**Contact Force (F):** The force value that needs to be reached to detect a target object.

**TCP Speed:** The movement speed while searching for an object.

**Retract if collision:** If this option is checked, the tool retracts after collision with the object.

## Center Tool

The **Center Tool** option can, for example find a center of a hole (various shapes) with a small object.



This option searches in set directions for the perimeters within a set distance, then moves the robot or base to the relative center of the boundaries that have been found.

**Frame:** Set the Tool or Base.

**Direction:** The directions in which the search is carried out.

**Max distance (D):** The maximum distance that the tool is going to move during the search operation. If the range is reached, the detection is unsuccessful.

**Max rotation:** The maximum rotation that the tool is going to execute during the search operation. The rotation direction uses the right-hand rule.

### Center Tool Advanced Settings

Pressing the advanced settings icon  displays additional options.

**Contact Force (F):** The force value that needs to be reached to detect a target object.

**TCP Speed:** The movement speed while searching for an object.

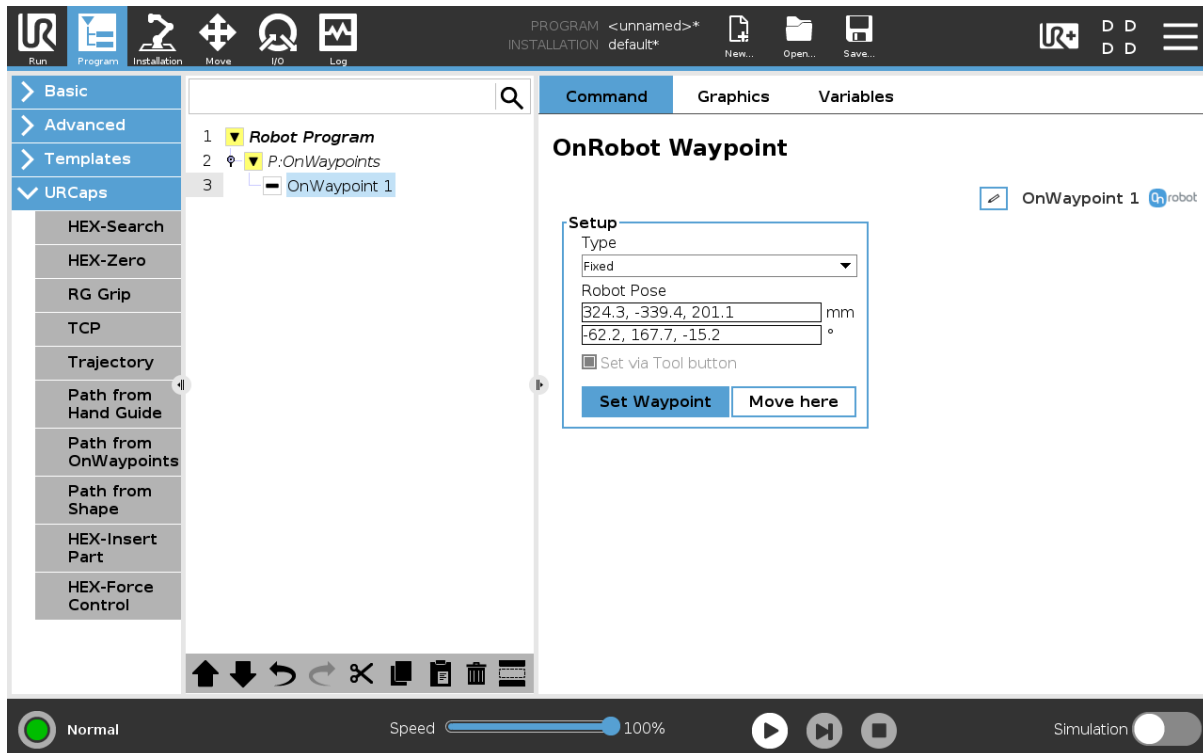
**Store center pose:** Stores the center position value into a list.

**Store A distance:** Stores the A relative distance value into a list.

**Store B distance:** Stores the B relative distance value into a list.

### 6.1.2.5. OnWaypoint

The `OnWaypoint` command is used to set a position for the robot.



**Type:** The type of the waypoint. It can be set to Fixed.

**Robot Pose:** Coordinate and rotation values for the waypoint.

**Set via Tool button:** This checkbox allows the command to automatically get the **Robot Pose** values when pressing the tool button. In this case, the LED of the Tool button turns to steady green.

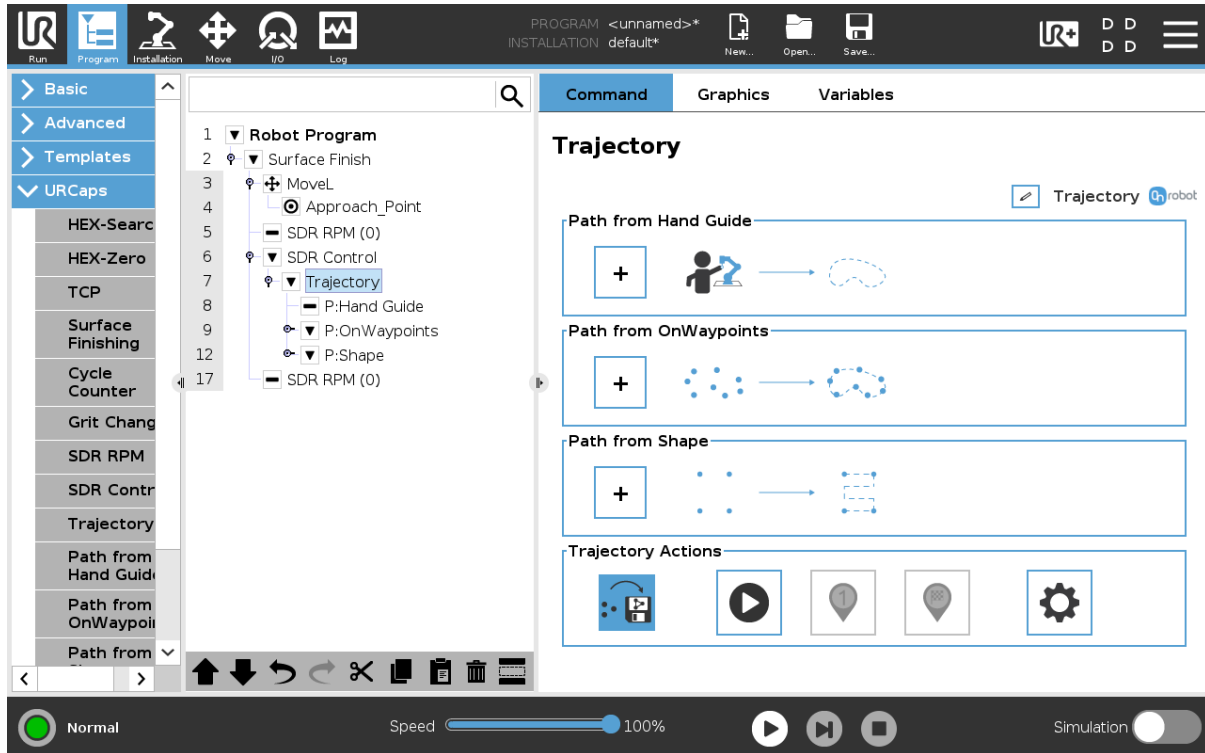
#### 6.1.2.6. Trajectory


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.



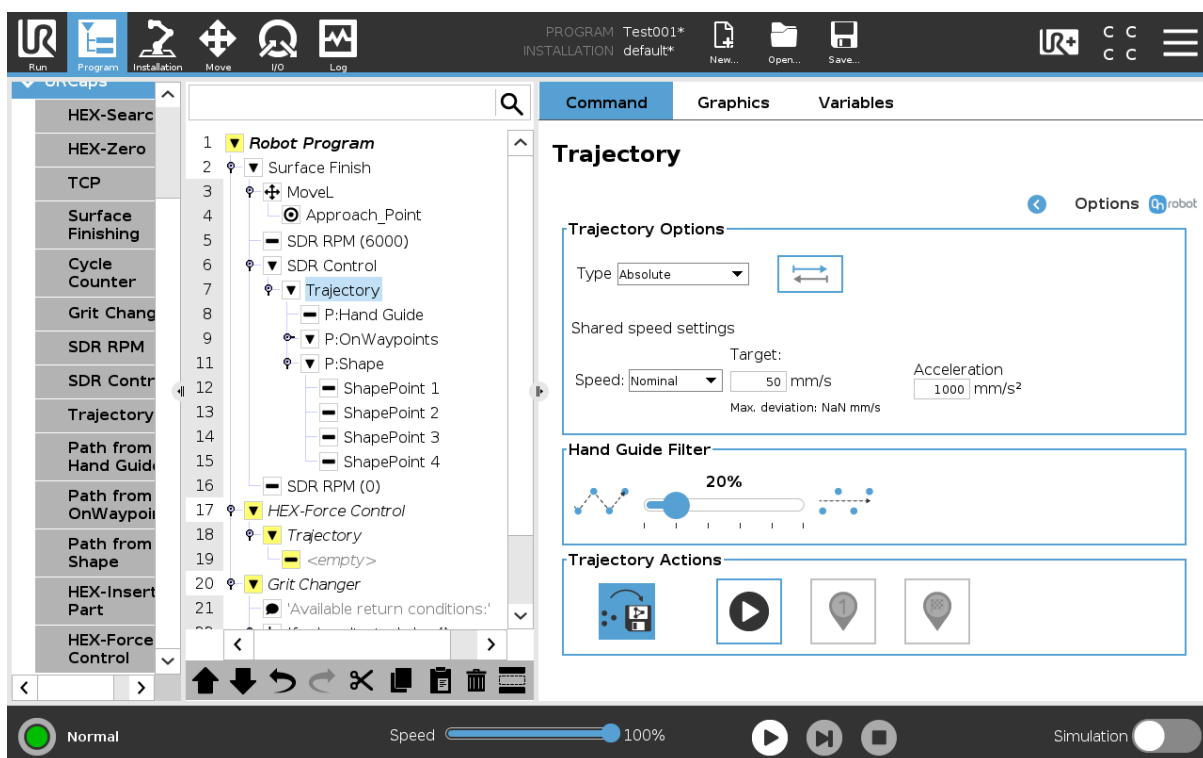
: jumps to the starting point of the trajectory.



: 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 **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.

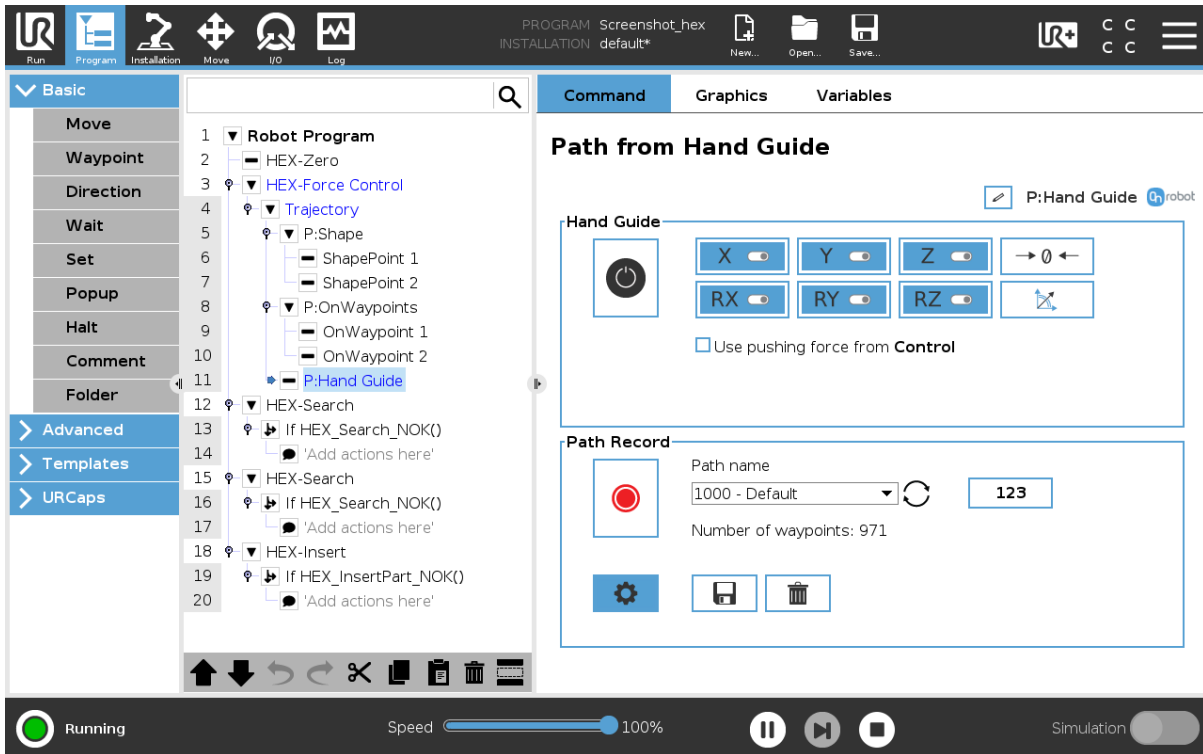


: jumps to the endpoint of the trajectory.

### 6.1.2.7. 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 [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).

## 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.





: 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.



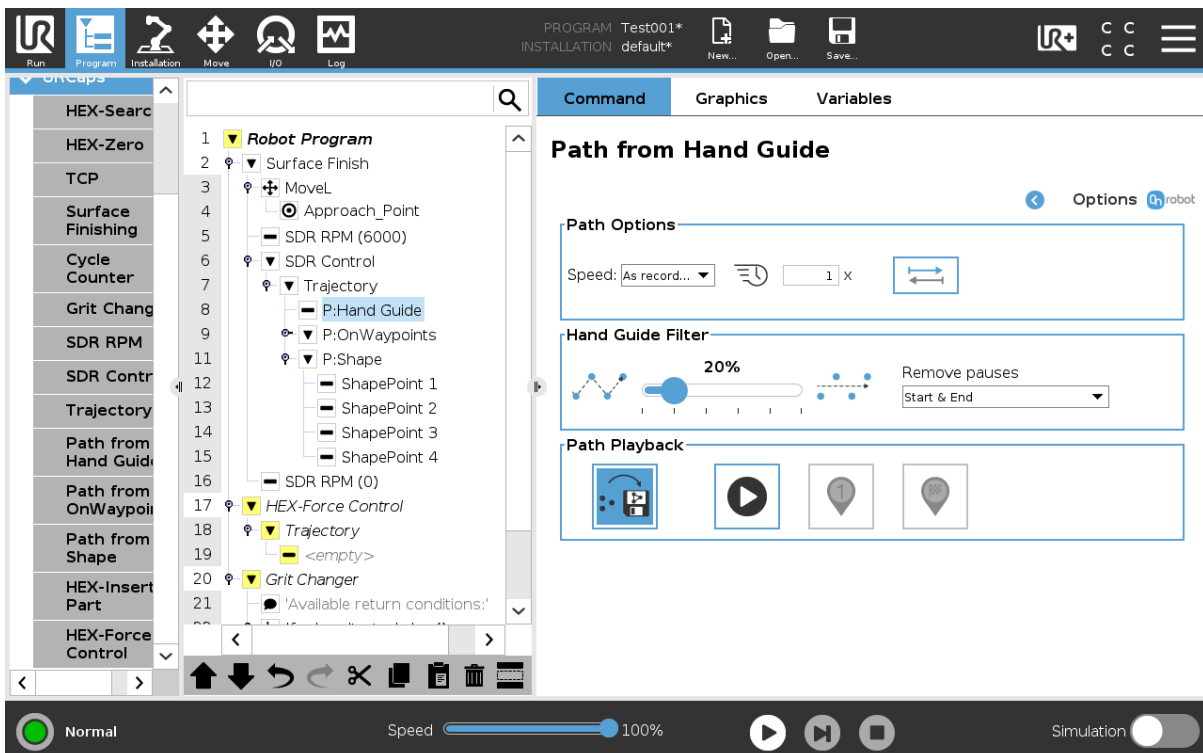
: saves the path.



: deletes the opened path.



: opens the **Path Options** page.



### Path Options

By default, the **Speed** settings are marked with gray (disabled) and got from the preset values, set on the **6.1.2.6. Trajectory** page. By selecting another speed type, the fields are enabled and can be edited.

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

- **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**.



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



: when checked, the system reverses 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.

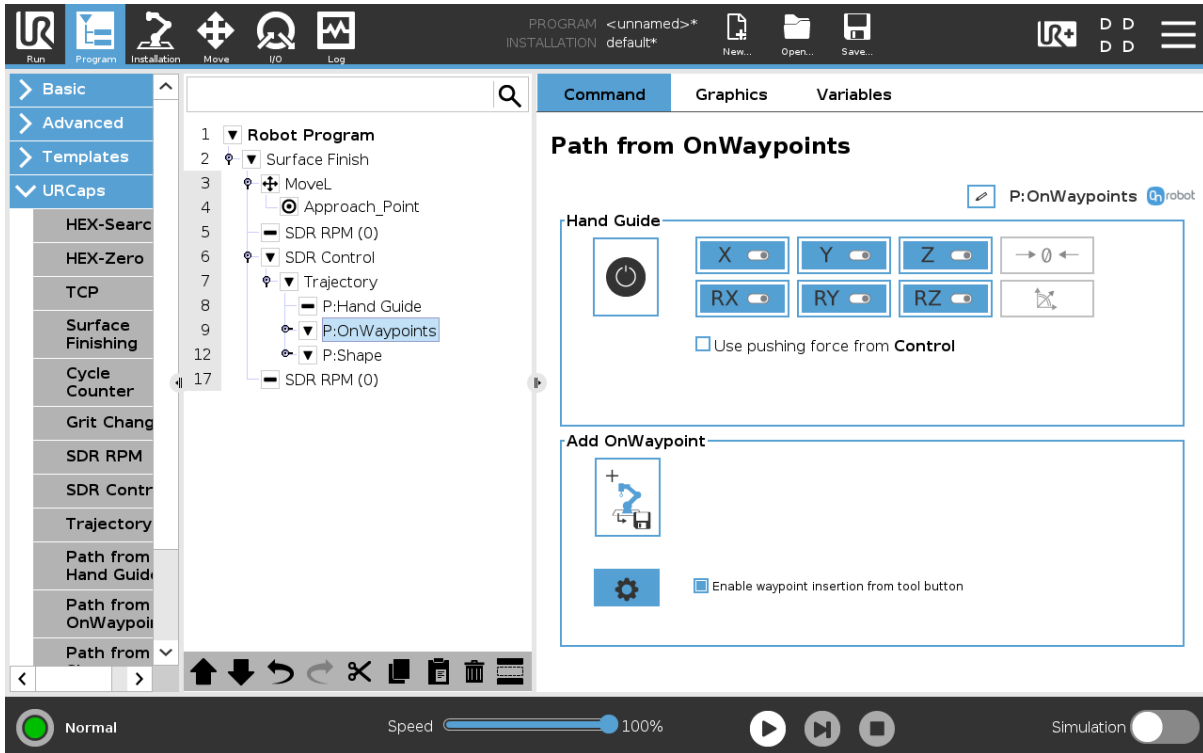



: jumps to the last element of the path.

