



USER MANUAL

FOR ABB ROBOTS

ORIGINAL INSTRUCTION (EN)

v1.1.2

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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 death or serious injury.

1.2 Scope of the Manual

The manual covers the following OnRobot products and its components:

| Grippers | Version |
|---------------|---------|
| 3FG15 | v1 |
| Gecko Gripper | v2 |
| RG2 | v2 |
| RG2-FT | v2 |
| RG6 | v2 |
| SG | v1 |
| VG10 | v2 |
| VGC10 | v1 |

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

Where applicable the combination of the products is also covered in the manual.



NOTE:

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

The manual covers the following Compute Box software version:

| Software | Version |
|-------------|---------|
| Compute Box | v5.1.2 |



NOTE:

In case when the used Compute Box has lower software version, please update the Compute Box. For detailed instructions refer to WebClient description at the end of this Manual.

1.3 Naming convention

In the user manual Gecko Gripper is called Gecko only.

The 3FG15 product sometimes will be called TFG as Three-Finger Gripper.

The RG2 and RG6 names as model variants are used separately or together as RG2/6 if the information is relevant for both variants.

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 How to read the Manual

The manual covers all OnRobot products and its components that is available for your robot.

To make it easy to follow what type of product (or combination) or component is the given information is relevant for, the following visual highlights are used:

RG2

This is an instruction relevant for the RG2 product only.

RG2-FT

This is an instruction relevant for the RG2-FT product only.

VG10

This is an instruction relevant for the VG10 product.

All text without these visual marks are relevant for all products or components.

For convenience, in each part that contains visual highlights (that span across pages) a table is provided in the beginning, to guide you which page contains the relevant information for your product or component:

| | |
|---|----------|
|  RG2 | 5 |
|  RG2-FT | 5 |
|  VG10 | 5 |

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 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 are normally used in pick-and-place, palletizing, machine tending, assembly, quality testing and inspection and surface finishing applications.

The end-of-arm tooling should only operate under conditions noted in **Technical sheets** section.

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

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

2.2 General Safety Instructions

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



DANGER:

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

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

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

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



WARNING:

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

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

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

2.3 Risk Assessment

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

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

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

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

2.4 Environmental Safety

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

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

Observe national [registration](#) requirements for importers according to EU WEEE Directive 2012/19/EU.



2.5 PLd CAT3 Safety Function

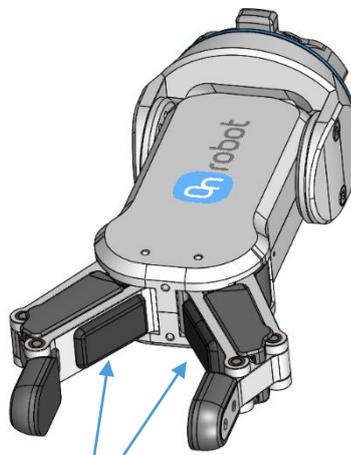
RG2
RG6

A safety-rated function has been designed as two buttons at the two arms of the product, conforming to ISO 13849-1 PLd CAT3.

This Safety Function has a max response time of 100 ms and a MTTF of 2883 years.

The behavior of the safety system is described below:

If something activates the two Safety Buttons, see picture below, the safety control system stops motion of the two arms of the product. Motion is then prevented as long as one or both of the two buttons are activated.



PLd CAT3 Safety Buttons

If this happens while running the robot program, user can detect this condition with the help of the provided status information and execute any necessary step on the robot.

To come back to normal operation with the gripper there are provided commands to reset the gripper.



CAUTION:

Before resetting the gripper always make sure that no part will be dropped due to the loss of gripper power. If Dual Quick Changer is used it will cycle the power for both sides.

For further details refer to the Operation section.

3 Operation mode(s)

There are two alternative modes how the device(s) could be used:

| Modes of Operation | |
|---|---|
| <p>OnRobot EtherNet/IP <i>required in the robot: EtherNet/IP module</i></p> | <p>OnRobot WebLogic™ <i>required in the robot: digital I/O module</i></p> |

OnRobot EtherNet/IP

This mode uses the EtherNet/IP industrial network protocol to operate the grippers/sensor.

EtherNet/IP is a fieldbus that uses the standard Ethernet networking (simple UTP cable, standard network switch can be used, etc.).

There are two supported ways of the operation:

- The Compute Box implements an EtherNet/IP **Scanner** (master device) and requires the robot controller to implement an EtherNet/IP Adapter (slave device) to operate.
- The Compute Box implements an EtherNet/IP **Adapter** (slave device) and requires the robot controller to implement an EtherNet/IP Scanner (master device) to operate.

With configurable cycle time (e.g.: 8ms) the Computer Box can "read" and "write" to the robot so the grippers/sensor can be controlled or monitored.

There are global functions provided (on the USB stick) to make it easy to access the product features.

OnRobot WebLogic™

This mode allows simple Digital I/O communication to be used to operate the grippers/sensor.

For example, the Compute Box could be easily programmed to:

- when one of the robot digital outputs is set to HIGH, then the RG2 gripper opens to 77mm
- or when the force values measured with the HEX-E QC reach 50N, the Compute Box sends a HIGH digital output to the robot.

The Compute Box has 8 digital inputs and 8 digital outputs that can be freely configured for any "logic".

In this way the user can configure:

- eight gripper/sensor controlling functionality (e.g.: set width to X, close, zero, set preload, etc.)
- and eight gripper/sensor monitoring functionality (e.g.: is grip detected, is preload > 50N, etc.).

Furthermore, the "logic" can be complex, like:

- is grip detected AND force >20 N

These "logics" can be programmed through the Compute Box's web interface called Web Client. It requires only a normal computer with a browser.

In this document both modes of operation will be covered and will be referred to as:

- OnRobot EtherNet/IP
- OnRobot WebLogic™

| |
|--|
|  Mode I - OnRobot EtherNet/IP 12 |
|  Mode II - OnRobot WebLogic™ 98 |

Mode I - OnRobot EtherNet/IP

4 Installation

4.1 Overview

For a successful installation the following steps will be required:

- Mount the components
- Setup the software

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

4.2 Mounting

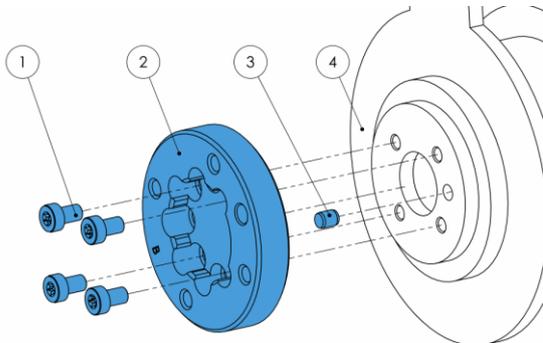
Required steps:

- Mount the robot dependent adapter
- Mount the Quick Changer option
- Mount the tool(s)

In the following three subsections these three mounting steps will be described.

4.2.1 Adapter(s)

For IRB 120 and IRB 1200 models

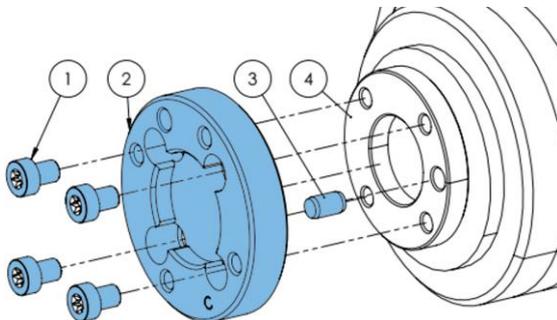


Adapter B (4 screws)

- 1 M5x8 screws (ISO14580 A4-70)
- 2 OnRobot adapter flange (ISO 9409-1-50-4-M6)
- 3 Dowel pin $\varnothing 5 \times 6$ (ISO2338 h8)
- 4 Robot tool flange (ISO 9409-1-31.5-4-M5)

Use 5 Nm tightening torque.

For IRB 140, IRB 1410 and IRB 1600 models



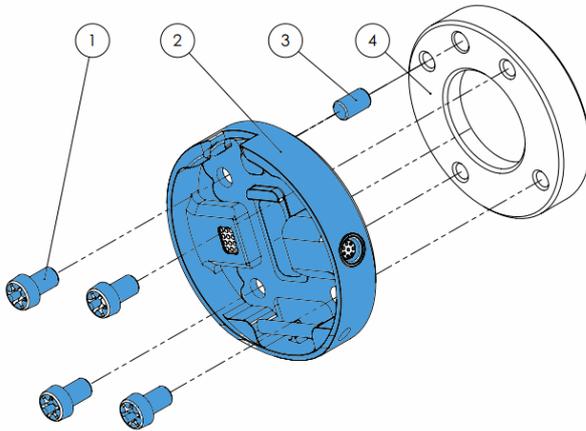
Adapter C

- 1 M6x8 screws (ISO14580 A4-70)
- 2 OnRobot adapter flange (ISO 9409-1-50-4-M6)
- 3 Dowel pin $\varnothing 6 \times 10$ (ISO2338 h8)
- 4 Robot tool flange (ISO 9409-1-40-4-M6)

Use 10 Nm tightening torque.

4.2.2 Quick Changer options

Quick Changer - Robot Side

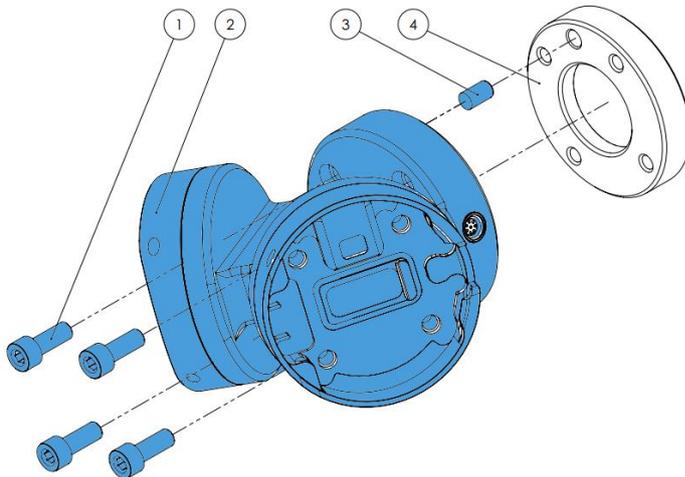


Quick Changer - Robot Side

- 1 M6x8mm (ISO14580 8.8)
- 2 Quick Changer (ISO 9409-1-50-4-M6)
- 3 Dowel pin $\varnothing 6 \times 10$ (ISO2338 h8)
- 4 Adapter/ Robot tool flange (ISO 9409-1-50-4-M6)

Use 10 Nm tightening torque.

Dual Quick Changer

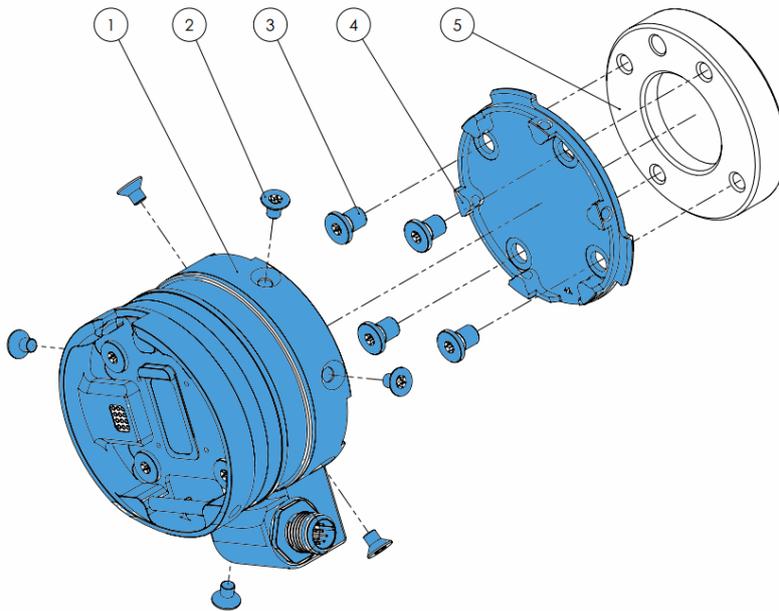


Dual Quick Changer

- 1 M6x20mm (ISO14580 8.8)
- 2 Dual Quick Changer
- 3 Dowel pin $\varnothing 6 \times 10$ (ISO2338 h8)
- 4 Adapter/ Robot tool flange (ISO 9409-1-50-4-M6)

Use 10 Nm tightening torque.

HEX-E/H QC



HEX-E/H QC

- 1 HEX-E/H QC sensor
- 2 M4x6mm (ISO14581 A4-70)
- 3 M6x8mm (NCN20146 A4-70)
- 4 HEX-E/H QC adapter
- 5 Adapter/ Robot tool flange (ISO 9409-1-50-4-M6)

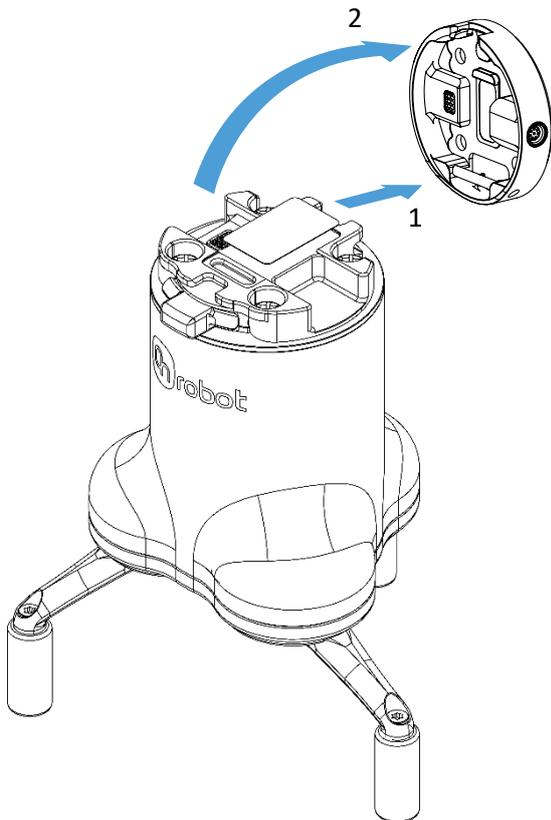
Use 1.5 Nm tightening torque. for M4x6mm

Use 10 Nm tightening torque. for M6x8mm

4.2.3 Tools

| | |
|--------------------------------|----|
| 3FG15..... | 63 |
| Gecko..... | 64 |
| RG2..... | 65 |
| RG2-FT..... | 66 |
| RG6..... | 67 |
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| Quick Changer - Tool side..... | 69 |

3FG15



Step 1:

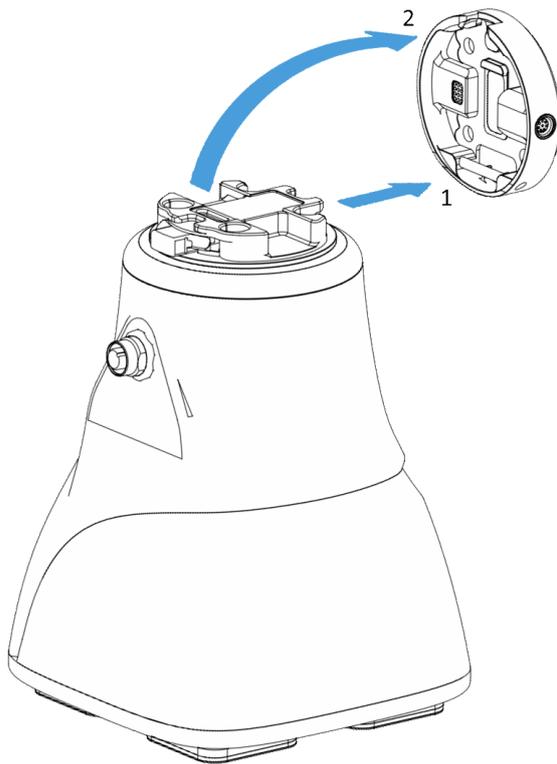
Move the tool close to the Quick Changer as illustrated.

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.

Gecko**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:

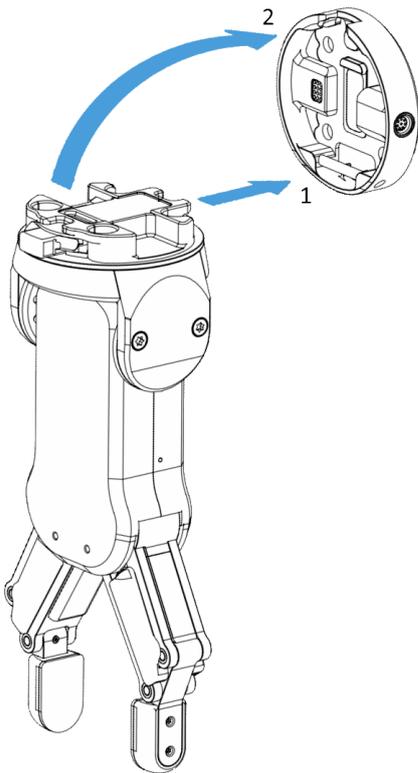
Flip the tool until it is fully mated, and you hear a clicking sound.

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

**CAUTION:**

With a Dual Quick Changer the Gecko Gripper can only be mounted on the Secondary (2) side. Mounting on the Primary (1) side will prevent the devices to function correctly.

RG2



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.

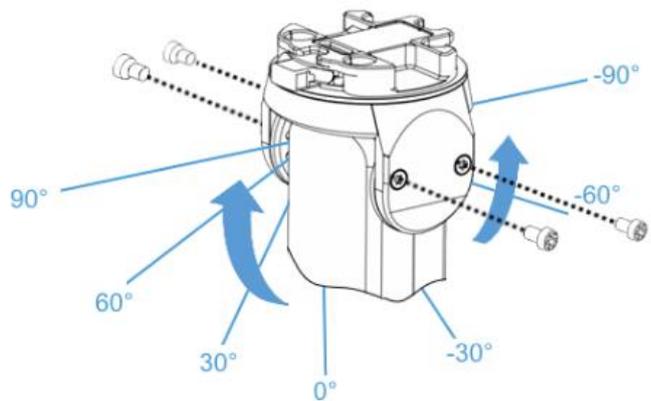
Step 2:

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.

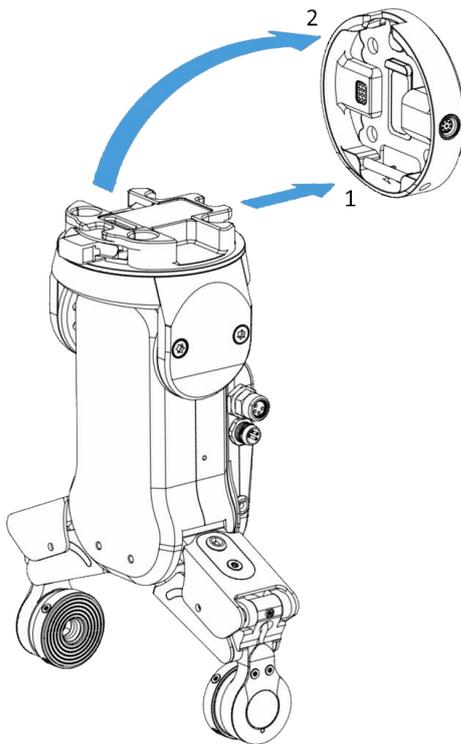
To change the relative angle of the gripper to the Quick Changer:

- first remove the four M4x6 screws
- tilt the gripper between -90° and 90°
- then put the four M4x6 screws back and use 1.35 Nm tightening torque to fix it.



WARNING:

Never use the device while any of the four M4x6 screws are removed.

RG2-FT
**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.

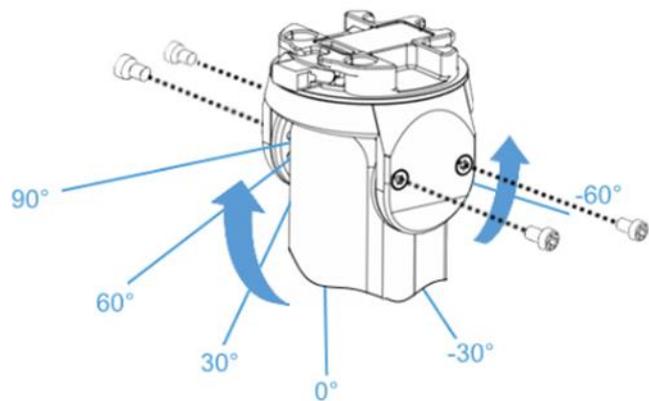
Step 2:

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.

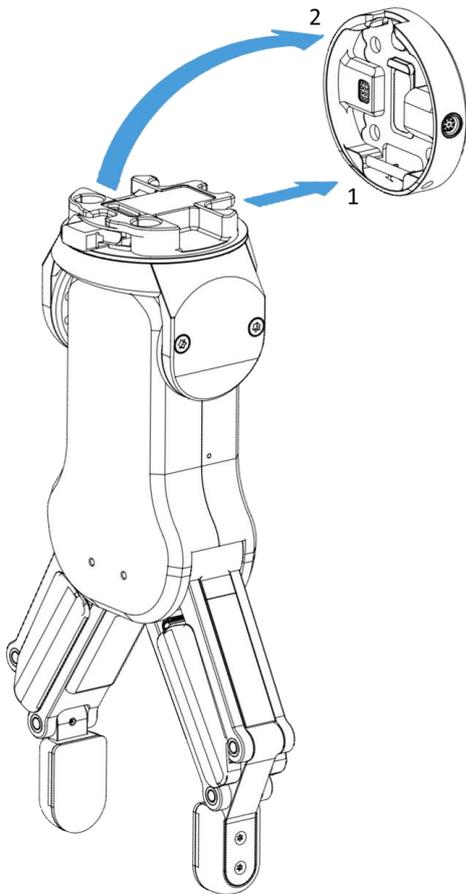
To change the relative angle of the gripper to the Quick Changer:

- first remove the four M4x6 screws
- tilt the gripper between -60° and 90°
- then put the four M4x6 screws back and use 1.35 Nm tightening torque to fix it.

**WARNING:**

Never use the device while any of the four M4x6 screws are removed.

RG6



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.

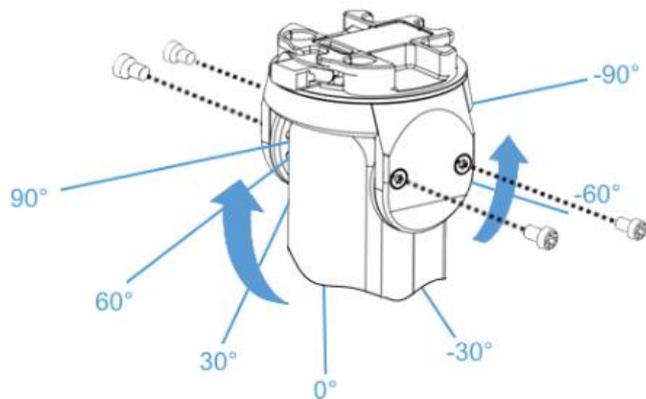
Step 2:

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.

To change the relative angle of the gripper to the Quick Changer:

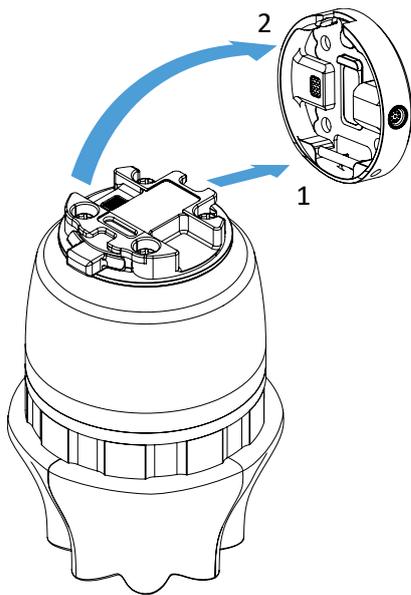
- first remove the four M4x6 screws
- tilt the gripper between -90° and 90°
- then put the four M4x6 screws back and use 1.35 Nm tightening torque to fix it.



WARNING:

Never use the device while any of the four M4x6 screws are removed.

SG



Step 1:

Move the tool close to the Quick Changer as illustrated.

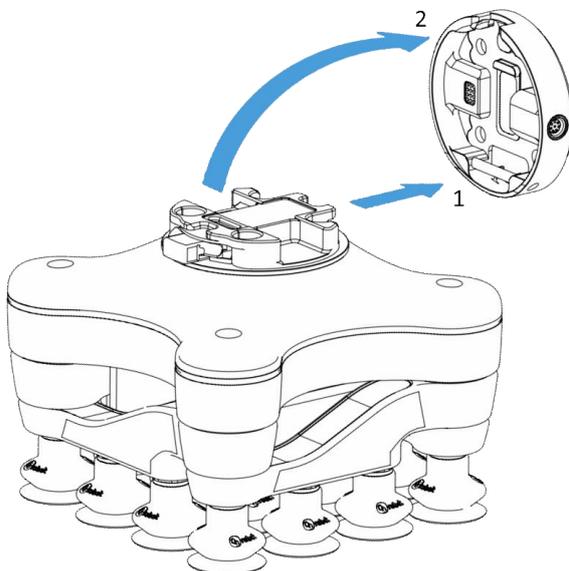
The hook mechanism (rod and hook tongue) will keep the lower part locked once mounted.

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.

VG10



Step 1:

Move the tool close to the Quick Changer as illustrated.

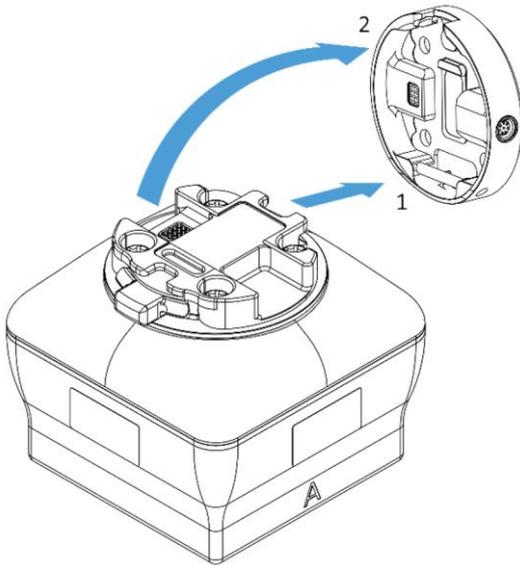
The hook mechanism (rod and hook tongue) will keep the lower part locked once mounted.

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.

VGC10

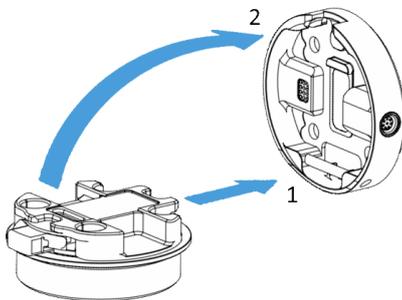


Step 1:
Move the tool close to the Quick Changer as illustrated.
The hook mechanism (rod and hook tongue) will keep the lower part locked once mounted.

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.

Quick Changer - Tool side



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.

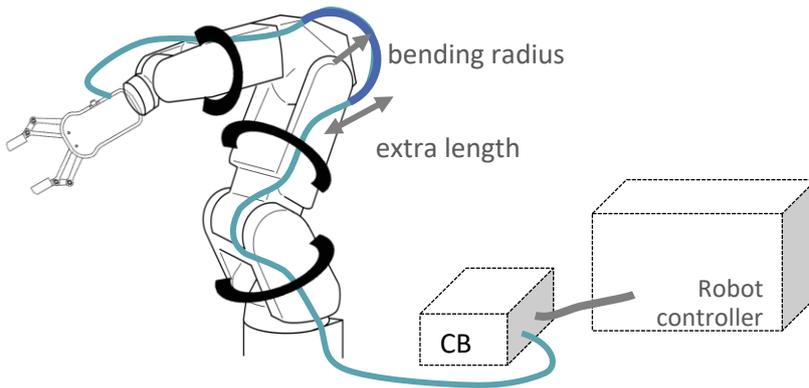
Step 2:
Flip the tool until it is fully mated, and you hear a clicking sound.

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

4.3 Wiring

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

- Tool data cable between the tool(s) and the Compute Box
- Ethernet communication cable between the robot controller and the Compute Box
- Power supply of the Compute Box



NOTE:

For the Quick Changer - Robot Side no cable is needed to be connected.

4.3.1 Tool data cable

First connect the data cable to the tool.

For Single or Dual 3FG15, RG2, RG6, SG, VG10, VGC10 or Gecko Gripper



Use the M8-8pin connector on the Quick Changer or on the Dual Quick Changer.

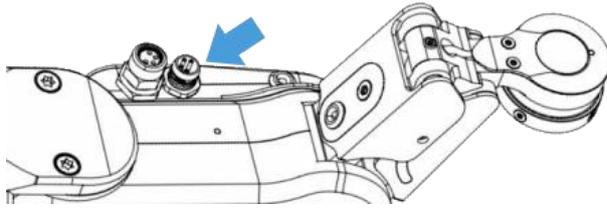
Use the cable holder as illustrated on the left.



CAUTION:

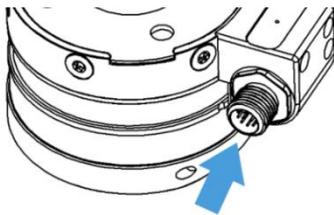
Make sure to use the supplied cable holder to prevent any excessive strain on the 90-degree M8 connector caused by the rotation of the cable.

For RG2-FT



For RG2-FT the Quick Changer tool data connector cannot be used. Instead use the marked M8-4pin connector

For HEX-E/H QC



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

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



NOTE:

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

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

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



CAUTION:

Use only original OnRobot tool data cables. Do not cut or extend these cables.



CAUTION:

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

Connect one end of the supplied Ethernet (UTP) cable to the robot controller's Ethernet X5 port.



NOTE:

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

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



CAUTION:

Use only shielded, maximum 3m long Ethernet cables.



WARNING:

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

4.3.2 Power supply



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



NOTE:

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



CAUTION:

Use only original OnRobot power supplies.

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

4.4 Software setup

4.4.1 Overview

The robot could be set either as an EtherNet/IP Scanner or as an adapter. Most of the steps are the same for these two options. When there is any difference it is highlighted as:

Robot as Scanner

or

Robot as Adapter

The following steps are required to set up the OnRobot devices for operation with your ABB robot:

- Setup the Compute Box
- Set the IP address of the robot.
- Setup the robot as a Scanner or as an Adapter.
- Map the EtherNet/IP inputs/outputs to the robot.
- Upload the OnRobot functions to the robot.
- Upload the MMC file to the robot

Generally, there are two ways to configure the EtherNet/IP communication. You can set up in the Flexpendant or in the Robotstudio program.

Listed below are the supplementary software accessories that are required for the setup:

| Software Component | Item Number |
|-----------------------------|-------------|
| EtherNet/IP Scanner/Adapter | 841-1 |



NOTE:

Please call your local ABB representative for pricing and purchase options.



NOTE:

The terms *Scanner*, *Master*, and *Client* can be used interchangeably. Here, we will use the term **Scanner**. (E.g. The robot is a scanner.)

The terms *Adapter*, *Slave*, and *Server* can be used interchangeably. Here, we will use the term **Adapter**. (E.g. The OnRobot Compute Box is an adapter.)

4.4.2 Setup the Compute Box

Robot as Adapter



NOTE:

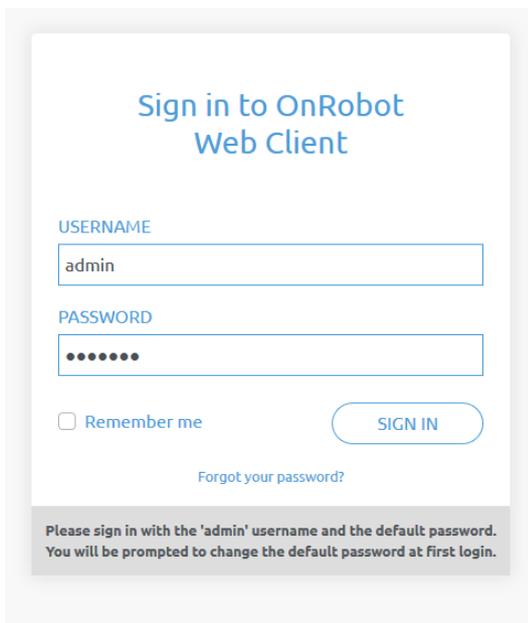
Temporarily the Compute Box will be needed to be connected to your computer.

To configure the Compute Box to be a Scanner you will need to access the Web Client interface of the Compute Box on your computer. To do that 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 Auto Mode (factory default) for IP settings of the Compute Box. For further details on the available IP settings modes see **Ethernet Interface setup**.

Then do the following steps:

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

The sign-in page opens:



The factory default administrator login is:

Username: admin

Password: OnRobot

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

Change the default administrator password

NEW PASSWORD

CONFIRM PASSWORD

Once logged in, click on the **Configuration** menu.

Configuration

This page allows the configuration of the Compute Box.

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

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

NETWORK SETTINGS

| | |
|--------------|---|
| MAC address | B8:27:EB:0F:DC:C0 |
| Network mode | Dynamic IP ⇅ |
| IP address | 192.168.1.1 |
| Subnet mask | 255.255.255.0 |

ETHERNET/IP SCANNER SETTINGS

| | |
|--------------------------------|---|
| IP address to connect to | 192.168.1.10 ✎ |
| Origin-to-target instance id | 112 ✎ |
| Target-to-origin instance id | 100 ✎ |
| Configuration instance id | 0 ✎ |
| Requested packet interval (ms) | 8 ✎ |

Enable the **EtherNet/IP scanner settings** checkbox and set the values as shown above:

- **IP address to connect to:** Robot IP address (if default values are used enter 192.168.1.10)
- **Origin-to-target instance id:** 112

- **Target-to-origin instance id:** 100
- **Configuration instance id:** 0
- **Requested packet interval (ms):** 8

Finally, click the **Save** button to store the new settings.



NOTE:

Now unplug the UTP cable from your computer and plug it back to the robot.

Robot as Scanner

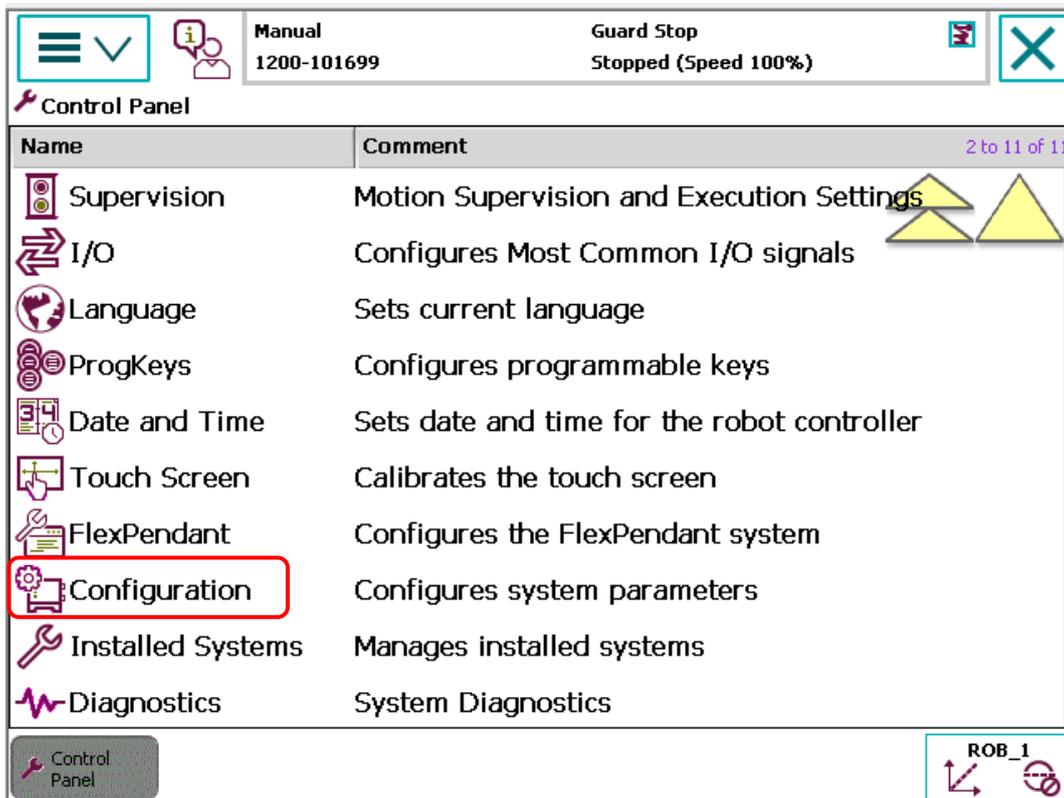
The factory default settings could be used. If it may has changed then follow the section before and ensure the **EtherNet/IP scanner settings** checkbox is disabled. If not, uncheck it and click the **Save** button to store the new settings.

4.4.3 Set the IP address of the robot

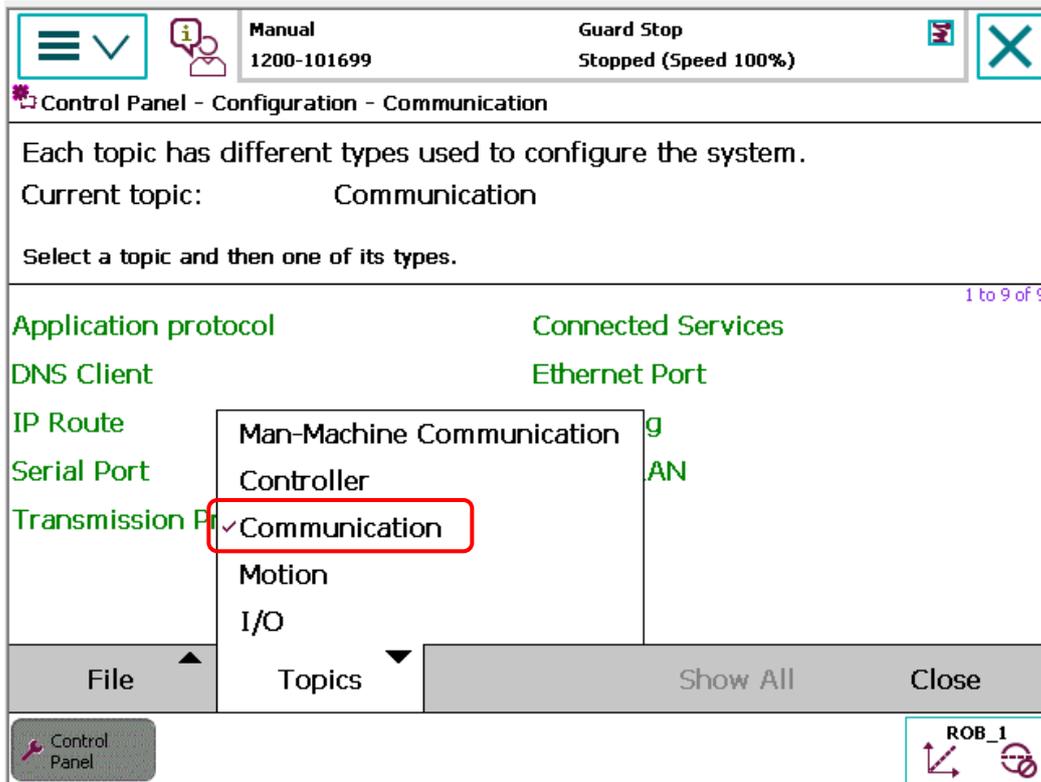
Flexpendant

This step is common for the Robot as a Scanner and Adapter.

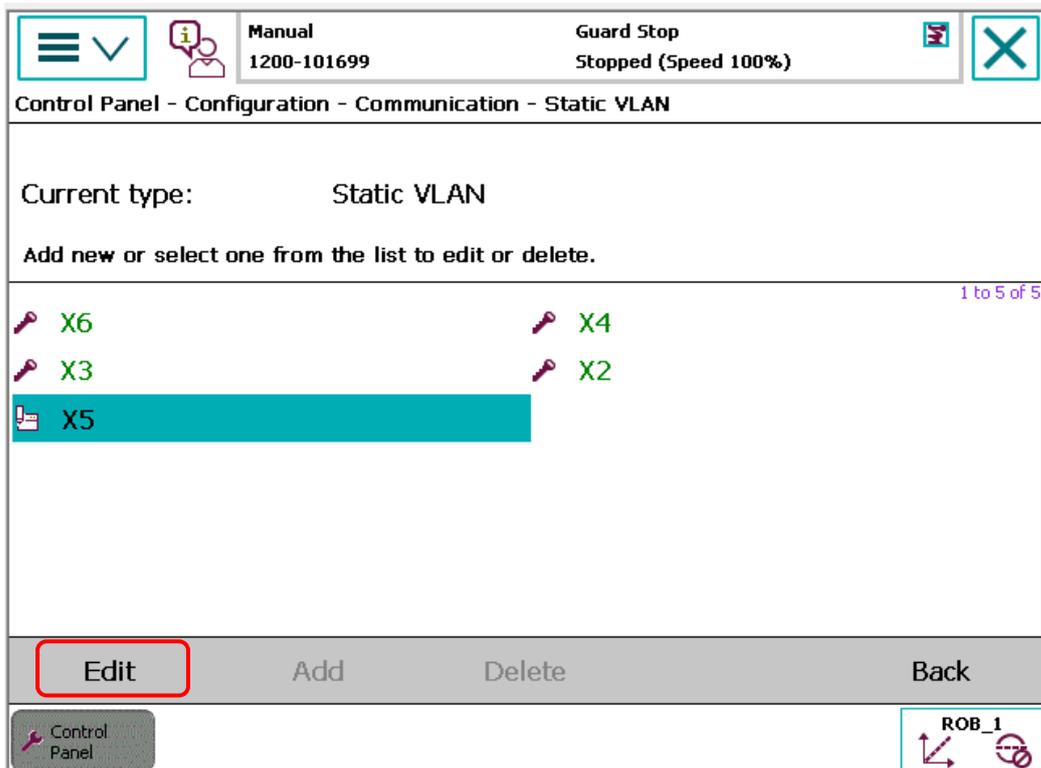
- On the robot Flexpendant, press **MENU**.
- Select **Control Panel**.
- Press **Configuration**.



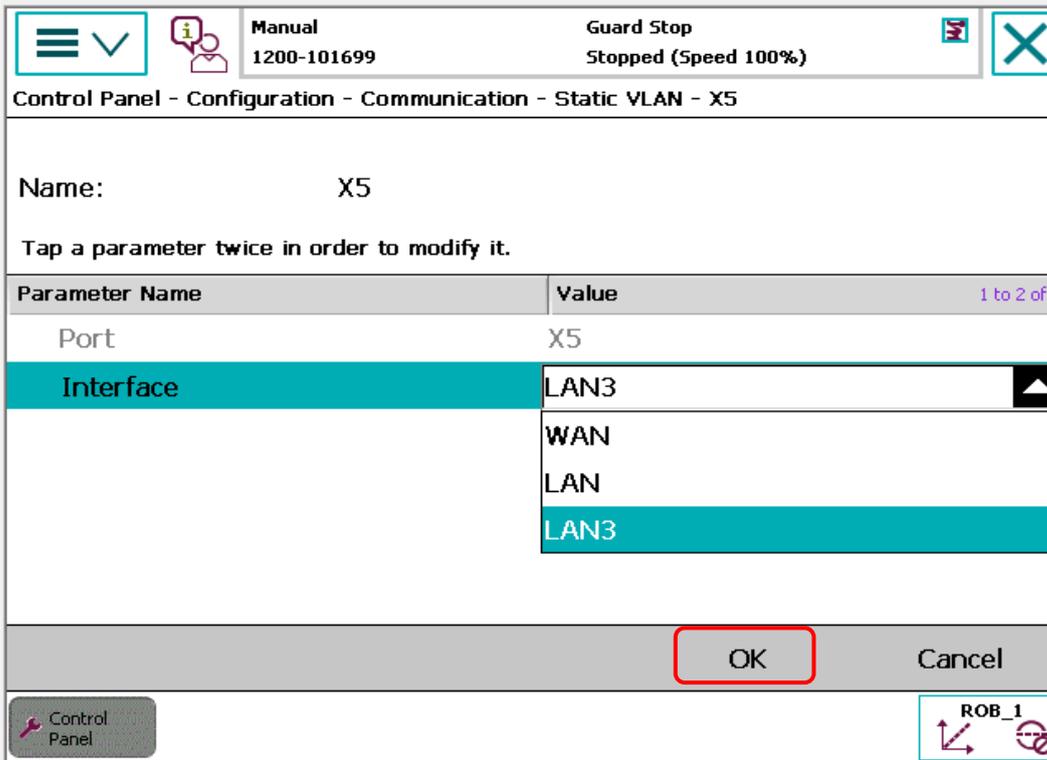
- In the Topics list box select **Communication**.



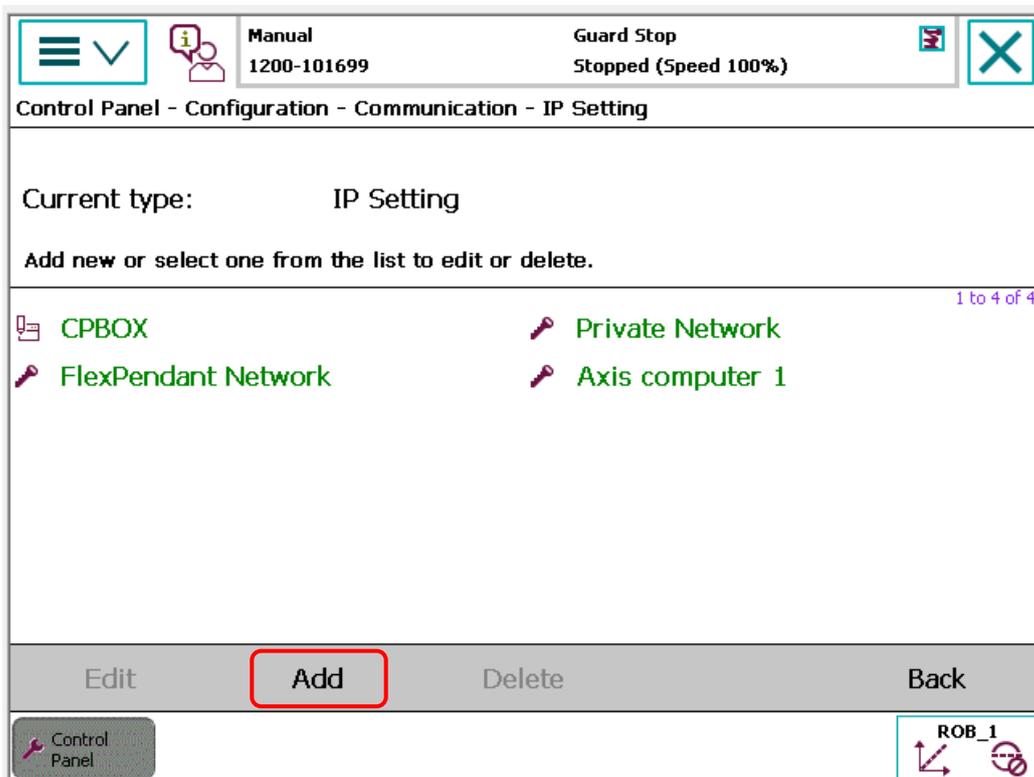
- Select **Static VLAN**.
- Select **X5** and Press **Edit**.



- On the **Interface** parameter select **LAN3** and press **OK**.

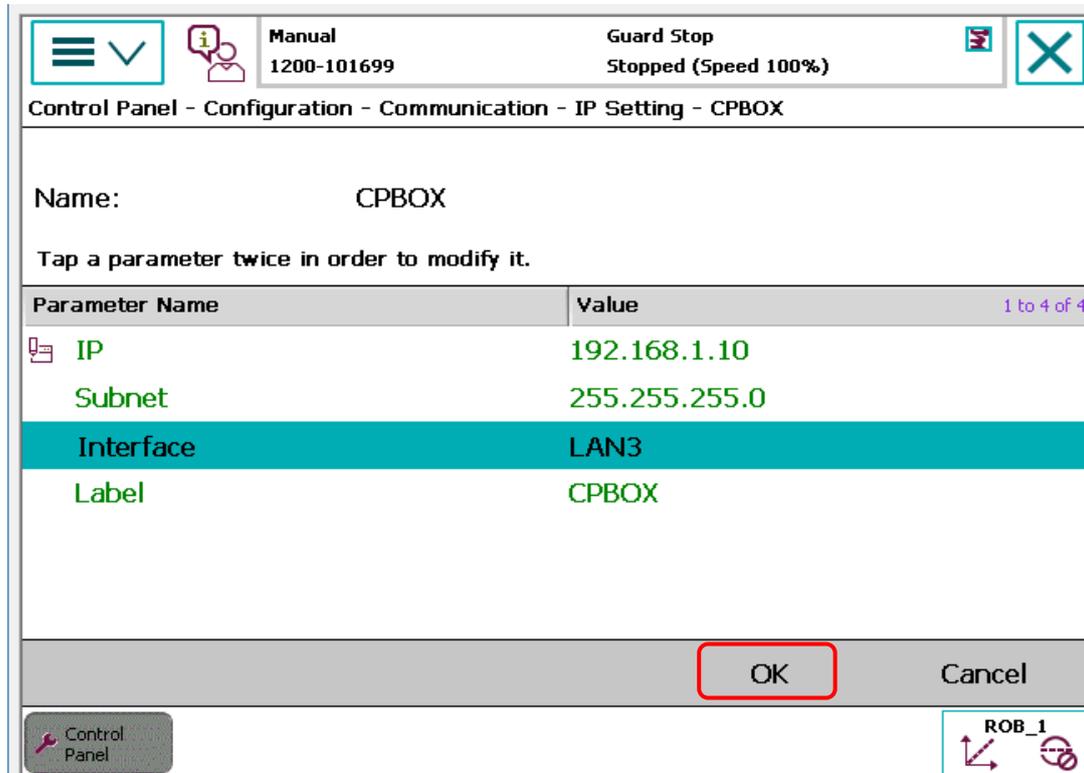


- Go back to the **Communication** topic.



- Select **IP Setting** and Press **Add**.
- Configure the host IP address. The default IP address for the OnRobot Compute Box is 192.168.1.1. You must put your robot on the IP address 192.168.1.X. Below, we have used the address

192.168.1.10 and 255.255.255.0 for subnet mask. On the Interface parameter select **LAN3**. Name the Label parameter that you want, we have used the **CPBOX** name. Finally press **OK**.



- Power cycle the robot controller manually for these changes to take effect. (You may perform the power cycling after completing the rest of the robot installation steps within this section.)



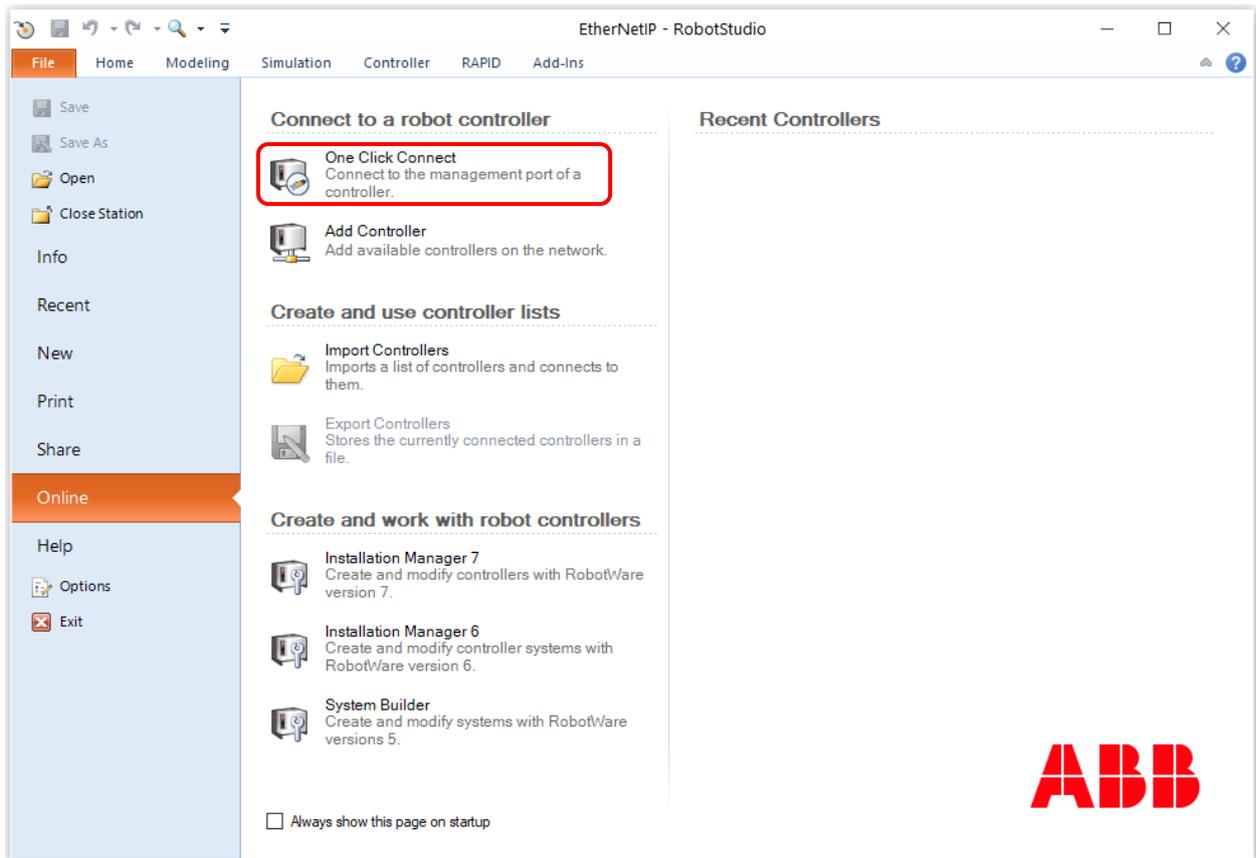
NOTE:

Any time you change Ethernet/IP settings, you will need to cycle power to the robot controller for the changes to take effect.

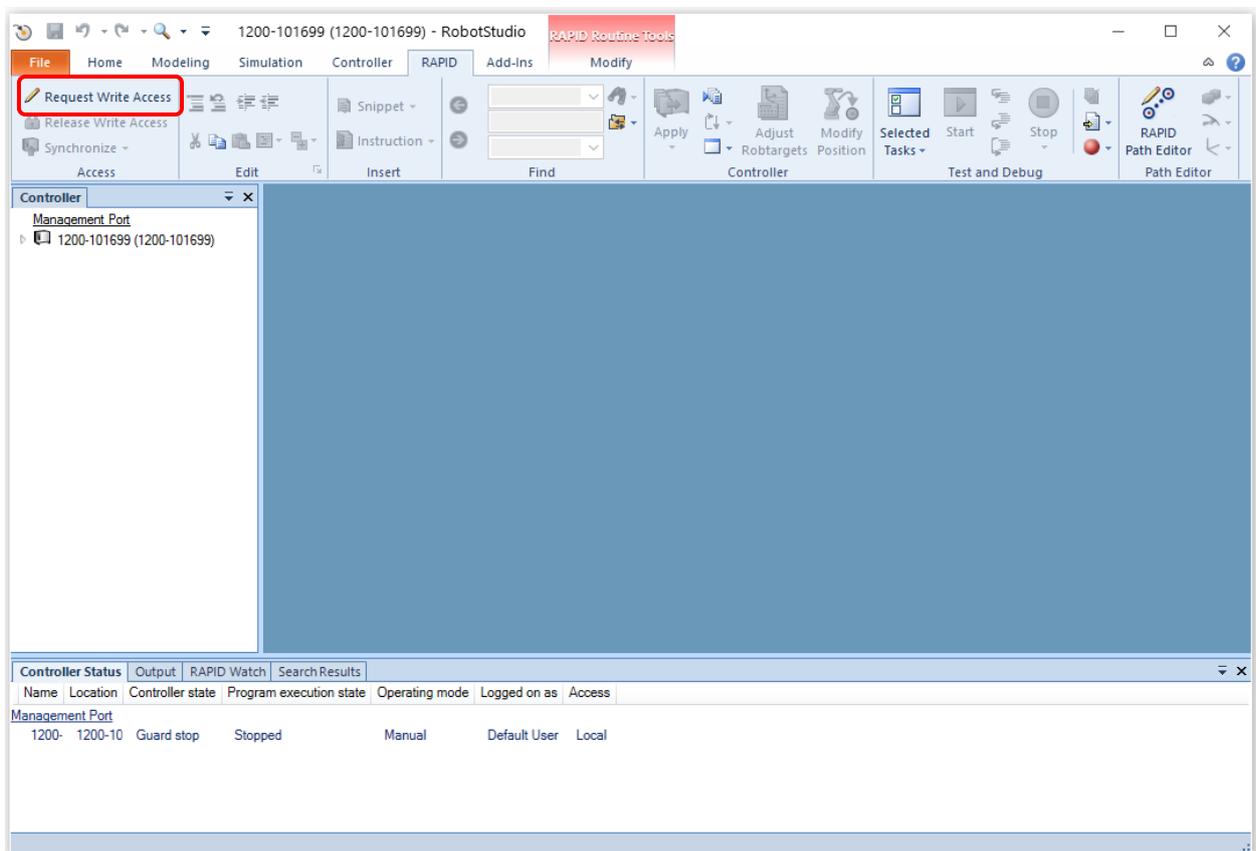
Robotstudio

You can connect to the robot controller to your PC. Connect the controller to your computer with the UTP cable. Use the X2 service port. On the PC side you need to set up a fix IP address, for example: 192.168.125.2. Then you need to open RobotStudio software.

- Select **File** and Press **Online**.
- Press **One Click Connect**.



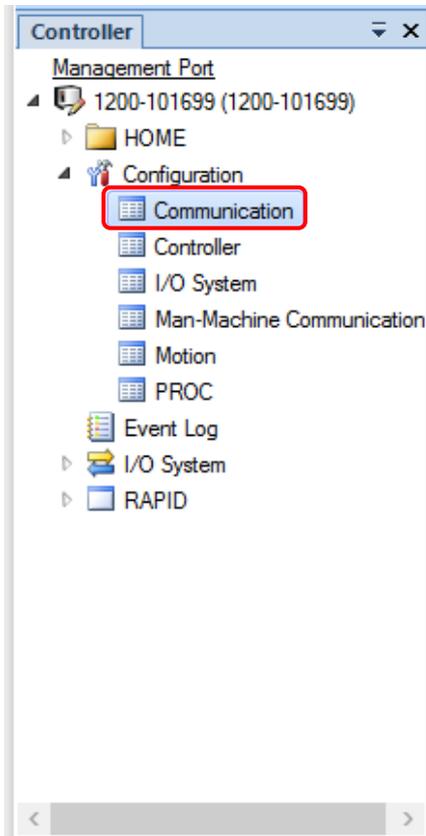
- On the **RAPID** tab press **Request Write Access**.
- On the Flexpendant side press **Grant**.



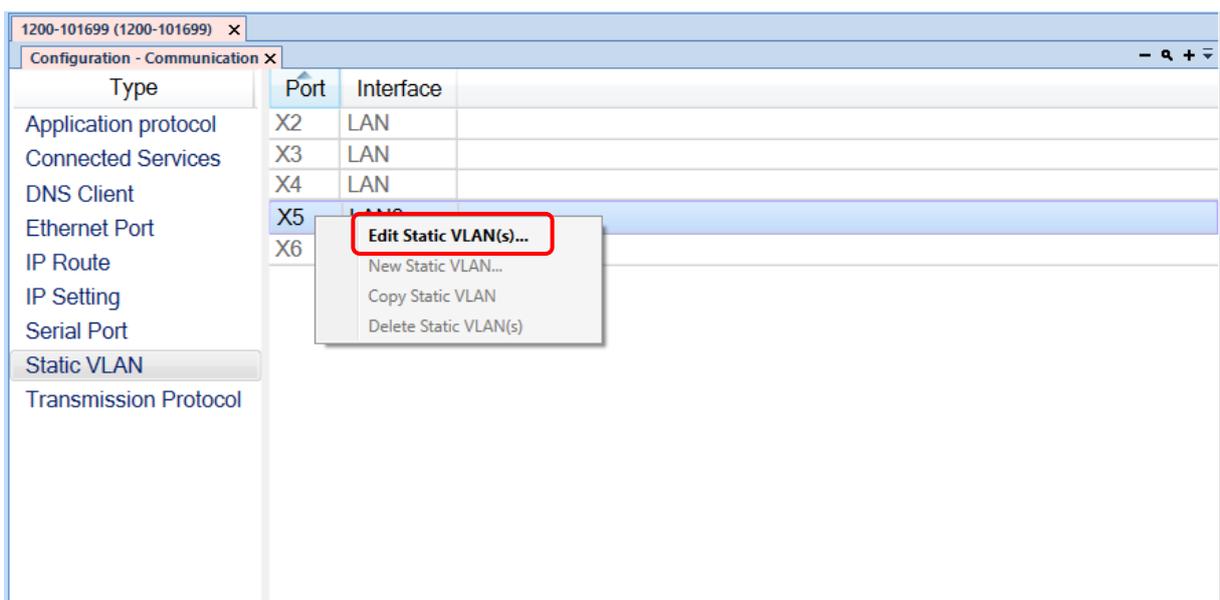
Installation

Now you have write access on the PC.

