USER MANUAL

FOR **KAWASAKI** ROBOTS

ORIGINAL INSTRUCTION (EN)

v1.02

Contents

1 Introduction

1.1 Important Safety Notice

DANGER:

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

1.2 Scope of the Manual

The manual covers the following OnRobot products and its components:

Grippers	Version
Gecko Gripper	v2
RG2	v2
RG2-FT	v2
RG6	v2
VG10	v2

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.

1.3 Naming convention

In the user manual Gecko Gripper is called Gecko only.

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:

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 use 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:

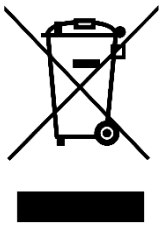
- Objects flying from OnRobot tools due to loss of grip
- Objects falling down from OnRobot tools due to loss of grip
- Injuries due to collisions between humans and workpieces, OnRobot tools tooling, robot or other obstacles
- Consequences due to loosen of bolts
- Consequences if OnRobot tools cable 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

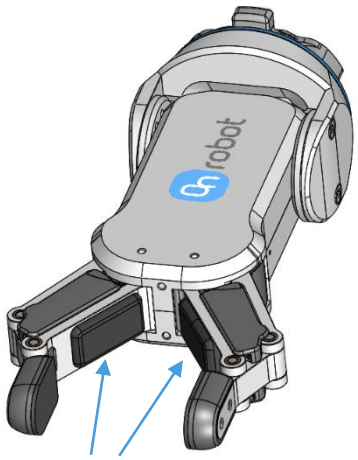
RG2
RG6

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	
OnRobot EtherNet/IP *required in the robot: EtherNet/IP module*	**OnRobot WebLogic** *required in the robot: digital I/O module*

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.).

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.

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.

The communication is implemented via EtherNet/IP Assembly Instances that are created for each product or product combination (e.g.: RG2+VG10). The instances are containing a set of words (16-bit data) that can be used to control/monitor the grippers/sensor (e.g.: the 4th word of the Assembly Instance 104 is the Actual Width for the RG2/6).

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

4 Installation

4.1 Overview

For a successful installation the following steps will be required:

- Mount the components
- Wire the cables
- Setup the software

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

4.2 Mounting

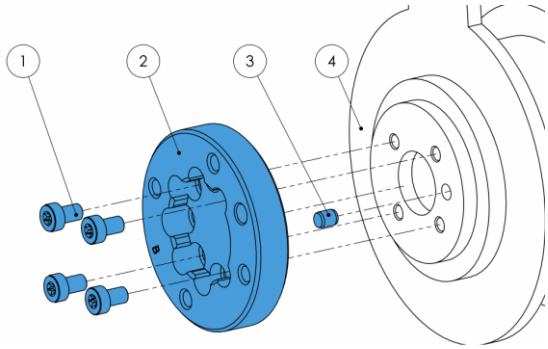
Required steps:

- 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 RS003N, RS005L, RS005N models

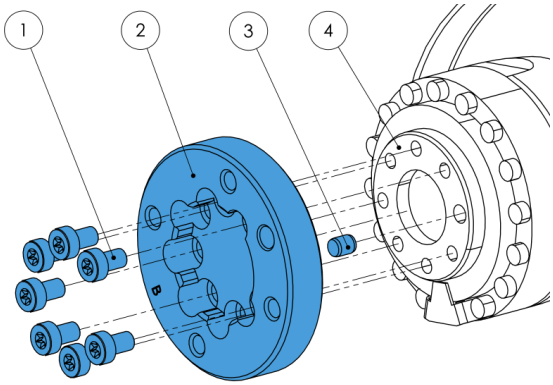


Adapter B (4 screws)

1	M5x8 screws (ISO14580 A4-70)
2	OnRobot adapter flange (ISO 9409-1-50-4-M6)
3	Dowel pin Ø5x6 (ISO2338 h8)
4	Robot tool flange (ISO 9409-1-31.5-4-M5)

Use 5 Nm tightening torque.

For RS007L, RS007N



Adapter B (7 screws)

1 M5x8 screws (ISO14580 A4-70)

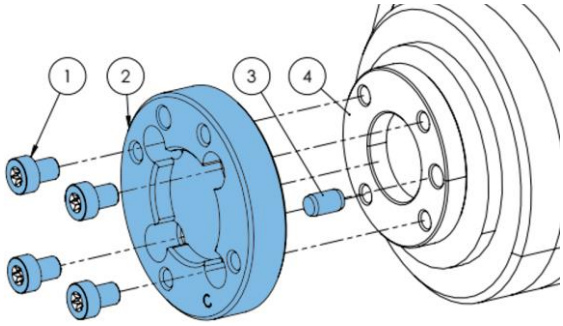
2 OnRobot adapter flange (ISO 9409-1-50-4-M6)

3 Dowel pin Ø5x6 (ISO2338 h8)

4 Robot tool flange (ISO 9409-1-31.5-4-M5)

Use 5 Nm tightening torque.

For RS006L, RS010N models



Adapter C

1 M6x8 screws (ISO14580 A4-70)

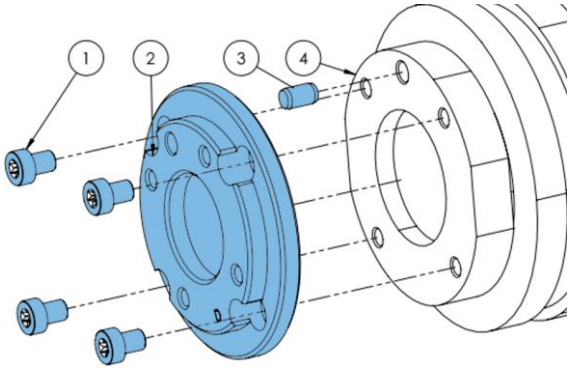
2 OnRobot adapter flange (ISO 9409-1-50-4-M6)

3 Dowel pin Ø6x10 (ISO2338 h8)

4 Robot tool flange (ISO 9409-1-40-4-M6)

Use 10 Nm tightening torque.

For RS0010L, RS020N, RS015X models



Adapter D

1 M6x8 screws (ISO14580 A4-70)

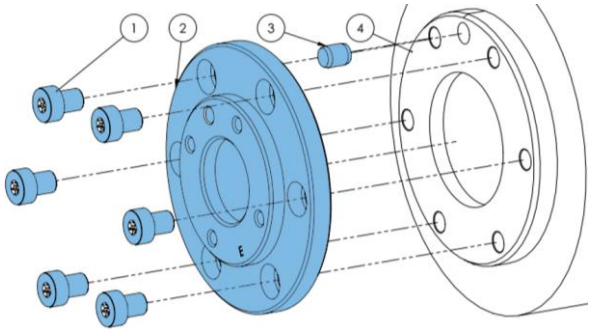
2 OnRobot adapter flange (ISO 9409-1-50-4-M6)

3 Dowel pin Ø6x10 (ISO2338 h8)

4 Robot tool flange (ISO 9409-1-63-4-M6)

Use 10 Nm tightening torque.

For RS030N, RS050N, RS080N models



Adapter E

1 M8x10 screws (ISO14580 A4-70)

2 OnRobot adapter flange (ISO 9409-1-50-4-M6)

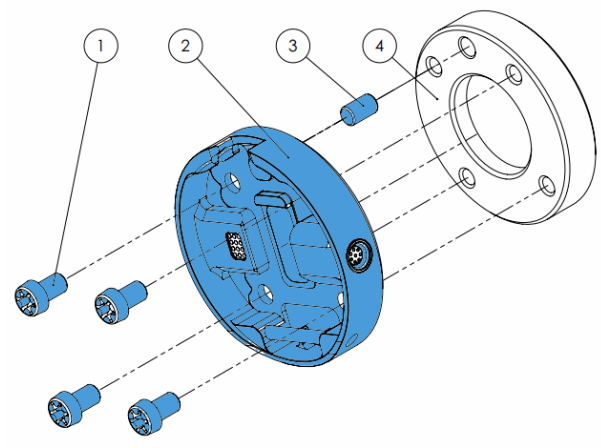
3 Dowel pin Ø8x10 (ISO2338 h8)

4 Robot tool flange (ISO 9409-1-80-6-M8)

Use 25 Nm tightening torque.

4.2.2 Quick Changer options

Quick Changer - Robot Side



Quick Changer - Robot Side

1 M6x8mm (ISO14580 8.8)

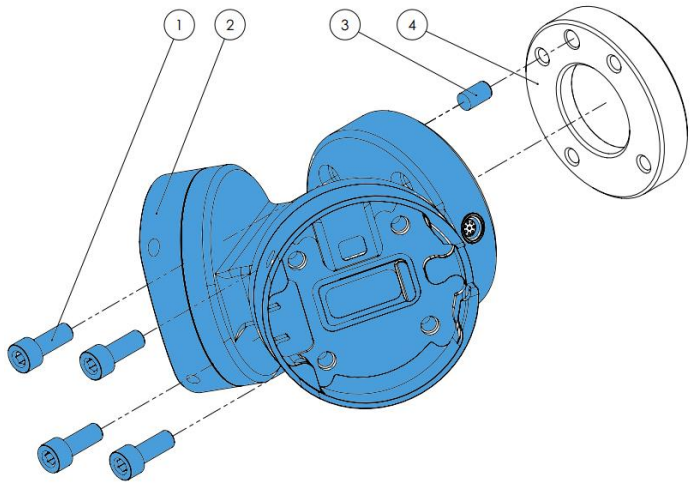
2 Quick Changer (ISO 9409-1-50-4-M6)

3 Dowel pin Ø6x10 (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)

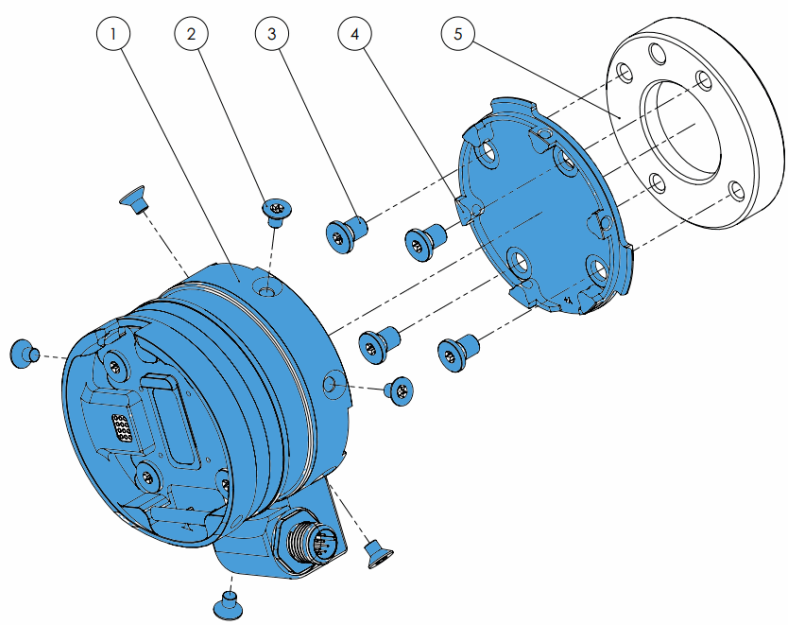
2 Dual Quick Changer

3 Dowel pin Ø6x10 (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

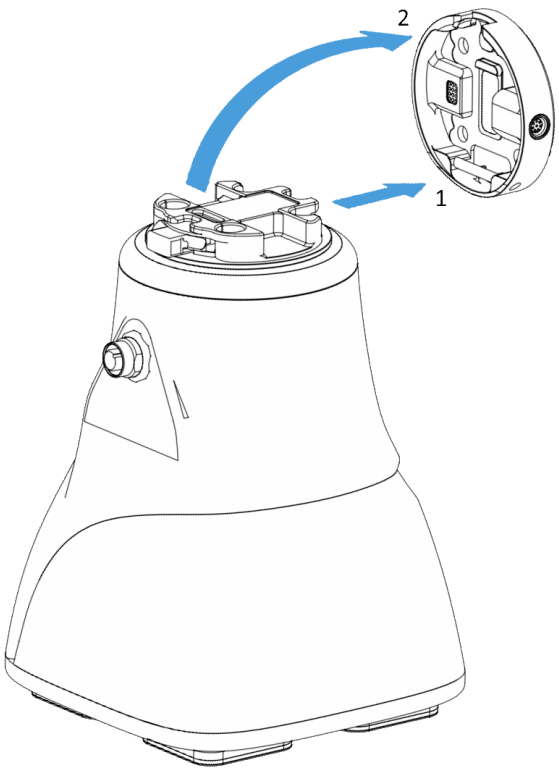
1	HEX-E/H QC sensor
2	M4x6mm (ISO14581 A4-70)
3	M6x8mm (NCN20146 A4-70)
4	HEX-E/H QC adapter
5	Adapter/ Robot tool flange (ISO 9409-1-50-4-M6)

Use 1.5 Nm tightening torque. for M4x6mm

Use 10 Nm tightening torque. for M6x8mm

4.2.3 Tools

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:

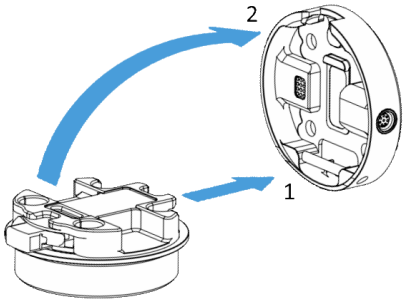
Flip the tool until it is fully mated, and you hear a clicking sound.

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.

Quick Changer - Tool side



Step 1:

Move the tool close to the Quick Changer as illustrated.

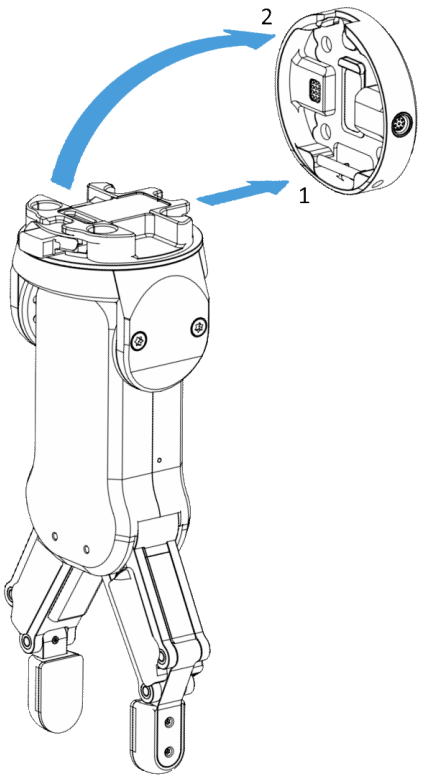
The hook mechanism (rod and hook tongue) will keep the lower part locked once mounted.

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.

RG2



Step 1:

Move the tool close to the Quick Changer as illustrated.

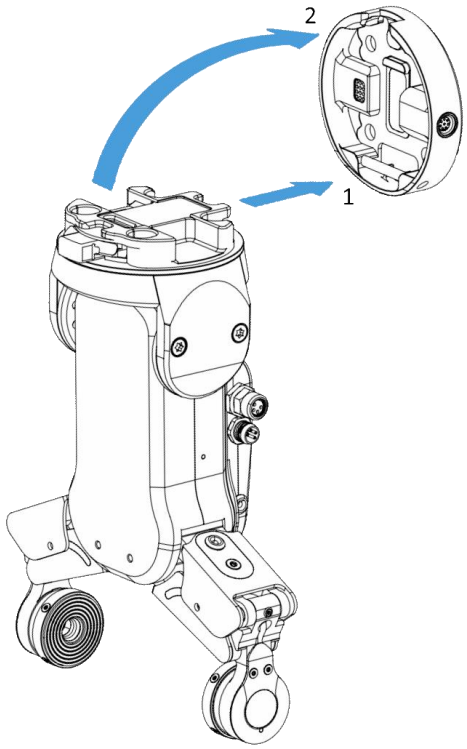
The hook mechanism (rod and hook tongue) will keep the lower part locked once mounted.

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.

RG2-FT



Step 1:

Move the tool close to the Quick Changer as illustrated.

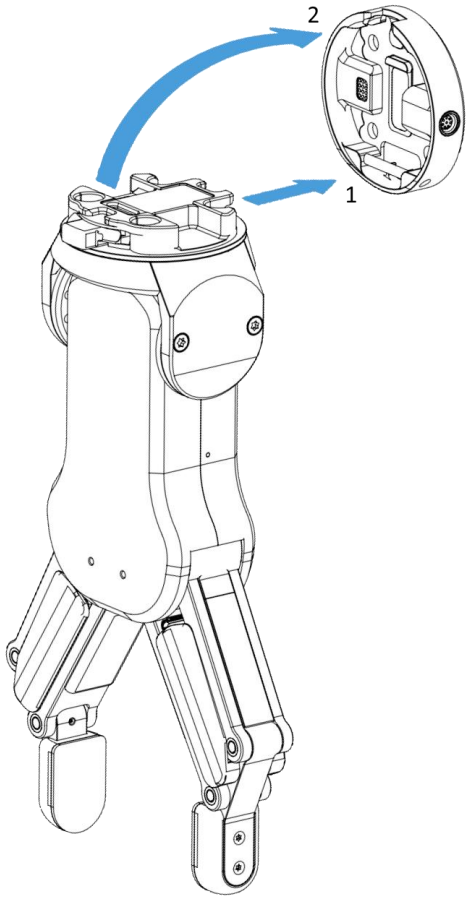
The hook mechanism (rod and hook tongue) will keep the lower part locked once mounted.

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.

RG6



Step 1:

Move the tool close to the Quick Changer as illustrated.

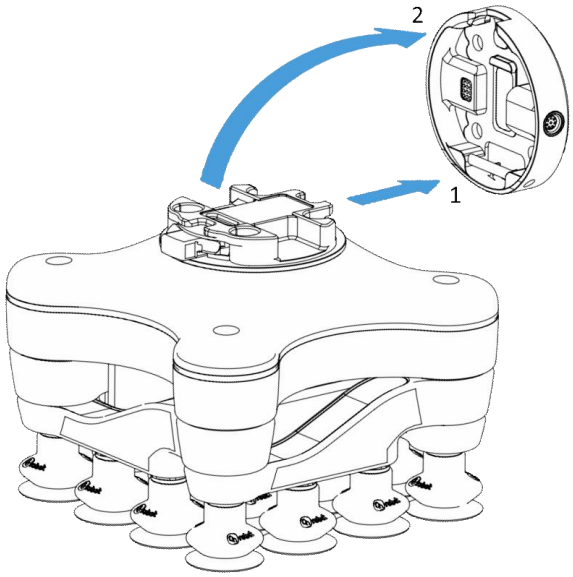
The hook mechanism (rod and hook tongue) will keep the lower part locked once mounted.

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.

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:

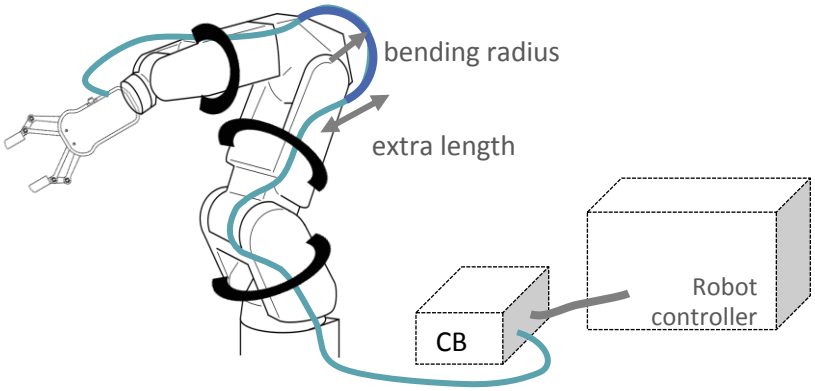
Flip the tool until it is fully mated, and you hear a clicking sound.

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

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

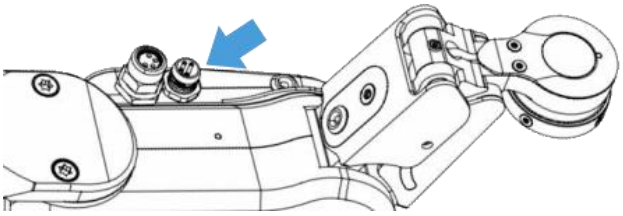


4.3.1 Tool data cable

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:

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



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)

Then, connect the other end 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.

4.3.2 Ethernet cable

Connect one end of the supplied Ethernet (UTP) cable to the robot controller's Ethernet (LAN) port as shown below.

Kawasaki E Controller

Use Port 2 (right one).

Kawasaki F Controller

Use XLAN Port #2.

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).

4.3.3 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

There are three steps required to set up the OnRobot device for operation with your robot:

1. Set up the Compute Box as a Scanner.
2. Set up the robot as an Adapter.
3. Upload the OnRobot functions to the robot.

NOTE:

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

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

NOTE:

Kawasaki controllers do not support explicit messaging.

4.4.2 Configure the Compute Box as a Scanner

NOTE:

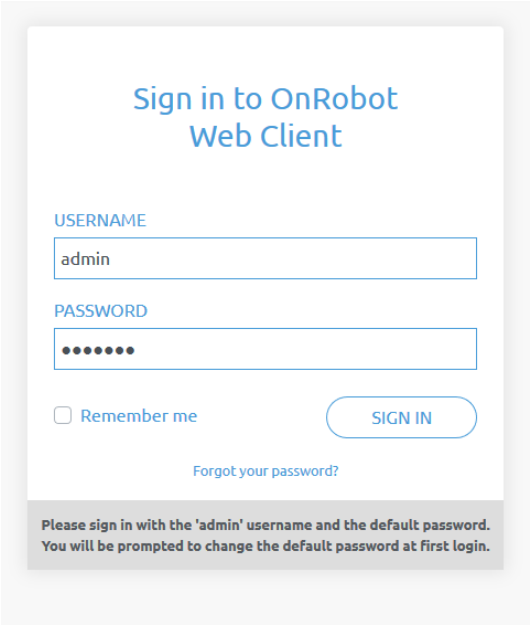
Temporarily the Compute Box will be needed to be connected to your computer.

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:

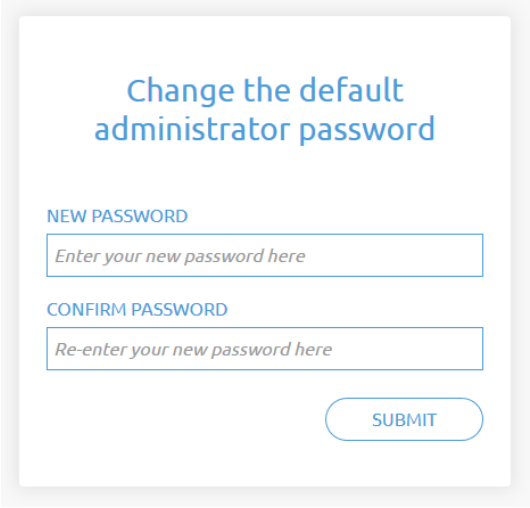


The factory default administrator login is:

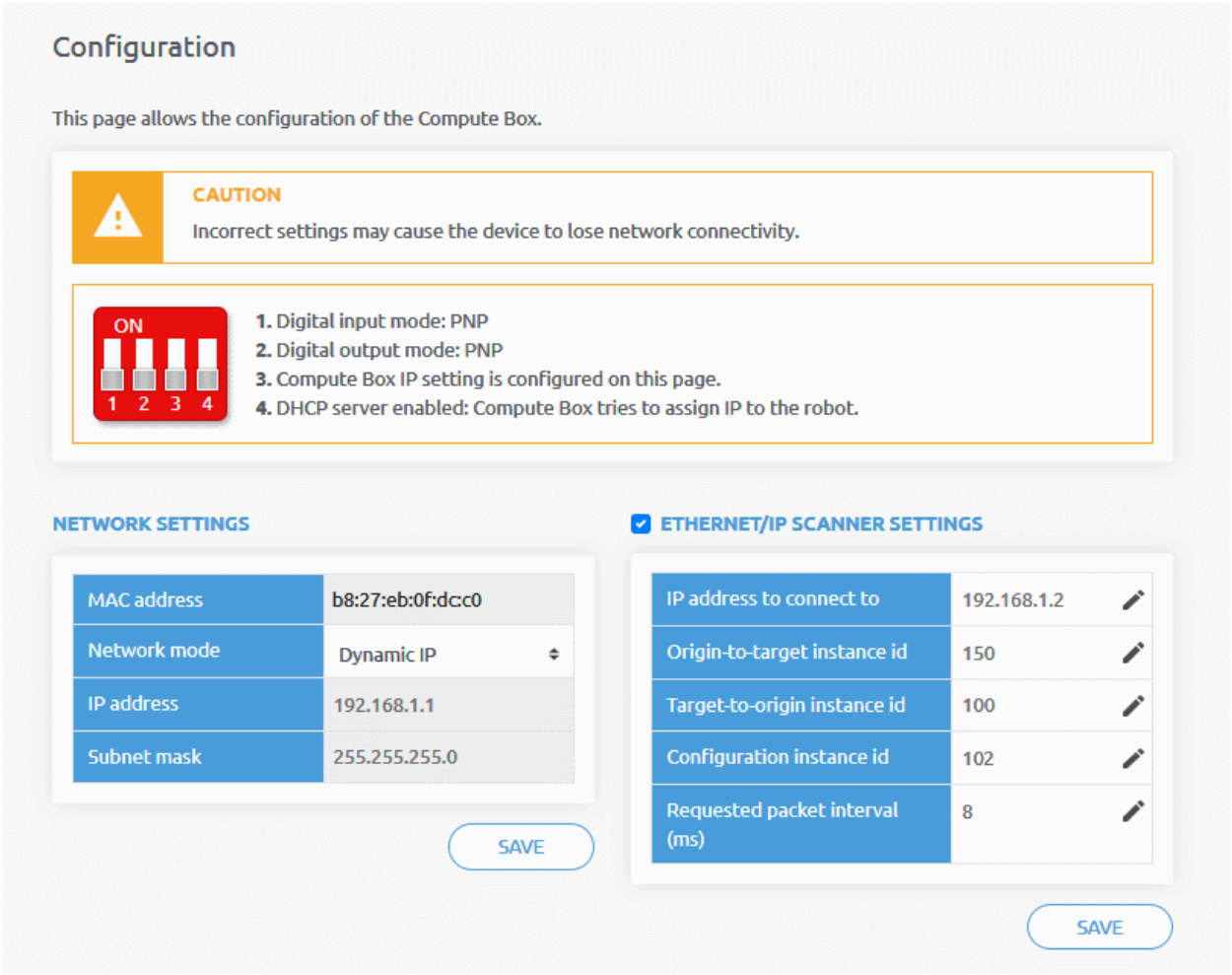
Username: admin

Password: OnRobot

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



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



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 192.168.1.2)*
- **Origin-to-target instance id**: 150
- **Target-to-origin instance id**: 100
- **Configuration instance id**: 102
- **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.

4.4.3 Configure the Robot as an Adapter

Refer to **Kawasaki DE General Fieldbus Manual** for detailed instructions.

Ensure that the Fieldbus software option is enabled on the controller.