#### 6.1.2.8. 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 [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.

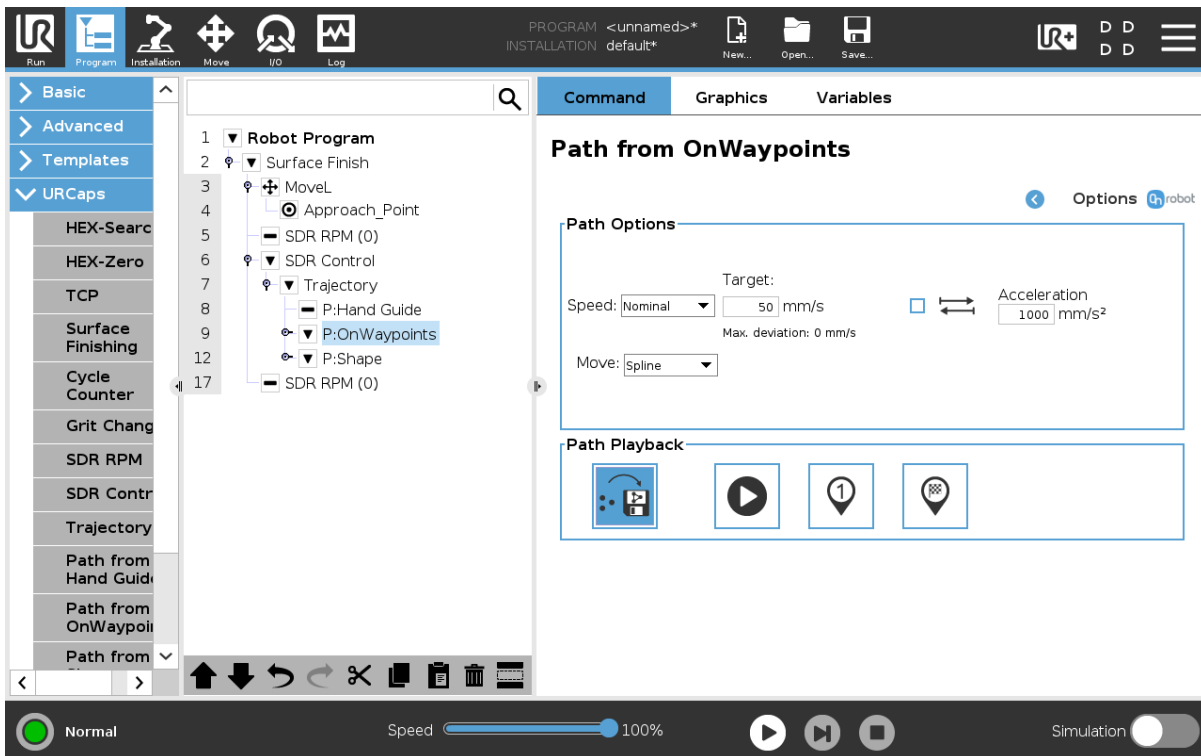


Only visible when the  button is pressed.

**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 marked with gray (disabled) and got from the preset values, set on the [6.1.2.6. Trajectory](#) page. By selecting another speed type, the fields are enabled and can be edited.

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

- **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.



: when checked, the system reverses 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.

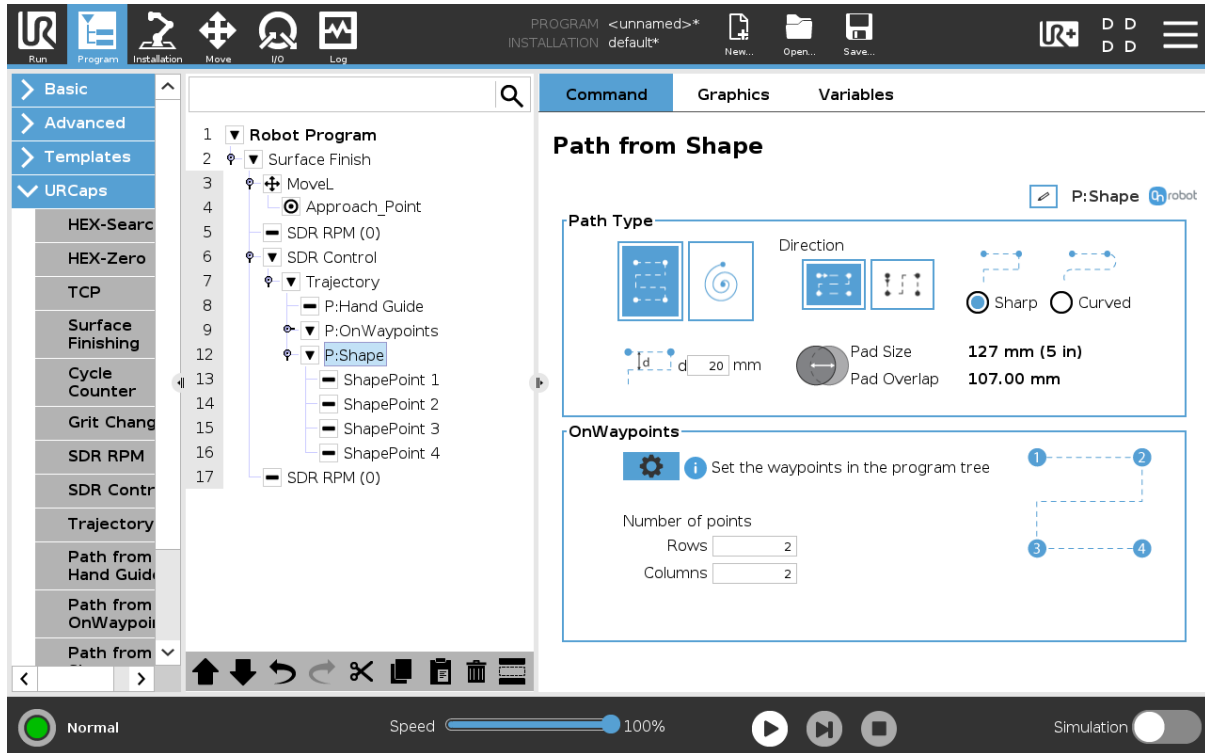


: jumps to the last element of the path.

#### 6.1.2.9. 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



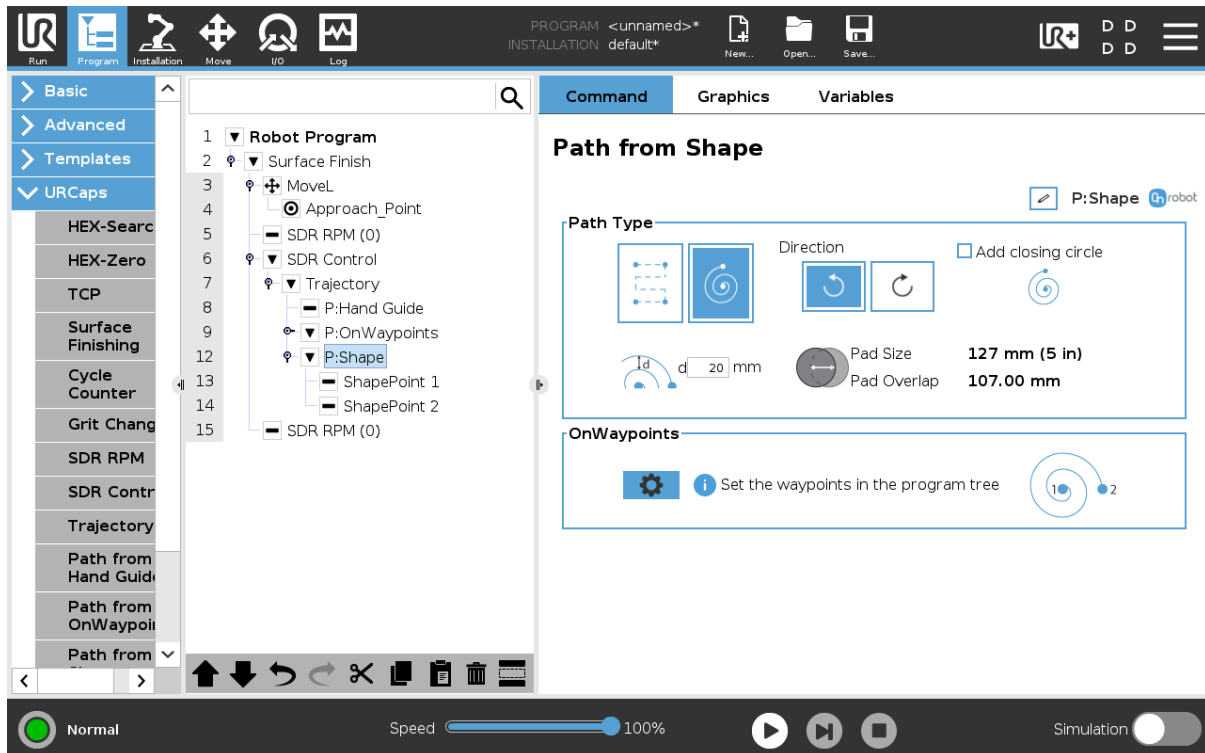
: sets the direction of the path.

**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

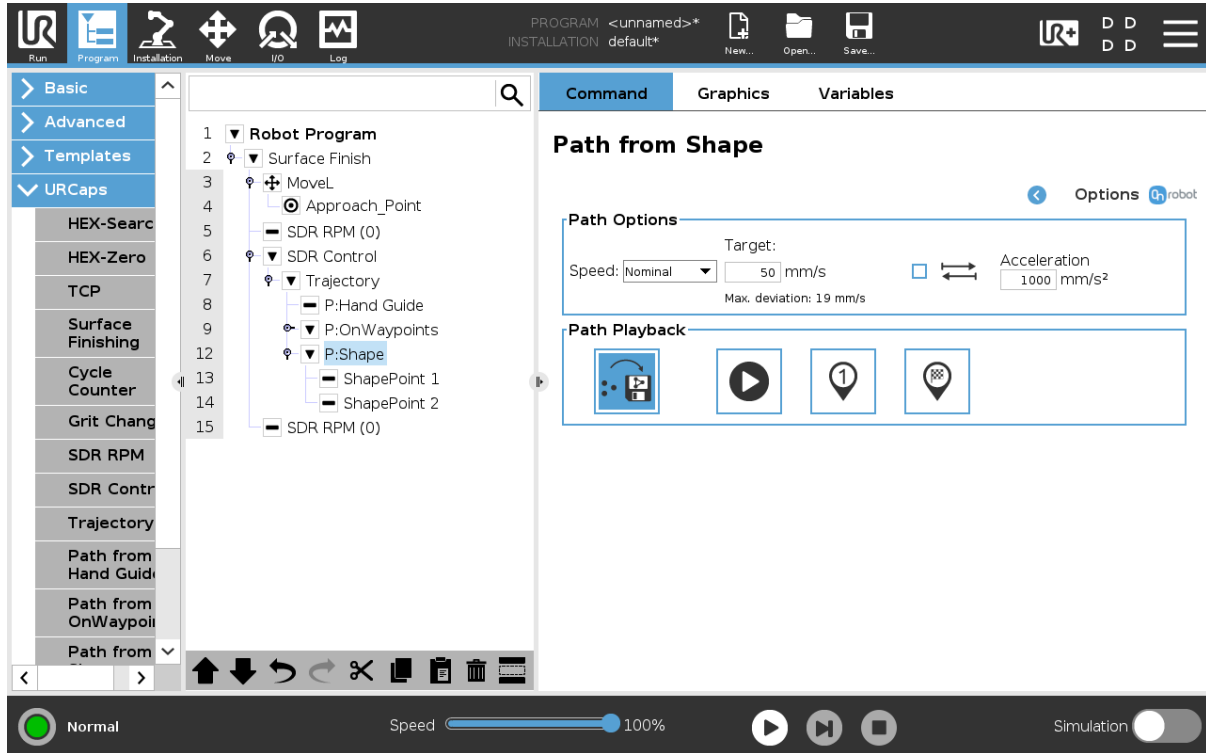
This option is only displayed when squared path is selected.



**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 marked with gray (disabled) and got from the preset values, set on the [6.1.2.6. Trajectory](#) page. By selecting another speed type, the fields are enabled and can be edited.

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

- **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.



: when checked, the system reverses 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.



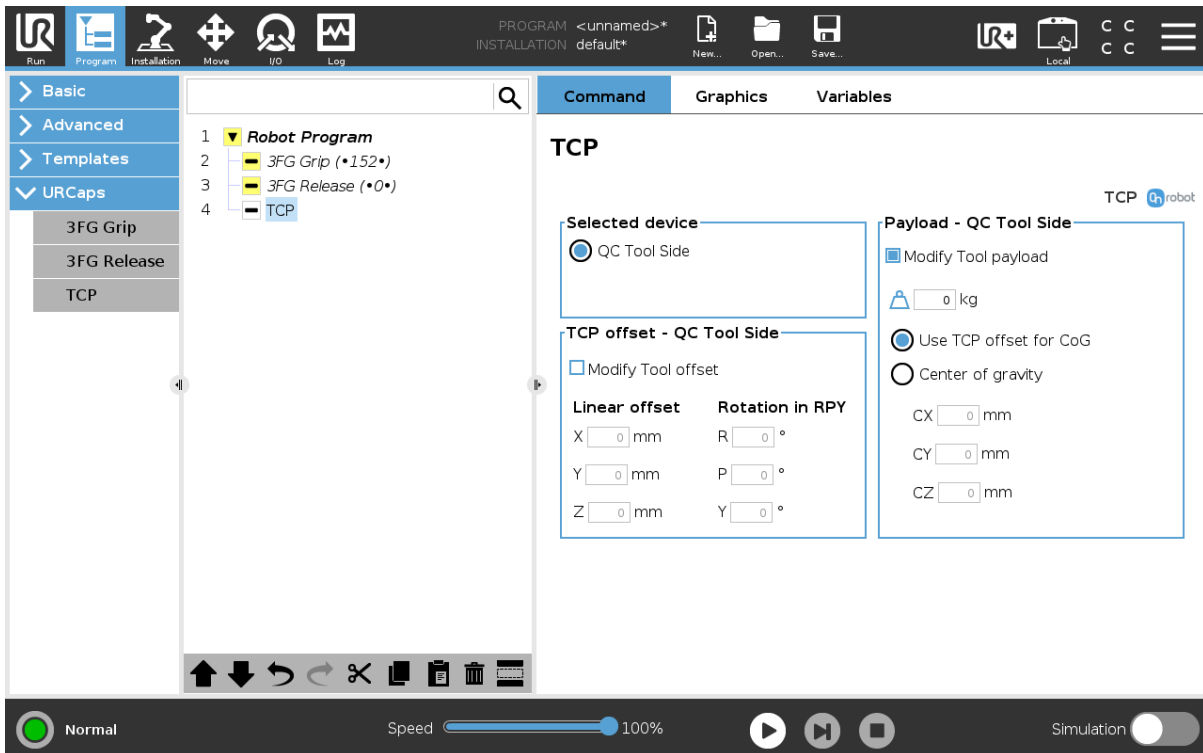
: jumps to the first element of the path.



: jumps to the last element of the path.

### 6.1.2.10. 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.

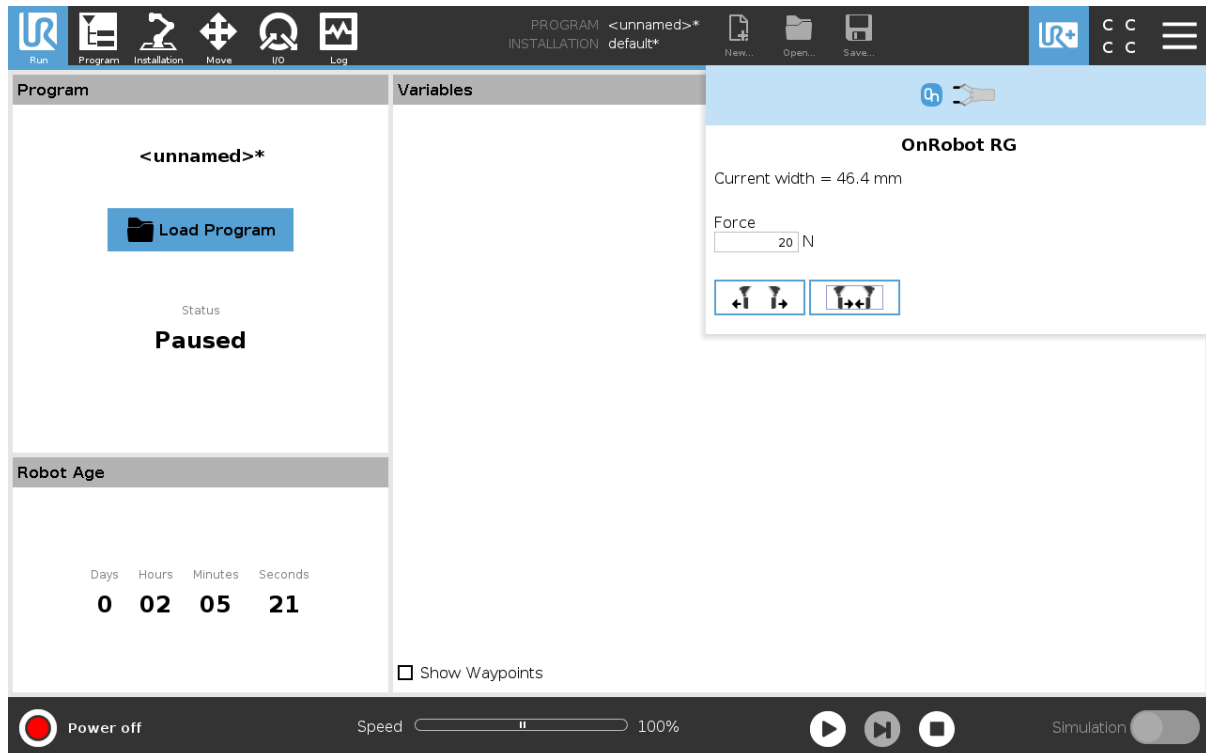
## 6.2. URCap Toolbar

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 .