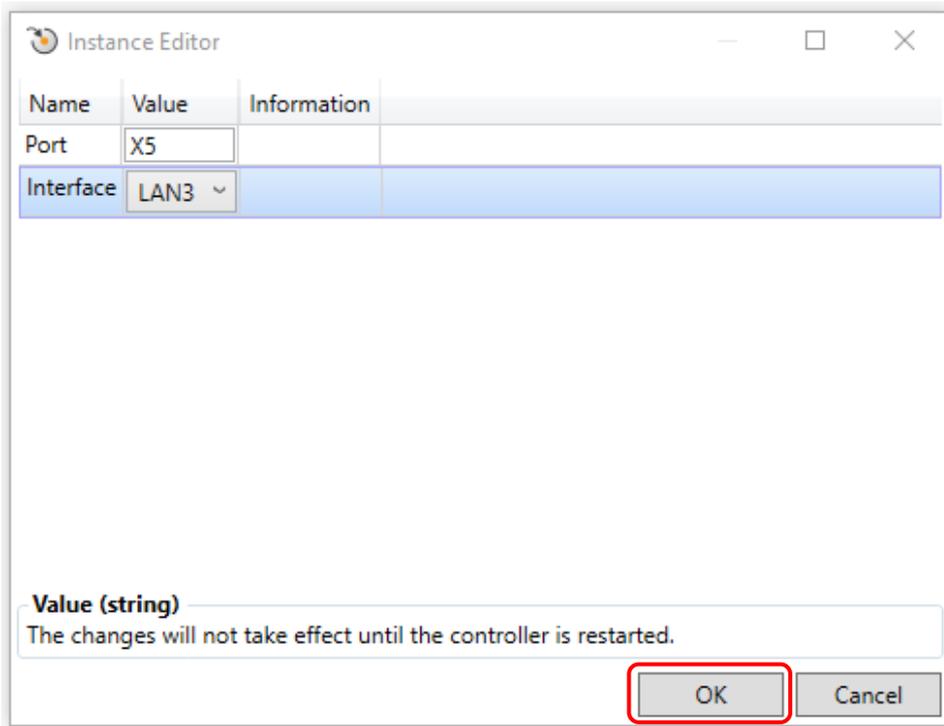
- On the Controller tab expand the controller tree and then the **configuration** tree
- Double click on the **Communication** topic



- Select **Static VLAN**.
- Right click on **X5** and select **Edit Static VLAN(s)....**



- On the **Interface** parameter select **LAN3** and press **OK**



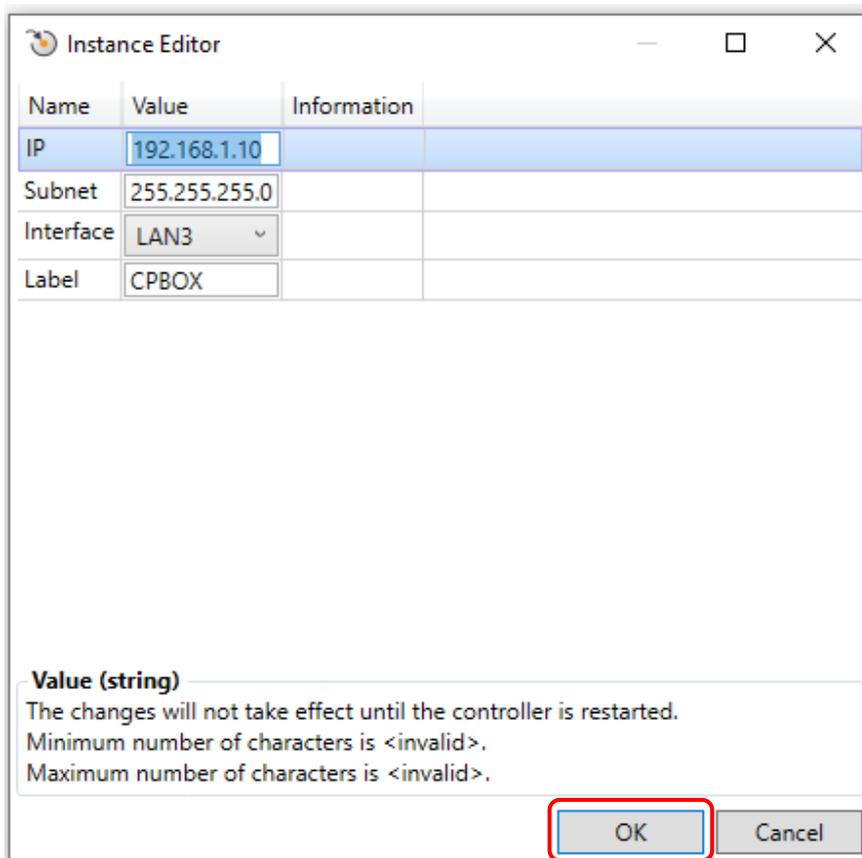
Instance Editor

| Name | Value | Information |
|-----------|-------|-------------|
| Port | X5 | |
| Interface | LAN3 | |

Value (string)
The changes will not take effect until the controller is restarted.

OK Cancel

- Go back to the **Communication** topic.
- Select **IP Setting**.
- Right click and select **New IP Setting...**



Instance Editor

| Name | Value | Information |
|-----------|---------------|-------------|
| IP | 192.168.1.10 | |
| Subnet | 255.255.255.0 | |
| Interface | LAN3 | |
| Label | CPBOX | |

Value (string)
The changes will not take effect until the controller is restarted.
Minimum number of characters is <invalid>.
Maximum number of characters is <invalid>.

OK Cancel

Installation

- Configure the IP address. The default IP address for the OnRobot Compute Box is 192.168.1.1. You must put your robot on the IP address 192.168.1.X. Below, we have used the address **192.168.1.10** and 255.255.255.0 for subnet mask. On the Interface parameter select **LAN3**. Name the Label parameter that you want, we have used the **CPBOX** name. Finally press **OK**
- Power cycle the robot controller manually for these changes to take effect. (You may perform the power cycling after completing the rest of the robot installation steps within this section.)

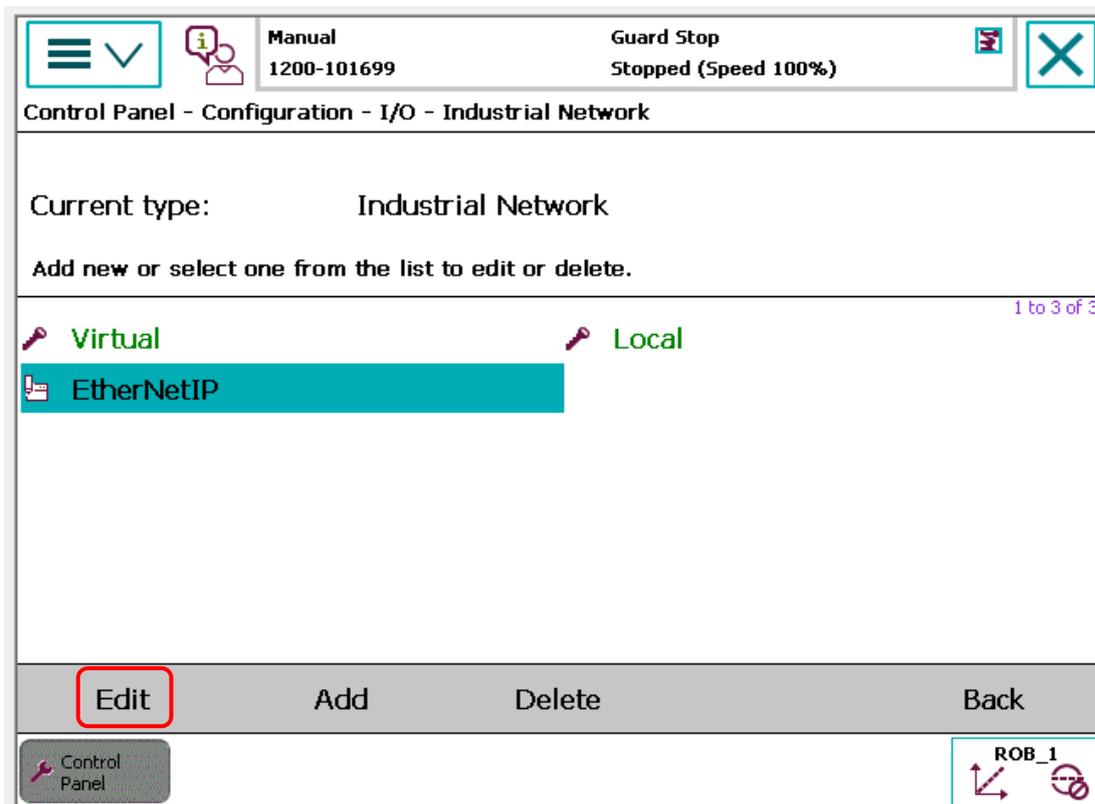
4.4.4 Setup the robot as a Scanner or as an Adapter

Robot as a Scanner

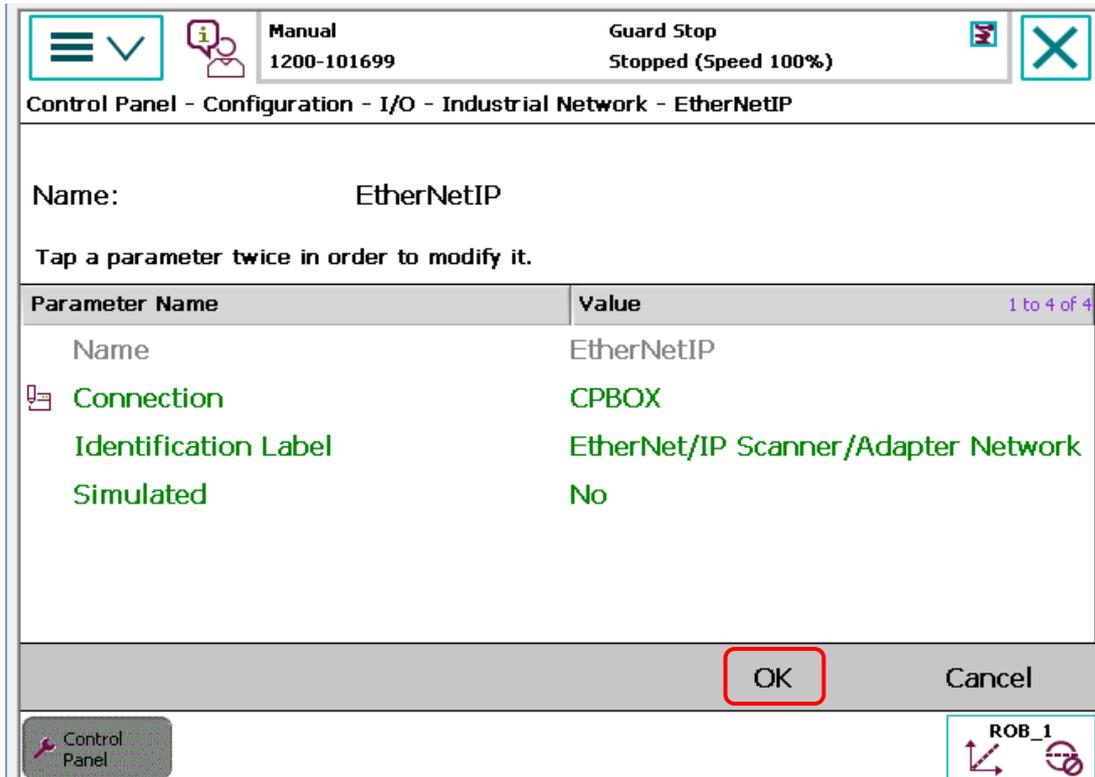
Flexpendant

For proper communication to the Compute Box and accessory, we must first set up the robot as a scanner using the robot Flexpendant.

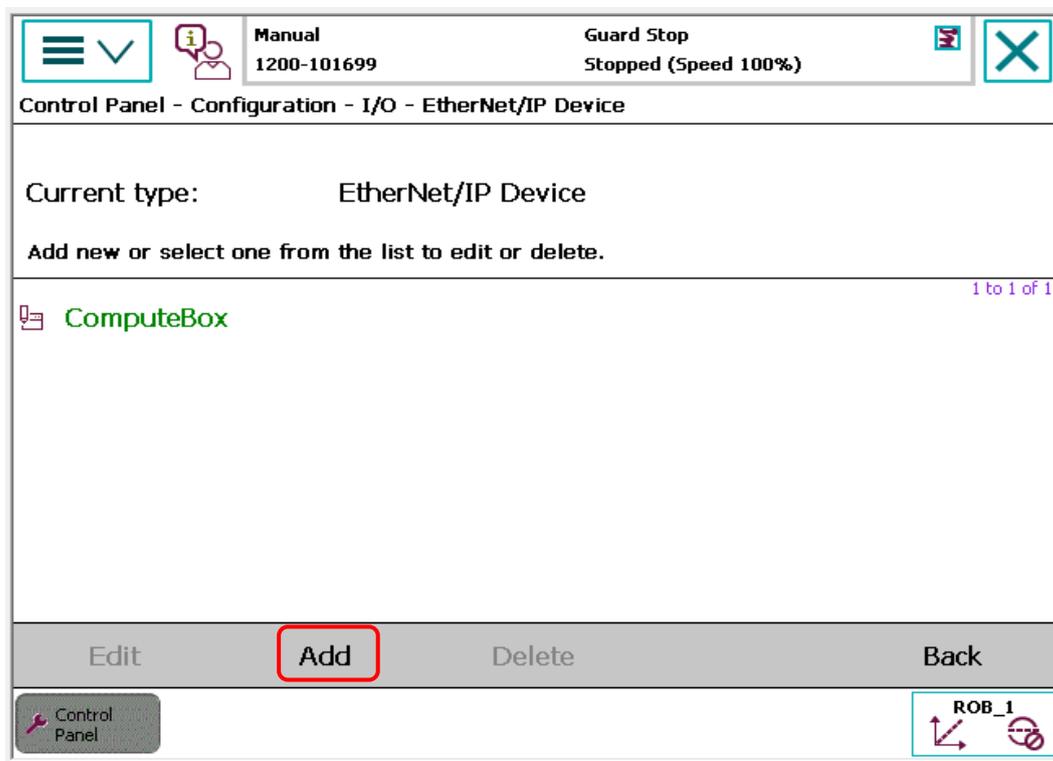
- Press **MENU**.
- Select **Control Panel**.
- Press **Configuration**.
- In the Topics list box select **I/O**.
- Select **Industrial Network**
- Select **EtherNetIP** and press **Edit**.



- On the Connection parameter, select one previously configured IP Setting in topic Communication., in our case this is **CPBOX**. On the Identification Label type: **EtherNet/IP Scanner/Adapter Network**. Finally press **OK**.



- Go back to the **I/O** topic.
- Select **EtherNet/IP Device** and Press **Add**.



- The following data must be manually entered on the robot teach pendant:

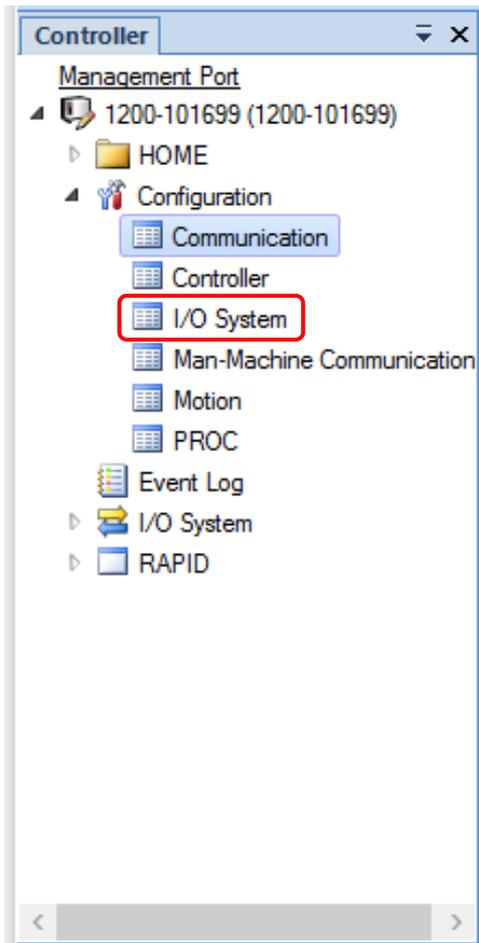
| Description | Value |
|--------------------------------------|-----------------------|
| Name | ComputeBox (optional) |
| StateWhenStartup | Activated |
| TrustLevel | DefaultTrustLevel |
| Simulated | 0 |
| RecoveryTime | 5000 |
| Address | 192.168.1.1 |
| Vendor ID | 0 |
| Product Code | 0 |
| Device Type | 0 |
| Output Assembly | 201 |
| Input Assembly | 200 |
| Configuration Assembly | 0 |
| Ownership | Exclusive |
| Input Connection Type | Point to Point |
| Connection Priority | Low |
| Output size (bytes) | 64 |
| Input size (bytes) | 64 |
| Output RPI (us) | 8000 |
| Input RPI (us) | 8000 |
| Quick Connect | Not Used |
| Connection Timeout Multiplier | 4 |

Once the appropriate information is entered, you are ready to map EtherNet/IP inputs to robot inputs.

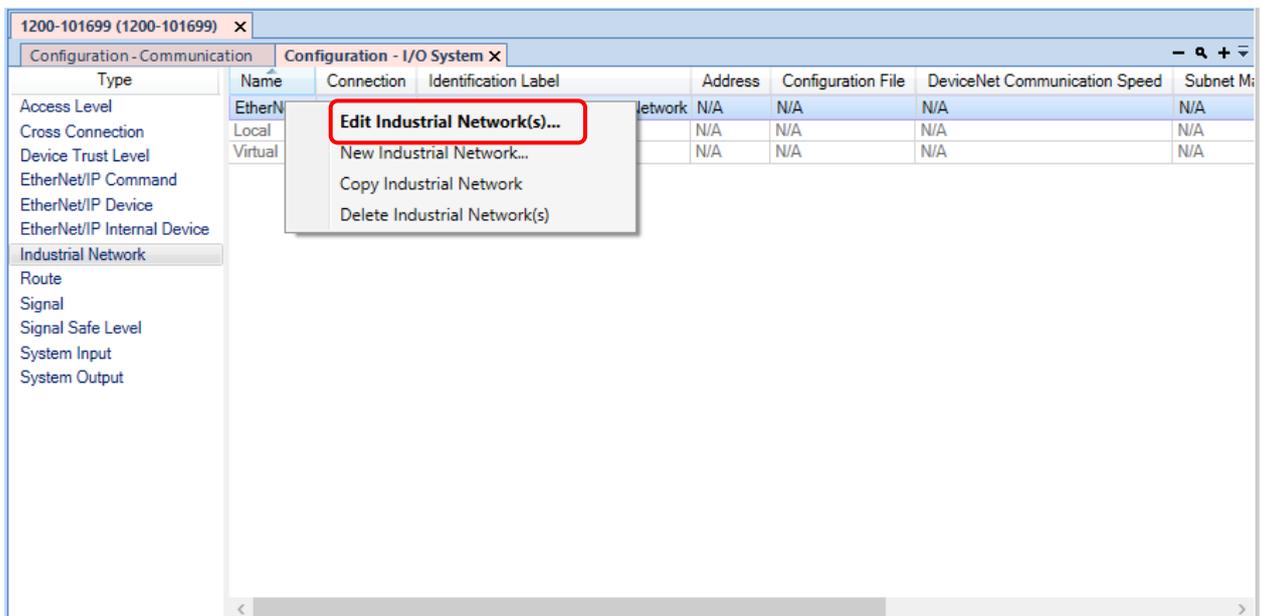
Robotstudio

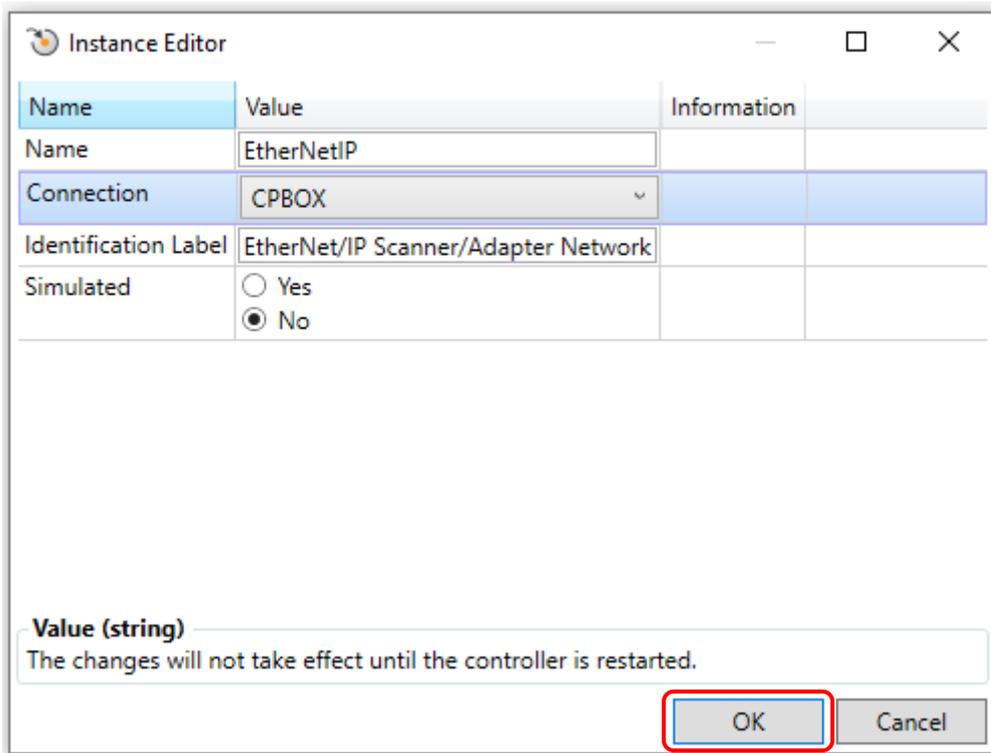
We can also configure the robot as scanner in the computer.

- On the Controller tab expand the controller tree and then the **configuration** tree.
- Double click on the **I/O System** topic.

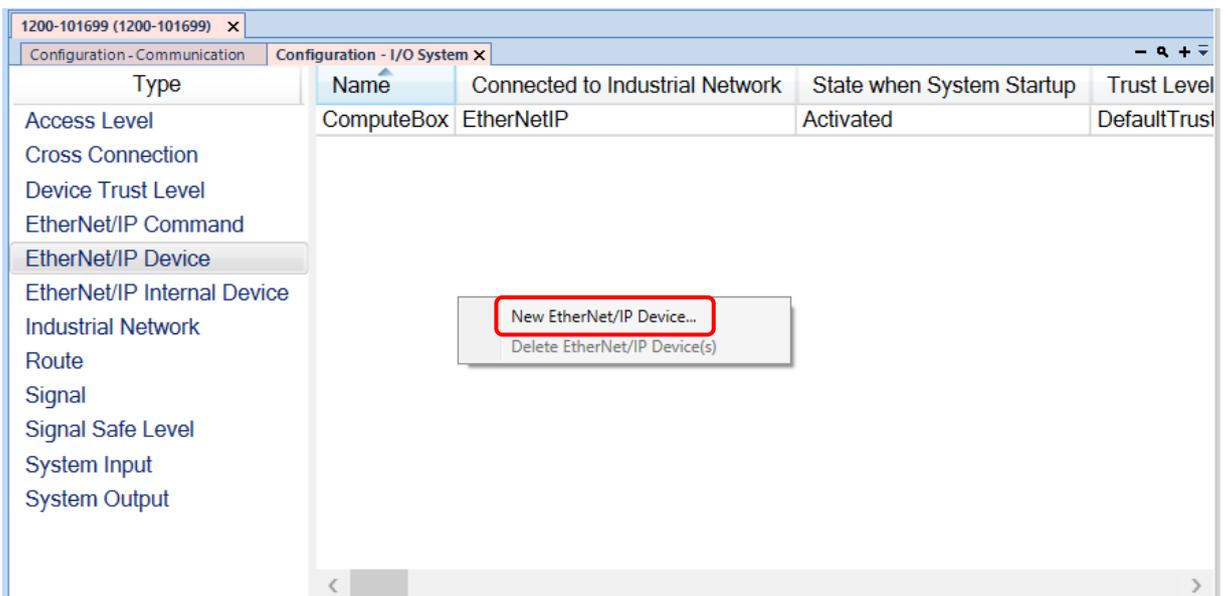


- Select **Industrial Network**.
- On the **EtherNetIP** row right click and **Edit Industrial Network(s)...**





- On the Connection parameter, select one previously configured IP Setting in topic Communication., in our case this is **CPBOX**.
 - On the **Identification Label** type: **EtherNet/IP Scanner/Adapter Network**.
 - Finally press **OK**.
-
- Go back to the **I/O** topic.
 - Select **EtherNet/IP Device**.
 - Right click and select **New EtherNet/IP Device ...**



- The following data must be entered:

Instance Editor
— □ ×

| Name | Value | Information |
|---------------------------------|--|-------------|
| Name | <input type="text" value="CPBOX"/> | |
| Connected to Industrial Network | <input type="text" value="EtherNet/IP"/> | |
| State when System Startup | <input type="text" value="Activated"/> ▾ | |
| Trust Level | <input type="text" value="DefaultTrustLevel"/> ▾ | |
| Simulated | <input type="radio"/> Yes <input checked="" type="radio"/> No | |
| Vendor Name | <input type="text"/> | |
| Product Name | <input type="text"/> | |
| Recovery Time (ms) | <input type="text" value="5000"/> | |
| Identification Label | <input type="text"/> | |
| Address | <input type="text" value="192.168.1.1"/> | |
| Vendor ID | <input type="text" value="0"/> | |
| Product Code | <input type="text" value="0"/> | |
| Device Type | <input type="text" value="0"/> | |
| Output Assembly | <input type="text" value="201"/> | |
| Input Assembly | <input type="text" value="200"/> | |
| Configuration Assembly | <input type="text" value="0"/> | |
| Ownership | <input type="text" value="Exclusive"/> ▾ | |
| Input Connection Type | <input type="text" value="Point to point"/> ▾ | |
| Connection Priority | <input type="text" value="Low"/> ▾ | |
| Output Size (bytes) | <input type="text" value="64"/> | |
| Input Size (bytes) | <input type="text" value="64"/> | |
| Output RPI (us) | <input type="text" value="8000"/> | |
| Input RPI (us) | <input type="text" value="8000"/> | |
| Quick Connect | <input type="text" value="Not Used"/> ▾ | |
| Connection Timeout Multiplier | <input type="text" value="4"/> ▾ | |

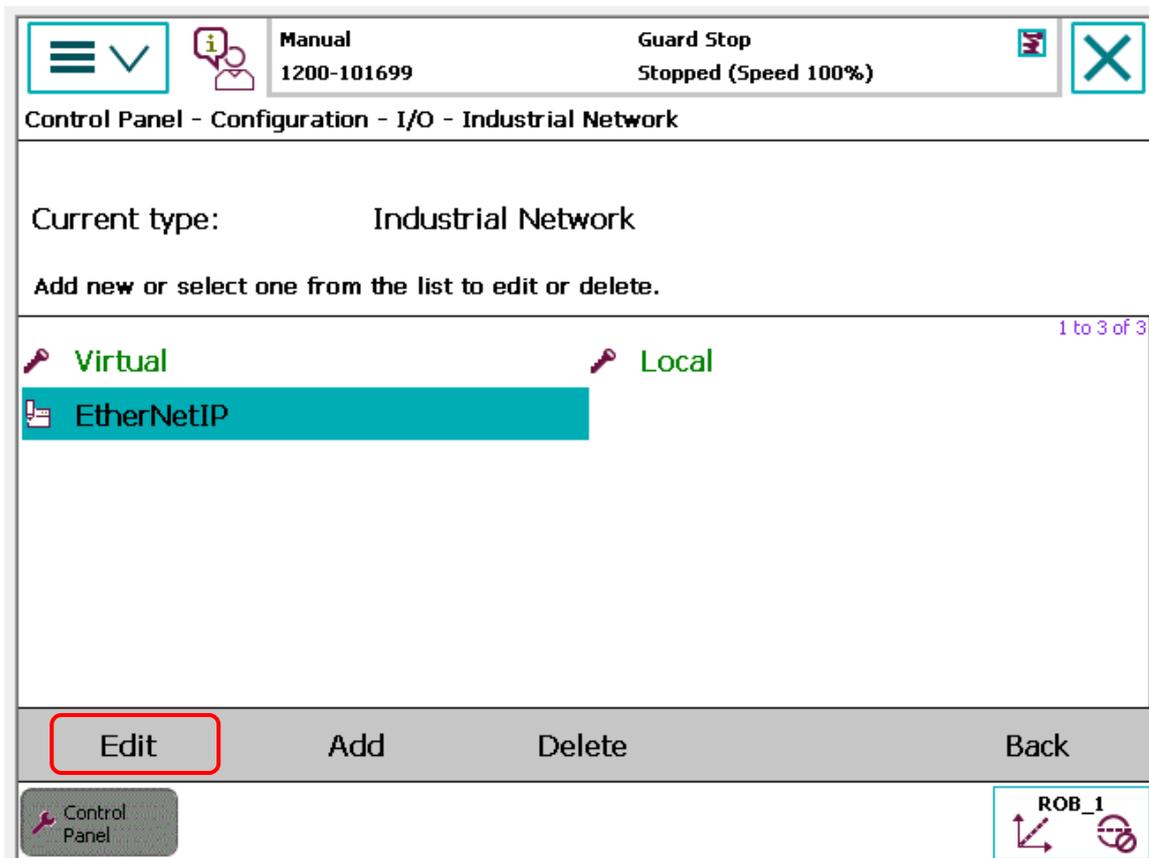
Once the appropriate information is entered, you are ready to map EtherNet/IP inputs to robot inputs.

Robot as Adapter

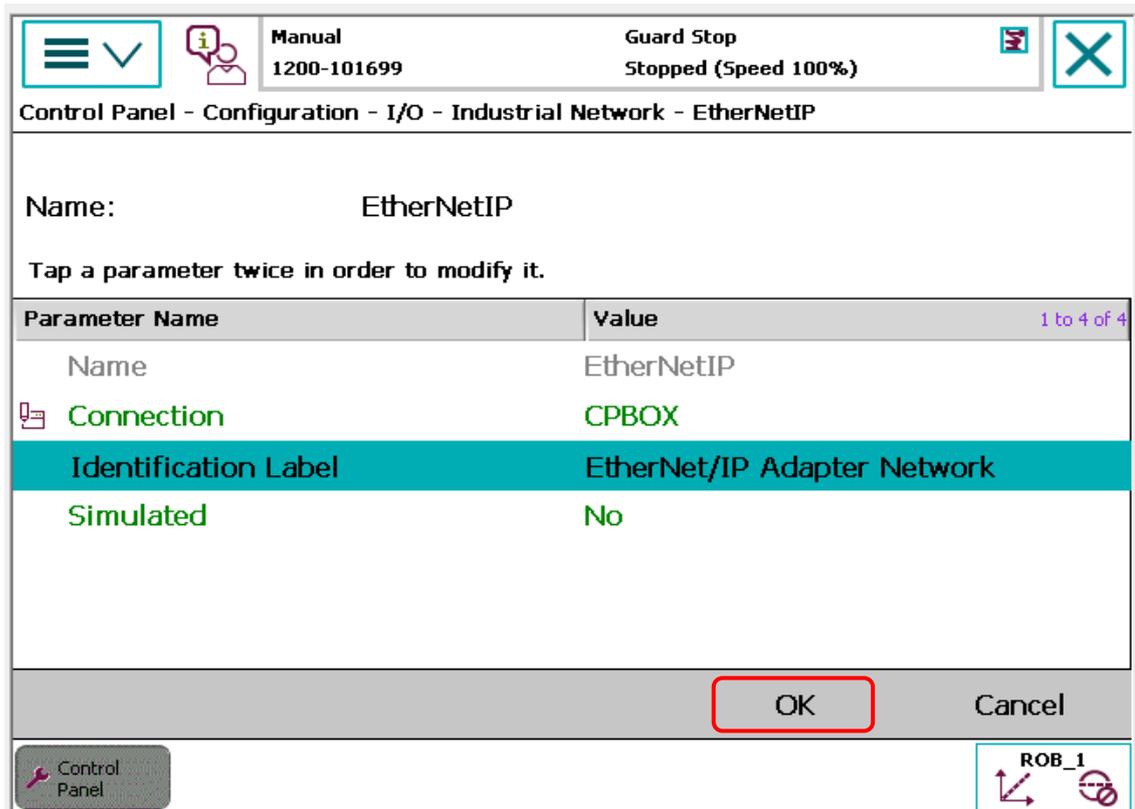
Flexpendant

For proper communication to the Compute Box and accessory, we must first set up the robot as an adapter using the robot Flexpendant.

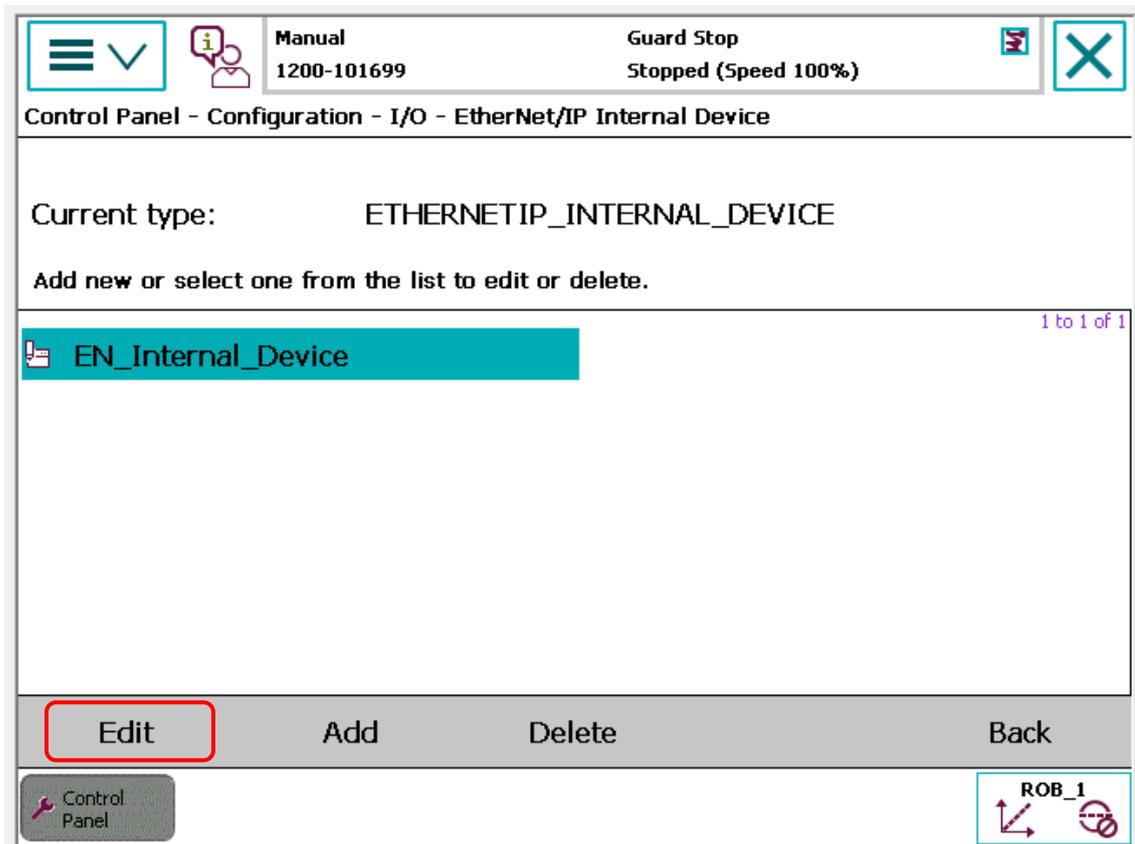
- Press **MENU**.
- Select **Control Panel**.
- Press **Configuration**.
- In the Topics list box select **I/O**.
- Select **Industrial Network**
- Select **EtherNetIP** and press **Edit**.



- On the Connection parameter, select one previously configured IP Setting in topic Communication., in our case this is **CPBOX**. On the Identification Label type: **EtherNet/IP Adapter Network**. Finally press **OK**.



- Go back to the I/O topic.
- Select **EtherNet/IP Internal Device**
- Select **EN_Internal_Device** and press **Edit**.



- The following data must be manually entered on the robot teach pendant:

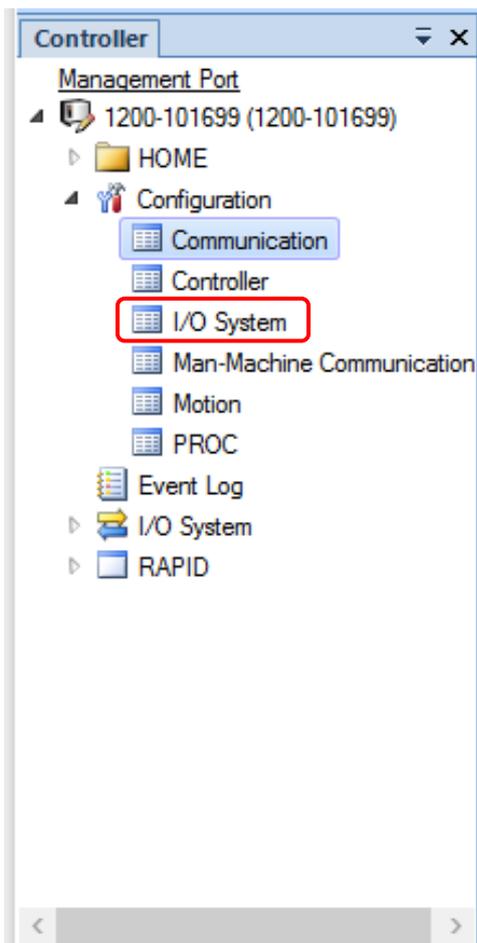
| Description | Value |
|-------------|--------------------|
| Name | EN_Internal_device |
| VendorName | ABB Robotics |
| ProductName | 0 |
| Label | |
| InputSize | 64 |
| OutputSize | 64 |

Once the appropriate information is entered, you are ready to map EtherNet/IP inputs to robot inputs.

Robotstudio

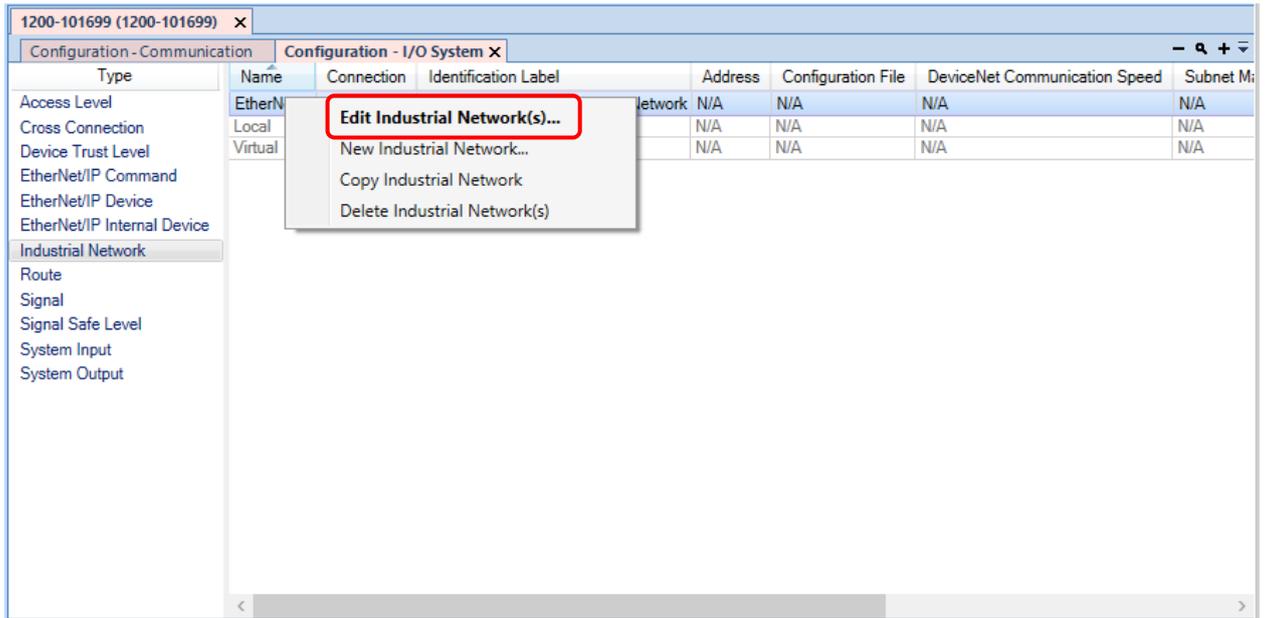
We can also configure the robot as scanner on the computer.

- On the Controller tab expand the controller tree and then the **configuration** tree.
- Double click on the **I/O System** topic.

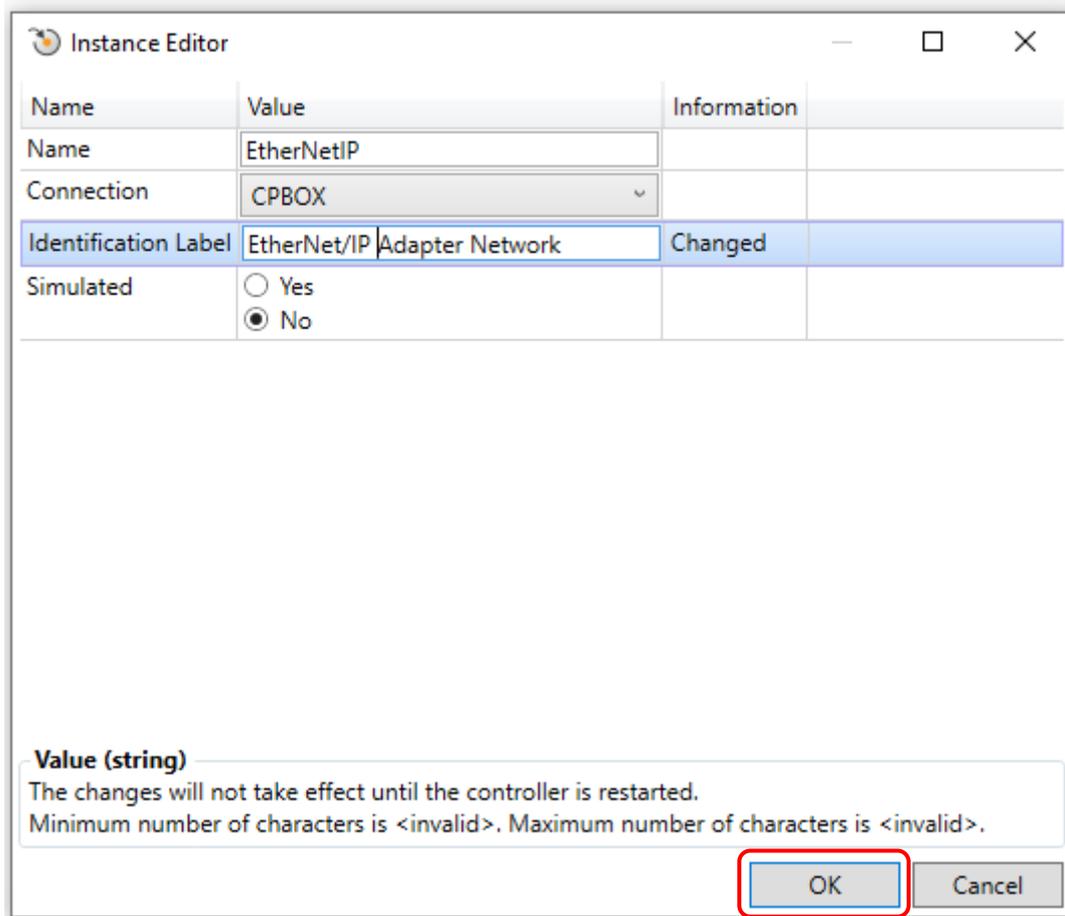


- Select **Industrial Network**.

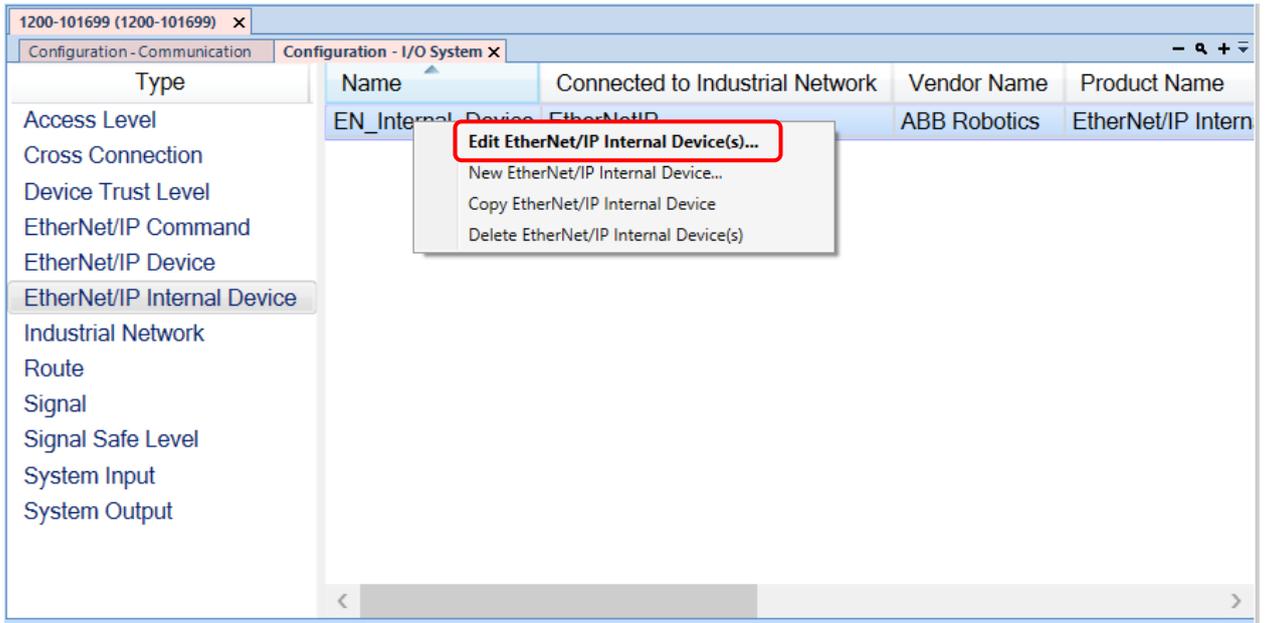
- On the **EtherNetIP** row right click and **Edit Industrial Network(s)...**



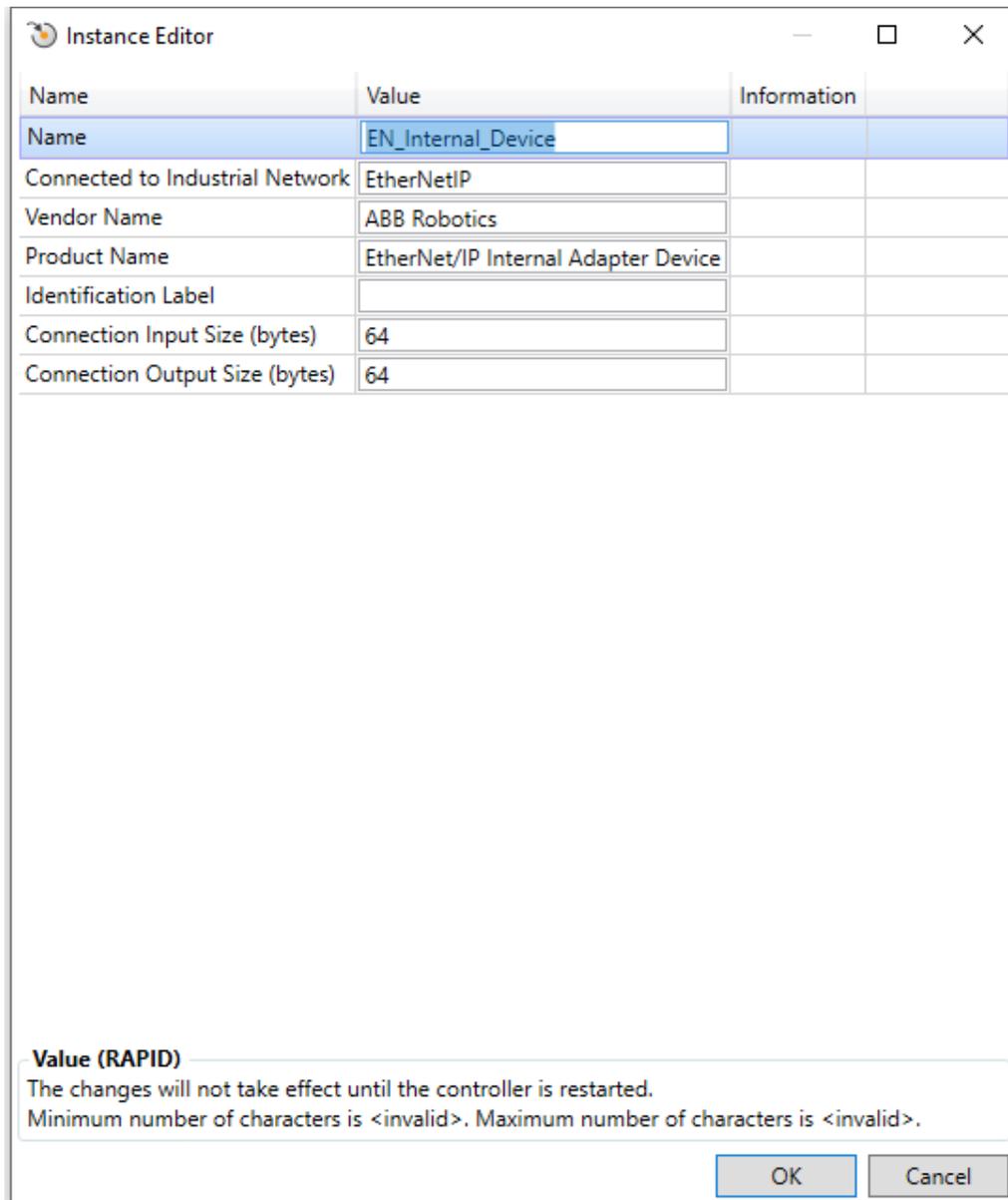
- On the Connection parameter, select one previously configured IP Setting in topic Communication., in our case this is **CPBOX**. On the Identification Label type: **EtherNet/IP Adapter Network**. Finally press **OK**.



- Go back to the **I/O** topic.
- Select **EtherNet/IP Internal Device**.
- Right click on the **EN_Internal_Device** and select Edit **EtherNet/IP Internal Device(s)...**



- The following data must be entered:



4.4.5 Map EtherNet/IP inputs/outputs to the robot

This step is mostly common for the Robot as a Scanner and Adapter.

The robot and Compute Box communicate through implicit messaging.

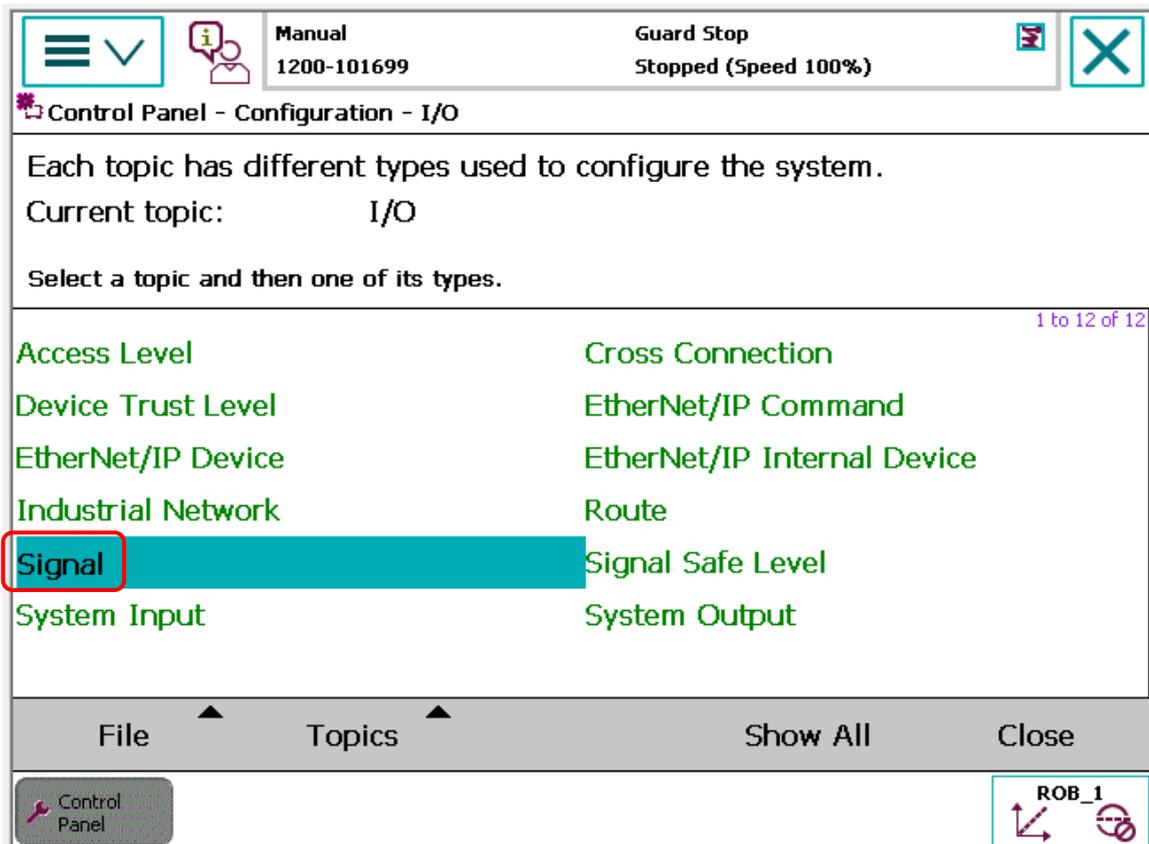


NOTE:

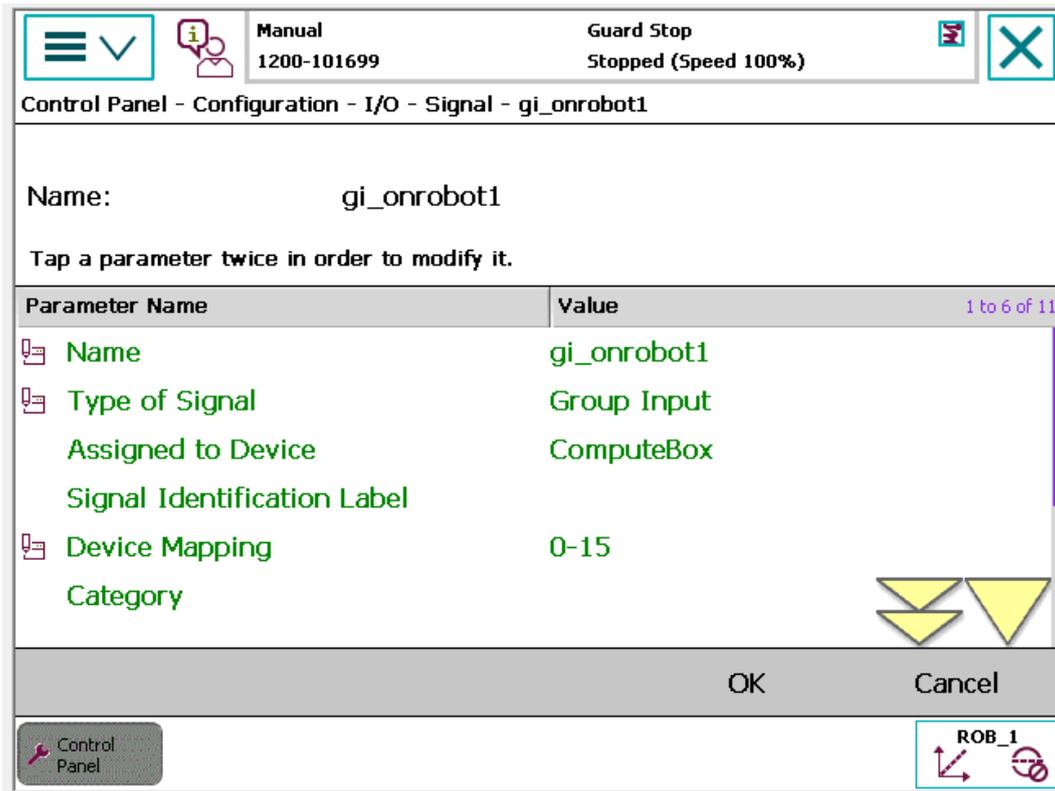
When discussing mapping information, all inputs and outputs are from the perspective of the robot.

Flexpendant

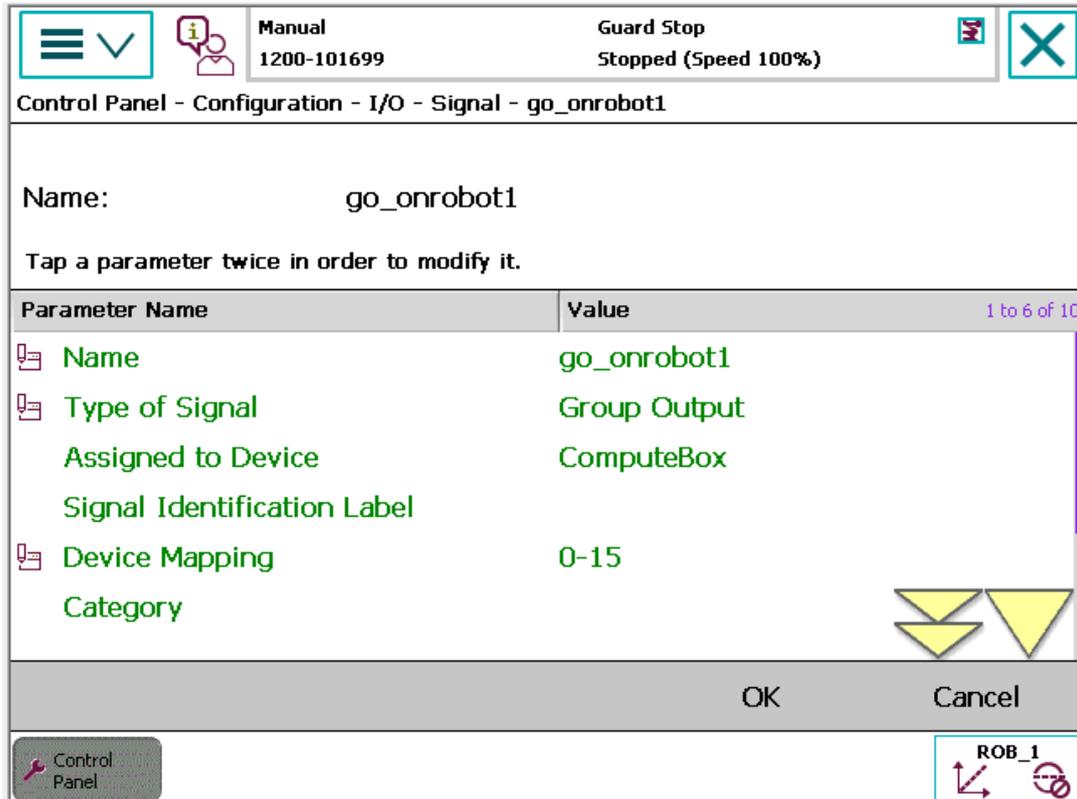
- Press **MENU**.
- Select **Control Panel**.
- Press **Configuration**.
- In the Topics list box select **I/O**.
- Select **Signal**.