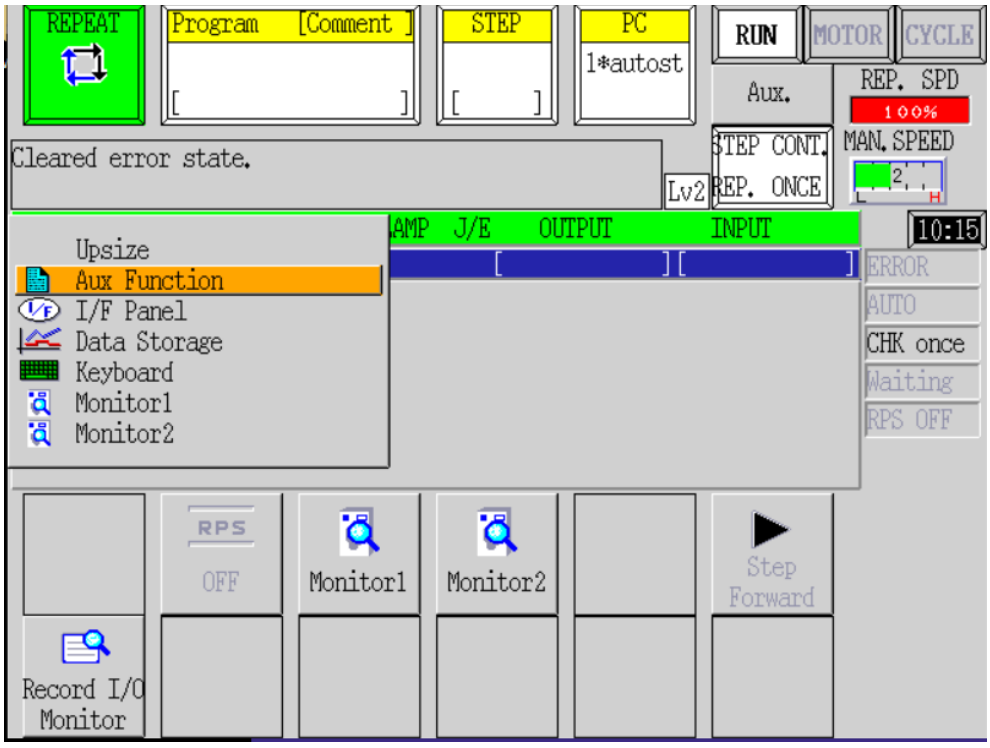
NOTE:

If Fieldbus software option is not enabled on the controller, contact Kawasaki for this option.

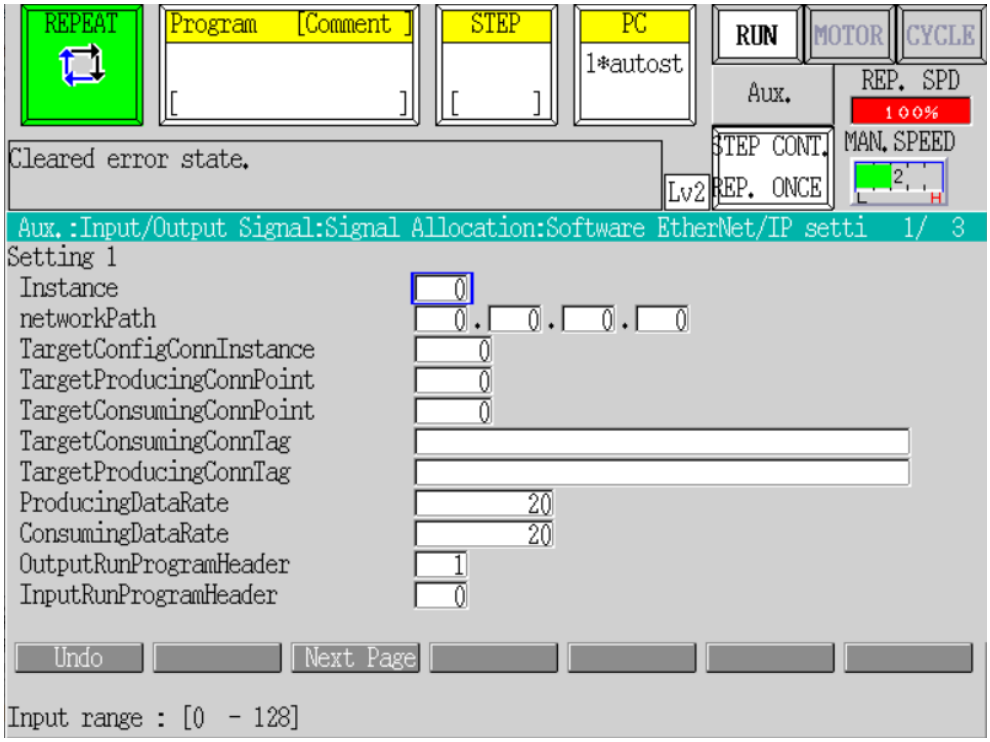
E series controller 28
F series controller 33

E series controller

Press the MENU button then go to **Aux Function** > **Input/Output Signal** > **Signal Allocation** > **Software Ethernet IP setting** > **IO Communication Setting** > **Setting 1** and press **ENTER.**



Ensure all fields are cleared in **Setting 1**, there should not be any prior saved data.

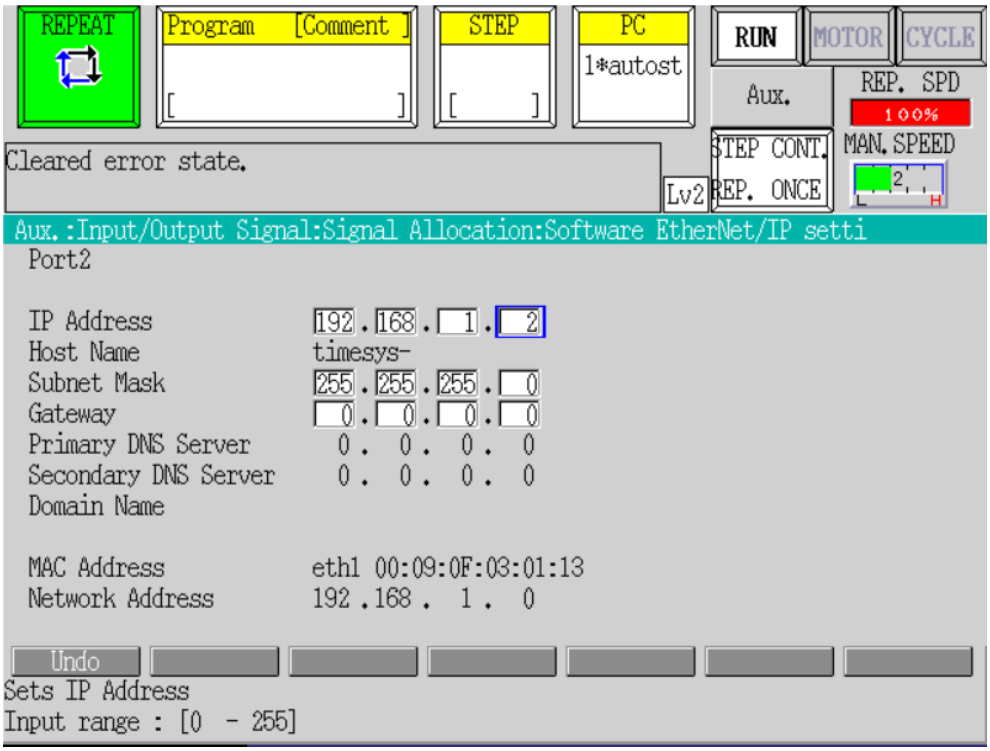


Return back in the menu to **Software Ethernet IP settings** > **Port Setting**.

Set the IP address of the robot to 192.168.1.2 to match the settings entered in the Compute Box.

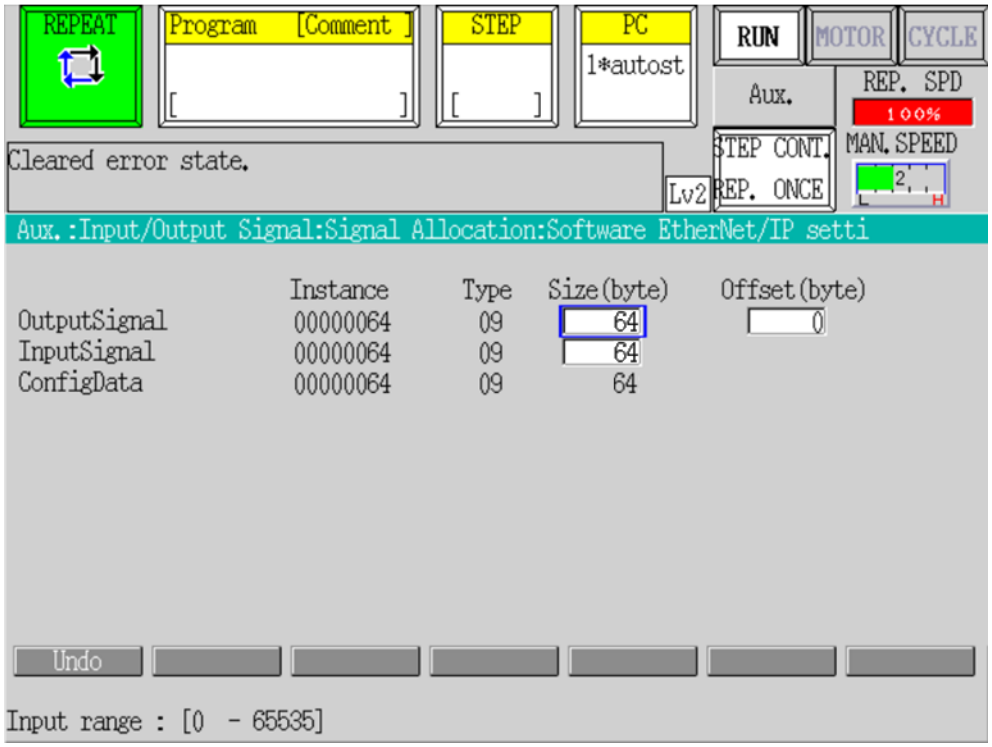
NOTE:

The robot IP address and the Compute Box IP address must be in the same subnet.



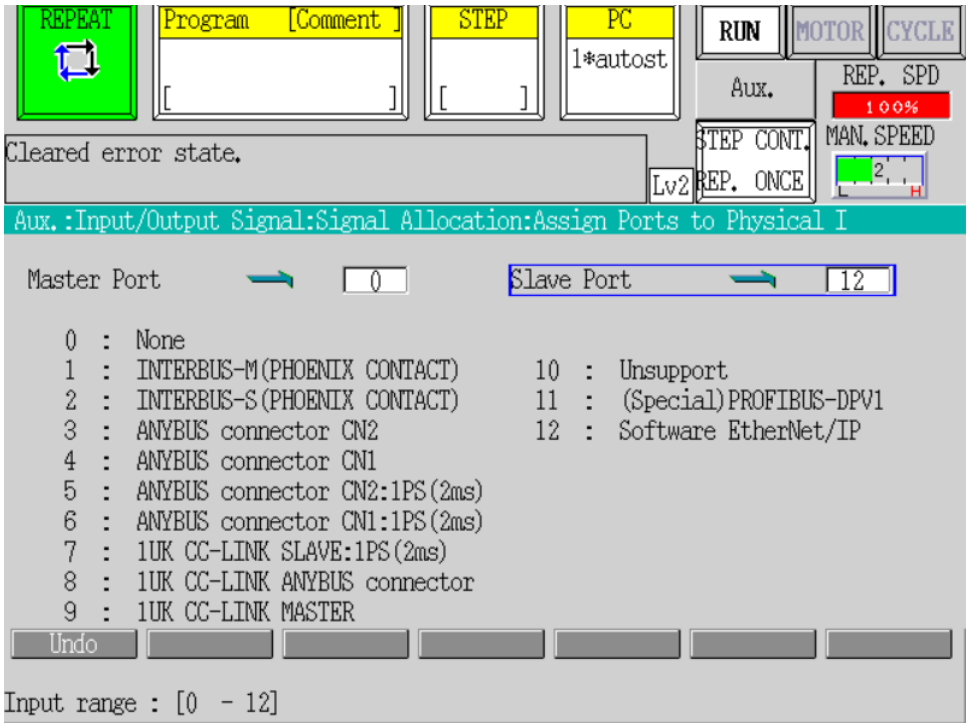
Return back in the menu to **Software Ethernet IP settings** > **Assembly Display and Setting**.

Enter 64 bytes for **OutputSignal** and **InputSignal** size.



Return back in the menu to **Signal Allocation** > **Assign Ports to Physical Interfaces.**

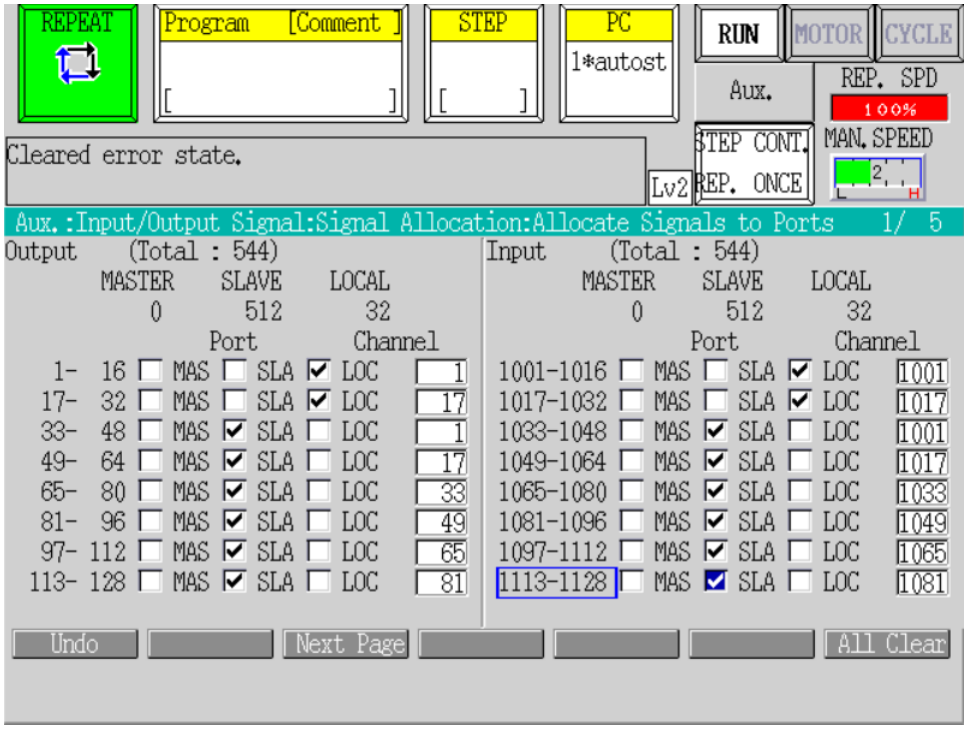
Set **Master Port** to 0 and set the **Slave Port** to 12.



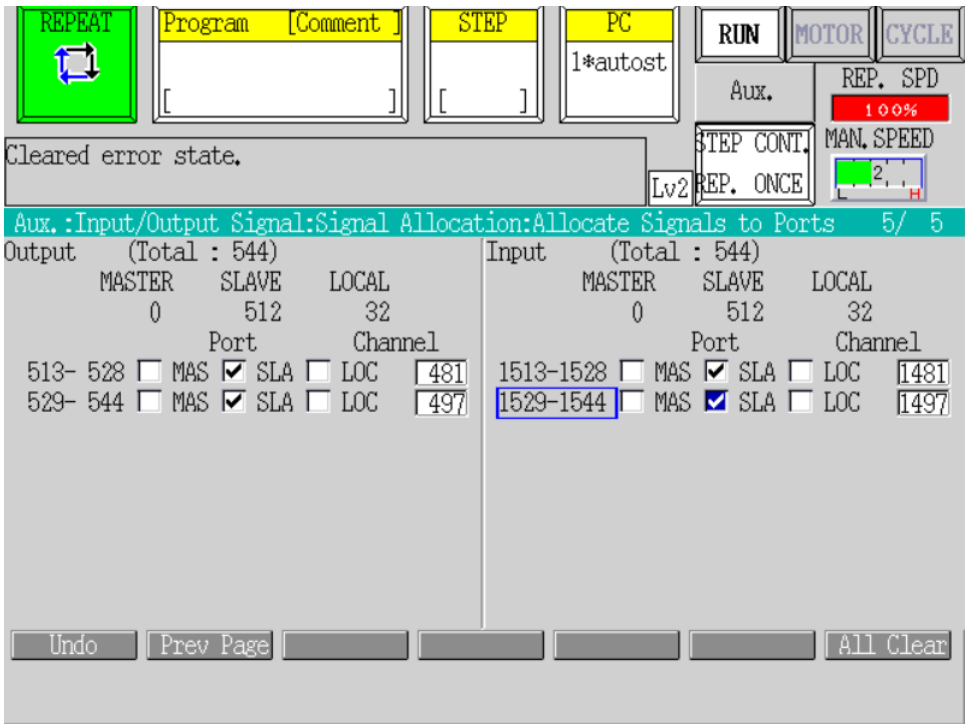
Return back in the menu to **Signal Allocation** > **Allocate Signals to Ports**.

Ensure the following signals are selected (☑) as **SLA** (Slave) signals:

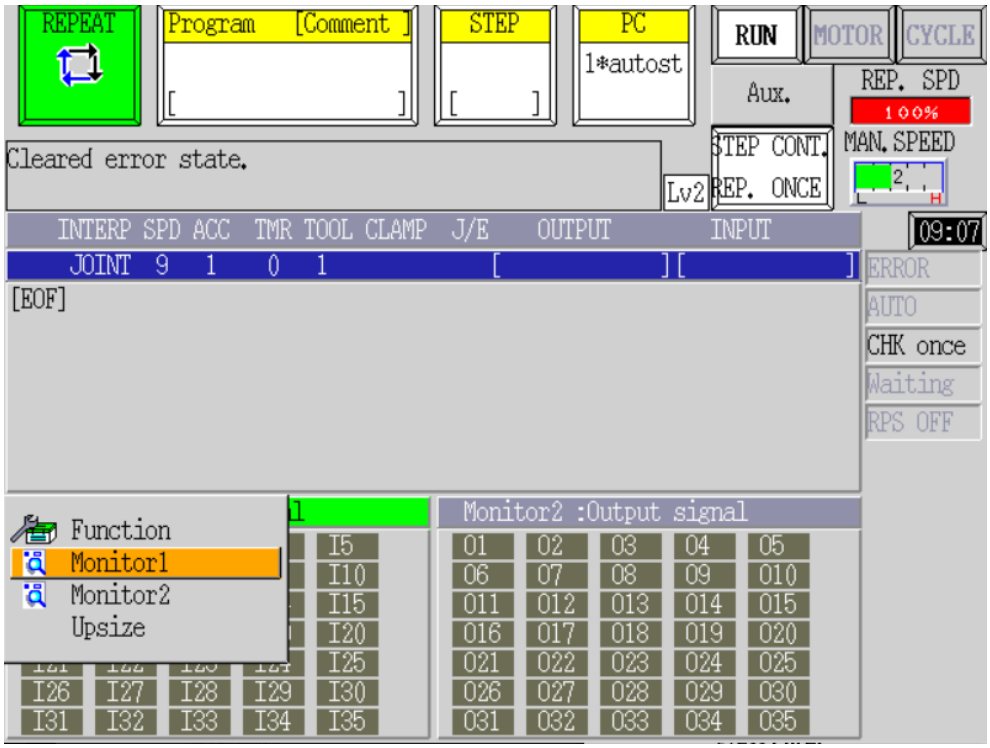
- 33-545 to Output
- 1033-1545 to Input



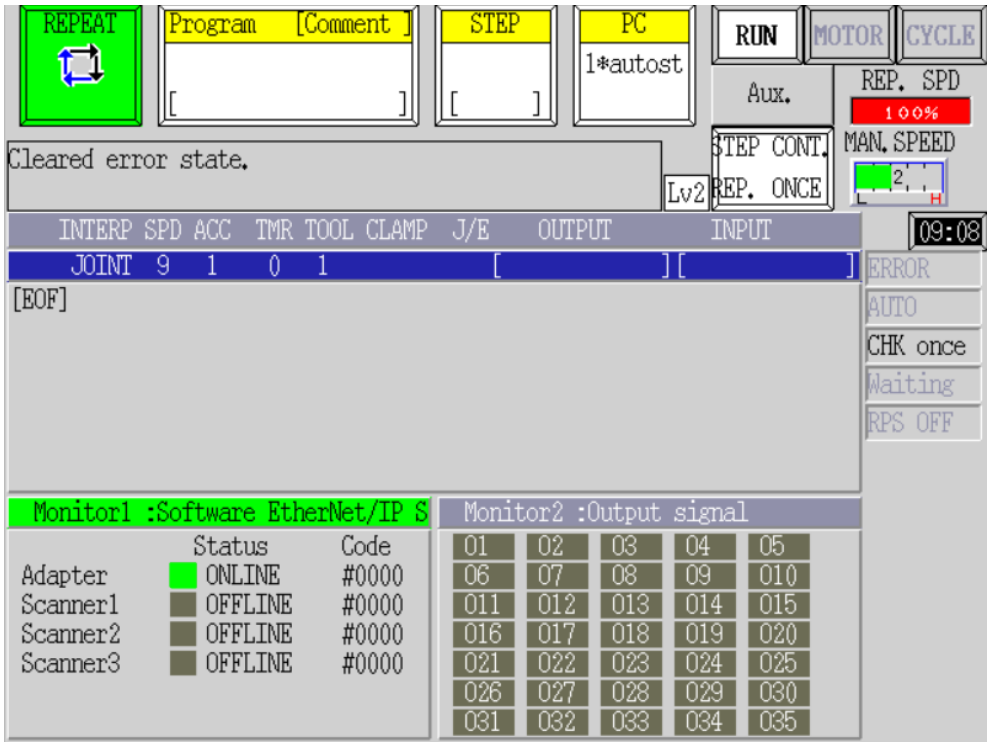
To go to next page press Next Page and continue all the way down to 545/1545.



After this step, power cycle the controller. Once power cycling is complete, check status to ensure robot has been set up as Adapter. To check, go to **Monitor 1** > **Software Ethernet IP Status**.

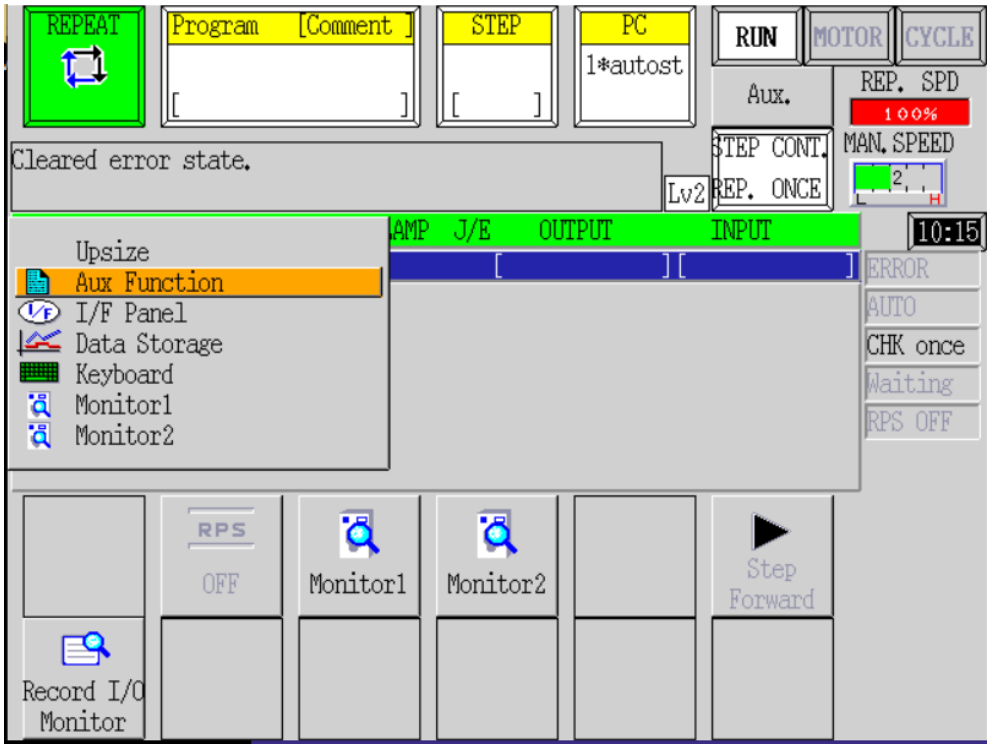


The status should show the **Adapter** as **ONLINE**.

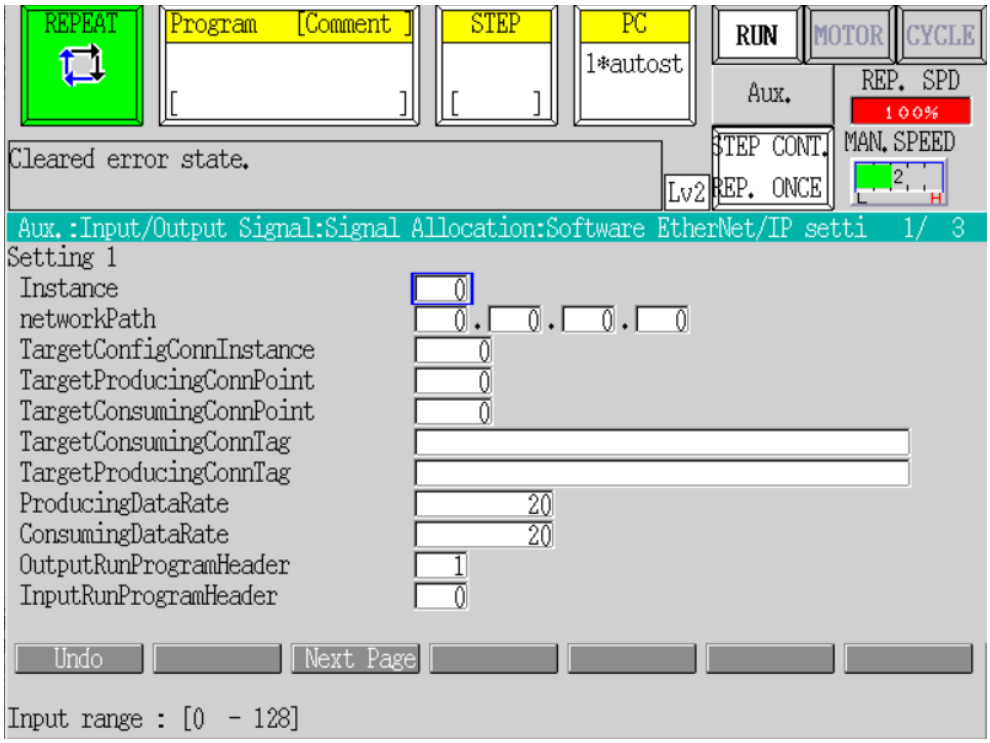


F series controller

Press the MENU button then go to **Aux Function** > **Input/Output Signal > Fieldbus Setting > Software Ethernet IP setting** > **IO Communication Setting** > **Setting 1** and press **ENTER.**



Ensure all fields are cleared in **Setting 1**, there should not be any prior saved data.