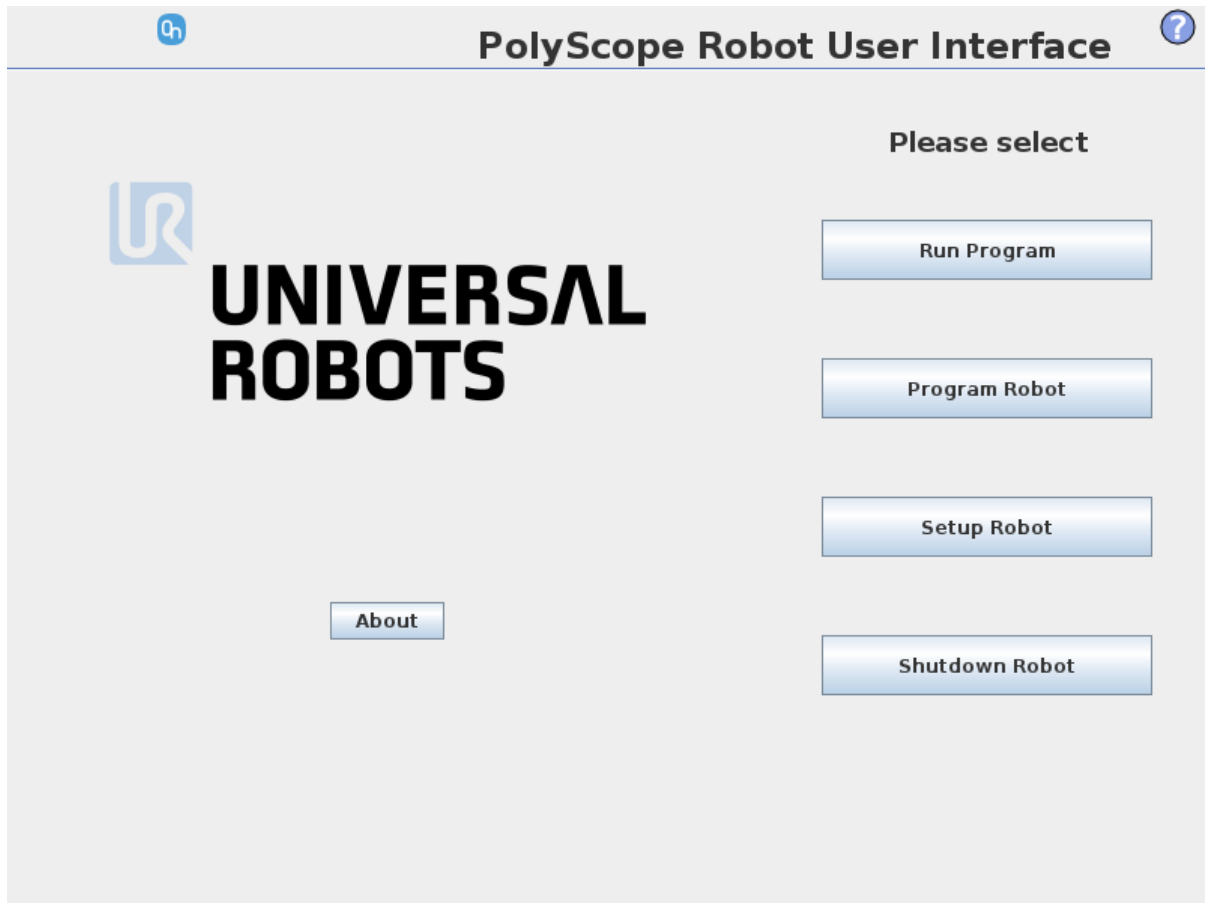
Each OnRobot End of Arm Tooling has its own functionality and that is explained in the sections below.


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.

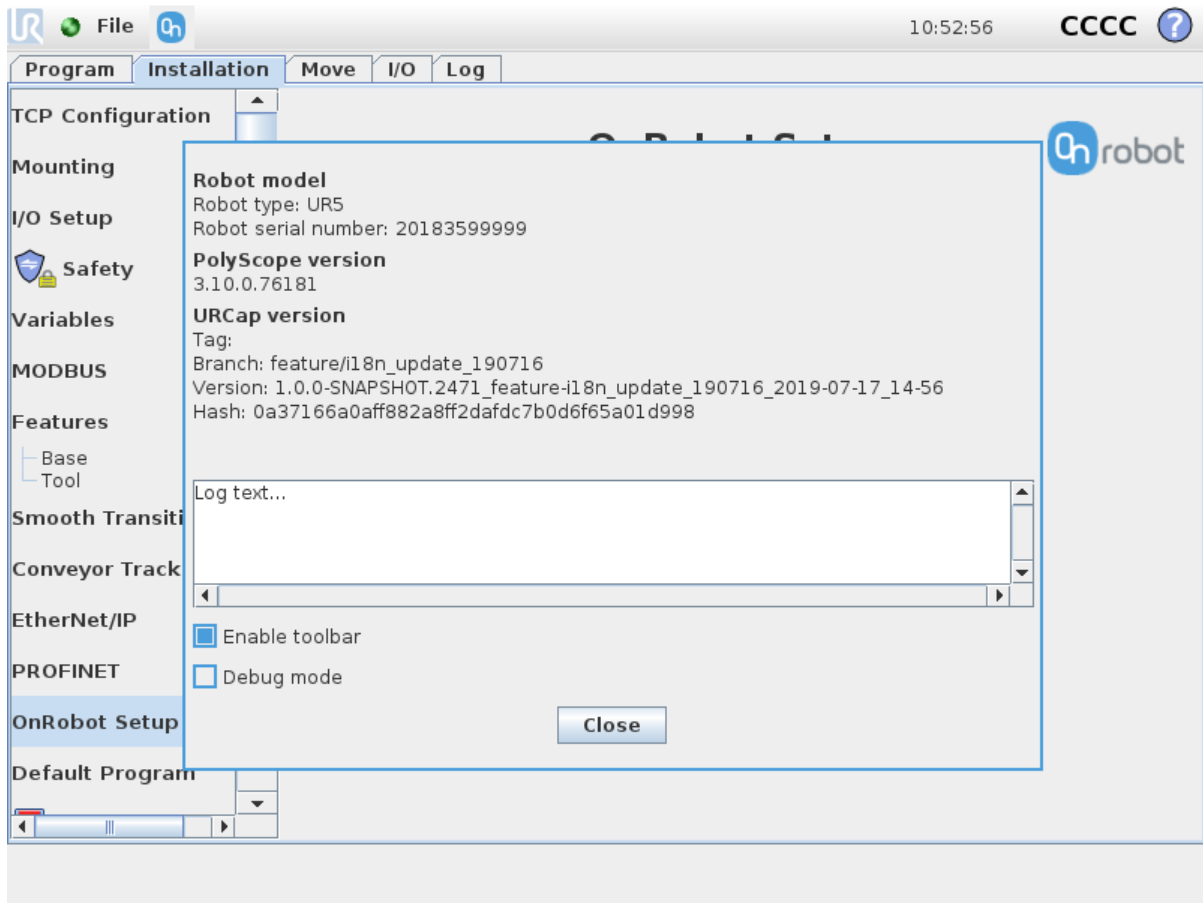


**NOTE:**

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.



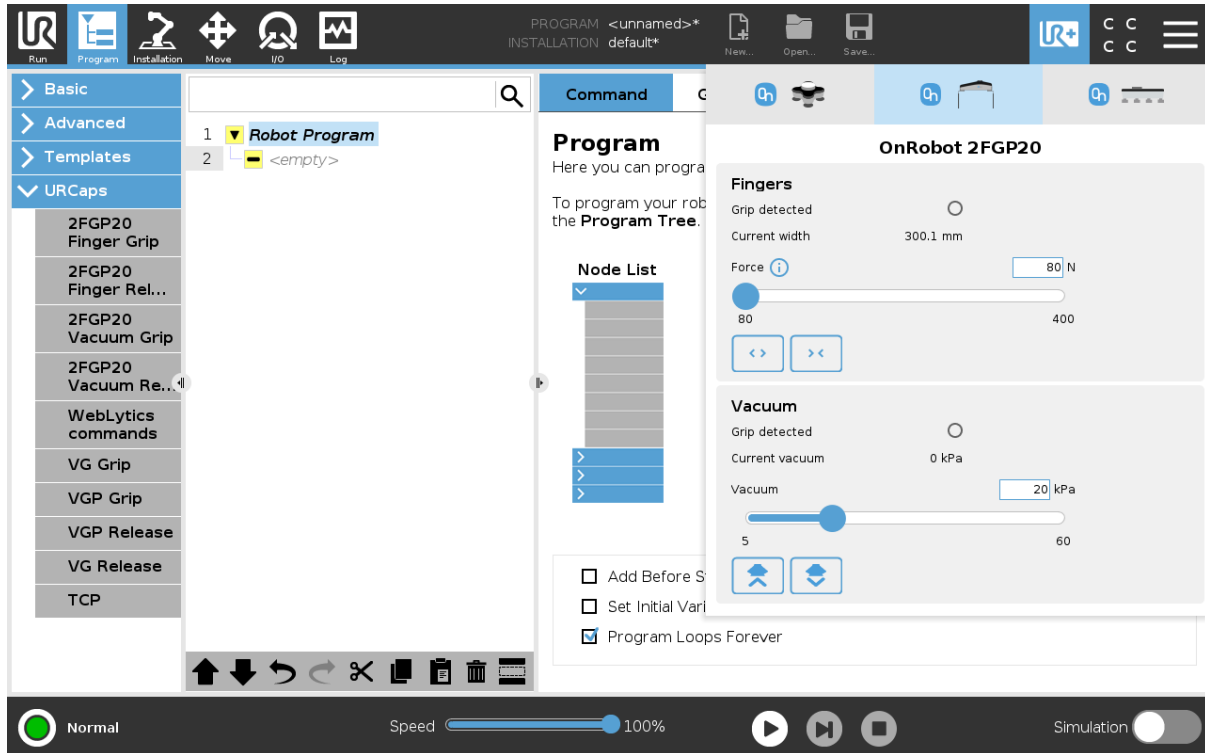
To enable/disable the toolbar, press on the OnRobot logo  on the top right corner and check/uncheck the **Enable toolbar** checkbox.



### 6.2.1. 2FGP20

To open up the toolbar, follow the instructions under [How to Access the Toolbar](#) in the [6.2. URCap Toolbar](#) section.

The toolbar for the 2FGP20 gripper is shown below.



## Fingers

**Grip detected:** The gripper detects that a workpiece is gripped with the fingers.

**Current width:** Shows the current width value.



### NOTE:

When the tool is connected to a CB3 robot via the tool connector, the precision of the displayed **Current width** value is valid up to 1 mm resolution.

**Force:** Sets the target gripping force.



Buttons to open or close the gripper.

## Vacuum

**Grip detected:** The gripper detects that a workpiece is gripped with the vacuum cups.

**Current vacuum:** Displays the current vacuum level.

**Vacuum:** Sets the target vacuum.



(Grip button): when pressed, the pump will start to generate vacuum at the selected level on the selected channel(s).

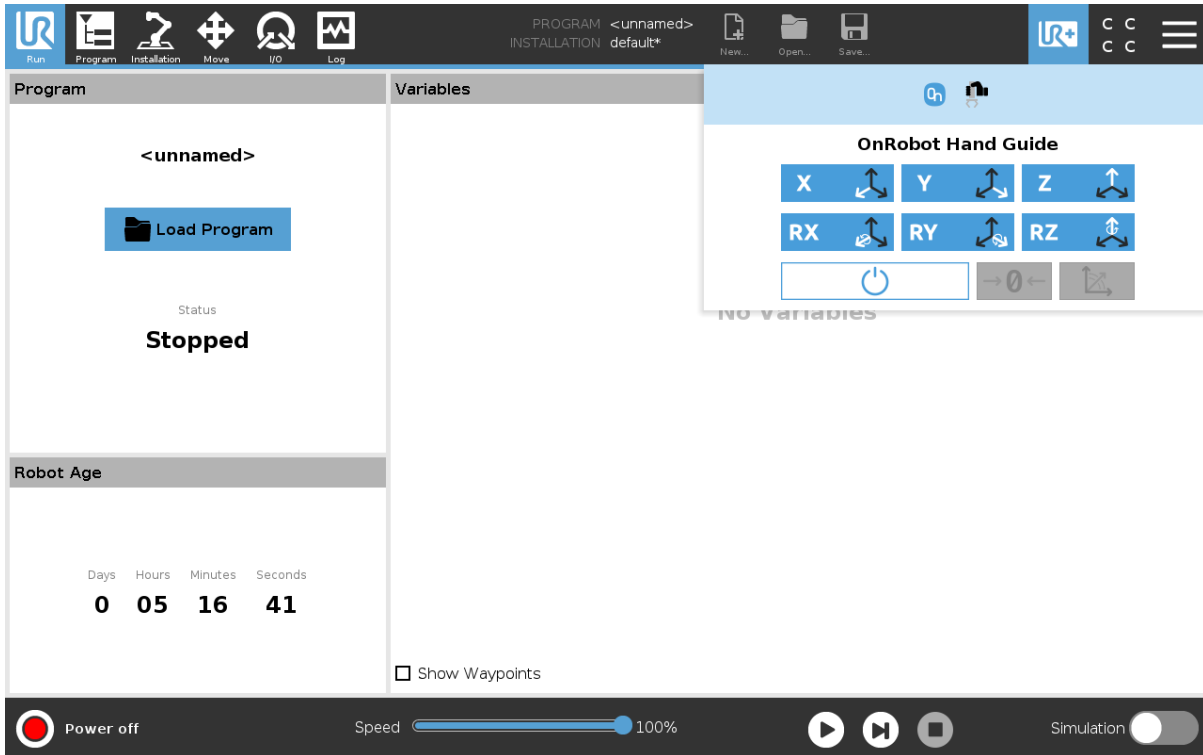





(Release button): when pressed, the test-grip will terminate and release any workpieces that may be held by the selected channel.


### 6.2.2. HEX-E/H QC

To open up the toolbar, follow the instructions under [How to Access the Toolbar](#) in the [6.2. URCap Toolbar](#) section.

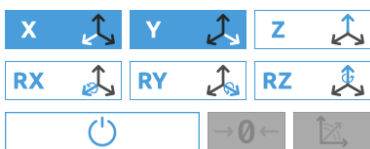
The toolbar for the HEX is called Hand Guide and it is shown below. This toolbar is used to hand guide the robot by holding the End of Arm Tooling with your hand. It is possible to lock some of the axes to reduce the degrees of freedom.



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).



## 6.3. URScript Commands

URScript commands can be used alongside other scripts.

### 6.3.1. 2FGP20

When the OnRobot URCap is enabled, the following 2FGP script functions are available:

- `fgp_grip(width, force, speed)`: Commands the 2FGP20 fingers to move to a specific width with a specific force and speed.  
`width`: The width that the gripper will open or close to. [mm]  
`force`: The force that the gripper will try to reach. [N]  
`speed`: The speed that the gripper will try to reach. [%]
- `fgp_release(width, speed)`: Commands the 2FGP20 fingers to move to a specific width with a specific speed.  
`width`: The width that the gripper will open or close to. [mm]  
`speed`: The speed that the gripper will try to reach. [%]
- `fgp_vg_grip(vacuum=20)`: Commands the 2FGP20 to turn on the vacuum to grip the workpiece.  
`vacuum`: Sets the target vacuum level. The value range is 5 – 60%.
- `fgp_vg_release()`: Commands the 2FGP20 to turn off the vacuum to release the workpiece.

## 6.4. Feedback Variables

### 6.4.1. 2FGP20

Feedback Variable	Unit	Description
<code>fgp_Busy</code>	True/False	Whether the 2FGP20 is busy or not.
<code>fgp_Grip_Detected</code>	True/False	The gripper detects that a workpiece is gripped with the fingers.
<code>fgp_vg_Release_Status</code>	Int	0 - Not released 1 - Release ok 2 - Release failed
<code>fgp_vg_Status</code>	Int	0 - Not gripped 1 - Grip detected 2 - Required grip timeout 3 - Grip lost
<code>fgp_vg_Vacuum</code>	%Vacuum	Returns the %Vacuum achieved. The value range is 0 - 60%.

Feedback Variable	Unit	Description
fgp_Width_int	[mm]	Width between the inner side of the fingers of the gripper.
on_return		The return value of the OnRobot commands.

### 6.4.2. 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 $F3D = \sqrt{F_x^2 + F_y^2 + F_z^2}$
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 $T3D = \sqrt{T_x^2 + T_y^2 + T_z^2}$
Tx	[Nm]	Torque value about the X axis
Ty	[Nm]	Torque value about the Y axis
Tz	[Nm]	Torque value about the Z axis

## 7. Additional Software Options

### 7.1. Compute Box/Eye Box

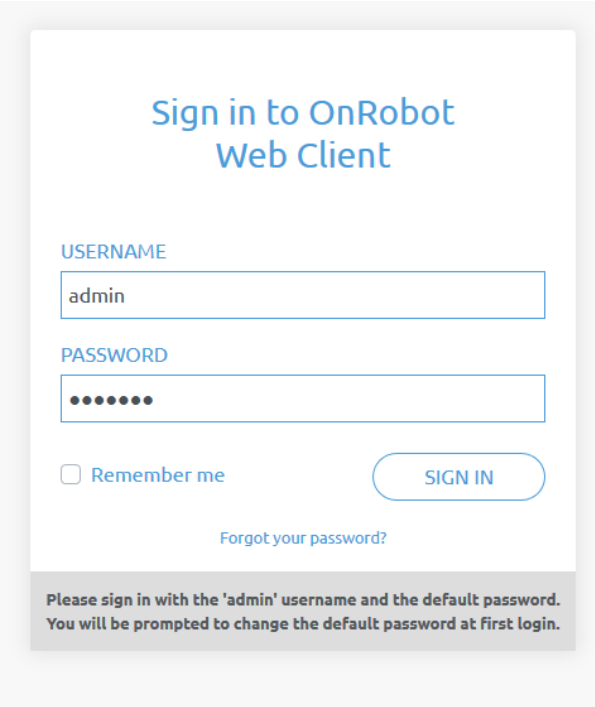
#### 7.1.1. Web Client

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 [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.
- To find the IP address of the Compute Box, open the OnRobot Discovery Tool.
- 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:



Sign in to OnRobot  
Web Client

USERNAME  
admin

PASSWORD  
●●●●●●

Remember me

[Forgot your password?](#)

Please sign in with the 'admin' username and the default password.  
You will be prompted to change the default password at first login.

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)

## Change the default administrator password

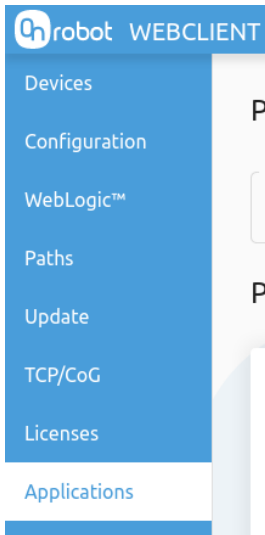
**NEW PASSWORD**

*Enter your new password here*

**CONFIRM PASSWORD**

*Re-enter your new password here*

Once signed in the following menu 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
- **Licenses** - Activate the licenses for a software product
- **Applications** - Create and manage applications

The following menu 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.