- Select **Add** and the following data must be entered for the first input:



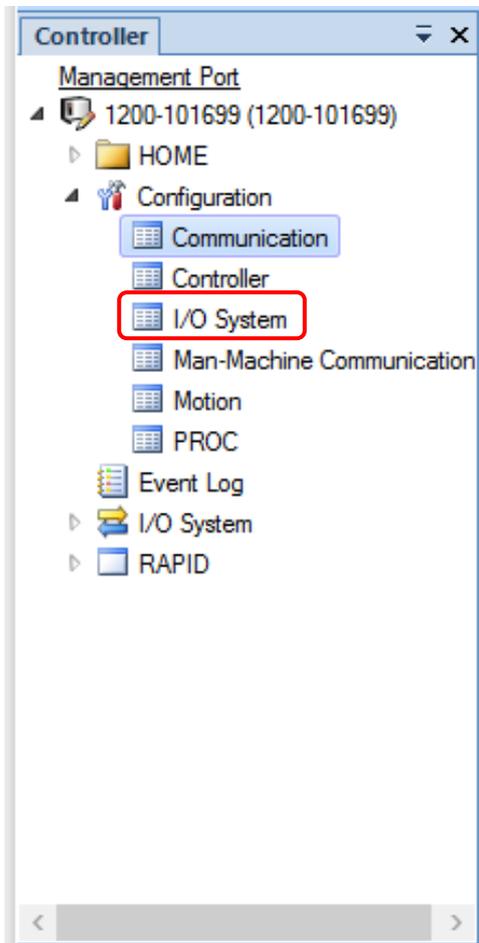
- The assigned to device parameter is **ComputeBox** if the robot is scanner or **EN_Internal_Device** if the robot is adapter.
- Select **Add** and the following data must be entered for the first output:



- You can find in the table below all the I/O-s that you need to map

RobotStudio

- On the Controller tab expand the controller tree and then the **configuration** tree
- Double click on the **I/O System** topic



- Select **Signal**
- Right click and select **New Signal ...**
- The following data must be entered for the first input:

| Name | Value | Information |
|-----------------------------|--|-------------|
| Name | gi_onrobot1 | |
| Type of Signal | Group Input | |
| Assigned to Device | ComputeBox | |
| Signal Identification Label | | |
| Device Mapping | 0-15 | |
| Category | | |
| Access Level | Default | |
| Default Value | 0 | |
| Filter Time Passive (ms) | 0 | |
| Filter Time Active (ms) | 0 | |
| Invert Physical Value | <input type="radio"/> Yes <input checked="" type="radio"/> No | |

Value (RAPID)
 The changes will not take effect until the controller is restarted.
 Minimum number of characters is <invalid>. Maximum number of characters is <invalid>.

OK Cancel

- The assigned to device parameter is **ComputeBox** if the robot is scanner or **EN_Internal_Device** if the robot is adapter.
- The following data must be entered for the first output:

| Name | Value | Information |
|-----------------------------|--|-------------|
| Name | go_onrobot1 | |
| Type of Signal | Group Output | |
| Assigned to Device | ComputeBox | |
| Signal Identification Label | | |
| Device Mapping | 0-15 | |
| Category | | |
| Access Level | All | |
| Default Value | 0 | |
| Invert Physical Value | <input type="radio"/> Yes <input checked="" type="radio"/> No | |
| Safe Level | DefaultSafeLevel | |

Value (RAPID)
 The changes will not take effect until the controller is restarted.
 Minimum number of characters is <invalid>. Maximum number of characters is <invalid>.

OK Cancel

- You can find in the table below all the I/O-s that you need to map

- You need to map 32 Input:

| Name | Type | Assigned to Device | Device Mapping |
|--------------|------|--|----------------|
| gi_onrobot1 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 0-15 |
| gi_onrobot2 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 16-31 |
| gi_onrobot3 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 32-47 |
| gi_onrobot4 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 48-63 |
| gi_onrobot5 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 64-79 |
| gi_onrobot6 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 80-95 |
| gi_onrobot7 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 96-111 |
| gi_onrobot8 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 112-127 |
| gi_onrobot9 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 128-143 |
| gi_onrobot10 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 144-159 |
| gi_onrobot11 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 160-175 |
| gi_onrobot12 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 176-191 |
| gi_onrobot13 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 192-207 |
| gi_onrobot14 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 208-223 |
| gi_onrobot15 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 224-239 |
| gi_onrobot16 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 240-255 |
| gi_onrobot17 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 256-271 |
| gi_onrobot18 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 272-287 |
| gi_onrobot19 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 288-303 |
| gi_onrobot20 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 304-319 |
| gi_onrobot21 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 320-335 |
| gi_onrobot22 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 336-351 |
| gi_onrobot23 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 352-367 |
| gi_onrobot24 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 368-383 |
| gi_onrobot25 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 384-399 |
| gi_onrobot26 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 400-415 |
| gi_onrobot27 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 416-431 |
| gi_onrobot28 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 432-447 |
| gi_onrobot29 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 448-463 |
| gi_onrobot30 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 464-479 |
| gi_onrobot31 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 480-495 |
| gi_onrobot32 | GI | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 496-511 |

**NOTE:**

All inputs must be mapped with the name that is used in the table and the device mapping also.

- You need to map 32 Output:

| Name | Type | Assigned to Device | Device Mapping |
|--------------|------|--|----------------|
| go_onrobot1 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 0-15 |
| go_onrobot2 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 16-31 |
| go_onrobot3 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 32-47 |
| go_onrobot4 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 48-63 |
| go_onrobot5 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 64-79 |
| go_onrobot6 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 80-95 |
| go_onrobot7 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 96-111 |
| go_onrobot8 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 112-127 |
| go_onrobot9 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 128-143 |
| go_onrobot10 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 144-159 |
| go_onrobot11 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 160-175 |
| go_onrobot12 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 176-191 |
| go_onrobot13 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 192-207 |
| go_onrobot14 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 208-223 |
| go_onrobot15 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 224-239 |
| go_onrobot16 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 240-255 |
| go_onrobot17 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 256-271 |
| go_onrobot18 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 272-287 |
| go_onrobot19 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 288-303 |
| go_onrobot20 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 304-319 |
| go_onrobot21 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 320-335 |
| go_onrobot22 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 336-351 |
| go_onrobot23 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 352-367 |
| go_onrobot24 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 368-383 |
| go_onrobot25 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 384-399 |
| go_onrobot26 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 400-415 |
| go_onrobot27 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 416-431 |
| go_onrobot28 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 432-447 |
| go_onrobot29 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 448-463 |
| go_onrobot30 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 464-479 |
| go_onrobot31 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 480-495 |
| go_onrobot32 | GO | ComputeBox (Scanner) or EN_Internal_Device (Adapter) | 496-511 |



NOTE:

All outputs must be mapped with the name that is used in the table and the device mapping also.

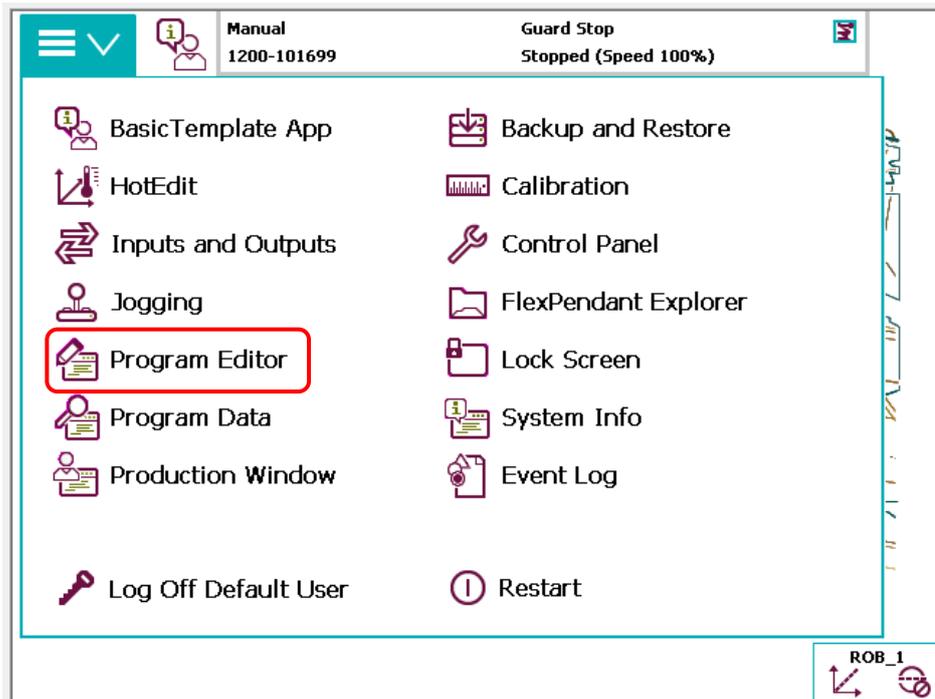
4.4.6 Upload the OnRobot functions to the robot

In order to make easier to use the OnRobot products, high level functions have been written are stored in the accompanying USB stick. You can load them up directly from the FlexPendant or from the PC using RobotStudio.

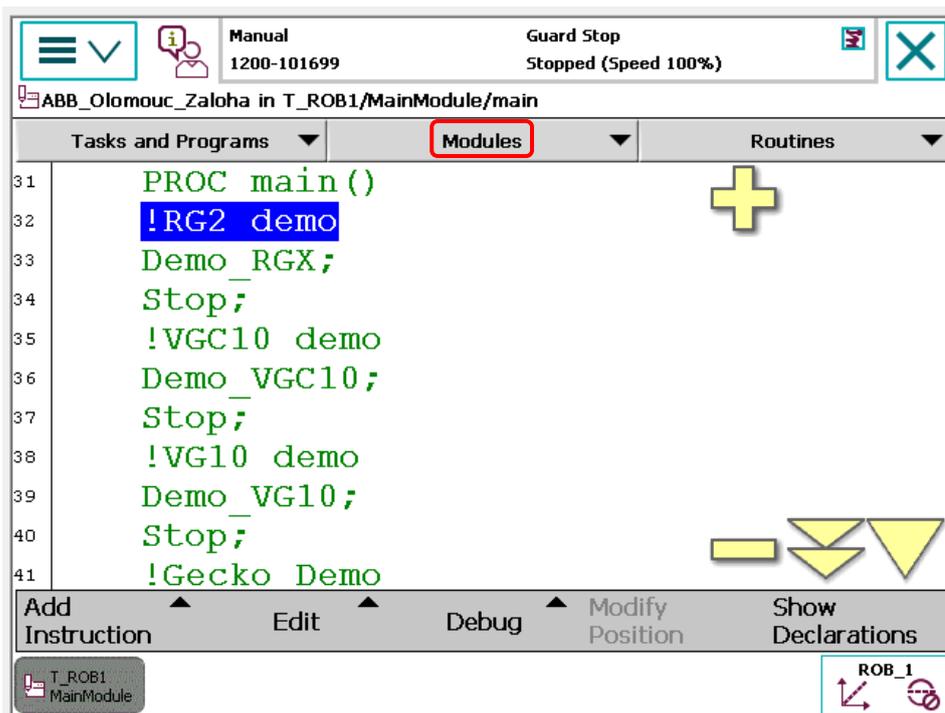
Flexpendant

To upload the OnRobot functions to the controller follow the steps below:

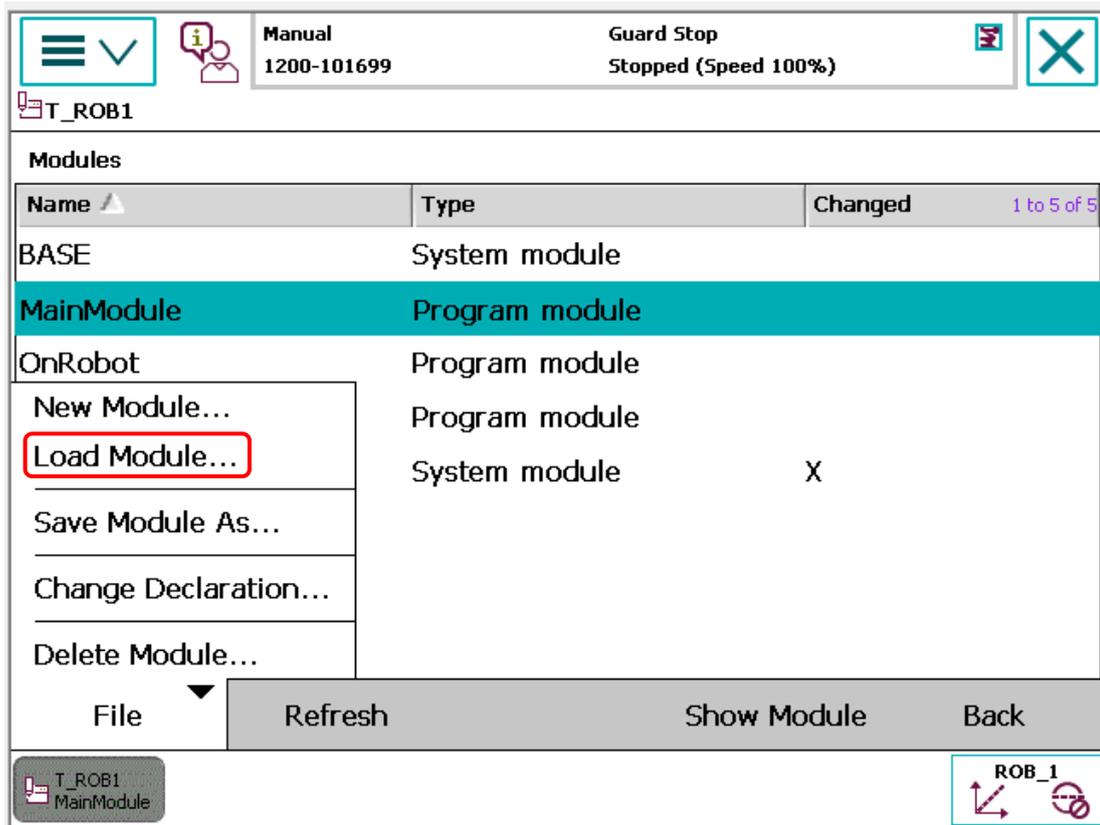
- Connect the USB stick to the Flexpendant or the controller.
- Select **Program editor** from the Menu.



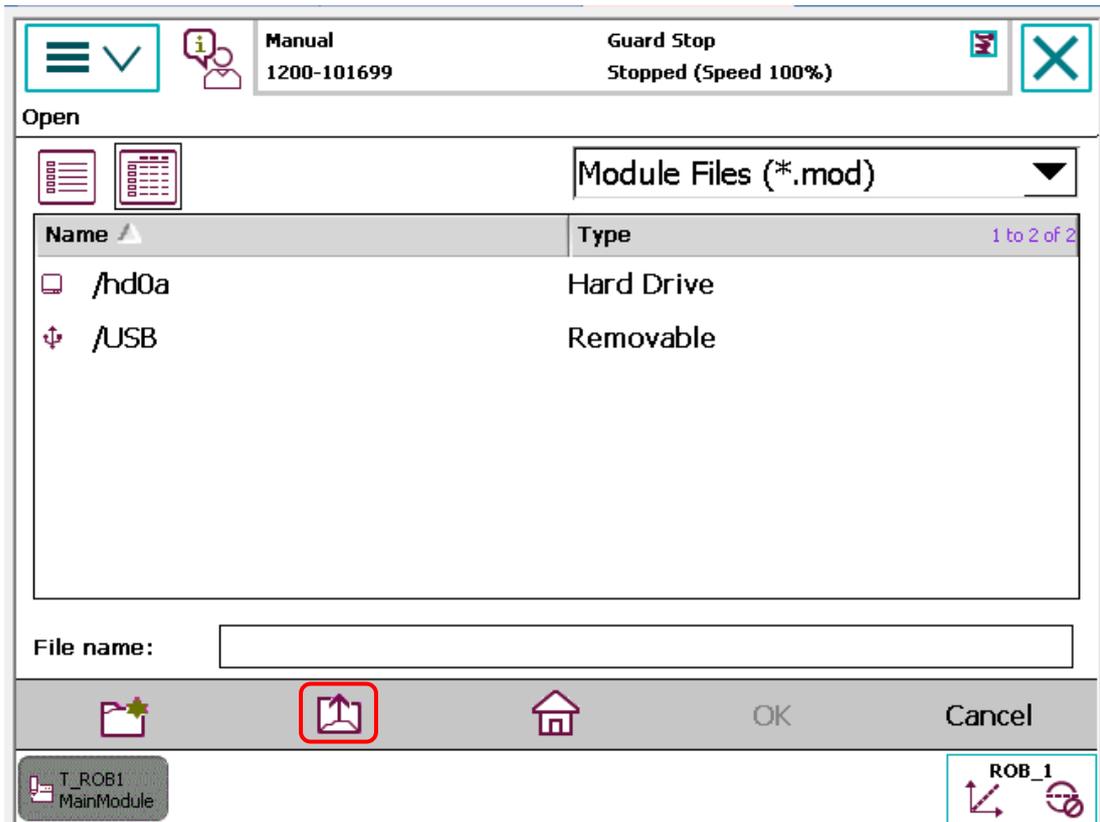
- Select **Modules**



- Press **Load Module** in the **File** menu



- Now use the **Up arrow** until you reach the USB stick

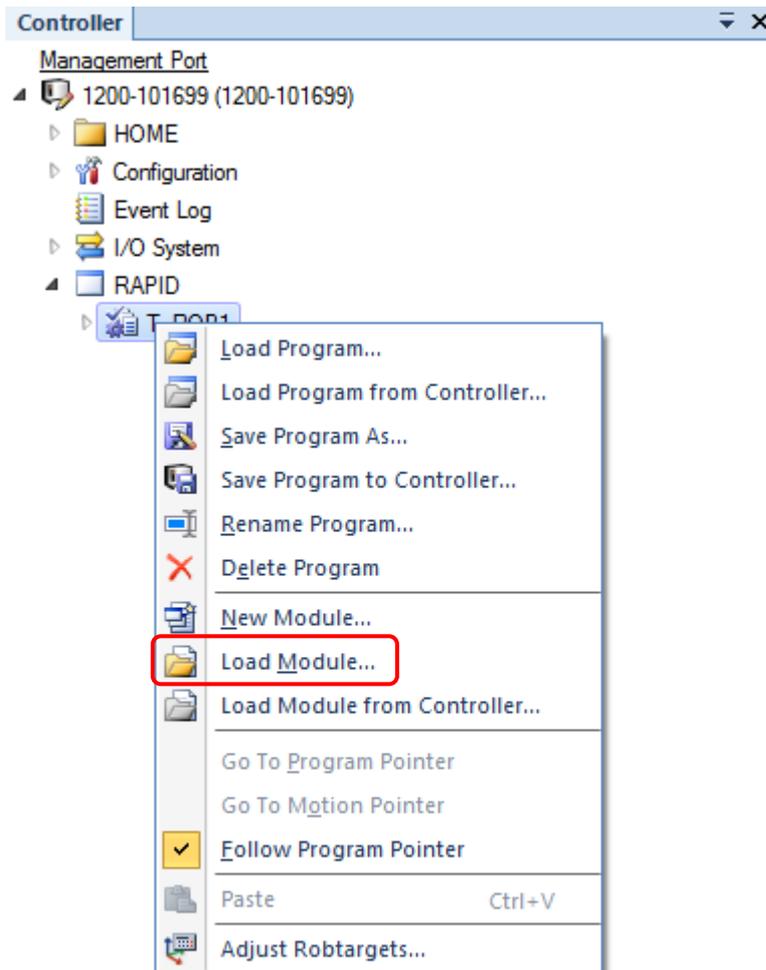


- From the USB choose the **Onrobot.mod**, and click **OK**

Robotstudio

To upload the OnRobot functions to the controller follow the steps below:

- Connect the controller with your PC
- On the Controller tab expand the controller tree and then the **RAPID** tree
- Right click on the **Task** (In this case: **T_ROB1**)
- Select **Load Module**



- Find the **Onrobot.mod** file and press **Open**

4.4.7 Upload MMC file

In order to use the OnRobot procedures and make them visible in **Add Instruction** tab you need to load the `MMC.cfg` file. The file stored in the USB stick. You can load them up directly from the FlexPendant or from the PC using RobotStudio.



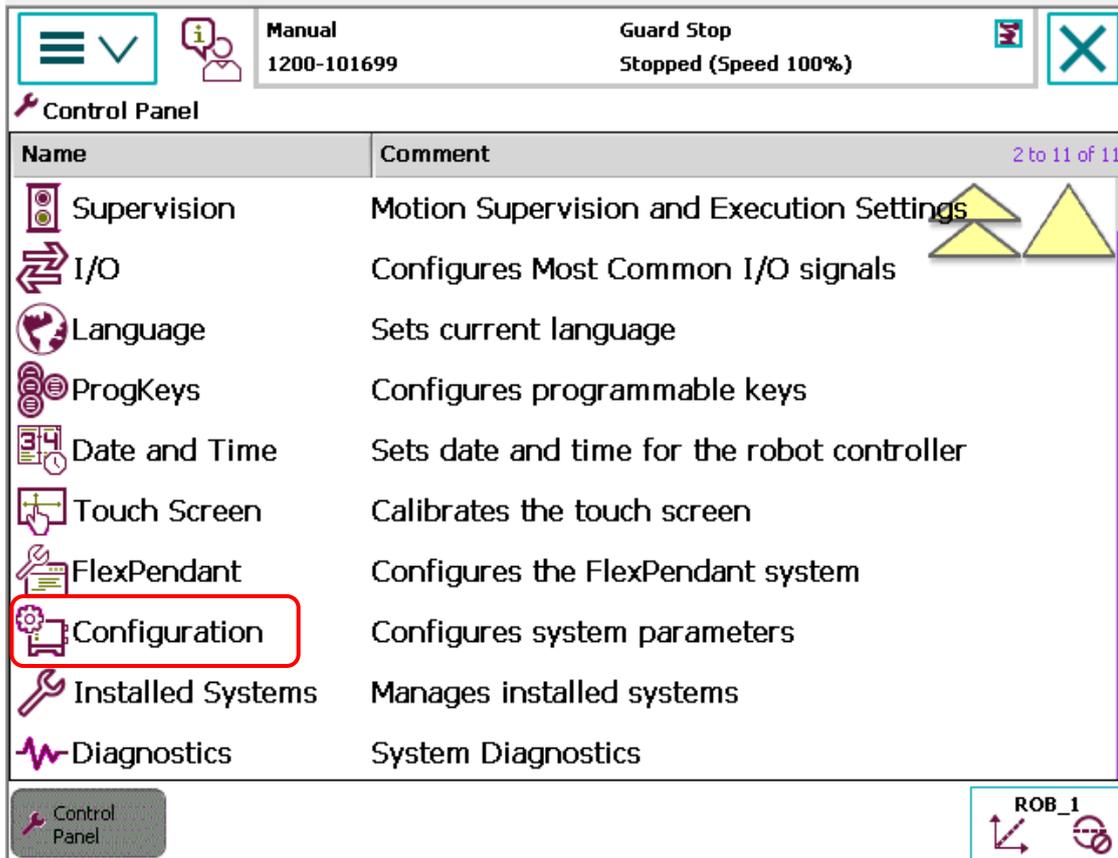
NOTE:

Make sure to create a robot backup before overwriting the `MMC.cfg`.

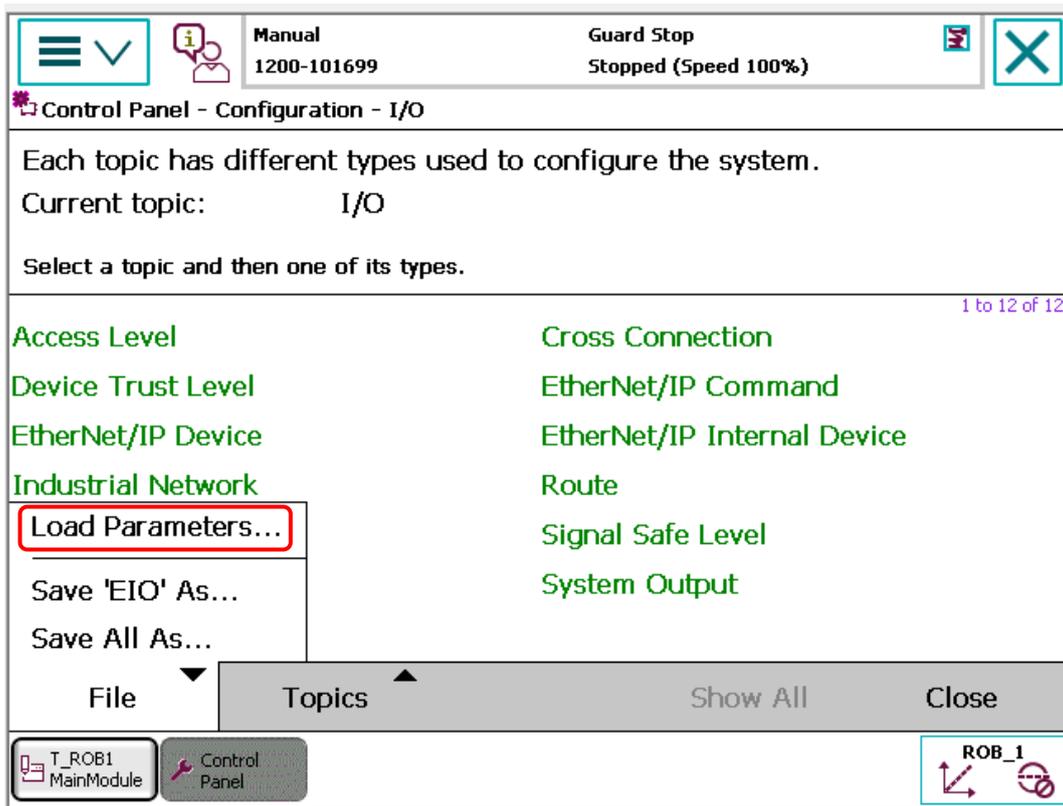
Flexpendant

To upload the OnRobot functions to the controller follow the steps below:

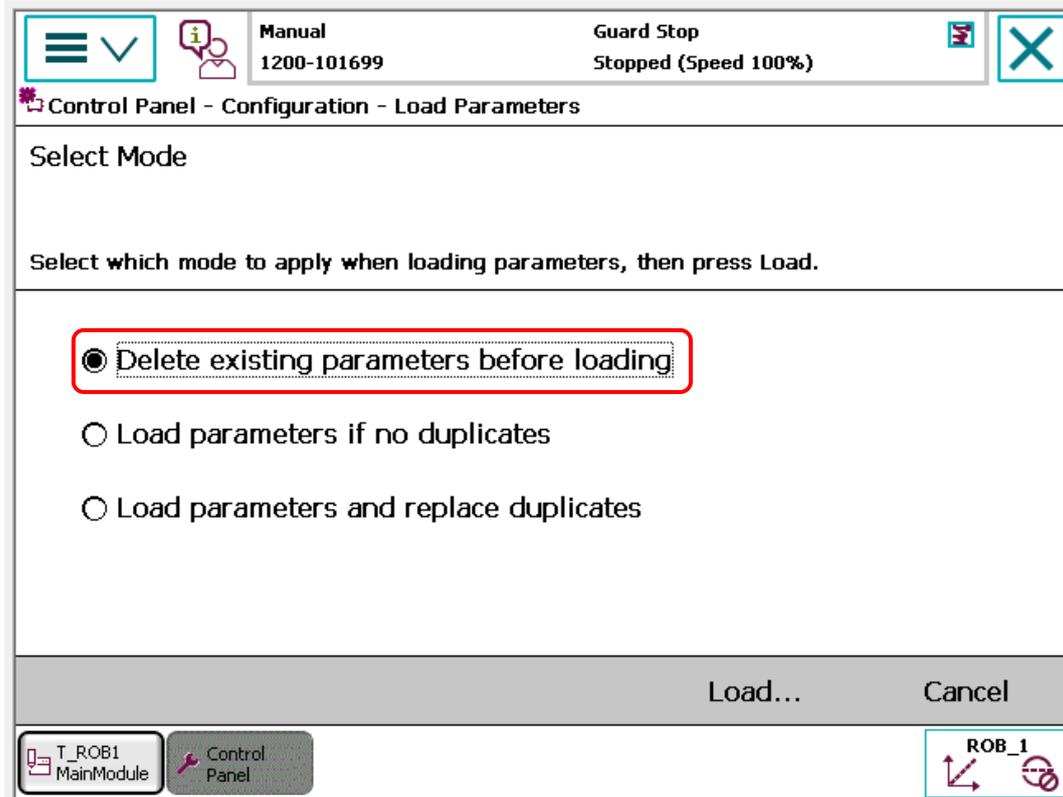
- Connect the USB stick to the Flexpendant or the controller.
- Select **Control Panel** from the menu.
- Press **Configuration**.



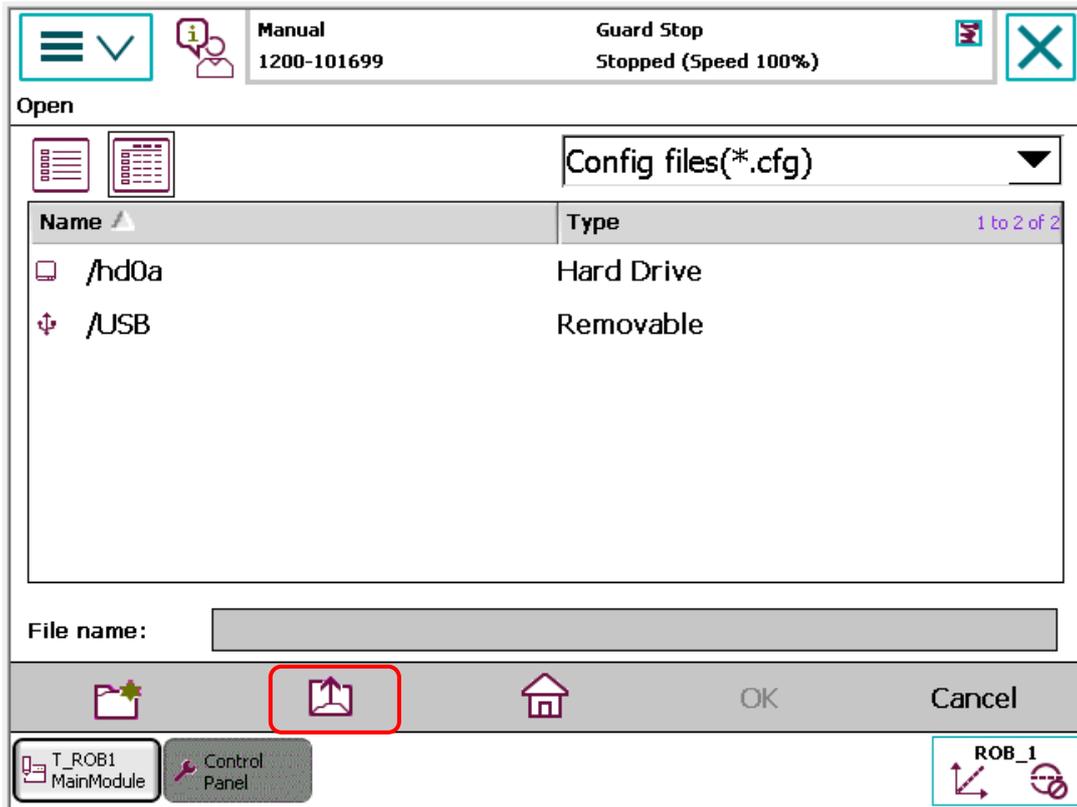
- Press **Load Parameters** in the **File** menu.



- Select **Delete existing parameters before loading**.



- Now use the **Up arrow** until you reach the USB stick.

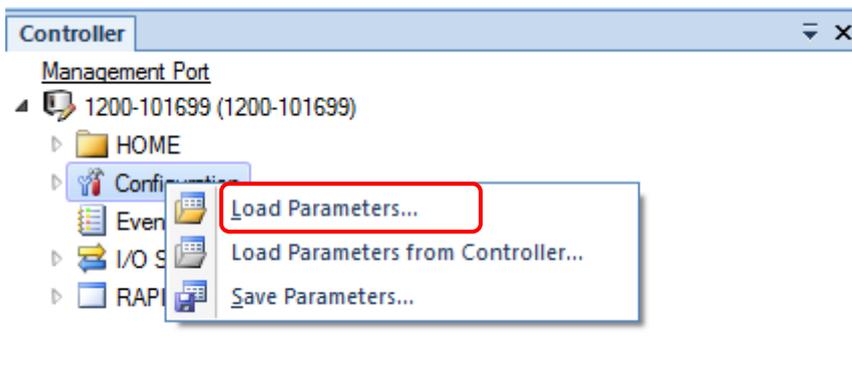


- From the USB choose the **MMC.cfg**, and click **OK**.

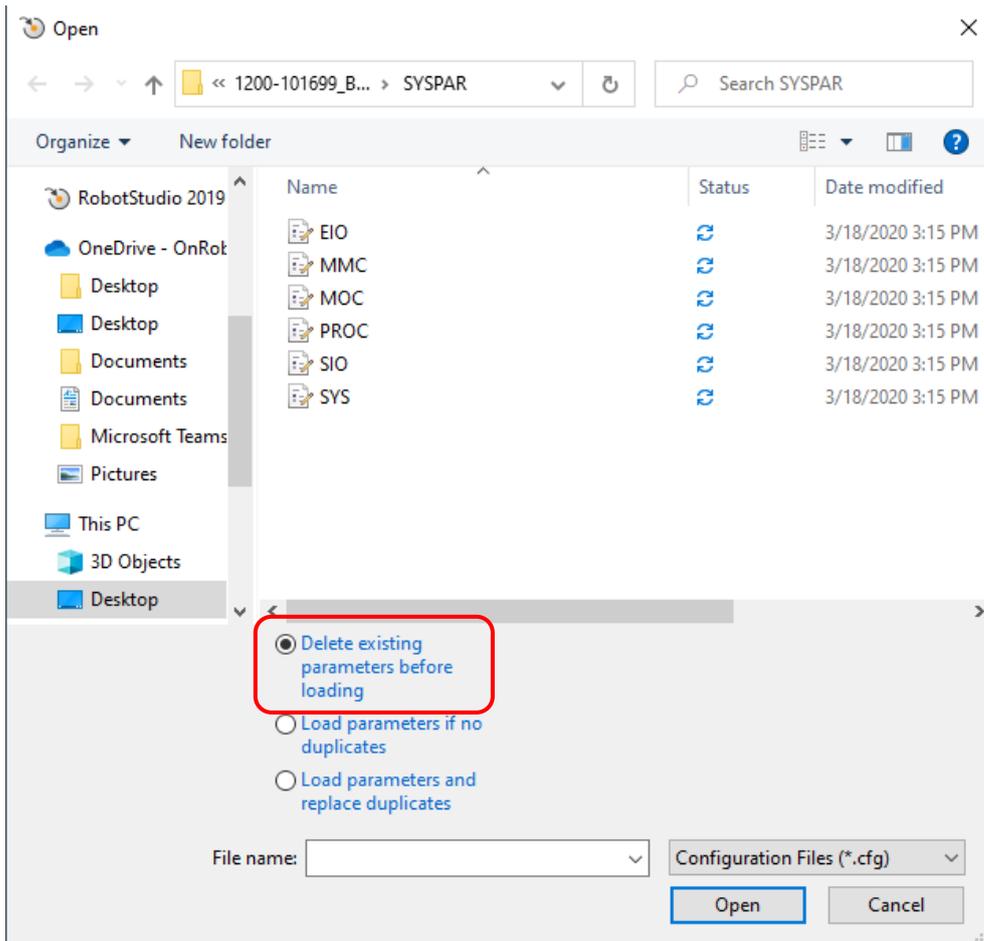
Robotstudio

To upload the MMC.cfg file to the controller follow the steps below:

- Connect the controller with your PC.
- Right click on the **Configuration**.
- Select **Load Parameters...**



- Pick **Delete existing parameters before loading**.



- Find the **MMC.cfg** file and press **Open**.

Software setup is finished.

5 Operation



NOTE:

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

5.1 Overview

In order to make it easier to use the OnRobot products, high level routines have been written into the `OnRobot.Mod` file. Some mandatory parameters, which shall be configured, are stored in the first program (`OR_INIT`). The routines are uploaded to the robot during the installation.

These high-level procedures can be used by calling these functions in your program:

```
OR_RGX_MOVE instance, width, force, wait;
```

You can get values directly from the previously declared functions:

```
IF OR_RGX_GETWIDTH(1) > 20 THEN
```

```
ENDIF
```

Or you can store the values in variables:

```
VAR num width;
```

```
width:=OR_RGX_GETWIDTH(1);
```

Sometimes a few procedures store the values in previously defined arrays. These are `OR_HEX_GET`, `OR_RG2FT_GETLHEX`, `OR_RG2FT_GETRHEX`. The name of updated arrays can be found at the description of these functions.

All user programs must start with calling the `OR_INIT` procedure. It is used to set up which tools are mounted on the robot, in which configuration:

```
OR_INIT;
```

5.2 List of functions

| Procedure: OR_INIT() | | | |
|----------------------|---|------|-------------|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | - | - | - |
| Behavior: | Function to initialize the communication for the current tool used. Make sure that this function is called before using any other function. | | |
| Example: | OR_INIT; | | |

| | | |
|---|--------------------------|-----------|
|  | 3FG15 | 63 |
|  | HEX | 70 |
|  | Gecko | 73 |
|  | RG2/6 | 77 |
|  | RG2-FT | 82 |
|  | SG | 88 |
|  | VG10 /VGC10 | 94 |

3FG15

| Procedure | | | |
|---------------------------------------|---|------|--|
| OR_TFG_MOVE(instance, diameter, wait) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | diameter | num | Define the desired raw diameter in mm |
| | wait | byte | 0: program will continue while gripper is moving 1: program will wait until gripper have stopped moving |
| Output: | - | - | - |
| Behavior: | Moves the fingers to the desired position | | |
| Example: | OR_TFG_MOVE 1,100,0; | | |

| Procedure | | | |
|--|---|------|--|
| OR_TFG_GRIP(instance, diameter, force, griptype, wait) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | diameter | num | Define the desired diameter with fingertip offset in mm |
| | force | num | Define the desired gripping force in % |
| | griptype | num | 1: Internal grip 2: External grip |
| | wait | byte | 0: program will continue while gripper is moving 1: program will wait until gripper have stopped moving |
| Output: | - | - | - |
| Behavior: | Moves the fingers to the desired position and with the target force | | |
| Example: | OR_TFG_GRIP 1,100,20,2,0; | | |

| Procedure | | | |
|-----------------------|--------------------------------------|------|--|
| OR_TFG_STOP(instance) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | - | - | - |
| Behavior: | Stops the finger motion in progress. | | |
| Example: | OR_TFG_STOP 1; | | |

| Procedure | | | |
|---|------------------------------|------|--|
| OR_TFG_SETFINGERLENGTH(instance,fingerLength) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | fingerLength | num | The current tool finger length in mm |
| Output: | - | - | - |
| Behavior: | Sets the finger length | | |
| Example: | OR_TFG_SETFINGERLENGTH 1,49; | | |

| Procedure | | | |
|---|--------------------------|------|--|
| OR_TFG_SETFINGERPOS(instance,fingerPos) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | fingerPos | num | The current tool finger position The valid values are: 1,2,3 |
| Output: | - | - | - |
| Behavior: | Sets the finger position | | |
| Example: | OR_TFG_SETFINGERPOS 1,2; | | |

| Procedure | | | |
|---|----------------------------|------|--|
| OR_TFG_SETFTOFFSET(instance, fingertipOffset) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | fingertipOffset | num | Diameter of fingertip in mm |
| Output: | - | - | - |
| Behavior: | Sets the fingertip offset | | |
| Example: | OR_TFG_SETFTOFFSET 1,13.5; | | |

| Function OR_TFG_GETDIAMETERFT(instance) | | | |
|---|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Current diameter with fingertip offset in mm. |
| Behavior: | Returns current diameter with fingertip offset to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num diameterft; diameterft:=OR_TFG_GETDIAMETERFT(1); !Or use the function directly IF OR_TFG_GETDIAMETERFT(1)> 40 THEN ENDIF</pre> | | |

| Function OR_TFG_GETDIAMETERRAW(instance) | | | |
|--|--|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Current raw diameter in mm. |
| Behavior: | Returns current raw diameter to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num diameter; diameter:=OR_TFG_GETDIAMETERRAW(1); !Or use the function directly IF OR_TFG_GETDIAMETERRAW(1)>50 THEN ENDIF</pre> | | |

| Function OR_TFG_GETDIAMETERMIN(instance) | | | |
|--|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Current minimum diameter in mm. |
| Behavior: | Returns current minimum diameter to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num diametermin; diametermin:=OR_TFG_GETDIAMETERMIN(1); !Or use the function directly IF OR_TFG_GETDIAMETERMIN(1)> 20 THEN ENDIF</pre> | | |

| Function OR_TFG_GETDIAMETERMAX(instance) | | | |
|--|--|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Current maximum diameter in mm. |
| Behavior: | Returns current maximum diameter to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num diametermax; diametermax:=OR_TFG_GETDIAMETERMAX(1); !Or use the function directly IF OR_TFG_GETDIAMETERMAX(1)>70 THEN ENDIF</pre> | | |

| Function OR_TFG_GETFORCE(instance) | | | |
|------------------------------------|--|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Current gripping force in %. |
| Behavior: | Returns current gripping force to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num force; force:=OR_TFG_GETFORCE(1); !Or use the function directly IF OR_TFG_GETFORCE(1)<35 THEN ENDIF</pre> | | |

| Function OR_TFG_ISCONN(instance) | | | |
|----------------------------------|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: No TFG is absent TRUE: TFG is present |
| Behavior: | Returns connection state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool isconnected; isconnected:=OR_TFG_ISCOON(1); !Or use the function directly IF OR_TFG_ISCOON(1) THEN ENDIF</pre> | | |

| Function | | | |
|-------------------------|---|------|--|
| OR_TFG_ISBUSY(instance) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: Gripper arms are not moving TRUE: Gripper arms are moving |
| Behavior: | Returns busy state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool isbusy; isbusy:=OR_TFG_ISBUSY(1); !Or use the function directly IF OR_TFG_ISBUSY(1) THEN ENDIF</pre> | | |

| Function | | | |
|-------------------------|---|------|--|
| OR_TFG_ISGRIP(instance) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: No grip detected TRUE: Grip detected |
| Behavior: | Returns grip state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool isgrip; isgrip:=OR_TFG_ISGRIP(1); !Or use the function directly IF OR_TFG_ISGRIP(1) THEN ENDIF</pre> | | |

| Function | | | |
|------------------------------|---|------|--|
| OR_TFG_ISFORCEGRIP(instance) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: No force grip detected TRUE: Force grip detected |
| Behavior: | Returns force grip state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool isforcegrip; isforcegrip:=OR_TFG_ISFORCEGRIP(1); !Or use the function directly IF OR_TFG_ISFORCEGRIP(1) THEN ENDIF</pre> | | |

| Function OR_TFG_ISCALIBRATIONVALID(instance) | | | |
|--|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: Calibration is not valid TRUE: Calibration is valid |
| Behavior: | Returns calibration state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool iscalvalid; iscalvalid:=OR_TFG_ISCALIBRATIONVALID(1); !Or use the function directly IF OR_TFG_ISCALIBRATIONVALID(1) THEN ENDIF</pre> | | |

| Function OR_TFG_HASERROR(instance) | | | |
|------------------------------------|--|---------|--|
| | Name | Type | Description |
| Input: | instance | Integer | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: No error detected TRUE: Error detected |
| Behavior: | Returns error state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool haserror; haserror:= OR_TFG_HASERROR(1); !Or use the function directly IF OR_TFG_HASERROR(1) THEN ENDIF</pre> | | |

| Function OR_TFG_HASGENERALERROR(instance) | | | |
|---|--|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: No general error detected TRUE: General error detected |
| Behavior: | Returns general error state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool hasgeneralerror; hasgeneralerror:= OR_TFG_HASGENERALERROR(1); !Or use the function directly IF OR_TFG_HASGENERALERROR(1) THEN ENDIF</pre> | | |

| Function | | | |
|-----------------------------------|--|------|--|
| OR_TFG_HASSAFETYDCERROR(instance) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: No error detected on DC motor TRUE: Error detected on DC motor |
| Behavior: | Returns DC motor error state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool hasdcerror; hasdcerror:= OR_TFG_HASSAFETYDCERROR(1); !Or use the function directly IF OR_TFG_HASSAFETYDCERROR(1) THEN ENDIF</pre> | | |

HEX

| Procedure: OR_HEX_GET | | | |
|-----------------------|--|------|----------------------|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | Hexvalues{1} | num | Force x value in N |
| | Hexvalues{2} | num | Force y value in N |
| | Hexvalues{3} | num | Force z value in N |
| | Hexvalues{4} | num | Torque x value in Nm |
| | Hexvalues{5} | num | Torque y value in Nm |
| | Hexvalues{6} | num | Torque z value in Nm |
| Behavior: | Returns all HEX sensor values in Hexvalues array. | | |
| Example: | <pre>OR_HEX_GET; IF Hexvalues{1} > 2.5 THEN ENDIF</pre> | | |

| Procedure: OR_HEX_ISCONN | | | |
|--------------------------|--|------|--|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | | bool | FALSE: HEX is absent TRUE: HEX is present |
| Behavior: | Returns connection state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool isconnected; isconnected:=OR_HEX_ISCONN(); !Or use the function directly IF OR_HEX_ISCONN() THEN ENDIF :CALL OR_HEX_ISCONN;</pre> | | |

| Procedure: OR_HEX_UNZERO | | | |
|--------------------------|-----------------------------------|------|-------------|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | - | - | - |
| Behavior: | Clears biasing of the HEX sensor. | | |
| Example: | <pre>OR_HEX_UNZERO;</pre> | | |

| Procedure: OR_HEX_ZERO | | | |
|------------------------|---------------------------------|------|-------------|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | - | - | - |
| Behavior: | Sets biasing of the HEX sensor. | | |
| Example: | OR_HEX_ZERO; | | |

| Procedure: OR_HEX_SETFILTER(filterIndex) | | | |
|--|--------------------------------|------|--|
| | Name | Type | Description |
| Input: | filterIndex | byte | 1: No filter 2: 500 Hz 3: 150 Hz 4: 50 Hz 5: 15 Hz 6: 5 Hz 7: 1.5 Hz |
| Output: | - | - | - |
| Behavior: | Sets filter to the HEX sensor. | | |
| Example: | OR_HEX_SETFILTER 2; | | |

| Function: OR_HEX_GETFILTER | | | |
|----------------------------|--|------|--|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | | num | 1: No filter 2: 500 Hz 3: 150 Hz 4: 50 Hz 5: 15 Hz 6: 5 Hz 7: 1.5 Hz |
| Behavior: | Returns filter index to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num filter; filter:=OR_HEX_GETFILTER(); !Or use the function directly IF OR_HEX_GETFILTER()=1 THEN ENDIF</pre> | | |

| Function: | | OR_HEX_HASERROR | |
|-----------|---|-----------------|--------------------------------|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | | bool | FALSE: No error TRUE: Error |
| Behavior: | Returns error state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool haserror; haserror:=OR_HEX_HASERROR(); !Or use the function directly IF OR_HEX_HASERROR() THEN ENDIF</pre> | | |

Gecko

| Procedure: OR_GECKO_PADIN(instance, wait) | | | |
|---|---------------------|------|---|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | wait | byte | 0: program will continue while pad is moving 1: program will wait until pads have stopped moving |
| Output: | - | - | - |
| Behavior: | Pull in Gecko pads. | | |
| Example: | OR_GECKO_PADIN 1,1; | | |

| Procedure: OR_GECKO_PADOUT(instance, wait) | | | |
|--|----------------------|------|---|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | wait | byte | 0: program will continue while pad is moving 1: program will wait until pads have stopped moving |
| Output: | - | - | - |
| Behavior: | Push out Gecko pads. | | |
| Example: | OR_GECKO_PADOUT 1,1; | | |

| Procedure: OR_GECKO_SETPRELOAD(instance, preloadIndex) | | | |
|--|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | preloadIndex | byte | Preload force threshold: 1: 50 N 2: 90 N 3: 120 N |
| Output: | - | - | - |
| Behavior: | Set the preload force threshold to the preset values. | | |
| Example: | OR_GECKO_SETPRELOAD 1,2; | | |

| Function: OR_GECKO_GETFORCE(instance) | | | |
|---------------------------------------|--|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Current preload force value in Newtons. Typical values: 0 or 45-150. |
| Behavior: | Returns preload force to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num force; force:=OR_GECKO_GETFORCE(1); !Or use the function directly IF OR_GECKO_GETFORCE(1)>70 THEN ENDIF</pre> | | |

| Function: OR_GECKO_GETULTRASONIC(instance) | | | |
|--|--|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Current ultrasonic distance in mm. Valid values: 0-220. |
| Behavior: | Returns ultrasonic distance to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num ultradist; ultradist:=OR_GECKO_GETULTRASONIC(1); !Or use the function directly IF OR_GECKO_GETULTRASONIC(1)>20 THEN ENDIF</pre> | | |

| Function: OR_GECKO_ISCONN(instance) | | | |
|-------------------------------------|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: Gecko is absent TRUE: Gecko is present |
| Behavior: | Returns connection state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool connected; connected:=OR_GECKO_ISCONN(1); !Or use the function directly IF OR_GECKO_ISCONN(1) THEN ENDIF</pre> | | |

| Function: OR_GECKO_ISPART(instance) | | | |
|-------------------------------------|---|---------|--|
| | Name | Type | Description |
| Input: | instance | Integer | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: No workpiece is present TRUE: Workpiece detected |
| Behavior: | Returns part detected state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool ispart; ispart:=OR_GECKO_ISPART(1); !Or use the function directly IF OR_GECKO_ISPART(1) THEN ENDIF</pre> | | |

| Function: OR_GECKO_ISBUSY(instance) | | | |
|-------------------------------------|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: No workpiece is present TRUE: Workpiece detected |
| Behavior: | Returns busy state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool isbusy; isbusy:=OR_GECKO_ISBUSY(1); !Or use the function directly IF OR_GECKO_ISBUSY(1) THEN ENDIF</pre> | | |

| Function: OR_GECKO_PADPOS(instance) | | | |
|-------------------------------------|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: Pads are in TRUE: Pads are out |
| Behavior: | Returns pad position to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool padpos; padpos:=OR_GECKO_PADPOS(1); !Or use the function directly IF OR_GECKO_PADPOS(1) THEN ENDIF</pre> | | |

| Function: OR_GECKO_PADST(instance) | | | |
|------------------------------------|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | byte | FALSE: Pads are good TRUE: Pads are worn |
| Behavior: | Returns pads worn state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool padstate; padstate:=OR_GECKO_PADST(1); !Or use the function directly IF OR_GECKO_PADST(1) THEN ENDIF</pre> | | |

RG2/6

| Procedure: OR_RGX_MOVE(instance, width, force, wait) | | | |
|---|--|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | width | num | Define the desired opening in mm |
| | force | num | Define the desired gripping force in N |
| | wait | byte | 0: return after command is executed (without waiting for execution to be complete) 1: return after fingers reached the position |
| Output: | - | - | - |
| Behavior: | Moves the fingers to the desired position. | | |
| Example: | OR_RGX_MOVE 1,100,40,1; | | |

| Procedure: OR_RGX_FTOFFSVAL(instance, fingertipOffset) | | | |
|---|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | fingertipOffset | num | Fingertip offset in mm |
| Output: | - | - | - |
| Behavior: | Sets the fingertip offset measured from the inside of the bare metal. | | |
| Example: | OR_RGX_FTOFFSVAL 1,4.6; | | |

| Procedure: OR_RGX_RESETPOWER(instance) | | | |
|---|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | - | - | - |
| Behavior: | Resets the tool power on the Compute Box. Warning, when using a double mount or HEX, the power of both devices will be reset. Watch out for a VG10 releasing grip on powerup. | | |
| Example: | OR_RGX_RESETPOWER 1; | | |

| Procedure: OR_RGX_STOP(instance) | | | |
|----------------------------------|--------------------------------------|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | - | - | - |
| Behavior: | Stops the finger motion in progress. | | |
| Example: | OR_RGX_STOP 1; | | |

| Function: OR_RGX_GETWIDTH(instance) | | | |
|-------------------------------------|--|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Current fingertip distance in mm. |
| Behavior: | Returns current fingertip distance to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num width; width:=OR_RGX_GETWIDTH(1); !Or use the function directly IF OR_RGX_GETWIDTH(1)>26 THEN ENDIF</pre> | | |

| Function: OR_RGX_GETDEPTH(instance) | | | |
|-------------------------------------|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Gripper current depth in mm. |
| Behavior: | Returns gripper current depth to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num depth; depth:=OR_RGX_GETDEPTH(1); !Or use the function directly IF OR_RGX_GETDEPTH(1)>5 THEN ENDIF</pre> | | |

| Function: OR_RGX_GETRDEPTH(instance) | | | |
|--------------------------------------|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Gripper current relative depth in mm. |
| Behavior: | Returns gripper current relative depth to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num reldepth; reldepth:=OR_RGX_GETRDEPTH(1); !Or use the function directly IF OR_RGX_GETRDEPTH(1)>2 THEN ENDIF</pre> | | |

| Function: OR_RGX_ISCONN(instance) | | | |
|-----------------------------------|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: No RG2 nor RG6 is present TRUE: Either RG2 or RG6 is present |
| Behavior: | Returns connection state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool connect; connect:=OR_RGX_ISCONN(1); !Or use the function directly IF OR_RGX_ISCONN(1) THEN ENDIF</pre> | | |

| Function: OR_RGX_ISBUSY(instance) | | | |
|-----------------------------------|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: Gripper fingers are not moving TRUE: Gripper fingers are moving |
| Behavior: | Returns busy state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool busy; busy:=OR_RGX_ISBUSY(1); !Or use the function directly IF OR_RGX_ISBUSY(1) THEN ENDIF</pre> | | |

| Function: OR_RGX_ISGRIP(instance) | | | |
|-----------------------------------|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: No grip detected TRUE: Inner or outer grip detected |
| Behavior: | Returns grip state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool grip; grip:=OR_RGX_ISGRIP(1); !Or use the function directly IF OR_RGX_ISGRIP(1) THEN ENDIF</pre> | | |

| Function: OR_RGX_ISRG2(instance) | | | |
|----------------------------------|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: No RG2 is present (it may be an RG6 though) TRUE: RG2 is present |
| Behavior: | Returns RG2 connection state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool isrg2; isrg2:=OR_RGX_ISRG2(1); !Or use the function directly IF OR_RGX_ISRG2(1) THEN ENDIF</pre> | | |

| Function: OR_RGX_ISRG6(instance) | | | |
|----------------------------------|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: No RG6 is present (it may be an RG2 though) TRUE: RG6 is present |
| Behavior: | Returns RG6 connection state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool isrg6; isrg6:=OR_RGX_ISRG6(1); !Or use the function directly IF OR_RGX_ISRG6(1) THEN ENDIF</pre> | | |

| Function: OR_RGX_ISSON(instance) | | | |
|----------------------------------|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: Safety switches are inactive TRUE: At least one safety switch has been activated |
| Behavior: | Returns safety switch state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool safetyon; safetyon:=OR_RGX_ISSON(1); !Or use the function directly IF OR_RGX_ISSON(1) THEN ENDIF</pre> | | |

RG2-FT

| Procedure: OR_RG2FT_MOVE(width, force, wait) | | | |
|--|--|------|--|
| | Name | Type | Description |
| Input: | width | num | Define the desired opening in mm |
| | force | num | Define the desired gripping force in N |
| | wait | byte | 0: return after command is executed (without waiting for execution to be complete) 1: return after fingers reached the position |
| Output: | - | - | - |
| Behavior: | Moves the fingers to the desired position. | | |
| Example: | OR_RG2FT_MOVE 100, 40, 1; | | |

| Procedure: OR_RG2FT_STOP | | | |
|--------------------------|--------------------------------------|------|-------------|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | - | - | - |
| Behavior: | Stops the finger motion in progress. | | |
| Example: | OR_RG2FT_STOP; | | |

| Procedure: OR_RG2FT_HEXUNZERO | | | |
|-------------------------------|------------------------------------|------|-------------|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | - | - | - |
| Behavior: | Clears biasing of the HEX sensors. | | |
| Example: | OR_RG2FT_HEXUNZERO; | | |

| Procedure: OR_RG2FT_HEXZERO | | | |
|-----------------------------|----------------------------------|------|-------------|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | - | - | - |
| Behavior: | Sets biasing of the HEX sensors. | | |
| Example: | OR_RG2FT_HEXZERO; | | |

| Procedure: OR_RG2FT_POFFSACT | | | |
|------------------------------|---|------|-------------|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | - | - | - |
| Behavior: | Sets the proximity offset to the current measured value. | | |
| Example: | <pre>!Put a white paper between the fingers of the gripper! !Close gripper OR_RG2FT_MOVE 0,40,1; !Measure and store the actual offset (to the white paper) OR_RG2FT_POFFSACT; !Open the gripper again OR_RG2FT_MOVE 100,40,1; !Gripper proximity sensors are now calibrated</pre> | | |

| Procedure: OR_RG2FT_POFFSVAL(proximityOffsetL, proximityOffsetR) | | | |
|--|--|------|------------------------------|
| | Name | Type | Description |
| Input: | proximityOffsetL | num | Left proximity offset in mm |
| | proximityOffsetR | num | Right proximity offset in mm |
| Output: | - | - | - |
| Behavior: | Sets a custom offset for the left and right proximity sensors. | | |
| Example: | OR_RG2FT_POFFSVAL 22,24; | | |

| Function: OR_RG2FT_GETWIDTH | | | |
|-----------------------------|--|------|-----------------------------------|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | | num | Current fingertip distance in mm. |
| Behavior: | Returns current fingertip distance to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num width; width:=OR_RG2FT_GETWIDTH(); !Or use the function directly IF OR_RG2FT_GETWIDTH()>25.5 THEN ENDIF</pre> | | |

| Function: | OR_RG2FT_ISCONN | | |
|-----------|---|------|--|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | | bool | FALSE: RG2FT is absent TRUE: RG2FT is present |
| Behavior: | Returns busy state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool connected; connected:=OR_RG2FT_ISCONN(); !Or use the function directly IF OR_RG2FT_ISCONN() THEN ENDIF</pre> | | |

| Function: | OR_RG2FT_ISBUSY | | |
|-----------|---|------|---|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | | bool | FALSE: Gripper fingers are not moving TRUE: Gripper fingers are moving |
| Behavior: | Returns busy state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool busy; busy:=OR_RG2FT_ISBUSY(); !Or use the function directly IF OR_RG2FT_ISBUSY() THEN ENDIF</pre> | | |

| Function: | OR_RG2FT_ISGRIP | | |
|-----------|---|------|--|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | | bool | FALSE: No grip detected TRUE: Grip detected |
| Behavior: | Returns grip state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool grip; grip:=OR_RG2FT_ISGRIP(); !Or use the function directly IF OR_RG2FT_ISGRIP() THEN ENDIF</pre> | | |

| Function: OR_RG2FT_GETLHEX | | | |
|----------------------------|---|------|---|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | RG2FTLHexvalues{1} | num | Force x value in N of Left HEX sensor |
| | RG2FTLHexvalues{2} | num | Force y value in N of Left HEX sensor |
| | RG2FTLHexvalues{3} | num | Force z value in N of Left HEX sensor |
| | RG2FTLHexvalues{4} | num | Torque x value in Nm of Left HEX sensor |
| | RG2FTLHexvalues{5} | num | Torque y value in Nm of Left HEX sensor |
| | RG2FTLHexvalues{6} | num | Torque z value in Nm of Left HEX sensor |
| Behavior: | Return left HEX sensor values in RG2FTLHexvalues array | | |
| Example: | <pre>OR_RG2FT_GETLHEX; IF RG2FTLHexvalues{1} > 2.5, THEN ENDIF</pre> | | |

| Function: OR_RG2FT_GETRHEX | | | |
|----------------------------|---|------|--|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | RG2FTRHexvalues{1} | num | Force x value in N of Right HEX sensor |
| | RG2FTRHexvalues{2} | num | Force y value in N of Right HEX sensor |
| | RG2FTRHexvalues{3} | num | Force z value in N of Right HEX sensor |
| | RG2FTRHexvalues{4} | num | Torque x value in Nm of Right HEX sensor |
| | RG2FTRHexvalues{5} | num | Torque y value in Nm of Right HEX sensor |
| | RG2FTRHexvalues{6} | num | Torque z value in Nm of Right HEX sensor |
| Behavior: | Return right HEX sensor values in RG2FTRHexvalues array | | |
| Example: | <pre>OR_RG2FT_GETRHEX; IF RG2FTRHexvalues{1} > 2.5, THEN ENDIF</pre> | | |

| Function: OR_RG2FT_GETLPROX | | | |
|-----------------------------|---|------|--|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | | num | Current left proximity distance in mm. |
| Behavior: | Returns current left proximity distance to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num lprox; lprox:=OR_RG2FT_GETLPROX(); !Or use the function directly IF OR_RG2FT_GETLPROX()>5 THEN ENDIF</pre> | | |

| Function: OR_RG2FT_GETRPROX | | | |
|-----------------------------|---|------|---|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | | num | Current right proximity distance in mm. |
| Behavior: | Returns current right proximity distance to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num rprox; rprox:=OR_RG2FT_GETRPROX(); !Or use the function directly IF OR_RG2FT_GETRPROX()>5 THEN ENDIF</pre> | | |

| Function: OR_RG2FT_HASERROR | | | |
|-----------------------------|---|------|--------------------------------|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | | bool | FALSE: No error TRUE: Error |
| Behavior: | Returns error state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool haserror; haserror:=OR_RG2FT_HASERROR(); !Or use the function directly IF OR_RG2FT_HASERROR() THEN ENDIF</pre> | | |

| Procedure: OR_RG2FT_HEXSETFILTER(filterIndex) | | | |
|---|--------------------------------------|------|--|
| | Name | Type | Description |
| Input: | filterIndex | byte | 1: No filter 2: 500 Hz 3: 150 Hz 4: 50 Hz 5: 15 Hz 6: 5 Hz 7: 1.5 Hz |
| Output: | - | - | - |
| Behavior: | Sets filter to the RG2FT HEX sensor. | | |
| Example: | OR_RG2FT_HEX SETFILTER 1; | | |

| Function: | | OR_RG2FT_GETHEXFILTER | |
|-----------|---|-----------------------|--|
| | Name | Type | Description |
| Input: | - | - | - |
| Output: | | num | 1: No filter 2: 500 Hz 3: 150 Hz 4: 50 Hz 5: 15 Hz 6: 5 Hz 7: 1.5 Hz |
| Behavior: | Returns RG2FT HEX filter to the desired variable. | | |
| Example: | <pre> !Declare a variable VAR num hexfilter; hexfilter:=OR_RG2FT_GETHEXFILTER(); !Or use the function directly IF OR_ RG2FT_GETHEXFILTER()=4 THEN ENDIF </pre> | | |