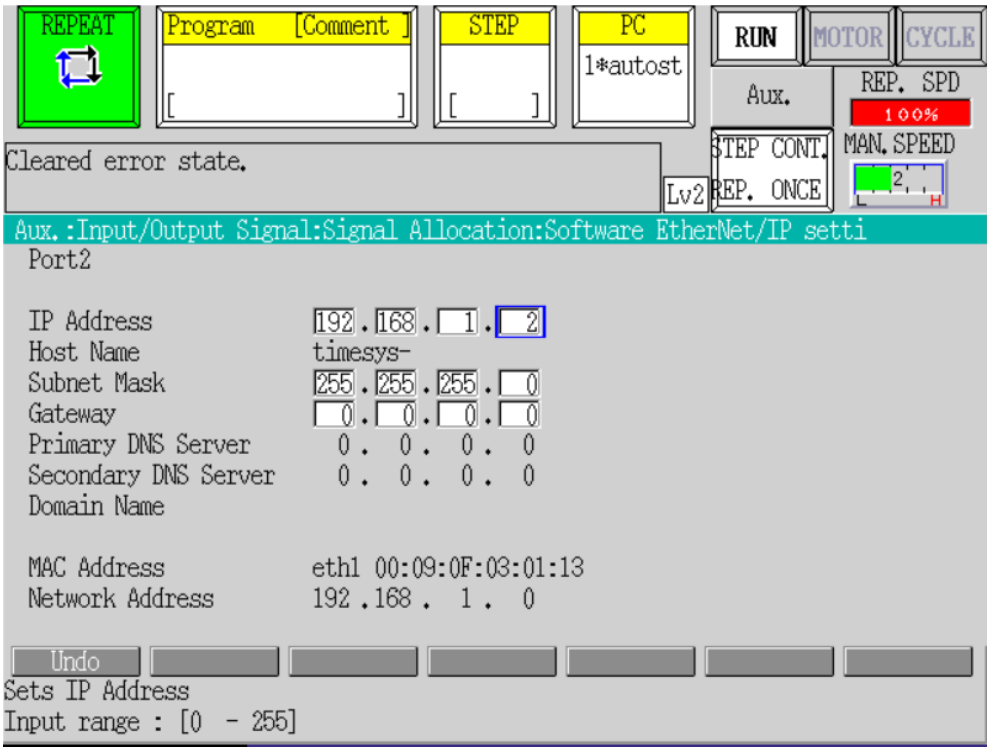


Return back in the menu to **Software Ethernet IP settings** > **Port Setting**.

Set the IP address of the robot to 192.168.1.2 to match the settings entered in the Compute Box.

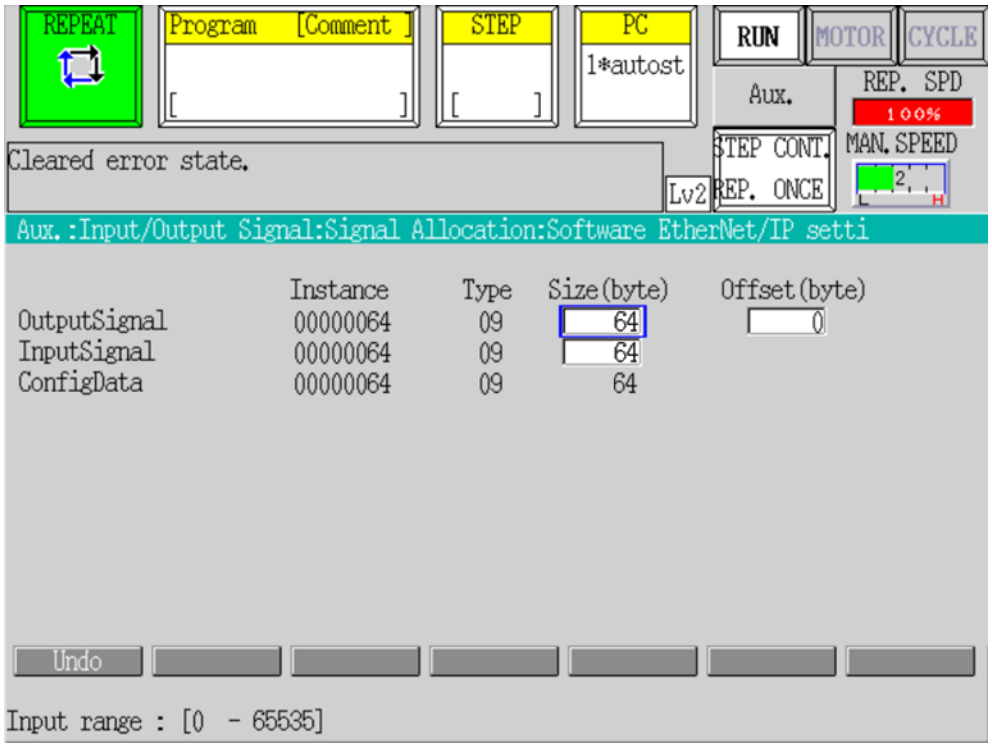
NOTE:

The robot IP address and the Compute Box IP address must be in the same subnet.



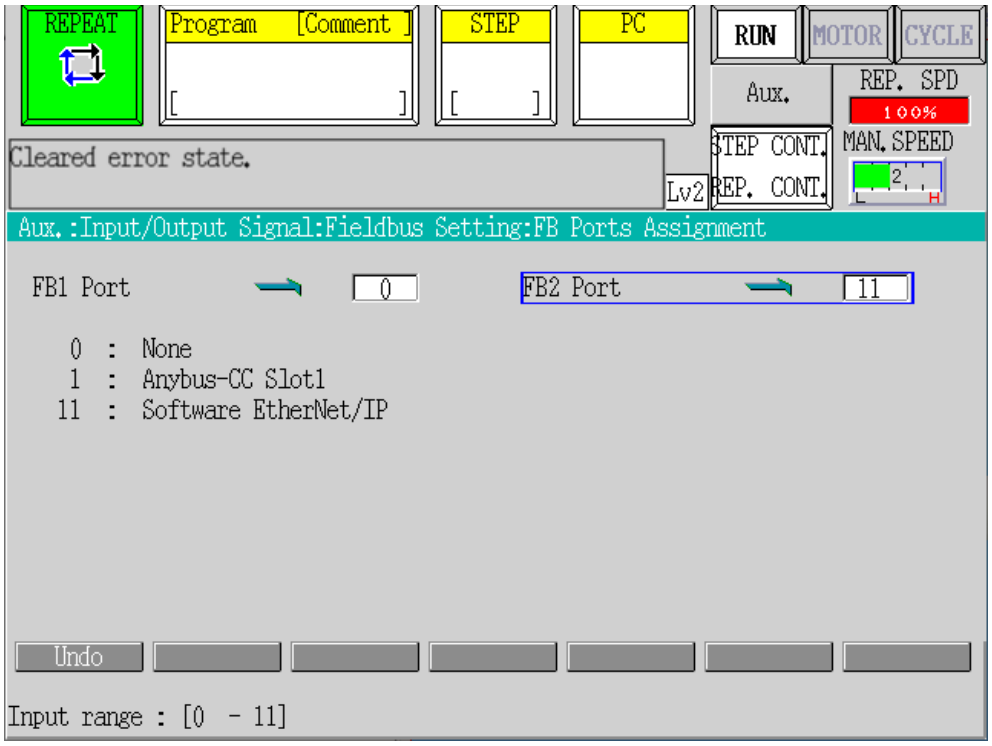
Return back in the menu to **Software Ethernet IP settings** > **Assembly Display and Setting**.

Enter 64 bytes for **OutputSignal** and **InputSignal** size.



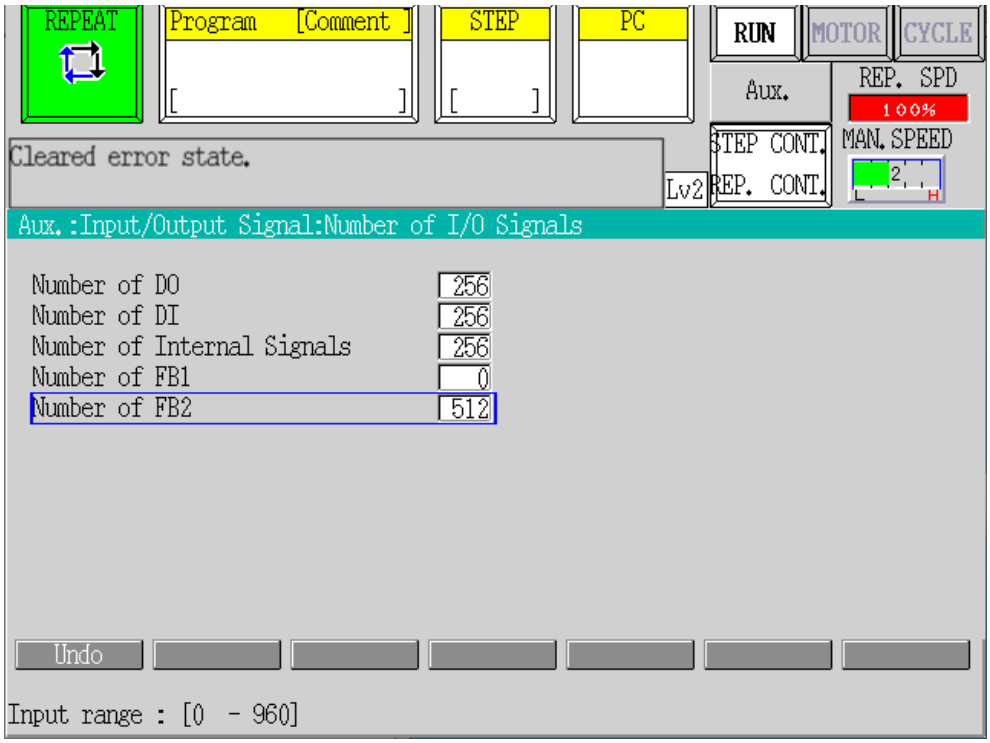
Return back in the menu to **Input/Output Signal > Fieldbus Setting** > **FB Ports Assignment.**

Set **FB1 Port** to 0 and set the **FB2 Port** to 11.



Return back in the menu to **Input/Output Signal > Number of I/O Signals**.

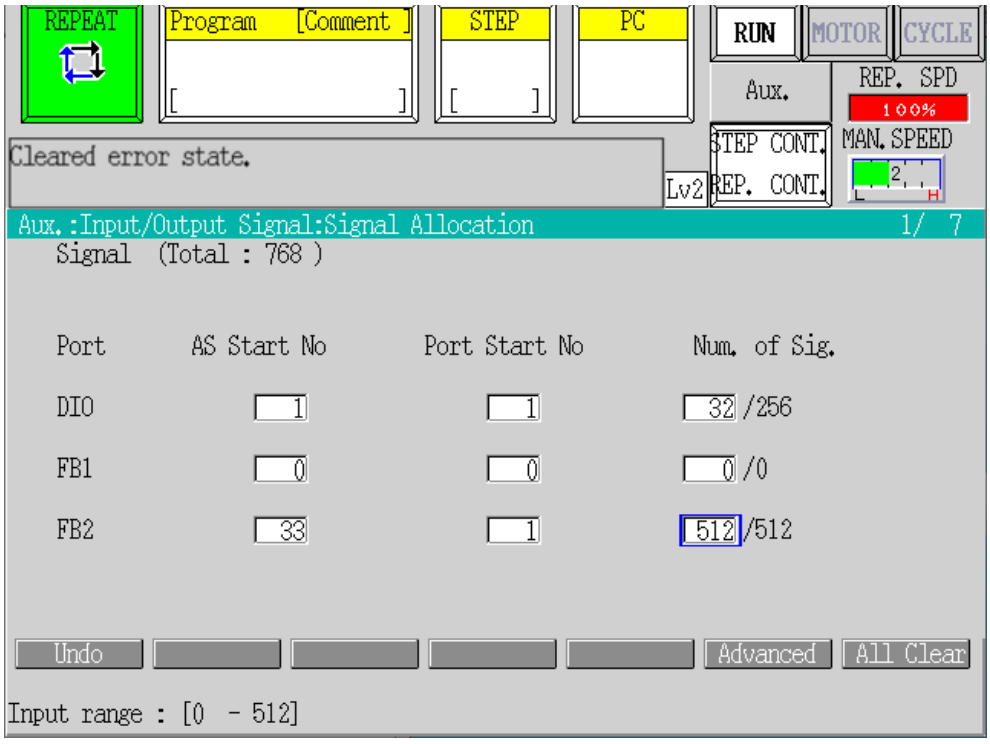
Set the **Number of FB2** to 512.



Return back in the menu to **Input/Output Signal > Signal Allocation**.

Set the following values for the **FB2**:

- **AS Start No**: 33
- **Port Start No**: 1
- **Num. of Sig.**: 512



4.4.4 Upload the OnRobot Functions to the robot

In order to make it easier to use the OnRobot products, high level functions have been written (`OR_Functions.as`) and provided on the USB stick.

Uploading the OnRobot `OR_Functions.as` to the robot using **KRTerm** application:

- Click **File** > **Set Current Folder**
- Navigate to where the `OR_Functions.as` file is located and click **OK**
- Connect to robot
- Type: `load OR_Functions.as`
- Press **Enter**

Installation 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 functions have been written into the `OR_Functions.as` file. Some mandatory parameters, which shall be configured, are stored in the first program (`OR_init.pc()`) in that file. The mandatory parameters are:

```
;Select Fieldbus (Ethernet/IP) bit offset
OR_R_bitOffset = 32
OR_W_bitOffset = 32
```

These are the offsets to where the gripper inputs and outputs start. Default is 32 for both.

The `OR_Functions.as` is uploaded to the robot during the installation.

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

```
CALL OR_RGx_move.pc(instance, width, force, waitfor)
```

When a function reads information, the value is stored and returned in the last argument:

```
CALL OR_Gecko_isConn.pc(instance, retVal)
PRINT retVal
```

All user program must start with calling the `OR_init.pc()` function. It is used to set up which tools are mounted on the robot, in which configuration. The table for the correct `configNum` value is shown in the `OR_init.pc` function.

```
CALL OR_init.pc(configNum)
```

CAUTION:

Calling the `OR_init.pc()` with parameters that does not match the attached tool(s) can result abnormal behavior.

5.2 List of functions

Function name:	OR_init.pc(toolCfgID)		
	Name	Type	Description
Input:	`toolCfgID`	integer	Tool configuration ID: 101 - RG2FT - 102 - RGx - 103 - VG10 - 104 - Gecko - 105 HEX - - 106 HEX RGx - 107 HEX VG10 - 108 HEX Gecko - 109 - RGx VG10 110 - RGx Gecko 111 - RGx RGx 112 - VG10 RGx 113 - VG10 Gecko 114 - VG10 VG10 (Primary / Secondary)
Output:	-	-	-
Behavior:	Function to initialize the communication for the currently used tools. Make sure, that this function is called before using all other function.		
Example:	`CALL OR_init.pc(104)`		

Gecko

Function name:	**OR_Gecko_padOut.pc(**instance, wait**)**		
	Name	Type	Description
Input:	instance	integer	1: single or primary - in dual configuration 2: secondary in dual configuration"
	wait	integer	0: return after command is executed 1: return after pads reached the final position
Output:	-	-	-
Behavior:	Command the pads to move out		
Example:	`CALL OR_Gecko_padOut.pc(1,0)`		

Function name:	**OR_Gecko_padIn.pc(**instance, wait**)**		
	Name	Type	Description
Input:	instance	integer	1: single or primary - in dual configuration 2: secondary in dual configuration
	wait	integer	0: return after command is executed 1: return after pads reached the final position
Output:	-	-	-
Behavior:	Command the pads to move in		
Example:	`CALL OR_Gecko_padIn.pc(1,0)`		

Function name:	**OR_Gecko_getF.pc(**instance, returnVal**)**		
	Name	Type	Description
Input:	instance	integer	1: single or primary - in dual configuration 2: secondary in dual configuration
Output:	returnVal	integer	Gripper measures the preload force in N
Behavior:	Command the gripper to get the preload force		
Example:	`CALL OR_Gecko_getF.pc(1, retVal)`		

Function name:	**OR_Gecko_getUS.pc(**instance, returnVal**)**		
	Name	Type	Description
Input:	instance	integer	1: single or primary - in dual configuration 2: secondary in dual configuration"
Output:	returnVal	integer	Ultrasonic sensor measures the distance in mm
Behavior:	Command the ultrasonic sensor to get data		
Example:	`CALL OR_Gecko_getUS.pc(1, retVal)`		

Function name:	**OR_Gecko_isConn.pc(**instance, returnVal**)**		
	Name	Type	Description
Input:	`instance`	integer	1: single or primary - in dual configuration 2: secondary in dual configuration"
Output:	`returnVal`	integer	0: gripper is not connected 1: gripper is connected
Behavior:	Check the connection to the gripper		
Example:	`CALL OR_Gecko_isConn.pc(1, retVal)`		

Function name:	**OR_Gecko_isPart.pc(**instance, returnVal**)**		
	Name	Type	Description
Input:	`instance`	integer	1: single or primary - in dual configuration 2: secondary in dual configuration"
Output:	`returnVal`	integer	0: part is not detected 1: part is detected
Behavior:	Check the part detection		
Example:	`CALL OR_Gecko_isPart.pc(1, retVal)`		

Function name:	**OR_Gecko_padSt.pc(**instance, returnVal**)**		
	Name	Type	Description
Input:	`instance`	integer	1: single or primary - in dual configuration 2: secondary in dual configuration"
Output:	`returnVal`	integer	0: pads are good 1: pads are worn-out
Behavior:	Check the pads worn-out state		
Example:	`CALL OR_Gecko_padSt.pc(1, retVal)`		

Function name:	**OR_Gecko_padPos.pc(**instance, returnVal**)**		
	Name	Type	Description
Input:	`instance`	integer	1: single or primary - in dual configuration 2: secondary in dual configuration"
Output:	`returnVal`	integer	0: pads are moved in 1: pads are moved out
Behavior:	Check the pads position		
Example:	`CALL OR_Gecko_padPos.pc(1, retVal)`		

HEX

Function name:	OR_HEX_get.pc(FT_type, returnVal)		
	Name	Type	Description
Input:	FT_type	string	Requested force/torque value. Valid inputs: “Fx”, “Fy”, “Fz”, “Tx”, “Ty”, “Tz”
Output:	returnVal	integer	Requested force/torque value. Forces are in N, torques are in Nm
Behavior:	Get actual force/torque value form the HEX sensor.		
Example:	`CALL OR_HEX_get.pc("Fx", retVal)`		

Function name:	OR_HEX_zero.pc()		
	Name	Type	Description
Input:	-	-	-
Output:	-	-	-
Behavior:	Command the HEX sensor to set the values to zero. (The actual force/torque values will be zero.)		
Example:	`CALL OR_HEX_zero.pc`		

Function name:	OR_HEX_unzero.pc()		
	Name	Type	Description
Input:	-	-	-
Output:	-	-	-
Behavior:	Command the HEX sensor to set the values to default		
Example:	`CALL OR_HEX_unzero.pc`		

Function name:	OR_HEX_isConn.pc(returnVal)		
Input:	Name	Type	Description
	-	-	-
Output:	returnVal	integer	0: sensor is not connected 1: sensor is connected
Behavior:	Check the connection to the sensor		
Example:	`CALL OR_HEX_isConn.pc(retVal)`		

RG2-FT

Function name:	**OR_RG2FT_move.pc(**width, force, wait**)**		
	Name	Type	Description
Input:	width	integer	Define the distance in mm
	force	integer	Define the grip force in N
	wait	integer	0: return after command is executed (without waiting for gripper fingers move) 1: return after fingers reached the position
Output:	-	-	-
Behavior:	Move the gripper fingers		
Example:	`CALL OR_RG2FT_move.pc(70, 35, 1)`		

Function name:	**OR_RG2FT_stop.pc()**		
	Name	Type	Description
Input:	-	-	-
Output:	-	-	-
Behavior:	Command to stop the gripper motion		
Example:	`CALL OR_RG2FT_stop.pc`		

Function name:	**OR_RG2FT_pOfAct.pc()**		
	Name	Type	Description
Input:	-	-	-
Output:	-	-	-
Behavior:	Set the actual values as offset for proximity sensors. (The current distance value		
Example:	`CALL OR_RG2FT_pOfAct.pc`		

Function name:	**OR_RG2FT_pOfVaL.pc(**valueL, valueR **)**		
	Name	Type	Description
Input:	valueL	integer	Left proximity custom offset value in mm
	valueR	integer	Right proximity custom offset value in mm
Output:	-	-	-
Behavior:	Sets the custom offset values for proximity sensors		
Example:	`CALL OR_RG2FT_pOfVaL.pc( 10, 15)`		

Function name:	OR_RG2FT_hxZr.pc()		
	Name	Type	Description
Input:	-	-	-
Output:	-	-	-
Behavior:	Zeroing the HEX sensors (actual force/torque values will be zero).		
Example:	`CALL OR_RG2FT_hxZr.pc`		

Function name:	OR_RG2FT_hxUnzr.pc()		
	Name	Type	Description
Input:	-	-	-
Output:	-	-	-
Behavior:	Unzero the values of the HEX sensors (don't use any offset, reset to the original values)		
Example:	`CALL OR_RG2FT_hxUnzr.pc`		

Function name:	OR_RG2FT_gtLPrx.pc(returnVal)		
	Name	Type	Description
Input:	-	-	-
Output:	`returnVal`	integer	Left proximity sensor measured distance in mm
Behavior:	Get left proximity sensor value		
Example:	`CALL OR_RG2FT_gtLPrx.pc(retVal)`		

Function name:	OR_RG2FT_gtRPrx.pc(returnVal)		
	Name	Type	Description
Input:	-	-	-
Output:	`returnVal`	integer	Right proximity sensor measured distance in mm
Behavior:	Get right proximity sensor value		
Example:	`CALL OR_RG2FT_gtRPrx.pc(retVal)`		

Function name:	**OR_RG2FT_getHex.pc**(FT_type, returnVal)		
	Name	Type	Description
Input:	`FT_type`	string	Requested force/torque value. Valid inputs: “Fx”, “Fy”, “Fz”, “Tx”, “Ty”, “Tz” (F/T values)
Output:	`returnVal`	integer	Requested force or torque value. Force values are in 1/10N, torque values are in 1/100Nm.
Behavior:	Get force/torque value from HEX sensors		
Example:	`FT_type = "Fz"` ‘get left HEX force value on Z axis `CALL OR_RG2FT_getHex.pc("Fz", retVal)`		

Function name:	**OR_RG2FT_getWid.pc**(returnVal)		
	Name	Type	Description
Input:	-	-	-
Output:	`returnVal`	integer	Gripper actual width in mm
Behavior:	Get gripper fingertip actual width		
Example:	`CALL OR_RG2FT_getWid.pc(retVal)`		

Function name:	**OR_RG2FT_isConn.pc**(returnVal)		
	Name	Type	Description
Input:	-	-	-
Output:	`returnVal`	integer	0: gripper is not connected 1: gripper is connected
Behavior:	Check the connection to the gripper		
Example:	`CALL OR_RG2FT_isConn.pc(retVal)`		

Function name:	**OR_RG2FT_isBusy.pc**(returnVal)		
	Name	Type	Description
Input:	-	-	-
Output:	`returnVal`	integer	0: gripper is idle 1: gripper is busy
Behavior:	Check the gripper status		
Example:	`CALL OR_RG2FT_isBusy.pc(retVal)`		

Function name:	**OR_RG2FT_isGrip.pc(**returnVal**)**		
	Name	Type	Description
Input:	-	-	-
Output:	`returnVal`	integer	0: grip is not detected 1: grip is detected
Behavior:	Check the grip presence		
Example:	`CALL OR_RG2FT_isGrip.pc(retVal)`		

RG2/6

Function name:	**OR_RGx_move.pc(**instance, width, force, wait**)**		
	Name	Type	Description
Input:	instance	integer	1: single or primary - in dual configuration 2: secondary in dual configuration
	width	integer	Define the distance in mm
	force	integer	Define the grip force in N
	wait	integer	0: return after command is executed (without waiting for gripper fingers move) 1: return after fingers reached the position
Output:	-	-	-
Behavior:	Move the gripper fingers		
Example:	`CALL OR_RGx_move.pc(1, 50, 20, 1)`		

Function name:	**OR_RGx_isConn.pc(**instance, returnVal**)**		
	Name	Type	Description
Input:	instance	integer	1: single or primary - in dual configuration 2: secondary in dual configuration
Output:	returnVal	integer	0: gripper is not connected 1: gripper is connected
Behavior:	Check the connection to the gripper		
Example:	`CALL OR_RGx_isConn.pc(1,  retVal)`		

Function name:	**OR_RGx_isGrip.pc(**instance, returnVal**)**		
	Name	Type	Description
Input:	instance	integer	1: single or primary - in dual configuration 2: secondary in dual configuration
Output:	returnVal	integer	0: grip not detected 1: grip detected (something gripped)
Behavior:	Check grip		
Example:	`CALL OR_RGx_isGrip.pc(1, retVal)`		

Function name:	**OR_RGx_isBusy.pc(**instance, returnVal**)**		
	Name	Type	Description
Input:	`instance`	integer	1: single or primary - in dual configuration 2: secondary in dual configuration
Output:	`returnVal`	integer	0: idle 1: busy (fingers still moving)
Behavior:	Check, that is gripper busy or not		
Example:	`CALL OR_RGx_isBusy.pc(1, retVal )`		

Function name:	**OR_RGx_isSSOn.pc(**instance, returnVal**)**		
	Name	Type	Description
Input:	`instance`	integer	1: single or primary - in dual configuration 2: secondary in dual configuration
Output:	`returnVal`	integer	0: safety switch not triggered, normal operation 1: safety switch triggered, gripper disabled
Behavior:	Check safety switch status		
Example:	`CALL OR_RGx_isSSOn.pc(1, retVal)`		

VG10

Function name:	**OR_VG10_grip.pc(**instance, vacuumA, vaccumB, wait **)**		
	Name	Type	Description
Input:	instance	integer	1: single or primary - in dual configuration 2: secondary in dual configuration
	vacuumA	integer	Required vacuum level for channel A in %, set 0 to release
	vacuumB	integer	Required vacuum level for channel B in %, set 0 to release
	wait	integer	Wait until the vacuum reach the required level 0: don't wait for vacuum 1: wait until the vacuum reach the required level
Output:	-	-	-
Behavior:	Set the required vacuum for channels or release the part gripped		
Example:	`CALL OR_VG10_grip.pc(1, 20 , 20, 1)`		

Function name:	**OR_VG10_getVacA.pc(**instance, returnVal**)**		
	Name	Type	Description
Input:	instance	integer	1: single or primary - in dual configuration 2: secondary in dual configuration
Output:	returnVal	Integer	Vacuum level of A channel in %
Behavior:	Get actual vacuum level of A channel		
Example:	`CALL OR_VG10_getVacA.pc(1, retVal)`		

Function name:	**OR_VG10_getVacB.pc(**instance, returnVal**)**		
	Name	Type	Description
Input:	instance	integer	1: single or primary - in dual configuration 2: secondary in dual configuration
Output:	returnVal	Integer	Vacuum level of B channel in %
Behavior:	Get actual vacuum level of B channel		
Example:	`CALL OR_VG10_getVacB.pc(1, retVal)`		

Function name:	**OR_VG10_setCur.pc(**instance, current**)**		
	Name	Type	Description
Input:	`instance`	integer	1: single or primary - in dual configuration 2: secondary in dual configuration
	`current`	integer	Current limit for VG10 in mA. Valid in 100-1000 mA range.
Output:	-	-	
Behavior:	Set current limit for VG10		
Example:	`CALL OR_VG10_setCur.pc(1, 600)`		

Function name:	**OR_VG10_getLim.pc(**instance, returnVal**)**		
	Name	Type	Description
Input:	`instance`	integer	1: single or primary - in dual configuration 2: secondary in dual configuration
Output:	`returnVal`	integer	Current limit in mA
Behavior:	Get actual current limit		
Example:	`CALL OR_VG10_getLim.pc(1, retVal)`		

Function name:	**OR_VG10_isConn.pc(**instance, returnVal**)**		
	Name	Type	Description
Input:	`instance`	integer	1: single or primary - in dual configuration 2: secondary in dual configuration
Output:	`returnVal`	integer	0: gripper is not connected 1: gripper is connected
Behavior:	Check the connection to the gripper		
Example:	`CALL OR_VG10_isConn.pc(1, retVal)`		

Detailed description on the EtherNet/IP Assembly Instances (what values can be read and write) can be found in the **EtherNet/IP** section.