### 7.1.2. Web Client: Devices Menu



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

Please select from the detected device(s):

 <p>Compute Box</p> <p><a href="#">SELECT</a></p>	 <p>HEX-E/H QC</p> <p><a href="#">SELECT</a></p>	 <p>RG2</p> <p><a href="#">SELECT</a></p>
--	---	--

In case the following screen appears, follow the instructions below.

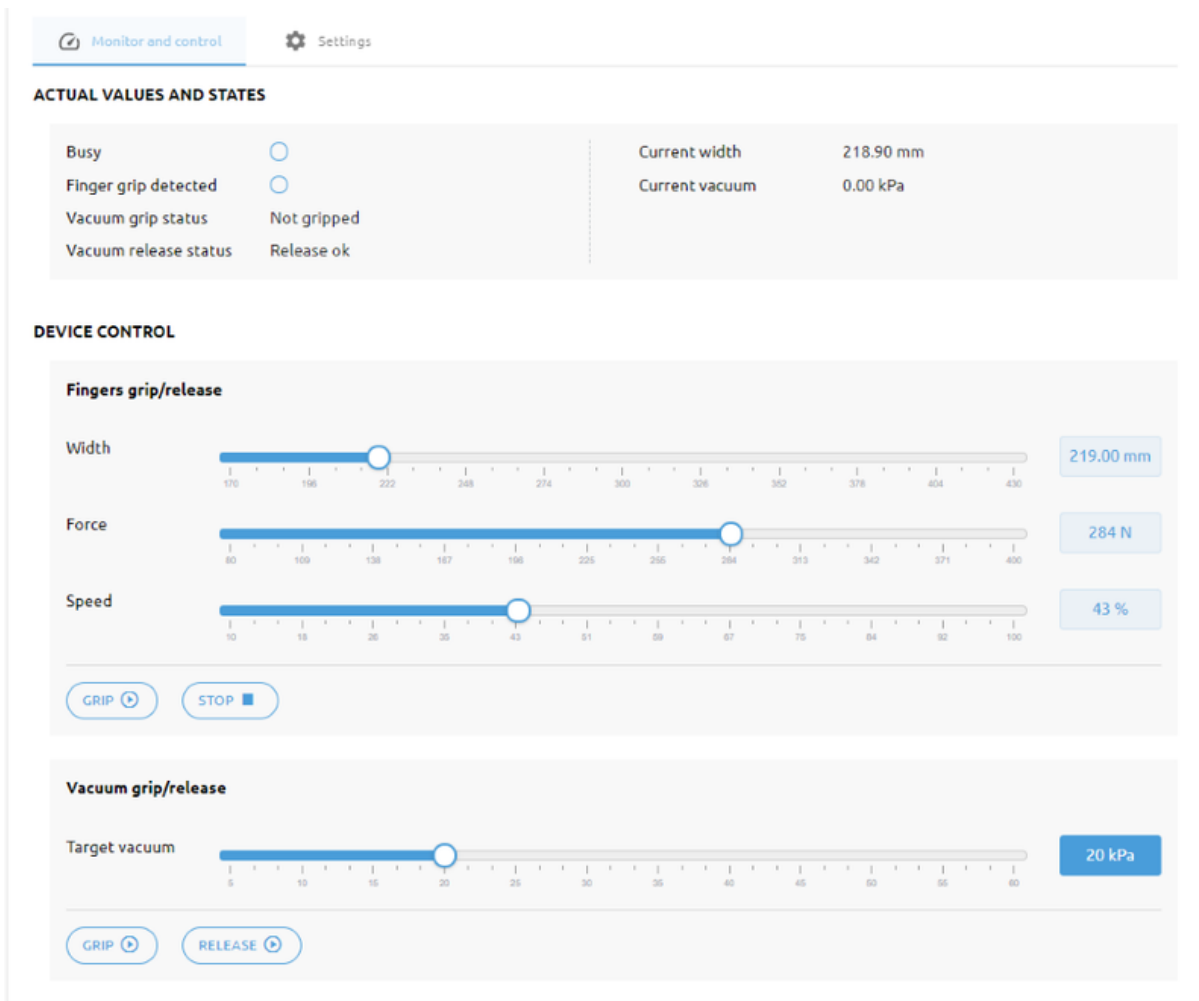
Please select from the detected device(s):

 <p>Compute Box</p> <p><a href="#">SELECT</a></p>	 <p>Tool power has automatically been turned off</p> <p><a href="#">POWER ON</a></p>
--	---

To manually turn on the HEX and the connected devices, click on the **Power on** button. For more information about automatically powering off the HEX and the connected tools, go to the [7.1.2.2. HEX-E/H QC](#) section.

### 7.1.2.1. 2FGP20

#### Monitor and control



#### Actual Values and States

This section displays information about the status of the gripper.

- **Busy:** The gripper is in motion or the gripper is generating vacuum.
- **Finger grip detected:** The gripper detects that a workpiece is gripped with the fingers.
- **Vacuum grip status:** The gripper detects that a workpiece is gripped with the vacuum cups.
- **Vacuum release status:** The gripper detects that a workpiece is released.
- **Current Width:** Shows the current width value.
- **Current vacuum:** Shows the current vacuum level.

#### Device control

Control the gripper as described below.

- **Fingers grip/release**  
To grip on a part, set the **Width**, the **Force** and the **Speed** sliders.  
Click on **Grip** to execute the command with the set values.

Click on **Stop** to stop the command.

- **Vacuum grip/release**

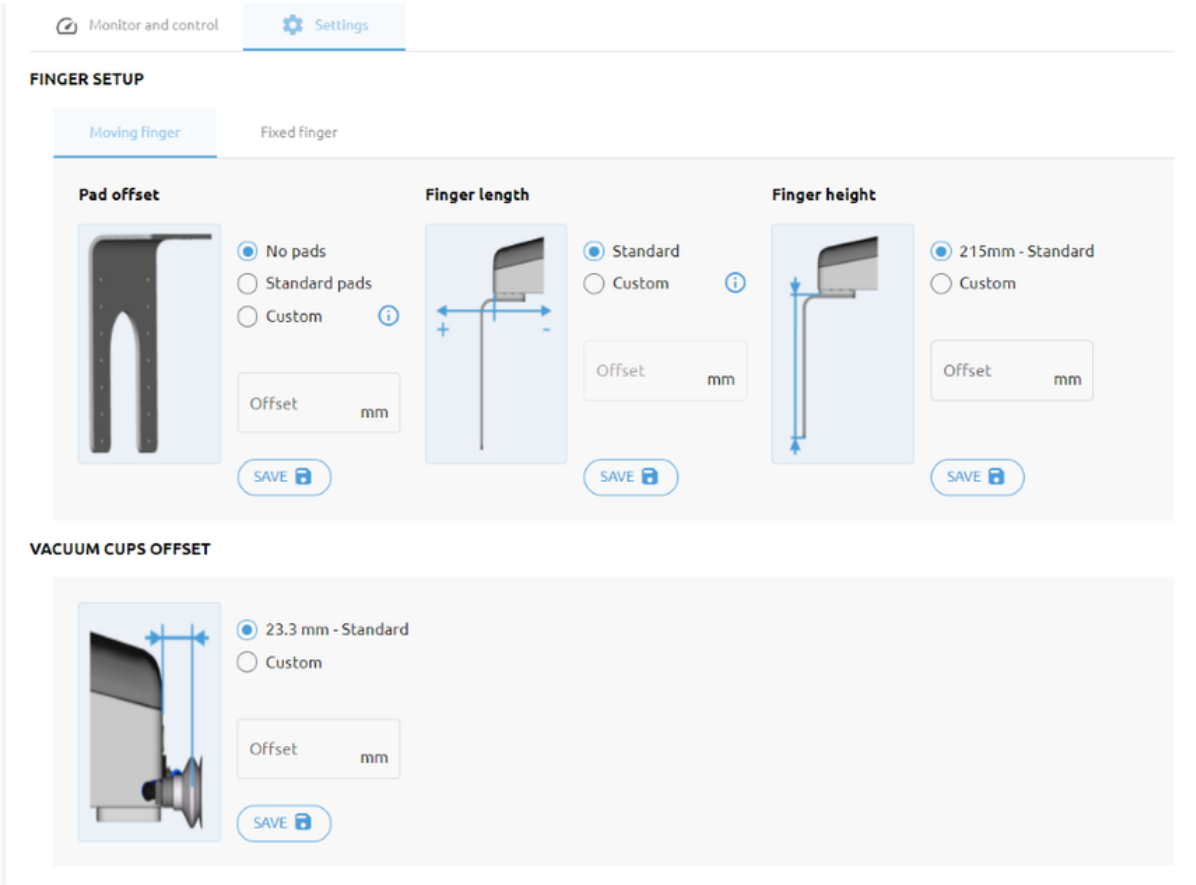
Use the slider to set the **Target vacuum** level.

Click on **Grip** to execute the command with the set values.

Click on **Release** to release the vacuum.

The default settings can be changed on the **Settings** tab.

## Settings



The screenshot shows the 'Settings' tab in the software interface. It is divided into two main sections: 'FINGER SETUP' and 'VACUUM CUPS OFFSET'.

**FINGER SETUP** is further divided into 'Moving Finger' and 'Fixed Finger' sub-sections. The 'Moving Finger' sub-section contains three configuration panels:

- Pad offset:** Includes a diagram of a finger with a pad, radio buttons for 'No pads', 'Standard pads', and 'Custom', and an 'Offset mm' input field with a 'SAVE' button.
- Finger length:** Includes a diagram of a finger with a length indicator, radio buttons for 'Standard' and 'Custom', and an 'Offset mm' input field with a 'SAVE' button.
- Finger height:** Includes a diagram of a finger with a height indicator, radio buttons for '215mm - Standard' and 'Custom', and an 'Offset mm' input field with a 'SAVE' button.

**VACUUM CUPS OFFSET** includes a diagram of a vacuum cup with an offset indicator, radio buttons for '23.3 mm - Standard' and 'Custom', and an 'Offset mm' input field with a 'SAVE' button.

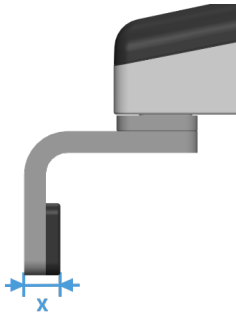
## Finger setup

### Pad offset

Select one of the pad offsets:

- No pads
- Standard pads
- Custom pads

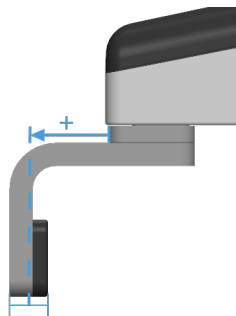
To input the right custom pad offset value, measure the width of the finger and the pad together and divide that value by two. Custom pad offset value =  $x/2$ .



**Finger length**

Select one of the finger lengths:

- Standard finger
- Custom finger  
 To input the right custom finger length value, measure the distance from the outer part of the finger base to the pad offset position (middle between the outer part of the finger and the outer part of the pad).



**Finger height**

Select one of the finger heights:

- Standard finger
- Custom finger  
 Add the custom finger height value to the input field.

**Vacuum cups offset**

Select one of the vacuum cup offsets:

- Standard vacuum cups  
 Shows the value when the OnRobot vacuum cups and brackets are used.
- Custom vacuum cups  
 Add the custom vacuum cups offset value to the input field.



**NOTE:**

The changes in the 2FGP20 Setup settings are saved to the gripper and not to the installation file. Therefore, if the gripper is moved to another robot, the settings will remain the same. However, if another gripper is used in the same robot, the settings might need to be reset again.



### 7.1.2.2. HEX-E/H QC

#### Monitor and control

HEX-E/H QC

This page allows the device to be monitored and controlled. By navigating to the Device info tab the device status is shown. (Some functions might not be accessible without Admin permission.)

Monitor and control    Device info    Auto-calibration

Force/Torque values

HEXHC042	
Fx (N)	-0.05
Fy (N)	0.13
Fz (N)	0.01
Tx (Nm)	0.029
Ty (Nm)	-0.017
Tz (Nm)	-0.021

ZERO

**CAUTION**

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 connected tools as well. The HEX and the tools are always turned back on automatically. Check the manual for more details.

Power off HEX

Inactive timer (hours)   
 1

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:

- HEX sensor overload. This could be due to overload or Auto-calibration is needed. See User Manual for full details. Auto-calibration or HEX sensor restart is required to close this message. If message persists after Auto-calibration, please see User Manual under Auto-calibration for details.
- Error code: 4096

CLOSE

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

- HEX sensor overload. Eliminate cause of overload, if already done, use Auto-Calibration function. Please see User Manual under Auto-calibration for details.
- Error code: 128

CLOSE

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:

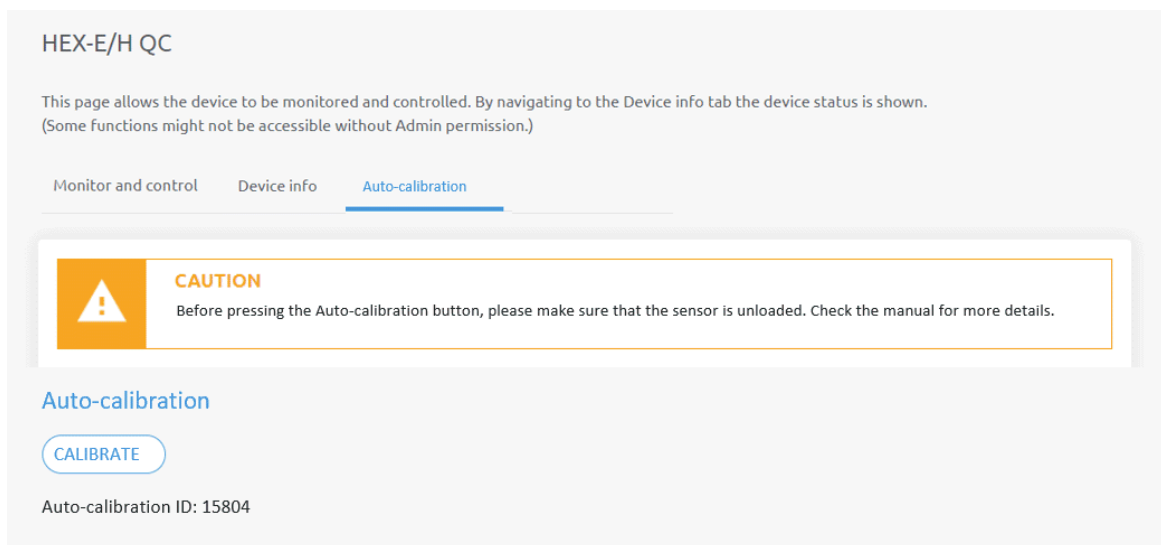
1. Stop the robot.



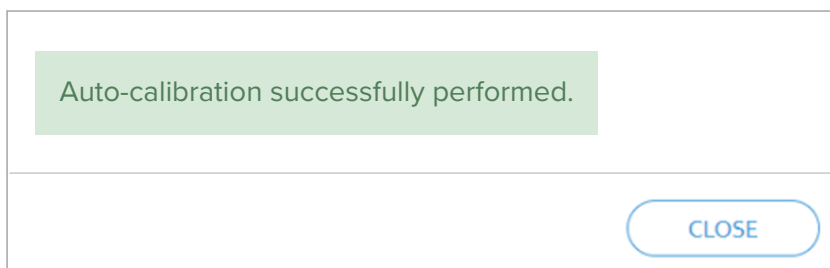
**NOTE:**

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.

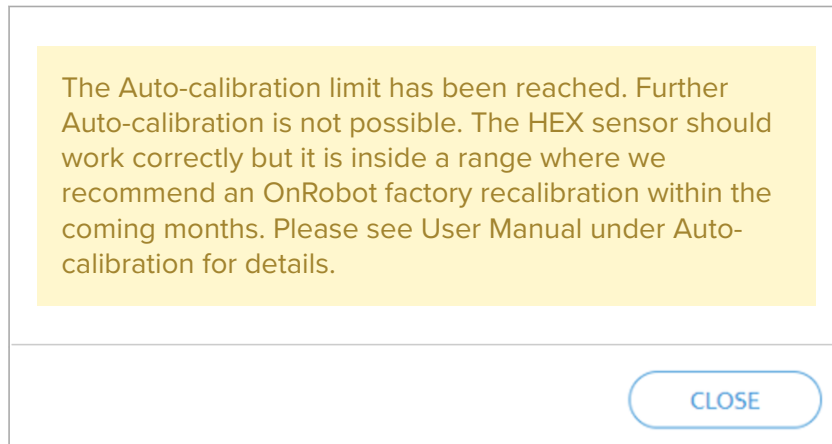
2. The sensor's tool side should face upward (robot side facing downward) to get the most accurate result.
3. Note how the tool(s) are connected to the sensor. After the calibration, the tools need to be re-attached to the sensor the same way to prevent any disturbance in your application (for example 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. Web Client: Configuration Menu

**Configuration**

This page allows the configuration of the Compute Box / Eye Box.

**CAUTION**  
Incorrect settings may cause the device to lose network connectivity.



1. Digital input mode: NPN
2. Digital output mode: NPN
3. Compute Box / Eye Box IP setting is configured on this page.
4. DHCP server enabled: Compute Box / Eye Box tries to assign IP to the robot.

**NETWORK SETTINGS**

MAC address	B8:27:EB:0E:C9:A3
Network mode	Default Static IP
IP address	192.168.1.1
Subnet mask	255.255.255.0
Gateway	192.168.1.1

[SAVE](#)

**ETHERNET/IP SCANNER SETTINGS**

IP address to connect to	_____
Origin-to-target instance id	1
Target-to-origin instance id	1
Configuration instance id	0
Requested packet interval (ms)	8

[SAVE](#)

**COMPUTE BOX / EYE BOX SETTINGS**

Display name \_\_\_\_\_ [✎](#)

[SAVE](#)

Clock delay 0 sec ✔

[SYNCHRONIZE CLOCK](#)

**ROBOT SETTINGS**

Robot type	None
Robot ID	_____
Robot IP address	_____

[SAVE](#)

**WEBLYTICS SETTINGS**

WebLytics support	Disabled, discoverable
WebLytics IP address	_____
Connected to server	Disconnected

[SAVE](#)

**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.

**7.1.4. 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.

Manage paths

This page allows uploading and downloading path files.

IMPORT You can import a path file from your computer.

PATH NAME	FILE NAME	VERSION	SIZE (IN BYTES)	POINTS	
Test path	1000	2	1,145	40	✎ ↓ 🗑
2973	2973	1	2,728	74	⇄ ↓ 🗑

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.

### 7.1.5. Web Client: Update Menu

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

## Update

This page allows updating the software and firmware.