SG

| Procedure | OR_SG_INITIALIZE(instance, ToolID) | | |
|-----------|------------------------------------|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | ToolID | byte | 1: None 2: SG-a-H 3:SG-a-S 4: SG-b-H |
| Output: | - | - | - |
| Behavior: | Initialize the SG Tool | | |
| Example: | OR_SG_INITIALIZE 1, 2; | | |

| Procedure | OR_SG_HOME(instance) | | |
|-----------|--|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | - | - | - |
| Behavior: | Move Soft Gripper to the home position | | |
| Example: | OR_SG_MOVE 1, 100, 0; | | |

| Procedure name | OR_SG_GRIP(instance, width, wait) | | |
|----------------|-----------------------------------|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | width | num | Define the desired width in mm |
| | wait | byte | 0: program will continue while gripper is moving 1: program will wait until gripper have stopped moving |
| Output: | - | - | - |
| Behavior: | Grip to the desired position | | |
| Example: | OR_SG_GRIP 1, 35, 0; | | |

| Procedure name | | | |
|---------------------------------------|---|------|--|
| OR_SG_GENTLEGRIP(instance,width,wait) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | width | num | Define the desired width in mm |
| | wait | byte | 0: program will continue while gripper is moving 1: program will wait until gripper have stopped moving |
| Output: | - | - | - |
| Behavior: | Gentle grip to the desired position and slows down when the gripper is to close to the target width | | |
| Example: | OR_SG_GENTLEGRIP 1,35,0; | | |

| Procedure name | | | |
|------------------------------------|---|------|--|
| OR_SG_RELEASE(instance,width,wait) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | width | num | Define the desired width in mm |
| | wait | byte | 0: program will continue while gripper is moving 1: program will wait until gripper have stopped moving |
| Output: | - | - | - |
| Behavior: | Release the object by moving to the desired width | | |
| Example: | OR_SG_RELEASE 1,45,0; | | |

| Procedure | | | |
|----------------------|-------------------------------|------|--|
| OR_SG_STOP(instance) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | - | - | - |
| Behavior: | Stops the motion in progress. | | |
| Example: | OR_SG_STOP 1; | | |

| Function | | | |
|--------------------------|--|------|--|
| OR_SG_GETWIDTH(instance) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Gripper current width in mm. |
| Behavior: | Returns current width to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num width; width:=OR_TFG_GETWIDTH(1); !Or use the function directly IF OR_TFG_GETWIDTH(1)>35 THEN ENDIF</pre> | | |

| Function | | | |
|--------------------------|--|------|--|
| OR_SG_GETDEPTH(instance) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Gripper current depth in mm. |
| Behavior: | Returns current depth to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num depth; depth:=OR_TFG_GETDEPTH(1); !Or use the function directly IF OR_TFG_GETDEPTH(1)>10 THEN ENDIF</pre> | | |

| Function | | | |
|----------------------------------|--|------|--|
| OR_SG_GETRELATIVEDEPTH(instance) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Gripper current relative depth in mm. |
| Behavior: | Returns current relative depth to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num reldepth; reldepth:=OR_TFG_GETRELATIVEDEPTH(1); !Or use the function directly IF OR_TFG_GETRELATIVEDEPTH(1)>10 THEN ENDIF</pre> | | |

| Function | | | |
|---------------------------------|--|------|--|
| OR_SG_GETSILICONDEPTH(instance) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Gripper current silicon depth in mm. |
| Behavior: | Returns current silicon depth to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num silicondepth; silicondepth:=OR_TFG_GETSILICONDEPTH(1); !Or use the function directly IF OR_TFG_GETSILICONDEPTH(1)>10 THEN ENDIF</pre> | | |

| Function | | | |
|----------------------------|--|------|--|
| OR_SG_GETOPENMAX(instance) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Current tool maximum width in mm. |
| Behavior: | Returns current tool maximum width to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num openmax; openmax:=OR_SG_GETOPENMAX(1); !Or use the function directly IF OR_SG_GETOPENMAX(1)>60 THEN ENDIF</pre> | | |

| Function | | | |
|----------------------------|--|------|--|
| OR_SG_GETOPENMIN(instance) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Current tool maximum width in mm. |
| Behavior: | Returns current tool minimum width to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num openmin; openmin:=OR_SG_GETOPENMIN(1); !Or use the function directly IF OR_SG_GETOPENMIN(1)<30 THEN ENDIF</pre> | | |

| Function | | | |
|------------------------|---|------|--|
| OR_SG_ISBUSY(instance) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: Gripper is not moving TRUE: Gripper is moving |
| Behavior: | Returns busy state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool isbusy; isbusy:=OR_SG_ISBUSY(1); !Or use the function directly IF OR_SG_ISBUSY(1) THEN ENDIF</pre> | | |

| Function | | | |
|------------------------|---|------|--|
| OR_SG_ISCONN(instance) | | | |
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: No SG is absent TRUE: SG is present |
| Behavior: | Returns connection state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool isconnected; isconnected:=OR_SG_ISCOON(1); !Or use the function directly IF OR_SG_ISCOON(1) THEN ENDIF</pre> | | |

| Function | | OR_SG_ISINITIALIZED(instance) | |
|-----------|---|-------------------------------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: SG is not initialized TRUE: SG is initialized |
| Behavior: | Returns initialization state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool isinit; isinit:=OR_SG_ISINITIALIZED(1); !Or use the function directly IF OR_SG_ISINITIALIZED(1) THEN ENDIF</pre> | | |

| Function | | OR_SG_HASERROR(instance) | |
|-----------|--|--------------------------|--|
| | Name | Type | Description |
| Input: | instance | Integer | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: No error detected TRUE: Error detected |
| Behavior: | Returns error state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool haserror; haserror:= OR_SG_HASERROR(1); !Or use the function directly IF OR_SG_HASERROR(1) THEN ENDIF</pre> | | |

VG10 /VGC10

| Procedure: | | OR_VGX_GRIP(instance, vacuumA, vacuumB, wait) | |
|------------|--|---|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | vacuumA | num | Requested vacuum level for channel A 0: No change 1 to 80: vacuum percentage |
| | vacuumB | num | Requested vacuum level for channel B 0: No change 1 to 80: vacuum percentage |
| | wait | byte | 0: return after command is executed 1: return after requested vacuum level is reached |
| Output: | - | - | - |
| Behavior: | Sets the vacuum level for VG10 gripper channels. | | |
| Example: | OR_VGX_GRIP 1, 50, 50, 1; | | |

| Procedure: | | OR_VGX_SETLIMIT(instance, current) | |
|------------|---|------------------------------------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | current | num | Maximum allowed current in mA. Default: 500 mA Maximum: 1000 mA |
| Output: | - | - | - |
| Behavior: | Set the internal current limit, which is proportional to the airflow. | | |
| Example: | OR_VGX_SETLIMIT 1, 500; | | |

| Procedure: OR_VGX_IDLE(instance, channelA, channelB) | | | |
|--|--|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | channelA | byte | 0: No change 1: Set channel A idle |
| | channelB | byte | 0: No change 1: Set channel B idle |
| Output: | - | - | - |
| Behavior: | Turn off the pumps on the desired channels. The valves on the affected channels will be still closed. This is a low energy state that can keep the object gripped until several seconds. | | |
| Example: | !Set idle on channel B only OR_VGX_IDLE 1,0,1; | | |

| Procedure: OR_VGX_RELEASE(instance, channelA, channelB) | | | |
|---|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| | channelA | byte | 0: No change 1: Release vacuum on Channel A |
| | channelB | byte | 0: No change 1: Release vacuum on Channel B |
| Output: | - | - | - |
| Behavior: | Turn off the pumps and open the valves on the affected channels to release the workpiece. | | |
| Example: | !Release channel A only OR_VGX_IDLE 1,1,0; | | |

| Function: OR_VGX_GETLIMIT(instance) | | | |
|-------------------------------------|--|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | The actual current limit in mA. |
| Behavior: | Returns actual current limit to the desired variable. | | |
| Example: | !Declare a variable VAR num curlimit; curlimit:=OR_VGX_GETLIMIT(1); !Or use the function directly IF OR_VGX_GETLIMIT(1)>=500 THEN ENDIF | | |

| Function: OR_VGX_GETVACA(instance) | | | |
|------------------------------------|--|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Current vacuum of Channel A in %. |
| Behavior: | Returns current vacuum of Channel A to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num vacuumA; vacuumA:=OR_VGX_GETVACA(1); !Or use the function directly IF OR_VGX_GETVACA(1) > 40 THEN ENDIF</pre> | | |

| Function: OR_VGX_GETVACB(instance) | | | |
|------------------------------------|--|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | num | Current vacuum of Channel B in %. |
| Behavior: | Returns current vacuum of Channel B to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR num vacuumB; vacuumB:=OR_VGX_GETVACB(1); !Or use the function directly IF OR_VGX_GETVACB(1) > 40 THEN ENDIF</pre> | | |

| Function: OR_VGX_ISCONN(instance) | | | |
|-----------------------------------|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: VG10/VGC10 is absent TRUE: VG10/VGC10 is present |
| Behavior: | Returns connection state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool connected; connected:=OR_VGX_ISCONN(1); !Or use the function directly IF OR_VGX_ISCONN(1) THEN ENDIF</pre> | | |

| Function: OR_VGX_ISVG10(instance) | | | |
|-----------------------------------|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: VG10 is absent TRUE: VG10 is present |
| Behavior: | Returns connection state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool isvg10; isvg10:=OR_VGX_ISVG10(1); !Or use the function directly IF OR_VGX_ISVG10(1) THEN ENDIF</pre> | | |

| Function: OR_VGX_ISVGC10(instance) | | | |
|------------------------------------|---|------|--|
| | Name | Type | Description |
| Input: | instance | byte | 1: single or primary - in dual configuration 2: secondary in dual configuration |
| Output: | | bool | FALSE: VGC10 is absent TRUE: VGC10 is present |
| Behavior: | Returns connection state to the desired variable. | | |
| Example: | <pre>!Declare a variable VAR bool isvgc10; isvgc10:=OR_VGX_ISVGC10(1); !Or use the function directly IF OR_VGX_ISVGC10(1) THEN ENDIF</pre> | | |

Mode II - OnRobot WebLogic™

6 Installation

6.1 Overview

For a successful installation the following steps will be required:

- Mount the components
- Setup the software

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

6.2 Mounting

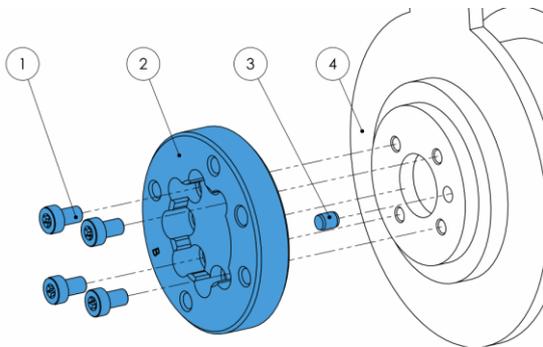
Required steps:

- Mount the robot dependent adapter
- Mount the Quick Changer option
- Mount the tool(s)

In the following three subsections these three mounting steps will be described.

6.2.1 Adapter(s)

For IRB 120 and IRB 1200 models

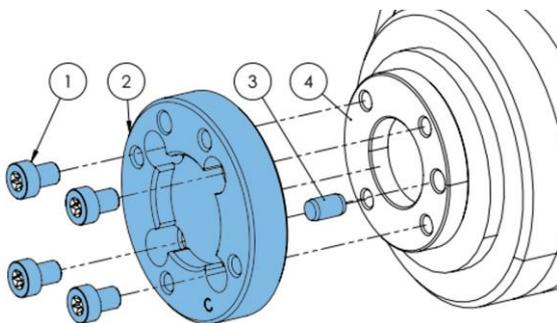


Adapter B (4 screws)

- 1 M5x8 screws (ISO14580 A4-70)
- 2 OnRobot adapter flange (ISO 9409-1-50-4-M6)
- 3 Dowel pin $\varnothing 5 \times 6$ (ISO2338 h8)
- 4 Robot tool flange (ISO 9409-1-31.5-4-M5)

Use 5 Nm tightening torque.

For IRB 140, IRB 1410 and IRB 1600 models



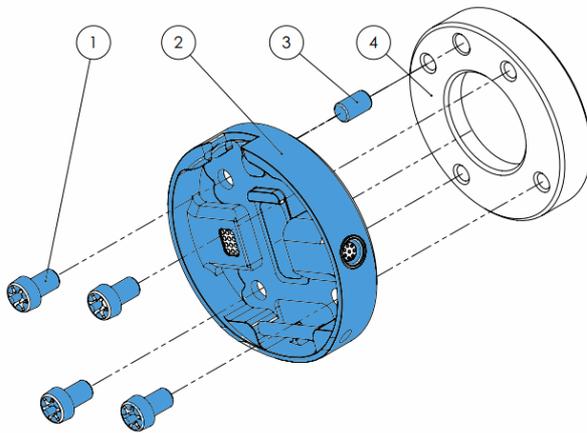
Adapter C

- 1 M6x8 screws (ISO14580 A4-70)
- 2 OnRobot adapter flange (ISO 9409-1-50-4-M6)
- 3 Dowel pin $\varnothing 6 \times 10$ (ISO2338 h8)
- 4 Robot tool flange (ISO 9409-1-40-4-M6)

Use 10 Nm tightening torque.

6.2.2 Quick Changer options

Quick Changer - Robot Side

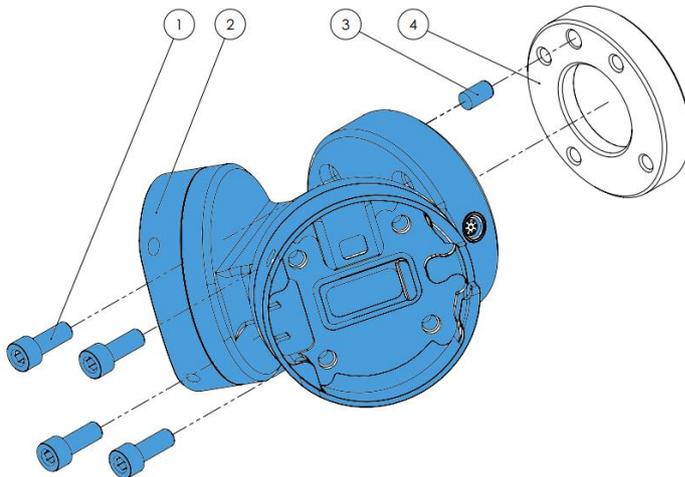


Quick Changer - Robot Side

- 1 M6x8mm (ISO14580 8.8)
- 2 Quick Changer (ISO 9409-1-50-4-M6)
- 3 Dowel pin $\varnothing 6 \times 10$ (ISO2338 h8)
- 4 Adapter/ Robot tool flange (ISO 9409-1-50-4-M6)

Use 10 Nm tightening torque.

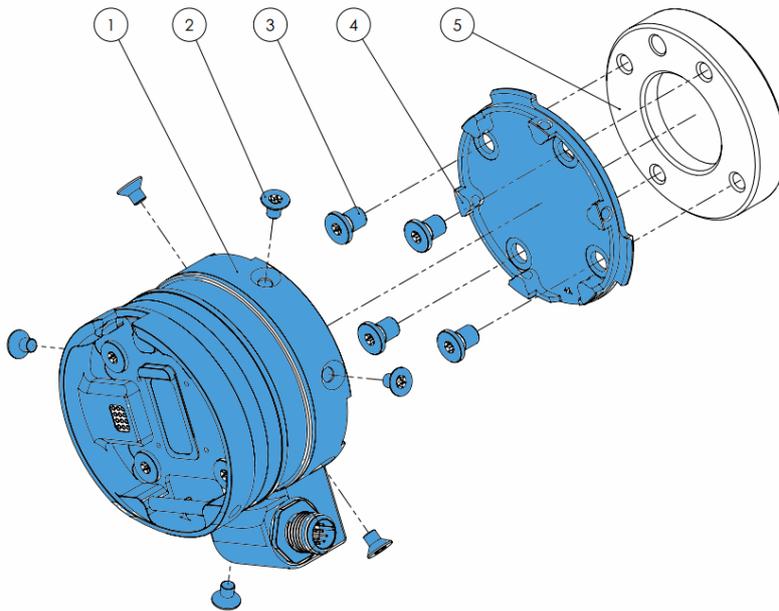
Dual Quick Changer



Dual Quick Changer

- 1 M6x20mm (ISO14580 8.8)
- 2 Dual Quick Changer
- 3 Dowel pin $\varnothing 6 \times 10$ (ISO2338 h8)
- 4 Adapter/ Robot tool flange (ISO 9409-1-50-4-M6)

Use 10 Nm tightening torque.

HEX-E/H QC**HEX-E/H QC**

- 1 HEX-E/H QC sensor
- 2 M4x6mm (ISO14581 A4-70)
- 3 M6x8mm (NCN20146 A4-70)
- 4 HEX-E/H QC adapter
- 5 Adapter/ Robot tool flange (ISO 9409-1-50-4-M6)

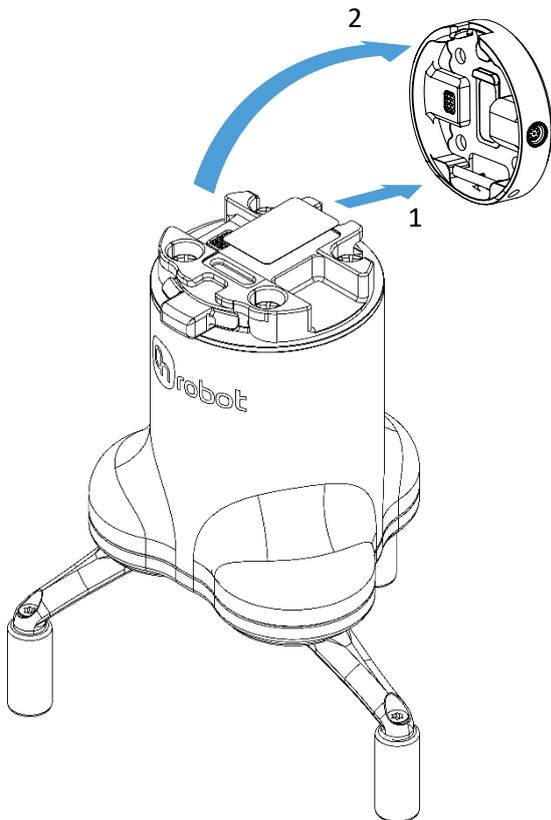
Use 1.5 Nm tightening torque.
for M4x6mm

Use 10 Nm tightening torque.
for M6x8mm

6.2.3 Tools

| | |
|--------------------------------|-----|
| 3FG15..... | 102 |
| Gecko..... | 103 |
| RG2..... | 104 |
| RG2-FT..... | 105 |
| RG6..... | 106 |
| SG..... | 107 |
| VG10..... | 107 |
| VGC10..... | 108 |
| Quick Changer - Tool side..... | 108 |

3FG15



Step 1:

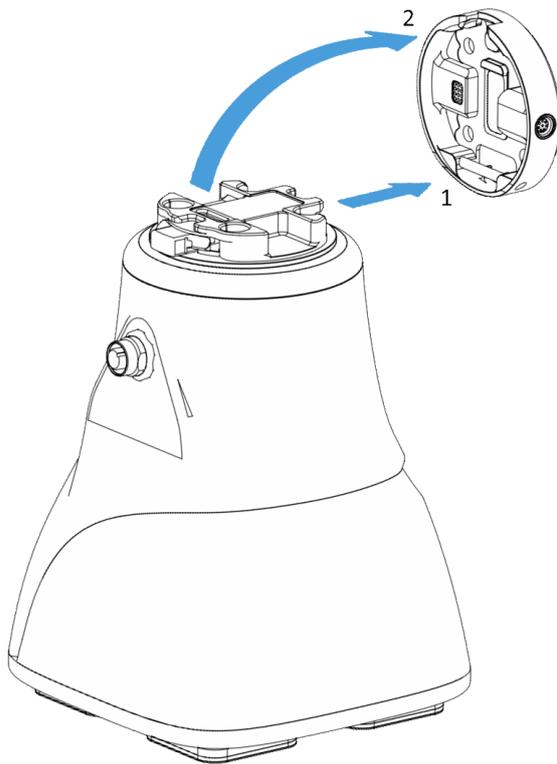
Move the tool close to the Quick Changer as illustrated.

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.

Gecko**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:

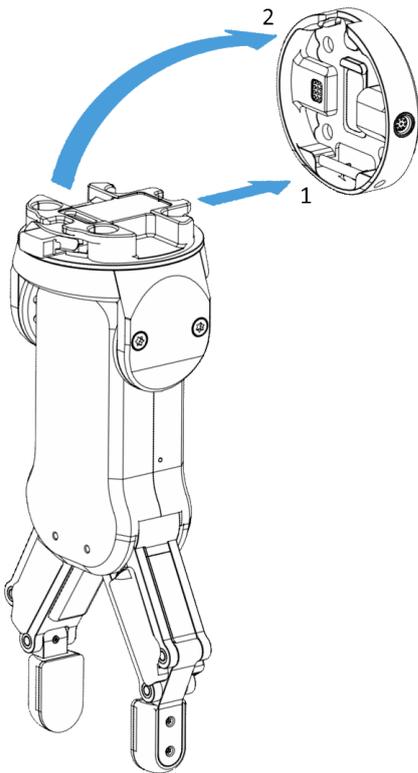
Flip the tool until it is fully mated, and you hear a clicking sound.

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

**CAUTION:**

With a Dual Quick Changer the Gecko Gripper can only be mounted on the Secondary (2) side. Mounting on the Primary (1) side will prevent the devices to function correctly.

RG2



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.

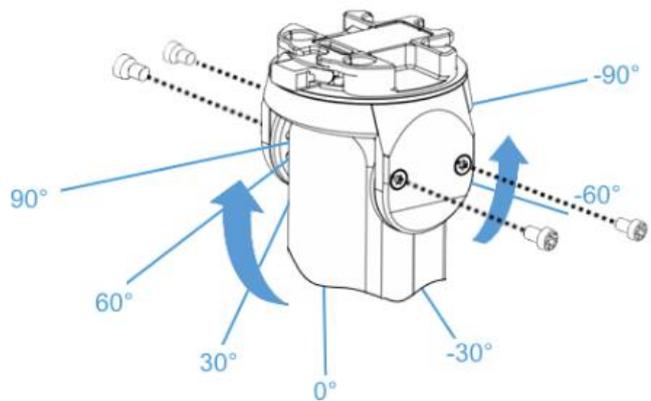
Step 2:

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.

To change the relative angle of the gripper to the Quick Changer:

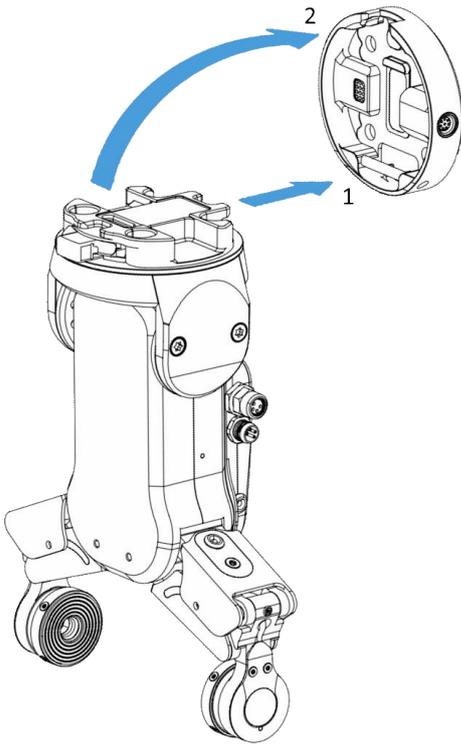
- first remove the four M4x6 screws
- tilt the gripper between -90° and 90°
- then put the four M4x6 screws back and use 1.35 Nm tightening torque to fix it.



WARNING:

Never use the device while any of the four M4x6 screws are removed.

RG2-FT



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.

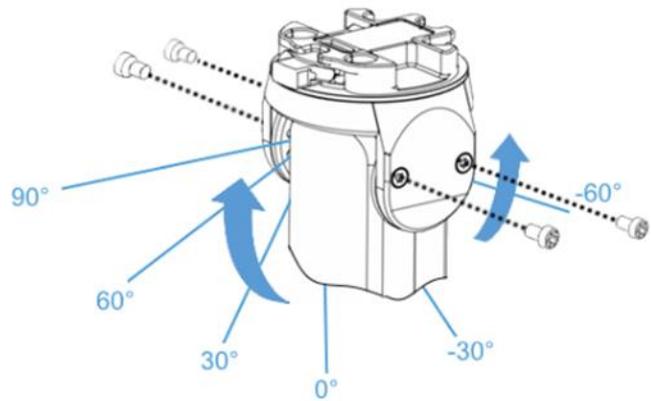
Step 2:

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.

To change the relative angle of the gripper to the Quick Changer:

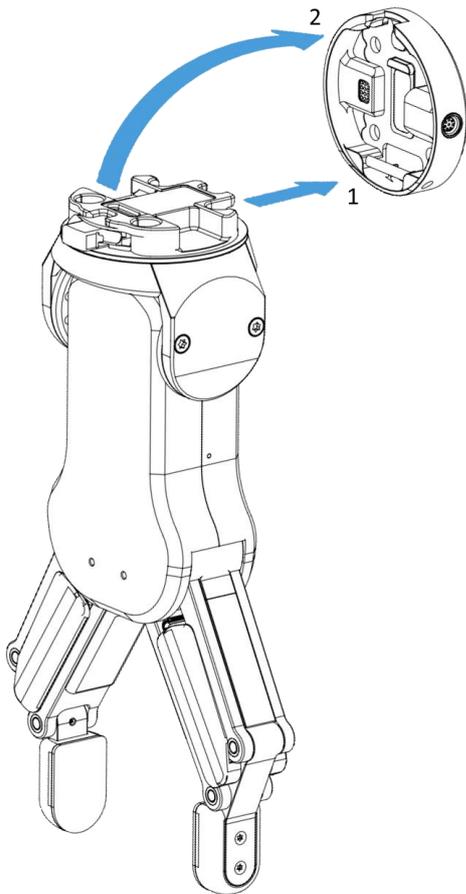
- first remove the four M4x6 screws
- tilt the gripper between -60° and 90°
- then put the four M4x6 screws back and use 1.35 Nm tightening torque to fix it.



WARNING:

Never use the device while any of the four M4x6 screws are removed.

RG6



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.

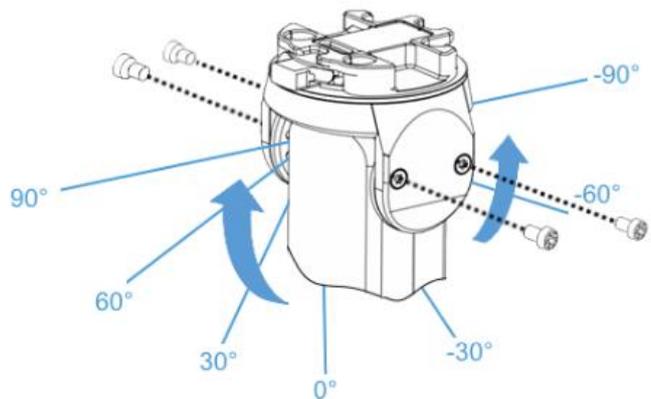
Step 2:

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.

To change the relative angle of the gripper to the Quick Changer:

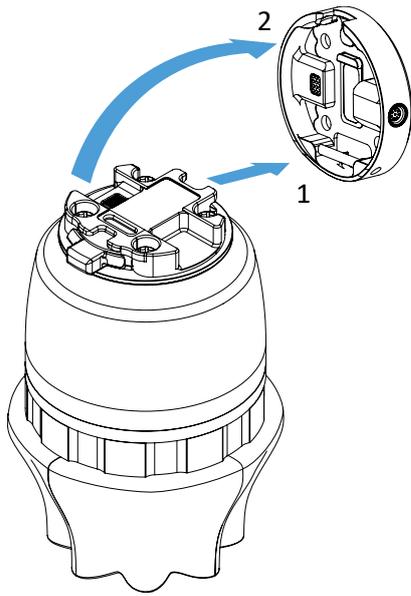
- first remove the four M4x6 screws
- tilt the gripper between -90° and 90°
- then put the four M4x6 screws back and use 1.35 Nm tightening torque to fix it.



WARNING:

Never use the device while any of the four M4x6 screws are removed.

SG



Step 1:

Move the tool close to the Quick Changer as illustrated.

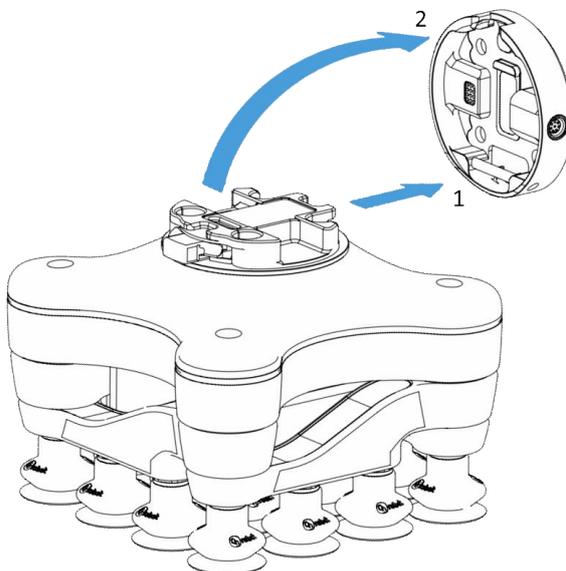
The hook mechanism (rod and hook tongue) will keep the lower part locked once mounted.

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.

VG10



Step 1:

Move the tool close to the Quick Changer as illustrated.

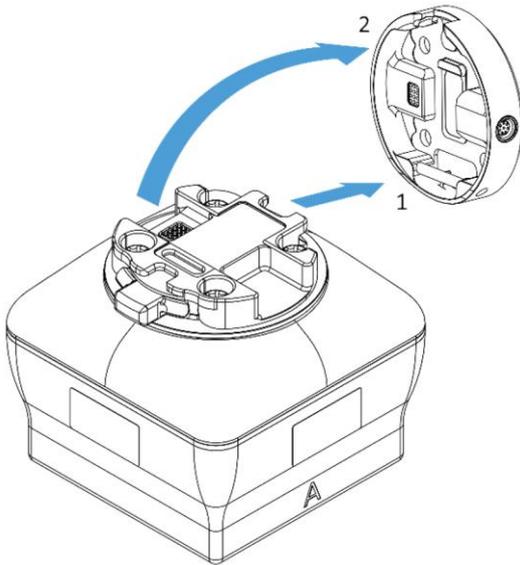
The hook mechanism (rod and hook tongue) will keep the lower part locked once mounted.

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.

VGC10



Step 1:

Move the tool close to the Quick Changer as illustrated.

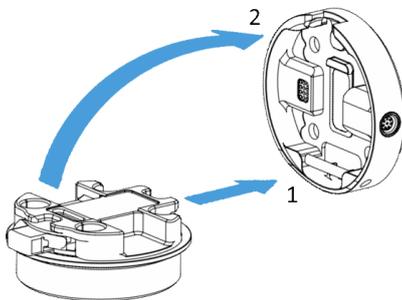
The hook mechanism (rod and hook tongue) will keep the lower part locked once mounted.

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.

Quick Changer - Tool side



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:

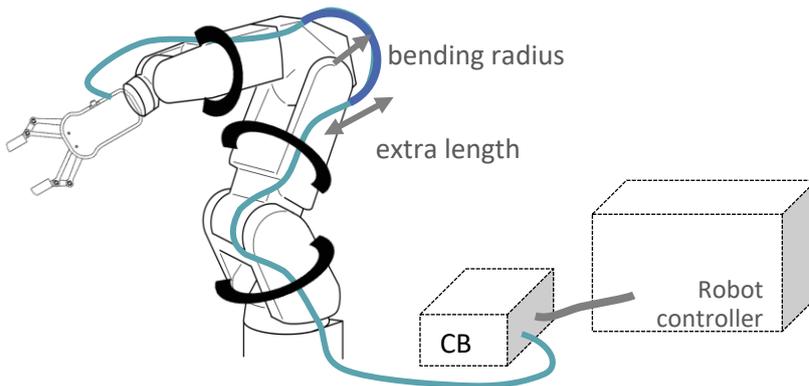
Flip the tool until it is fully mated, and you hear a clicking sound.

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

6.3 Wiring

Four kind of cables must be connected to wire the system properly:

- Tool data cable between the tool(s) and the Compute Box
- The provided Digital I/O wires between the Compute Box and the robot controller
- Ethernet communication cable between the Compute Box and your computer
- Power supply of the Compute Box



6.3.1 Tool data

Connect the data cable to the tool(s) then route the cable (blue line) to the Compute Box (CB) and use the supplied Velcro tape (black) to fix it.



NOTE:

Leave some extra cable length around the joints so that the cable is not pulled when the robot moves.

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

Then, connect the other end to the Compute Box's DEVICES connector.



CAUTION:

Use only original OnRobot tool data cables.

6.3.2 Digital I/O wires

For ABB IRC5 Compact and IRC5 controllers, for example the DSQC1030 Digital base can be used to connect the Compute Box to the robot controller via Digital I/O.

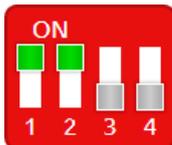
Installation

Make sure that the robot is powered off completely.

Check your digital I/O module installed in the control cabinet and configure the Compute Box DIP switches (red) accordingly:



For **PNP** type set the 1. and 2. DIP switches to OFF position (down).



For **NPN** type set the 1. and 2. DIP switches to ON position (up).

DIP switch 1: Digital Input mode

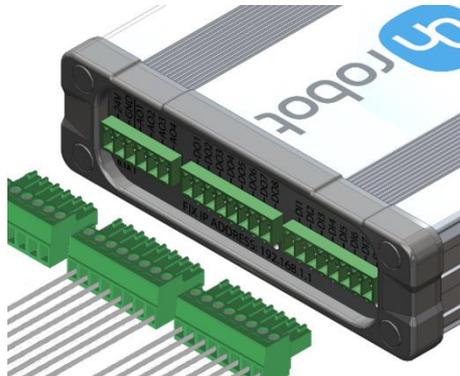
DIP switch 2: Digital Output mode



NOTE:

Do not change the DIP switch 3 and 4 otherwise the network settings will be changed.

Plug in the supplied green pluggable connectors.

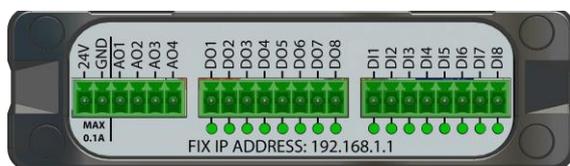


The supplied connector types are:

2 x Phoenix Contact MC 1,5/8-ST-3,5 Terminal Block

1 x Phoenix Contact MC 1,5/6-ST-3,5 Terminal Block

Wire the digital I/O wires from the Compute Box to the robot.



DO1-8: Digital outputs of the Compute Box (signals from the grippers/sensor to the robot)

DI1-8: Digital inputs of the Compute Box (signals from the robot to the grippers/sensor)

GND: To be used to have a common ground between the robot and the gripper/sensor

It is recommended to connect all 8 inputs and 8 outputs for simplicity.



CAUTION:

If some of the DO1-8 or DI1-8 wires will not be connected, make sure to unscrew it from the terminal block to avoid an accidental short circuit.



CAUTION:

The 24V and GND pins are only Reference Voltage Output. It cannot be used to power any equipment.

It is recommended to use the supplied wires only. If it is necessary to use different wire, use one that is shorter than 3 m.

Connect the Compute Box inputs to the robot outputs and the Compute Box outputs to robot inputs.

For simplicity, it is recommended to map the pins in order:

- | | |
|------------------------------------|-------------------------------------|
| DO1 to the robot's Digital input 1 | DI1 to the robot's Digital output 1 |
| DO2 to the robot's Digital input 2 | DI2 to the robot's Digital output 2 |
| ... | ... |
| DO8 to the robot's Digital input 8 | DI8 to the robot's Digital output 8 |

The DSQC1030 Digital base device has 16 digital inputs and 16 digital outputs and can be combined with up to four additional add-on devices.

It has four connectors:

| Connector | Description |
|-----------|--------------------------------|
| X1 | Digital outputs, process power |
| X2 | Digital inputs |
| X3 | Ethernet |
| X4 | Logic Power |

The DSQC1030 pins:

| Location | Designation | Left | Right |
|----------|-----------------------------------|---------|---------|
| TOP | X4 Logic Power | PWR | PWR |
| | | GND | GND |
| Front | X1 Digital outputs, process power | PWR DO | PWR DO |
| | | GND DO | GND DO |
| | | 1-DO1 | 9-DO9 |
| | | 2-DO2 | 10-DO10 |
| | | 3-DO3 | 11-DO11 |
| | | 4-DO4 | 12-DO12 |
| | | 5-DO5 | 13-DO13 |
| | | 6-DO6 | 14-DO14 |
| | 7-DO7 | 15-DO15 | |
| | 8-DO8 | 16-DO16 | |
| | X2 Digital inputs | GND DI | GND DI |
| | | 1-DI1 | 9-DI9 |
| | | 2-DI2 | 10-DI10 |
| | | 3-DI3 | 11-DI11 |
| | | 4-DI4 | 12-DI12 |
| | | 5-DI5 | 13-DI13 |
| | | 6-DI6 | 14-DI14 |
| | | 7-DI7 | 15-DI15 |
| 8-DI8 | 16-DI16 | | |

You must power the digital outputs/inputs externally by connecting 24V and 0V. In the IRC5 compact version you can use XS16 Power supply and with IRC5 XT31 block. The DSQC1030 is **PNP** type, the following pins needs to be wired together:

| Pins from | Pins to | Description |
|------------------------------------|----------------|---------------------------------|
| XS16 (IRC5C) or other Power supply | X4 | Controller PWR, GND to DSQC1030 |
| X4 | PWR DO, GND DO | PWR, GND to DO |
| GND DO | GND DI | DO GND to DI GND |

Finally connect the DSQC1030 X3 Ethernet port to the controller X4 (LAN2) port. The robot controller will automatically recognize the device. There is two way to configuring the local I/O-s:

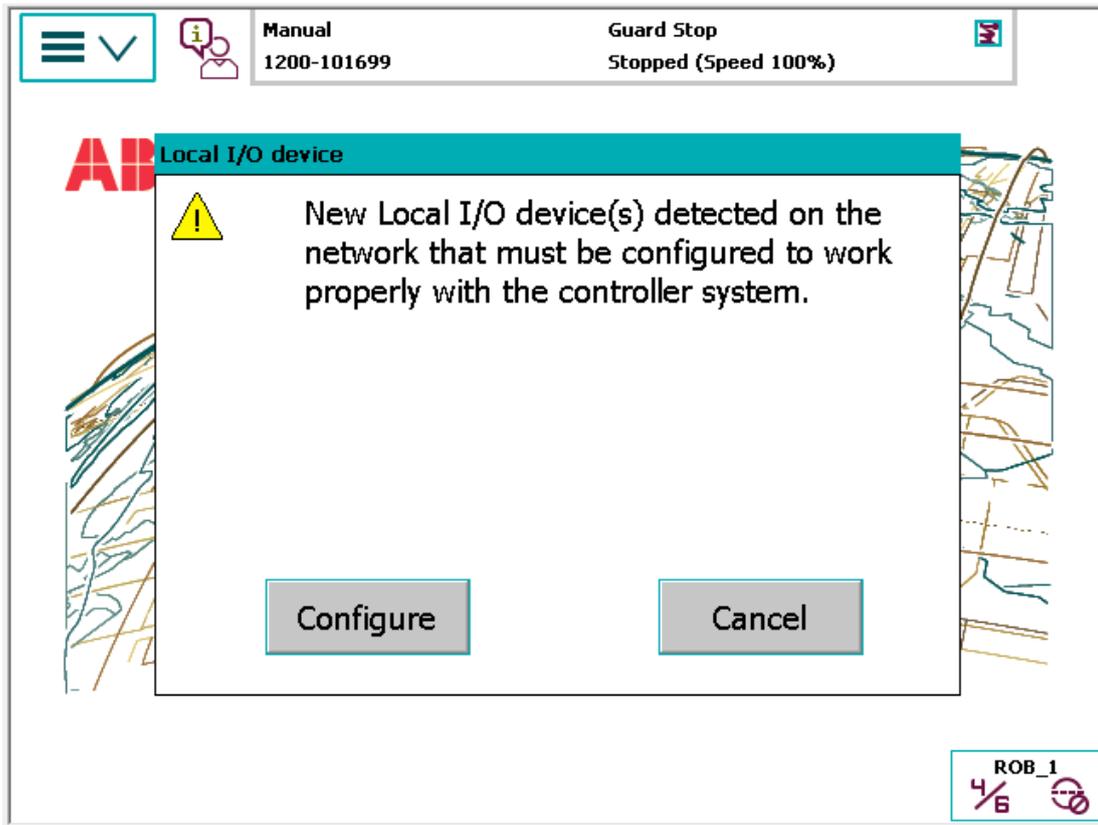
- Via the Flexpendant
- Via Robotstudio

Flexpendant

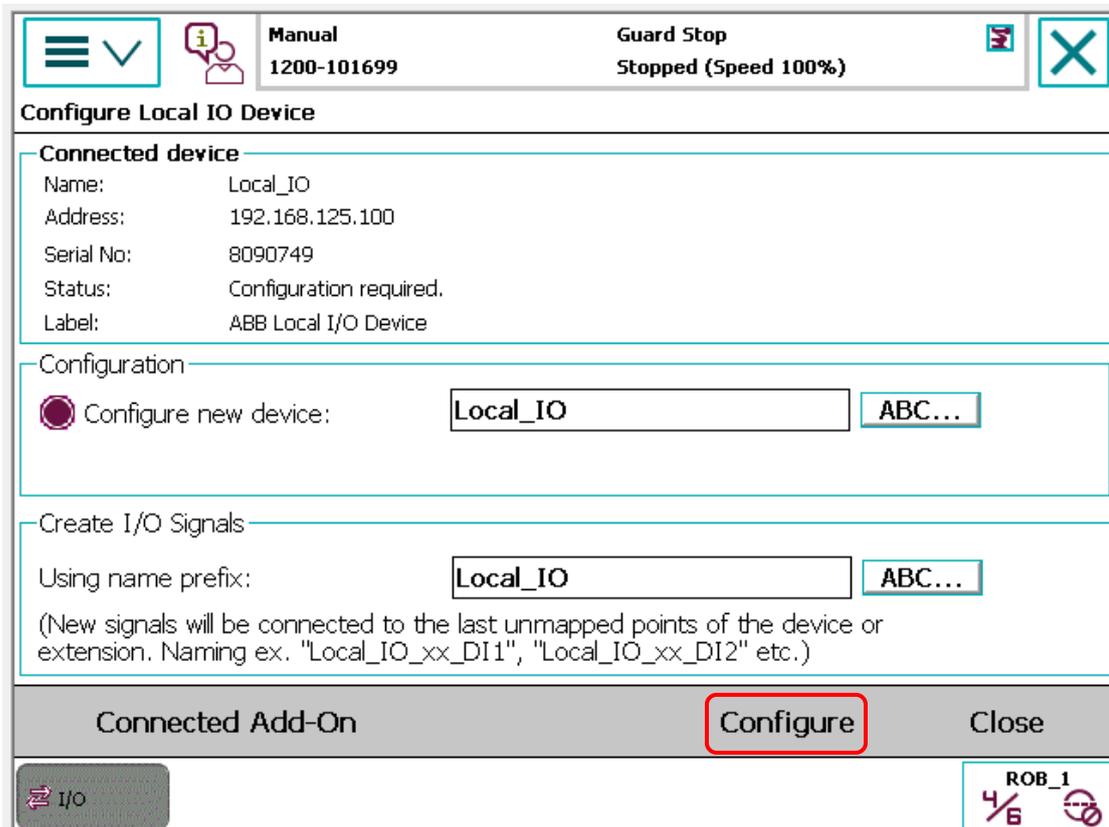
When you connect the DSQC1030 base, you will get a message: 'LOCAL I/O device(s) detected on the network that must be configured to work properly with the controller system.'

Then do the following steps:

- Press **Configure**



- Enter the I/O device name in the **Configure new device** field.
- Enter the signals name if desired.



- Press **Configure**.

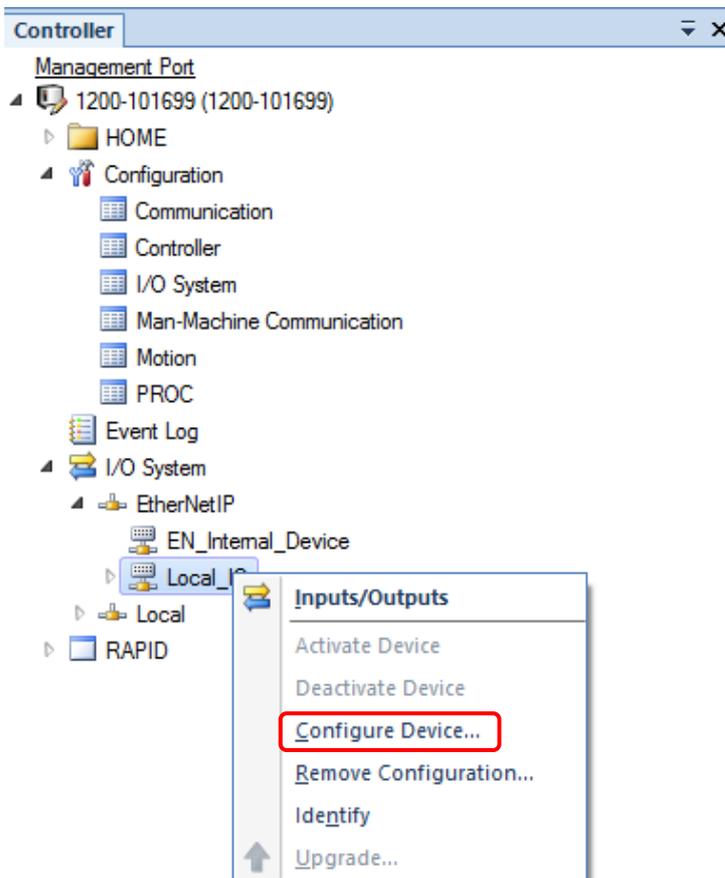
When you restart the controller the I/O device is will be added with signals.

Robotstudio

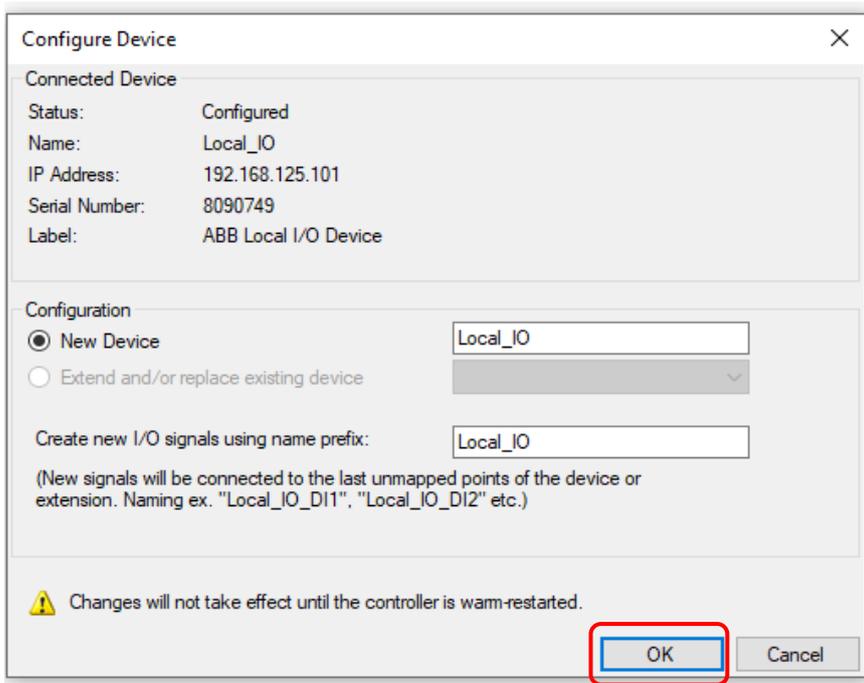
You need to connect to the controller with your PC first. When you connect the DSQC1030 Digital base, you will get a message: *'LOCAL I/O device(s) detected that must be configured to work properly with the controller.'*

Then do the following steps:

- On the **Controller** tab expand the controller tree and then the **I/O system** tree.
- Expand the **EtherNetIP** tree and right click on the LOCAL_IO.
- Press **Configure Device...**



- Enter the **I/O device name** in the Configure new device field.
- Enter the signals name if desired.



- Press **Ok**.

When you restart the controller the I/O device will be added with signals.

6.3.3 Ethernet cable



Connect the provided Compute Box (ETHERNET connector) and your computer with the supplied UTP cable.

This connection is only needed for programming.



CAUTION:

Use only original OnRobot ethernet cables or replace it with one that is shielded and no more than 3 meter long.



WARNING:

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

6.3.4 Power supply



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



NOTE:

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



CAUTION:

Use only original OnRobot power supplies.

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

7 Operation

**NOTE:**

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

7.1 Overview

OnRobot WebLogic™ requires to be programmed first with the help of a computer connected to the Compute box. Then it can run standalone without any Ethernet connection.

Steps to program it:

- Setup the Compute Box's Ethernet interface and connect to the Compute Box
- Open the Web Client on your computer to access the WebLogic™ menu
- Write your program in the WebLogic™ menu

The following subsections will guide you through these steps.

7.2 Ethernet Interface setup

A proper IP address must be set for the Compute Box and the robot/computer to be able to use the Ethernet interface. There are three ways how it could be configured (using the DIP switch 3 and 4):

- **Auto mode** (factory default)

This is the easiest way of getting the IP addresses to be configured for both the Compute Box and the robot/computer. It is recommended to start with this mode, so this is the factory default setting.

- **Fixed IP mode** (192.168.1.1)

If the **Auto mode** does not work, use this mode to have a fixed IP for the Compute Box. This requires a manual IP address configuration for the robot/computer. (This mode could also be used to reset the IP address to a known value if the Compute Box become unreachable in **Advanced mode**.)

- **Advanced mode** (any static IP/subnet mask)

If the Fixed IP address (192.168.1.1) is already in use in your network or a different subnet needs to be configured, in this mode the IP address and subnet mask can be changed to any value. This also requires a manual IP address configuration for the robot/computer.



NOTE:

To change between modes, first change the DIP switches and then the Compute Box power needs to be cycled for the changes to take effect.

Auto mode



Use the factory default settings (DIP switch 3 and 4 in OFF position).

In this case, the Compute Box has both Dynamic Host Configuration Protocol (DHCP) client, and DHCP server enabled.

DHCP Client enabled means, Compute Box will automatically obtain ("get") IP address FROM the connected robot/computer if that is capable of assigning ("give") IP to the Compute Box.

DHCP Server enabled means, Compute Box will automatically assign ("give") IP address TO the connected robot/computer if that was configured to obtain ("get") IP address automatically.



NOTE:

The assigned IP range is 192.168.1.100-105 (with subnet mask 255.255.255.0).

If the Compute Box is used in a company network where a DHCP server is already in use, it is recommended to disable the DHCP server of the Compute Box by setting DIP switch 4 to the ON position.

If no IP was assigned to the Compute Box within a minute, it will automatically get a fallback IP address (192.168.1.1).



NOTE:

If the Compute Box was in **Advanced mode**, first reset the IP setting by switching to **Fixed IP mode** and then switch back to **Auto mode**.

Fixed IP mode



Set the DIP switch 3 and 4 in ON position and cycle the power for the changes to take effect.

In this case the IP address of the Compute Box is set to 192.168.1.1 (subnet mask is 255.255.255). Both the DHCP Client and Server options are disabled.

Make sure to set the robot/computer IP address manually. To have a proper communication the robot/computer IP address must be in the range of 192.168.1.2 - 192.168.1.254.

Example robot/computer setting:

IP address: 192.168.1.2

Subnet mask: 255.255.255.0

Other settings like Gateway, DNS Server, etc. could be kept empty or set to 0.0.0.0.

Advanced mode



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

In this case the IP address of the Compute Box could be set to any value by using the Web Client. For more details see section Configuration menu.

In this mode, the DHCP server option is disabled.

Make sure to have a matching IP setting to your robot/computer network for a proper communication.



NOTE:

If the Compute Box become unreachable (due to improper or forgotten IP settings), switch to **Fixed IP mode** to reset the IP setting.

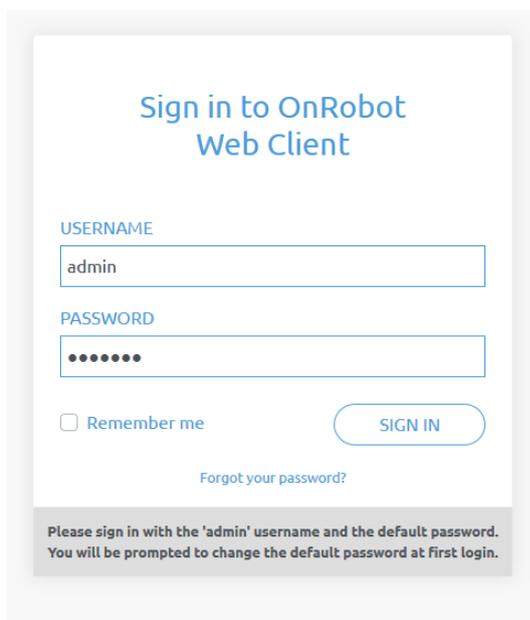
7.3 Web Client

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 Auto mode (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.
- Open a web browser on your computer and type in the IP address of the Compute Box (factory default is 192.168.1.1).

The Sign-in page opens:



The screenshot shows the sign-in page for the OnRobot Web Client. The page has a white background with a light blue border. At the top, the text "Sign in to OnRobot Web Client" is displayed in blue. Below this, there are two input fields: "USERNAME" with the value "admin" and "PASSWORD" with a masked password of six dots. To the left of the password field is a checkbox labeled "Remember me". To the right of the password field is a blue "SIGN IN" button. Below the input fields is a link that says "Forgot your password?". At the bottom of the page, there is a grey box containing the text: "Please sign in with the 'admin' username and the default password. You will be prompted to change the default password at first login."

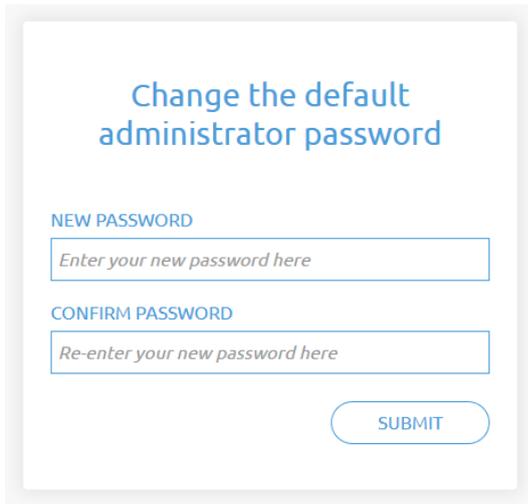
The factory default administrator login is:

Username: admin

Password: OnRobot

Operation

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



The screenshot shows a web form titled "Change the default administrator password". It contains two input fields: "NEW PASSWORD" with the placeholder text "Enter your new password here" and "CONFIRM PASSWORD" with the placeholder text "Re-enter your new password here". A "SUBMIT" button is located at the bottom right of the form.

Once logged in you can access top menus. Select **WebLogic™** menu.

7.4 OnRobot WebLogic™ menu

There are two tabs to choose from:

- **Browser** - manage (import/export, etc.) the WebLogic™ programs
- **Program Editor** - create/edit or run WebLogic™ programs

In the following these two will be described.

7.4.1 Browser

This tab lists the WebLogic™ programs that are stored on the Compute Box.

- To create a new program, go to the **Program Editor** tab.
- To edit a stored program, click on the pencil icon and it will be loaded in the **Program Editor**
- Any program can be deleted by clicking on the trash icon.
- Programs can be exported to your computer by clicking on the down arrow icon.
- Exported programs can be imported with the **Import** button.



NOTE:

The program name that are edited in the **Program Editor** is bolded.

OnRobot WebLogic

This page allows to browse/manage the OnRobot WebLogic programs. You can create new program and run it on the Editor tab. (To make your program run automatically on power-on, leave it running while powering the Compute Box off.)

Browser
Program Editor

IMPORT

You can import a program file from your computer.

| PROGRAM NAME | ROWS | SIZE | |
|------------------|----------|--------------|--|
| Program 1 | 2 | 2,742 | |
| Program 2 | 3 | 3,609 | |
| Program 3 | 13 | 20,480 | |

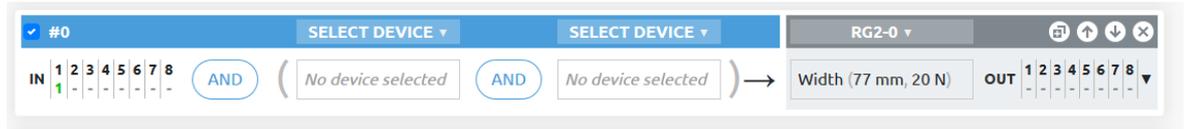
7.4.2 Program Editor

This tab shows the currently edited WebLogic™ program.