Mode II - OnRobot WebLogic

6 Installation

6.1 Overview

For a successful installation the following steps will be required:

- Mount the components
- Wire the cables
- Setup the software

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

6.2 Mounting

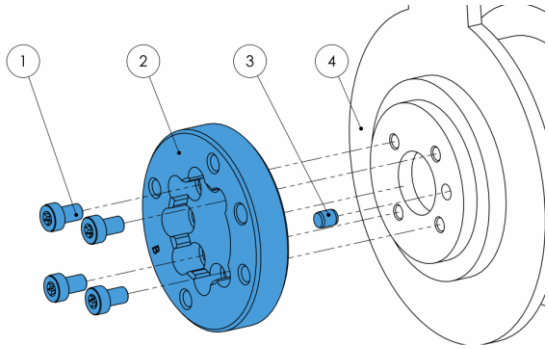
Required steps:

- 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 RS003N, RS005L, RS005N models

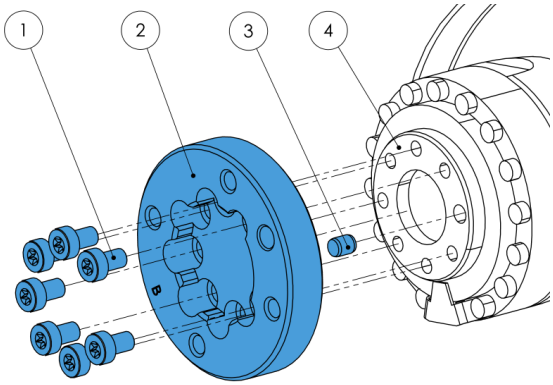


Adapter B (4 screws)

1	M5x8 screws (ISO14580 A4-70)
2	OnRobot adapter flange (ISO 9409-1-50-4-M6)
3	Dowel pin Ø5x6 (ISO2338 h8)
4	Robot tool flange (ISO 9409-1-31.5-4-M5)

Use 5 Nm tightening torque.

For RS007L, RS007N



Adapter B (7 screws)

1 M5x8 screws (ISO14580 A4-70)

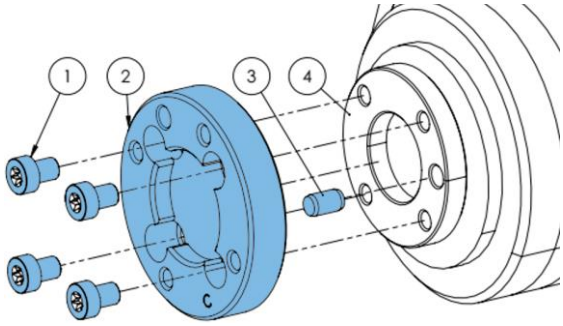
2 OnRobot adapter flange (ISO 9409-1-50-4-M6)

3 Dowel pin Ø5x6 (ISO2338 h8)

4 Robot tool flange (ISO 9409-1-31.5-4-M5)

Use 5 Nm tightening torque.

For RS006L, RS010N models



Adapter C

1 M6x8 screws (ISO14580 A4-70)

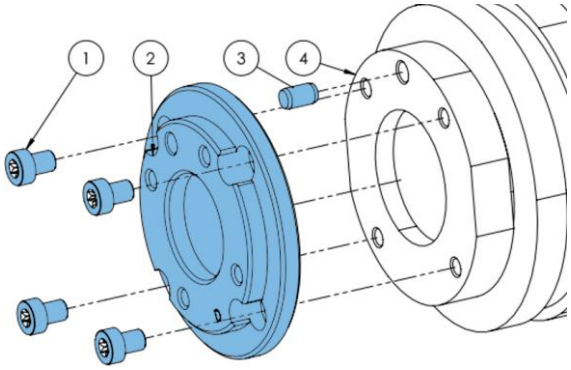
2 OnRobot adapter flange (ISO 9409-1-50-4-M6)

3 Dowel pin Ø6x10 (ISO2338 h8)

4 Robot tool flange (ISO 9409-1-40-4-M6)

Use 10 Nm tightening torque.

For RS0010L, RS020N, RS015X models



Adapter D

1 M6x8 screws (ISO14580 A4-70)

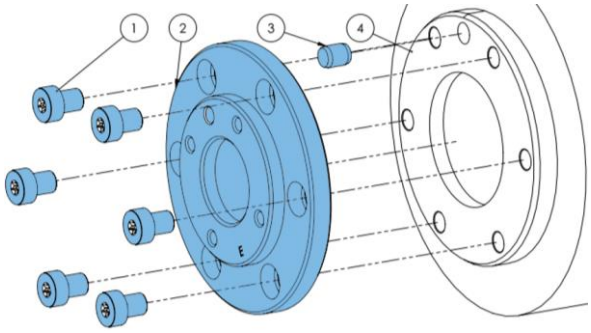
2 OnRobot adapter flange (ISO 9409-1-50-4-M6)

3 Dowel pin Ø6x10 (ISO2338 h8)

4 Robot tool flange (ISO 9409-1-63-4-M6)

Use 10 Nm tightening torque.

For RS030N, RS050N, RS080N models



Adapter E

1 M8x10 screws (ISO14580 A4-70)

2 OnRobot adapter flange (ISO 9409-1-50-4-M6)

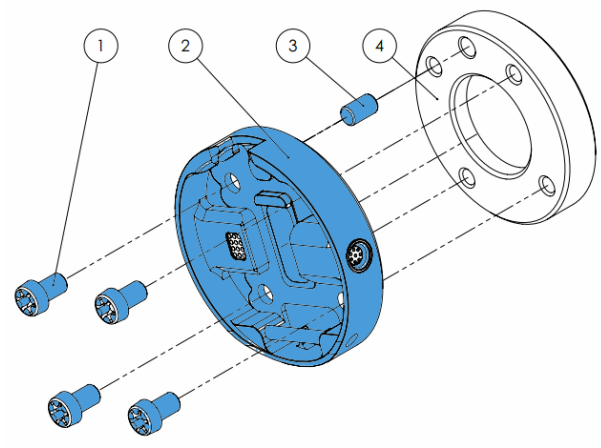
3 Dowel pin Ø8x10 (ISO2338 h8)

4 Robot tool flange (ISO 9409-1-80-6-M8)

Use 25 Nm tightening torque.

6.2.2 Quick Changer options

Quick Changer - Robot Side



Quick Changer - Robot Side

1 M6x8mm (ISO14580 8.8)

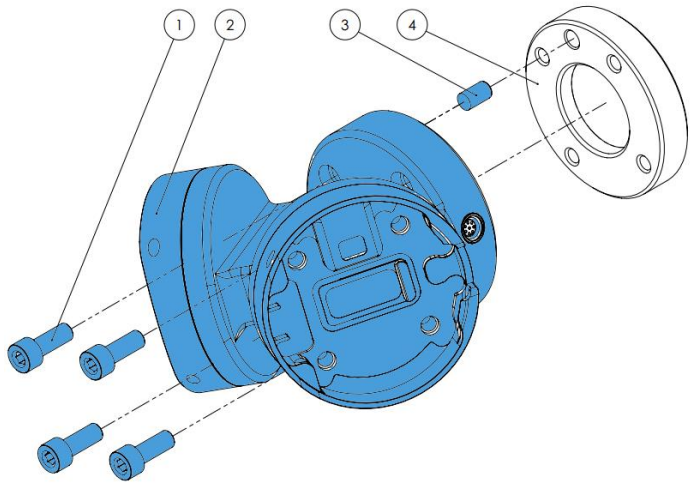
2 Quick Changer (ISO 9409-1-50-4-M6)

3 Dowel pin Ø6x10 (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)

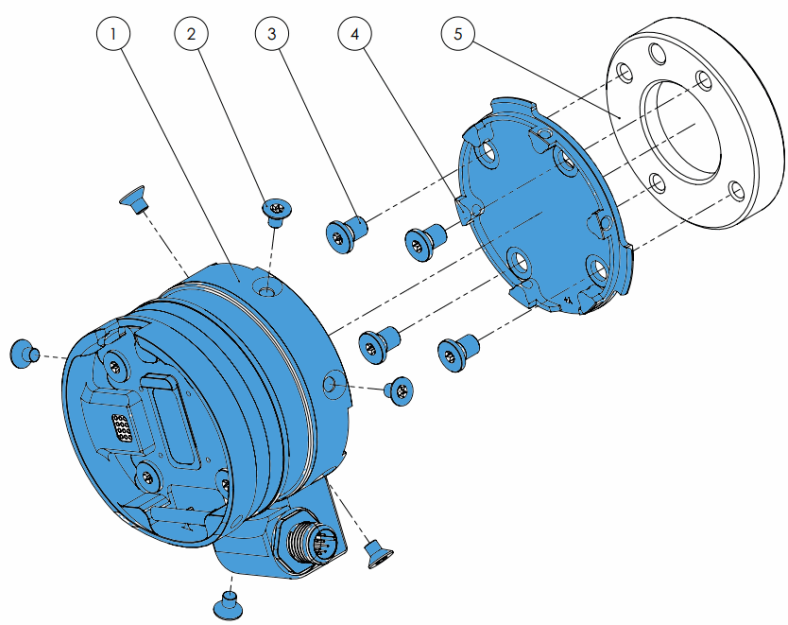
2 Dual Quick Changer

3 Dowel pin Ø6x10 (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

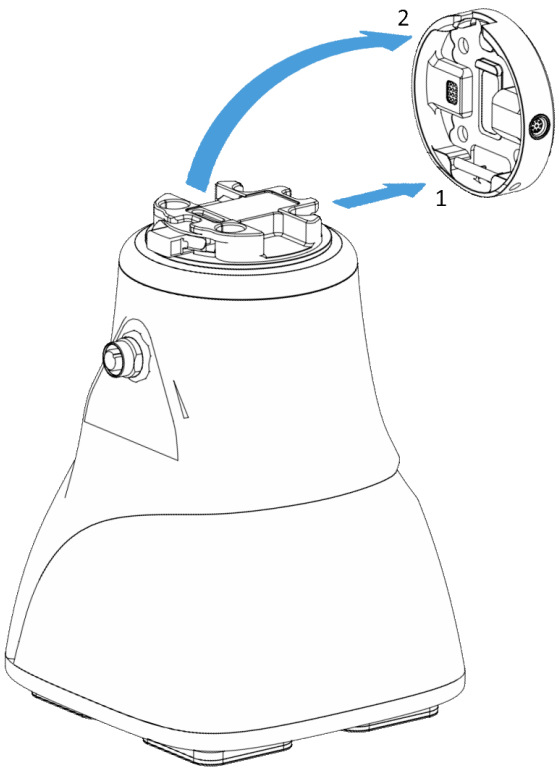
1	HEX-E/H QC sensor
2	M4x6mm (ISO14581 A4-70)
3	M6x8mm (NCN20146 A4-70)
4	HEX-E/H QC adapter
5	Adapter/ Robot tool flange (ISO 9409-1-50-4-M6)

Use 1.5 Nm tightening torque. for M4x6mm

Use 10 Nm tightening torque. for M6x8mm

6.2.3 Tools

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:

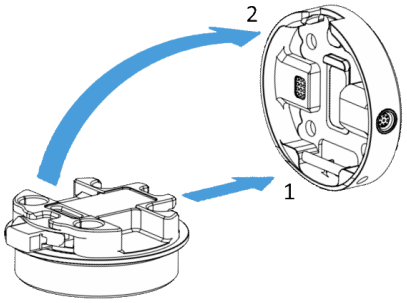
Flip the tool until it is fully mated, and you hear a clicking sound.

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.

Quick Changer - Tool side



Step 1:

Move the tool close to the Quick Changer as illustrated.

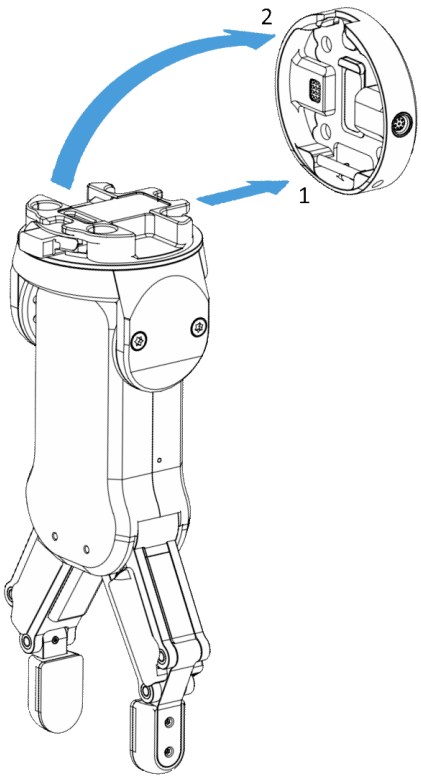
The hook mechanism (rod and hook tongue) will keep the lower part locked once mounted.

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.

RG2



Step 1:

Move the tool close to the Quick Changer as illustrated.

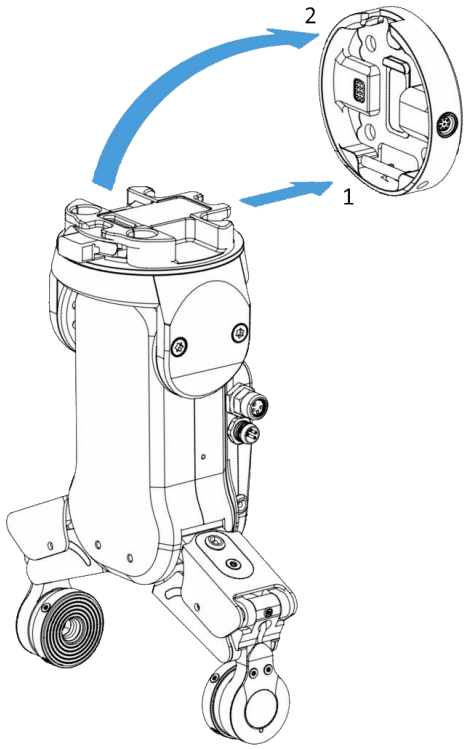
The hook mechanism (rod and hook tongue) will keep the lower part locked once mounted.

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.

RG2-FT



Step 1:

Move the tool close to the Quick Changer as illustrated.

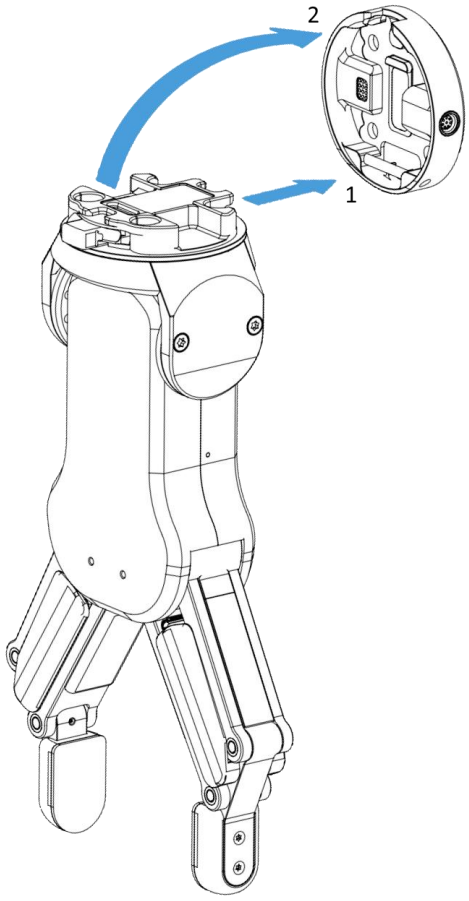
The hook mechanism (rod and hook tongue) will keep the lower part locked once mounted.

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.

RG6



Step 1:

Move the tool close to the Quick Changer as illustrated.

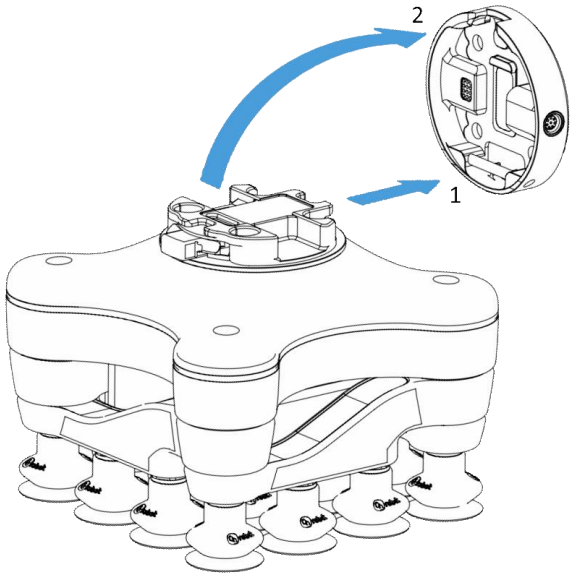
The hook mechanism (rod and hook tongue) will keep the lower part locked once mounted.

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.

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:

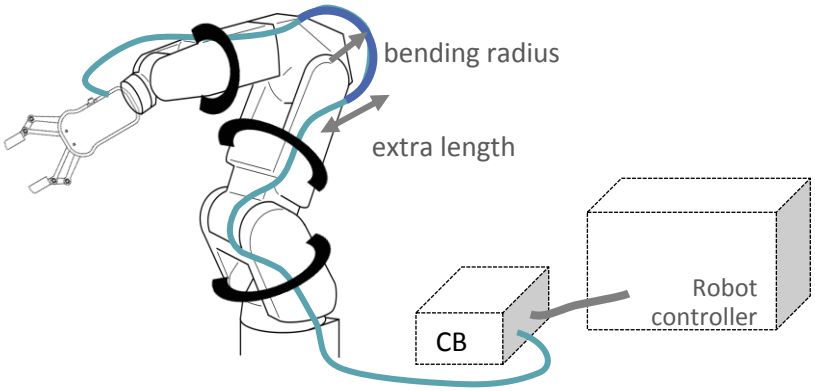
Flip the tool until it is fully mated, and you hear a clicking sound.

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

6.3 Wiring

Four kind of cables have to 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 Computer 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 KAWASAKI robots the two most recent controllers are:

- the F-Series which uses a DX40-50P connector for I/O interface

- and E-Series which uses a 37-pin D-Sub (M/F) connector.

The GPIO board in the control cabinet can be used be used to connect the Compute Box to the robot controller.

NOTE:

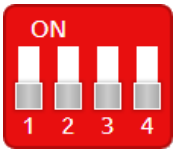
It is HIGHLY recommended to purchase the appropriate connector & harness parts before installing the gripper and I/O converter. There are no screw terminals for the I/O terminal in the controller. The I/O connections for the F-Series controller can be soldered, but the solder points are very small. The I/O connections for the E-Series controller cannot be soldered and require using a DB37 connector.

Controller	Description	Sample Vendor
F-Series (2AB/AE Board)	HIROSE DX40-50P Connector	Digikey, Mouser
	DX-50-CV Connector Backshell	
E-Series (1TW Board)	DB37 (M & F) Connector	Amazon, Digikey

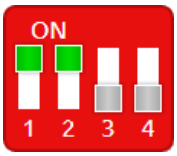
Make sure that the robot is powered off completely.

First locate the DB37 connector for E-Series on the back side of the cabinet or the DX40-50P connector for the F-Series on the side of the cabinet. Prepare the mating connectors.

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.

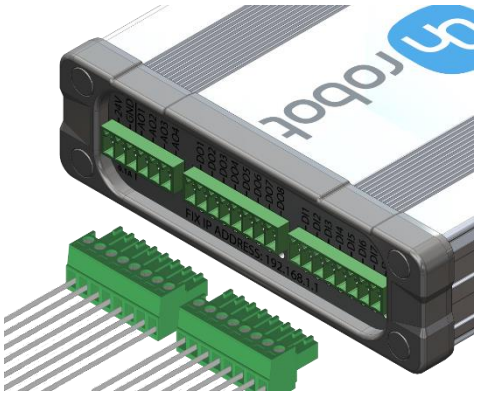
(Please refer to the robot manual to check whether it is an NPN or a PNP type.)

NOTE:

The Kawasaki robot controller has an XGPIO board that determines whether the robot is configured for PNP or NPN.

- For the F-Series, the XGPIO board (2AB/AE) is in PNP configuration by default and can be changed by setting jumper JP8 on the board (refer to the F Controller External IO Manual for more information).
- For the E-Series, robot PNP/NPN is determined by the XGPIO board (1TW); to change configurations, the controller's XGPIO board must be swapped out.

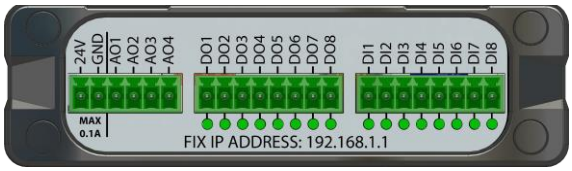
Plug in the two green 8 pole pluggable connectors.



The supplied connector type is:

2 x Phoenix Contact MC 1,5/8-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)

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.

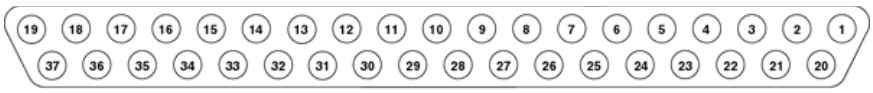
For simplicity, it is recommended to map the pins in order:

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

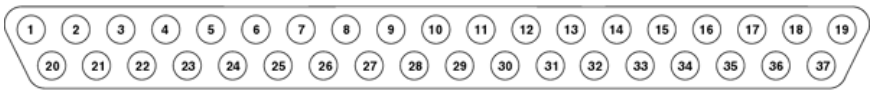
E-Series

List of the important pins of the CN2 and CN4 connectors:

Rear view of the male 37 pin sub-d connector:



Rear view of the female 37 pin sub-d connector:



Pin	Description	Pin	Description
CN4 - 1	Digital input 1	CN2 - 1	Digital output 1
CN4 - 2	Digital input 2	CN2 - 2	Digital output 2
CN4 - 3	Digital input 3	CN2 - 3	Digital output 3
CN4 - 4	Digital input 4	CN2 - 4	Digital output 4
CN4 - 5	Digital input 5	CN2 - 5	Digital output 5
CN4 - 6	Digital input 6	CN2 - 6	Digital output 6
CN4 - 7	Digital input 7	CN2 - 7	Digital output 7
CN4 - 8	Digital input 8	CN2 - 8	Digital output 8
CN4 - 18	IN-COM1	CN2 - 36	OUT-COM1

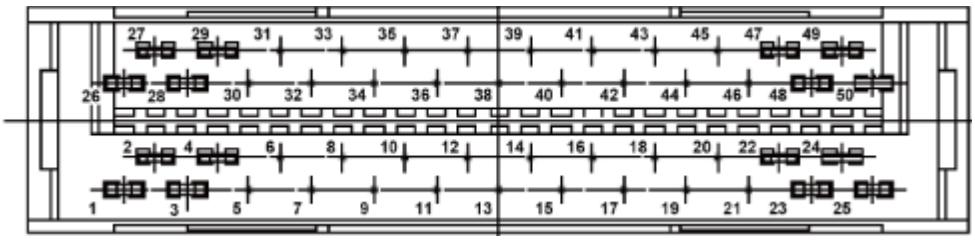
Please note which pin you used during the wiring, in a later step it is going to be needed for the mapping.

To have a common signal ground the following two pins needs to be wired together:

Pins from	Pins to	Description
Compute Box - GND	CN4 - 18	Compute Box GND to IN-COM1
Compute Box - GND	CN2 - 36	Compute Box GND to OUT-COM1

F-Series

List of the important pins of the DX40-50P connector:



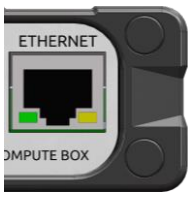
Pin	Description	Pin	Description
7	Digital input 1	31	Digital output 1
8	Digital input 2	32	Digital output 2
9	Digital input 3	33	Digital output 3
10	Digital input 4	34	Digital output 4
11	Digital input 5	35	Digital output 5
12	Digital input 6	36	Digital output 6
13	Digital input 7	37	Digital output 7
14	Digital input 8	38	Digital output 8
6	IN-COM1	30	OUT-COM1

Please note which pin you used during the wiring, in a later step it is going to be needed for the mapping.

To have a common signal ground the following two pins needs to be wired together:

Pins from	Pins to	Description
Compute Box - GND	6	Compute Box GND to IN-COM1
Compute Box - GND	30	Compute Box GND to OUT-COM1

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).

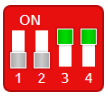
If the Compute Box is used in a company network where a DHCP server is already in use, it is recommended to disable the DHCP server of the Compute Box by setting DIP switch 4 to the ON position.

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.

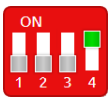
Example robot/computer setting:

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.

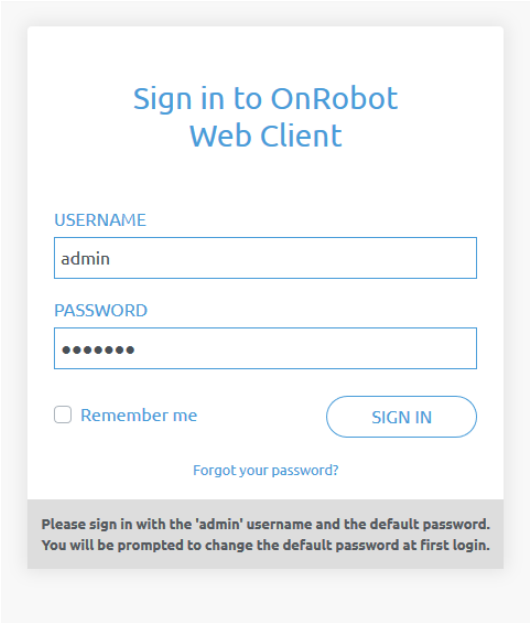
7.3 Web Client

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:

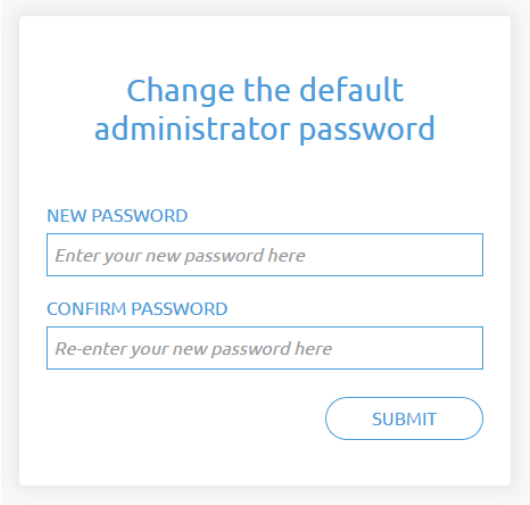


The factory default administrator login is:

Username: admin

Password: OnRobot

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



Once 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.