**CAUTION**

Installing updates may take several minutes to complete. Please do not power off or unplug your Compute Box or any of the connected devices during the update process.

**SOFTWARE**

BROWSE

[Click here to download the result of the last update.](#)

**FIRMWARE**

COMPONENTS	CURRENT VERSION	REQUIRED VERSION	
<b>Compute Box (CBOX_RPT)</b>			
Firmware	150	150	✓
<b>HEX-E/H QC (HEXHC001)</b>			
Firmware	208	208	✓

UPDATE

✓ Up-to-date
↻ Update required
✗ Downgrade not supported



**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.

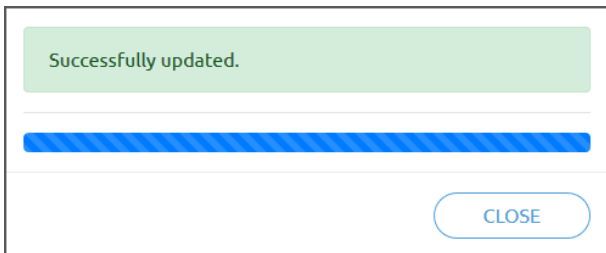
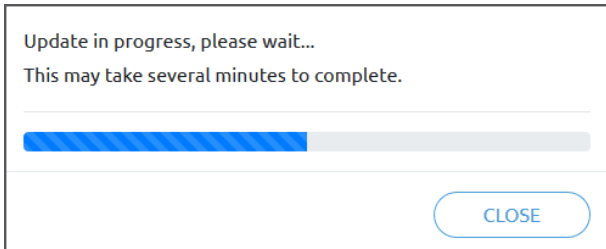
If the update is finished and was successful, the message below is shown.

**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.

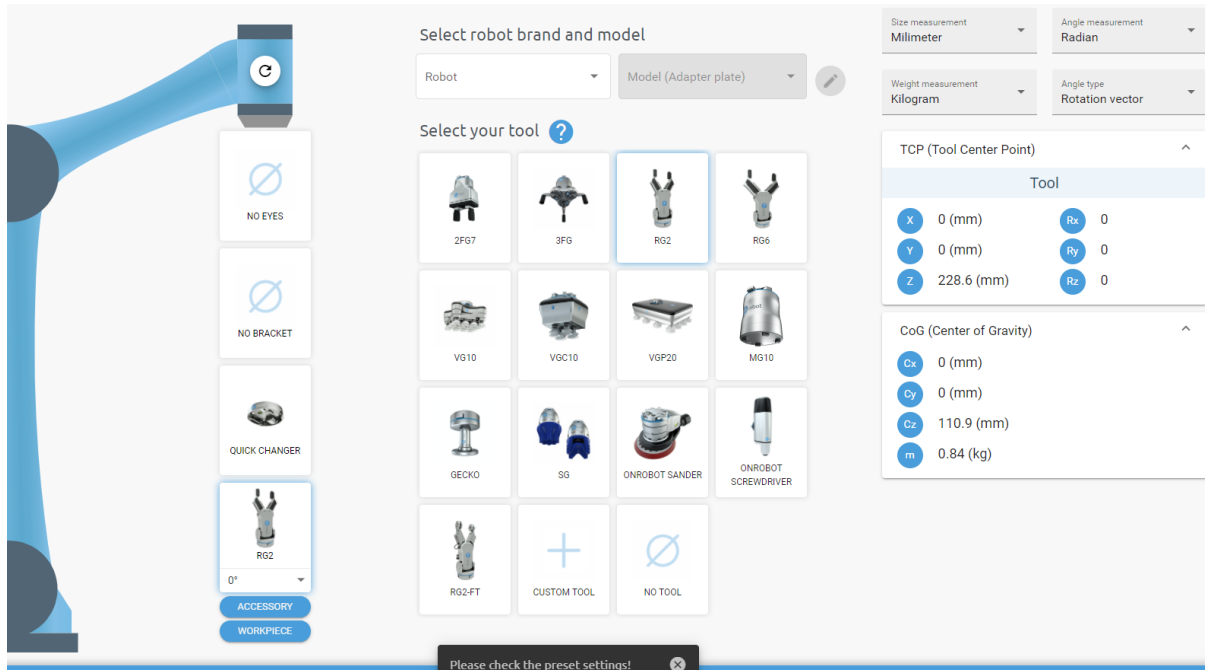
If the update is finished and was successful, the message below is shown.



**7.1.6. 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.

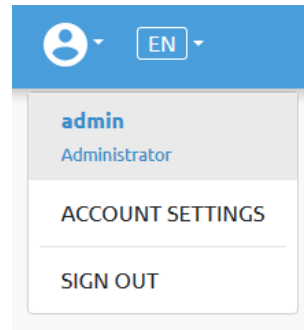
6. Click on **Accessory** to select any OnRobot accessories.
7. Click on **Workpiece** to enter the workpiece weight. Then the calculator calculates the resulting payload mass considering the gripper, the mounting, and the workpiece mass.
8. Choose the unit of measure for the values you want to enter 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.

### 7.1.7. Web Client: Account Settings

This menu can be used to:

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

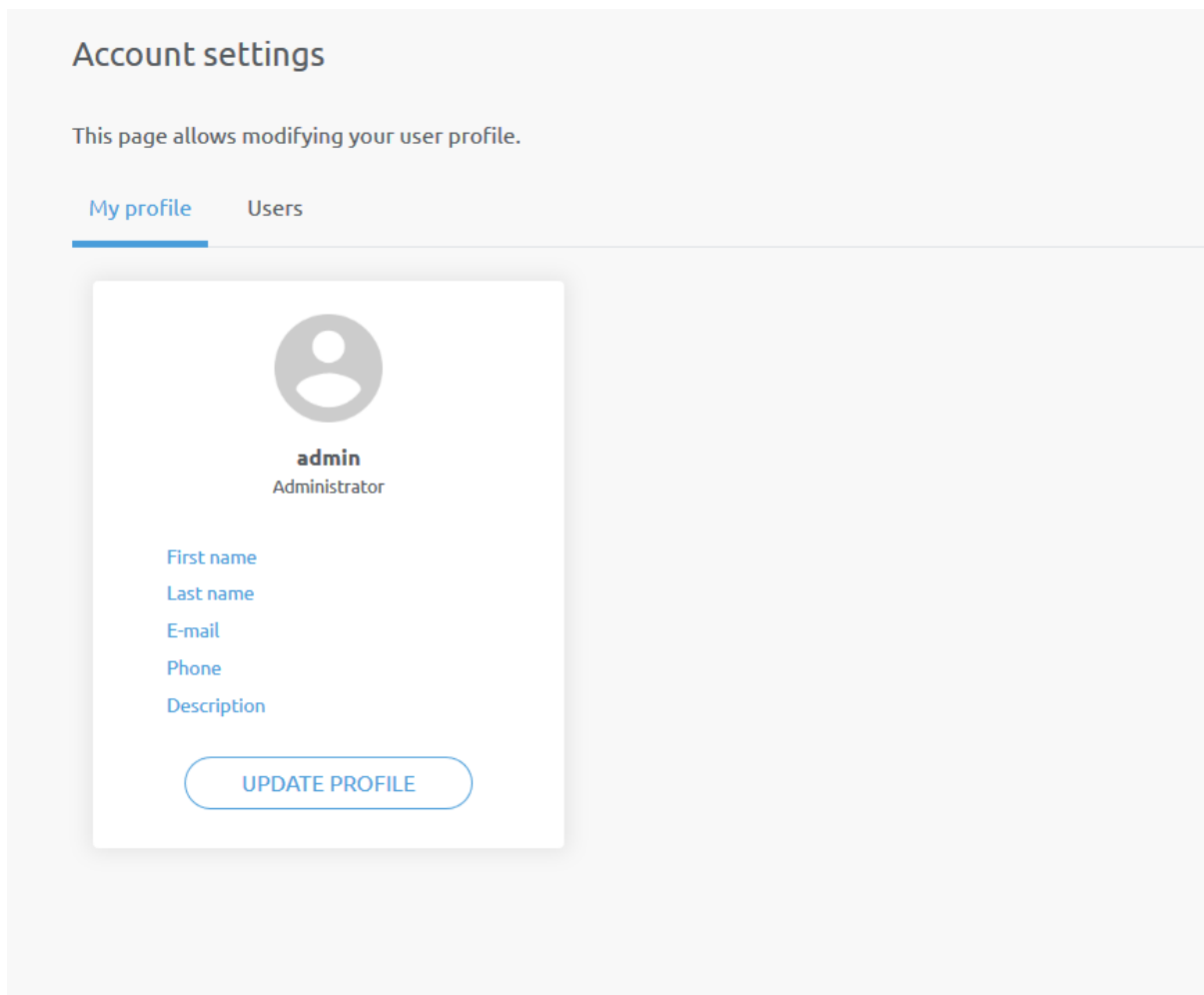


#### Account settings:

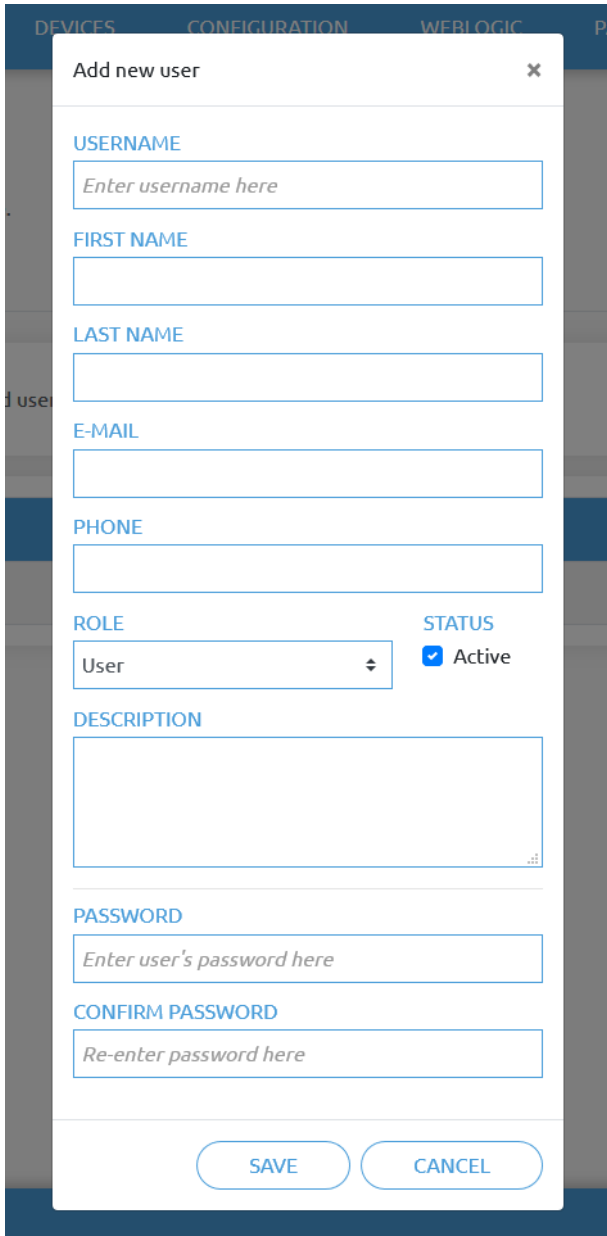
This page has two tabs:

- **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:



**Add new user** [X]

**USERNAME**  
Enter username here

**FIRST NAME**

**LAST NAME**

**E-MAIL**

**PHONE**

**ROLE** [User] [v]      **STATUS**  Active

**DESCRIPTION**

**PASSWORD**  
Enter user's password here


**CONFIRM PASSWORD**  
Re-enter password here

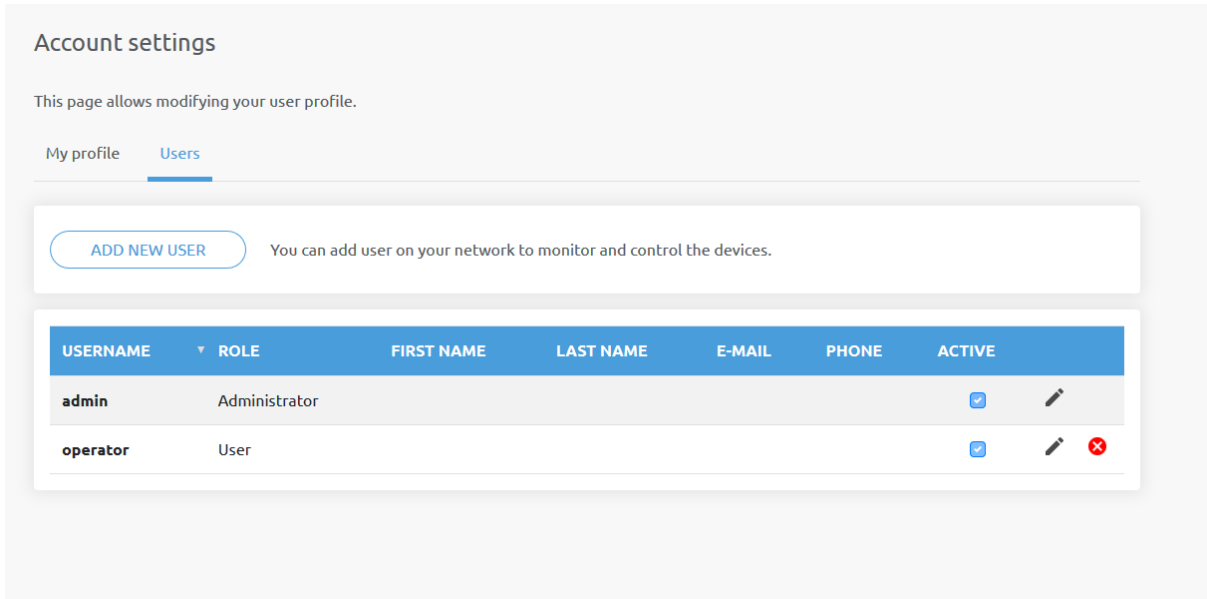
[SAVE] [CANCEL]

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. 2FGP20

Finger Grip Properties		Minimum	Typical	Maximum	Unit
Payload		- -	- -	20 44.1	[kg] [lb]
Total stroke		- -	260 10.24		[mm] [inch]
Grip width range <sup>(1)</sup>		170 6.69	-	430 16.93	[mm] [inch]
Gripping repeatability		- -	+/- 0.5 +/- 0.0197	- -	[mm] [inch]
Gripping force <sup>(2)</sup>		80	-	400	[N]
Gripping force tolerance		-	-	+/- 30	[N]
Gripping speed <sup>(3)</sup>		16	-	180	[mm/s]
Gripping time (including brake activation)		-	600	-	[ms]
Noise level <sup>(4)</sup>	Finger gripper	-	-	58 63	[dB(A)] <sub>Leq</sub> [dB(A)] <sub>Max</sub>
	Vacuum gripper	-	-	72 74	[dB(A)] <sub>Leq</sub> [dB(A)] <sub>Max</sub>
Hold workpiece in case of power loss?		Yes			
Motor		Integrated, electric BLDC			

<sup>(1)</sup> When pads are mounted, the minimum value is 158 mm and the maximum value is 418 mm.

<sup>(2)</sup> See [Force vs Current Graph](#)

<sup>(3)</sup> At 6 mm stroke and 150 N. The typical value is 900 ms at 20 mm and 200 N.

<sup>(4)</sup> For more information, see the [Noise level](#) section.

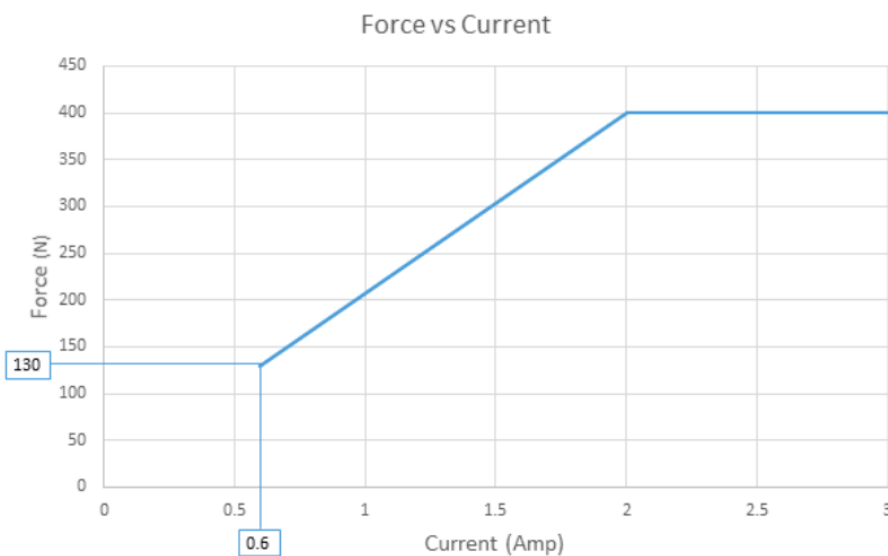
Vacuum grip properties	Minimum	Typical	Maximum	Unit
Vacuum	5	-	60	[%Vacuum]
	- 0.05	-	- 0.607	[Bar]
	1.5	-	17.95	[inHg]
Air flow	0		12	[L/min]
Payload (with delivered attachments)		-	2.5	[kg]
		-	5.51	[lb]
Vacuum cups	1		4	[pcs]

Vacuum grip properties	Minimum	Typical	Maximum	Unit
Gripping time (measured with vacuum target 40 %)		0.25		[s]
Release time		0.4		[s]
Vacuum pump	Integrated, electric BLDC			
Dust filters	Integrated 50 µm, field replaceable			

General properties	Minimum	Typical	Maximum	Unit
Storage temperature	0	-	60	[°C]
	32	-	140	[°F]
IP Classification	54			
Dimensions [L x W x D]	400 x 121.6 x 188			[mm]
	15.75 x 4.79 x 7.4			[inch]
Weight - Base unit without fingers or cups	3.7			[kg]
	8.16			[lb]
Weight - With fingers, pads on one finger, bracket for cups and cups	5.2			[kg]
	11.46			[lb]

Operating Conditions	Minimum	Typical	Maximum	Unit
Power supply	20	24	25	[V]
Current consumption	-	-	2000	[mA]
Operation temperature	5	-	50	[°C]
	41	-	122	[°F]
Relative humidity (non-condensing)	0	-	95	[%]

**Force vs Current Graph**



## Noise Level

The noise level of the 2FGP20 depends on whether the finger or vacuum gripping part is used. Vacuum gripping noise depends on the set vacuum level and whether an object is picked up or not. Higher speed and stroke increase the noise. The noise level also depends on the surroundings and other equipment.

To measure the 2FGP20's noise level, a test has been carried out by an external company.