WebLogic™ programs contains 1 or more "rows".

A row contains conditions (blue part) and commands (gray part) like this:

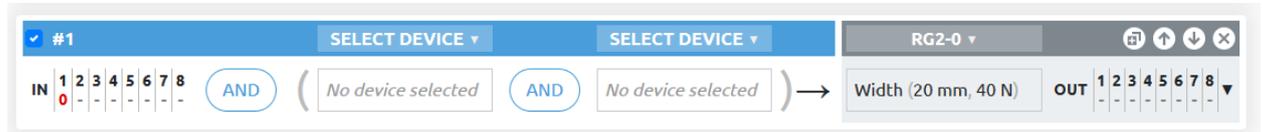
(If) DI1=1 → **(Then)** RG2-Width=77 (force=20N)



(If the robot sets the Digital Input 1 (DI1) of the Compute Box to high, **then** open the RG2 gripper to 77 mm.)

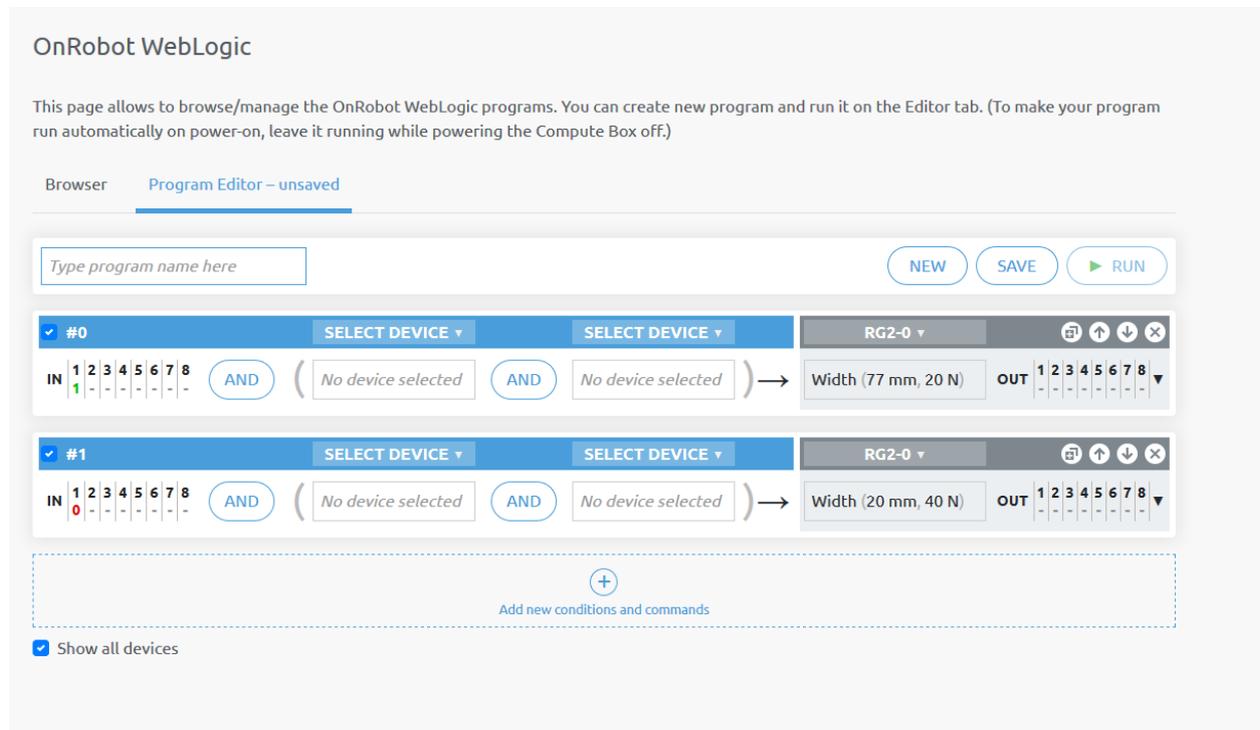
Another row in a program can be like this:

(If) DI1=0 → **(Then)** RG2-Width=20 (force=40N)



(If the robot sets the Digital Input 1 (DI1) of the Compute Box to low, **then** close the RG2 gripper to 20 mm.)

With the above two rows in a program an RG2/6 gripper could be operated (opened and closed) with a single Digital output of a robot, while the opening and closing width and force can be programmed to any value.



To execute a WebLogic™ program first make sure to enter a program name and click on the **Save** button to store it and then click on the **▶ Run** button.



NOTE:

To make a program run automatically when the Compute Box is powered on just leave the program running while you power the Compute Box off.

To start a new program, click on the **New** button.

- To add a new row, click on the **Add new conditions and commands.**
- To delete a row, click on the icon.
- To move the row up or down click on the icons.



NOTE:

Conditions and commands are executed from the top to the bottom. Same commands at the bottom can override the ones at the top.

- To duplicate a row, click on the icon.
- To disable a row (not to be executed), uncheck the checkbox next to the row number.

The rows must have at least one condition and at least one command to be executed.

Conditions

Conditions are the input fields marked by blue.

There are two types of conditions:

- Digital Input type - like DI4=1
- Device specific value type - like HEX Fx > 10N

These types of conditions can be combined with AND or OR logic to form a more complex condition:

If (DI4=1) OR (HEX Fx > 10 N AND HEX Fx < 20N)

Condition is true if Fx is between 10N and 20N or robot has signaled high in Digital Input 4.

Digital inputs (DI1-DI8) can have the following three states: (click to cycle through the states)

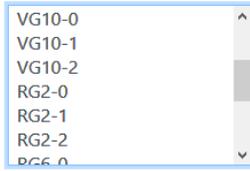
- - Don't care (this bit is masked and will give true result for the bit)
- - give logic true if Input bit is low
- -give logic true if Input bit is high



NOTE:

If no Digital Input type of condition is needed set DI1-DI8 to don't care.

For Device specific values first set the **Select device** by clicking on the arrow icon.



NOTE:

The list contains only the connected devices. If you would like to select a device that is not currently connected check the **Show all devices** checkbox.

For 3FG15, RG2/6, SG, VG10, VGC10 and Gecko there are three numbers after the device name:

- **0** - If the device is mounted on a Quick Changer or a HEX-E/H QC
- **1** - If the device is mounted on the Primary side of a Dual Quick Changer
- **2** - If the device is mounted on the Secondary side of a Dual Quick Changer



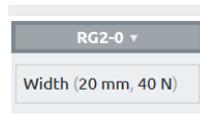
NOTE:

If a Device specific value type condition is not needed set it to **-- Not selected --** and it will give true result.

Commands

Commands are the input fields marked with gray.

There are two types of commands:



- Device specific value type - like (set RG2 width 77 mm and with force = 20N)

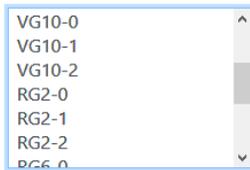
- Digital Output type - like DO4=1 (set Digital Output 4 to logic high)



NOTE:

Both types are always executed so make sure that the not relevant part is always set to Don't change or **-- Not selected --**.

For Device specific value first set the **Select device** by clicking on the arrow icon.



NOTE:

The list contains only the connected devices. If you would like to select a device that is not currently connected check the **Show all devices** checkbox.

For 3FG15, RG2/6, SG, VG10, VGC10 and Gecko there are three numbers after the device name:

- **0** - If the device is mounted on a Quick Changer or a HEX-E/H QC
- **1** - If the device is mounted on the Primary side of a Dual Quick Changer
- **2** - If the device is mounted on the Secondary side of a Dual Quick Changer

Operation

Digital outputs (DO1-DO8) can have the following three states: (click to cycle through the states)

-  - Don't change
-  - set the Output bit to logic low
-  - set the Output bit to logic high

List of Device specific values

| | | |
|---|---------------------------|------------|
|  | 3FG15 | 127 |
|  | Gecko | 127 |
|  | HEX-E/H QC | 128 |
|  | RG2/6 | 128 |
|  | RG2-FT | 129 |
|  | SG | 129 |
|  | VG10 / VGC10 | 130 |



NOTE:

Each device has an **OnStart** condition that becomes True only once the device is connected or the program is started and then becomes immediately False. This can be used to detect if a device is connected or set any initial value on program start.

3FG15

| Conditions | Description |
|-----------------------------|--|
| Dimeter | Actual raw diameter of the fingers [mm] |
| Dia. with fingertips | Actual diameter of the fingers with the fingertips [mm] |
| Force | Actual force in percentage |
| Busy | Becomes TRUE when the gripper is moving otherwise FALSE . |
| Grip detected | Becomes TRUE when the gripper was commanded to move and the move was stopped by gripping on a part otherwise FALSE . |
| Force grip detected | Becomes TRUE when the gripper was commanded to gripping and the target force is reached otherwise FALSE . |
| Error | Becomes TRUE when there is any error otherwise FALSE . |

| Commands | Description |
|-------------------------|---|
| Grip internal | To grip internally on a part with the given target force (1-100%). The target diameter needs to be 3mm more than the part diameter to be gripped. |
| Grip external | To grip externally on a part with the given target force (1-100%). The target diameter needs to be 3mm less than the part diameter to be gripped. |
| Move to diameter | Moves the fingers to the given diameter [mm] |
| Stop | Stops the fingers motion |

Gecko

| Conditions | Description |
|---------------------|---|
| Preload | Actual force applied to the pads [N] (below 50N it reads 0N) |
| Ultrasonic | Actual distance measured from the bottom of the gripper to the object.[mm] |
| Pad position | Actual position of the pads either In or Out |
| Pads worn | If a Grip was detected and then object distance becomes more than 18mm (without the pads being pulled IN) the object is lost so the Pads are Bad otherwise reads Good . |
| Busy | Pads are in motion |
| Grip | While the pads are OUT if the Preload force is reached and the object distance is less than 18mm, then Grip becomes TRUE otherwise FALSE . (resets to FALSE by pulling the pads IN) |

| Commands | Description |
|--------------------------|---|
| Pad position | To pull the pads In or push the pads Out |
| Preload threshold | To set the preload force limit that is used to detect a successful Grip . Available options are: 50N, 90N, 120N |
| Reset error logs | Clears the errors (e.g.: Pads worn) |

HEX-E/H QC

| Conditions | Description |
|-------------------------------|---|
| Bias | TRUE if the sensor has been zeroed (biased). |
| F3D, T3D | $F3D = \sqrt{Fx^2 + Fy^2 + Fz^2}$ [N] $T3D = \sqrt{Tx^2 + Ty^2 + Tz^2}$ [Nm] |
| Fx, Fy, Fz, Tx, Ty, Tz | Actual force [N] and torque [Nm] values |

| Commands | Description |
|-------------|---|
| Bias | Set to TRUE to zero the F/T sensor signals (not permanent, will revert on power reset) |

RG2/6

| Conditions | Description |
|-------------------------|---|
| Width | Actual width of the gripper [mm] |
| Busy | True if the gripper is in motion (can only accept new commands when not busy) |
| Grip | Internal or external grip is detected. |
| Safety pressed | True if any of the gripper's safety switch is currently being pressed. |
| Safety triggered | True if any of the gripper's safety switch is triggered. |

| Commands | Description |
|-------------------------|--|
| Width | Set the gripper to a new width [mm] with a gripping force [N] |
| Fingertip offset | Set the fingertip offset from the inner side of the metal [mm]. Positive number means inward. |
| Power cycle | If safety switch stopped the gripper use this to get back to normal operation. Resets the tool power for a second. If another gripper is connected, that will also be powered off and powered on for a second. (Make sure that during power off no part to will be dropped.) |

RG2-FT

| Conditions | Description |
|-------------------------------|--|
| Proximity (L,R) | Actual values of the left and right fingertip proximity sensors [mm] |
| Width | Actual width of the gripper [mm] |
| Busy | True if the gripper is in motion (can only accept new commands when not busy) |
| Grip | Internal or external grip is detected. |
| FT Bias | TRUE if the sensor has been zeroed (biased). |
| Left and Right F3D,T3D | $F3D = \sqrt{F_x^2 + F_y^2 + F_z^2}$ [N] where F_x, F_y, F_z are the fingertip sensor force components $T3D = \sqrt{T_x^2 + T_y^2 + T_z^2}$ [Nm] where T_x, T_y, T_z are the fingertip sensor torque components |
| Both F3D,T3D | The combined F3D and T3D acting on an object that the gripper gripped on |

| Commands | Description |
|--------------|---|
| Width | Set the gripper to a new width [mm] with a gripping force [N] |
| Bias | Set to TRUE to zero the F/T sensor signals (not permanent, will revert on power reset) |

SG

| Conditions | Description |
|--------------------|--|
| Width | Actual gripper width [mm] |
| Initialized | Becomes TRUE when the gripper received a valid Initialize command otherwise FALSE . |
| Busy | Becomes TRUE when the gripper is moving otherwise FALSE . |

| Commands | Description |
|-------------------|--|
| Initialize | The gripper first needs to be initialized by setting what type of SG Tool is used. |
| Grip | Set the small enough target width to grip on a part. If the Gentle grip option is TRUE than the speed of the grasp will be decreased 10mm before the set target width. |
| Release | Set the large enough target width to release the part. |

VG10 / VGC10

| Conditions | Description |
|--|---|
| Actual vacuum A Actual vacuum B | Actual vacuum level [0-80%] for channel A and channel B |

| Commands | Description |
|----------------------|---|
| Current limit | Set the current limit (0-1000mA), default is 500mA |
| Grip | Sets the vacuum level (0-80%) for channel A (param1) and channel B (param2) |
| Idle | Switch of the motor but keep the valve closed for channel A, B or A+B |
| Release | Opens the valve to quickly release the vacuum for channel A, B or A+B |

8 Additional Software Options

8.1 Compute Box

8.1.1 Interfaces

There are two interface types that could be used:

- **Ethernet interface**

This interface can be used to access the Web Client that can be used to monitor, control, and update the grippers/devices. Furthermore, via this interface the OnRobot WebLogic™ can also be accessed to program the Digital I/O Interface.

- **Digital I/O interface**

This interface could be used to communicate via simple digital I/O lines with the robots. There are 8 digital input and 8 digital output that could be used. These inputs and outputs can be programmed through the OnRobot WebLogic™ that requires the Ethernet interface to be used (only for programming time).

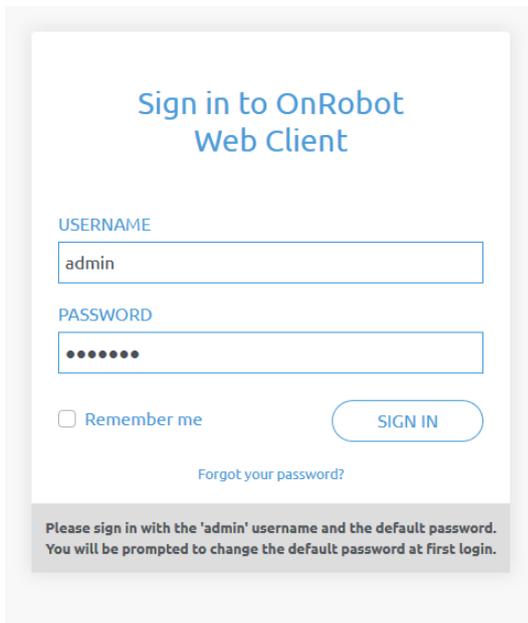
8.1.2 Web Client

To access the Web Client on your computer first the Ethernet interface needs to be set up to have a proper communication between your computer and the Compute Box. It is recommended to use Auto mode (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.
- Open a web browser on your computer and type in the IP address of the Compute Box (factory default is 192.168.1.1).

The Sign-in page opens:

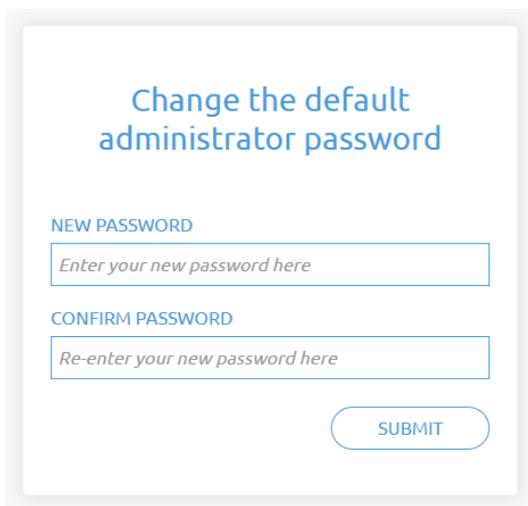


The factory default administrator login is:

Username: admin

Password: OnRobot

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



Once signed in the following top menus appear:



- **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

Additional Software Options

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

In the following, these menus will be described.

Devices menu

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

Please select from the detected device(s):



Compute Box

SELECT



HEX-E/H QC

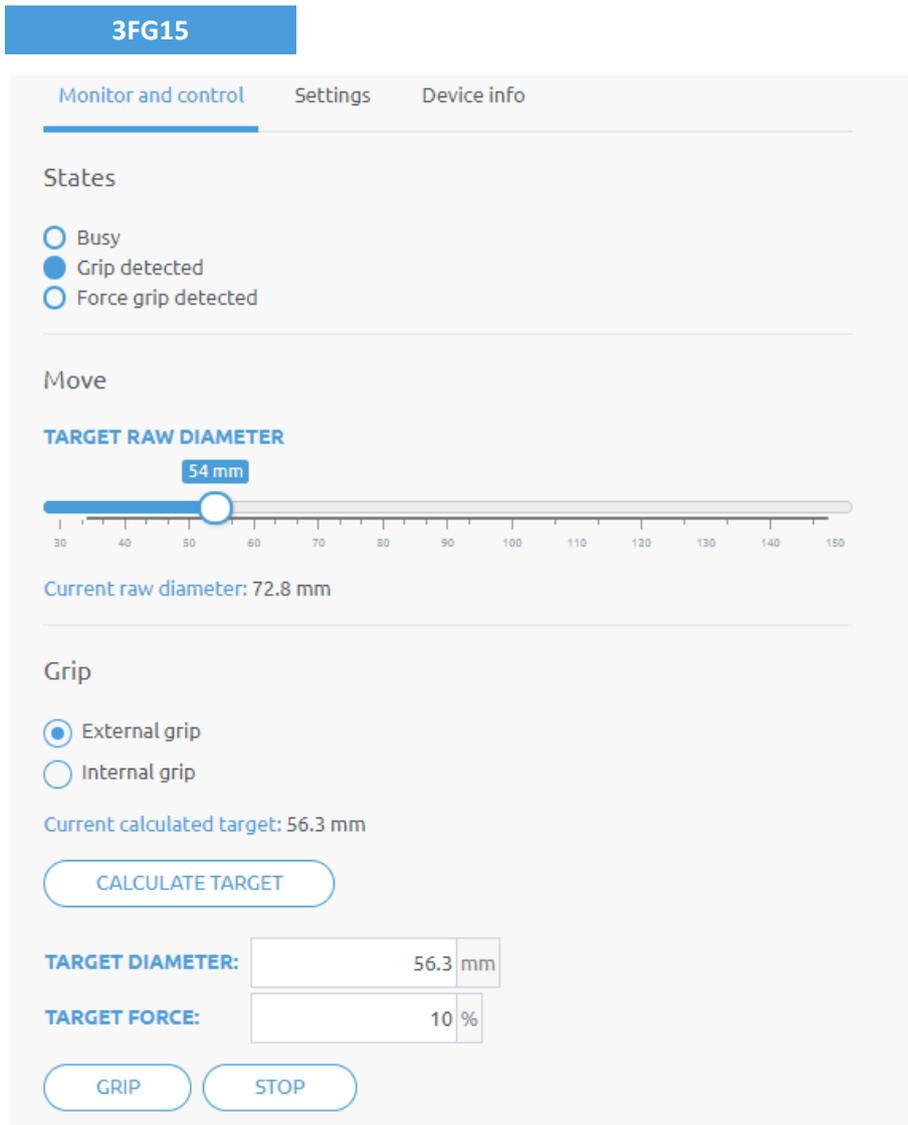
SELECT



RG2

SELECT

| | | |
|---|--------------------------|------------|
|  | 3FG15..... | 134 |
|  | Gecko..... | 137 |
|  | HEX-E/H QC..... | 139 |
|  | RG2/6..... | 140 |
|  | RG2-FT..... | 142 |
|  | SG..... | 144 |
|  | VG10 / VGC10..... | 146 |



The state of the gripper could be:

- **Busy** - the gripper is in motion
- **Grip detected** - the gripper has detected a workpiece
- **Force grip detected** - the gripper has applied the target force to a workpiece. This also activates a break. See more info in section [Finger movement and force on page 161](#).

The gripper can be controlled in two modes:

- **Move** mode - The easiest way to move the gripper but the gripping force is limited (<50N). This should be used to release a part and open the gripper.
- **Grip** mode - This should be used to properly grip a part with a given target force. If the part is properly gripped (target force is reached) the break will engage to make sure the part will not be dropped in case of a power loss.

In **Move** mode:

The gripper can be controlled by adjusting the **Target raw diameter** slider. The actual values of the fingers are shown by the **Current raw diameter**. The raw diameter is considered to be without the finger tip offset.

In **Grip** mode:

First set how to grip the part:

- Externally or
- Internally

To grip on a part set the **Target Diameter** and **Target force** and click on the **Grip** button.

There are two ways how the target diameter can be given:

- Enter manually - make sure to add 3mm to the part diameter if it is gripped internally and subtract 3mm if it is gripped externally
- Use the **Calculate target** button:

Move the fingers with the slider to touch the part and activate the **grip detected** (open fully for an internal grip or close fully for an external grip).

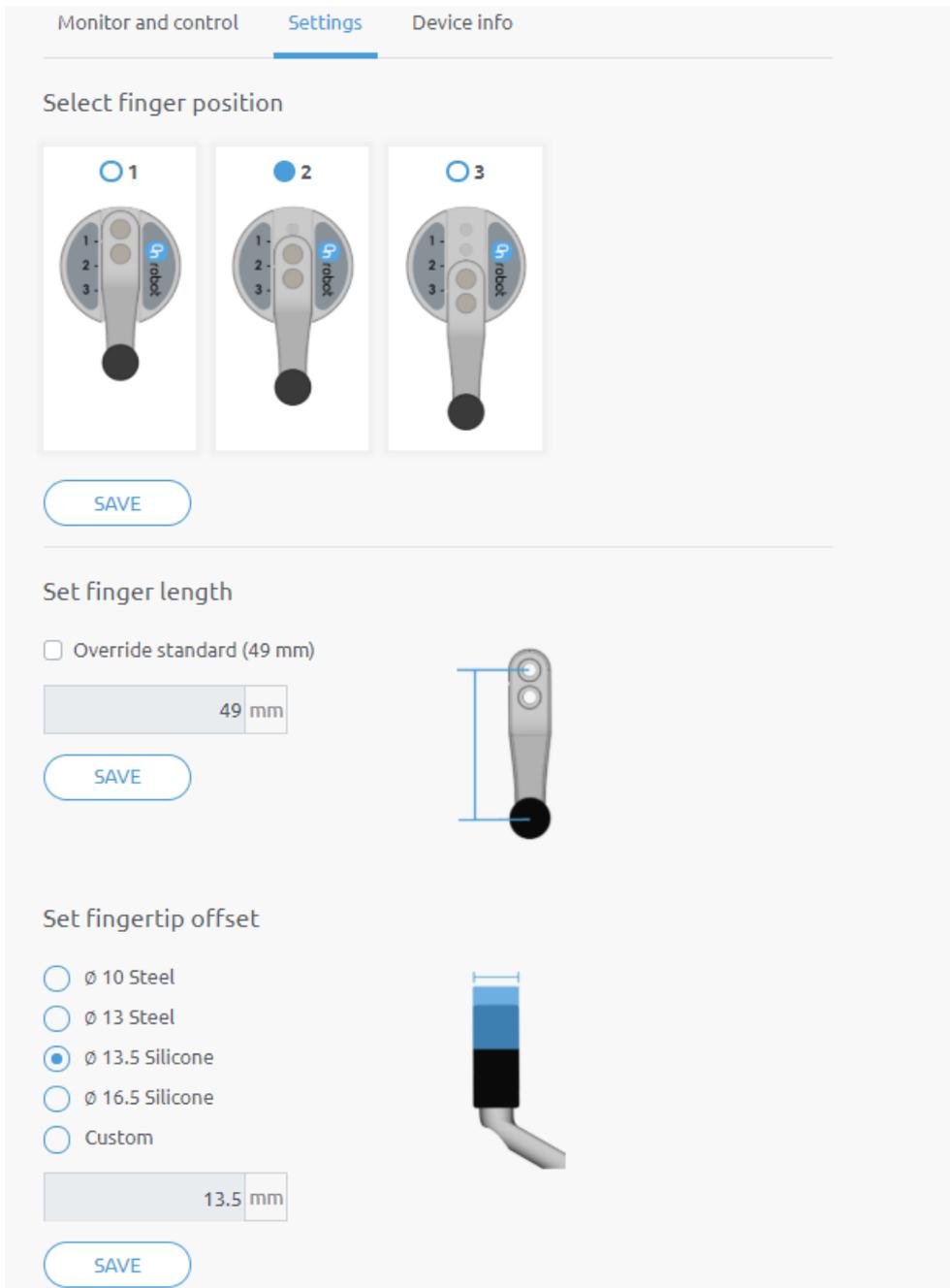
Based on whether it will be external or internal the **Current calculated target** (diameter) for the grip is shown. The fingertip offset is either added or subtracted to compensate for the set fingertip.

| Grip type | Current calculated target value |
|---------------|--|
| External Grip | Current raw diameter - fingertip offset - 3 mm |
| Internal Grip | Current raw diameter + fingertip offset + 3 mm |

Click on the **Calculate target** button to load the calculated value to the **Target diameter**.

- If the grip was successful, the **Force grip detected** signal should be activated and the engaged brake should make a clicking sound.
- During the gripping the motion of the finger can be terminated by clicking on the **Stop** button.
- To release the part from a gripped status, move the gripper:
 - Outward in case of an external grip
 - Inward in case of an internal grip.

The default finger setting can be changed on the **Settings** tab:



- **Select finger position** - Select the mounted finger position and **Save**.
- **Set finger length** - If customized fingers are needed, the checkbox can be enabled, and the new finger length can be entered.
- **Set fingertip offset** - The 4 different types that are delivered with the gripper can be selected by pressing the radio button. If customized fingertips are made, the custom option can be selected.

Saving any of these 3 settings will automatically apply the changes. Different finger positions, fingertip diameters and finger lengths will allow to achieve different diameters and forces. Find more information in sections Gripping Forces and Gripping Diameters

Gecko

Gecko Gripper

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

Actual values

| | |
|-----------------|-------------------------------------|
| Preload force | 0 N |
| Object distance | 1.76 mm |
| Pad position | Pads are out |
| Part detected | <input checked="" type="checkbox"/> |
| Busy | <input type="checkbox"/> |

RESET ERRORS

Set values

PAD POSITION

PADS OUT

PADS IN

PRELOAD THRESHOLD

50 N



There is a force and an ultrasonic distance sensor in the gripper. The actual values of these sensors are:

- **Preload** - the current forces acting on the pads (below 50N it displays 0N)
- **Object distance** - how far the object is from the bottom of the gripper

The state of the gripper could be:

- **Pad position**- Pads are either In or Out (out means ready for gripping)
- **Part detected** - the set preload force limit is reached, and object distance is < 18mm
- **Busy** - the pads are moving

The pads can be controlled by clicking on the **Out** and **In** buttons.

The **Preload threshold** value can be changed if higher preload force is required for a proper grip.

This value is only used to generate a proper **Part detected** signal.



NOTE:

Preload threshold value set on this page is not stored permanently and are restored to the default value (90N) on power reset.

If a part was detected and the object distance becomes $> 18\text{mm}$ (part is lost) BEFORE the pads are set to be IN (normal release) the **Pads worn** warning is displayed in the **Device info** tab.

To reset the warning:

- either click on the **RESET ERRORS** button
- or click on the **Out** button.

HEX-E/H QC

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

Force/Torque values

| HEXHC001 | |
|----------|--------|
| Fx (N) | -0.31 |
| Fy (N) | 0.16 |
| Fz (N) | -1.00 |
| Tx (Nm) | -0.008 |
| Ty (Nm) | 0.060 |
| Tz (Nm) | 0.003 |

ZERO

The force and torque values (**F_x**,**F_y**,**F_z** and **T_x**,**T_y**,**T_z**) 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.

RG2/6

RG2

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](#)

States

Busy
 Grip detected

Safety

| RG2 GRIPPER | SWITCH 1 | SWITCH 2 |
|-------------|-----------------------|-----------------------|
| Pushed | <input type="radio"/> | <input type="radio"/> |
| Triggered | <input type="radio"/> | <input type="radio"/> |

[POWER CYCLE](#)

Set width and force

FINGERTIP OFFSET

mm [SAVE](#)

WIDTH

51 mm

0 9 18 27 36 45 55 64 73 82 91 100

FORCE

20 N

0 10 20 30 40

Current width: 51 mm

The state of the gripper could be:

- **Busy** - the gripper is moving
- **Grip detected** - the set force limit is reached but the set width is not.

The status of the two safety switch shows:

- **Pushed** - the safety switch 1/2 is still being pushed
- **Triggered** - the safety switch 1/2 has been activated and gripper is stopped.

To recover from a Triggered state:

- Check if any of the safety switch is being pushed
- If yes, remove the object pushing the switch

Additional Software Options

- Click on **Power cycle** to power all devices off and then on to recover.

Fingertip offset must be set according to the current fingertips attached to the gripper. Offset is measured from the inner mating face of the bar metal fingertips. To save the value to the gripper permanently click **Save**.

The gripper can be controlled by adjusting the **Force** and **Width** value. First set the required gripping force and then adjust the width slider that will immediately control the gripper.

RG2-FT

RG2-FT

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

Force/Torque and Proximity sensor values

| LEFT / HEXSD329 | | HEXSD356 / RIGHT | |
|-----------------|----------------------|------------------|----------------------------|
| 22 mm | <input type="text"/> | Proximity | <input type="text"/> 29 mm |
| -0.53 | | Fx (N) | -0.88 |
| 0.29 | | Fy (N) | -0.28 |
| -4.31 | | Fz (N) | -1.58 |
| -0.014 | | Tx (Nm) | -0.029 |
| -0.019 | | Ty (Nm) | -0.160 |
| -0.007 | | Tz (Nm) | 0.003 |

ZERO

PROXIMITY OFFSET

LEFT 0 mm RIGHT 0 mm

Set width and force

WIDTH 0 mm

FORCE 20 N

Current width: 0 mm

The force and torque values (**Fx,Fy,Fz** and **Tx,Ty,Tz**) are shown in N/Nm along with the Proximity sensor values (optical distance sensor built in the fingertip) are show in mm for the left and right fingertip sensor.

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

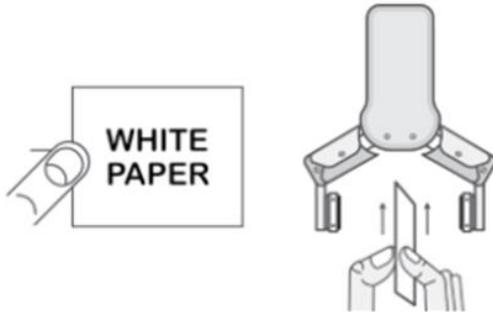


NOTE:

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

The **Proximity offset** can be used to calibrate the proximity reading. The calibration requires the following steps to be done:

- Write 0 mm to the **Left** and **Right** edit box and click on the **Save** button.
- Close the gripper fully (set the **Width** to 0) while you hold a white paper between the fingertips.



- Read the actual **Left** and **Right Proximity** values (e.g.: 19mm and 25mm)
- Write these values to the **Left** and **Right** edit boxes and click on the **Save** button to store it permanently.
- Open the gripper and the calibration is finished.



NOTE:

Setting the offsets too high may clip the proximity reading at 0 mm (negative distance is not shown). In case of clipping (reading 0 mm), try to decrease the offset values.

The gripper can be controlled by adjusting the **Force** and **Width** value. First set the required gripping force and then adjust the width slider that will immediately control the gripper.

SG

Monitor and control Device info

States

Busy
 Initialized

Select tool type

Current tool: Not selected

None  SG-a-H  SG-a-S

 SG-b-H

Set grip mode and width

GENTLE GRIP

TARGET WIDTH

0 mm

Current width: 0 mm

The **state** of the gripper could be:

- **Busy** - the gripper is moving
- **Initialized** - the gripper has been initialized.

Select tool type

- **Current tool** - Shows the currently selected SG tool. Select the desired SG tool, by clicking the adjacent radio button.
- Click on **Initialize** to initialize the selected SG tool

The state of the gripper could be:

- **Busy** - the gripper is moving
- **Initialized** - the gripper is initialized

Set grip mode and width

The default gripping speed is set as **Gentle Grip**, the gripping speed is reduced at 12.5mm before the specified target width, this results in a gentler grip, compared to normal grip settings.

The gripper can be controlled by adjusting the **Target Width** slider, this will immediately control the gripper.

- **Current Width** - shows the current width of the gripper.
- **Stop** button - stops the ongoing procedure.
- **Home** button - moves the gripper to its home position.

VG10 / VGC10

VG10

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

Actual values

| | |
|-------------|--------|
| Power limit | 500 mA |
| Channel A | 0 kPa |
| Channel B | 0 kPa |

Set values

POWER LIMIT

CHANNEL A

0%

RELEASE

Lock

CHANNEL B

0%

RELEASE

The actual vacuum level for **Channel A** and **Channel B** can be seen in percentage (in the range of 0...80 kPa vacuum). The actual value of the **Power limit** is shown in mA.

The **Power limit** can be adjusted in the range of 0...1000mA with the slider.



NOTE:

The power limit set in this page is not stored permanently and always restored to the default value on power reset.

Higher power limit value means the required vacuum level is reached faster (higher airflow), but if it is set too fast overshoot may occur.

Low power limit may not be enough for higher percentage of vacuum and the target vacuum level may not be reached.

The **Channel A** and **Channel B** vacuum level can be set individually or in tandem by checking the **Lock** checkbox.

Make sure to set high enough vacuum before you grip and lift any object.

To release the gripped object, click on the **Release** button.

Configuration menu

Configuration

This page allows the configuration of the Compute Box.

CAUTION

Incorrect settings may cause the device to lose network connectivity.

ON

1 2 3 4

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

NETWORK SETTINGS

| | |
|--------------|--|
| MAC address | b8:27:eb:0e:c9:a3 |
| Network mode | Static IP ⌵ |
| IP address | 192.168.1.1 ✎ |
| Subnet mask | 255.255.255.0 ✎ |

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 SETTINGS

Display name

✎

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, then the fixed 192.168.1.1 IP is used for the device (after 60 seconds of timeout).
- 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 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**.

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).

Paths 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 | SIZE (IN BYTES) | | |
|-----------|-----------------|---|----|
| 1539 | 1,692 | ↓ | 🗑️ |
| 3923 | 1,972 | ↓ | 🗑️ |
| 3924 | 1,972 | ↓ | 🗑️ |

To import a previously exported Path (.ofp file) 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 a .ofp 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.

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 | |
|-------------------------------|-----------------|------------------|---|
| Compute Box (CBOX_RPT) | | | |
| Firmware | 150 | 150 | ✓ |
| HEX-E/H QC (HEXHC001) | | | |
| Firmware | 208 | 208 | ✓ |

UPDATE

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

Start the software update by clicking on the **Browse** button to browse for the .cbu software update file.

Then the **Browse** button will turn to **Update**.

Click on that **Update** button to start the software update process:

Update in progress, please wait...

This may take several minutes to complete.

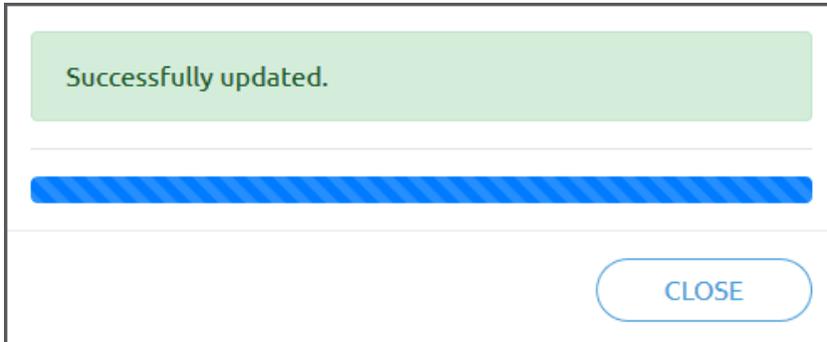
CLOSE



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.

If the update is finished and was successful, the following message is shown:



Now disconnect the device and use it as usual.

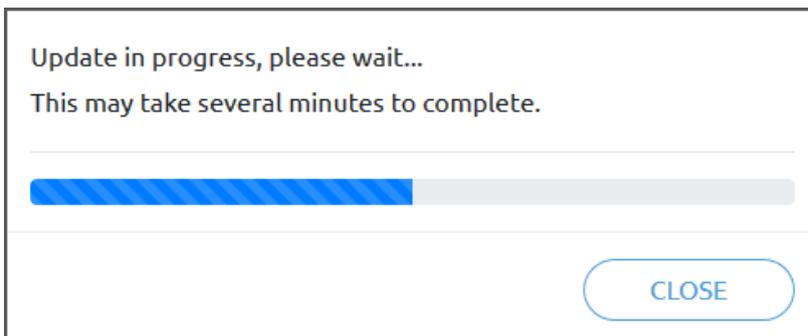


NOTE:

If the software update failed, please contact your distributor.

The firmware update is only required when any of the components  is out of date.

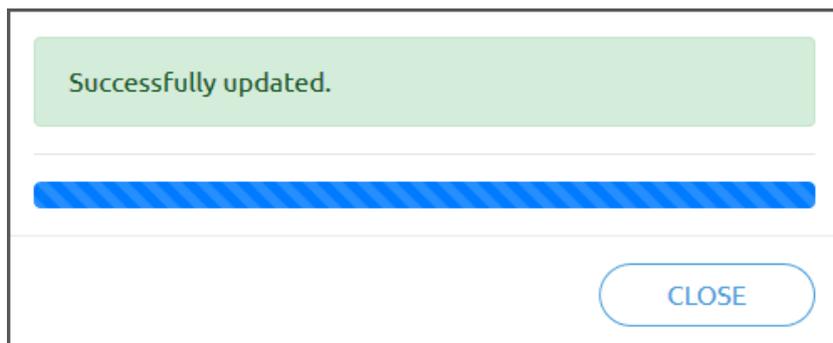
To start the firmware update, click on **Update** button in the firmware section of the page.



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.

If the update is finished and was successful, the following message is shown:



Now disconnect the device and use it as usual.



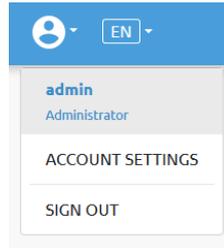
NOTE:

If the update is failed, please contact your distributor.

 **Account settings**

This menu can be used to:

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

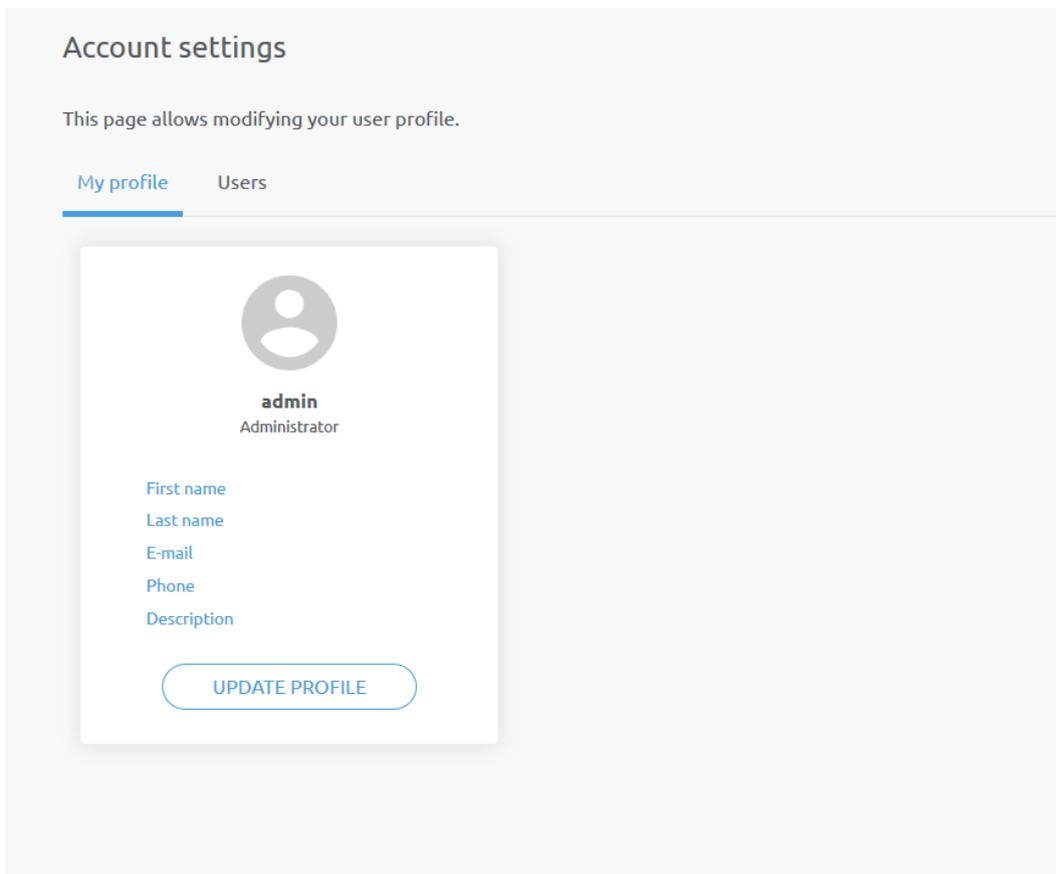


Account settings:

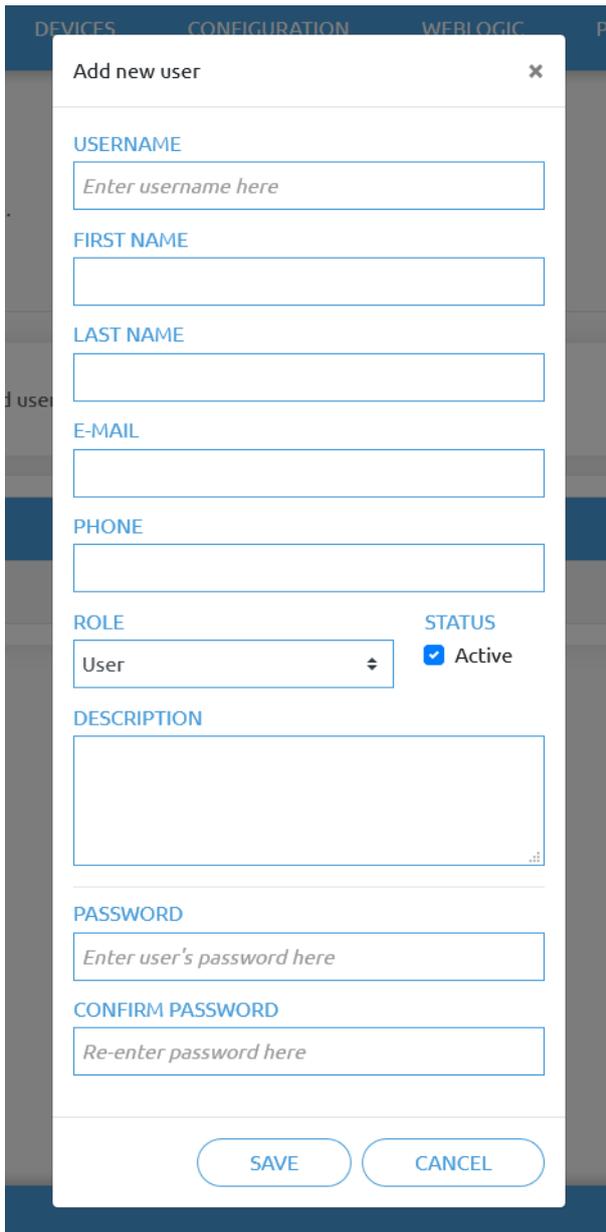
This page has two tabs:

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

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



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



There are three user levels:

- Administrator
- Operator
- User

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

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

Account settings

This page allows modifying your user profile.

My profile Users

[ADD NEW USER](#) You can add user on your network to monitor and control the devices.

| USERNAME | ROLE | FIRST NAME | LAST NAME | E-MAIL | PHONE | ACTIVE | |
|----------|---------------|------------|-----------|--------|-------|-------------------------------------|---|
| admin | Administrator | | | | | <input checked="" type="checkbox"/> |  |
| operator | User | | | | | <input checked="" type="checkbox"/> |   |

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

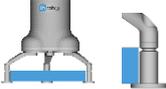
- deactivated by changing its **Active** status in the edit mode
- or removed by clicking the delete  icon.

9 Hardware Specification

9.1 Technical sheets

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3FG15

| General Properties | | Minimum | Typical | Maximum | Unit |
|---|--|------------|--------------|--------------|----------------|
| Payload Force Fit  | | - - | - - | 10 22 | [kg] [lb] |
| Payload Form Fit  | | - - | - - | 15 33 | [kg] [lb] |
| Grip Diameter* | External  | 4 0.16 | | 152 5.98 | [mm] [inch] |
| | Internal  | 35 1.38 | - - | 176 6.93 | [mm] [inch] |
| Finger position resolution | | - - | 0.1 0.004 | - - | [mm] [inch] |
| Diameter repetition accuracy | | - - | 0.1 0.004 | 0.2 0.007 | [mm] [inch] |
| Gripping force | | 10 | - | 240 | [N] |
| Gripping force (adjustable) | | 1 | - | 100 | [%] |
| Gripping speed (diameter change) | | - | - | 125 | [mm/s] |
| Gripping time (including brake activation)** | | - | 500 | - | [ms] |
| Hold workpiece if power loss? | Yes | | | | |
| Storage temperature | | 0 32 | - - | 60 122 | [°C] [°F] |
| Motor | Integrated, electric BLDC | | | | |
| IP Classification | IP67 | | | | |
| Dimensions [L, W, Ø] | 156 x 158 x 180 6.14 x 6.22 x 7.08 | | | | [mm] [inch] |
| Weight | 1.15 2.5 | | | | [kg] [lb] |

* With the scope of delivery

** 10 mm diameter distance. Also see section [Finger movement and force on page 156](#)

| Operating Conditions | Minimum | Typical | Maximum | Unit |
|------------------------------------|---------|---------|-----------|--------------|
| Power supply | 20 | 24 | 25 | [V] |
| Current consumption | 43 | - | 1500* | [mA] |
| Operating temperature | 5 41 | - - | 50 122 | [°C] [°F] |
| Relative humidity (non-condensing) | 0 | - | 95 | [%] |
| Calculated MTBF (operating life) | 30.000 | - | - | [Hours] |

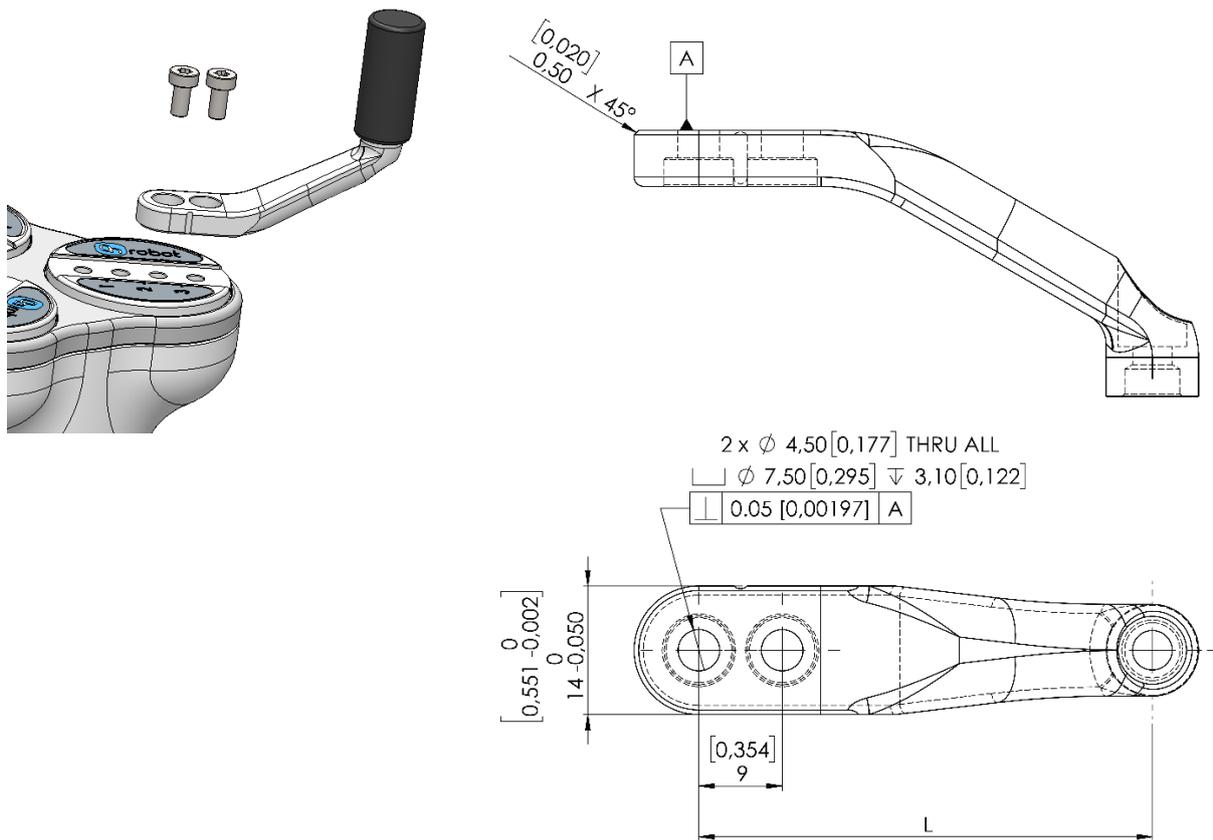
*600 mA set as default.

Fingers

The supplied fingers can be mounted in 3 different positions to achieve different **Gripping Forces below** and different **Gripping Diameters below**.



The delivered finger length is 49 mm (L in the drawing below). If custom fingers are required, they can be made to fit the Gripper according to the dimensions (mm)[inch] shown below. The needed screws are M4x8mm:

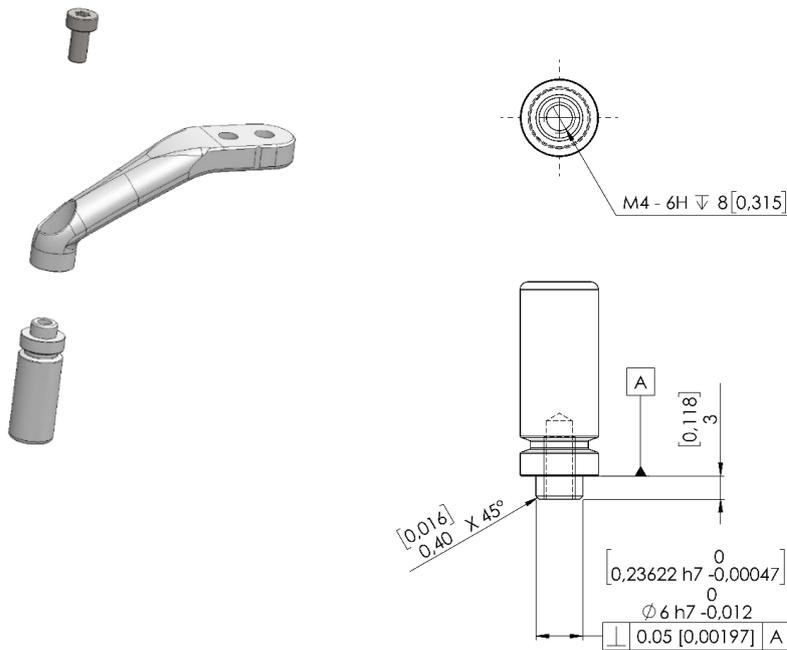


Fingertips

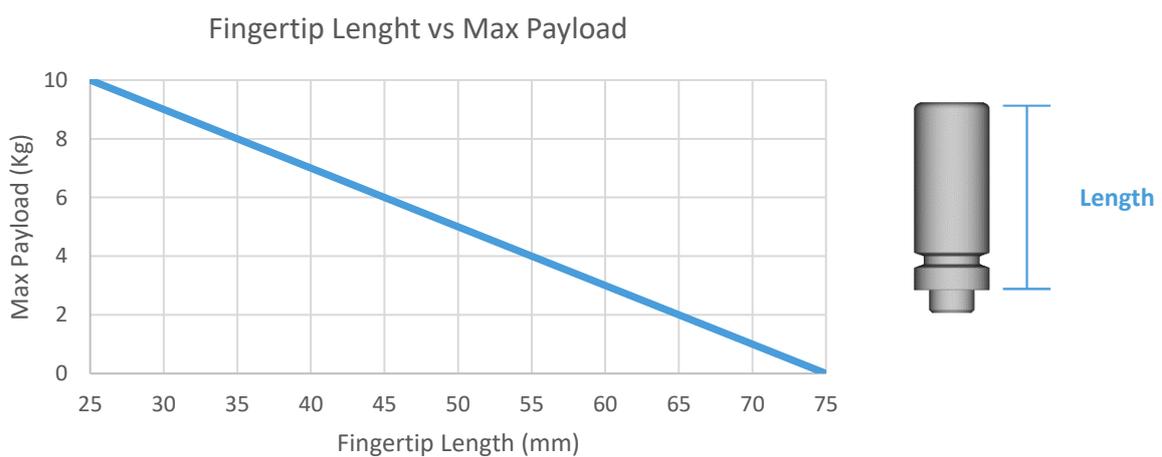
The supplied fingertips are listed below. Different fingertips will allow to achieve different **Gripping Forces below** and different **Gripping Diameters below**.

- Ø10 mm steel
- Ø13 mm steel
- Ø13.5 mm silicone
- Ø16.5 mm silicone

If custom fingertips are required, they can be made to fit the Gripper's fingers according to the dimensions (mm)[inch] shown below. The needed screws are M4x8mm:

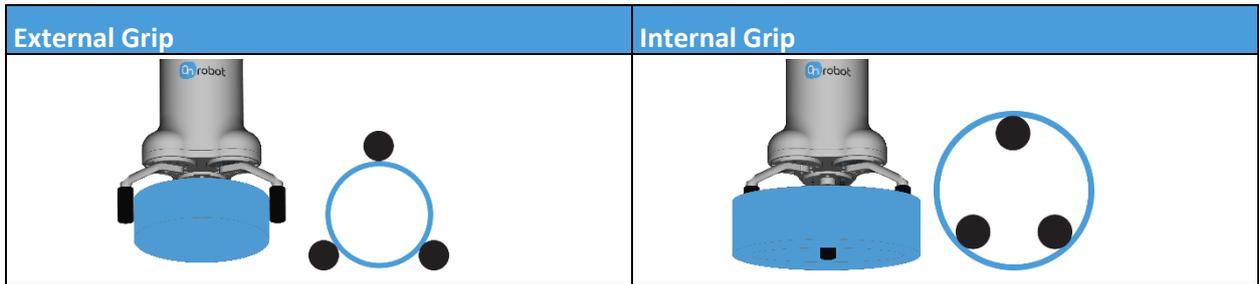


In the graph below, the maximum payload allowed for customized fingertip given a length is shown.



Types of Grips

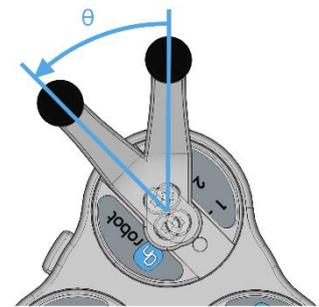
In the document the internal and external grip terms are used. These grips are related to how the workpiece is gripped.



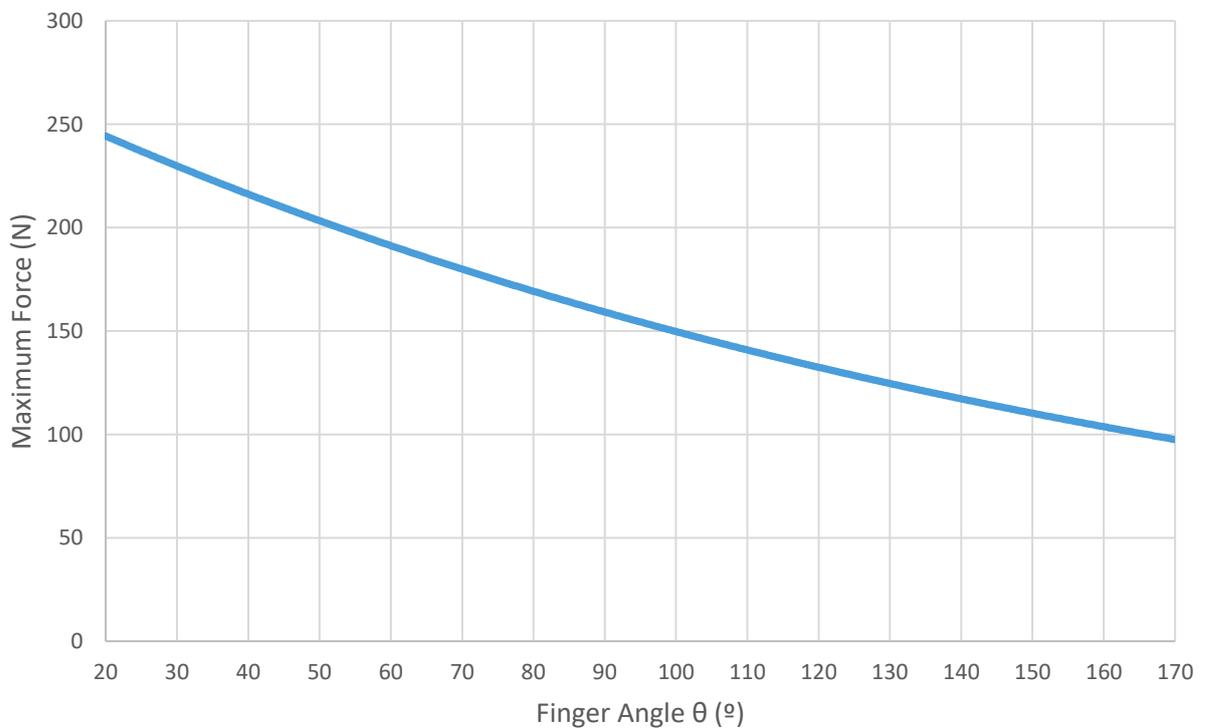
Gripping Force

The total gripping force highly depends on the finger angle θ . For both internal and external grip, the lower the finger angle, the higher the force that will be applied as shown in the graph below.

Although the fingers can move from 0 to 180, the angle range of an external grip is 30°-165° and for an internal grip 20°-160°



Maximum Force and Finger Angle θ



Graph plotted using measurements with 1 A current, silicone fingertips and a metal workpiece.



NOTE:

The total force applied depends on the finger angle, the input current (limited in some robots' tool flange connection) and the friction coefficient between the materials of the fingertips and the workpiece.

Finger movement and force

The gripping action has two phases:

Phase 1: For a safety reason, the fingers will start moving with a low force (maximum ~50 N) to avoid damaging anything that could get clamped between the gripper fingers and the workpiece.

Phase 2: When the gripper diameter is very close to the programed target diameter, the gripper will increase the force to grip with the programed target force. After the grip, a brake will be activated (tic sound). The activation of the brake, also known as, Force grip detected, can be verified in the GUI. This brake will hold the workpiece with the applied force, with no power consumption and holding the workpiece in case of power loss. This brake will automatically be deactivated when the gripper performs a release or a new grip command. While programming the gripper, the brake can be deactivated by using the features in the GUI.

Gripping Diameter

The different configurations of the delivered finger and fingertips allow to achieve a wide range of diameters.

| Finger Position | Fingertip (mm) | External Gripping range (mm) | Internal Gripping range (mm) |
|-----------------|----------------|------------------------------|------------------------------|
| 1 | Ø10 | 10 - 117 | 35 - 135 |
| | Ø13 | 7 - 114 | 38 - 138 |
| | Ø16.5 | 4 - 111 | 41 - 140 |
| 2 | Ø10 | 26 - 134 | 49 - 153 |
| | Ø13 | 23 - 131 | 52 - 156 |
| | Ø16.5 | 20 - 128 | 55 - 158 |
| 3 | Ø10 | 44 - 152 | 65 - 172 |
| | Ø13 | 41 - 149 | 68 - 174 |
| | Ø16.5 | 38 - 146 | 71 - 176 |

Based on:

- Angle for external gripping min 165° (Pos 1), 163 ° (Pos 2), 161 ° (Pos 3) and max 30° (all 3 positions)
- Angle for internal gripping min 160° and max 30°

The closer to the maximum diameter range, the lower the angle and, therefore, the higher the force.