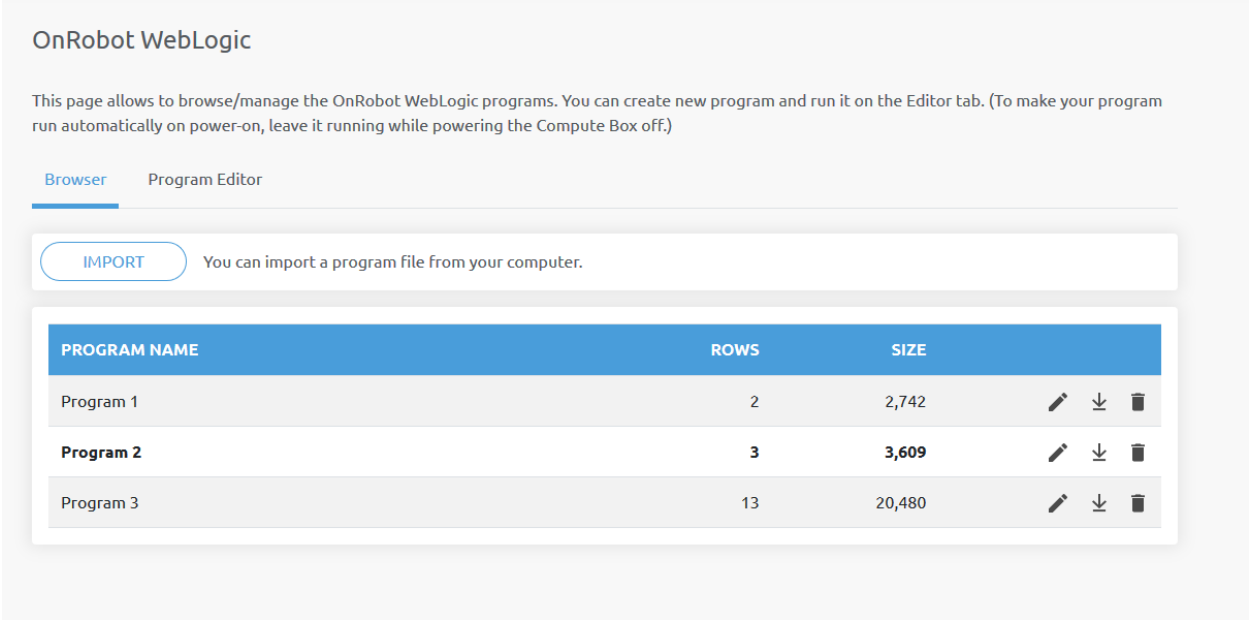
7.4.1 Browser

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.



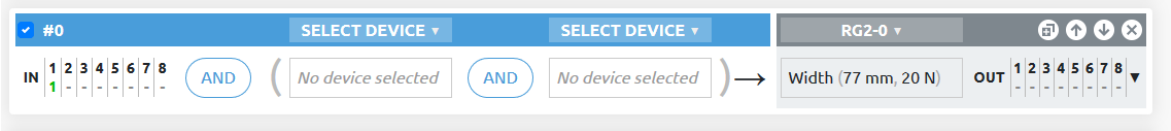
7.4.2 Program Editor

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:

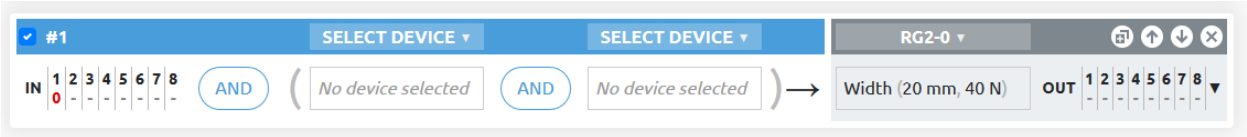
(**If**) DI1=1 → (**Then**) RG2-Width=77 (force=20N)



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

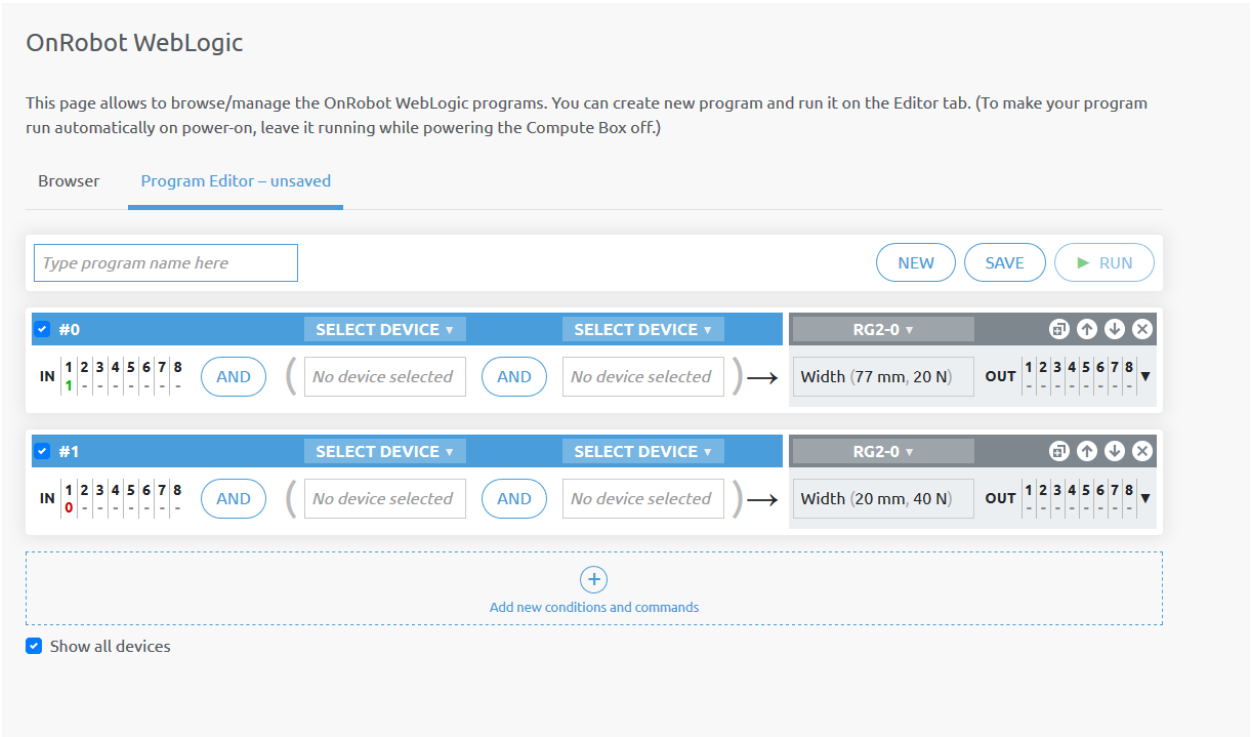
Another row in a program can be like this:

(**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.

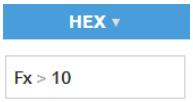
The rows must have at least one condition and at least one command to be executed.

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.

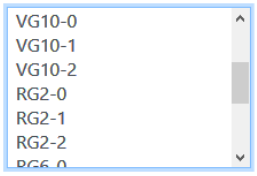
Digital inputs (DI1-DI8) can have the following three states: (click to cycle through the states)

- - - Don't care (this bit is masked and will give true result for the bit)
- 0 - give logic true if Input bit is low
- 1 -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 RG2/6, VG10 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 

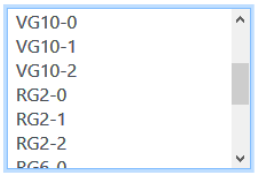
(set RG2 width 77 mm and with force = 20N)
- Digital Output type - like DO4=1 

(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 RG2/6, VG10 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

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

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

List of Device specific values

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.

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

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= $\sqrt{Fx^2 + Fy^2 + Fz^2}$ [N] where Fx, Fy, Fz are the fingertip sensor force components T3D= $\sqrt{Tx^2 + Ty^2 + Tz^2}$ [Nm] where Tx, Ty, Tz 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)

VG10

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).

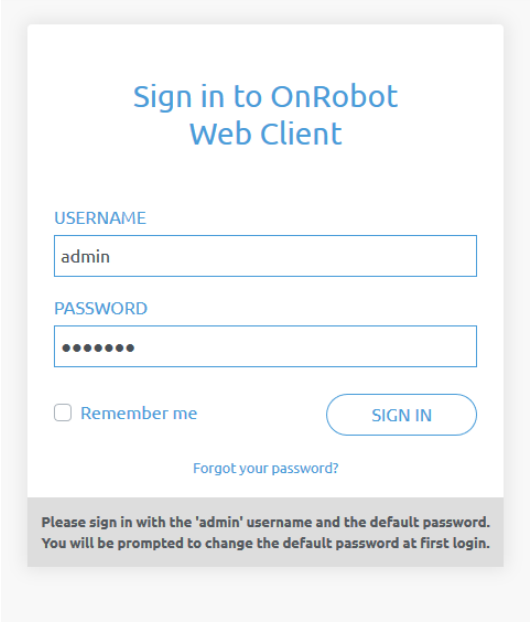
8.1.2 Web Client

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:

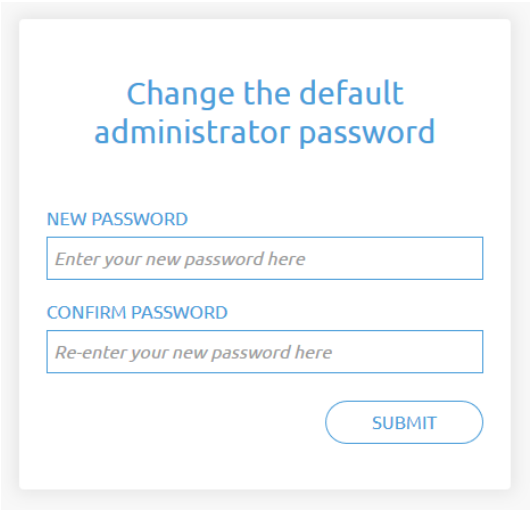


The factory default administrator login is:

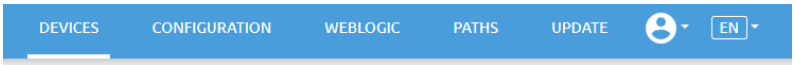
Username: admin

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:



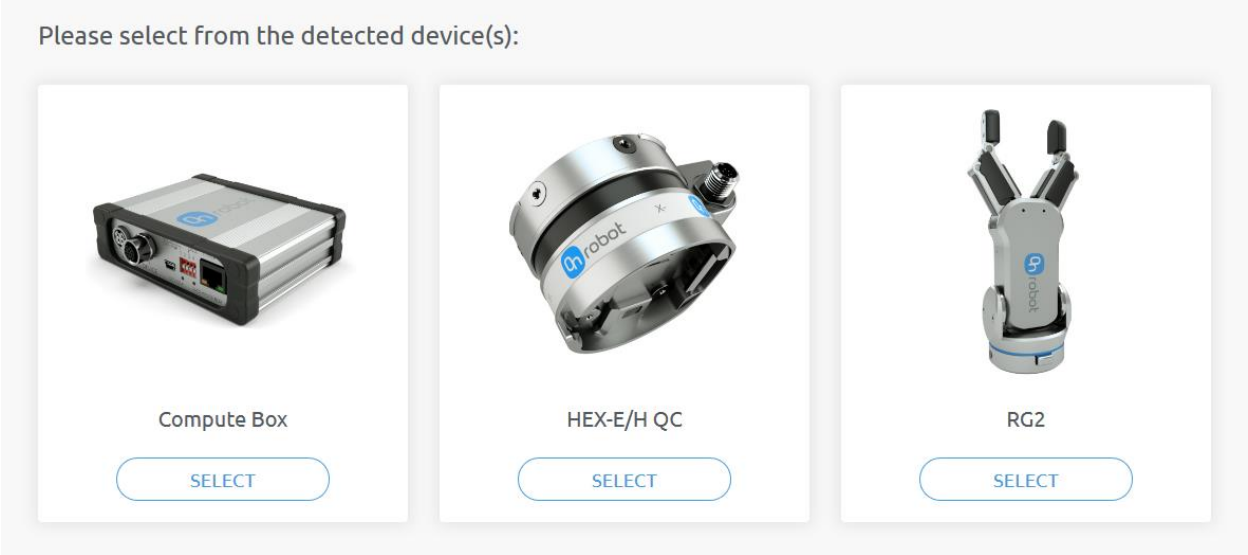
- **Devices** - Monitor and control the connected devices (e.g.: grippers)
- **Configuration** - Change the Compute Box's settings
- **WebLogic** - Program the Digital I/O interface through OnRobot WebLogic
- **Paths** - Import/export the recorded Paths (not available to all robots)
- **Update** - Update the Compute Box and the devices

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

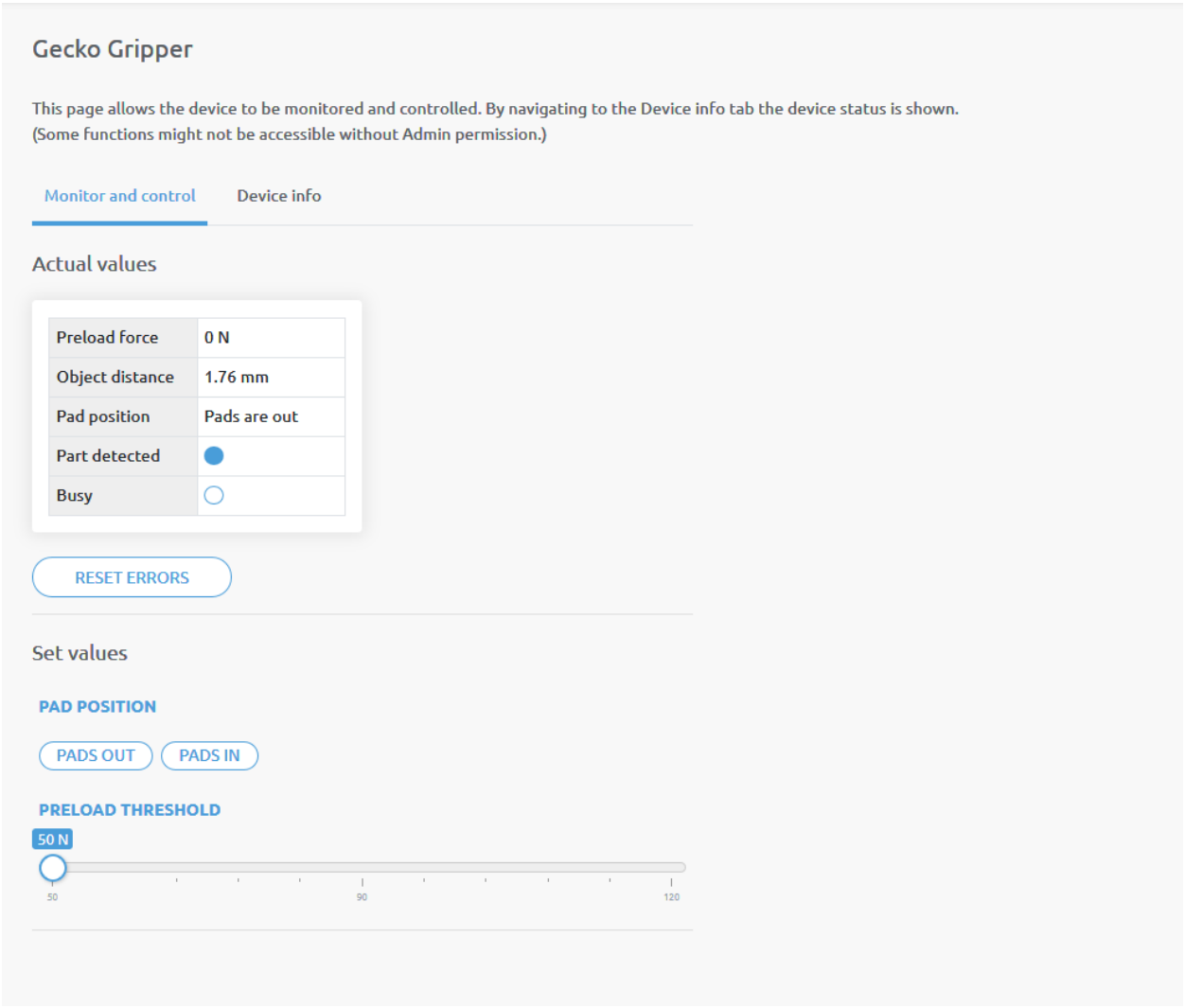
In the following, these menus will be described.

Devices menu

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



Gecko



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:

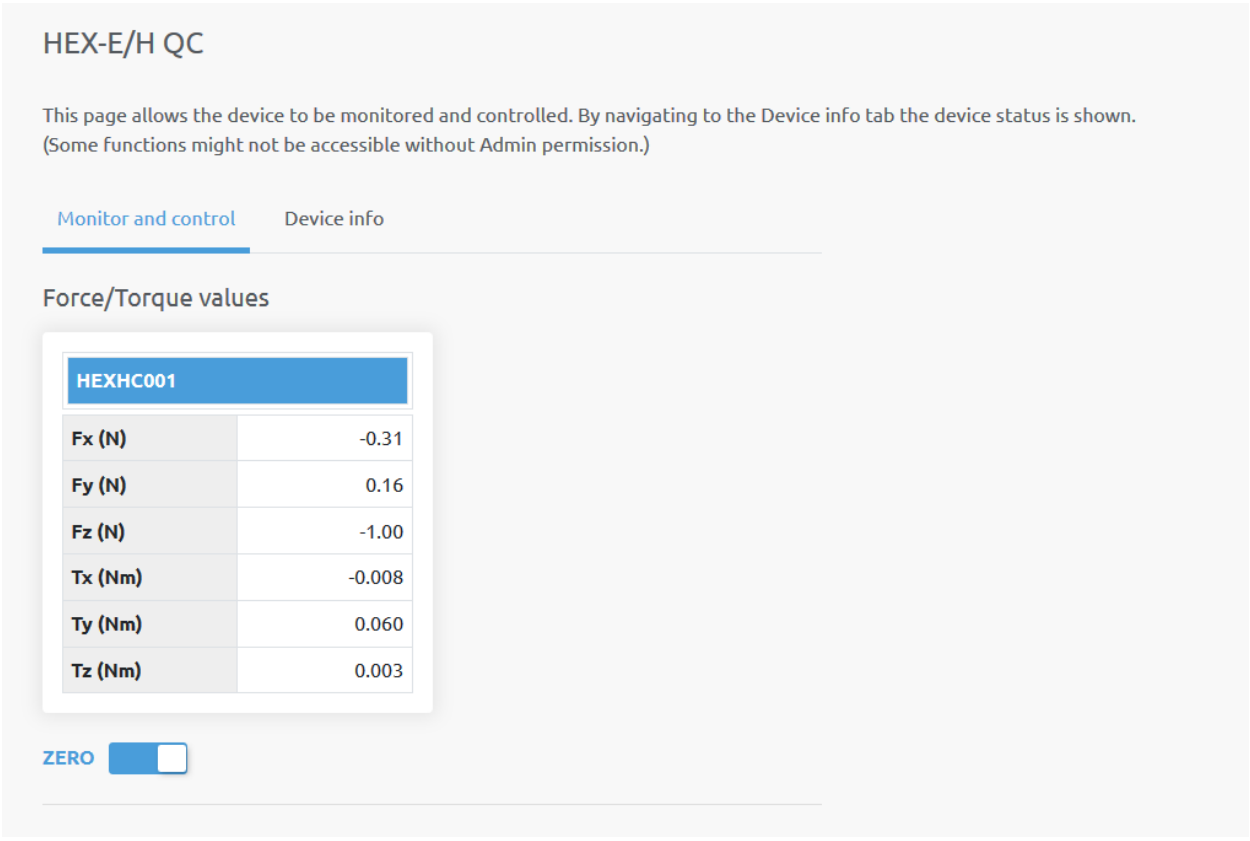
Preload threshold value set on this page is not stored permanently and are restored to the default value (90N) on power reset.

If a part was detected and the object distance becomes > 18mm (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



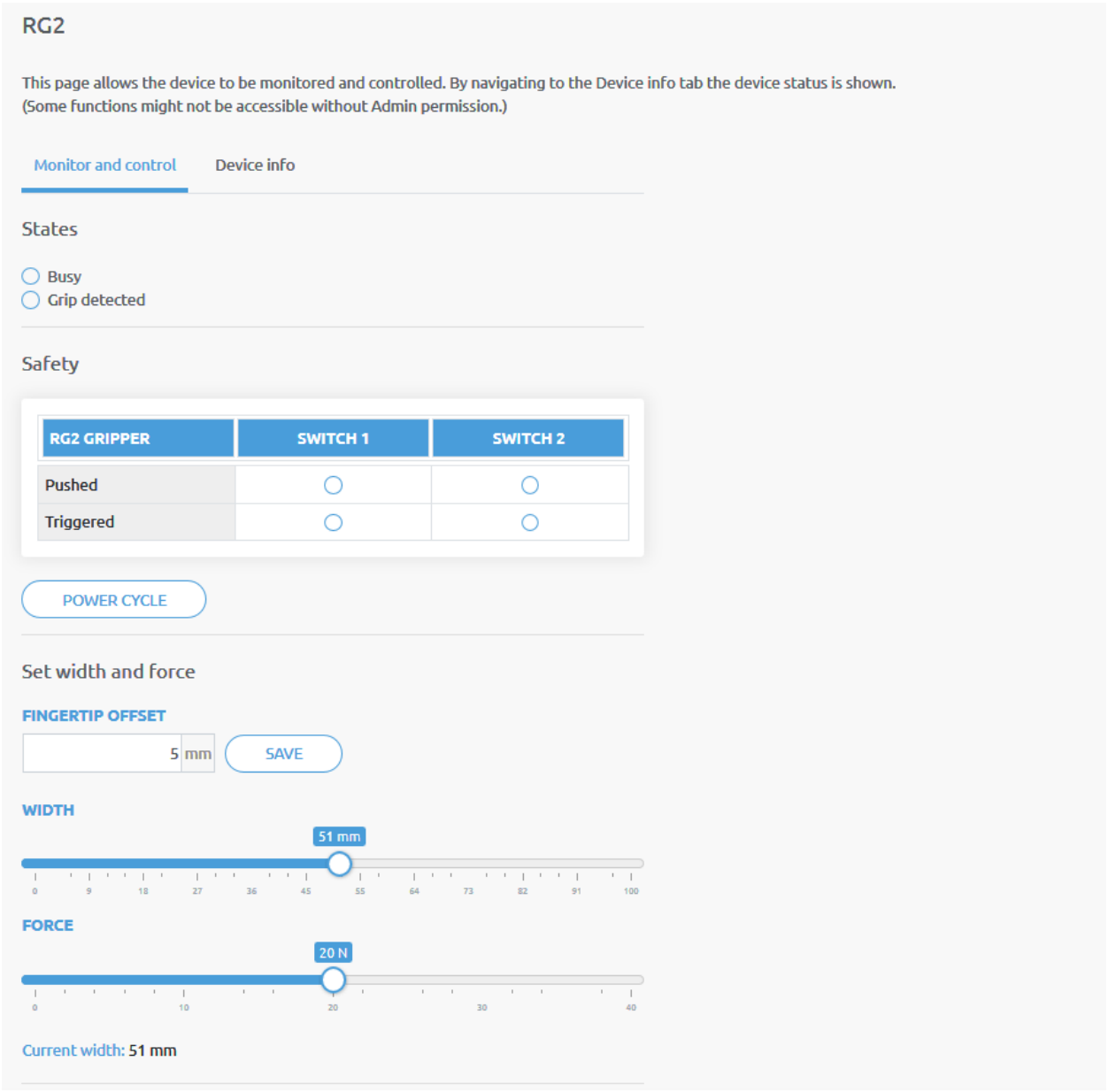
The force and torque values (**Fx,Fy,Fz** and **Tx,Ty,Tz**) are shown in N/Nm.

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

NOTE:

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

RG2/6



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:

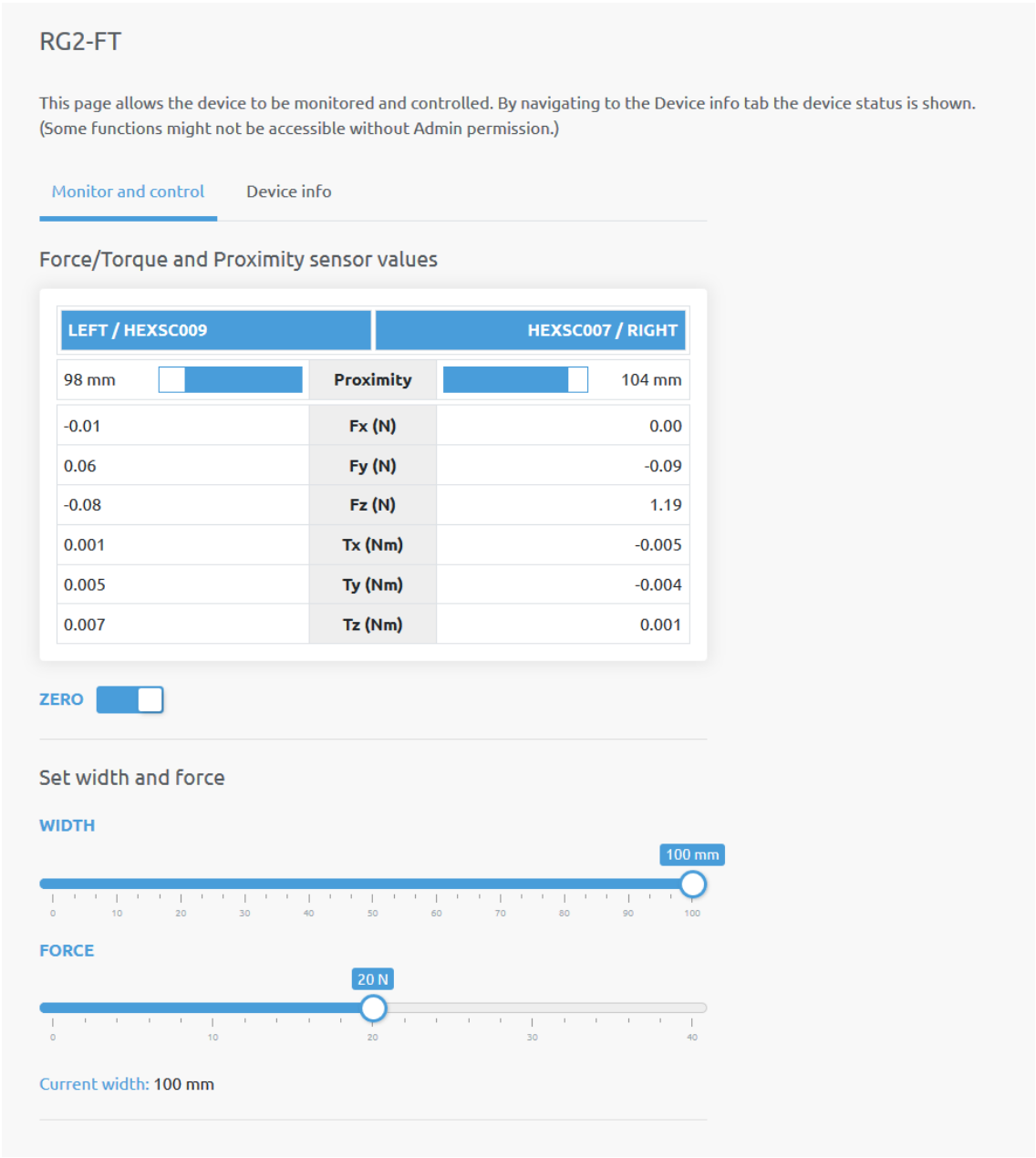
- Check if any of the safety switch is being pushed
- If yes, remove the object pushing the switch

- 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



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.