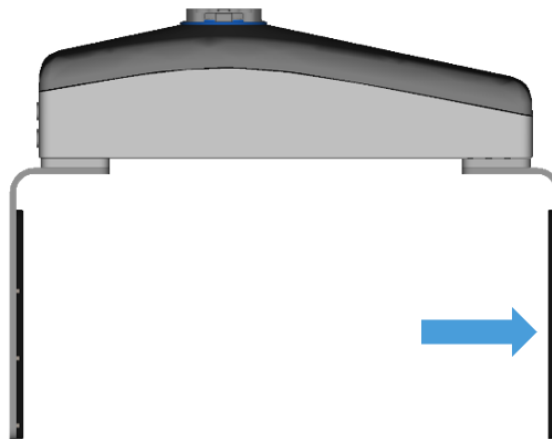
The test setup was the following:

- The test took place in a normal indoor production area.
- The finger gripping test ran 4 cycles full stroke, 100 % speed and with no pause in between the cycles.
- The vacuum gripping test was made with fully activated pump and with no pause.
- The noise measurement equipment was located in 1 m distance away from the 2FGP20.

The test concludes that the average measured noise level was below 58 dB(A)<sub>Leq</sub> for the finger gripper and 72 dB(A)<sub>Leq</sub> for the vacuum. The maximum noise level was measured below 63 dB(A)<sub>Max</sub> for the finger gripper and 74 dB(A)<sub>Max</sub> for the vacuum, which is below the maximum allowed noise level of (80 dB(A)). The 2FGP20 will not run continuously in an application which means that the average noise level will decrease significantly.

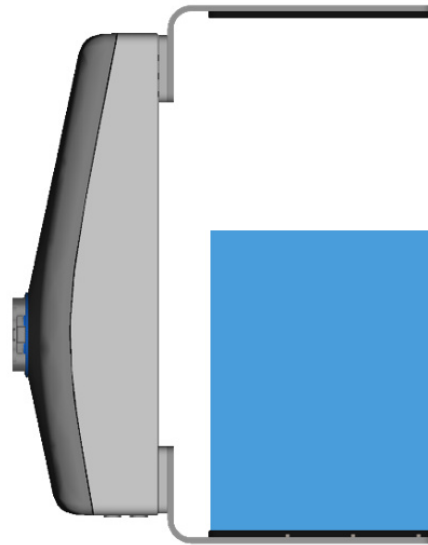
## Force Sensor

The gripper has a force sensor in the moving finger as shown in the figure below.



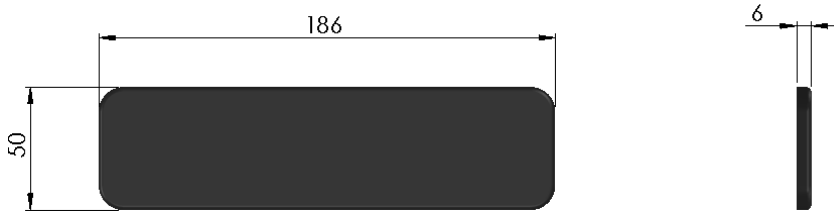
Consider the presence of the force sensor when the workpiece is aligned by using the fingers of the gripper or when the workpiece is picked sideways since the gravity can affect the force measurement.

If the workpiece is picked sideways, make sure to orient the gripper with the moving finger on top, as shown in the image below. Also ensure that the bottom finger makes contact with the workpiece before the top finger.

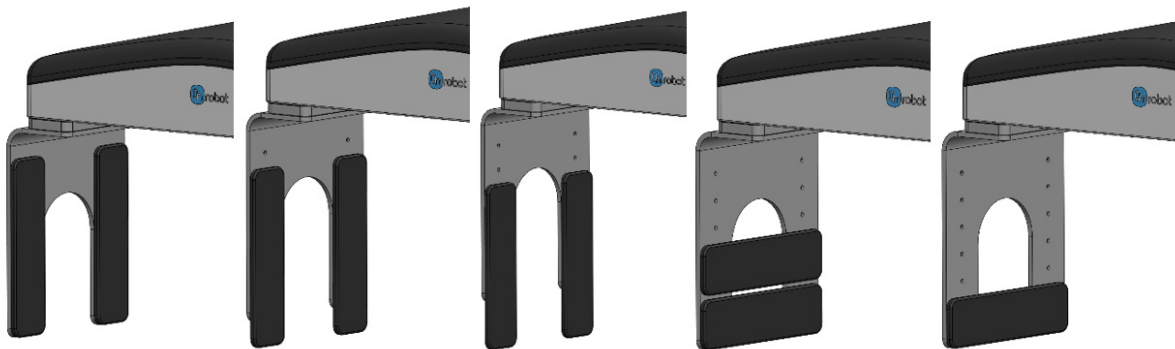


**Finger pads**

Four finger pads are provided with the gripper and can be mounted in different configurations to achieve the best grip for your workpiece.



Some examples of how the pads can be mounted are shown below.



The pads are made of aluminum with a cover of silicone. The maximum force (equally distributed in the blue area of the images below) that can be applied to the finger pads is shown in the table below.



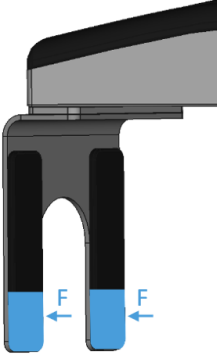
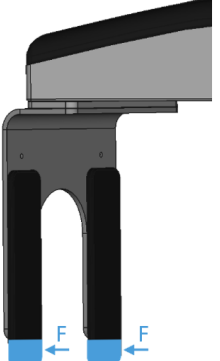
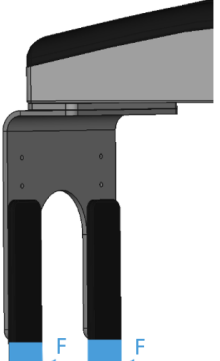
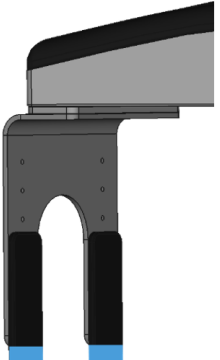
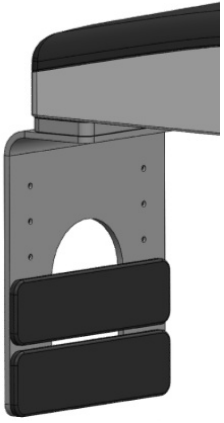
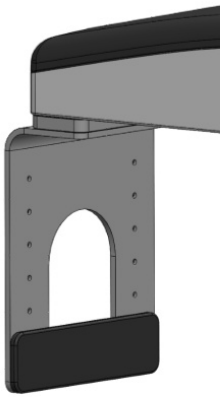
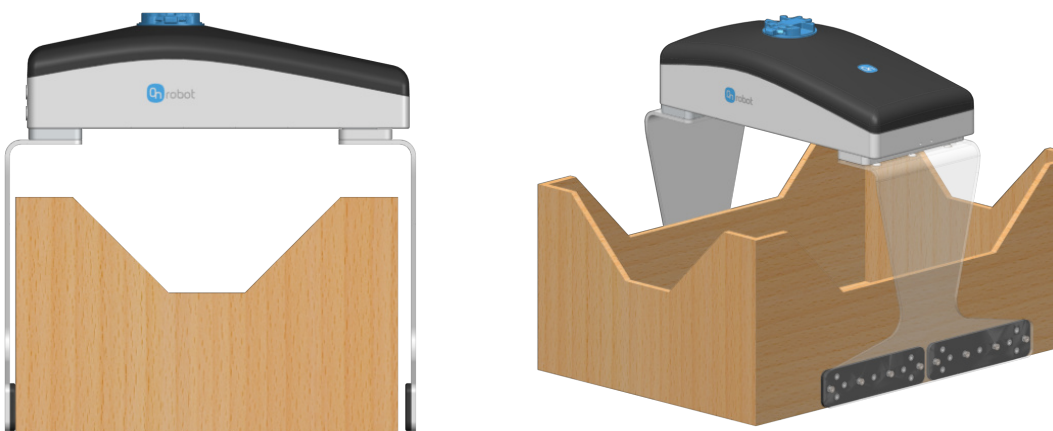
Illustration	Pad position	Maximum force (N)
	0	400
	1	300
	2	200
	3	100

Illustration	Pad position	Maximum force (N)
	4	400
	5	400

**Custom fingers**

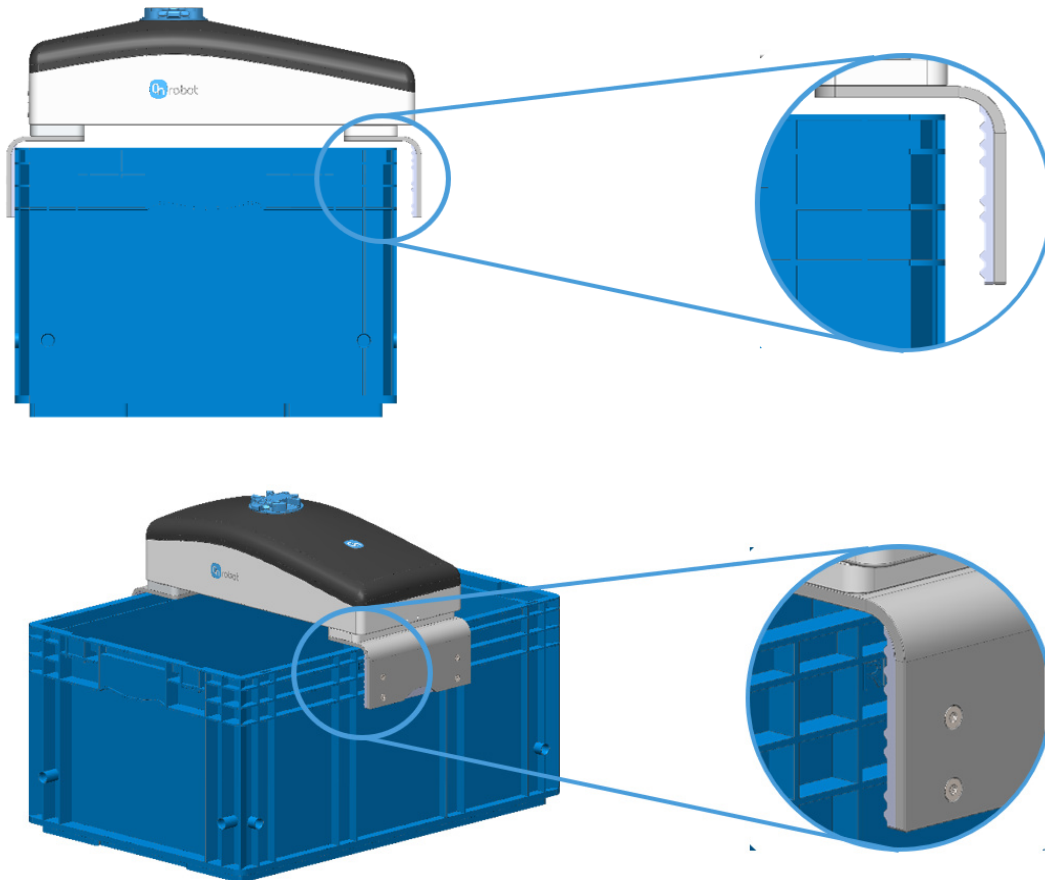
The standard fingers provided with the gripper have a height of 220 mm. For workpieces taller than 220 mm, it is recommended to customize the fingers.

An example is shown in the picture below where the pressure is recommended to be applied at the bottom of the workpiece. To achieve this, custom longer fingers are used, and the fingerpads are attached horizontally. This is the best way to get a firm grip.

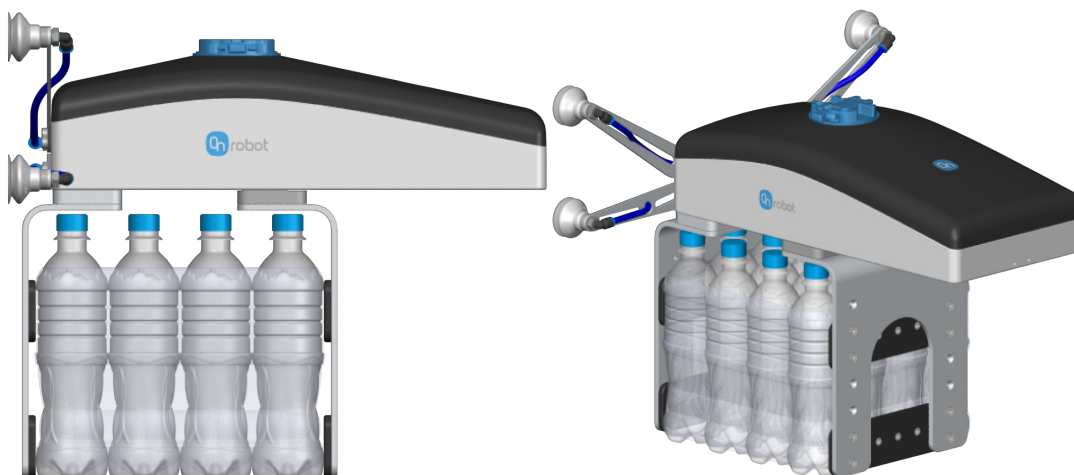


By increasing the finger height, the allowed torque might be reduced as shown in the [Moments in the finger base](#) section.

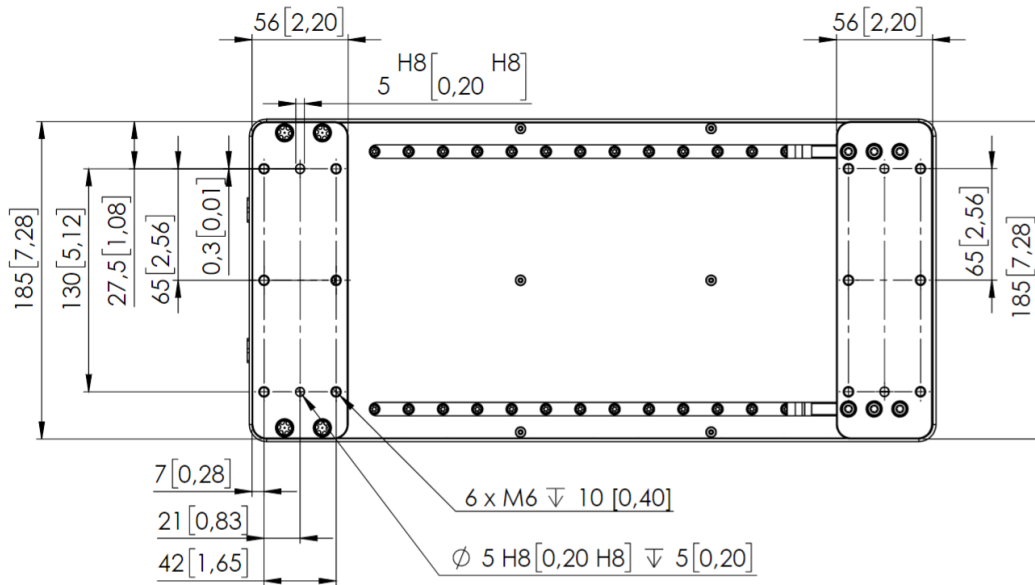
Another example is shown in the image below with custom fingers and fingerpads that are made to achieve a form fit. These kinds of fingers and fingerpads are helpful with KLT boxes.



Another example is shown in the image below for picking wrapped foil bottles. For this workpiece type, it is recommended to mount the pads horizontally to have as many contact points as possible. By doing so, the applied force can be increased and a firmer grip is achieved. Place the pads as close to the bottom of the workpiece as possible, so the workpiece structure is stronger and can resist more force.

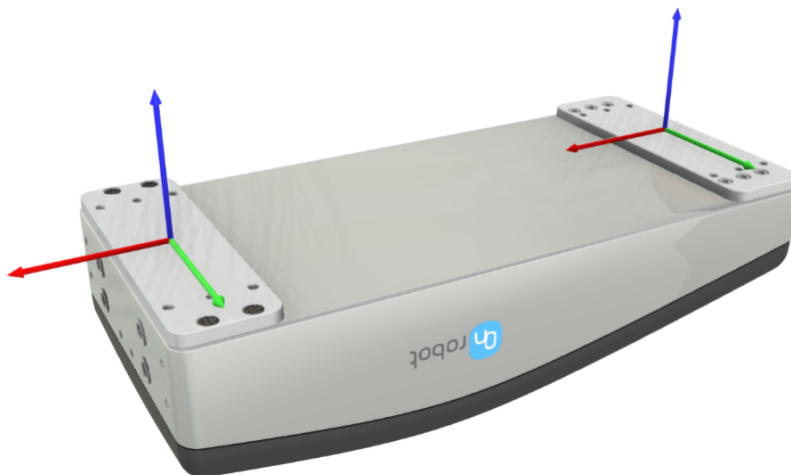


If custom fingers are required, they can be made to fit the gripper according to the dimensions (mm) [inch] shown below. Use M6x10mm screws to attach the fingers.



### Moments in the finger base

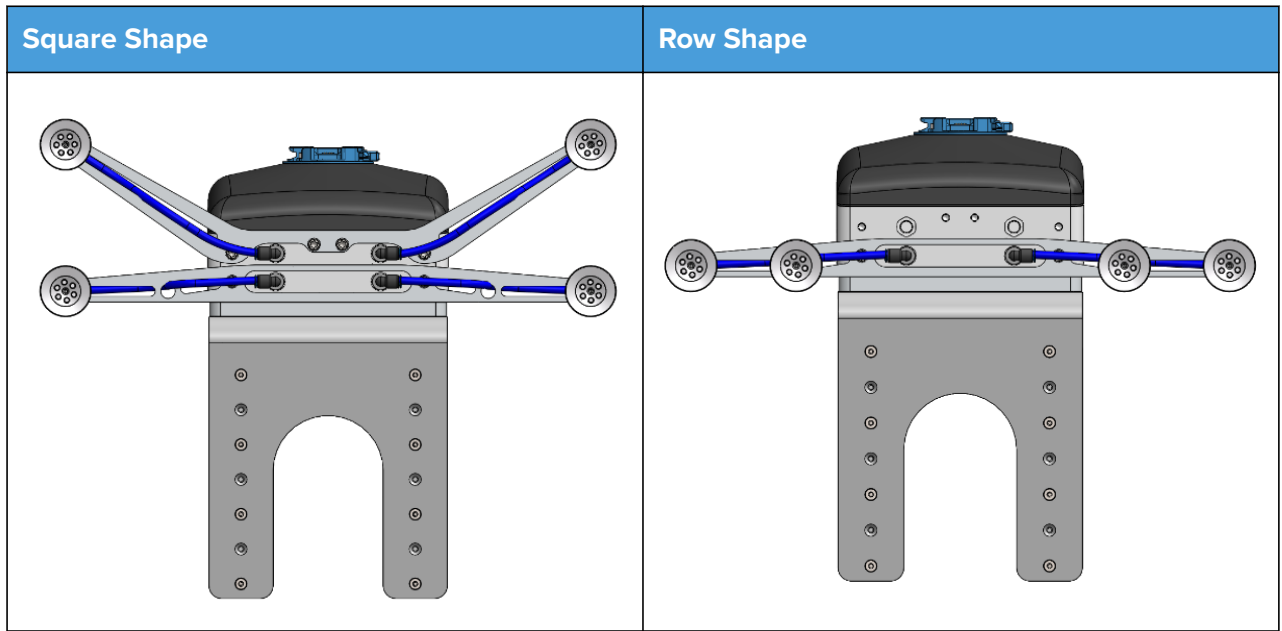
A maximum moment 80 Nm is allowed on each direction of the finger base.