Gecko

| General Properties | | | | | Unit |
|--|---|--------------------|-------------------------|-----------------------|-----------------------|
| Gripper | | | | | |
| Workpiece Material | Polished Steel | Acrylic | Glass | Sheet Metal | |
| Maximum payload (x2 safety factor) | 6.5 14.3 | 6.5 14.3 | 5.5 12.1 | 5.5 12.1 | [kg] [lb] |
| Preload required for max adhesion | 140 | | | | [N] |
| Detachment time | 300 | | | | [msec] |
| Holds workpiece on power loss? | yes | | | | |
| Pads | | | | | |
| Change-out interval | 150 000 to 200 000 cycles for HIGH preload 200 000 to 250 000 cycles for LOW preload | | | | [cycles] |
| Manual Cleaning | Isopropyl alcohol and lint free cloth | | | | |
| Robotic cleaning system | Cleaning Station | | | | |
| Robotic cleaning interval and % recovery | Refer to Cleaning Station User Guide | | | | |
| Sensors | | | | | |
| | Pre-load sensor | | Ultrasonic Range sensor | | |
| Range | 45 [N] 9 [lb] | 140 [N] 31 [lb] | 0 | 260 [mm] 10 [inch] | [N][mm] [lb][inch] |
| Error | 7% | | 2% | | |
| IP Classification | 42 | | | | |
| Dimensions (HxW) | 187 x 146 7.3 x 5.7 | | | | [mm] [inch] |
| Weight | 2.85 6.3 | | | | [kg] [lb] |



NOTE:

Avoid preloading the gripper with an inverted robot or in non-vertical loading conditions. If preloaded whilst inverted, preload sensor will not meet typical performance standards.

| Operating Conditions | Minimum | Typical | Maximum | Unit |
|--------------------------|--------------|-----------------|-----------|--------------|
| Temperature | 0 32 | - - | 50 122 | [°C] [°F] |
| Surface Characteristics* | Matte finish | Highly polished | - | |

* Smoother surfaces require less preload force for a desired payload force.

| Specification or Feature | Target value |
|----------------------------------|---|
| Parts Presence Sensing | Yes (Ultrasonic) |
| Pad Material | Proprietary silicone blend |
| Wear Properties | Depends on surface roughness and preload |
| Pad Attachment Mechanism | Magnetic |
| Change-out interval | 150000 – 200000 for HIGH PRELOAD 200000 – 250000 for LOW PRELOAD |
| Cleaning system | Cleaning station |
| Cleaning interval and % recovery | See Cleaning Station Manual |

Effectiveness on Different Materials

The Gecko Gripper is best suited for smooth, low surface roughness substrates that are generally flat, stiff, and rigid. For other materials, the Gecko Gripper’s effectiveness drops depending the stiffness and roughness of the picking surface. The table below shows a relationship between rigid and flexible substrates, surface finish, payload and the required preload to pick up said substrate. For example, if the customer knows that their part/substrate is rigid, with a mirror-like finish and weighs 2kg, the preload required to pick up the part/substrate is a medium-level preload.

| Flexibility | Surface finish | Payload (kg) | Required Preload |
|-------------|--------------------|--------------|------------------|
| Rigid | Mirror-like finish | 0 to 2 | Low |
| | | 2 to 4 | Medium |
| | | 4 to 6 | High |
| | Smooth | 0 to 2 | Medium |
| | | 2 to 4 | High |
| | | 4 to 6 | N/A |
| | Matte | 0 to 2 | High |
| | | 2 to 4 | N/A |
| | | 4 to 6 | N/A |
| Flexible | Mirror-like finish | 0 to 2 | Medium |
| | | 2 to 4 | High |
| | | 4 to 6 | N/A |
| | Smooth | 0 to 2 | High |
| | | 2 to 4 | N/A |
| | | 4 to 6 | N/A |
| | Matte | 0 to 2 | N/A |
| | | 2 to 4 | N/A |
| | | 4 to 6 | N/A |

To further elaborate the significance between preload and payload, the table below shows visual matrix that displays the capability of the gecko gripper to pick up different materials with varying stiffness and roughness, at three different preload values (low 40N, medium 90N, high 140N).

| Stiffness | Roughness | Example of material | Preload - 140N | | | | | | Preload - 90N | | | | | | Preload - 40N | | | | | |
|-----------|-----------|---|----------------|-----|---|---|---|---|---------------|-----|---|---|---|---|---------------|-----|---|---|---|---|
| | | | Payload [kg] | | | | | | Payload [kg] | | | | | | Payload [kg] | | | | | |
| | | | 0.1 | 0.5 | 1 | 2 | 4 | 6 | 0.1 | 0.5 | 1 | 2 | 4 | 6 | 0.1 | 0.5 | 1 | 2 | 4 | 6 |
| 1 | 1 | Mylar | ✓ | ✓ | ✓ | * | | | ✓ | ✓ | * | | | ✓ | * | | | | | |
| 5 | 1 | Transparency sheet | ✓ | ✓ | ✓ | ✓ | * | | ✓ | ✓ | * | | | ✓ | * | | | | | |
| 10 | 1 | Polished mirror-like steel, solar panel | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | * | ✓ | ✓ | ✓ | ✓ | * | |
| 1 | 5 | Cling film, ziploc bags | ✓ | ✓ | * | | | | ✓ | * | | | | ✓ | * | | | | | |
| 5 | 5 | Glossy carboard (cereal box) | ✓ | ✓ | * | | | | ✓ | * | | | | ✓ | * | | | | | |
| 10 | 5 | Printed circuit board | ✓ | ✓ | ✓ | ✓ | * | | ✓ | ✓ | * | | | ✓ | * | | | | | |
| 1 | 10 | Laminating plastic / film | * | | | | | | | | | | | | | | | | | |
| 5 | 10 | Corrugated cardboard | | | | | | | | | | | | | | | | | | |
| 10 | 10 | Sandblasted aluminum | | | | | | | | | | | | | | | | | | |

✓ the gripper can easily pick up the material

* the gripper can pick up the material in some cases (requires caution and testing to verify)

Nothing the gripper cannot pick up this type of material.



NOTE:

This table is to be utilized as a guide to better understand the payload capacity and substrate type for the Gecko Gripper.

The criteria for stiffness and roughness is a basic scale from 1-10, here are the benchmarks used to determine the values.

| Stiffness | Description | Example |
|-----------|---------------|-----------|
| 1 | Flexible | Fabric |
| 5 | Semi-flexible | Cardboard |
| 10 | Stiff | Metal |

| Roughness | Description | Example | RMS Value |
|-----------|-----------------|-------------------|------------|
| 1 | Polished/Smooth | Polished Metal | 0.1 micron |
| 5 | Textured | Carboard | 7 microns |
| 10 | Rough | Sandblasted Metal | 28 microns |

HEX-E QC

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

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

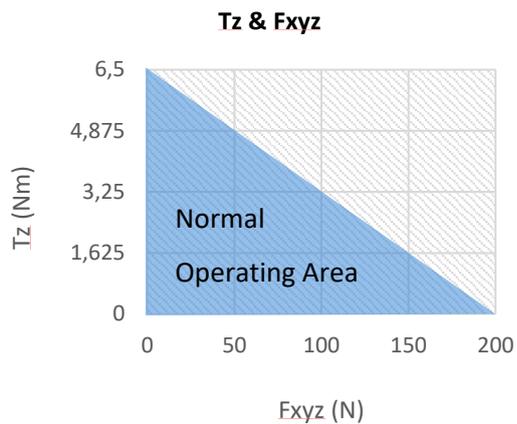
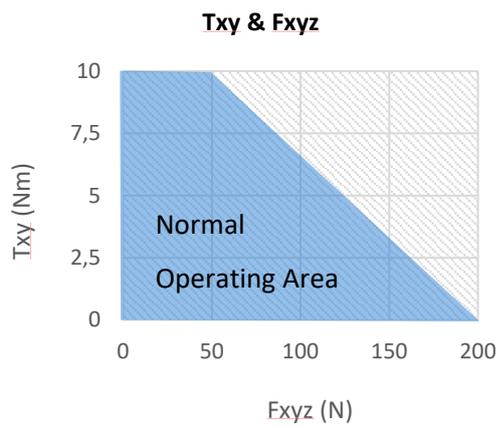
| Operating Conditions | Minimum | Typical | Maximum | Unit |
|------------------------------------|---------|---------|-----------|--------------|
| Power supply | 7 | - | 24 | [V] |
| Power consumption | - | - | 0.8 | [W] |
| Operating temperature | 0 32 | - - | 55 131 | [°C] [°F] |
| Relative humidity (non-condensing) | 0 | - | 95 | [%] |
| Calculated MTBF (operating life) | 30.000 | - | - | [Hours] |

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.



HEX-H QC

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

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

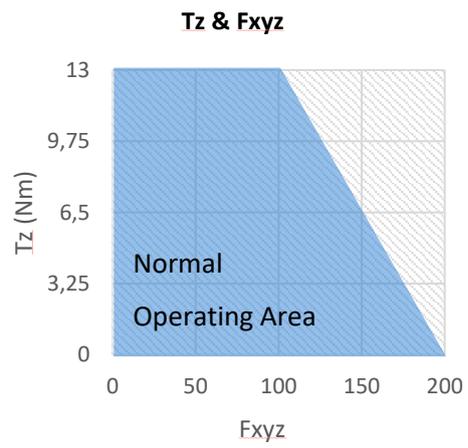
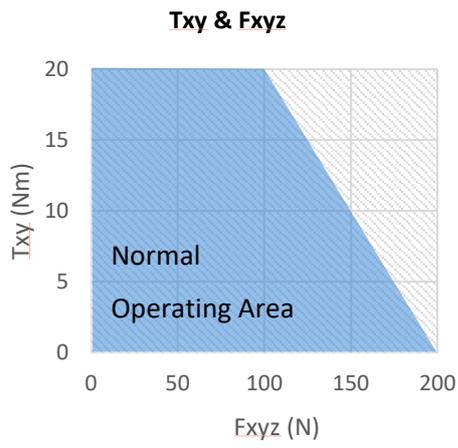
| Operating Conditions | Minimum | Typical | Maximum | Unit |
|------------------------------------|---------|---------|-----------|--------------|
| Power supply | 7 | - | 24 | [V] |
| Power consumption | - | - | 0.8 | [W] |
| Operating temperature | 0 32 | - - | 55 131 | [°C] [°F] |
| Relative humidity (non-condensing) | 0 | - | 95 | [%] |
| Calculated MTBF (operating life) | 30.000 | - | - | [Hours] |

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.



- Quick Changer
- Quick Changer for I/O
- Dual Quick Changer
- Quick Changer - Tool side

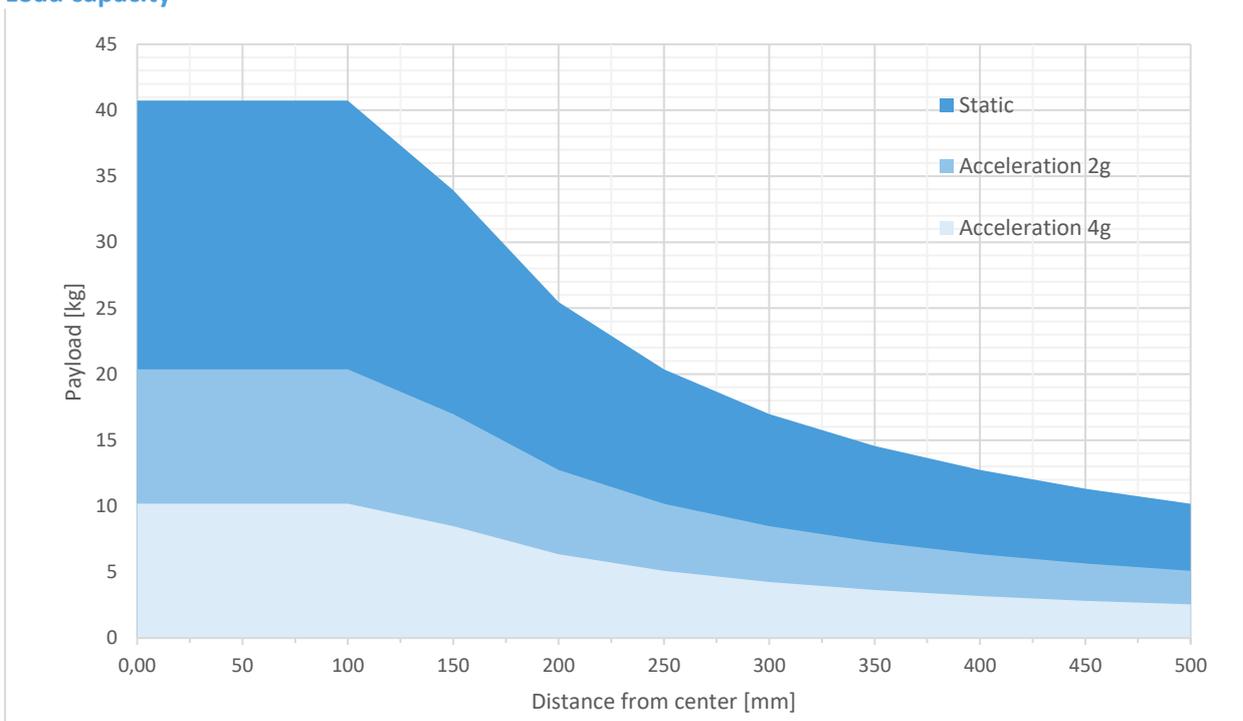
If not specified, the data represent the combination of the different Quick Changer types/sides.

| Technical data | Min | Typical | Max | Units |
|----------------------------------|-----|---------|-----------|---------------|
| Permissible force* | - | - | 400* | [N] |
| Permissible torque* | - | - | 50* | [Nm] |
| Rated payload* | - | - | 20* 44 | [kg] [lbs] |
| Repeatability | - | - | ±0.02 | [mm] |
| IP Classification | 64 | | | |
| Operating life (Tool change) | - | 5.000 | - | [cycles] |
| Operating life (Robot operation) | 10 | - | - | [M cycles] |

* See load capacity graph below.

| | Quick Changer | Quick Changer for I/O | Dual Quick Changer | Quick Changer - Tool Side | Units |
|------------|----------------------------------|-----------------------|--------------------|---------------------------|-------|
| Weight | 0.06 | 0.093 | 0.41 | 0.14 | [kg] |
| | 13.22 | 2.05 | 90.39 | 30.86 | [lb] |
| Dimensions | See Mechanical dimension section | | | | |

Load capacity



RG2-FT

| General Properties | Min | Typical | Max | Units |
|---|-----------------------------------|--------------|--------------|----------------|
| Payload Force Fit   2 Kg | - - | - - | 2 4.4 | [kg] [lb] |
| Payload Form Fit   4 Kg | - - | - - | 4 8.8 | [Kg] [lb] |
| Total stroke (adjustable) | 0 0 | - - | 100 3.93 | [mm] [inch] |
| Finger position resolution | - - | 0.1 0.004 | - - | [mm] [inch] |
| Repetition accuracy | - - | 0.1 0.004 | 0.2 0.007 | [mm] [inch] |
| Reversing backlash | 0.2 0.007 | 0.4 0.015 | 0.6 0.023 | [mm] [inch] |
| Gripping force (adjustable) | 3 | - | 40 | [N] |
| Gripping speed* | 55 | 110 | 184 | [mm/s] |
| Gripping time** | 0.04 | 0.07 | 0.11 | [s] |
| Adjustable bracket tilting accuracy | - | < 1 | - | ° |
| Ambient operating temperature | 5 | - | 50 | [°C] |
| Storage temperature | 0 | - | 60 | [°C] |
| Motor | Integrated, electric BLDC | | | |
| IP Classification | IP54 | | | |
| Dimensions | 219 x 149 x 49 8.6 x 5.9 x 1.9 | | | [mm] [inch] |
| Product weight | 0.98 2.16 | | | [kg] [lb] |

* see speed table 169

** based on 8mm total movement between fingers. The speed is linearly proportional to the force. For more details see speed table on page 169.

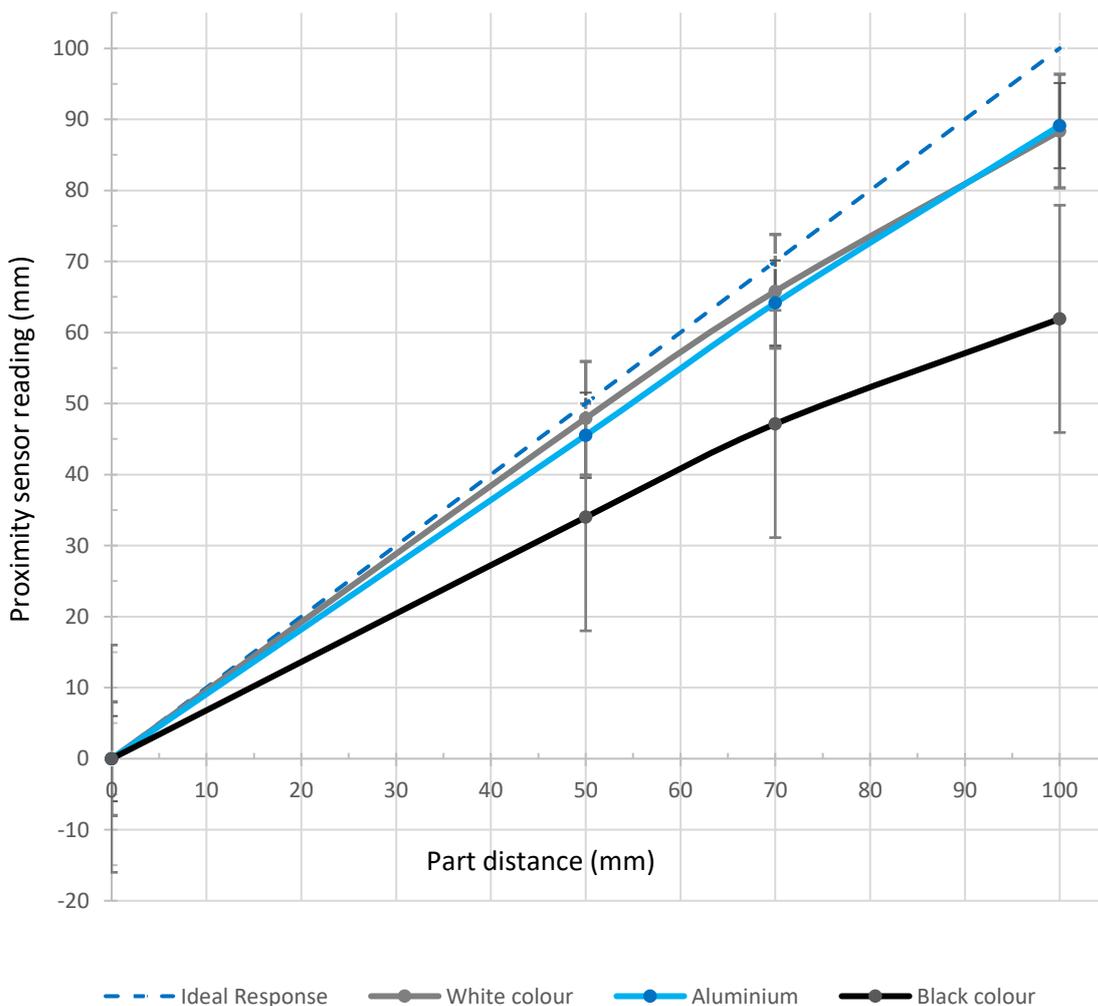
| Force Sensor Properties | Fxy | Fz | Txy | Tz | Units |
|---|--------------|-------------|-------|-------|------------------------|
| Nominal capacity (N.C.) | 20 | 40 | 0.7 | 0.5 | [N] [Nm] |
| Single axis overload | 200 | 200 | 200 | 200 | [%] |
| Noise free resolution | 0.1 | 0.4 | 0.008 | 0.005 | [N] [Nm] |
| Single axis deformation at N.C. | 0.4 0.015 | 0.1 0.04 | 2 | 5 | [mm] [°] [inch] [°] |
| Full scale nonlinearity Temperature compensation | < 2 | | | | [%] |

| Proximity Sensor Properties | Min | Typical | Max | Units |
|-----------------------------|-----|---------|------|--------|
| Sensing range | 0 | - | 100 | [mm] |
| | 0 | - | 3.93 | [inch] |
| Precision | - | 2 | - | [mm] |
| | - | 0.078 | - | [inch] |
| Non-linearity* | - | 12 | - | [%] |

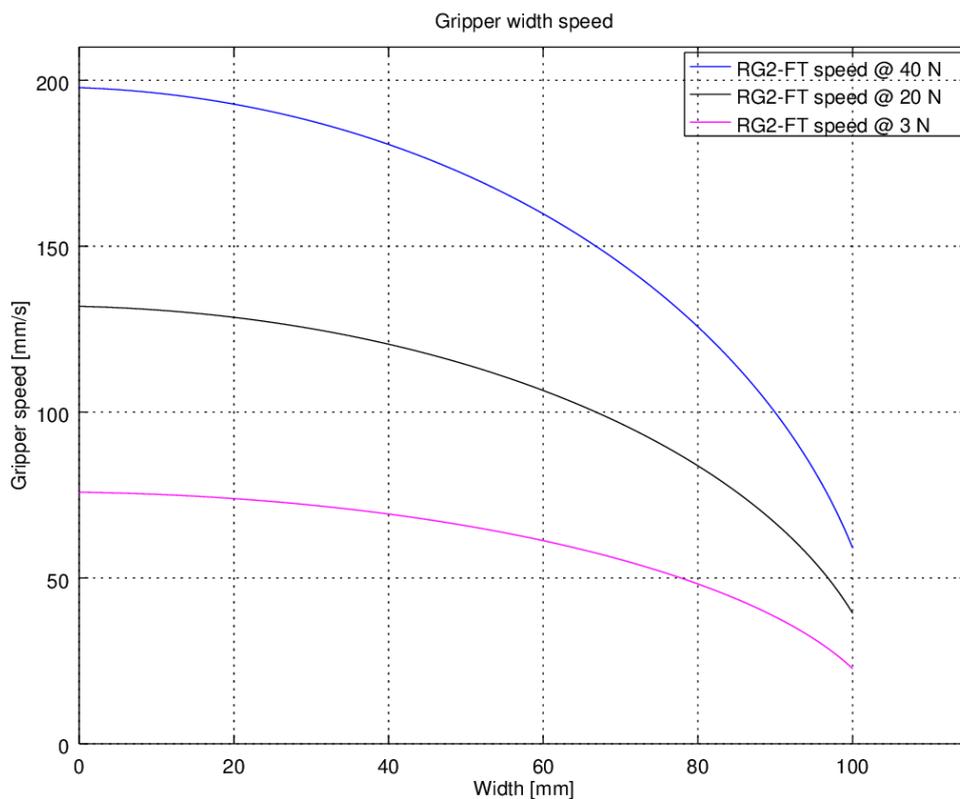
* the non-linearity refers to the max value and depends on the object properties (e.g. surface type and color)

| Operating Conditions | Minimum | Typical | Maximum | Unit |
|------------------------------------|---------|---------|---------|---------|
| Power requirement (PELV) | 24 | - | 24 | [V] |
| Power consumption | 6.5 | - | 22 | [W] |
| Operating temperature | 0 | - | 55 | [°C] |
| | 32 | - | 131 | [°F] |
| Relative humidity (non-condensing) | 0 | - | 95 | [%] |
| Calculated MTBF (operating life) | 30.000 | - | - | [Hours] |

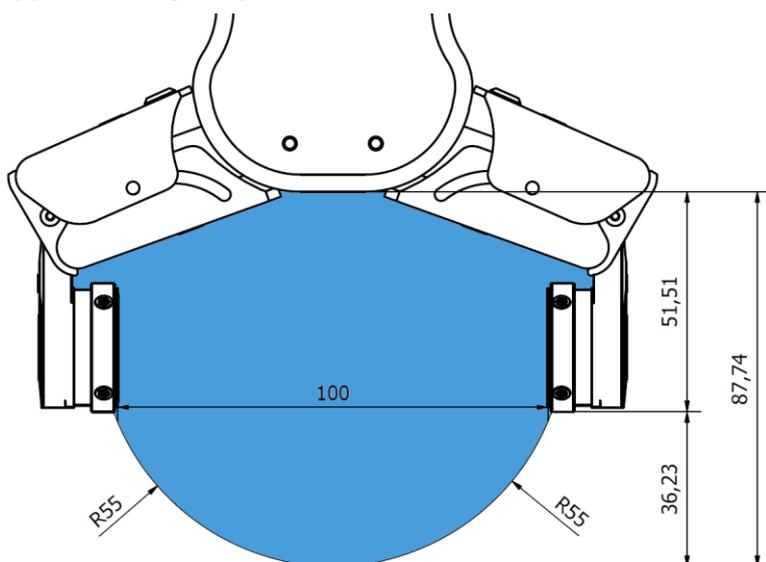
Proximity sensor typical accuracy



RG2-FT Gripping Speed Graph



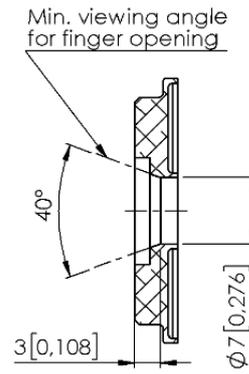
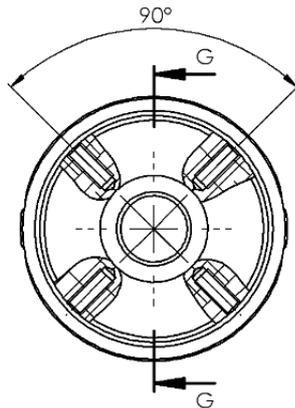
Gripper Working Range



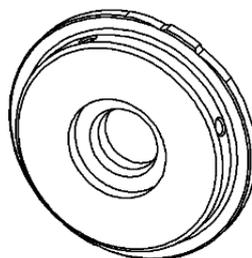
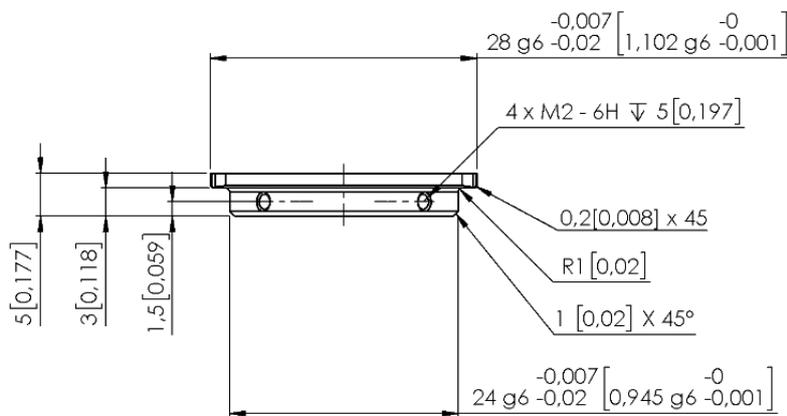
The dimensions are in millimeters.

Fingertips

The standard fingertips can be used for many different workpieces. If custom fingertips are required, they can be made to fit the Gripper fingers.



SECTION G-G



Dimensions of the Gripper's finger, in millimeters.



NOTE:

During the fingertip design, the following shall be considered to maintain optimal performance:

Clear optical path for the proximity sensors

Protect the proximity sensors from direct sunlight or strong light source

Avoid dust and liquid penetration



WARNING:

The proximity sensors are sensitive parts and shall be protected against:

Direct strong light (such as directional laser sources)

Direct high temperature

Mechanical contacts in any case

Expose to any liquid or fine conductive dust



NOTE:

Please clean regularly the proximity sensor surface with low pressure compressed air (<5 bar) from a 5 cm distance. For stronger contamination use isopropyl alcohol with a soft cotton swab to keep it clean.

Finger Thickness

The default fingertips are considered while the finger thickness has been set and could not be changed in the software. In case when custom fingertips are used, the user should manually compensate for the difference in the finger thickness.

RG2

| General Properties | Minimum | Typical | Maximum | Unit |
|---|-----------------------------------|--------------|--------------|----------------|
| Payload Force Fit  | - - | - - | 2 4.4 | [kg] [lb] |
| Payload Form Fit  | - - | - - | 5 11 | [kg] [lb] |
| Total stroke (adjustable) | 0 0 | - - | 110 4.33 | [mm] [inch] |
| Finger position resolution | - - | 0.1 0.004 | - - | [mm] [inch] |
| Repetition accuracy | - - | 0.1 0.004 | 0.2 0.007 | [mm] [inch] |
| Reversing backlash | 0.1 0.004 | - - | 0.3 0.011 | [mm] [inch] |
| Gripping force (adjustable) | 3 | - | 40 | [N] |
| Gripping force deviation | | ±25 | | % |
| Gripping speed* | 38 | - | 127 | [mm/s] |
| Gripping time** | 0.06 | - | 0.21 | [s] |
| Adjustable bracket tilting accuracy | - | < 1 | - | ° |
| Storage temperature | 0 32 | - - | 60 140 | [°C] [°F] |
| Motor | Integrated, electric BLDC | | | |
| IP Classification | IP54 | | | |
| Dimensions | 213 x 149 x 36 8.3 x 5.9 x 1.4 | | | [mm] [inch] |
| Weight | 0.78 1.72 | | | [kg] [lb] |

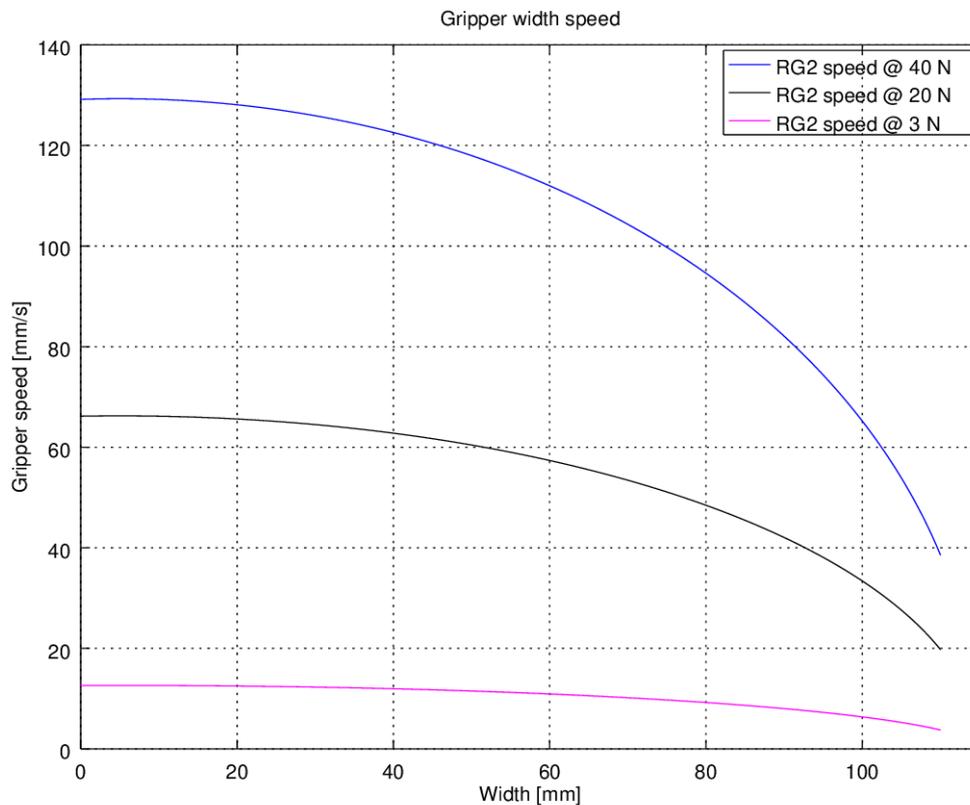
*See table on the next page

** based on 8mm total movement between fingers. The speed is linearly proportional to the force. For more details see speed table on next page.

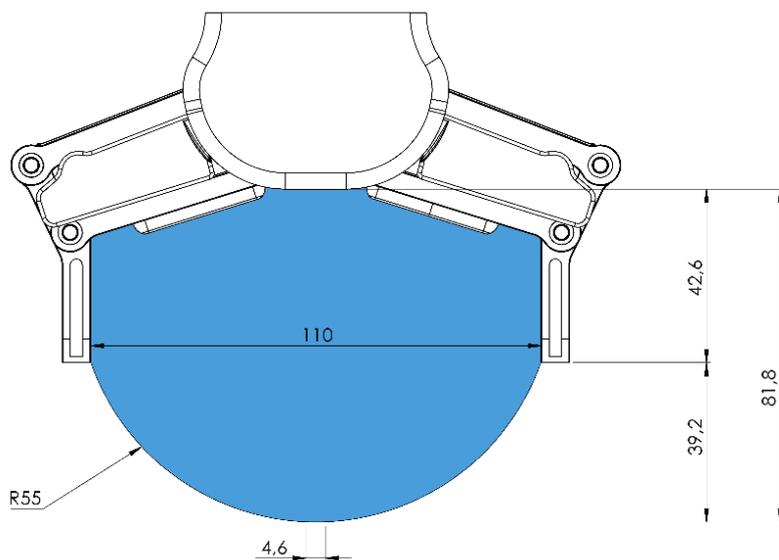
| Operating Conditions | Minimum | Typical | Maximum | Unit |
|------------------------------------|---------|---------|-----------|--------------|
| Power supply | 20 | 24 | 25 | [V] |
| Current consumption | 70 | - | 600* | [mA] |
| Operating temperature | 5 41 | - - | 50 122 | [°C] [°F] |
| Relative humidity (non-condensing) | 0 | - | 95 | [%] |
| Calculated MTBF (operating life) | 30.000 | - | - | [Hours] |

*Current spikes up to 3A (max 6mS) may occur during the release action.

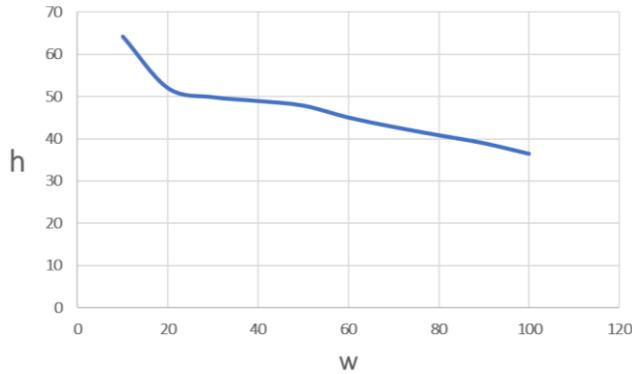
RG2 Gripping Speed Graph



RG2 Work Range

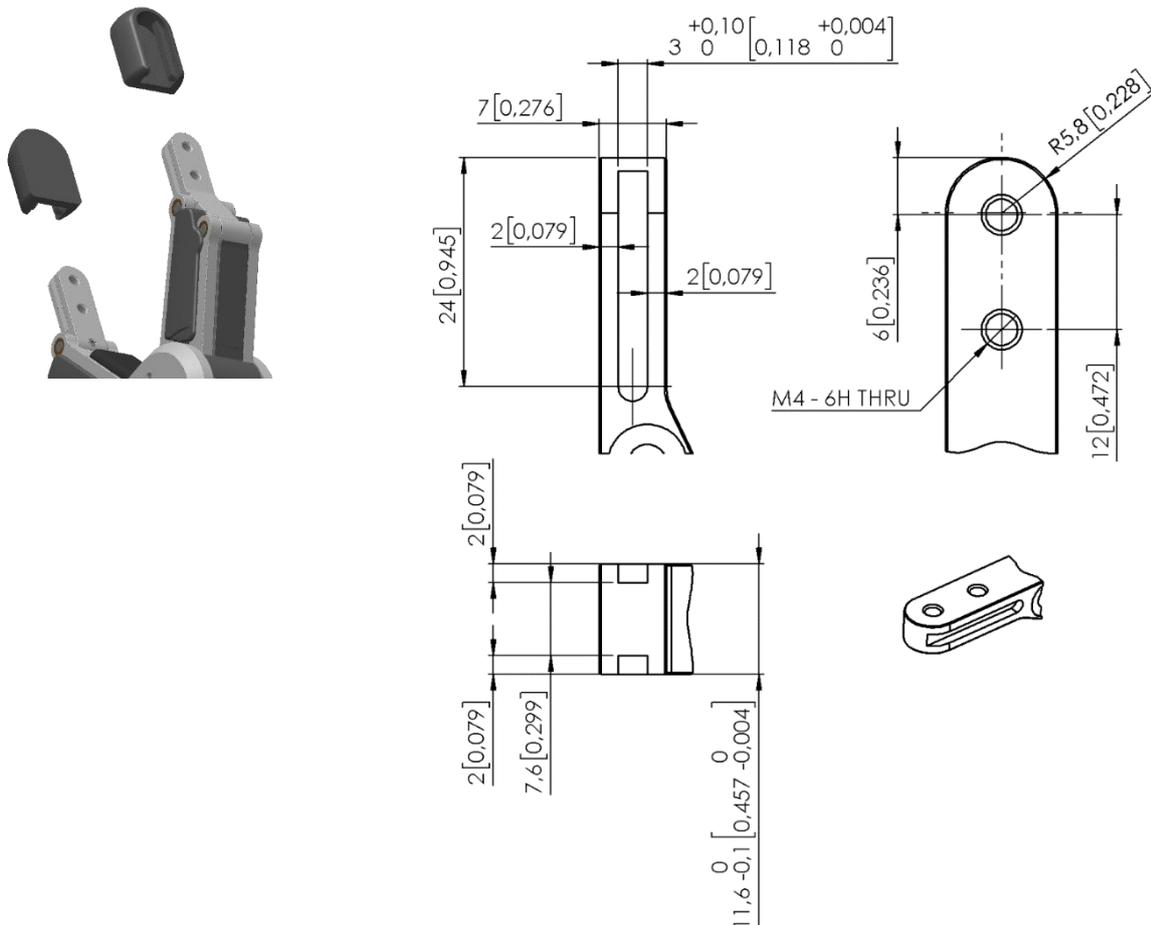


Gripping on long objects can unintentionally activate the Safety switches. The maximum workpiece height (calculated from the end of the fingertips) is dependent on the gripping width (w). For various width values the height (h) limit is given below:



Fingertips

The standard fingertips can be used for many different workpieces. If custom fingertips are required, they can be made to fit the Gripper's fingers according to the dimensions (mm) shown below:



RG6

| General Properties | Minimum | Typical | Maximum | Unit |
|---|------------------------------------|--------------|--------------|----------------|
| Payload Force Fit  | - - | - - | 6 13.2 | [kg] [lb] |
| Payload Form Fit  | - - | - - | 10 22.04 | [Kg] [lb] |
| Total stroke (adjustable) | 0 - | - - | 160 6.3 | [mm] [inch] |
| Finger position resolution | - - | 0.1 0.004 | - - | [mm] [inch] |
| Repetition accuracy | - - | 0.1 0.004 | 0.2 0.007 | [mm] [inch] |
| Reversing backlash | 0.1 0.004 | - - | 0.3 0.011 | [mm] [inch] |
| Gripping force (adjustable) | 25 | - | 120 | [N] |
| Gripping force deviation | | ±25 | | % |
| Gripping speed* | 51 | - | 160 | [mm/s] |
| Gripping time** | 0.05 | - | 0.15 | |
| Adjustable bracket tilting accuracy | | < 1 | | ° |
| Storage temperature | 0 32 | | 60 140 | [°C] [°F] |
| Motor | Integrated, electric BLDC | | | |
| IP Classification | 54 | | | |
| Dimensions | 262 x 212 x 42 10.3 x 8.3 x 1.6 | | | [mm] [inch] |
| Weight | 1.25 2.76 | | | [kg] [lb] |

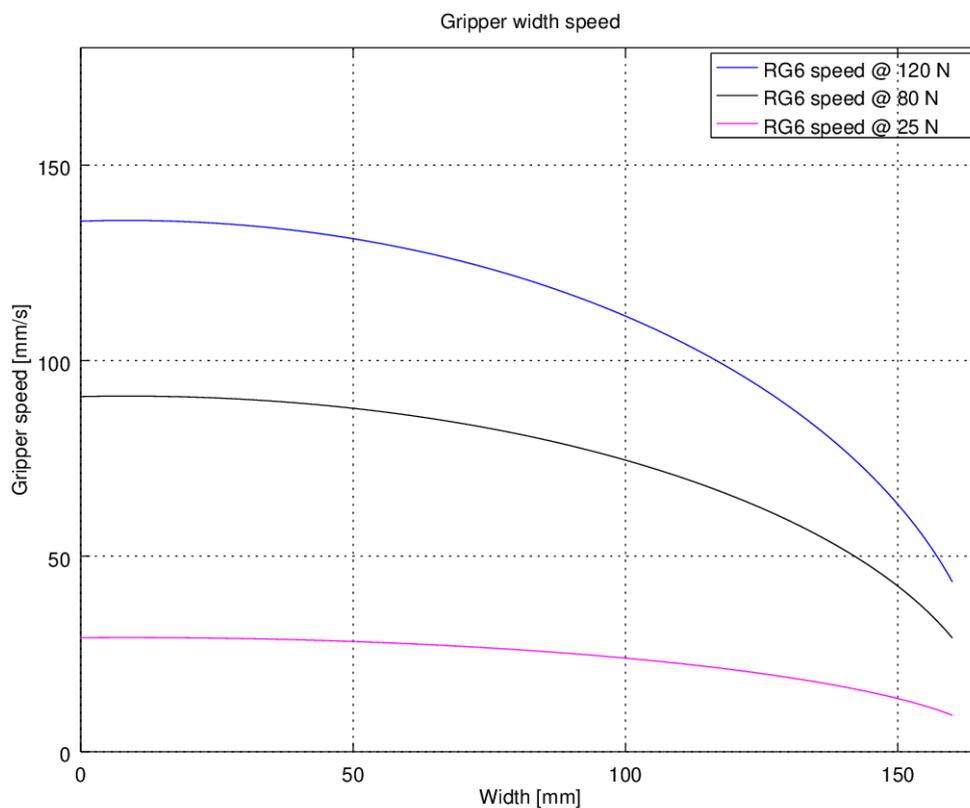
*See table on the next page

** based on 8mm total movement between fingers. The speed is linearly proportional to the force. For more details see speed table on next page.

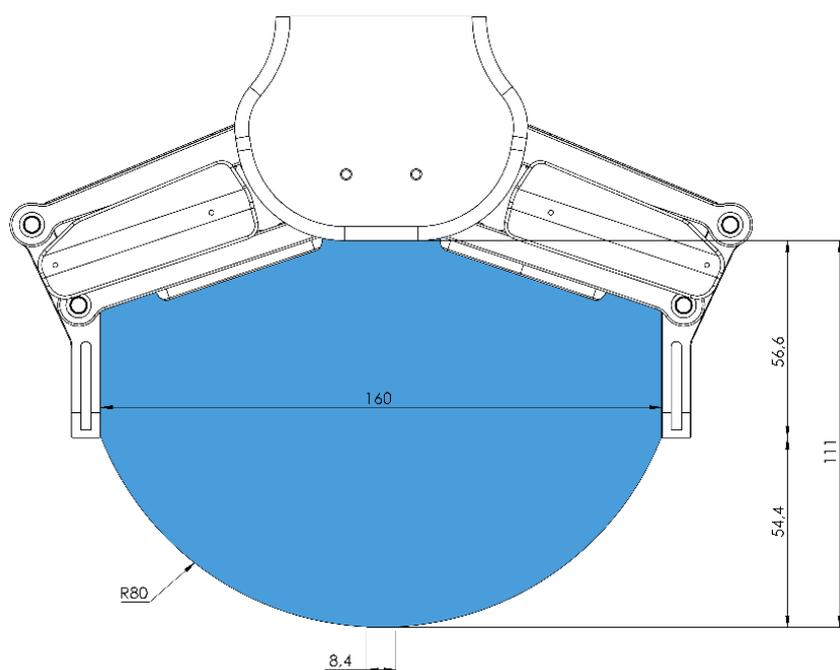
| Operating Conditions | Minimum | Typical | Maximum | Unit |
|------------------------------------|---------|---------|-----------|--------------|
| Power supply | 20 | 24 | 25 | [V] |
| Current consumption | 70 | - | 600* | [mA] |
| Operating temperature | 5 41 | - - | 50 122 | [°C] [°F] |
| Relative humidity (non-condensing) | 0 | - | 95 | [%] |
| Calculated MTBF (operating life) | 30.000 | - | - | [Hours] |

*Current spikes up to 3A (max 6mS) may occur during the release action.

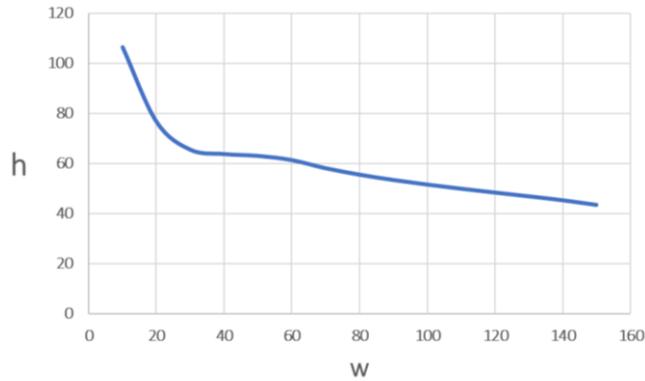
RG6 Gripping Speed Graph



RG6 Work Range

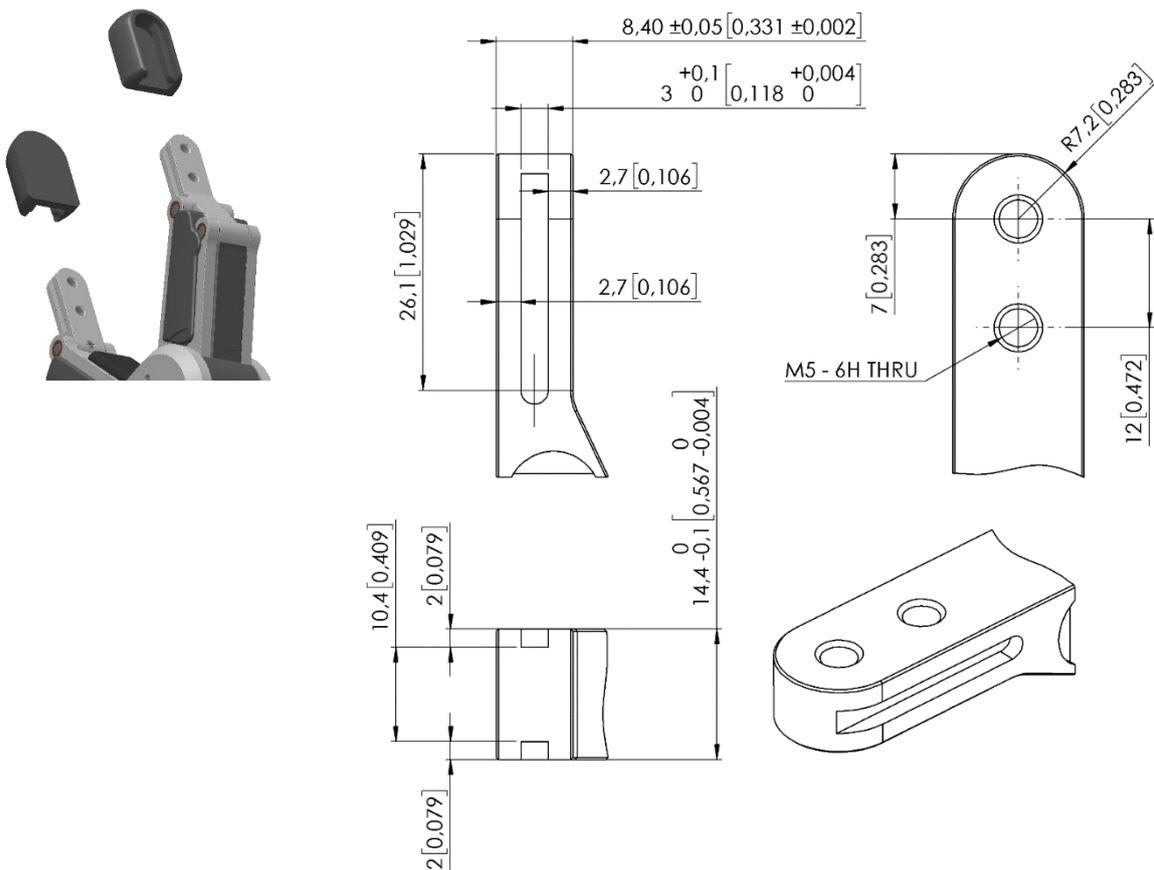


Gripping on long objects can unintentionally activate the Safety switches. The maximum workpiece height (calculated from the end of the fingertips) is dependent on the gripping width (w). For various width values the height (h) limit is given below:



Fingertips

The standard fingertips can be used for many different workpieces. If custom fingertips are required, they can be made to fit the Gripper's fingers according to the dimensions (mm) shown below:



SG

| General Properties | Minimum | Typical | Maximum | Unit |
|------------------------------|---------------------------|---------------|------------|--------------------|
| Total spindle stroke | 11 0.43 | - | 40 1.57 | [mm] [inch] |
| Spindle position resolution | - | 0.1 0.0039 | - | [mm] [inch] |
| Spindle force | - | - | 380 | [N] |
| Spindle speed | - | - | 37 1.46 | [mm/s] [inch/s] |
| Gripping time* (SG-a-H) | - | - | 32 | [grip/min] |
| SG-tool attachment mechanism | Smart lock | | | |
| Motor | Integrated, electric BLDC | | | |
| IP Classification | IP67 | | | |
| Dimensions (H x Ø) | 84 x 98 3.3 x 3.85 | | | [mm] [inch] |
| Weight | 0.77 1.69 | | | [kg] [lb] |

*Gripping time is tool depended. See the separate SG Datasheet for the tool specific gripping time.

| Operating Conditions | Minimum | Typical | Maximum | Unit |
|------------------------------------|---------|---------|-----------|--------------|
| Power supply | 20 | 24 | 25 | [V] |
| Current consumption | 45 | - | 600 | [mA] |
| Operating temperature | 0 32 | - - | 50 122 | [°C] [°F] |
| Storage temperature | 0 32 | - - | 60 140 | [C] [F] |
| Relative humidity (non-condensing) | 0 | - | 95 | [%] |
| Calculated MTBF (operating life) | 30.000 | - | - | [Hours] |



NOTE:

For technical specification for the SG-tools, see the separate SG Datasheet.

How to handle a workpiece

With the elastic silicone SG tools, the gripper can handle a wide range of workpieces, for a high number of applications. Different tool designs have some overlap in capability when handling the same workpiece, but the tools have different characteristics and do have individual effectiveness on a given workpiece.

Soft silicone

Some SG tool designs has a soft silicone part in the top of the gripper. These tools are better suited for handling fragile workpieces and/or workpieces with a high variance in size, compared to the hard silicone tools. This is due to the more "forgiving" nature of the soft part. The user may experience a reduced payload compared to the hard silicone tools.

To handle a workpiece properly, the user must know some parameters that are defined by the general conditions of the workpiece and its presentation in the application. This helps to define which tool to choose and the actual grip width on it.

A general overview of such parameters is listed below:

- Shape
- Dimension
- Weight
- Roughness
- Fragility
- Orientation of pick/placement

For a better understanding of how to handle workpieces with different parameters, tests were conducted with a SG-a-H tool, see table below.

| Example of material | Workpiece | Dimension | Weight | Roughness | Shape | Actual gripping width |
|----------------------|----------------------|-----------|--------|-----------|----------|-----------------------|
| Smooth wood (Sanded) | Round stick | 27mm | 32g | 5 | Cylinder | 20mm |
| Polished metal | Aluminum cube | 35x25mm | 512g | 1 | Square | 15mm |
| Rough metal | Aluminum cylinder | 60mm | 490g | 8 | Cylinder | 55mm |
| Plastic | PET Bottle | 65mm | 431g | 1 | Cylinder | 50mm |
| | POM-C | 50mm | 221g | 2 | Cylinder | 42mm |
| | POM-C | 50mm | 1410g | 2 | Cylinder | 15mm |
| Glass | Drinking glass | 68mm | 238g | 1 | Cylinder | 50mm |
| Organic material | Tomato | 54mm | 92g | 2 | Round | 53mm |
| | Mushroom | 40mm | 8g | 10 | Round | 39mm |
| | Grape | 20mm | 7g | 10 | Oval | 16mm |
| Carbonfiber | Carbonfiber cylinder | 38mm | 48g | 7 | Cylinder | 29mm |

Notice objects with high weight needs higher force asserted upon them, therefor the small gripping width.



NOTE:

The results shown in the table above, should be considered as indicative and may vary. The actual grip width always require testing, for verification.

It is often a good idea to set a target width smaller, than actual workpiece width, to reach a higher surface contact area and to accommodate for vibrations and other unexpected conditions.

For heavy and large workpieces test at low velocity and with caution.



NOTE:

For individual SG-tool examples. See the separate SG-tool manual.

The criteria for roughness are a basic scale from 1-10, here are the benchmarks used to determine the values.

| Roughness | Description | Example |
|-----------|-----------------|-------------------|
| 1 | Polished/Smooth | Polished Metal |
| 5 | Textured | Cardboard |
| 10 | Rough | Sandblasted Metal |



WARNING:

Sharp edges, on a workpiece, may damage the silicone and reduce lifetime of the tool.

SG Tool Mounting Guide



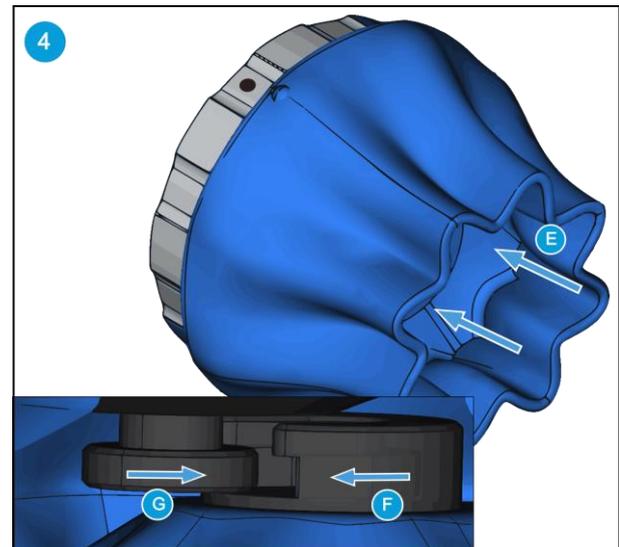
Rotate the ring so marking **(A)** facing you. Align the dot on the SG tool **(B)** with marking **(A)**. Make them fit together and mount the ring onto the SG tool.



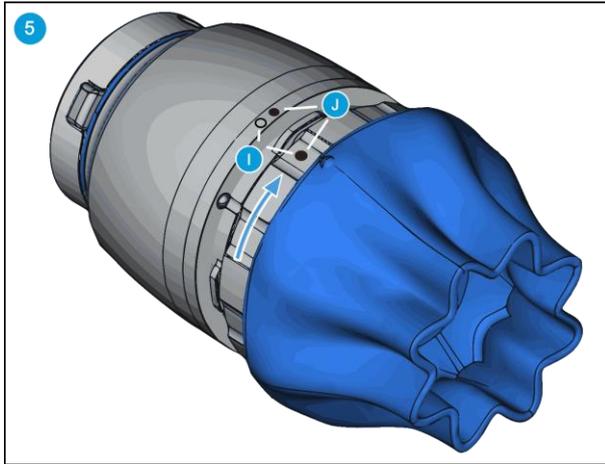
Press the SG tool up against the ring until it fits perfectly **(C)**. Make sure there is no gap between the SG tool and the ring **(D)**.



It is highly recommended to install the SG Base Part on the robot before installing the SG tool. Make sure the SG Base Part is in home position or initialized.



Use your thumbs to press the inside of the SG tool **(E)**. This will make the smart lock female **(F)** visible. Locate the marking on the ring as described in step 1. Slide the SG tool smart lock female **(F)** and the smart lock male **(G)** together.



Scan for mounting guide video.



Align the markings **(I)**. Press the SG tool into the SG Base Part and rotate CW to align the two markings **(J)**.



WARNING:

When working with the SG, please make sure that the grippers inward/outward motion is not obstructed, otherwise the positioning system may get out of sync. If that were to happen, move the grip/release point away from the workpiece, and reinitialize the gripper.

VG10

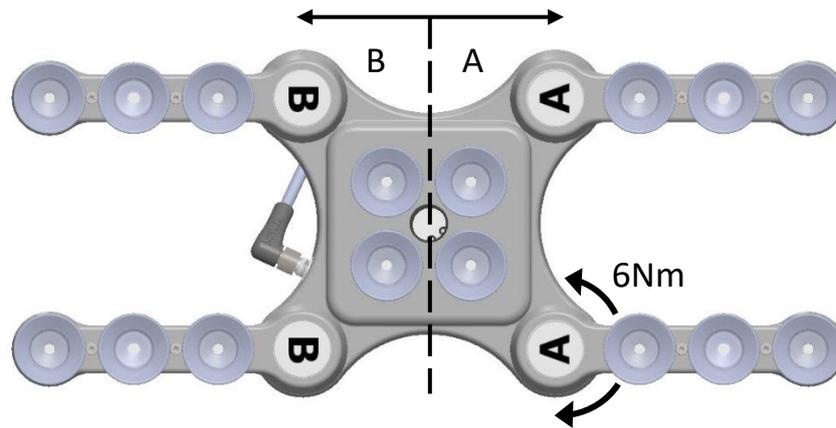
| General Properties | | Minimum | Typical | Maximum | Unit |
|-----------------------|---------|---|-------------|----------------------|-----------------------------|
| Vacuum | | 5 % -0.05 1.5 | - - - | 80 % -0.810 24 | [Vacuum] [Bar] [inHg] |
| Air flow | | 0 | - | 12 | [L/min] |
| Arms adjustment | | 0 | - | 270 | [°] |
| Arm holding torque | | - | 6 | - | [Nm] |
| Payload | Rated | 10 22 | | | [kg] [lb] |
| | Maximum | 15 33 | | | [kg] [lb] |
| Vacuum cups | | 1 | - | 16 | [pcs.] |
| Gripping time | | - | 0.35 | - | [s] |
| Releasing time | | - | 0.20 | - | [s] |
| Foot-inch-foot | | - | 1.40 | - | [s] |
| Vacuum pump | | Integrated, electric BLDC | | | |
| Arms | | 4, adjustable by hand | | | |
| Dust filters | | Integrated 50µm, field replaceable | | | |
| IP Classification | | IP54 | | | |
| Dimensions (folded) | | 105 x 146 x 146 4.13 x 5.75 x 5.75 | | [mm] [inch] | |
| Dimensions (unfolded) | | 105 x 390 x 390 4.13 x 15.35 x 15.35 | | [mm] [inch] | |
| Weight | | 1.62 3.57 | | [kg] [lb] | |

| Operating Conditions | Minimum | Typical | Maximum | Unit |
|------------------------------------|---------|---------|---------|---------|
| Power supply | 20.4 | 24 | 28.8 | [V] |
| Current consumption | 50 | 600 | 1500 | [mA] |
| Operating temperature | 0 | - | 50 | [°C] |
| | 32 | - | 122 | [°F] |
| Relative humidity (non-condensing) | 0 | - | 95 | [%] |
| Calculated MTBF (operating life) | 30.000 | - | - | [hours] |

Positioning the VG10 arms and channels

The arms can be folded to the preferred position simply by pulling in the arms. The torque needed to overcome the friction in the rotatable joints of the arm is high (6 N/m) to ensure that the arms do not move when handling 15 kg payloads.

The VG10 suction cups are grouped into two independent channels.



When the four arms are adjusted to preferred angles, it is recommended to add the accompanied arrow stickers. This allows for easy realignment and exchanging between different work items.