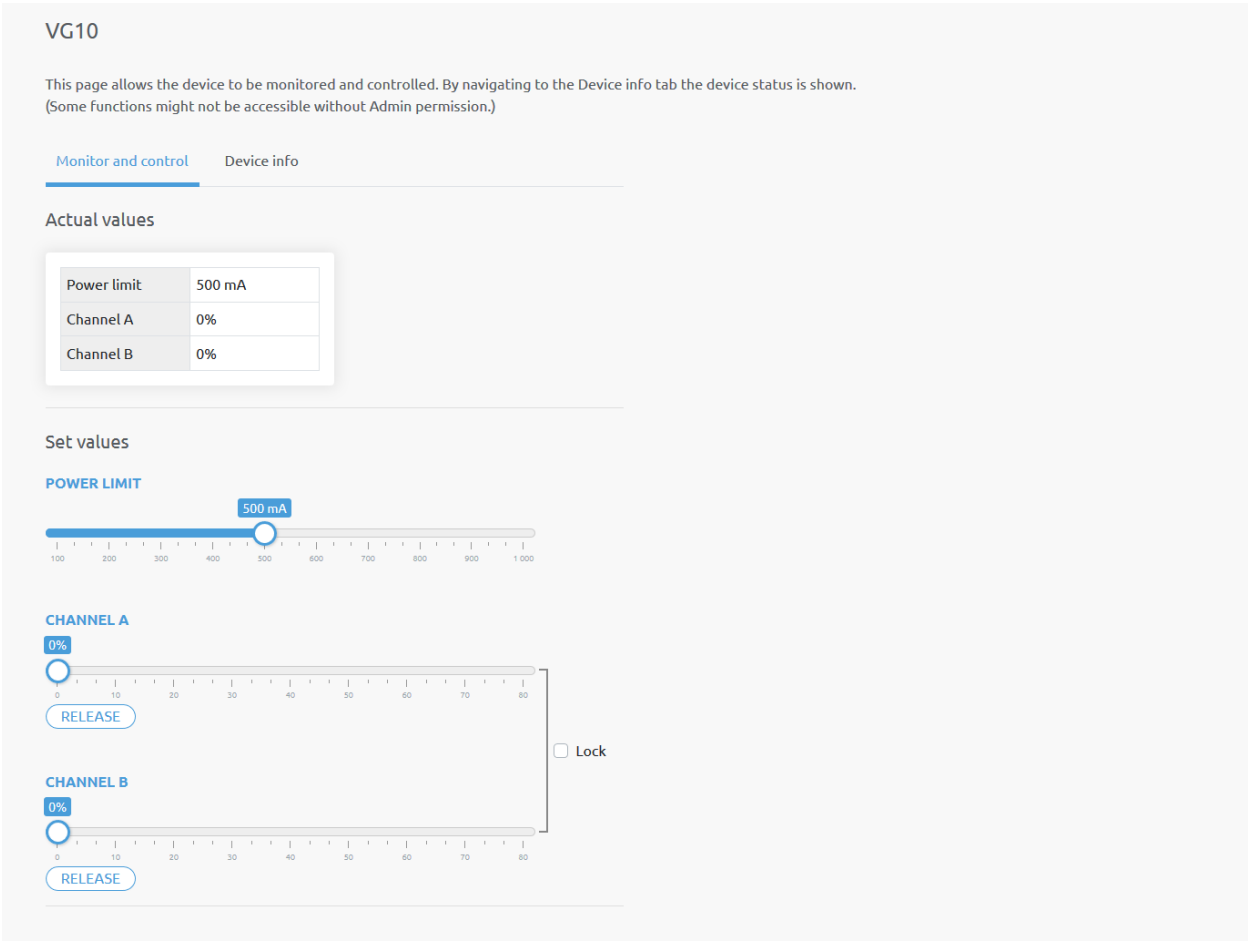
The **Zero** toggle switch can be used to zero the force and torque reading.

NOTE:

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

The 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.

VG10



The actual vacuum level for **Channel A** and **Channel B** can be seen in percentage (in the range of 0…80% 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.

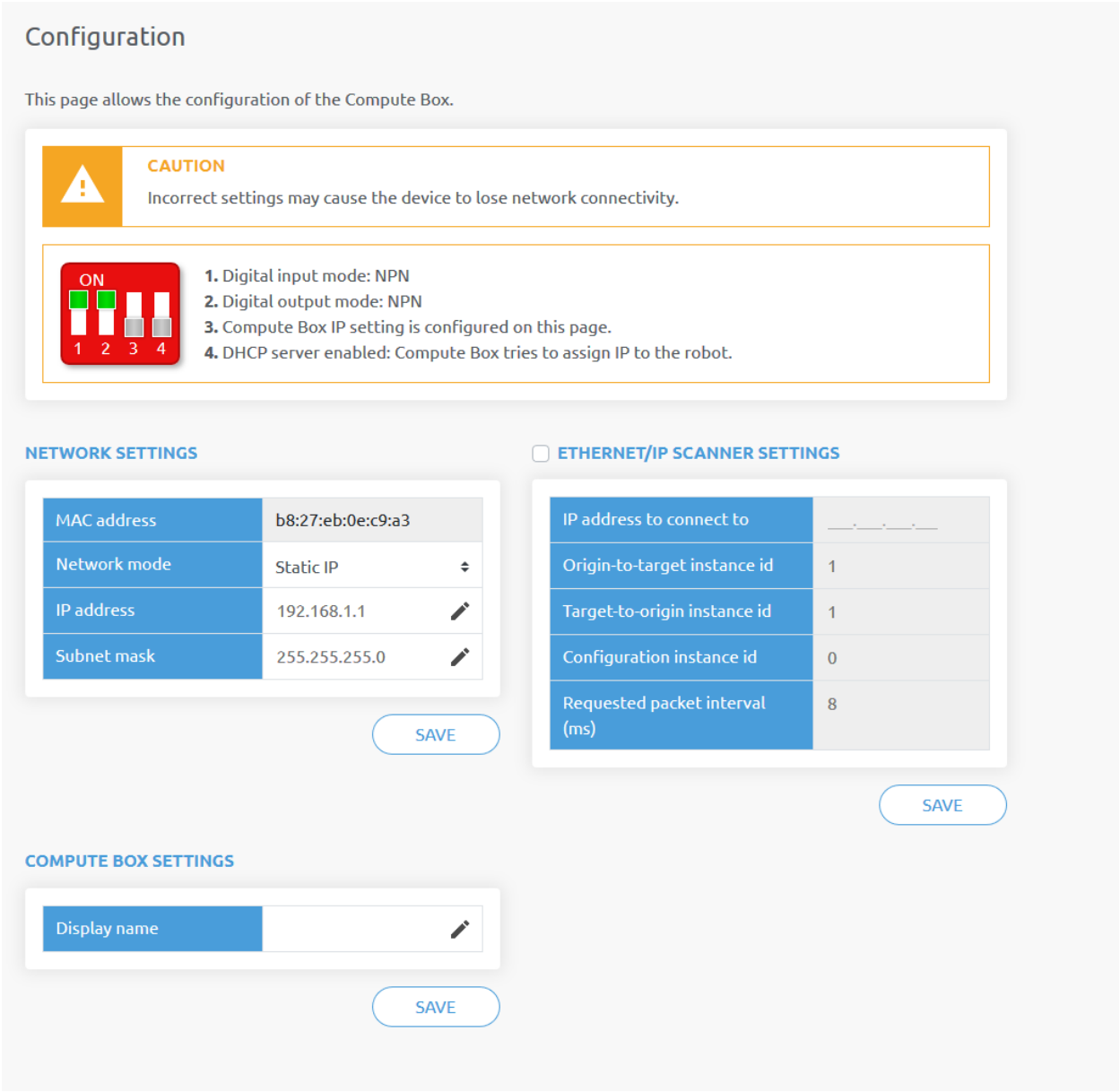
Low power limit may not be sufficient for higher percentage of vacuum and the target vacuum level may not be reached.

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



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)

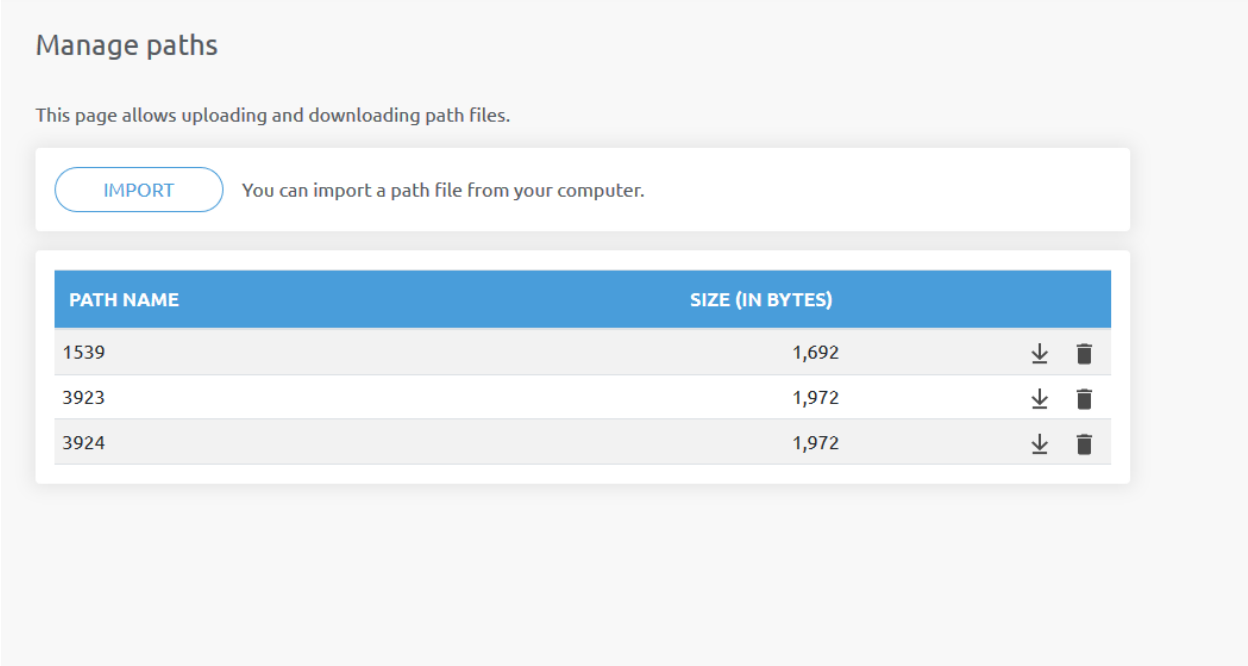
Check the checkbox and the Compute Box will try to automatically connect to the robot (via the given IP address).

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.



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.

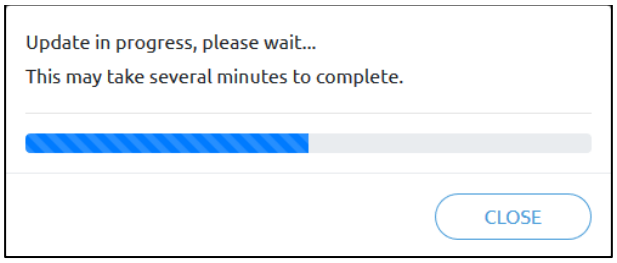
The Compute Box can store up to 100 Mbytes of paths that is roughly equal to 1000 hours of recordings.

Update menu

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**.

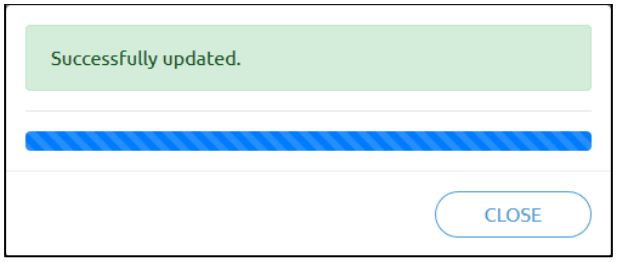
Click on that **Update** button to start the software update process:



CAUTION:

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

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



Now disconnect the device and use it as usual.

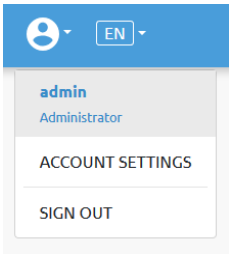
NOTE:

If the software update failed, please contact your distributor.

Account settings

This menu can be used to:

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

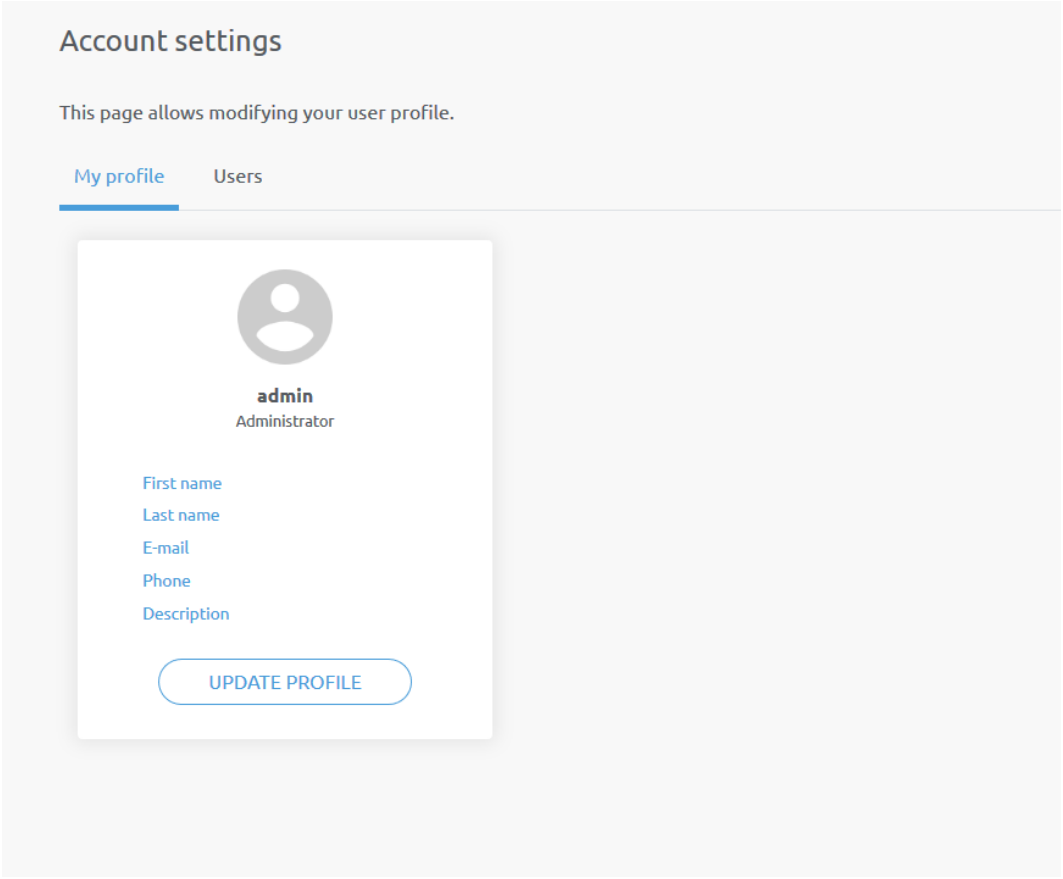


Account settings:

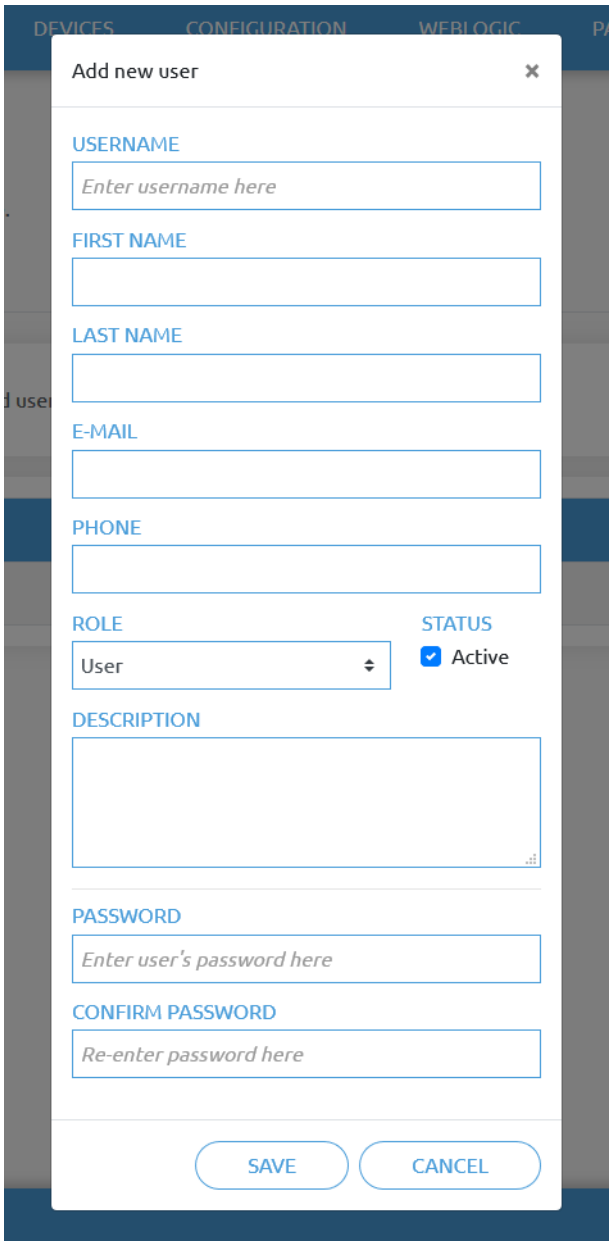
This page has two tabs:

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

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



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

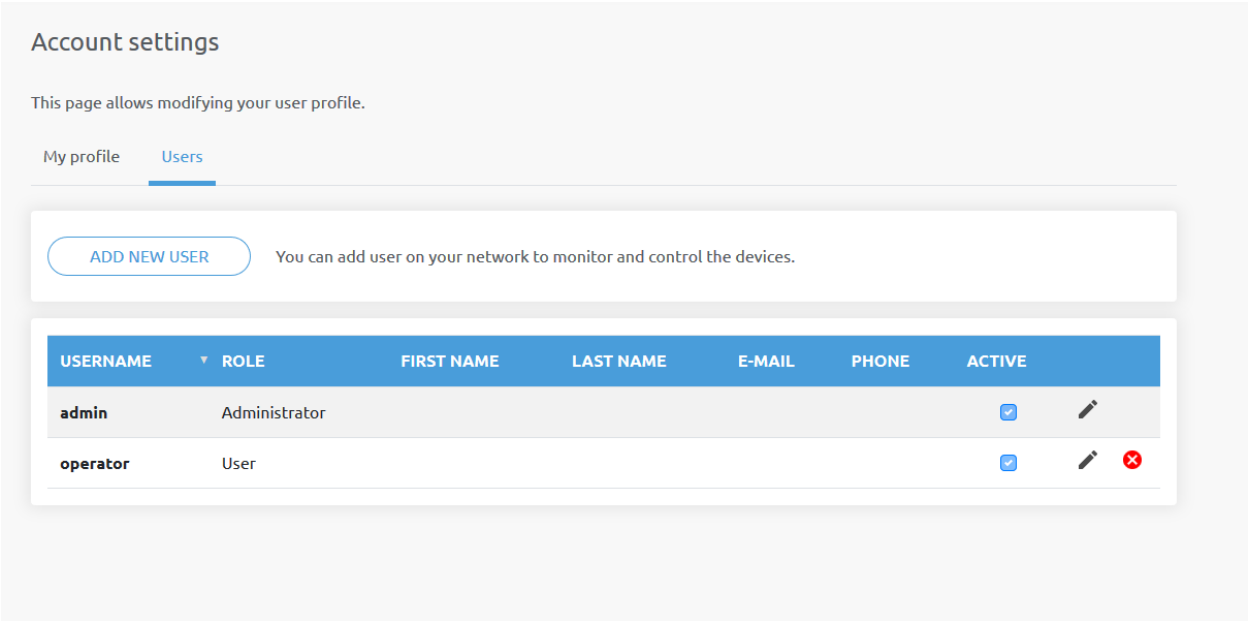


There are three user levels:

- Administrator
- Operator
- User

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

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



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

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

8.2 EtherNet/IP

The OnRobot multi-device EtherNet/IP adapter can be accessed via scanner device (e.g. a robot, a PLC controller). Class 1 (implicit) and Class 3 (explicit) connections are available.

NOTE:

EtherNet/IP EDS file is provided with the devices and can be located on the USB stick.

8.2.1 Available connections and assembly instances

Every device and device combination have 3 connections implemented:

- Exclusive Owner - RECOMMENDED to be used
- Input-only
- Listen-only

Every connection has an [**Input / Target-to-Origin / Producing** assembly] - [**Output / Origin-to-Target / Consuming** assembly] pair.

All assemblies are contained in **Class 4** and have the single **Attribute 3** implemented.

NOTE:

There is no Configuration Instance implemented, if required use instance number 0 and data size 0.

The following assembly instances are available for the single devices and device combinations:

HEX-E/H QC

T->O assembly id: 100

T->O data size: 24 bytes

T->O parameters:

Parameter name		Bytes	Type	Comments	Start bit
	HEX Device connected	2	UINT 16	0: Disconnected 64: HEX is connected	1
	HEX Status	4	UINT 32	0: No error	17
	HEX Filter	2	UINT 16	See below	49
	HEX Fx	2	INT 16	1/10 N	65
	HEX Fy	2	INT 16	1/10 N	81
	HEX Fz	2	INT 16	1/10 N	97
	HEX Tx	2	INT 16	1/100 Nm	113
	HEX Ty	2	INT 16	1/100 Nm	129
	HEX Tz	2	INT 16	1/100 Nm	145
	Reserved	4			161

O->T assembly id: 101

O->T data size: 16 bytes

O->T parameters:

Parameter name		Bytes	Type	Comments	Start bit
	HEX Zero	2	UINT 16	0: Ignored 1: Zero 2: Unzero	1
	HEX Filter	2	UINT 16	0: Ignored 1: No filtering 2: 500 Hz 3: 150 Hz 4: 50 Hz 5: 15 Hz 6: 5 Hz 7: 1.5 Hz	17
	Reserved	12			33

RG2-FT

T->O assembly id: 102

T->O data size: 64 bytes

T->O parameters:

Parameter name		Bytes	Type	Comments	Start bit
	RG2-FT Device connected	2	UINT 16	0: Disconnected 34: RG2-FT is Connected	1
Left	HEX Status	4	UINT 32	0: No error	17
Left	HEX Filter	2	UINT 16	See below	49
Left	HEX Fx	2	INT 16	1/10 N	65
Left	HEX Fy	2	INT 16	1/10 N	81
Left	HEX Fz	2	INT 16	1/10 N	97
Left	HEX Tx	2	INT 16	1/100 Nm	113
Left	HEX Ty	2	INT 16	1/100 Nm	129
Left	HEX Tz	2	INT 16	1/100 Nm	145
	Reserved	4			161
Right	HEX Status	4	UINT 32	0: No error	193
Right	HEX Filter	2	UINT 16	See below	225
Right	HEX Fx	2	INT 16	1/10 N	241
Right	HEX Fy	2	INT 16	1/10 N	257
Right	HEX Fz	2	INT 16	1/10 N	273
Right	HEX Tx	2	INT 16	1/100 Nm	289
Right	HEX Ty	2	INT 16	1/100 Nm	305
Right	HEX Tz	2	INT 16	1/100 Nm	321
	Reserved	4			337
Left	Proximity Distance	2	INT 16	mm	369
Left	Proximity Raw Dist.	2	INT 16	mm	385
Right	Proximity Distance	2	INT 16	mm	401
Right	Proximity Raw Dist.	2	INT 16	mm	417
	RG Actual width	2	INT 16	1/10 mm	433
	RG Status	2	UINT 16	0b___1: Busy 0b__1_: Grip detected 0b_1__: Left Proximity has error 0b1___: Right Proximity has error	449
	Reserved	6			465

O->T assembly id: 103

O->T data size: 32 bytes

O->T parameters:

Parameter name		Bytes	Type	Comments	Start bit
	RG Target Width	2	UINT 16	1/10 mm	1
	RG Target Force	2	UINT 16	1/10 N	17
	RG Control	2	UINT 16	0: Ignored 1: Move 2: Stop	33
	HEX Zero	2	UINT 16	0: Ignored 1: Zero 2: Unzero	49
	HEX Filter	2	UINT 16	0: Ignored 1: No filtering 2: 500 Hz 3: 150 Hz 4: 50 Hz 5: 15 Hz 6: 5 Hz 7: 1.5 Hz	65
Left	Proximity Custom Offset	2	UINT 16	mm	81
Right	Proximity Custom Offset	2	UINT 16	mm	97
	Proximity Store Offset	2	UINT 16	0: Ignored 1: Store actual measured value 2: Store custom offset value	113
	Reserved	16			129

RG2/6

NOTE:

This assembly instance can be used for both single and dual gripper configuration. Not only dual RG2 or dual RG6 but mixed configuration is also possible (RG2+RG6 or RG6+RG2). When used in single gripper configuration always use the **Primary (Prim.)** values.

T->O assembly id: 104

T->O data size: 32 bytes

T->O parameters:

Parameter name		Bytes	Type	Comments	Start bit
Prim.	RG Device connected	2	UINT 16	0: Disconnected 32: RG2 is connected 33: RG6 is connected	1
Prim.	RG Actual Depth	2	INT 16	1/10 mm	17
Prim.	RG Actual Relative Depth	2	INT 16	1/10 mm	33
Prim.	RG Actual Width	2	INT 16	1/10 mm (with fingertip offset)	49
Prim.	RG Status	2	UINT 16	0b_____1: 1 when in motion, 0 when not. The gripper will only accept new commands when 0. 0b_____1_: Internal- or external grip is detected. 0b____1__: Safety switch 1 is pushed. 0b___1___: Safety circuit 1 is activated. The gripper will not move while this flag is high; can only be reset by power cycling the gripper. 0b__1____: Safety switch 2 is pushed. 0b_1_____: Safety circuit 2 is activated. The gripper will not move while this flag is high; can only be reset by power cycling the gripper. 0b1_____: General safety error. Possible cause: the gripper is booted with some safety switch pressed or hardware error.	65
	Reserved	6			81
Sec.	RG Device connected	2	UINT 16	0: Disconnected 32: RG2 is connected 33: RG6 is connected	129
Sec.	RG Actual Depth	2	INT 16	1/10 mm	145
Sec.	RG Actual Relative Depth	2	INT 16	1/10 mm	161
Sec.	RG Actual Width	2	INT 16	1/10 mm (with fingertip offset)	177
Sec.	RG Status	2	UINT 16	Same as above	193
	Reserved	6			209

O->T assembly id: 105

O->T data size: 32 bytes

O->T parameters:

Parameter name		Bytes	Type	Comments	Start bit
Prim.	RG Target Width	2	UINT 16	1/10 mm (corrected with fingertip offset)	1
Prim.	RG Target Force	2	UINT 16	1/10 N	17
Prim.	RG Control	2	UINT 16	0: Ignored 1: Start motion to target 2: Stop the current motion	33
Prim.	RG Custom Fingertip offset	2	INT 16	Offset measured from metal (1/10mm)	49
Prim.	RG Store Fingertip offset	2	UINT 16	0: Ignored 1: Store offset	65
Prim.	RG Reset Tool Power	2	UINT 16	0: Ignored 1: Reset	81
	Reserved	4			97
Sec.	RG Target Width	2	UINT 16	1/10 mm (corrected with fingertip offset)	129
Sec.	RG Target Force	2	UINT 16	1/10 N	145
Sec.	RG Control	2	UINT 16	0: Ignored 1: Start motion to target 2: Stop the current motion	161
Sec.	RG Custom Fingertip offset	2	INT 16	Offset measured from metal (1/10mm)	177
Sec.	RG Store Fingertip offset	2	UINT 16	0: Ignored 1: Store offset	193
Sec.	RG Reset Tool Power	2	UINT 16	0: Ignored 1: Reset	209
	Reserved	4			225

VG10

NOTE:

This assembly instance can be used for both single and dual gripper configuration. When used in single gripper configuration always use the **Primary (Prim.)** values.