### Vacuum cups

The vacuum solution has been designed to handle slip sheets and similar items. The two most common configurations with the delivered bracket and cups are shown below.

Square Shape	Row Shape
Better for cardboard slip sheets or multiple layer paper	Better for paper or similar slip sheets



The provided tube length is adequate for the Square Shape. For using the Row Shape, please cut two of the tubes to 83 mm length.

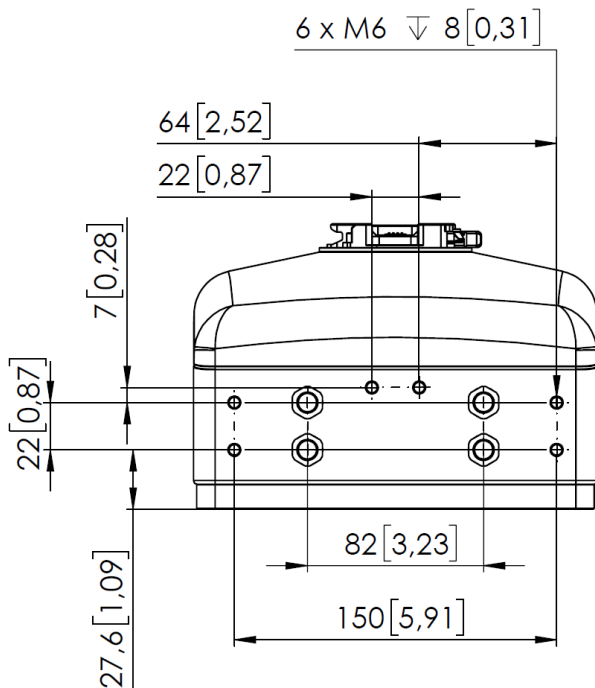


**NOTE:**

It is important to always use the four air sources together.

**Custom Vacuum Bracket**

If a custom bracket is required, it can be made to fit the gripper according to the dimensions (mm) [inch] shown below. Use M6x6mm screws to attach the fingers.



### 8.1.2. 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  $\sigma$ ) 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:

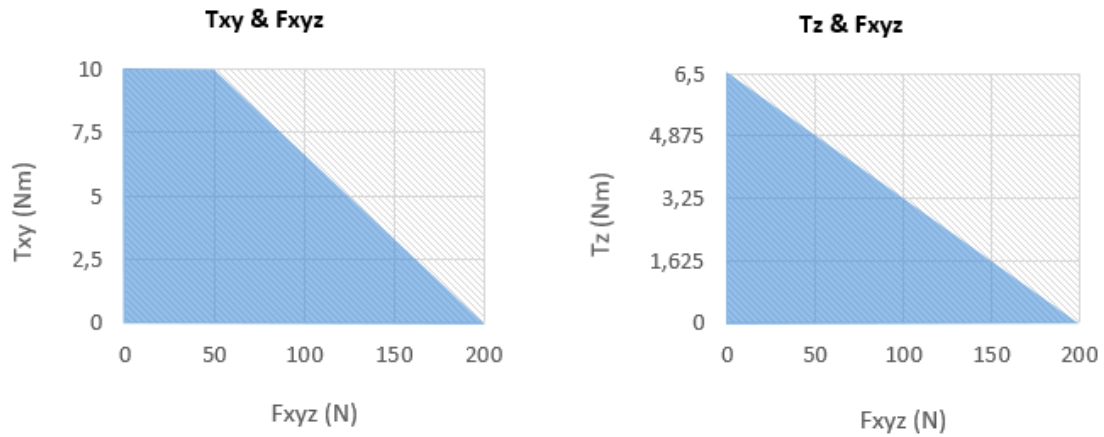
- Turn off the HEX sensor when not in use for a longer period.
- Offload the HEX sensor when not used for a longer period.
- The Auto-calibration software feature is recommended every 2-3 month or when needed.

#### 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).



### 8.1.3. 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 Conditions	Minimum	Typical	Maximum	Unit
Operating temperature	0	-	55	[°C]
	32	-	131	[°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:

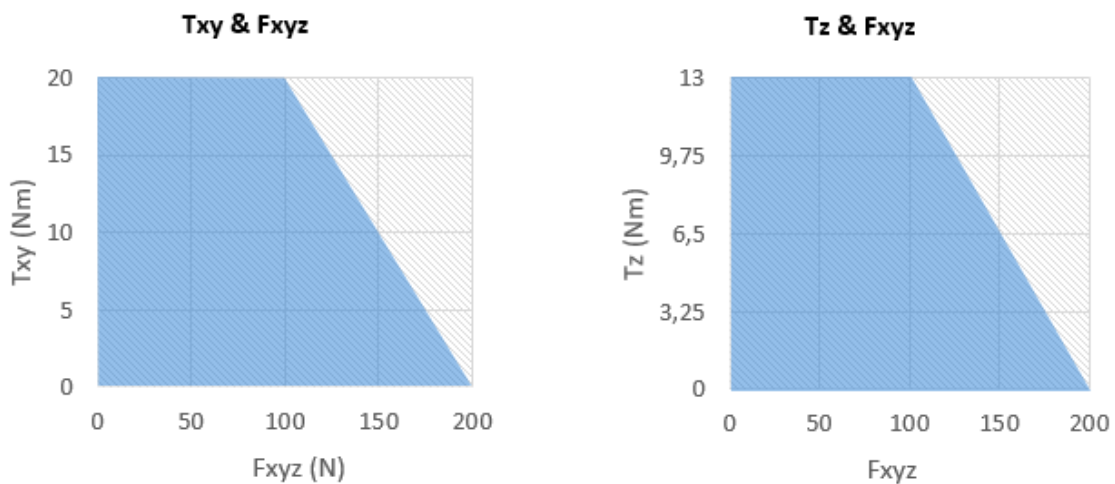
- Turn off the HEX sensor when not in use for a longer period.
- Offload the HEX sensor when not used for a longer period.
- The Auto-calibration software feature is recommended every 2-3 month or when needed.

### 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).



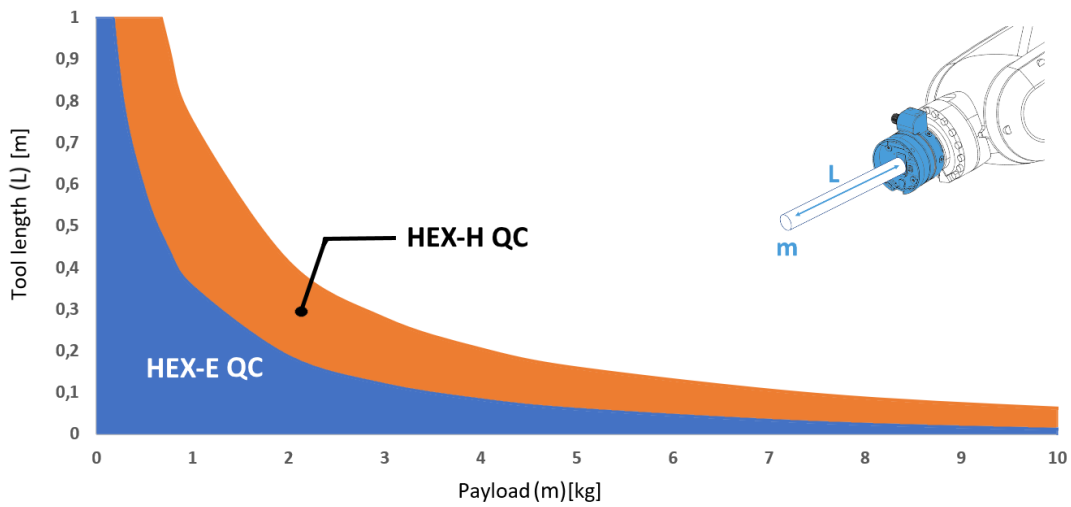
### 8.1.4. HEX-E QC and HEX-H QC Comparison

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.

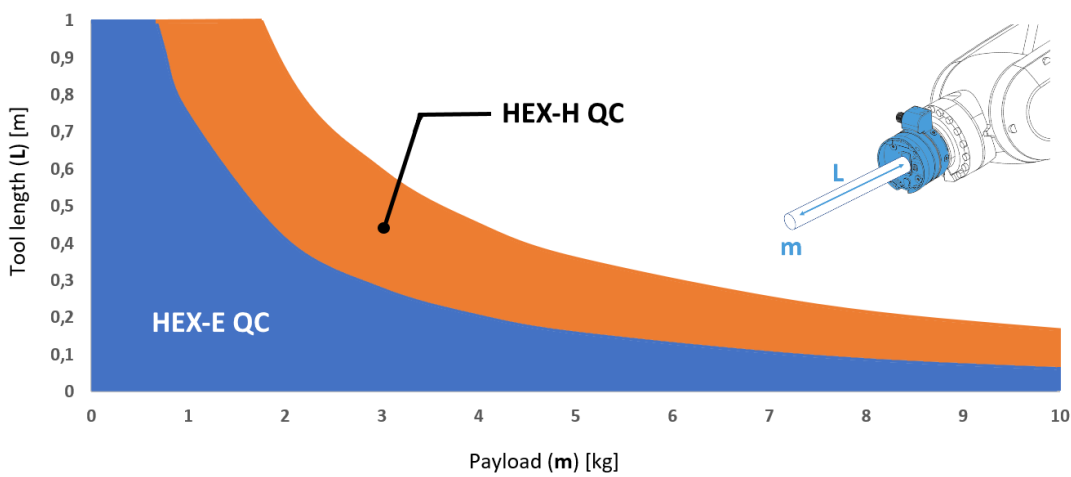
The following graphs show the extent of the payload and the tool length that you can use together with the HEX-E and the HEX-H sensors in case of applications requiring high or moderate precision.



**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 recommended to use only the HEX-E QC.

**8.1.5. Compute Box**

**8.1.5.1. 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]

Compute Box Power input (24V connector)	Minimum	Typical	Maximum	Unit
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

### 8.1.5.2. 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	-	[ $\Omega$ ]

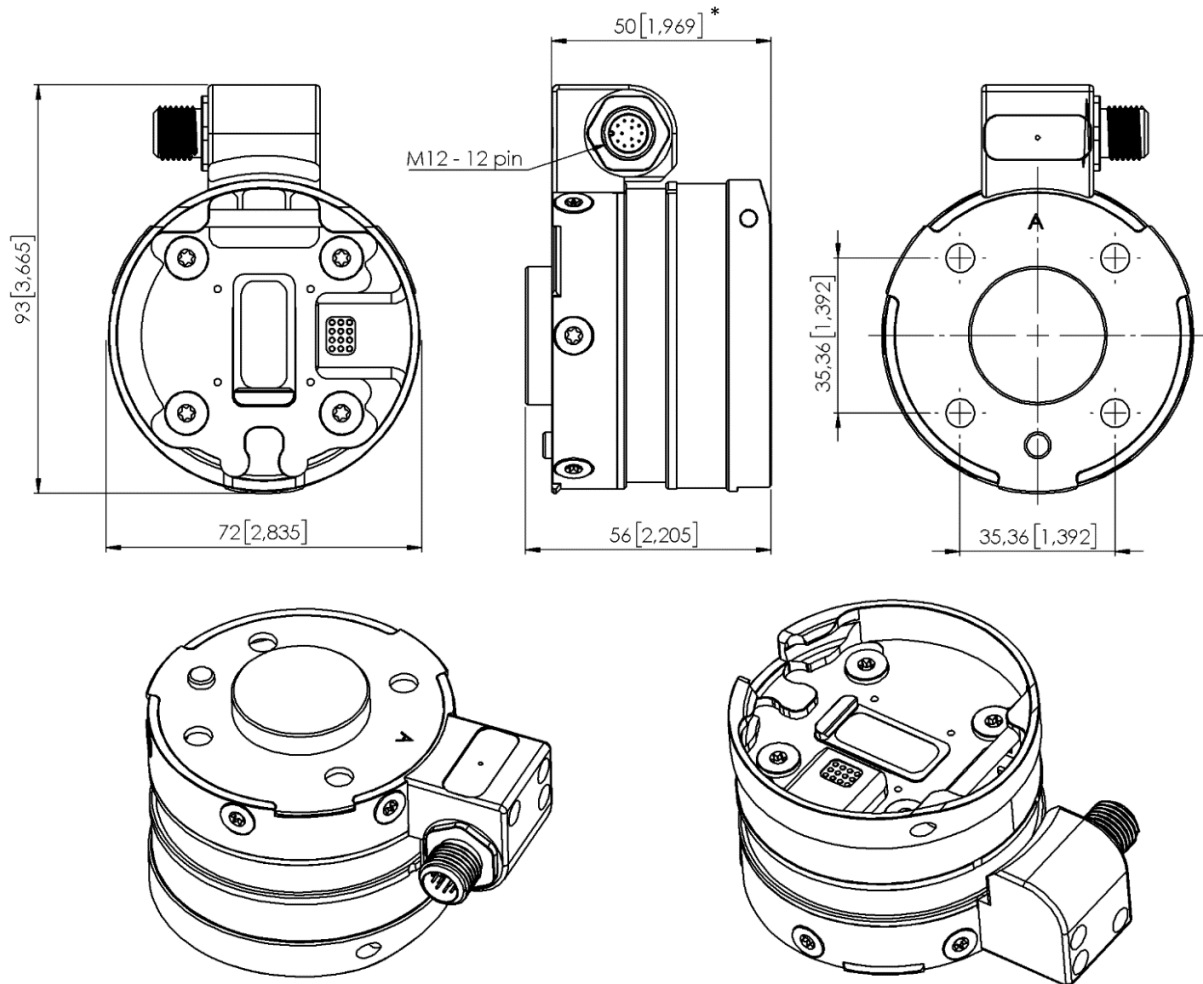
Input (DI1-DI8) as PNP	Minimum	Typical	Maximum	Unit
Voltage level - TRUE	18	24	30	[V]
Voltage level - FALSE	-0.5	0	2.5	[V]
Input current	-	-	6	[mA]
Input resistance	-	5	-	[k $\Omega$ ]

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	-	[k $\Omega$ ]

## 8.2. Mechanical Drawings

### 8.2.1. Mountings

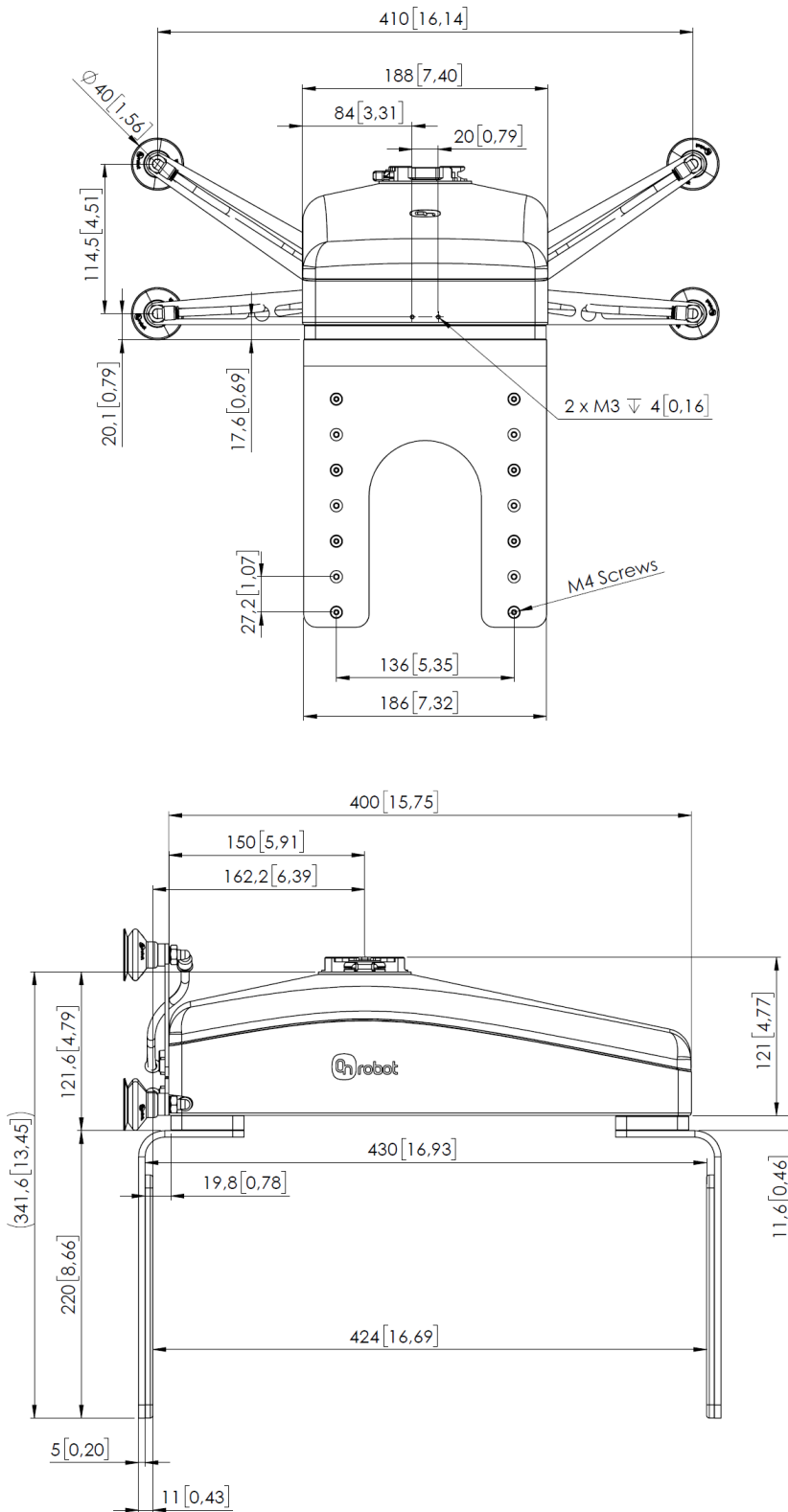
#### 8.2.1.1. HEX-E/H QC



\* Distance from Robot flange interface to OnRobot tool  
 All dimensions are in mm and [inches].