Payload

The lifting capacity of the VG grippers depends primarily on the following parameters:

- Vacuum cups
- Vacuum
- Air flow

Vacuum Cups

Choosing the right vacuum cups for your application is essential. The VG grippers come with common 15, 30 and 40 mm silicone vacuum cups (see table below) which are good for hard and flat surfaces, but not good for uneven surfaces and it might leave microscopic traces of silicone on the workpiece which can cause issues with some types of painting processes afterwards.

| Image | External Diameter [mm] | Internal Diameter [mm] | Gripping Area [mm ²] |
|---|------------------------|------------------------|----------------------------------|
|  | 15 | 6 | 29 |
|  | 30 | 16 | 200 |
|  | 40 | 24 | 450 |

For non-porous materials, the OnRobot suction cups are highly recommended. Some of the most common non-porous materials are listed below:

- Composites
- Glass
- High density cardboard
- High density paper
- Metals
- Plastic
- Porous materials with a sealed surface
- Varnished wood

In an ideal case, working with non-porous material workpieces where there are no air flow going through the workpiece, the table below shows the number of cups and the cup size needed depending on the payload (workpiece mass) and the vacuum used.

Number of Cups needed for non-porous materials depending on payload and vacuum:

| Payload (kg) |  15mm | | | |  30mm | | | |  40mm | | | |
|--------------|---|----|----|----|---|----|----|----|---|----|----|----|
| | Vacuum (kPa) | | | | Vacuum (kPa) | | | | Vacuum (kPa) | | | |
| | 20 | 40 | 60 | 75 | 20 | 40 | 60 | 75 | 20 | 40 | 60 | 75 |
| 0.1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0.5 | 13 | 7 | 5 | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | - | 13 | 9 | 7 | 4 | 2 | 2 | 1 | 2 | 1 | 1 | 1 |
| 2 | - | - | - | 14 | 8 | 4 | 3 | 2 | 4 | 2 | 2 | 1 |
| 3 | - | - | - | - | 12 | 6 | 4 | 3 | 5 | 3 | 2 | 2 |
| 4 | - | - | - | - | 15 | 8 | 5 | 4 | 7 | 4 | 3 | 2 |
| 5 | - | - | - | - | - | 10 | 7 | 5 | 9 | 5 | 3 | 3 |
| 6 | - | - | - | - | - | 12 | 8 | 6 | 10 | 5 | 4 | 3 |
| 7 | - | - | - | - | - | 13 | 9 | 7 | 12 | 6 | 4 | 4 |
| 8 | - | - | - | - | - | 15 | 10 | 8 | 14 | 7 | 5 | 4 |
| 9 | - | - | - | - | - | - | 12 | 9 | 15 | 8 | 5 | 4 |
| 10 | - | - | - | - | - | - | 13 | 10 | - | 9 | 6 | 5 |
| 11 | - | - | - | - | - | - | 14 | 11 | - | 9 | 6 | 5 |
| 12 | - | - | - | - | - | - | 15 | 12 | - | 10 | 7 | 6 |
| 13 | - | - | - | - | - | - | 16 | 13 | - | 11 | 8 | 6 |
| 14 | - | - | - | - | - | - | - | 14 | - | 12 | 8 | 7 |
| 15 | - | - | - | - | - | - | - | 15 | - | 13 | 9 | 7 |



NOTE:

To use more than 7 (15mm), 4 (30mm) or 3 (40mm) vacuum cups with the VGC10 a customized adaptor plate is needed.

The table above is created with the following formula that equalizes the lifting force with the payload considering 1.5G of acceleration.

$$\text{Amount}_{\text{Cups}} * \text{Area}_{\text{Cup}}[\text{mm}] = 14700 \frac{\text{Payload} [\text{kg}]}{\text{Vacuum} [\text{kPa}]}$$

It is often a good idea to use more vacuum cups than needed, to accommodate for vibrations, leaks and other unexpected conditions. However, the more vacuum cups, the more air leakage (air flow) is expected and the more air is moved in a grip resulting in longer gripping times.

When using porous materials, the vacuum that can be achieved by using the OnRobot suction cups will depend on the material itself and will be between the range stated in the specifications. Some of the most common non-porous materials are listed below:

- Fabrics
- Foam
- Foam with open cells
- Low density cardboard

Hardware Specification

- Low density paper
- Perforated materials
- Untreated wood

See the table below with general recommendations, in case other suction cups are needed for specific materials.

| Workpiece surface | Vacuum cup shape | Vacuum cup material |
|-----------------------------|--------------------------|--------------------------|
| Hard and flat | Normal or dual lip | Silicone or NBR |
| Soft plastic or plastic bag | Special plastic bag type | Special plastic bag type |
| Hard but curved or uneven | Thin dual lip | Silicone or soft NBR |
| To be painted afterwards | Any type | NBR only |
| Varying heights | 1.5 or more bevels | Any type |



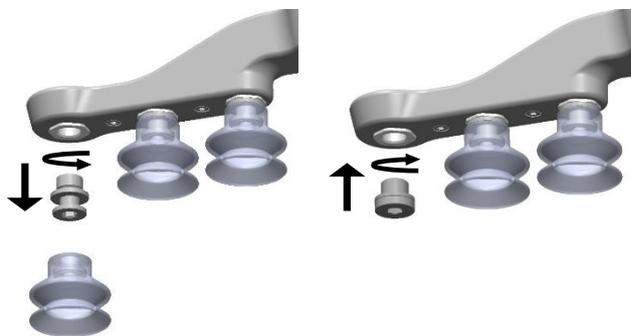
NOTE:

It is recommended to consult a vacuum cup specialist to find the optimal vacuum cup where the standard types are insufficient.

Fittings and Blind Screws.

It is possible to change suction cups simply by pulling them off the fittings. It might be a bit challenging to remove the 15 mm Diameter vacuum cups. As suggestion try to stretch the silicon to one of the sides and then pull it out.

Unused holes can be blinded using a blind screw, and each fitting can be changed to a different type to match the desired suction cup. The fittings and the blinding screws are mounted or dismounted by screwing (2Nm tightening torque) or unscrewing them with the provided 3 mm Allen key.



The thread size is the commonly used G1/8"; allowing for standard fittings, blinders and extenders to be fitted directly to the VG grippers.

Vacuum

Vacuum is defined as the percentage of absolute vacuum achieved relative to atmospheric pressure, i.e.:

| % vacuum | Bar | kPa | inHg | Typically used for |
|----------|-----------------------|------------------------|-----------------------|---|
| 0% | 0.00rel. 1.01 abs. | 0.00rel. 101.3 abs. | 0.0rel. 29.9 abs. | No vacuum / No lifting capacity |
| 20% | 0.20rel. 0.81 abs. | 20.3rel. 81.1 abs. | 6.0rel. 23.9 abs. | Cardboard and thin plastics |
| 40% | 0.41rel. 0.61 abs. | 40.5rel. 60.8 abs. | 12.0rel. 18.0 abs. | Light workpieces and long suction cup life span |
| 60% | 0.61rel. 0.41 abs. | 60.8rel. 40.5 abs. | 18.0rel. 12.0 abs. | Heavy workpieces and strongly secured grips |
| 80% | 0.81rel. 0.20 abs. | 81.1rel. 20.3 abs. | 23.9rel. 6.0 abs. | Max. vacuum. Not recommended |

The vacuum in kPa setting is the target vacuum. The pump will run at full speed until the target vacuum is achieved, and then run at a lower speed necessary to maintain the target vacuum.

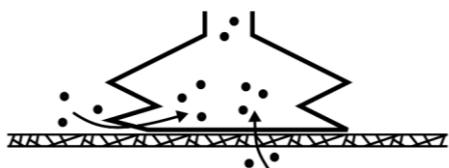
The pressure in the atmosphere varies with weather, temperature and altitude. The VG grippers automatically compensate for altitudes up to 2km, where the pressure is about 80% of sea level.

Air flow

Air flow is the amount of air that must be pumped to maintain the target vacuum. A completely tight system will not have any air flow, whereas real life applications have some smaller air leakages from two different sources:

- Leaking vacuum cup lips
- Leaking workpieces

The smallest leak under a vacuum cup can be hard to find (see picture below).



Leaking workpieces can be even harder to identify. Things that look completely tight might not be tight at all. A typical example is coarse cardboard boxes. The thin outer layer is often requiring a lot of air flow to create a pressure difference over it (see figure below).

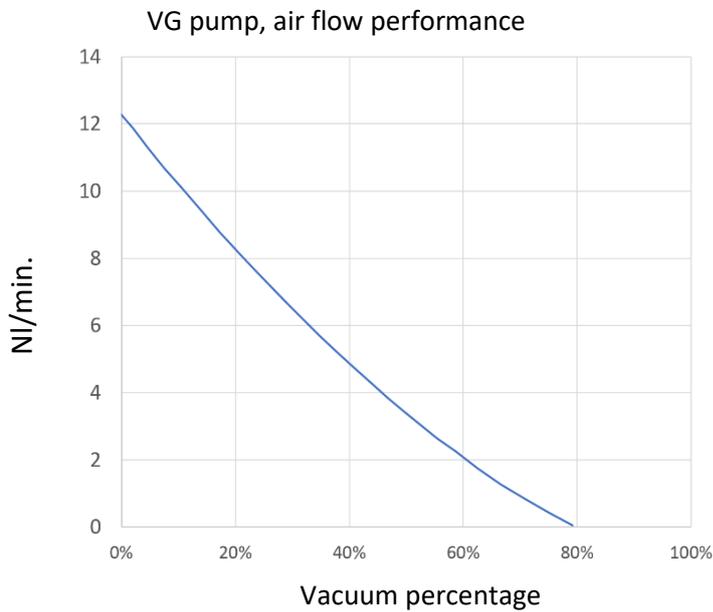


Therefore, the users must be aware of the following:

- VG grippers are not suitable for most uncoated, coarse cardboard boxes.

- Extra attention must be paid to leakages, e.g. vacuum cup shape and surface roughness

The air flow capability of a VG grippers is shown in the graph below:



NOTE:

The easiest way to check if a cardboard box is sufficiently tight is simply to test it using the VG grippers.

A high vacuum percentage setting does not give a higher lifting capacity on corrugated cardboard. In fact, a lower setting is recommended, e.g. 20%.

A low vacuum setting results in less air flow and less friction below the vacuum cups. This means VG gripper filters and vacuum cups will last longer.

VGC10

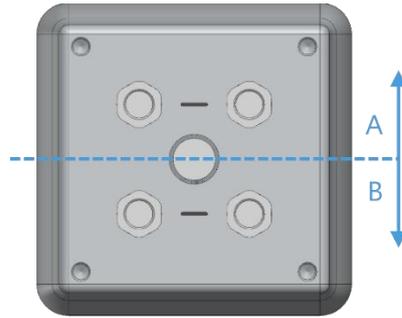
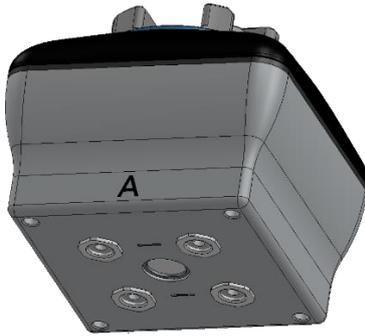
| General Properties | | Minimum | Typical | Maximum | Unit |
|--------------------|-----------------------------|---------------------------------------|-------------|----------------------|-----------------------------|
| Vacuum | | 5 % -0.05 1.5 | - - - | 80 % -0.810 24 | [Vacuum] [Bar] [inHg] |
| Air flow | | 0 | - | 12 | [L/min] |
| Payload | With default attachments | - - | - - | 6 * 13.2 * | [kg] [lb] |
| | With customized attachments | - - | 10 22 | 15 33.1 | [kg] [lb] |
| Vacuum cups | | 1 | - | 7 | [pcs.] |
| Gripping time | | - | 0.35 | - | [s] |
| Releasing time | | - | 0.20 | - | [s] |
| Vacuum pump | | Integrated, electric BLDC | | | |
| Dust filters | | Integrated 50µm, field replaceable | | | |
| IP Classification | | IP54 | | | |
| Dimensions | | 101 x 100 x 100 3.97 x 3.94 x 3.94 | | [mm] [inch] | |
| Weight | | 0.814 1.79 | | [kg] [lb] | |

* By using three 40mm cups. More info in the table **Number of Cups needed for non-porous materials depending on payload and vacuum.**

| Operating Conditions | Minimum | Typical | Maximum | Unit |
|------------------------------------|---------|---------|---------|---------|
| Power supply | 20.4 | 24 | 28.8 | [V] |
| Current consumption | 50 | 600 | 1500 | [mA] |
| Operating temperature | 0 | - | 50 | [°C] |
| | 32 | - | 122 | [°F] |
| Relative humidity (non-condensing) | 0 | - | 95 | [%] |
| Calculated MTBF (operating life) | 30.000 | - | - | [hours] |

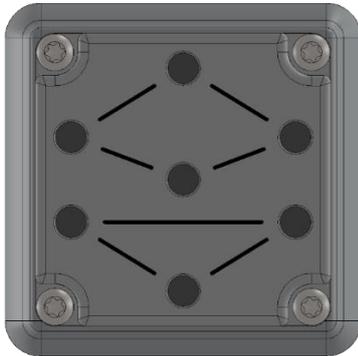
2 channels

The VGC10 has 4 holes to use fittings with vacuum cups or blinding screws as needed. It also has lines which show the holes that are communicated together. This is useful when using channels A and B independently for vacuum.

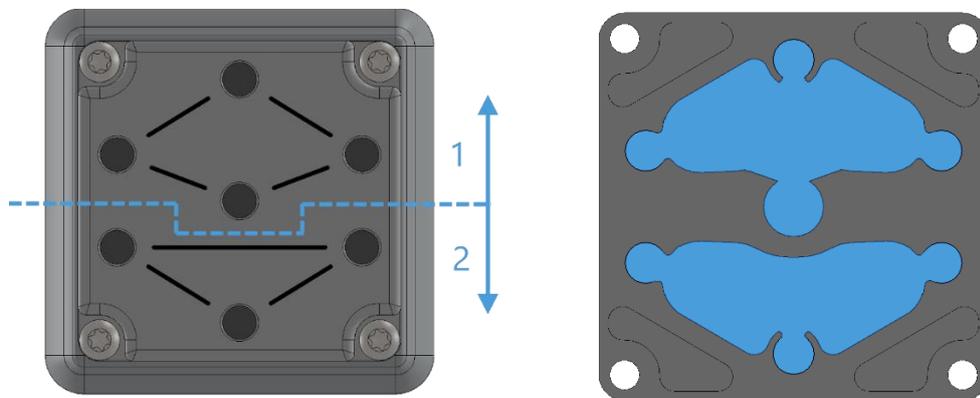


Adaptor Plate

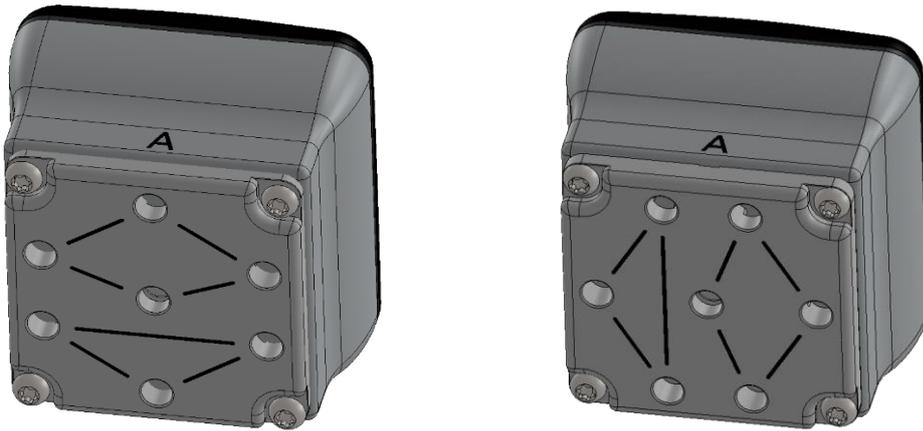
The VGC10 comes with an Adaptor Plate which provides extra flexibility to locate the vacuum cups in different configurations.



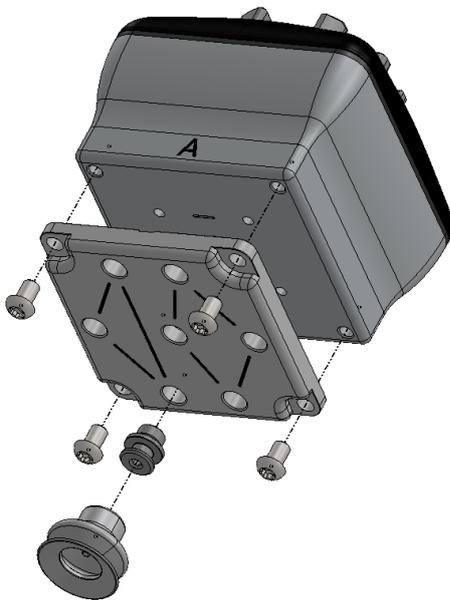
The Adaptor Plate has 7 holes to use fittings with vacuum cups or blinding screws as needed. It also has lines which show the holes that are communicated together. This is useful when using channel A and B independently for vacuum.



The Adaptor Plate can be placed in different positions by rotating it 90°. Having as reference the letters A and B written on the gripper housing, the Adaptor Plate can be placed to separate both channels or to communicate them. If the Adaptor Plate is placed as in picture below on the left, both channels will be separated, and they can be used independently or combined. If the Adaptor Plate is placed as in picture below on the right, both channels will be communicated and a higher air flow can be achieved, although both channels will have to be used combined.



To mount the Adaptor Plate simply remove the 4 fittings or blinding screws from the gripper, place the Adaptor Plate by choosing the right angle according to the desired configuration, and tighten the 4 screws with 4 Nm tighten torque.



NOTE:

Please, note that the O-Ring in the Adaptor Plate is not glued therefore it can be pulled out. If that happens simply put it back in place and the gripper will work as before.

Extension Pipe

The Extension Pipe provides an extra length of 50 mm to reach narrow spaces.



NOTE:

Remember to use the Adaptor Plate rotated to achieve a higher air flow when using both channels together.

The Extension Pipe can be mounted in any of the holes by simply screwing it in and adding a fitting on top as shown in the image below.

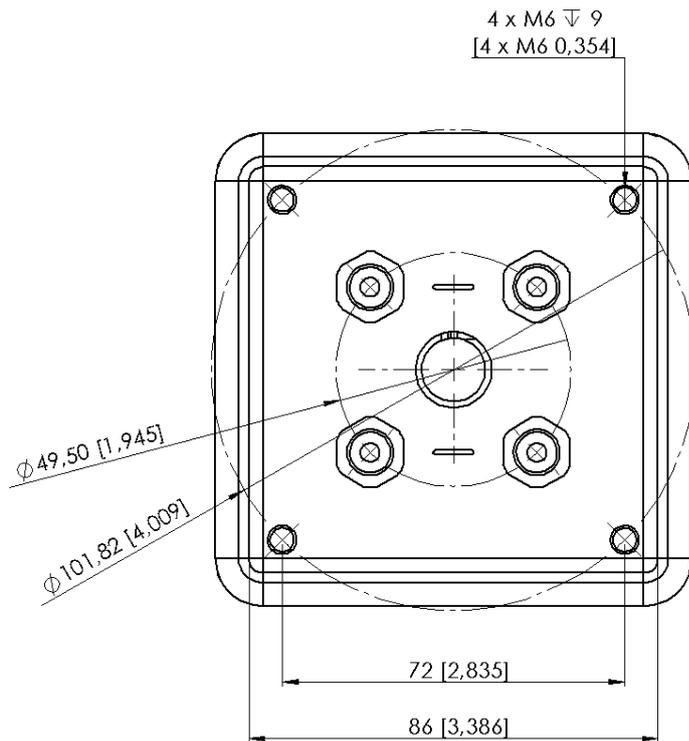


Below different mounting configurations with the provided attachments are shown.



Customized Adaptor Plates and Push-in Fittings

The design of the VGC10 is meant to facilitate the users to make their own adaptor plates to create different kinds of configurations. The dimensions needed to create a customized adaptor plate are shown in the image below.

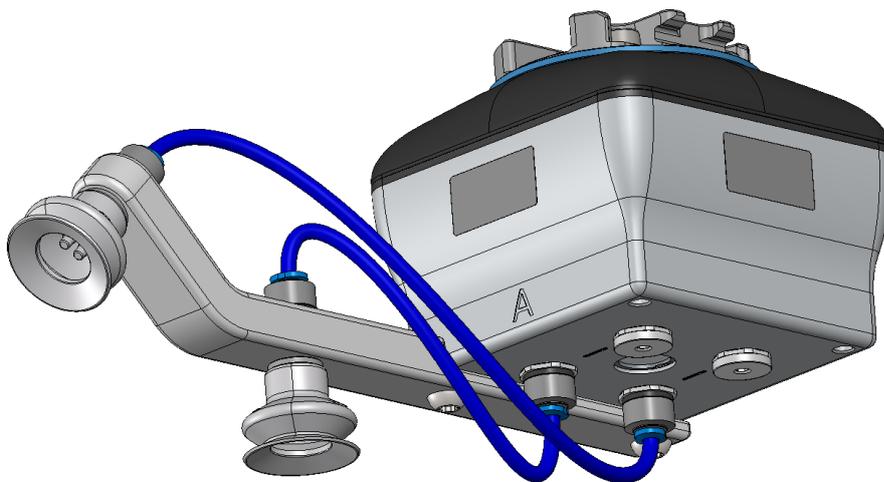


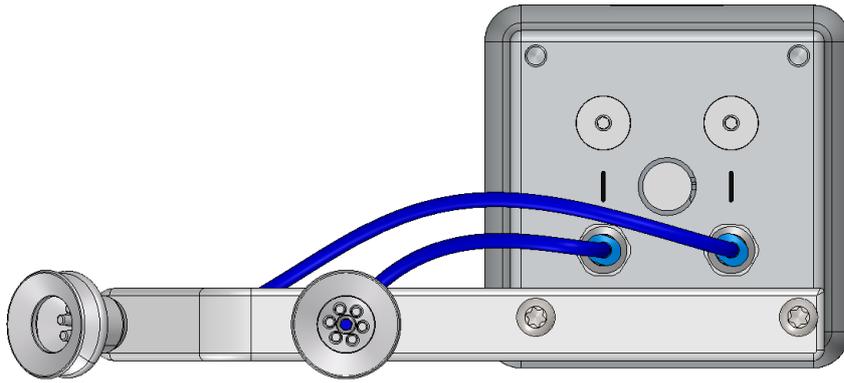
The Push-in Fittings are used to attach 4 mm vacuum tubes to create customized configuration that required remote vacuum. In most cases, this size is enough for generating the needed vacuum from the pump in the gripper.



The commercial name of the Push-in Fittings is Fitting QSM-G1/8-4-I-R in case some more units need to be purchased.

An example of a customized configuration with a homemade adaptor plate and remote vacuum is shown below.





The image below shows how the push-in fittings and the normal fittings are communicated.



Payload

The lifting capacity of the VG grippers depends primarily on the following parameters:

- Vacuum cups
- Vacuum
- Air flow

Vacuum Cups

Choosing the right vacuum cups for your application is essential. The VG grippers come with common 15, 30 and 40 mm silicone vacuum cups (see table below) which are good for hard and flat surfaces, but not good for uneven surfaces and it might leave microscopic traces of silicone on the workpiece which can cause issues with some types of painting processes afterwards.

| Image | External Diameter [mm] | Internal Diameter [mm] | Gripping Area [mm ²] |
|---|------------------------|------------------------|----------------------------------|
|  | 15 | 6 | 29 |
|  | 30 | 16 | 200 |
|  | 40 | 24 | 450 |

For non-porous materials, the OnRobot suction cups are highly recommended. Some of the most common non-porous materials are listed below:

- Composites
- Glass
- High density cardboard
- High density paper
- Metals
- Plastic
- Porous materials with a sealed surface
- Varnished wood

In an ideal case, working with non-porous material workpieces where there are no air flow going through the workpiece, the table below shows the number of cups and the cup size needed depending on the payload (workpiece mass) and the vacuum used.

Number of Cups needed for non-porous materials depending on payload and vacuum:

| Payload (kg) |  15mm | | | |  30mm | | | |  40mm | | | |
|--------------|---|----|----|----|---|----|----|----|---|----|----|----|
| | Vacuum (kPa) | | | | Vacuum (kPa) | | | | Vacuum (kPa) | | | |
| | 20 | 40 | 60 | 75 | 20 | 40 | 60 | 75 | 20 | 40 | 60 | 75 |
| 0.1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0.5 | 13 | 7 | 5 | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | - | 13 | 9 | 7 | 4 | 2 | 2 | 1 | 2 | 1 | 1 | 1 |
| 2 | - | - | - | 14 | 8 | 4 | 3 | 2 | 4 | 2 | 2 | 1 |
| 3 | - | - | - | - | 12 | 6 | 4 | 3 | 5 | 3 | 2 | 2 |
| 4 | - | - | - | - | 15 | 8 | 5 | 4 | 7 | 4 | 3 | 2 |
| 5 | - | - | - | - | - | 10 | 7 | 5 | 9 | 5 | 3 | 3 |
| 6 | - | - | - | - | - | 12 | 8 | 6 | 10 | 5 | 4 | 3 |
| 7 | - | - | - | - | - | 13 | 9 | 7 | 12 | 6 | 4 | 4 |
| 8 | - | - | - | - | - | 15 | 10 | 8 | 14 | 7 | 5 | 4 |
| 9 | - | - | - | - | - | - | 12 | 9 | 15 | 8 | 5 | 4 |
| 10 | - | - | - | - | - | - | 13 | 10 | - | 9 | 6 | 5 |
| 11 | - | - | - | - | - | - | 14 | 11 | - | 9 | 6 | 5 |
| 12 | - | - | - | - | - | - | 15 | 12 | - | 10 | 7 | 6 |
| 13 | - | - | - | - | - | - | 16 | 13 | - | 11 | 8 | 6 |
| 14 | - | - | - | - | - | - | - | 14 | - | 12 | 8 | 7 |
| 15 | - | - | - | - | - | - | - | 15 | - | 13 | 9 | 7 |



NOTE:

To use more than 7 (15mm), 4 (30mm) or 3 (40mm) vacuum cups with the VGC10 a customized adaptor plate is needed.

The table above is created with the following formula that equalizes the lifting force with the payload considering 1.5G of acceleration.

$$\text{Amount}_{\text{Cups}} * \text{Area}_{\text{Cup}}[\text{mm}] = 14700 \frac{\text{Payload} [\text{kg}]}{\text{Vacuum} [\text{kPa}]}$$

It is often a good idea to use more vacuum cups than needed, to accommodate for vibrations, leaks and other unexpected conditions. However, the more vacuum cups, the more air leakage (air flow) is expected and the more air is moved in a grip resulting in longer gripping times.

When using porous materials, the vacuum that can be achieved by using the OnRobot suction cups will depend on the material itself and will be between the range stated in the specifications. Some of the most common non-porous materials are listed below:

- Fabrics
- Foam
- Foam with open cells
- Low density cardboard
- Low density paper
- Perforated materials
- Untreated wood

See the table below with general recommendations, in case other suction cups are needed for specific materials.

| Workpiece surface | Vacuum cup shape | Vacuum cup material |
|-----------------------------|--------------------------|--------------------------|
| Hard and flat | Normal or dual lip | Silicone or NBR |
| Soft plastic or plastic bag | Special plastic bag type | Special plastic bag type |
| Hard but curved or uneven | Thin dual lip | Silicone or soft NBR |
| To be painted afterwards | Any type | NBR only |
| Varying heights | 1.5 or more bevels | Any type |



NOTE:

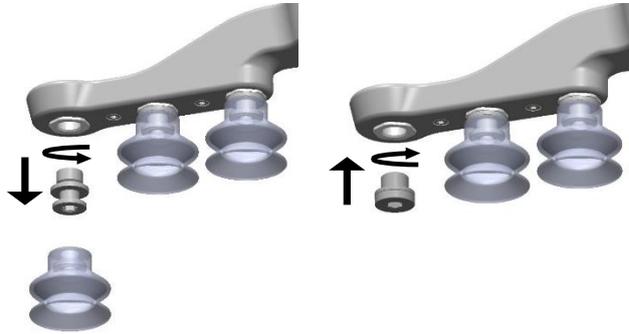
It is recommended to consult a vacuum cup specialist to find the optimal vacuum cup where the standard types are insufficient.

Fittings and Blind Screws.

It is possible to change suction cups simply by pulling them off the fittings. It might be a bit challenging to remove the 15 mm Diameter vacuum cups. As suggestion try to stretch the silicon to one of the sides and then pull it out.

Hardware Specification

Unused holes can be blinded using a blind screw, and each fitting can be changed to a different type to match the desired suction cup. The fittings and the blinding screws are mounted or dismounted by screwing (2Nm tightening torque) or unscrewing them with the provided 3 mm Allen key.



The thread size is the commonly used G1/8"; allowing for standard fittings, blinders and extenders to be fitted directly to the VG grippers.

Vacuum

Vacuum is defined as the percentage of absolute vacuum achieved relative to atmospheric pressure, i.e.:

| % vacuum | Bar | kPa | inHg | Typically used for |
|----------|-----------------------|------------------------|-----------------------|---|
| 0% | 0.00rel. 1.01 abs. | 0.00rel. 101.3 abs. | 0.0rel. 29.9 abs. | No vacuum / No lifting capacity |
| 20% | 0.20rel. 0.81 abs. | 20.3rel. 81.1 abs. | 6.0rel. 23.9 abs. | Cardboard and thin plastics |
| 40% | 0.41rel. 0.61 abs. | 40.5rel. 60.8 abs. | 12.0rel. 18.0 abs. | Light workpieces and long suction cup life span |
| 60% | 0.61rel. 0.41 abs. | 60.8rel. 40.5 abs. | 18.0rel. 12.0 abs. | Heavy workpieces and strongly secured grips |
| 80% | 0.81rel. 0.20 abs. | 81.1rel. 20.3 abs. | 23.9rel. 6.0 abs. | Max. vacuum. Not recommended |

The vacuum in kPa setting is the target vacuum. The pump will run at full speed until the target vacuum is achieved, and then run at a lower speed necessary to maintain the target vacuum.

The pressure in the atmosphere varies with weather, temperature and altitude. The VG grippers automatically compensate for altitudes up to 2km, where the pressure is about 80% of sea level.

Air flow

Air flow is the amount of air that must be pumped to maintain the target vacuum. A completely tight system will not have any air flow, whereas real life applications have some smaller air leakages from two different sources:

- Leaking vacuum cup lips
- Leaking workpieces

The smallest leak under a vacuum cup can be hard to find (see picture below).



Leaking workpieces can be even harder to identify. Things that look completely tight might not be tight at all. A typical example is coarse cardboard boxes. The thin outer layer is often requiring a lot of air flow to create a pressure difference over it (see figure below).

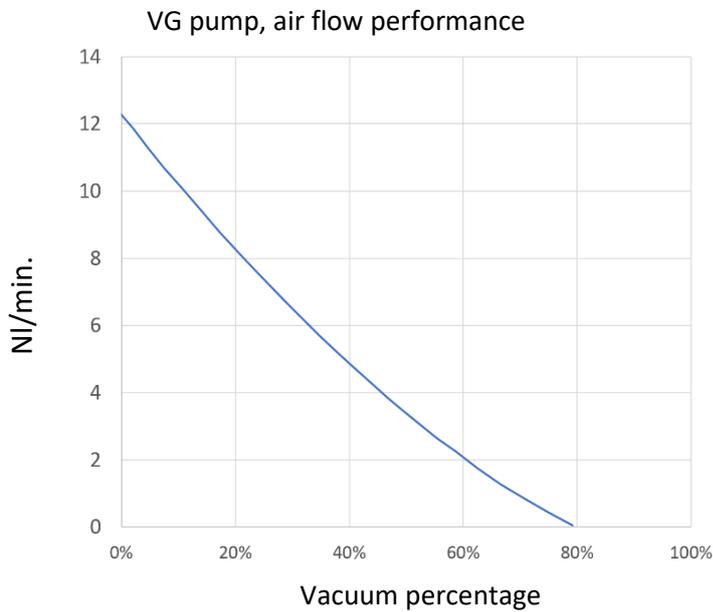


Therefore, the users must be aware of the following:

- VG grippers are not suitable for most uncoated, coarse cardboard boxes.

- Extra attention must be paid to leakages, e.g. vacuum cup shape and surface roughness

The air flow capability of a VG grippers is shown in the graph below:



NOTE:

The easiest way to check if a cardboard box is sufficiently tight is simply to test it using the VG grippers.

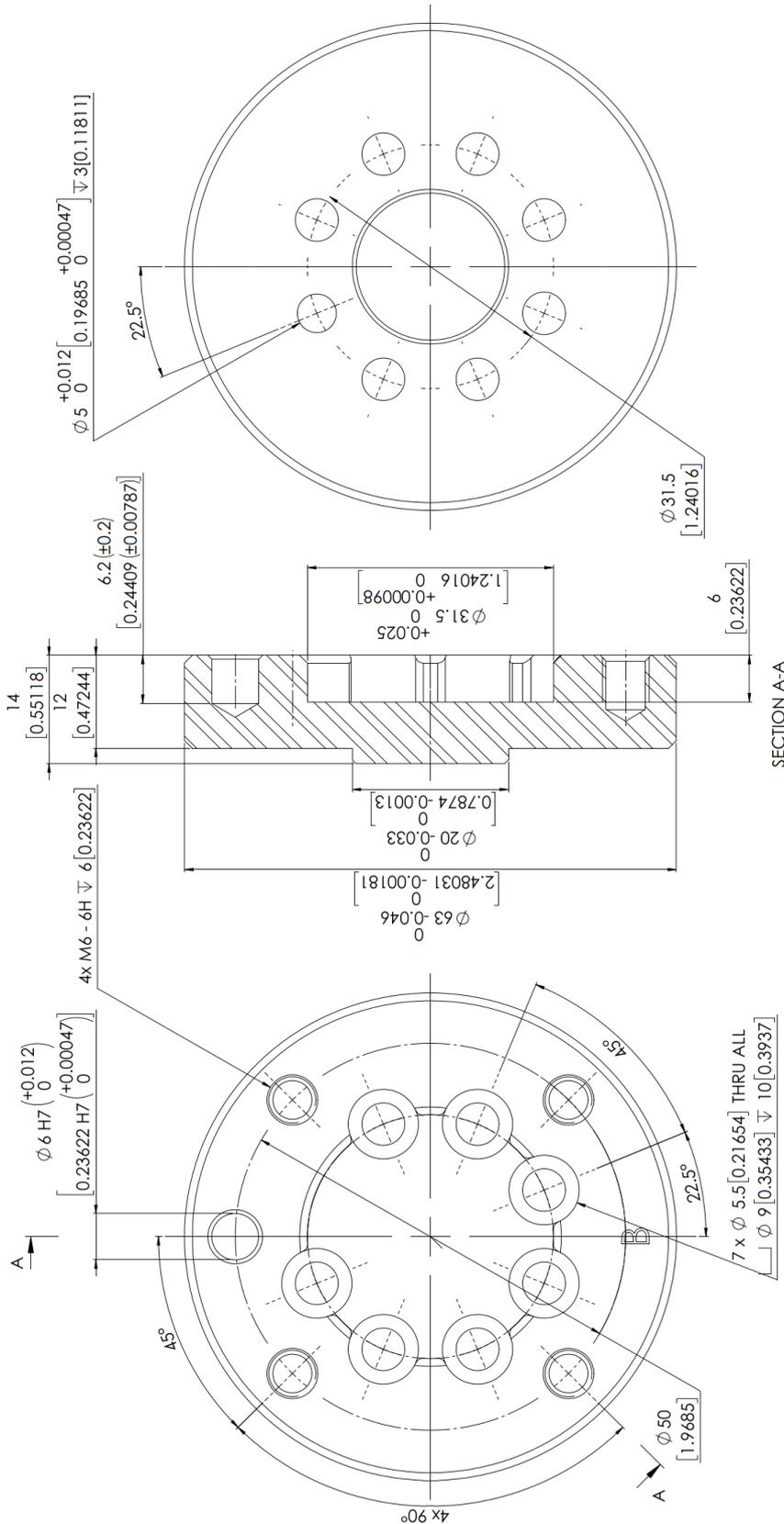
A high vacuum percentage setting does not give a higher lifting capacity on corrugated cardboard. In fact, a lower setting is recommended, e.g. 20%.

A low vacuum setting results in less air flow and less friction below the vacuum cups. This means VG gripper filters and vacuum cups will last longer.

9.2 Mechanical Drawings

9.2.1 Adapter plate(s)

Adapter B

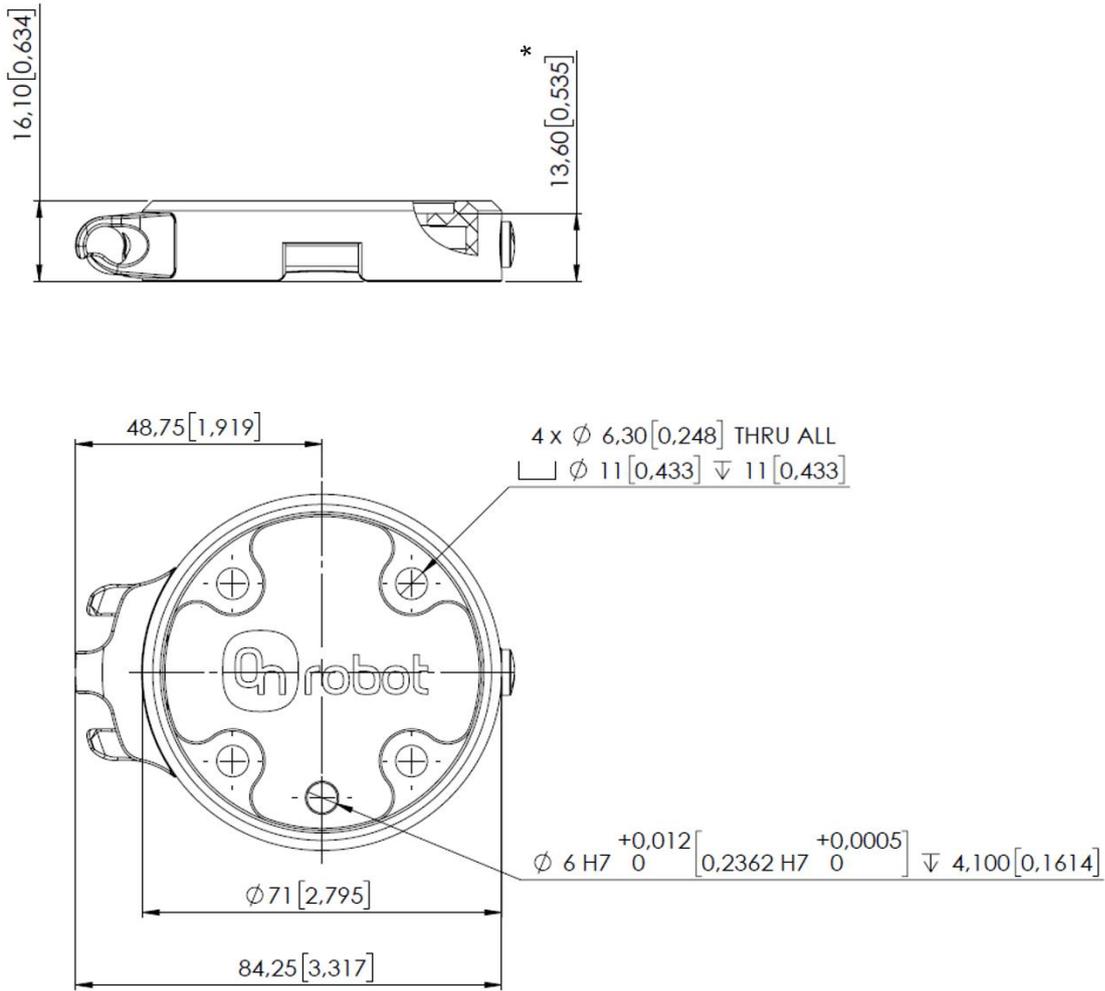


All dimensions are in mm and [inches].

9.2.2 Mountings

| | |
|--|-----|
|  Quick Changer - Robot side | 207 |
|  Dual Quick Changer..... | 208 |
|  HEX-E/H QC | 209 |

**Quick Changer -
Robot side**



* Distance from Robot flange interface to OnRobot tool.

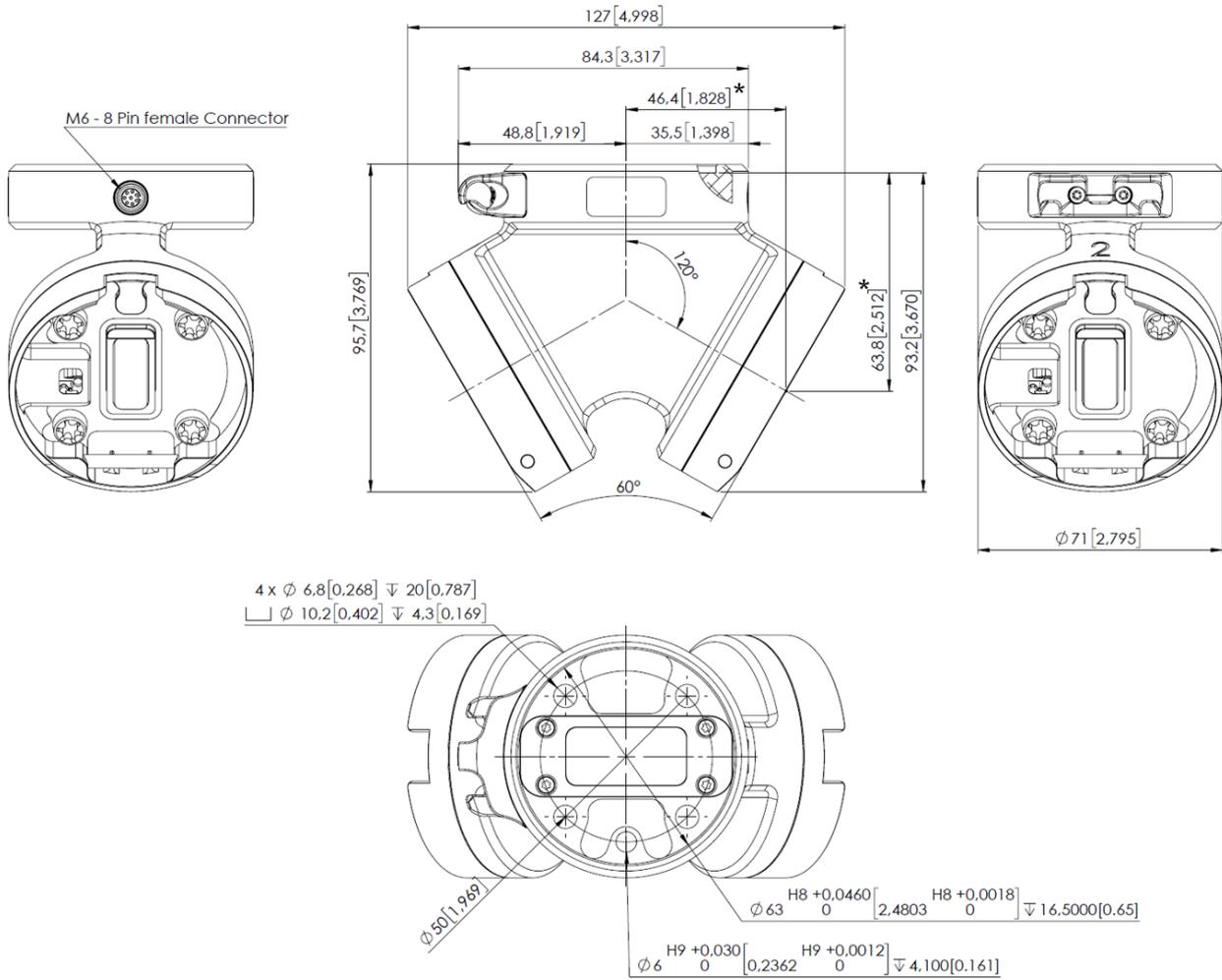
All dimensions are in mm and [inches].



NOTE:

The cable holder (on the left side) is only required with the long (5 meter) cable.

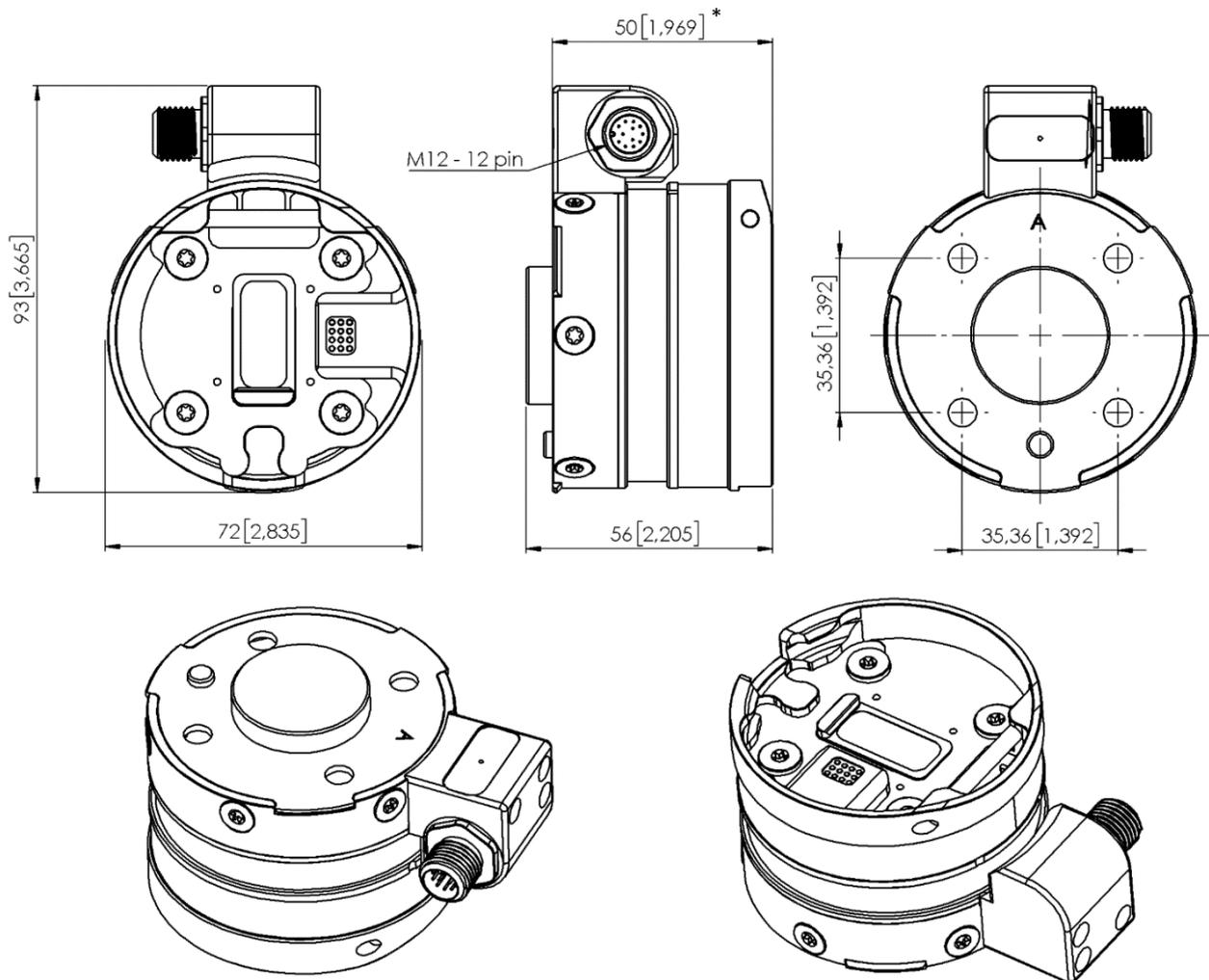
Dual Quick Changer



* Distance from Robot flange interface to OnRobot tool

All dimensions are in mm and [inches].

HEX-E/H QC



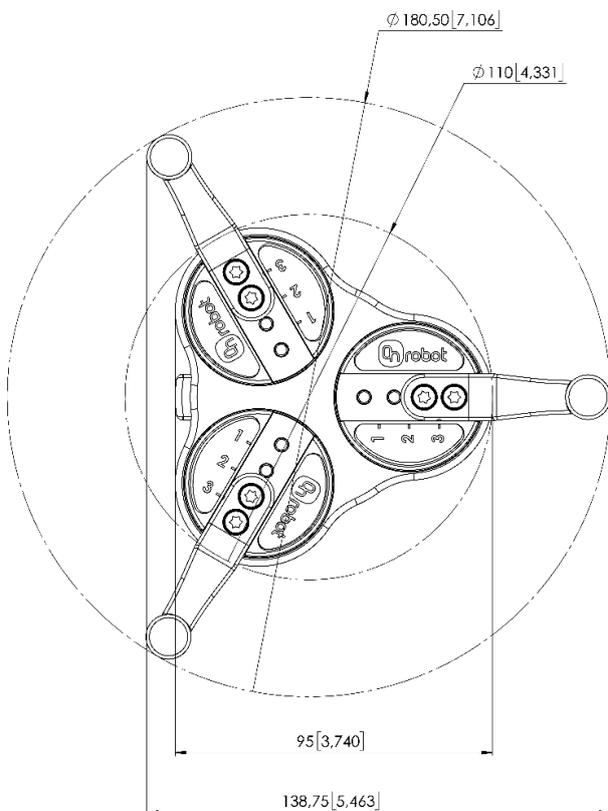
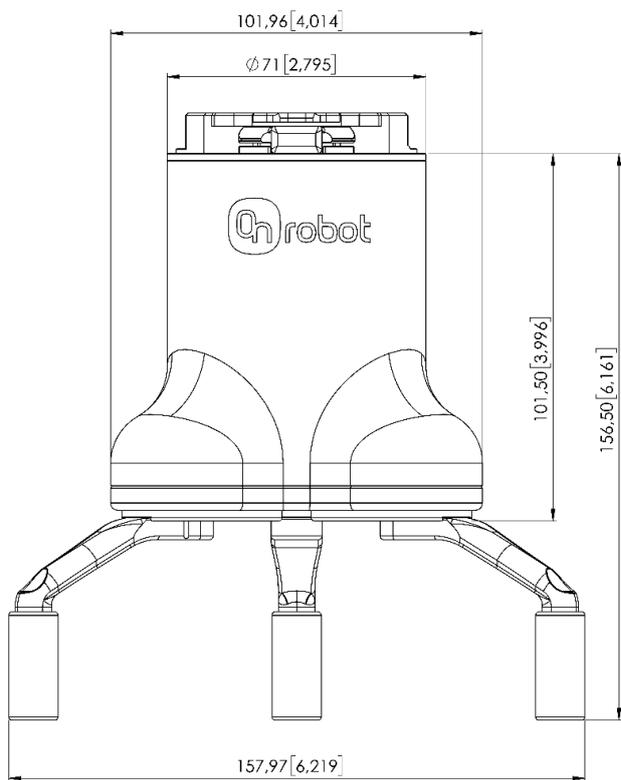
* Distance from Robot flange interface to OnRobot tool

All dimensions are in mm and [inches].

9.2.3 Tools

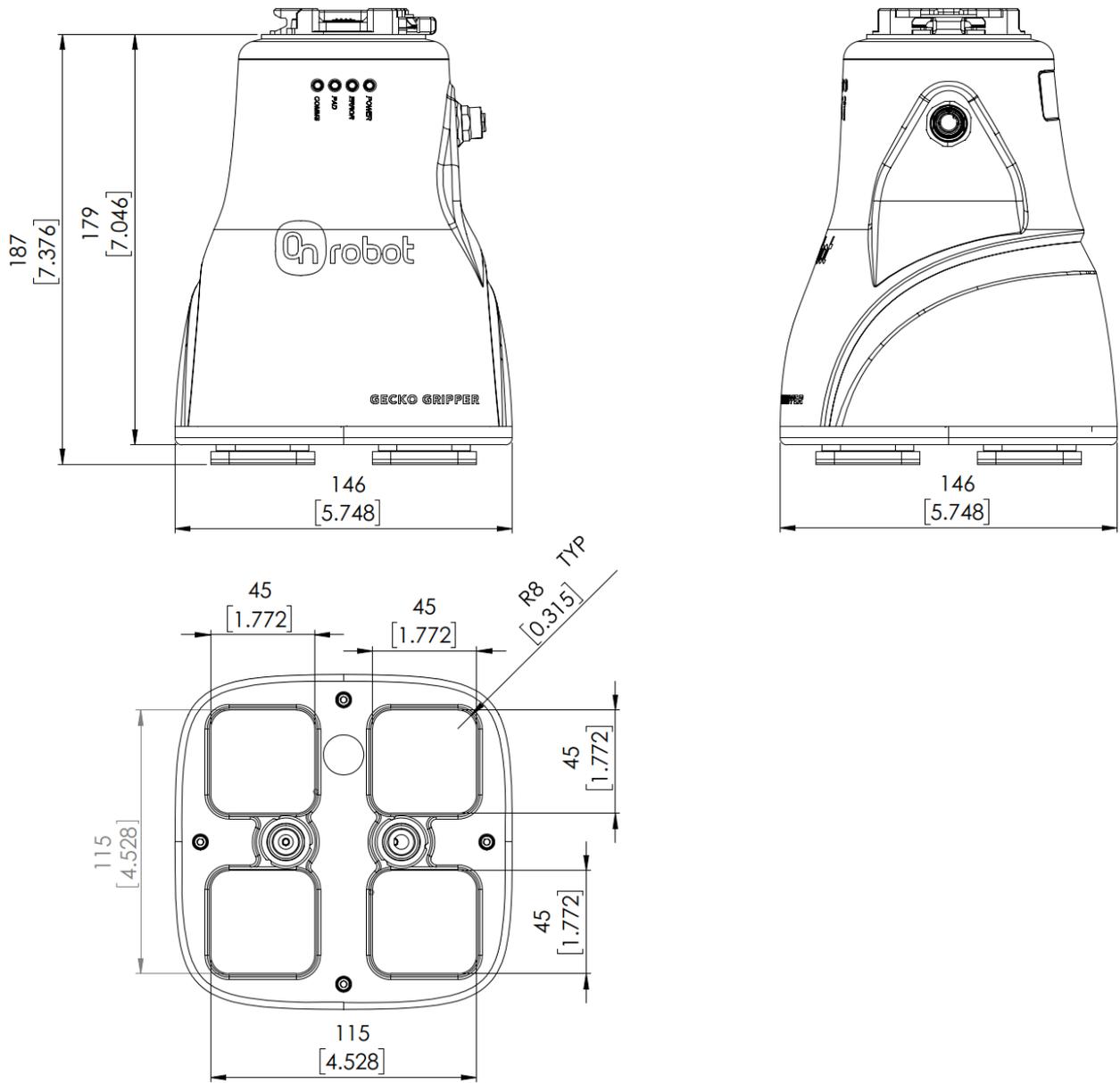
| | |
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3FG15



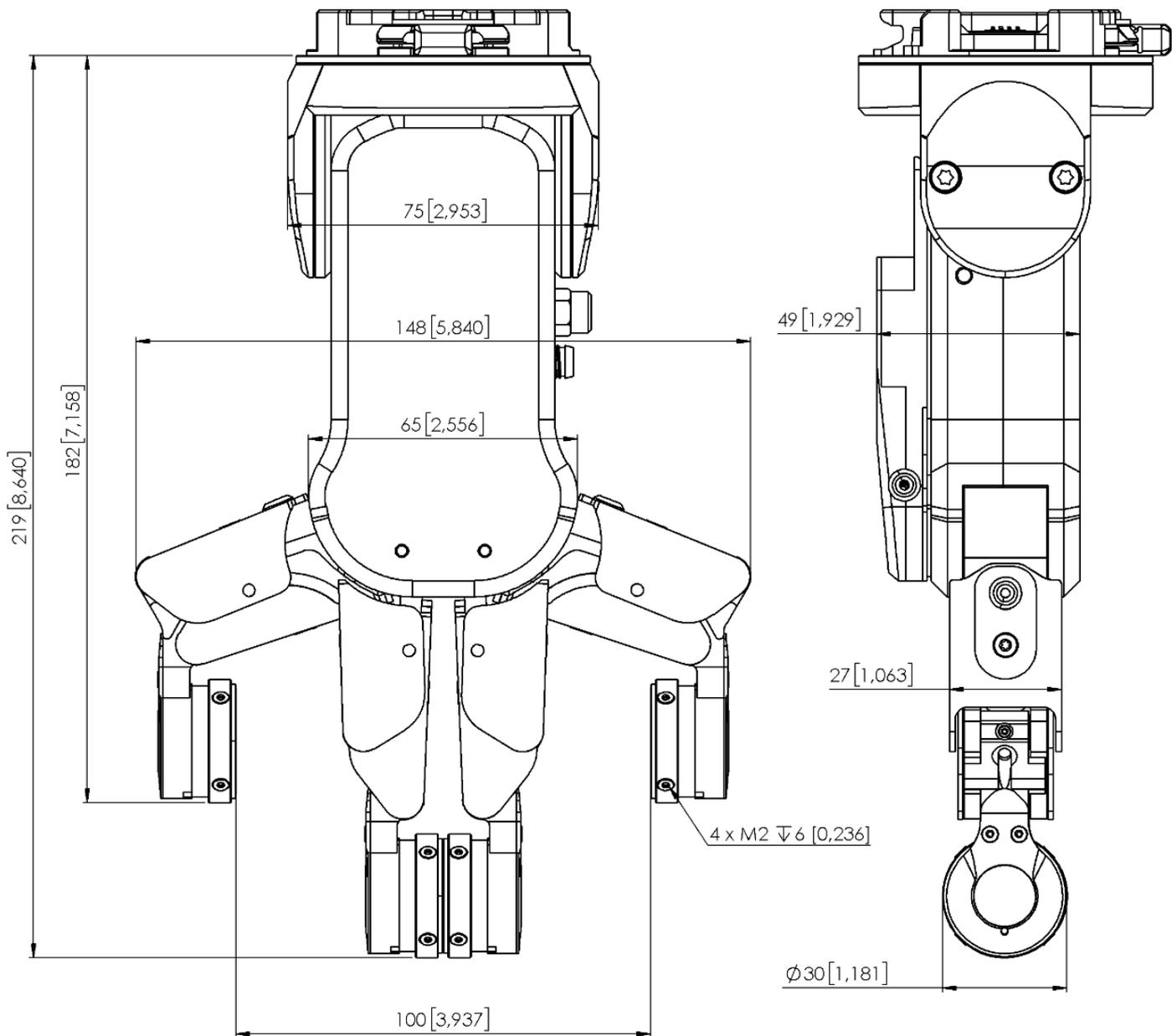
All dimensions are in mm and [inches].