T->O assembly id: 106

T->O data size: 32 bytes

T->O parameters:

Parameter name		Bytes	Type	Comments	Start bit
Prim.	VG Device connected	2	UINT 16	0: Disconnected 16: VG10 is connected	1
Prim.	VG Current limit	2	UINT 16	mA	17
Prim.	VG CH A actual vacuum	2	UINT 16	1/10 %	33
Prim.	VG CH B actual vacuum	2	UINT 16	1/10 %	49
	Reserved	8			65
Sec.	VG Device connected	2	UINT 16	0: Disconnected 16: VG10 is connected	129
Sec.	VG Current limit	2	UINT 16	mA	145
Sec.	VG CH A actual vacuum	2	UINT 16	1/10 %	161
Sec.	VG CH B actual vacuum	2	UINT 16	1/10 %	177
	Reserved	8			193

O->T assembly id: 107

O->T data size: 32 bytes

O->T parameters:

Parameter name		Bytes	Type	Comments	Start bit
Prim.	VG CH A Control	2	UINT 16	0: Ignore 1: Grip 2: Idle 3: Release	1
Prim.	VG CH B Control	2	UINT 16	Same as Channel A	17
Prim.	VG CH A Target Vacuum	2	UINT 16	%	33
Prim.	VG CH B Target Vacuum	2	UINT 16	%	49
Prim.	VG Current limit	2	UINT 16	mA	65
	Reserved	6			81
Sec.	VG CH A Control	2	UINT 16	0: Ignore 1: Grip 2: Idle 3: Release	129
Sec.	VG CH B Control	2	UINT 16	Same as Channel A	145
Sec.	VG CH A Target Vacuum	2	UINT 16	%	161
Sec.	VG CH B Target Vacuum	2	UINT 16	%	177
Sec.	VG Current limit	2	UINT 16	mA	193
	Reserved	6			209

Gecko

NOTE:

This assembly instance can be used for both single and dual gripper configuration. When used in single gripper configuration always use the **Primary (Prim.)** values.

T->O assembly id: 108

T->O data size: 32 bytes

T->O parameters:

Parameter name		Bytes	Type	Comments	Start bit
Prim.	Gecko Device connected	2	UINT 16	0: Disconnected 48: Gecko is connected	1
Prim.	Gecko Status	2	UINT 16	0b___1: Part detected 0b__1_: Pads worn 0b_1__: Pads OUT 0b1___: Busy	17
Prim.	Gecko Last Error Code	2	UINT 16	0: No error	33
Prim.	Actual Gecko Preload Force	2	INT 16	1/100 N	49
Prim.	Actual Gecko Ultrasonic Sensor Value	2	INT 16	1/100 mm	65
	Reserved	6			81
Sec.	Gecko Device connected	2	UINT 16	0: Disconnected 48: Gecko is connected	129
Sec.	Gecko Status	2	UINT 16	Same as above	145
Sec.	Gecko Last Error Code	2	UINT 16	0: No error	161
Sec.	Actual Gecko Preload Force	2	INT 16	1/100 N	177
Sec.	Actual Gecko Ultrasonic Sensor Value	2	INT 16	1/100 mm	193
	Reserved	6			209

O->T assembly id: 109

O->T data size: 32 bytes

O->T parameters:

Parameter name		Bytes	Type	Comments	Start bit
Prim.	Gecko Pad Control	2	UINT 16	0: Ignored 1: Push Pads OUT 2: Pull Pads IN	1
Prim.	Gecko Preload Force Threshold	2	UINT 16	0: Ignored 1: 50N 2: 90N 3: 120N	17
Prim.	Gecko Reset Error Logs	2	UINT 16	0: Do not reset, keep logging 1: Reset and disable logging	33
	Reserved	10			49
Sec.	Gecko Pad Control	2	UINT 16	0: Ignored 1: Push Pads OUT 2: Pull Pads IN	129
Sec.	Gecko Preload Force Threshold	2	UINT 16	0: Ignored 1: 50N 2: 90N 3: 120N	145
Sec.	Gecko Reset Error Logs	2	UINT 16	0: Do not reset, keep logging 1: Reset and disable logging	161
	Reserved	10			177

HEX-E/H QC + RG2/6

T->O assembly id: 150

T->O data size: 40 bytes

T->O parameters:

Parameter name		Bytes	Type	Comments	Start bit
	HEX Device connected	2	UINT 16	0: Disconnected 64: HEX is connected	1
	HEX Status	4	UINT 32	0: No error	17
	HEX Filter	2	UINT 16	See below	49
	HEX Fx	2	INT 16	1/10 N	65
	HEX Fy	2	INT 16	1/10 N	81
	HEX Fz	2	INT 16	1/10 N	97
	HEX Tx	2	INT 16	1/100 Nm	113
	HEX Ty	2	INT 16	1/100 Nm	129
	HEX Tz	2	INT 16	1/100 Nm	145
	Reserved	4			161
Prim.	RG Device connected	2	UINT 16	0: Disconnected 32: RG2 is connected 33: RG6 is connected	193
Prim.	RG Actual Depth	2	INT 16	1/10 mm	209
Prim.	RG Actual Relative Depth	2	INT 16	1/10 mm	225
Prim.	RG Actual Width	2	INT 16	1/10 mm (with fingertip offset)	241
Prim.	RG Status	2	UINT 16	0b_____1: 1 when in motion, 0 when not. The gripper will only accept new commands when 0. 0b_____1_: Internal- or external grip is detected. 0b____1__: Safety switch 1 is pushed. 0b___1___: Safety circuit 1 is activated. The gripper will not move while this flag is high; can only be reset by power cycling the gripper. 0b__1____: Safety switch 2 is pushed. 0b_1_____: Safety circuit 2 is activated. The gripper will not move while this flag is high; can only be reset by power cycling the gripper. 0b1_____: General safety error. Possible cause: the gripper is booted with some safety switch pressed or hardware error.	257
	Reserved	6			273

O->T assembly id: 151

O->T data size: 32 bytes

O->T parameters:

Parameter name		Bytes	Type	Comments	Start bit
	HEX Zero	2	UINT 16	0: Ignored 1: Zero 2: Unzero	1
	HEX Filter	2	UINT 16	0: Ignored 1: No filtering 2: 500 Hz 3: 150 Hz 4: 50 Hz 5: 15 Hz 6: 5 Hz 7: 1.5 Hz	17
	Reserved	12			33
Prim.	RG Target Width	2	UINT 16	1/10 mm (corrected with fingertip offset)	129
Prim.	RG Target Force	2	UINT 16	1/10 N	145
Prim.	RG Control	2	UINT 16	0: Ignored 1: Start motion to target 2: Stop the current motion	161
Prim.	RG Custom Fingertip offset	2	INT 16	Offset measured from metal (1/10mm)	177
Prim.	RG Store Fingertip offset	2	UINT 16	0: Ignored 1: Store offset	193
Prim.	RG Reset Tool Power	2	UINT 16	0: Ignored 1: Reset	209
	Reserved	4			225

HEX-E/H QC + VG10

T->O assembly id: 152

T->O data size: 40 bytes

T->O parameters:

Parameter name		Bytes	Type	Comments	Start bit
	HEX Device connected	2	UINT 16	0: Disconnected 64: HEX is connected	1
	HEX Status	4	UINT 32	0: No error	17
	HEX Filter	2	UINT 16	See below	49
	HEX Fx	2	INT 16	1/10 N	65
	HEX Fy	2	INT 16	1/10 N	81
	HEX Fz	2	INT 16	1/10 N	97
	HEX Tx	2	INT 16	1/100 Nm	113
	HEX Ty	2	INT 16	1/100 Nm	129
	HEX Tz	2	INT 16	1/100 Nm	145
	Reserved	4			161
Prim.	VG Device connected	2	UINT 16	0: Disconnected 16: VG10 is connected	193
Prim.	VG Current limit	2	UINT 16	mA	209
Prim.	VG CH A actual vacuum	2	UINT 16	1/10 %	225
Prim.	VG CH B actual vacuum	2	UINT 16	1/10 %	241
	Reserved	8			257

O->T assembly id: 153

O->T data size: 32 bytes

O->T parameters:

Parameter name		Bytes	Type	Comments	Start bit
	HEX Zero	2	UINT 16	0: Ignored 1: Zero 2: Unzero	1
	HEX Filter	2	UINT 16	0: Ignored 1: No filtering 2: 500 Hz 3: 150 Hz 4: 50 Hz 5: 15 Hz 6: 5 Hz 7: 1.5 Hz	17
	Reserved	12			33
Prim.	VG CH A Control	2	UINT 16	0: Ignore 1: Grip 2: Idle 3: Release	129
Prim.	VG CH B Control	2	UINT 16	Same as Channel A	145
Prim.	VG CH A Target Vacuum	2	UINT 16	%	161
Prim.	VG CH B Target Vacuum	2	UINT 16	%	177
Prim.	VG Current limit	2	UINT 16	mA	193
0	Reserved	6			209

HEX-E/H QC + Gecko

T->O assembly id: 154

T->O data size: 40 bytes

T->O parameters:

Parameter name		Bytes	Type	Comments	Start bit
	HEX Device connected	2	UINT 16	0: Disconnected 64: HEX is connected	1
	HEX Status	4	UINT 32	0: No error	17
	HEX Filter	2	UINT 16	See below	49
	HEX Fx	2	INT 16	1/10 N	65
	HEX Fy	2	INT 16	1/10 N	81
	HEX Fz	2	INT 16	1/10 N	97
	HEX Tx	2	INT 16	1/100 Nm	113
	HEX Ty	2	INT 16	1/100 Nm	129
	HEX Tz	2	INT 16	1/100 Nm	145
	Reserved	4			161
Prim.	Gecko Device connected	2	UINT 16	0: Disconnected 48: Gecko is connected	193
Prim.	Gecko Status	2	UINT 16	0b___1: Part detected 0b__1_: Pads worn 0b_1__: Pads OUT 0b1___: Busy	209
Prim.	Gecko Last Error Code	2	UINT 16	0: No error	225
Prim.	Actual Gecko Preload Force	2	INT 16	1/100 N	241
Prim.	Actual Gecko Ultrasonic Sensor Value	2	INT 16	1/100 mm	257
	Reserved	6			273

O->T assembly id: 155

O->T data size: 32 bytes

O->T parameters:

Parameter name		Bytes	Type	Comments	Start bit
	HEX Zero	2	UINT 16	0: Ignored 1: Zero 2: Unzero	1
	HEX Filter	2	UINT 16	0: Ignored 1: No filtering 2: 500 Hz 3: 150 Hz 4: 50 Hz 5: 15 Hz 6: 5 Hz 7: 1.5 Hz	17
	Reserved	12			33
Prim.	Gecko Pad Control	2	UINT 16	0: Ignored 1: Push Pads OUT 2: Pull Pads IN	129
Prim.	Gecko Preload Force Threshold	2	UINT 16	0: Ignored 1: 50N 2: 90N 3: 120N	145
Prim.	Gecko Reset Error Logs	2	UINT 16	0: Do not reset, keep logging 1: Reset and disable logging	161
	Reserved	10			177

RG2/6 + VG10

T->O assembly id: 156

T->O data size: 64 bytes

T->O parameters:

Parameter name		Bytes	Type	Comments	Start bit
Prim.	RG Device connected	2	UINT 16	0: Disconnected 32: RG2 is connected 33: RG6 is connected	1
Prim.	RG Actual Depth	2	INT 16	1/10 mm	17
Prim.	RG Actual Relative Depth	2	INT 16	1/10 mm	33
Prim.	RG Actual Width	2	INT 16	1/10 mm (with fingertip offset)	49
Prim.	RG Status	2	UINT 16	0b_____1: 1 when in motion, 0 when not. The gripper will only accept new commands when 0. 0b_____1_: Internal- or external grip is detected. 0b____1__: Safety switch 1 is pushed. 0b___1___: Safety circuit 1 is activated. The gripper will not move while this flag is high; can only be reset by power cycling the gripper. 0b__1____: Safety switch 2 is pushed. 0b_1_____: Safety circuit 2 is activated. The gripper will not move while this flag is high; can only be reset by power cycling the gripper. 0b1_____: General safety error. Possible cause: the gripper is booted with some safety switch pressed or hardware error.	65
	Reserved	6			81
Sec.	RG Device connected	2	UINT 16	0: Disconnected 32: RG2 is connected 33: RG6 is connected	129
Sec.	RG Actual Depth	2	INT 16	1/10 mm	145
Sec.	RG Actual Relative Depth	2	INT 16	1/10 mm	161
Sec.	RG Actual Width	2	INT 16	1/10 mm (with fingertip offset)	177
Sec.	RG Status	2	UINT 16	Same as above	193
	Reserved	6			209
Prim.	VG Device connected	2	UINT 16	0: Disconnected 16: VG10 is connected	257
Prim.	VG Current limit	2	UINT 16	mA	273
Prim.	VG CH A actual vacuum	2	UINT 16	1/10 %	289
Prim.	VG CH B actual vacuum	2	UINT 16	1/10 %	305
	Reserved	8			321
Sec.	VG Device connected	2	UINT 16	0: Disconnected 16: VG10 is connected	385
Sec.	VG Current limit	2	UINT 16	mA	401
Sec.	VG CH A actual vacuum	2	UINT 16	1/10 %	417
Sec.	VG CH B actual vacuum	2	UINT 16	1/10 %	433
	Reserved	8			449

O->T assembly id: 157

O->T data size: 64 bytes

O->T parameters:

Parameter name		Bytes	Type	Comments	Start bit
Prim.	RG Target Width	2	UINT 16	1/10 mm (corrected with fingertip offset)	1
Prim.	RG Target Force	2	UINT 16	1/10 N	17
Prim.	RG Control	2	UINT 16	0: Ignored 1: Start motion to target 2: Stop the current motion	33
Prim.	RG Custom Fingertip offset	2	INT 16	Offset measured from metal (1/10mm)	49
Prim.	RG Store Fingertip offset	2	UINT 16	0: Ignored 1: Store offset	65
Prim.	RG Reset Tool Power	2	UINT 16	0: Ignored 1: Reset	81
	Reserved	4			97
Sec.	RG Target Width	2	UINT 16	1/10 mm (corrected with fingertip offset)	129
Sec.	RG Target Force	2	UINT 16	1/10 N	145
Sec.	RG Control	2	UINT 16	0: Ignored 1: Start motion to target 2: Stop the current motion	161
Sec.	RG Custom Fingertip offset	2	INT 16	Offset measured from metal (1/10mm)	177
Sec.	RG Store Fingertip offset	2	UINT 16	0: Ignored 1: Store offset	193
Sec.	RG Reset Tool Power	2	UINT 16	0: Ignored 1: Reset	209
	Reserved	4			225
Prim.	VG CH A Control	2	UINT 16	0: Ignore 1: Grip 2: Idle 3: Release	257
Prim.	VG CH B Control	2	UINT 16	Same as Channel A	273
Prim.	VG CH A Target Vacuum	2	UINT 16	%	289
Prim.	VG CH B Target Vacuum	2	UINT 16	%	305
Prim.	VG Current limit	2	UINT 16	mA	321
	Reserved	6			337
Sec.	VG CH A Control	2	UINT 16	0: Ignore 1: Grip 2: Idle 3: Release	385
Sec.	VG CH B Control	2	UINT 16	Same as Channel A	401
Sec.	VG CH A Target Vacuum	2	UINT 16	%	417
Sec.	VG CH B Target Vacuum	2	UINT 16	%	433
Sec.	VG Current limit	2	UINT 16	mA	449
	Reserved	6			465

RG2/6 + Gecko

T->O assembly id: 158

T->O data size: 64 bytes

T->O parameters:

Parameter name		Bytes	Type	Comments	Start bit
Prim.	RG Device connected	2	UINT 16	0: Disconnected 32: RG2 is connected 33: RG6 is connected	1
Prim.	RG Actual Depth	2	INT 16	1/10 mm	17
Prim.	RG Actual Relative Depth	2	INT 16	1/10 mm	33
Prim.	RG Actual Width	2	INT 16	1/10 mm (with fingertip offset)	49
Prim.	RG Status	2	UINT 16	0b_____1: 1 when in motion, 0 when not. The gripper will only accept new commands when 0. 0b_____1_: Internal- or external grip is detected. 0b____1__: Safety switch 1 is pushed. 0b___1___: Safety circuit 1 is activated. The gripper will not move while this flag is high; can only be reset by power cycling the gripper. 0b__1____: Safety switch 2 is pushed. 0b_1_____: Safety circuit 2 is activated. The gripper will not move while this flag is high; can only be reset by power cycling the gripper. 0b1_____: General safety error. Possible cause: the gripper is booted with some safety switch pressed or hardware error.	65
	Reserved	6			81
Sec.	RG Device connected	2	UINT 16	0: Disconnected 32: RG2 is connected 33: RG6 is connected	129
Sec.	RG Actual Depth	2	INT 16	1/10 mm	145
Sec.	RG Actual Relative Depth	2	INT 16	1/10 mm	161
Sec.	RG Actual Width	2	INT 16	1/10 mm (with fingertip offset)	177
Sec.	RG Status	2	UINT 16	Same as above	193
	Reserved	6			209
Prim.	Gecko Device connected	2	UINT 16	0: Disconnected 48: Gecko is connected	257
Prim.	Gecko Status	2	UINT 16	0b___1: Part detected 0b__1_: Pads worn 0b_1__: Pads OUT 0b1___: Busy	273
Prim.	Gecko Last Error Code	2	UINT 16	0: No error	289
Prim.	Actual Gecko Preload Force	2	INT 16	1/100 N	305
Prim.	Actual Gecko Ultrasonic Sensor Value	2	INT 16	1/100 mm	321
	Reserved	6			337
Sec.	Gecko Device connected	2	UINT 16	0: Disconnected 48: Gecko is connected	385

Sec.	Gecko Status	2	UINT 16	Same as above	401
Sec.	Gecko Last Error Code	2	UINT 16	0: No error	417
Sec.	Actual Gecko Preload Force	2	INT 16	1/100 N	433
Sec.	Actual Gecko Ultrasonic Sensor Value	2	INT 16	1/100 mm	449
	Reserved	6			465

O->T assembly id: 159

O->T data size: 64 bytes

O->T parameters:

Parameter name		Bytes	Type	Comments	Start bit
Prim.	RG Target Width	2	UINT 16	1/10 mm (corrected with fingertip offset)	1
Prim.	RG Target Force	2	UINT 16	1/10 N	17
Prim.	RG Control	2	UINT 16	0: Ignored 1: Start motion to target 2: Stop the current motion	33
Prim.	RG Custom Fingertip offset	2	INT 16	Offset measured from metal (1/10mm)	49
Prim.	RG Store Fingertip offset	2	UINT 16	0: Ignored 1: Store offset	65
Prim.	RG Reset Tool Power	2	UINT 16	0: Ignored 1: Reset	81
	Reserved	4			97
Sec.	RG Target Width	2	UINT 16	1/10 mm (corrected with fingertip offset)	129
Sec.	RG Target Force	2	UINT 16	1/10 N	145
Sec.	RG Control	2	UINT 16	0: Ignored 1: Start motion to target 2: Stop the current motion	161
Sec.	RG Custom Fingertip offset	2	INT 16	Offset measured from metal (1/10mm)	177
Sec.	RG Store Fingertip offset	2	UINT 16	0: Ignored 1: Store offset	193
Sec.	RG Reset Tool Power	2	UINT 16	0: Ignored 1: Reset	209
	Reserved	4			225
Prim.	Gecko Pad Control	2	UINT 16	0: Ignored 1: Push Pads OUT 2: Pull Pads IN	257
Prim.	Gecko Preload Force Threshold	2	UINT 16	0: Ignored 1: 50N 2: 90N 3: 120N	273
Prim.	Gecko Reset Error Logs	2	UINT 16	0: Do not reset, keep logging 1: Reset and disable logging	289
	Reserved	10			305
Sec.	Gecko Pad Control	2	UINT 16	0: Ignored 1: Push Pads OUT 2: Pull Pads IN	385
Sec.	Gecko Preload Force Threshold	2	UINT 16	0: Ignored 1: 50N 2: 90N 3: 120N	401
Sec.	Gecko Reset Error Logs	2	UINT 16	0: Do not reset, keep logging 1: Reset and disable logging	417
	Reserved	10			433

VG10 + Gecko

T->O assembly id: 160

T->O data size: 64 bytes

T->O parameters:

Parameter name		Bytes	Type	Comments	Start bit
Prim.	VG Device connected	2	UINT 16	0: Disconnected 16: VG10 is connected	1
Prim.	VG Current limit	2	UINT 16	mA	17
Prim.	VG CH A actual vacuum	2	UINT 16	1/10 %	33
Prim.	VG CH B actual vacuum	2	UINT 16	1/10 %	49
	Reserved	8			65
Sec.	VG Device connected	2	UINT 16	0: Disconnected 16: VG10 is connected	129
Sec.	VG Current limit	2	UINT 16	mA	145
Sec.	VG CH A actual vacuum	2	UINT 16	1/10 %	161
Sec.	VG CH B actual vacuum	2	UINT 16	1/10 %	177
	Reserved	8			193
Prim.	Gecko Device connected	2	UINT 16	0: Disconnected 48: Gecko is connected	257
Prim.	Gecko Status	2	UINT 16	0b___1: Part detected 0b__1_: Pads worn 0b_1__: Pads OUT 0b1___: Busy	273
Prim.	Gecko Last Error Code	2	UINT 16	0: No error	289
Prim.	Actual Gecko Preload Force	2	INT 16	1/100 N	305
Prim.	Actual Gecko Ultrasonic Sensor Value	2	INT 16	1/100 mm	321
	Reserved	6			337
Sec.	Gecko Device connected	2	UINT 16	0: Disconnected 48: Gecko is connected	385
Sec.	Gecko Status	2	UINT 16	Same as above	401
Sec.	Gecko Last Error Code	2	UINT 16	0: No error	417
Sec.	Actual Gecko Preload Force	2	INT 16	1/100 N	433
Sec.	Actual Gecko Ultrasonic Sensor Value	2	INT 16	1/100 mm	449
	Reserved	6			465

O->T assembly id: 161

O->T data size: 64 bytes

O->T parameters:

Parameter name		Bytes	Type	Comments	Start bit
Prim.	VG CH A Control	2	UINT 16	0: Ignore 1: Grip 2: Idle 3: Release	1
Prim.	VG CH B Control	2	UINT 16	Same as Channel A	17
Prim.	VG CH A Target Vacuum	2	UINT 16	%	33
Prim.	VG CH B Target Vacuum	2	UINT 16	%	49
Prim.	VG Current limit	2	UINT 16	mA	65
	Reserved	6			81
Sec.	VG CH A Control	2	UINT 16	0: Ignore 1: Grip 2: Idle 3: Release	129
Sec.	VG CH B Control	2	UINT 16	Same as Channel A	145
Sec.	VG CH A Target Vacuum	2	UINT 16	%	161
Sec.	VG CH B Target Vacuum	2	UINT 16	%	177
Sec.	VG Current limit	2	UINT 16	mA	193
	Reserved	6			209
Prim.	Gecko Pad Control	2	UINT 16	0: Ignored 1: Push Pads OUT 2: Pull Pads IN	257
Prim.	Gecko Preload Force Threshold	2	UINT 16	0: Ignored 1: 50N 2: 90N 3: 120N	273
Prim.	Gecko Reset Error Logs	2	UINT 16	0: Do not reset, keep logging 1: Reset and disable logging	289
	Reserved	10			305
Sec.	Gecko Pad Control	2	UINT 16	0: Ignored 1: Push Pads OUT 2: Pull Pads IN	385
Sec.	Gecko Preload Force Threshold	2	UINT 16	0: Ignored 1: 50N 2: 90N 3: 120N	401
Sec.	Gecko Reset Error Logs	2	UINT 16	0: Do not reset, keep logging 1: Reset and disable logging	417
	Reserved	10			433

9 Hardware Specification

9.1 Technical sheets

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.

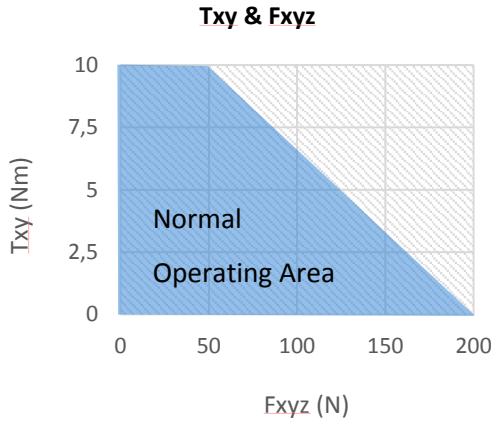
Operating Conditions	Minimum	Typical	Maximum	Unit
Power supply	7	-	24	[V]
Power consumption	-	-	0.8	[W]
Operating temperature	0 32	- -	55 131	[°C] [°F]
Relative humidity (non-condensing)	0	-	95	[%]
Calculated MTBF (operating life)	30.000	-	-	[Hours]

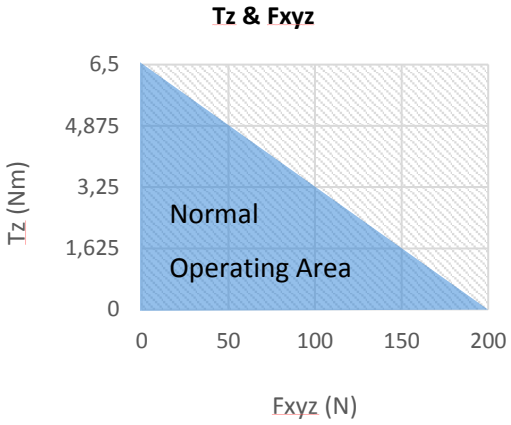
Complex loading

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.