## 8.2.2. Tools

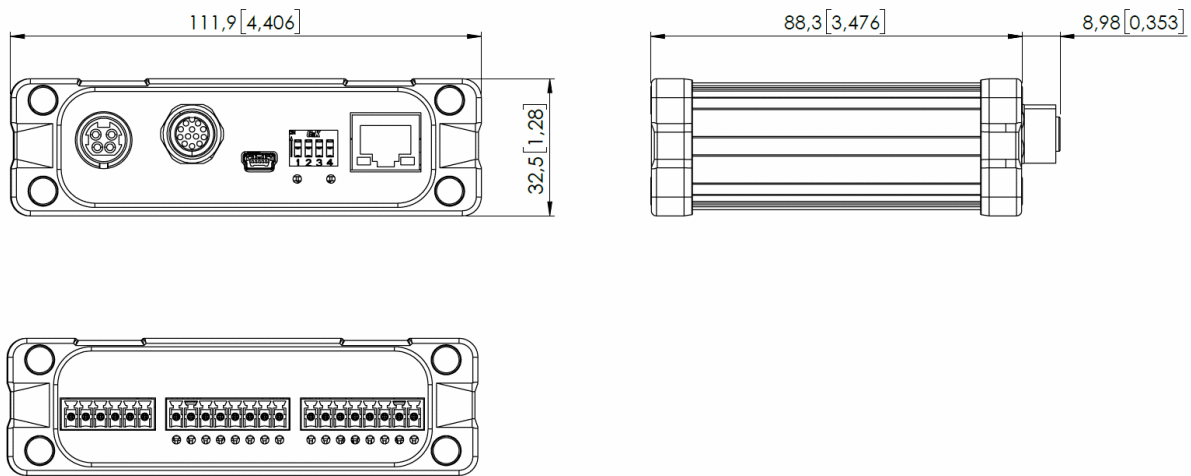
### 8.2.2.1. 2FGP20



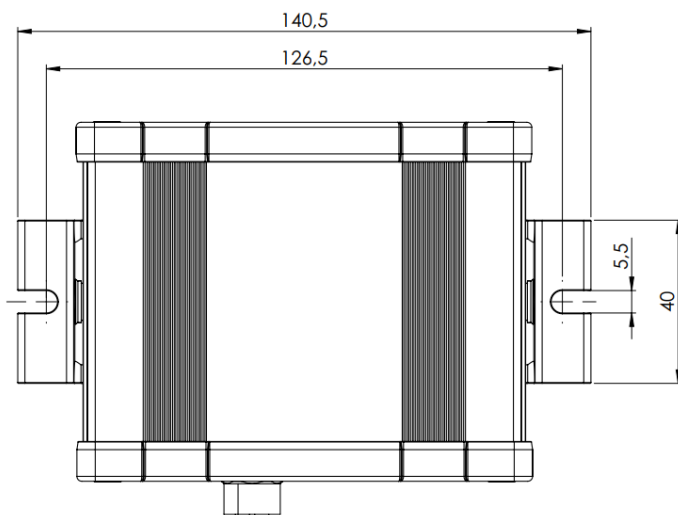
All dimensions are in mm and [inches].

### 8.2.2.2. 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.

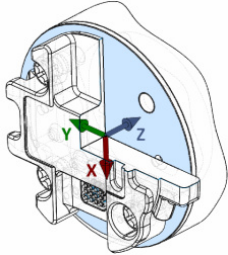
The TCP/CoG calculator can be downloaded from [www.onrobot.com/downloads](http://www.onrobot.com/downloads).

### Using Compute Box/Eye Box

For more information, see the [7.1.6. Web Client: TCP, CoG](#) section.

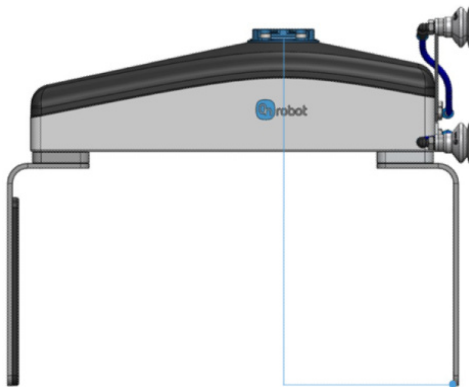
TCP, CoG, and weight parameters of the single devices (without any mounting/adapter):

### 8.3.1. 2FGP20

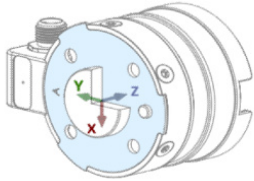
Coordinate system	TCP [mm] *	Center of Gravity [mm] **	Weight **
	<p>X=168</p> <p>Y=0</p> <p>Z=341</p>	<p>cX=1.6</p> <p>cY=-6</p> <p>cZ=110</p>	<p>5.2 kg</p> <p>11.46 lb</p>

\* TCP at the end of the fixed finger (marked with the blue dot on the image below).

\*\* Suction cups and two pads on the moving finger as shown in the image below.



### 8.3.2. HEX-E/H QC

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

## 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](http://www.onrobot.com) to contact us.

### 9.1. 2FGP20

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#### Vacuum Cups

The gripper is equipped with one filter for each suction cup socket, and one filter for the exhaust. How often the filters need to be changed depends on the nature of the workpiece and the working environment. The gripper automatically de-dusts the filters every time a grip is released. However, particles can eventually get stuck and build up inside the filter, lowering the performance of the gripper.

**DANGER:**

Identify how often the filters need service and schedule maintenance with a fixed period short enough to ensure a firm grip at all times. An overall inspection of the gripper must be performed regularly and at least once every 6 months. Neither use nor power on the gripper without filters or with filters mounted incorrectly. Dust, hair and larger particles can get stuck in pump membranes and valve seats, causing permanent damage to the gripper.

#### Spare Parts

**Vacuum**

Suction cup kit - PN 109538

- 4x Ø40 mm cups

I-shape bracket kit - PN 109539

- 1x I-shape bracket
- 2x M6x10 screws

V-shape bracketed kit - PN 109540

- 1x V-shape bracket
- 4x M6x10 screws

**Fingers**

Finger kit - PN 109536

- 1x Finger
- 6x M6x12 screws

Finger pad kit - PN 109537

- 2x Finger pad
- 8x M4x8 screws

### Cleaning Recommendations

The following cleaning aids can be used to clean the product:

- Isopropyl 70% alcohol
- Peroxide



**NOTE:**

Long time exposure and high temperatures can have a negative effect on the materials, especially on the sealings.

Use a dry cloth to wipe the product dry of the cleaning aids used. For optimum product care, use a cloth with water to do the final cleaning of the product. In this way the exposure of chemical aids is minimized on the product.



## 10. Troubleshooting

### 10.1. Robot Has Not Obtained an IP Address

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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. Changing the DIP Switch Does Not Take Effect

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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.

### 10.3. URCap Operation

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**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.

### 10.4. Tool Functions Are Not Available

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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.

## 10.5. 2FGP20 Error Codes

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### 10.5.1. Motor Not Calibrated

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

**Description:** Motor is not calibrated.

**Suggestion(s) to solve the error:**

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

### 10.5.2. Solenoid Brake Not Calibrated

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

**Description:** Solenoid brake is not calibrated.

**Suggestion(s) to solve the error:**

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

## 10.6. HEX-E/H QC Error Codes

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### 10.6.1. 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.

### 10.6.2. 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.

### 10.6.3. 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.

### 10.6.4. 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.

### 10.6.5. 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.

### 10.6.6. 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.

### 10.6.7. Unknown Error

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

**Description:** Unknown error.

**Suggestion(s) to solve the error:**

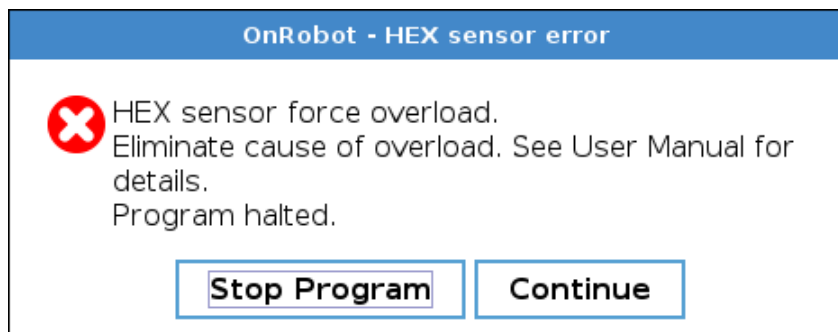
- Check the cable connection between the tool and the Compute Box.
- Power cycle the HEX.
- Ensure that the Compute Box software and the HEX firmware are updated.

## 10.7. URCap Pop-Up Messages

### 10.7.1. HEX-E/H QC

#### 10.7.1.1. Force Overload Protection

##### Displayed pop-up message



**Error code (on the Web Client):** 128

**Description:** The HEX sensor is overloaded because of:

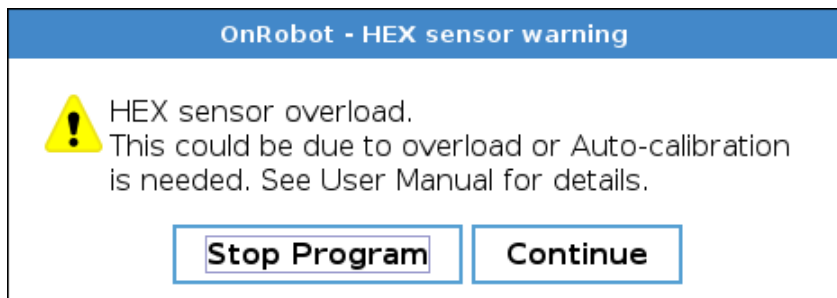
- **Case 1.** Too much payload has been put on the robot.  
or
- **Case 2.** The payload on the robot is within limit and high force drifting occurs in the Fz direction.

**How to solve and clear the error:**

	Solution	Error Clearance
<b>Case 1.</b>	Remove the payload from the robot.	Acknowledge the message in the pop-up dialog. Removing the payload will clear the error message.
<b>Case 2.</b>	Use the Auto-calibration function. See <a href="#">7.1.2.2. HEX-E/H QC</a> section.	Acknowledge the message in the pop-up dialog. Using Auto-calibration will clear the error message.

### 10.7.1.2. Auto-calibration Warning

#### Displayed pop-up message



**Error code (on the Web Client):** 4096

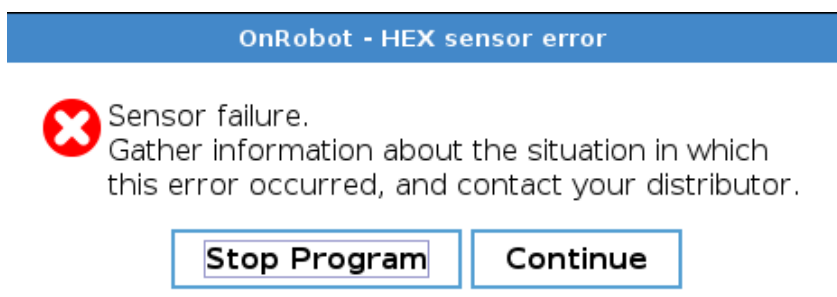
**Description:** The HEX sensor requires Auto-calibration.

**How to solve and clear the error:**

Solution	Error Clearance
Use the Auto-calibration function. See <a href="#">7.1.2.2. HEX-E/H QC</a> 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 <b>Auto-calibration</b> part of the <a href="#">URCap Setup - HEX</a> section to suppress future warnings.

### 10.7.1.3. 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:**

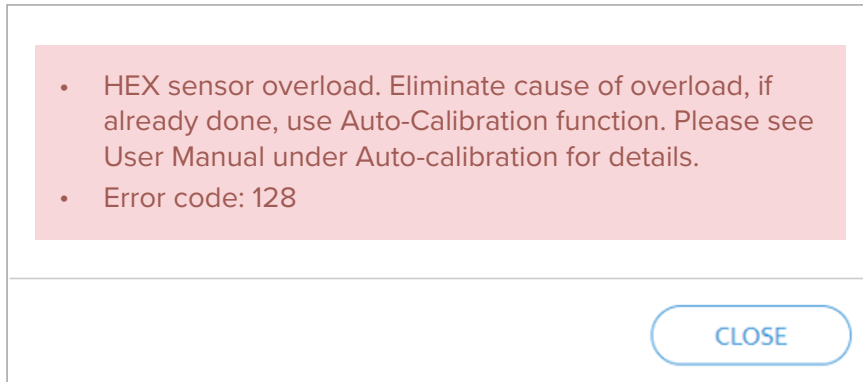
	Solution	Error Clearance
<b>Case</b>	Hardware replacement is needed.	This is not a repairable issue. Contact your distributor.

## 10.8. Web Client Pop-Up Messages

### 10.8.1. HEX-E/H QC

#### 10.8.1.1. 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
<b>Case 1.</b>	Remove the payload from the robot.	Click <b>Close</b> . Removing the payload will clear the error message.
<b>Case 2.</b>	Use the Auto-calibration function. See <a href="#">7.1.2.2. HEX-E/H QC</a> section.	Click <b>Close</b> . Using Auto-calibration will clear the error message.

### 10.8.1.2. Error 4096

#### Displayed pop-up message

- HEX sensor overload. This could be due to overload or Auto-calibration is needed. See User Manual for full details. Auto-calibration or HEX sensor restart is required to close this message. If message persists after Auto-calibration, please see User Manual under Auto-calibration for details.
- Error code: 4096

CLOSE

**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 <a href="#">7.1.2.2. HEX-E/H QC</a> section.	Click <b>Close</b> . Using Auto-calibration or restarting the HEX sensor will clear the error message.

### 10.8.1.3. Error 2048

#### Displayed pop-up message

- Sensor failure. Gather information about the situation in which this error occurred, and contact your distributor.
- Error code: 2048

CLOSE

**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:**

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



## 11. Warranties

### 11.1. Patents

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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

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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

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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



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



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

**Intertek**

**Carl-Johan von Plomgren**  
 MD, Business Assurance Nordics

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



In the issuance of this certificate, Intertek assumes no liability to any party other than to the Client, and then only in accordance with the agreed upon Certification Agreement. This certificate's validity is subject to the organization maintaining their system in accordance with Intertek's requirements for systems certification. Validity may be confirmed via email at [certificate.validation@intertek.com](mailto:certificate.validation@intertek.com) or by scanning the code to the right with a smartphone. The certificate remains the property of Intertek, to whom it must be returned upon request.



## 12.1. Manufacturer Test Certificate

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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.

<b>Attestation holder</b> OnRobot A/S, Teglværksvej 47H, 5220 Odense SØ, Denmark																	
<b>Product identification - Name (Part no.)</b> <b>Power Supplies:</b> PSU (104788), VER36U240-JA, VES120PS24, VES150PS24 (106034). <b>Controllers:</b> 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). <b>Mountings:</b> 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). <b>Tools:</b> 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).																	
<b>Manufacturer</b> OnRobot A/S																	
<b>Technical documentation</b> FORCE Technology Assessment no. 121-31033-A1																	
<b>Standards/Normative documents</b> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">IEC 61000-3-2:2018</td> <td>EMC Directive 2014/30/EU, Article 6</td> </tr> <tr> <td>IEC 61000-3-3:2013/AMD1:2017</td> <td>EN 61000-3-2:2014</td> </tr> <tr> <td>IEC 61000-6-2:2016</td> <td>EN IEC 61000-3-2:2019</td> </tr> <tr> <td>IEC 61000-6-4:2018</td> <td>EN 61000-3-3:2013/A1:2019</td> </tr> <tr> <td></td> <td>EN 61000-6-2:2005/AC:2005</td> </tr> <tr> <td></td> <td>EN IEC 61000-6-2:2019</td> </tr> <tr> <td></td> <td>EN 61000-6-4:2007/A1:2011</td> </tr> <tr> <td></td> <td>EN IEC 61000-6-4:2019</td> </tr> </table> <p>Additionally, for RG2 (102012), RG6 (102021), 2FGP20 Palettizing Gripper (108585) and Lift100 Lifting robot (108800):                  IEC 61326-3-1:2017, Industry locations, SIL 2</p> <p>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.</p>		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
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																
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	EN IEC 61000-6-2:2019																
	EN 61000-6-4:2007/A1:2011																
	EN IEC 61000-6-4:2019																
<b>Signature</b> Knud A. Baltzen	Digitally signed by Knud A. Baltzen Date: 2022.03.23 17:16:22 +01'00'																
Signed by: Knud A. Baltzen, Senior Specialist, Product Compliance																	



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## 12.3. 2FGP20 - Environment



### Attestation of Conformity no. 121-33855

<p><b>Assessment holder</b></p> <p>OnRobot A/S                  Teglværksvej 47H                  5220 Odense SØ                  Denmark</p>													
<p><b>Product identification</b></p> <p>OnRobot Gripper 2FGP20</p>													
<p><b>FORCE Technology test reports</b></p> <p>Environmental tests of Gripper 2FGP20, report no.: 121-33855-1 dated 03 January 2022</p>													
<p><b>Other technical documentation</b></p>													
<p><b>Conclusion</b></p> <p>The Gripper 2FGP20 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 stated by the client.</p> <table border="0"> <tr> <td>IP 5X</td> <td>IEC 60529:2013</td> </tr> <tr> <td>IP X4</td> <td>IEC 60529:2013</td> </tr> <tr> <td>Dry heat</td> <td>IEC 60068-2-2:2007</td> </tr> <tr> <td>Low temperature (cold)</td> <td>IEC 60068-2-1:2007</td> </tr> <tr> <td>Vibration - Endurance random</td> <td>IEC 60068-2-64:2008</td> </tr> <tr> <td>Shock test</td> <td>IEC 60068-2-27:2008</td> </tr> </table>		IP 5X	IEC 60529:2013	IP X4	IEC 60529:2013	Dry heat	IEC 60068-2-2:2007	Low temperature (cold)	IEC 60068-2-1:2007	Vibration - Endurance random	IEC 60068-2-64:2008	Shock test	IEC 60068-2-27:2008
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Vibration - Endurance random	IEC 60068-2-64:2008												
Shock test	IEC 60068-2-27:2008												
<p><b>Date</b></p>	<p>2022.01.03</p>												
<p><b>Signature</b></p>													



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 +45 43 25 00 10  
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 www.forcetechnology.com

## 12.4. Declaration of Incorporation

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### 12.4.1. 2FGP20

#### 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 gripper
Model:	2FGP20
Generation:	V1
Serial:	100000000-1009999999

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, Annex I, 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, 1.6.1, 1.6.3, 1.7.2, 1.7.4. 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)  
 2015/863/EU — Amendment directive (RoHS3)

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, December 12th, 2021



Group Management

Vilmos Beskid, CTO

## 12.4.2. 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

  
 Vilmos Beskid  
 CTO

### 12.4.3. 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.

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)

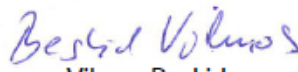
Relevant essential health and safety requirements of the following EU directives are also applied:

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

  
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