Gecko



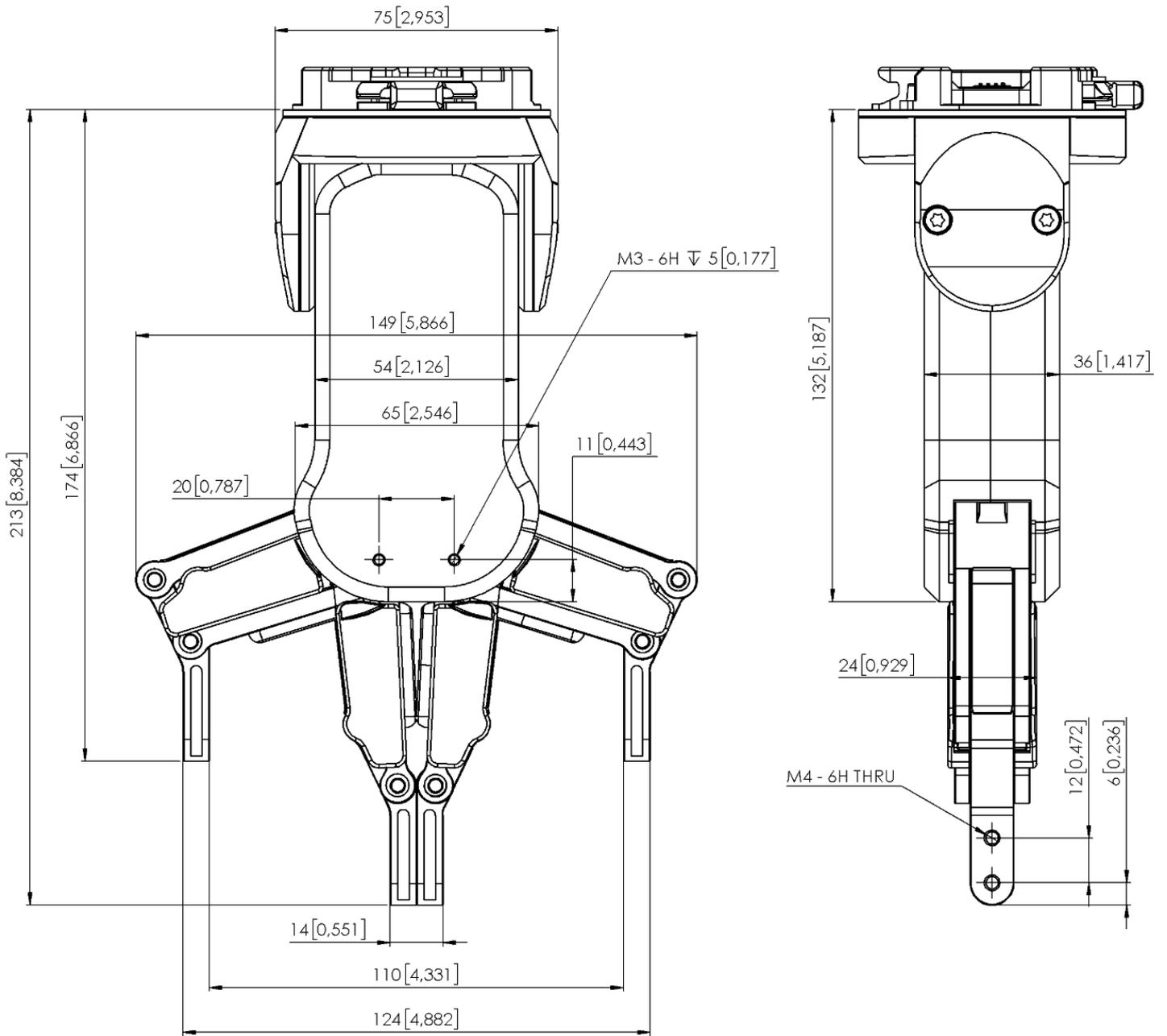
All dimensions are in mm and [inches].

RG2-FT



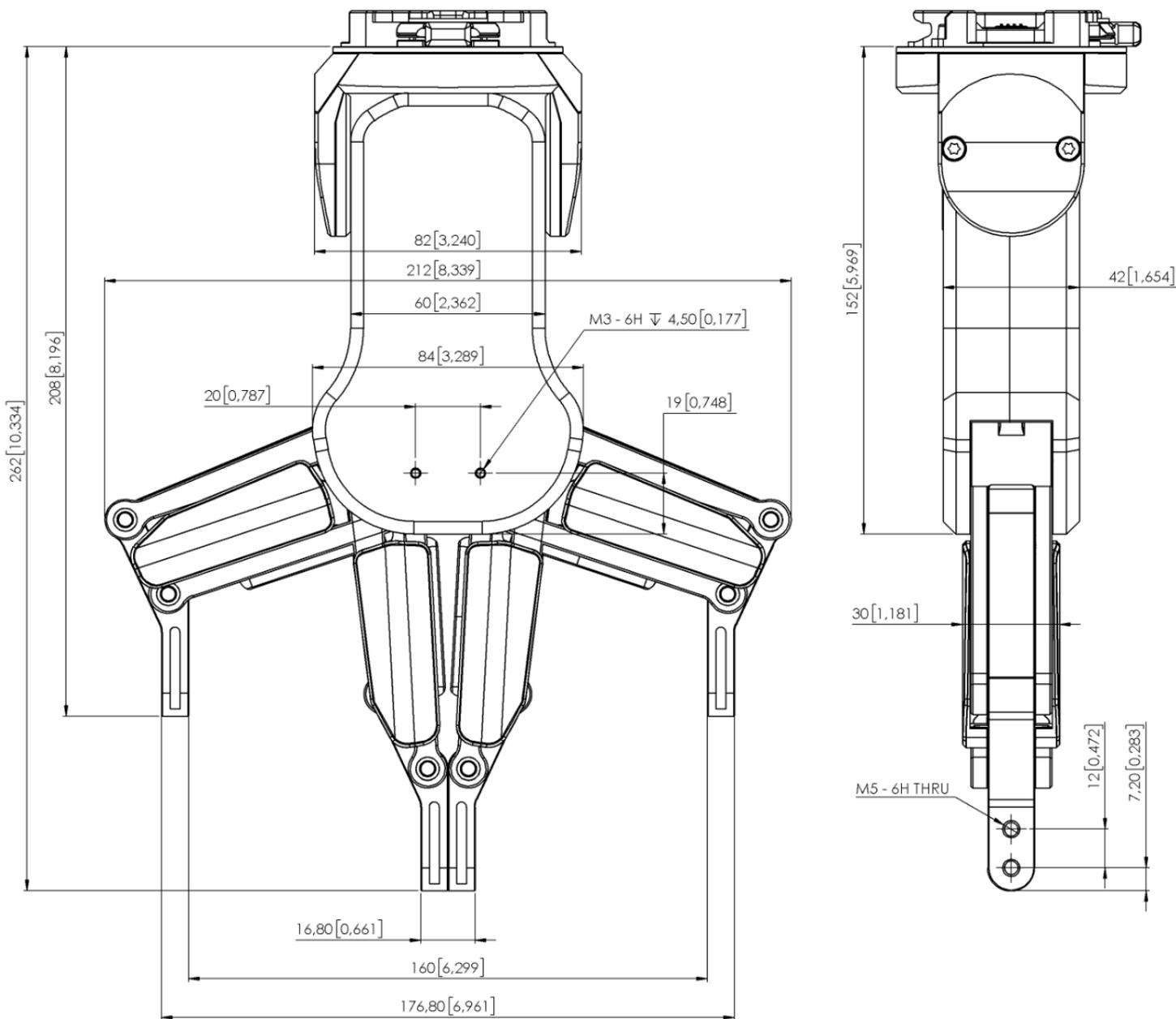
All dimensions are in mm and [inches].

RG2



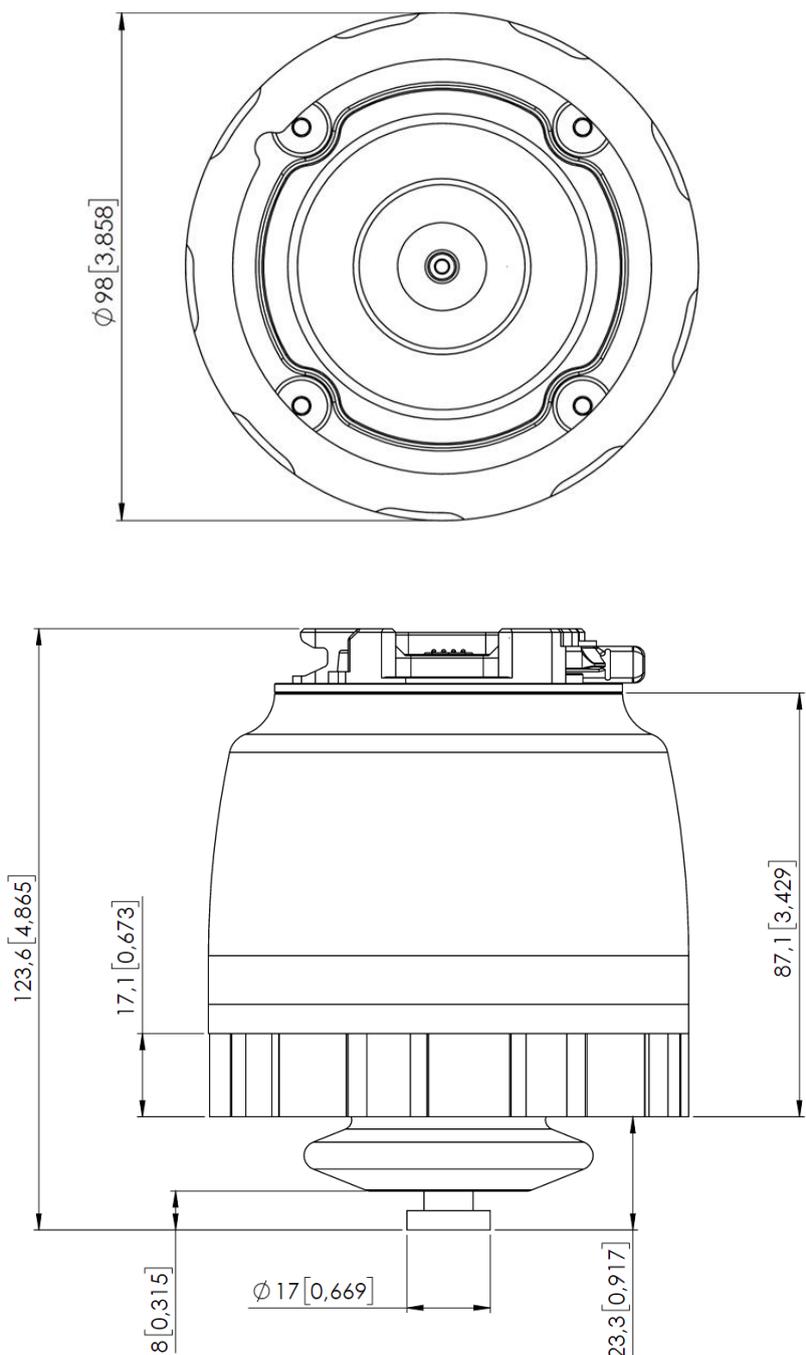
All dimensions are in mm and [inches].

RG6



All dimensions are in mm and [inches].

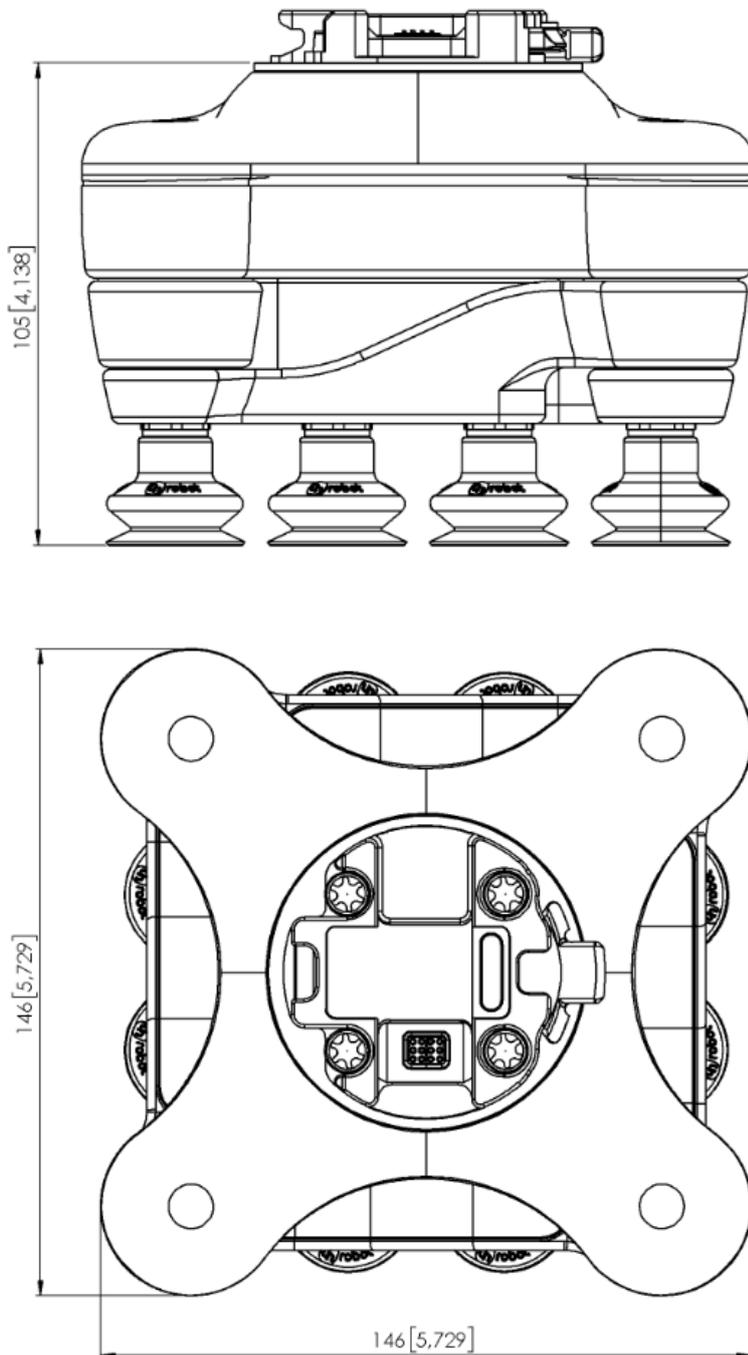
SG



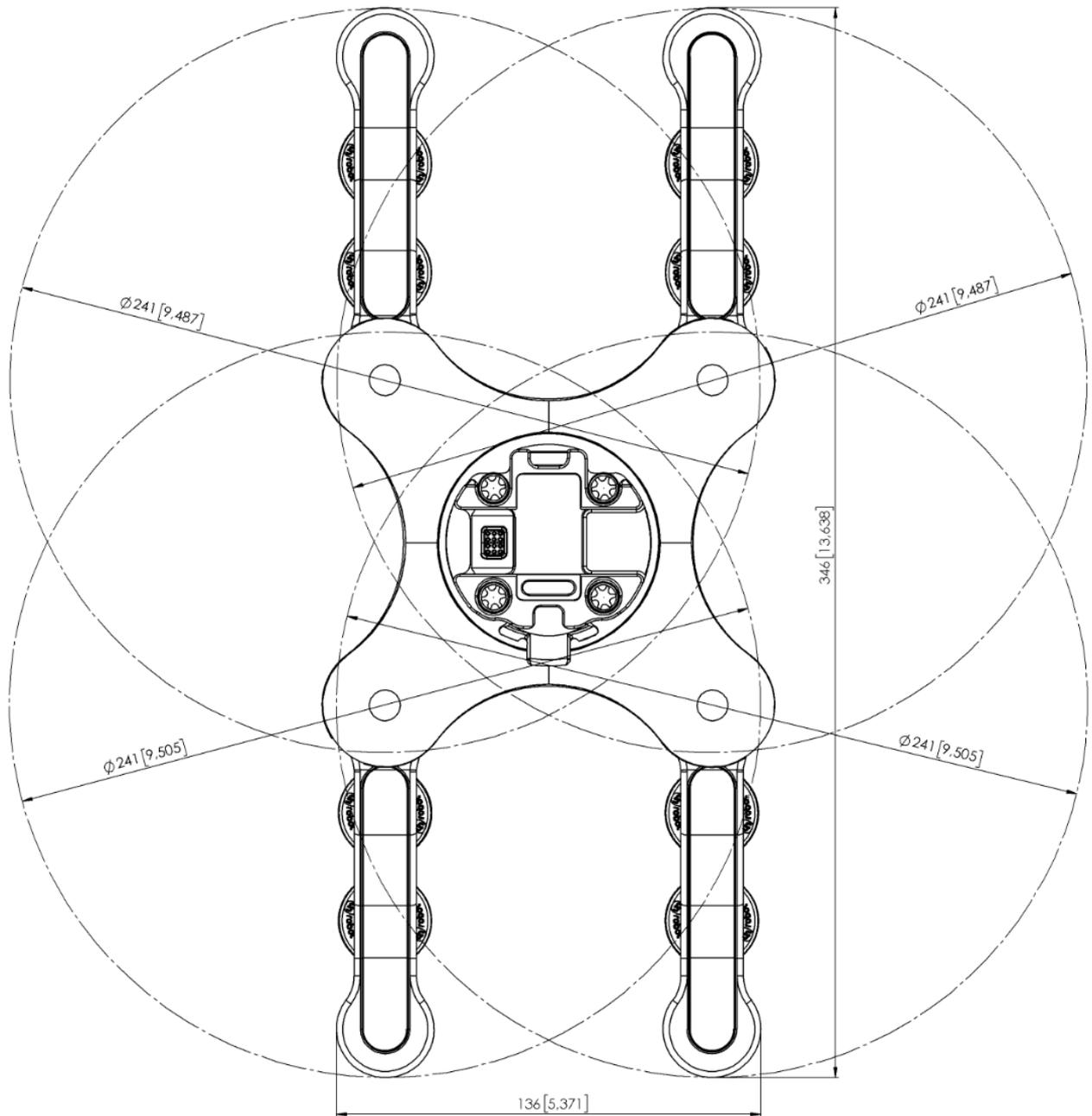
All dimensions are in mm and [inches].

The Silicone Tool parts - that are attached to the SG base part -, are described in the SG Datasheet.

VG10

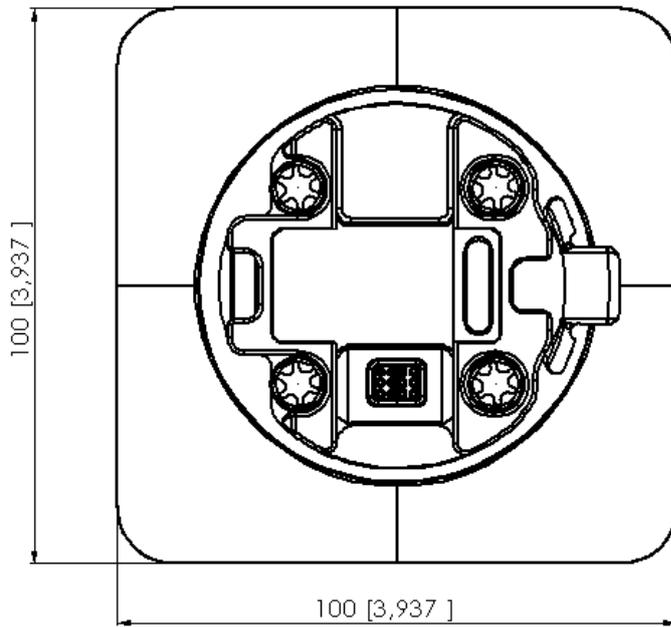
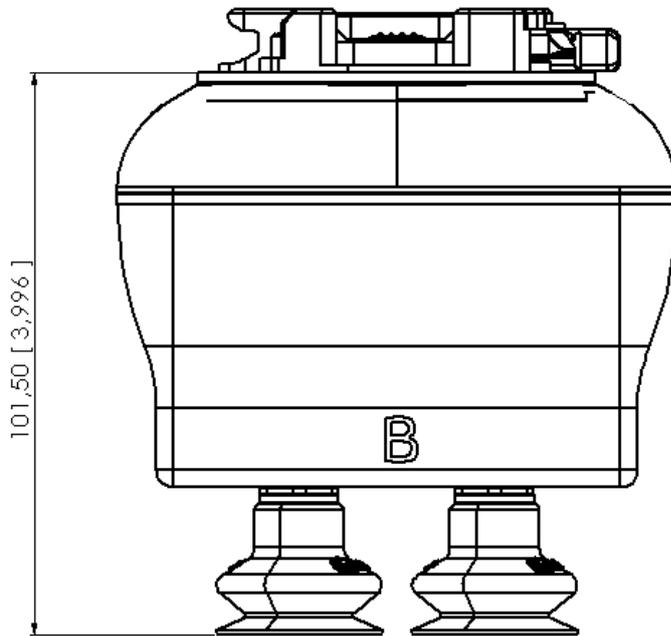


All dimensions are in mm and [inches].

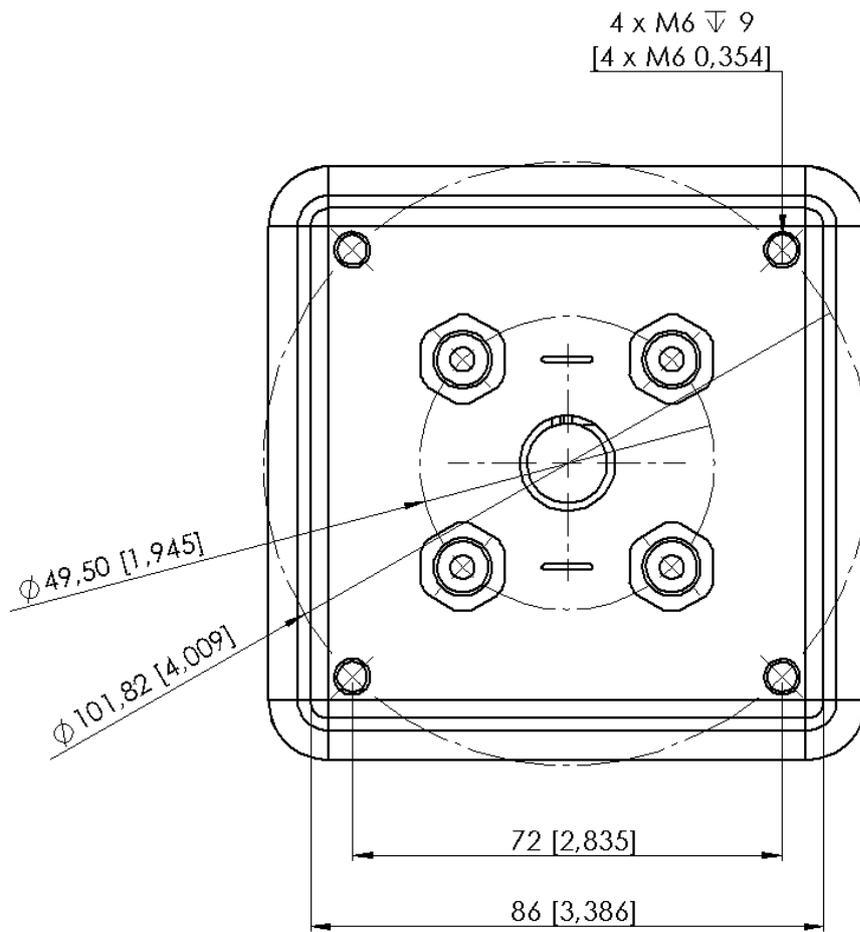


All dimensions are in mm and [inches].

VGC10

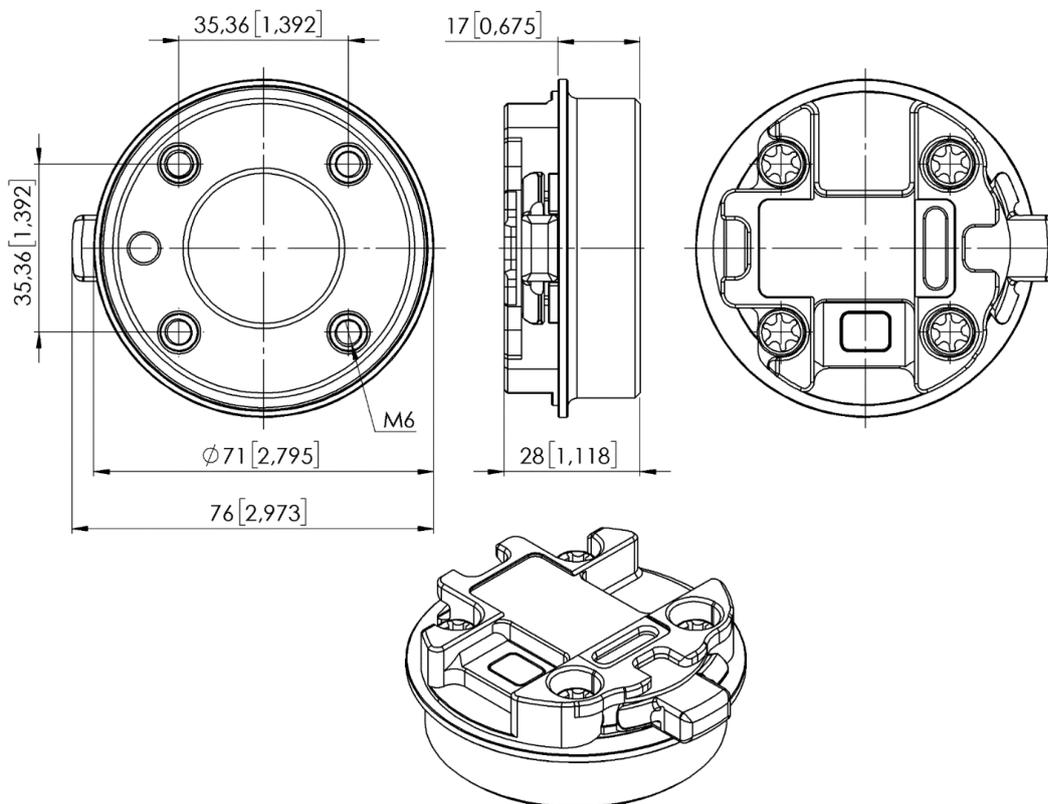


All dimensions are in mm and [inches].



All dimensions are in mm and [inches].

Quick Changer -
Tool side

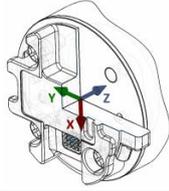


All dimensions are in mm and [inches].

9.3 Center of Gravity

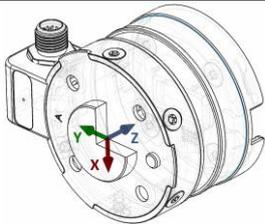
COG, TCP, and weight parameters of the single devices (without any mounting/adapter):

3FG15

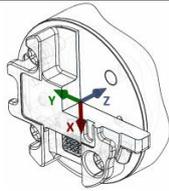
| Coordinate system | TCP [mm] | Center of Gravity [mm] | Weight |
|---|---------------------|--------------------------|-------------------|
|  | X=0 Y=0 Z=156 | cX= 0 cY= 0 cZ= 83 | 1.15 kg 2.5 lb |

* With delivered fingers and 13.5 silicone fingertips on.

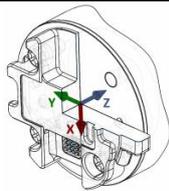
HEX-E/H QC

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

Gecko

| Coordinate system | TCP [mm] | Center of Gravity [mm] | Weight |
|---|---------------------|------------------------|--------------------|
|  | X=0 Y=0 Z=187 | cX=0 cY=0 cZ=113 | 2.83 kg 6.10 lb |

RG2-FT

| Coordinate system | TCP [mm] | Center of Gravity [mm] | Weight |
|---|---------------------|------------------------|--------------------|
|  | X=0 Y=0 Z=205 | cX=0 cY=0 cZ=65 | 0.98 kg 2.16 lb |

* Mounted at 0°

RG2

| Coordinate system | TCP [mm] | Center of Gravity [mm] | Weight |
|-------------------|---------------------|------------------------|--------------------|
| | X=0 Y=0 Z=200 | cX=0 cY=0 cZ=64 | 0.78 kg 1.72 lb |

* Mounted at 0°

RG6

| Coordinate system | TCP [mm] | Center of Gravity [mm] | Weight |
|-------------------|---------------------|------------------------|--------------------|
| | X=0 Y=0 Z=250 | cX=0 cY=0 cZ=90 | 1.25 kg 2.76 lb |

* Mounted at 0°

SG

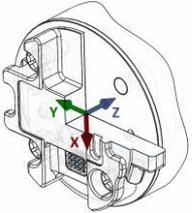
Without any Silicone Tool, only the SG Base Part with spindle in.

| Coordinate system | TCP [mm] | Center of Gravity [mm] | Weight |
|-------------------|---------------------|--------------------------|--------------------|
| | X=0 Y=0 Z=113 | cX=-13 cY=-5 cZ=31 | 0.77 kg 1.69 lb |

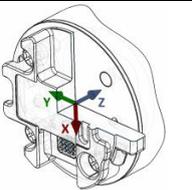
With Silicone Tool Type A on (SG-a-S/H).

| Coordinate system | TCP [mm] | Center of Gravity [mm] | Weight |
|-------------------|---------------------|--------------------------|---------------------|
| | X=0 Y=0 Z=154 | cX=-12 cY=-5 cZ=45 | 0.932 kg 2.05 lb |

With Silicone Tool Type B on (SG-b-H).

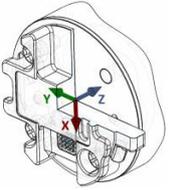
| Coordinate system | TCP [mm] | Center of Gravity [mm] | Weight |
|---|---------------------|--------------------------|---------------------|
|  | X=0 Y=0 Z=155 | cX=-12 cY=-5 cZ=46 | 0.937 kg 2.06 lb |

VG10

| Coordinate system | TCP [mm] | Center of Gravity [mm] | Weight |
|---|---------------------|------------------------|--------------------|
|  | X=0 Y=0 Z=105 | cX=15 cY=0 cZ=54 | 1.62 kg 3.57 lb |

* With arms folded back

VGC10

| Coordinate system | TCP [mm] | Center of Gravity [mm] | Weight |
|---|--------------------|-------------------------|---------------------|
|  | X=0 Y=0 Z=75 | cX=-1 cY=-1 cZ=37 | 0.814 kg 1.79 lb |

* With no attachments

10 Maintenance



WARNING:

An overall inspection of the OnRobot's End of Arm Tooling 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 the OnRobot's End of Arm Tooling and the robot. Failure to comply with this precaution can cause unexpected risks, resulting in severe injury.

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

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3FG15



WARNING:

Please check regularly the silicon fingertips since these parts can wear out.

If the fingertip is worn out , it can be ordered as spare part:

- Ø10 mm steel, PN 104160
- Ø13 mm steel, PN 104241
- Ø13.5 mm silicone, PN 104162
- Ø16.5 mm silicone, PN 104240

Gecko

Gecko Gripper pads are made from a precision cast silicone or polyurethane film with a gecko microstructure. Contact with sharp objects may damage the pad surface and impair function. The Gecko Gripper performance is maximized when the pads are clean and dry. The pads can collect dust, so it is best to use the Gecko Gripper in a clean environment and/or establish a routine cleaning schedule.

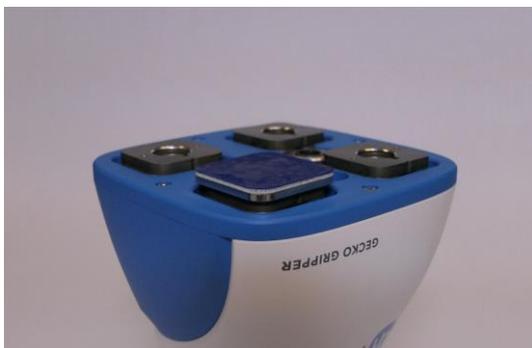
| Part | Description of Maintenance | Frequency |
|--------------|---------------------------------------|--|
| Pad Cleaning | Routine cleaning: Cleaning Station | Dependent on operating conditions. Guidelines are: See Cleaning Station User Guide |
| Pad Wear | Replacement due to wear | 150000 – 200000 for HIGH preload operation 200000 – 250000 for LOW preload operation |

Replacing the Gripper Pads

Gecko Gripper pads are designed to last for 200,000-300,000 cycles under typical operating conditions. If the pads do not seem to be gripping properly, even with routine cleaning (see table in the previous page), we recommend fully replacing the gripper pads.

To replace the gripper pads, use the provided pad removal tool.

Step 1: Move gripper pads to the maximum extruded setting such that the pads are maximally exposed/visible.

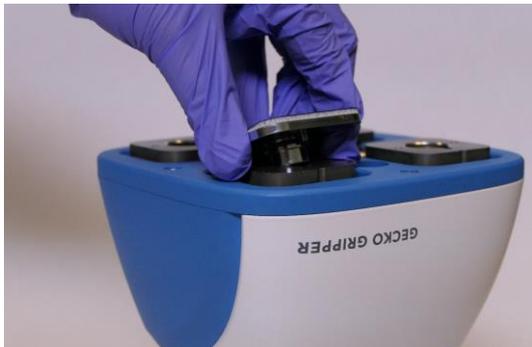


Maintenance

Step 2: Insert the edge of the pad removal tool between the shiny silver plate of the pads and the dull backing plate. Leverage the pad removal tool against the gripper housing to pry off the used pad. Repeat for all pads.



Step 3: To install new replacement pads, align the notch of the pad with the tab in the mounting hole. Push the pad into the gripper until there are no gaps between the shiny silver pad plate and backing plate.



RG2/6



WARNING:

An overall inspection of the PLd CAT3 Safety Buttons must be performed regularly and at least once every 6 months.

RG2-FT



WARNING:

Please clean the proximity sensor surface regularly with low pressure compressed air (<5 bar) from a 5 cm distance. For stronger contamination use isopropyl alcohol with a soft cotton swab to keep it clean.

SG

For the SG Base Part



WARNING:

Please, clean the SG Base Part regularly by using a cloth and a cleaning agent with a pH value between 6-8.

When cleaning the SG Base Part please keep it mounted on the robot to prevent water getting into the connector.

After cleaning, use a cloth and clean water, to rinse of any leftover cleaning agent.

Please ensure that the used cleaning agent does not contain chlorine as this can lead to corrosion.



WARNING:

On a regular basis, check that the silicone bellow has not come loose from neither the aluminum base nor the Smart Lock male. If the bellow is not sitting correctly, this can lead to water seeping into the SG base part.

For the SG Tools:

The silicone part and the smart lock female are dishwasher safe, at temperatures $\leq 80^{\circ}\text{C}$ (176°F).

Various cleaners can be used for cleaning the silicone part. Dish soap. Alcohol, regular ethanol, isopropanol and acetone works as well for cleaning.

Do not use concentrated acids and alkalis, since these can potentially damage the silicone, in particularly oxidizing acids such as sulfuric or nitric acid. It is recommended to use cleaning agent with a pH value between 2 and 13.



On a regular basis, please do a visual inspection of the smart-lock female and the ball spring. If needed clean it with a brush or cloth.

**NOTE:**

In the cleaning process please make sure the smart-lock female is placed upside down to prevent water being caught inside the ball spring.

VG10 / VGC10

The VG grippers are 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 work piece and the working environment. The VG grippers automatically de-dust the filters every time a grip is released. However, particles can eventually get stuck and build up inside the filter, lowering the VG grippers performance.

A filter service kit is available, which include both new filters and tools needed.

- Filter service kit for VG10, PN 100064
- Filter service kit for VGC10, PN 103757

Neither use nor power on the VG grippers without filters. Dust, hair and larger particles can get stuck in pump membranes and valve seats, causing permanent damage to the VG grippers.

**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 VG grippers must be performed regularly and at least once every 6 months.

Never power the VG grippers without filters or with filters mounted incorrectly. Failure to comply with this precaution can cause irreversible failure of pump or valves.

11 Warranties

11.1 Patents

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

11.2 Product Warranty

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

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

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

11.3 Disclaimer

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

12 Certifications

ZERTIFIKAT CERTIFICATE

Hiermit wird bescheinigt, dass die Firma / *This certifies that the company*

OnRobot A/S
 Teglværksvej 47H
 5220 Odense SØ
 Denmark

berechtigt ist, das unten genannte Produkt mit dem abgebildeten Zeichen zu kennzeichnen
is authorized to provide the product mentioned below with the mark as illustrated

| | |
|---|---|
| Fertigungsstätte: <i>Manufacturing plant:</i> | OnRobot A/S Teglværksvej 47H 5220 Odense SØ Denmark |
| Beschreibung des Produktes: <i>(Details s. Anlage 1)</i> <i>Description of product:</i> <i>(Details see Annex 1)</i> | Safety Gripper for collaborative robots RG2 v2 and RG6 v2 |
| Geprüft nach: <i>Tested in accordance with:</i> | EN ISO 13849-1:2015 Cat. 3, PL ,d' |

| | |
|---|---|
| Registrier-Nr. / <i>Registered No.</i> 44 780 18106002 Prüfbericht Nr. / <i>Test Report No.</i> 3523 2689 Aktenzeichen / <i>File reference</i> 8000489144 | Gültigkeit / <i>Validity</i> von / <i>from</i> 2019-06-04 bis / <i>until</i> 2024-06-03 |
|---|---|

Zertifizierungsstelle der
TÜV NORD CERT GmbH

Essen, 2019-06-04

TÜV NORD CERT GmbH Langemarckstraße 20 45141 Essen www.tuev-nord-cert.de technology@tuev-nord.de

Bitte beachten Sie auch die umseitigen Hinweise
Please also pay attention to the information stated overleaf



CERTIFICATE OF REGISTRATION

This is to certify that the management system of:

OnRobot A/S

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

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

has been registered by Intertek as conforming to the requirements of

ISO 9001:2015

The management system is applicable to:

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

Certificate Number:

0096721

Initial Certification Date:

26 November 2019

Date of Certification Decision:

26 November 2019

Issuing Date:

26 November 2019

Valid Until:

25 November 2022



Intertek



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

Carl-Johan von Plomgren
MD, Business Assurance Nordics

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



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 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.





Report Number: **B91115V1**
 EN 61000-6-2 and EN 55011 Test Report
Gecko Gripper
 Model: *GEN2*

GENERAL REPORT SUMMARY

This electromagnetic emission and immunity test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the “Test Procedures” section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced without the written permission of Compatible Electronics, unless done so in full.

This report must not be used to claim product certification, approval or endorsement by NVLAP, NIST or any agency of the federal government.

Device Tested: Gecko Gripper
 Model: GEN2
 S/N: RAPUNZEL

Product Description: The equipment under test is a robotic attachment that makes it possible to lift flat, smooth, and level surfaces.

Modifications: The EUT was not modified in order to comply with specifications.

Customer: OnRobot Los Angeles
 8928 Ellis Avenue
 Los Angeles, California 90034

Test Dates: October 4; November 12, 13, 14 and 15, 2019

Test Specifications covered by Accreditation:
 Emissions and Immunity Requirements European Standards:
 EN 61000-6-2 (2005), EN 55011 (2016) + A1 (2017); IEC 61000-3-2 (2014); and IEC 61000-3-3 (2013)



EN 61000-6-2 (2005) is a product family immunity standard that references the following specifications:

- EN 61000-4-2 (2009)
- EN 61000-4-3 (2006) + A1 (2008) + A2: 2010
- EN 61000-4-4 (2004) + A1 (2010)
- EN 61000-4-5 (2006)
- EN 61000-4-6 (2009)
- EN 61000-4-8 (2009)
- EN 61000-4-11 (2004)

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Newbury Park Division
 1050 Lawrence Drive
 Newbury Park, CA 91320
 (805) 480-4044

Lake Forest Division
 20621 Pascal Way
 Lake Forest, CA 92630
 (949) 587-0400



Attestation of Conformity no. 119-29901-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.

| | | | | | | | | | | | | | |
|---|---|--------------------|-------------------------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--|-------------------|--|-----------------------------|
| <p>Attestation holder</p> <p>OnRobot A/S Teglværksvej 47H 5220 Odense SØ Denmark.</p> | | | | | | | | | | | | | |
| <p>Product identification</p> <p>Compute box with Power Supply Unit (PSU) VER36U240-JA. Mountings: HEX-E QC V3 (101904), QC – R v2 (102037), Dual QC v2 (101788). Tools: VG10 v2 (101661), RG2 v2 (102012), RG2-FT v2 (102075), RG6 v2 (102021).</p> | | | | | | | | | | | | | |
| <p>Manufacturer</p> <p>On Robot A/S</p> | | | | | | | | | | | | | |
| <p>Technical documentation</p> <p>Assessment no. 119-29901-A1</p> | | | | | | | | | | | | | |
| <p>Standards list no. 1:</p> <table border="0"> <tr> <td>IEC 61000-3-2:2014</td> <td>EMC Directive 2014/30/EU, Article 6</td> </tr> <tr> <td>IEC 61000-3-3:2013</td> <td>EN 61000-3-2:2014</td> </tr> <tr> <td>IEC 61000-6-2:2016</td> <td>EN 61000-3-3:2013</td> </tr> <tr> <td>IEC 61000-6-4:2018</td> <td>EN 61000-6-2:2005</td> </tr> <tr> <td></td> <td>EN 61000-6-2:2019</td> </tr> <tr> <td></td> <td>EN 61000-6-4:2007 + A1:2011</td> </tr> </table> <p>Standard list no. 2: (applicable specifically to RG2 v2 (102012) and RG6 v2 (102021))</p> <p>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 61000-3-2:2014 | EMC Directive 2014/30/EU, Article 6 | IEC 61000-3-3:2013 | EN 61000-3-2:2014 | IEC 61000-6-2:2016 | EN 61000-3-3:2013 | IEC 61000-6-4:2018 | EN 61000-6-2:2005 | | EN 61000-6-2:2019 | | EN 61000-6-4:2007 + A1:2011 |
| IEC 61000-3-2:2014 | EMC Directive 2014/30/EU, Article 6 | | | | | | | | | | | | |
| IEC 61000-3-3:2013 | EN 61000-3-2:2014 | | | | | | | | | | | | |
| IEC 61000-6-2:2016 | EN 61000-3-3:2013 | | | | | | | | | | | | |
| IEC 61000-6-4:2018 | EN 61000-6-2:2005 | | | | | | | | | | | | |
| | EN 61000-6-2:2019 | | | | | | | | | | | | |
| | EN 61000-6-4:2007 + A1:2011 | | | | | | | | | | | | |
| <p>Signature</p> <p>Knud A. Baltsen</p> | <p>Digitally signed by Knud A. Baltsen Date: 2019.11.15 19:38:04 +01'00'</p> | | | | | | | | | | | | |
| <p>Signed by: Knud A. Baltsen, Senior Specialist, Product Compliance</p> | | | | | | | | | | | | | |



Attestation of Conformity no. 118-33022-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.

| | | | |
|---|--|---|--|
| <p>Attestation holder</p> <p>OnRobot A/S Teglværksvej 47H 5220 Odense SØ Denmark</p> | | | |
| <p>Product identification</p> <p>Gripper RG2 2.0</p> | | | |
| <p>Manufacturer</p> <p>OnRobot A/S</p> | | | |
| <p>Technical documentation</p> <p>FORCE Technology Test Report 117-29737, dated 01 September 2017 FORCE Technology Assessment Sheet 1668, dated 17 October 2017 FORCE Technology Test Report 118-33022-2 Rev. 1, dated 06 February 2019 FORCE Technology Assessment 118-33022-A1, dated 21 February 2019</p> | | | |
| <p>Standards/Normative documents</p> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top;"> <p>IEC 61000-6-2:2005 IEC 61000-6-4:2006 + A1:2010 IEC 61326-3-1:2017, Industrial locations, SIL 2 FCC Part 15B, Class A</p> </td> <td style="vertical-align: top;"> <p>EMC Directive 2014/30/EU, Article 6 EN 61000-6-2:2005 + AC:2005 EN 61000-6-4:2007 + A1:2011 EN 61326-3-1:2017, Industrial locations, SIL 2</p> </td> </tr> </table> <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> | | <p>IEC 61000-6-2:2005 IEC 61000-6-4:2006 + A1:2010 IEC 61326-3-1:2017, Industrial locations, SIL 2 FCC Part 15B, Class A</p> | <p>EMC Directive 2014/30/EU, Article 6 EN 61000-6-2:2005 + AC:2005 EN 61000-6-4:2007 + A1:2011 EN 61326-3-1:2017, Industrial locations, SIL 2</p> |
| <p>IEC 61000-6-2:2005 IEC 61000-6-4:2006 + A1:2010 IEC 61326-3-1:2017, Industrial locations, SIL 2 FCC Part 15B, Class A</p> | <p>EMC Directive 2014/30/EU, Article 6 EN 61000-6-2:2005 + AC:2005 EN 61000-6-4:2007 + A1:2011 EN 61326-3-1:2017, Industrial locations, SIL 2</p> | | |
| <p>Signature</p> <div style="border: 1px solid black; background-color: #e0e0ff; padding: 10px; display: inline-block;"> <p style="text-align: center;">Knud A. Baltzen 2019-02-21</p> <p style="font-size: small;">Digitally signed by Knud A. Baltzen kab@force.dk Senior Specialist</p> </div> <p>Signed by: Knud A. Baltzen, Senior Specialist, Product Compliance</p> | | | |



Attestation of Conformity no. 118-33022-A2

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.

| | | | |
|---|--|---|--|
| <p>Attestation holder</p> <p>OnRobot A/S Teglværksvej 47H 5220 Odense SØ Denmark</p> | | | |
| <p>Product identification</p> <p>Gripper RG6 2.0</p> | | | |
| <p>Manufacturer</p> <p>OnRobot A/S</p> | | | |
| <p>Technical documentation</p> <p>FORCE Technology Test Report 117-29737, dated 01 September 2017 FORCE Technology Assessment Sheet 1668, dated 17 October 2017 FORCE Technology Test Report 118-33022-2 Rev. 1, dated 06 February 2019 FORCE Technology Assessment 118-33022-A1, dated 21 February 2019</p> | | | |
| <p>Standards/Normative documents</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>IEC 61000-6-2:2005 IEC 61000-6-4:2006 + A1:2010 IEC 61326-3-1:2017, Industrial locations, SIL 2 FCC Part 15B, Class A</p> </td> <td style="width: 50%; vertical-align: top;"> <p>EMC Directive 2014/30/EU, Article 6 EN 61000-6-2:2005 + AC:2005 EN 61000-6-4:2007 + A1:2011 EN 61326-3-1:2017, Industrial locations, SIL 2</p> </td> </tr> </table> <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> | | <p>IEC 61000-6-2:2005 IEC 61000-6-4:2006 + A1:2010 IEC 61326-3-1:2017, Industrial locations, SIL 2 FCC Part 15B, Class A</p> | <p>EMC Directive 2014/30/EU, Article 6 EN 61000-6-2:2005 + AC:2005 EN 61000-6-4:2007 + A1:2011 EN 61326-3-1:2017, Industrial locations, SIL 2</p> |
| <p>IEC 61000-6-2:2005 IEC 61000-6-4:2006 + A1:2010 IEC 61326-3-1:2017, Industrial locations, SIL 2 FCC Part 15B, Class A</p> | <p>EMC Directive 2014/30/EU, Article 6 EN 61000-6-2:2005 + AC:2005 EN 61000-6-4:2007 + A1:2011 EN 61326-3-1:2017, Industrial locations, SIL 2</p> | | |
| <p>Signature</p> | <p>Knud A. Baltzen 2019-02-21</p> <p>Digitally signed by Knud A. Baltzen kab@force.dk Senior Specialist</p> | | |
| <p>Signed by: Knud A. Baltzen, Senior Specialist, Product Compliance</p> | | | |



Attestation of Conformity no. 119-31690-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.

| | | | | | | | | | | | | | |
|--|-------------------------------------|--------------------|-------------------------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--|-------------------|--|-----------------------------|
| <p>Attestation holder</p> <p>OnRobot A/S Teglværksvej 47H 5220 Odense SØ DENMARK</p> | | | | | | | | | | | | | |
| <p>Product identification</p> <p>Compute box with Power Supply Unit (PSU) VER36U240-JA. Mounting: Quick Changer HEX-E QC V3 (101904). Robot Tool: Soft Gripper (103546).</p> | | | | | | | | | | | | | |
| <p>Manufacturer</p> <p>OnRobot A/S</p> | | | | | | | | | | | | | |
| <p>Technical documentation</p> <p>Test report. 119-31690-1</p> | | | | | | | | | | | | | |
| <p>Standards/Normative documents</p> <table border="0"> <tr> <td>IEC 61000-3-2:2014</td> <td>EMC Directive 2014/30/EU, Article 6</td> </tr> <tr> <td>IEC 61000-3-3:2013</td> <td>EN 61000-3-2:2014</td> </tr> <tr> <td>IEC 61000-6-2:2016</td> <td>EN 61000-3-3:2013</td> </tr> <tr> <td>IEC 61000-6-4:2018</td> <td>EN 61000-6-2:2005</td> </tr> <tr> <td></td> <td>EN 61000-6-2:2019</td> </tr> <tr> <td></td> <td>EN 61000-6-4:2007 + A1:2011</td> </tr> </table> <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 61000-3-2:2014 | EMC Directive 2014/30/EU, Article 6 | IEC 61000-3-3:2013 | EN 61000-3-2:2014 | IEC 61000-6-2:2016 | EN 61000-3-3:2013 | IEC 61000-6-4:2018 | EN 61000-6-2:2005 | | EN 61000-6-2:2019 | | EN 61000-6-4:2007 + A1:2011 |
| IEC 61000-3-2:2014 | EMC Directive 2014/30/EU, Article 6 | | | | | | | | | | | | |
| IEC 61000-3-3:2013 | EN 61000-3-2:2014 | | | | | | | | | | | | |
| IEC 61000-6-2:2016 | EN 61000-3-3:2013 | | | | | | | | | | | | |
| IEC 61000-6-4:2018 | EN 61000-6-2:2005 | | | | | | | | | | | | |
| | EN 61000-6-2:2019 | | | | | | | | | | | | |
| | EN 61000-6-4:2007 + A1:2011 | | | | | | | | | | | | |
| <p>Signature</p> <p style="text-align: center;">Johan Weisbjerg 2020-01-24</p> <p style="text-align: center;">Digitally signed by Johan Weisbjerg jow@force.dk Technician</p> <p>Signed by: Johan Weisbjerg, Specialist, Product Compliance</p> | | | | | | | | | | | | | |



Attestation of Conformity no. 120-21521-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.

| | | | | | | | | | | | |
|--|---|--------------------|-------------------------------------|--------------------|-------------------|--------------------|-------------------|------------------------------|------------------------------|--|---------------------------|
| <p>Attestation holder</p> <p>OnRobot A/S Teglværksvej 47H 5220 Odense SØ Denmark</p> | | | | | | | | | | | |
| <p>Product identification</p> <p>Robot tool: Three finger gripping tool 3FG15 (103666).</p> | | | | | | | | | | | |
| <p>Manufacturer</p> <p>OnRobot A/S</p> | | | | | | | | | | | |
| <p>Technical documentation</p> <p>FORCE Technology test report 120-21521-1.</p> | | | | | | | | | | | |
| <p>Standards/Normative documents</p> <table border="0"> <tr> <td>IEC 61000-3-2:2014</td> <td>EMC Directive 2014/30/EU, Article 6</td> </tr> <tr> <td>IEC 61000-3-3:2013</td> <td>EN 61000-3-2:2014</td> </tr> <tr> <td>IEC 61000-6-2:2016</td> <td>EN 61000-3-3:2013</td> </tr> <tr> <td>IEC 61000-6-4:2006/AMD1:2010</td> <td>EN 61000-6-2:2005/Corr.:2005</td> </tr> <tr> <td></td> <td>EN 61000-6-4:2007/A1:2011</td> </tr> </table> | | IEC 61000-3-2:2014 | EMC Directive 2014/30/EU, Article 6 | IEC 61000-3-3:2013 | EN 61000-3-2:2014 | IEC 61000-6-2:2016 | EN 61000-3-3:2013 | IEC 61000-6-4:2006/AMD1:2010 | EN 61000-6-2:2005/Corr.:2005 | | EN 61000-6-4:2007/A1:2011 |
| IEC 61000-3-2:2014 | EMC Directive 2014/30/EU, Article 6 | | | | | | | | | | |
| IEC 61000-3-3:2013 | EN 61000-3-2:2014 | | | | | | | | | | |
| IEC 61000-6-2:2016 | EN 61000-3-3:2013 | | | | | | | | | | |
| IEC 61000-6-4:2006/AMD1:2010 | EN 61000-6-2:2005/Corr.:2005 | | | | | | | | | | |
| | EN 61000-6-4:2007/A1:2011 | | | | | | | | | | |
| <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> | | | | | | | | | | | |
| <p>Signature</p> |  <p>Digitally signed by Knud A. Baltsen Date: 2020.03.30 19:48:21 +02'00'</p> | | | | | | | | | | |
| <p>Signed by: Knud A. Baltsen, Senior Specialist, Product Compliance</p> | | | | | | | | | | | |

SG-x-H

DECLARATION OF CONFORMITY

According to Regulation (EC/EU) No.1935/2004 Article 3, it is required that food contact articles “*must be sufficient inert to preclude substances from being transferred to food in quantities large enough to endanger human health or to bring about an unacceptable change in the composition of the food or a deterioration in its organoleptic properties*”.

This document stands to certify that all OnRobot SG-x-H materials, intended for food contact complies with:

1. Europe:

Regulation (EC/EU) No. 1935/2004 and national provisions (Article 6). The materials of SG Tools are suitable for food contact, materials and articles under article 3 of the before mentioned egulation. Compliance with the, requirements of Regulation (EC/EU) No.1935/2004 for the food contact material or article, concerning any limitations in particular max. use limits or limits on migration or extraction, the effect on taste and smell of the food and the suitability of the article for the specific use must be in compliance with the recommendations of the BfR.

See results next page.

2. USA:

FDA 21 CFR 177.2600 “*Rubber articles intended for repeated use in contact with food*”.

Tested and approved for use on non-fatty food objects.

See results next page.

The above product is also produced according to EC regulation 2023/2006 “*Good manufacturing practice for materials and articles intended to come into contact with food*” and is subject to control by the Danish food and health authorities.

To the best knowledge of the manufacturer, that the information presented in this certificate, is correct as of date of the declaration. It is the responsibility of the end-user to ensure that the status of the regulation is still in effect at the date of use.

Odense, April 6th, 2020

Group Management



Vilmos
CTO

Beskid

Results

The materials and color additive have been tested for extraction and migration limits by an independent testing organization (Eurofins Product Testing A/S. Accreditation number 522)

Sensory Analysis:

| Parameter: | Food Simulant: | Median Grade: | Limit Value* |
|------------|----------------|--|--------------|
| Odour | Water | 1.5 (Just recognizable to slight deviation, chemical) | 2.5 |
| Taste | Water | 2.5 (Slight to intense deviation, chemical and flavoured) | 2.5 |

* From 61. Statement of BfR, Bundesgesundheitsbl. 46, 2003, 362-5.

Analysis - BfR recommendation XV on silicone:

| Parameter: | Result: | Limit value ** |
|--|---------|----------------|
| Extractable components in water | < 0.2 % | 0.5 % |
| Extractable components in 3% acetic acid | < 0.3 % | 0.5 % |
| Extractable components in 10% ethanol | < 0.2 % | 0.5 % |
| Volatile Compounds | < 0.1 % | 0.5 % |
| Platinum | 5 mg/kg | 50 mg/kg |

** According to BfR recommendation XV on silicone

Extraction Analysis:

| Parameter: | Single determinations [mg/inch ²] | Limit Value[mg/inch ²] |
|--|---|------------------------------------|
| Water-extracted residue after 7 hours | 0.19 | < 20 |
| Water-extracted residue after +2 hours | < 0.1 | < 1 |

SG-x-S

DECLARATION OF CONFORMITY

According to Regulation (EC/EU) No.1935/2004 Article 3, it is required that food contact articles “*must be sufficient inert to preclude substances from being transferred to food in quantities large enough to endanger human health or to bring about an unacceptable change in the composition of the food or a deterioration in its organoleptic properties*”.

This document stands to certify that all OnRobot SG-x-S materials, intended for food contact complies with:

1. Europe:

Regulation (EC/EU) No. 1935/2004 and national provisions (Article 6). The materials of SG Tools are suitable for food contact, materials and articles under article 3 of the before mentioned egulation. Compliance with the, requirements of Regulation (EC/EU) No.1935/2004 for the food contact material or article, concerning any limitations in particular max. use limits or limits on migration or extraction, the effect on taste and smell of the food and the suitability of the article for the specific use must be in compliance with the recommendations of the BfR.

See results next page.

2. USA:

FDA 21 CFR 177.2600 “*Rubber articles intended for repeated use in contact with food*”.

Tested and approved for use on non-fatty food objects.

See results next page.

The above product is also produced according to EC regulation 2023/2006 “*Good manufacturing practice for materials and articles intended to come into contact with food*” and is subject to control by the Danish food and health authorities.

To the best knowledge of the manufacturer, that the information presented in this certificate, is correct as of date of the declaration. It is the responsibility of the end-user to ensure that the status of the regulation is still in effect at the date of use.

Odense, April 6th, 2020

Group Management



Vilmos
CTO

Beskid

Results

The materials and color additive have been tested for extraction and migration limits by an independent testing organization (Eurofins Product Testing A/S. Accreditation number 522)

For the Hard part

Sensory Analysis:

| Parameter: | Food Simulant: | Median Grade: | Limit Value* |
|------------|----------------|--|--------------|
| Odour | Water | 1.5 (Just recognizable to slight deviation, chemical) | 2.5 |
| Taste | Water | 2.5 (Slight to intense deviation, chemical and flavoured) | 2.5 |

* From 61. Statement of BfR, Bundesgesundheitsbl. 46, 2003, 362-5.

Analysis - BfR recommendation XV on silicone:

| Parameter: | Result: | Limit value ** |
|--|---------|----------------|
| Extractable components in water | < 0.2 % | 0.5 % |
| Extractable components in 3% acetic acid | < 0.3 % | 0.5 % |
| Extractable components in 10% ethanol | < 0.2 % | 0.5 % |
| Volatile Compounds | < 0.1 % | 0.5 % |
| Platinum | 5 mg/kg | 50 mg/kg |

** According to BfR recommendation XV on silicone

Extraction Analysis:

| Parameter: | Single determinations [mg/inch ²] | Limit Value[mg/inch ²] |
|--|---|------------------------------------|
| Water-extracted residue after 7 hours | 0.19 | < 20 |
| Water-extracted residue after +2 hours | < 0.1 | < 1 |

For the Soft part

Sensory Analysis:

| Parameter: | Food Simulant: | Median Grade: | Limit Value* |
|------------|----------------|----------------------------------|--------------|
| Odour | Water | 1 (Just noticeable deviation) | 2.5 |
| Taste | Water | 1 (Just noticeable deviation) | 2.5 |

* From 61. Statement of BfR, Bundesgesundheitsbl. 46, 2003, 362-5.

Analysis - BfR recommendation XV on silicone:

| Parameter: | Result: | Limit value ** |
|--|----------|----------------|
| Extractable components in water | < 0.2 % | 0.5 % |
| Extractable components in 3% acetic acid | < 0.3 % | 0.5 % |
| Extractable components in 10% ethanol | < 0.2 % | 0.5 % |
| Volatile Compounds | < 0.1 % | 0.5 % |
| Platinum | 10 mg/kg | 50 mg/kg |

** According to BfR recommendation XV on silicone

Extraction Analysis:

| Parameter: | Single determinations [mg/inch ²] | Limit Value[mg/inch ²] |
|--|---|------------------------------------|
| Water-extracted residue after 7 hours | 1.5 | < 20 |
| Water-extracted residue after +2 hours | < 0.1 | < 1 |

12.1 Declaration of Incorporation

| | |
|---|------------|
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3FG15

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: 3FG15
 Generation: V1
 Serial: 1000000000-1009999999

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

The product is prepared for compliance with all essential requirements of Directive 2006/42/EC under the correct incorporation conditions, see instructions and guidance in this manual. 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, February 14th, 2020

Group Management



Vilmos Beskid
 CTO

Gecko

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: | Gecko Gripper |
| Generation: | V2 |
| 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. 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, December 16th, 2019

Group Management



Vilmos Beskid
 CTO

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. 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, December 16th, 2019

Group Management



Vilmos Beskid
 CTO

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. 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, December 16th, 2019

Group Management



Vilmos Beskid
CTO

RG2-FT

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: RG2-FT
 Generation: V2
 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. 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, December 16th, 2019

Group Management



Vilmos Beskid
 CTO

RG2

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: | RG2 |
| Generation: | V2 |
| 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. 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, December 16th, 2019

Group Management



Vilmos Beskid
 CTO

RG6

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: RG6
 Generation: V2
 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. Compliance with all essential requirements of Directive 2006/42/EC relies on the specific robot installation and the final risk assessment.

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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, December 16th, 2019

Group Management



Vilmos Beskid
 CTO

SG

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: | SG |
| Generation: | V1 |
| Serial: | 1000000000-1009999999 |

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

The product is prepared for compliance with all essential requirements of Directive 2006/42/EC under the correct incorporation conditions, see instructions and guidance in this manual. 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.

Odense, April 6th, 2020

Group Management



Vilmos Beskid
 CTO

VG10

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: VG10
 Generation: V2
 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. Compliance with all essential requirements of Directive 2006/42/EC relies on the specific robot installation and the final risk assessment.

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- 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, December 16th, 2019

Group Management



Vilmos Beskid
 CTO

VGC10

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: VGC10
 Generation: V1
 Serial: 1000000000-1009999999

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

The product is prepared for compliance with all essential requirements of Directive 2006/42/EC under the correct incorporation conditions, see instructions and guidance in this manual. Compliance with all essential requirements of Directive 2006/42/EC relies on the specific robot installation and the final risk assessment.

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

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

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

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

Budapest, December 16th, 2019

Group Management



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