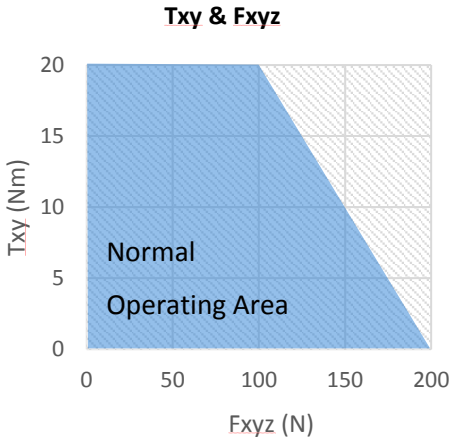
Operating Conditions	Minimum	Typical	Maximum	Unit
Power supply	7	-	24	[V]
Power consumption	-	-	0.8	[W]
Operating temperature	0 32	- -	55 131	[°C] [°F]
Relative humidity (non-condensing)	0	-	95	[%]
Calculated MTBF (operating life)	30.000	-	-	[Hours]

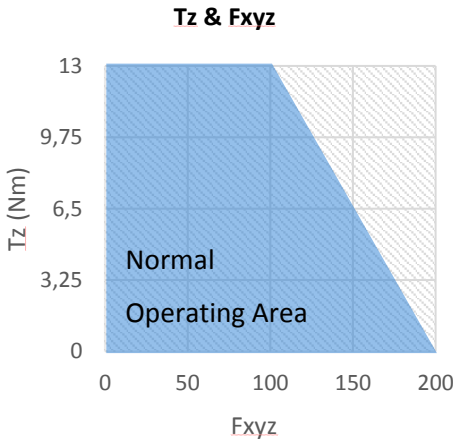
Complex loading

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

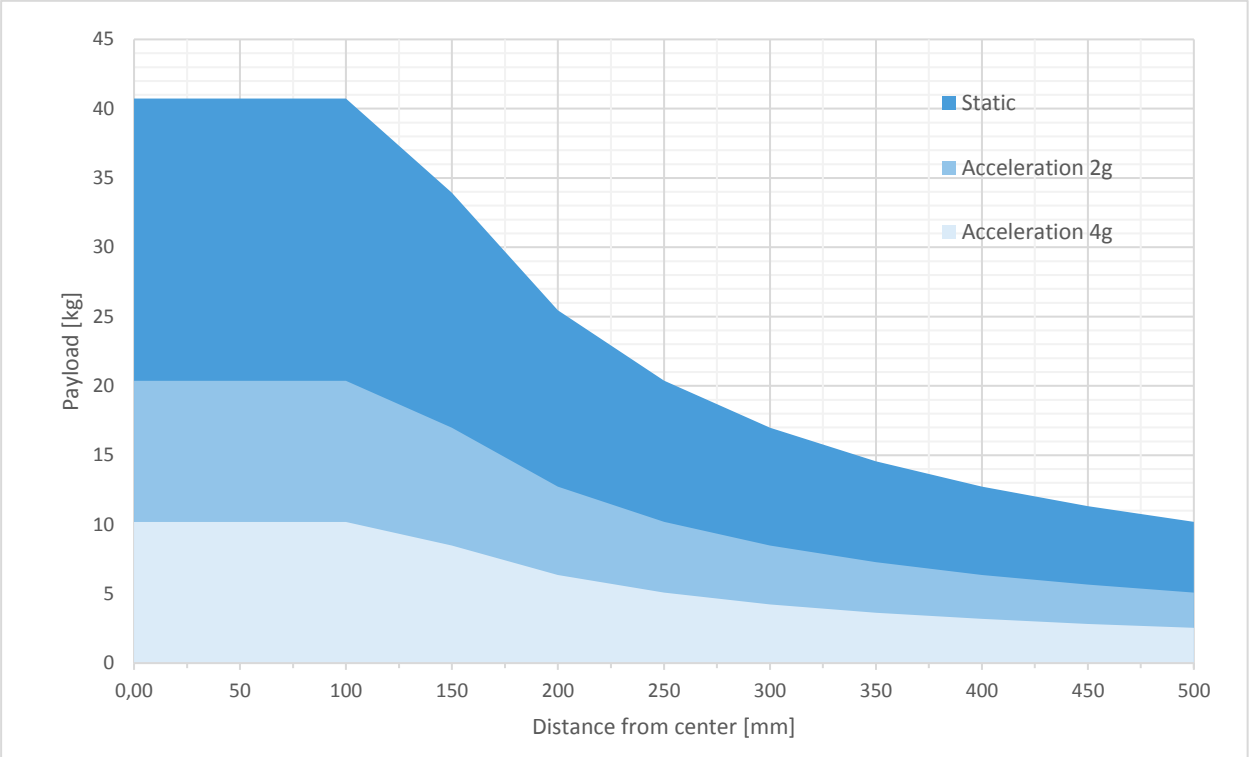
If not specified, the data represent the combination of the different Quick Changer types/sides.

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]

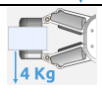
* See load capacity graph on the next page.

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

Load capacity



RG2-FT

General Properties	Min	Typical	Max	Units
Payload Force Fit 	- -	- -	2 4.4	[kg] [lb]
Payload Form Fit 	- -	- -	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]
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 136

** based on 8mm total movement between fingers. The speed is linearly proportional to the force. For more details see speed table on page 136.

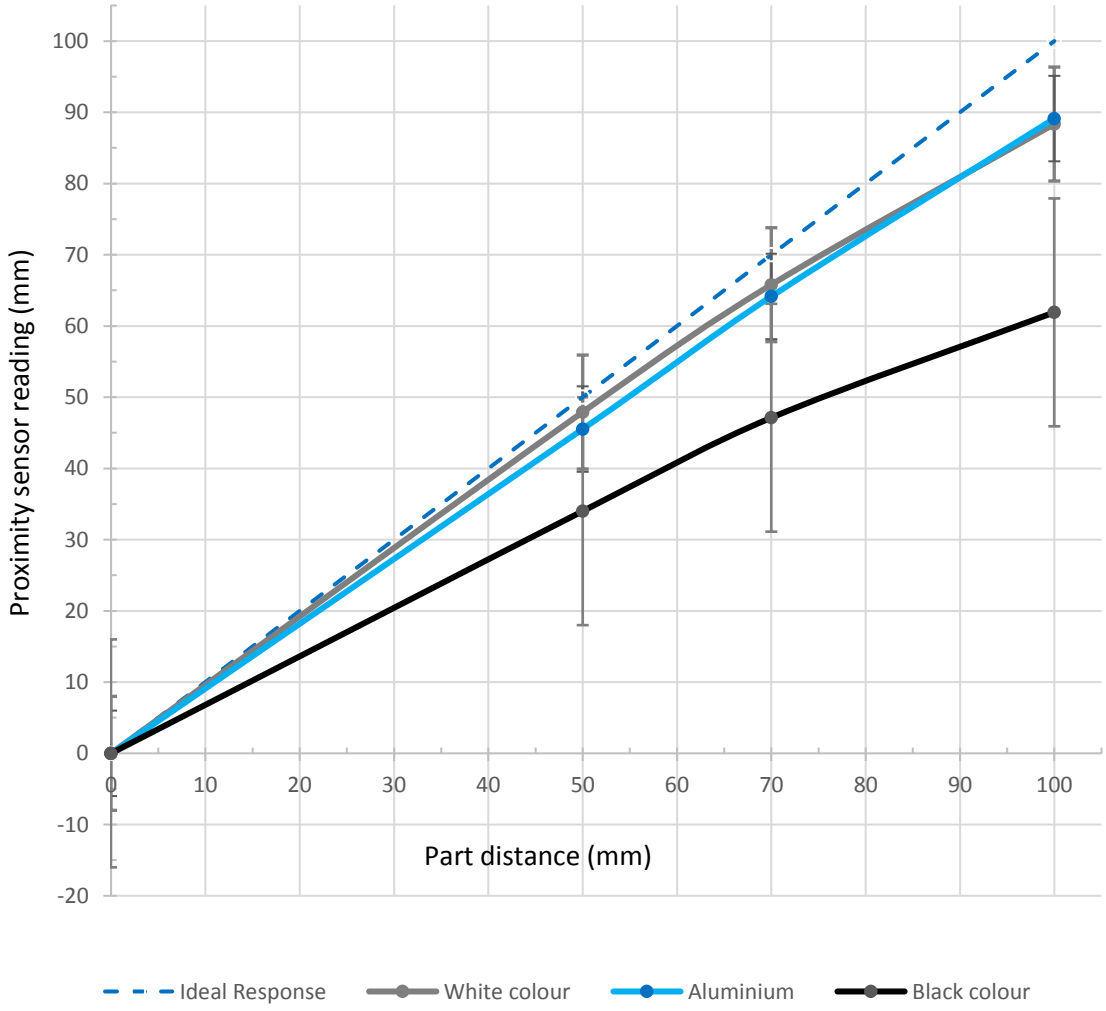
Force Sensor Properties	Fxy	Fz	Txy	Tz	Units
Nominal capacity (N.C.)	20	40	0.7	0.5	[N] [Nm]
Single axis overload	200	200	200	200	[%]
Noise free resolution	0.1	0.4	0.008	0.005	[N] [Nm]
Single axis deformation at N.C.	0.4 0.015	0.1 0.04	2	5	[mm] [°] [inch] [°]
Full scale nonlinearity Temperature compensation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

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

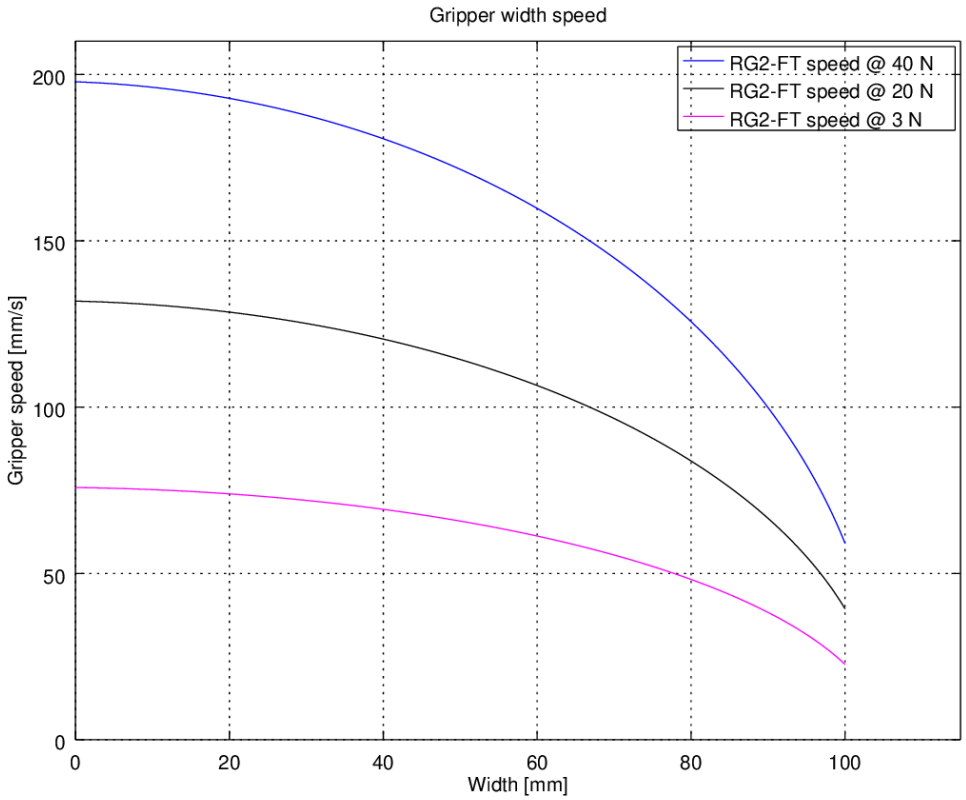
* the non-linearity refers to the max value and depends on the object properties (e.g. surface type and color)

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

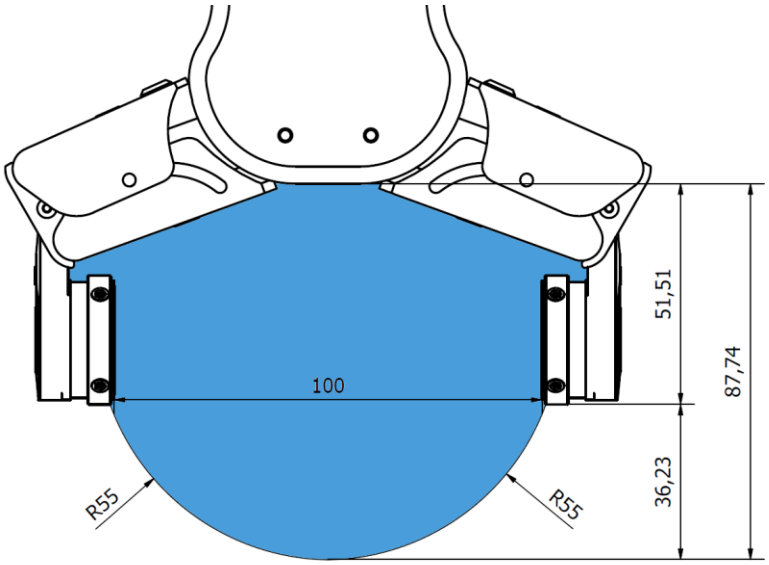
Proximity sensor typical accuracy



RG2-FT Gripping Speed Graph



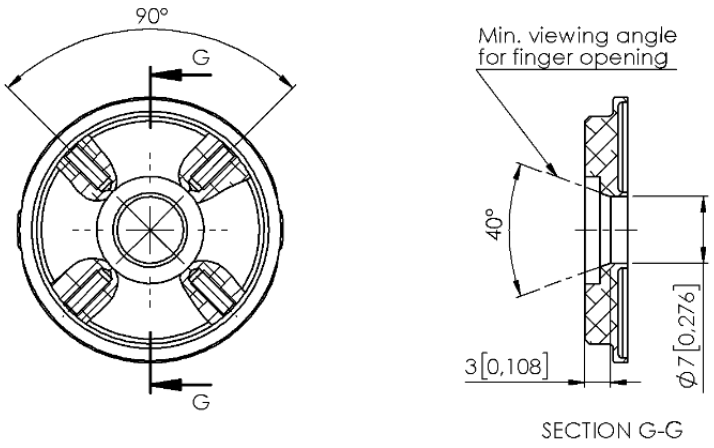
Gripper Working Range

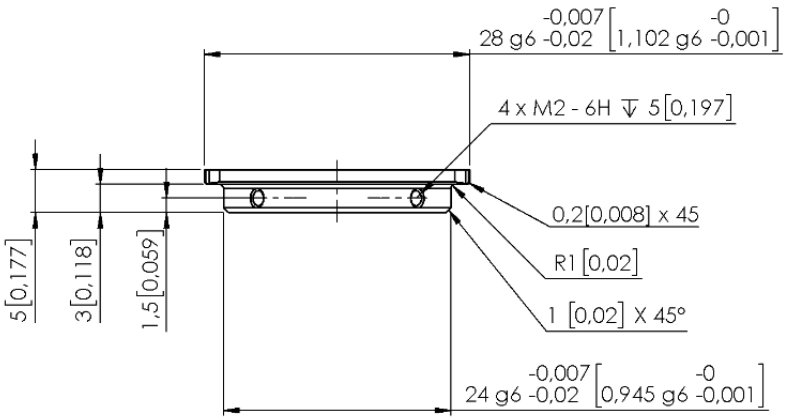


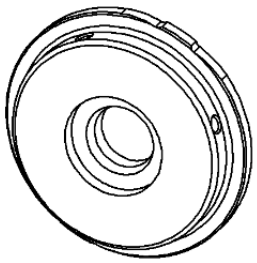
The dimensions are in millimeters.

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.







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

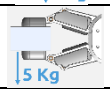
NOTE:

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]
Storage temperature	0 32	- -	60 122	[°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]

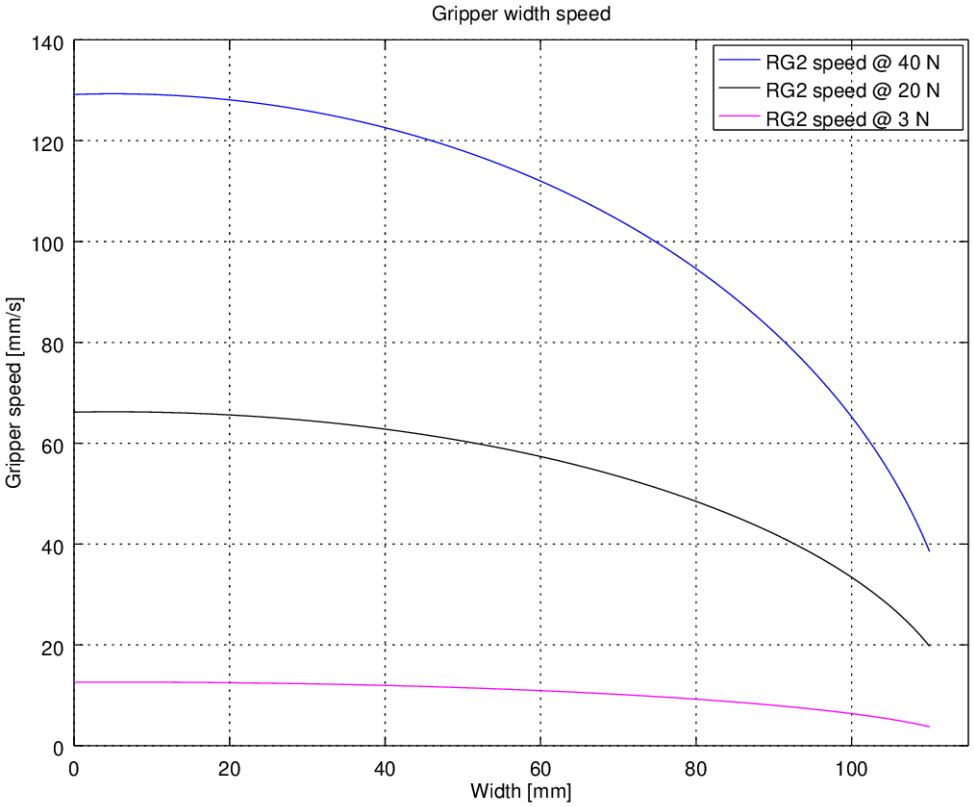
*See table on the next page

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

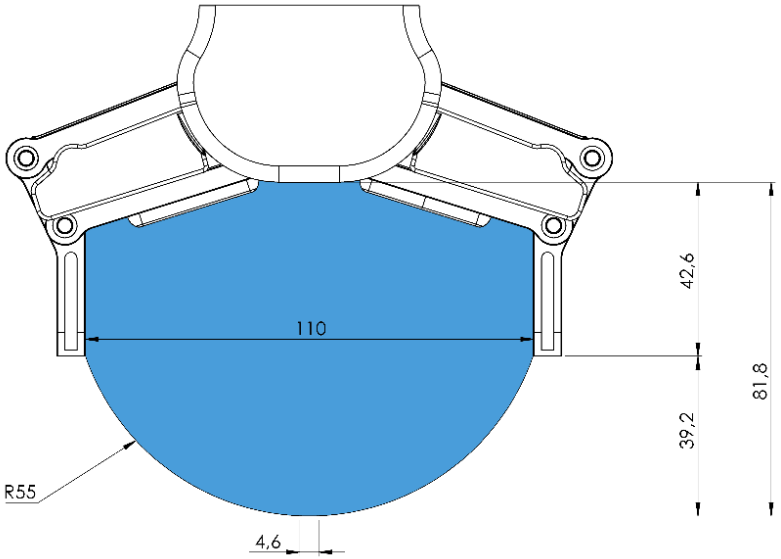
Operating Conditions	Minimum	Typical	Maximum	Unit
Power supply	20	24	25	[V]
Current consumption	70	-	600*	[mA]
Operating temperature	5 41	- -	50 122	[°C] [°F]
Relative humidity (non-condensing)	0	-	95	[%]
Calculated MTBF (operating life)	30.000	-	-	[Hours]

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

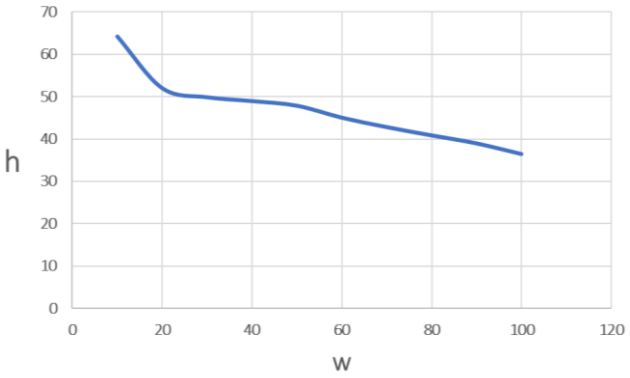
RG2 Gripping Speed Graph



RG2 Work Range

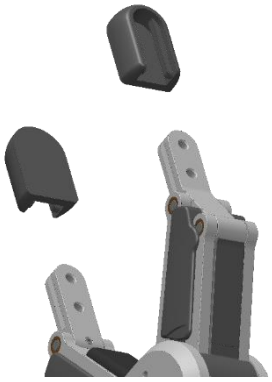


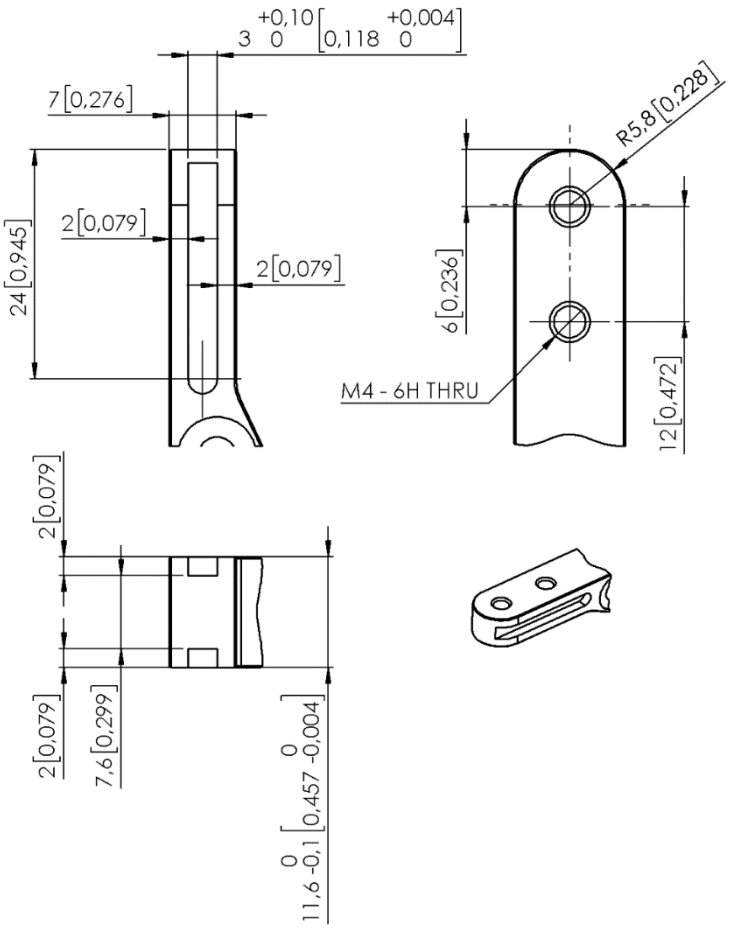
Gripping on long objects can unintentionally activate the Safety switches. The maximum workpiece height (calculated from the end of the fingertips) is dependent on the gripping width (w). For various width values the height (h) limit is given below:



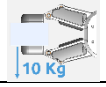
Fingertips

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	
Storage temperature	0 32		60 122	[°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]

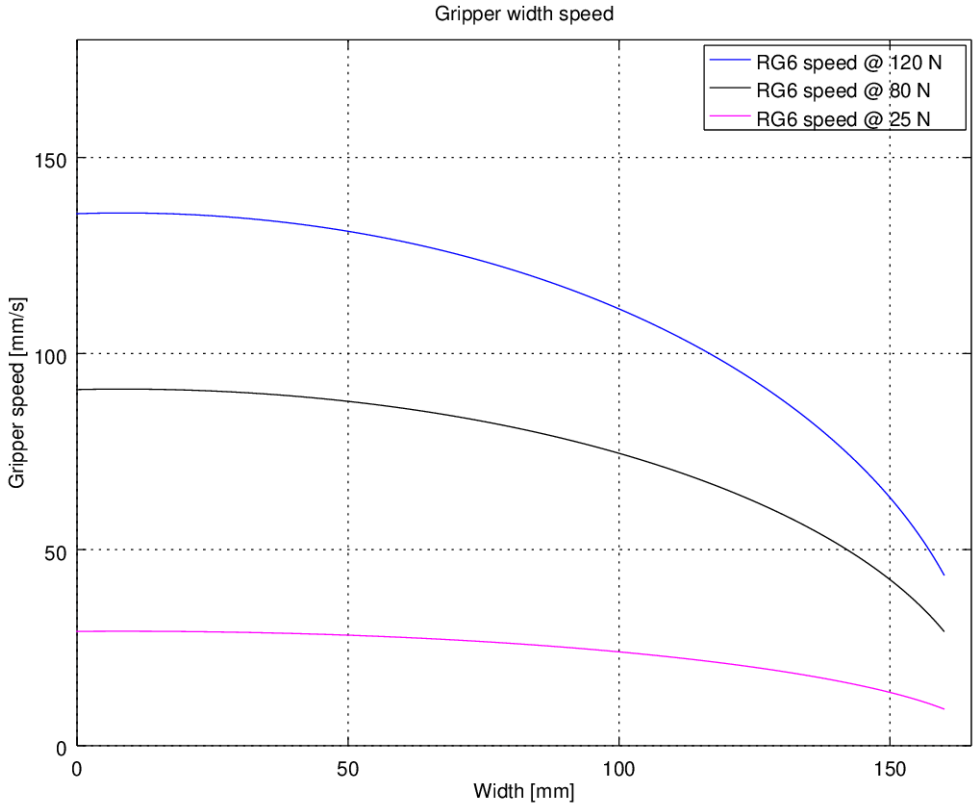
*See table on the next page

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

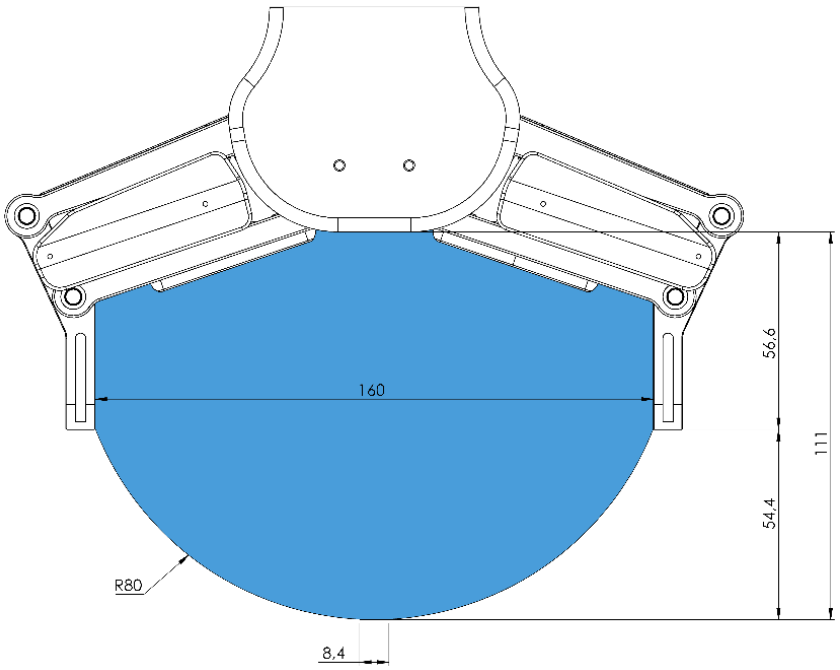
Operating Conditions	Minimum	Typical	Maximum	Unit
Power supply	20	24	25	[V]
Current consumption	70	-	600*	[mA]
Operating temperature	5 41	- -	50 122	[°C] [°F]
Relative humidity (non-condensing)	0	-	95	[%]
Calculated MTBF (operating life)	30.000	-	-	[Hours]

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

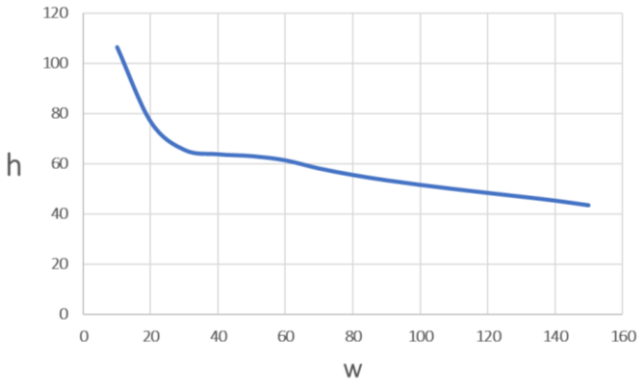
RG6 Gripping Speed Graph



RG6 Work Range

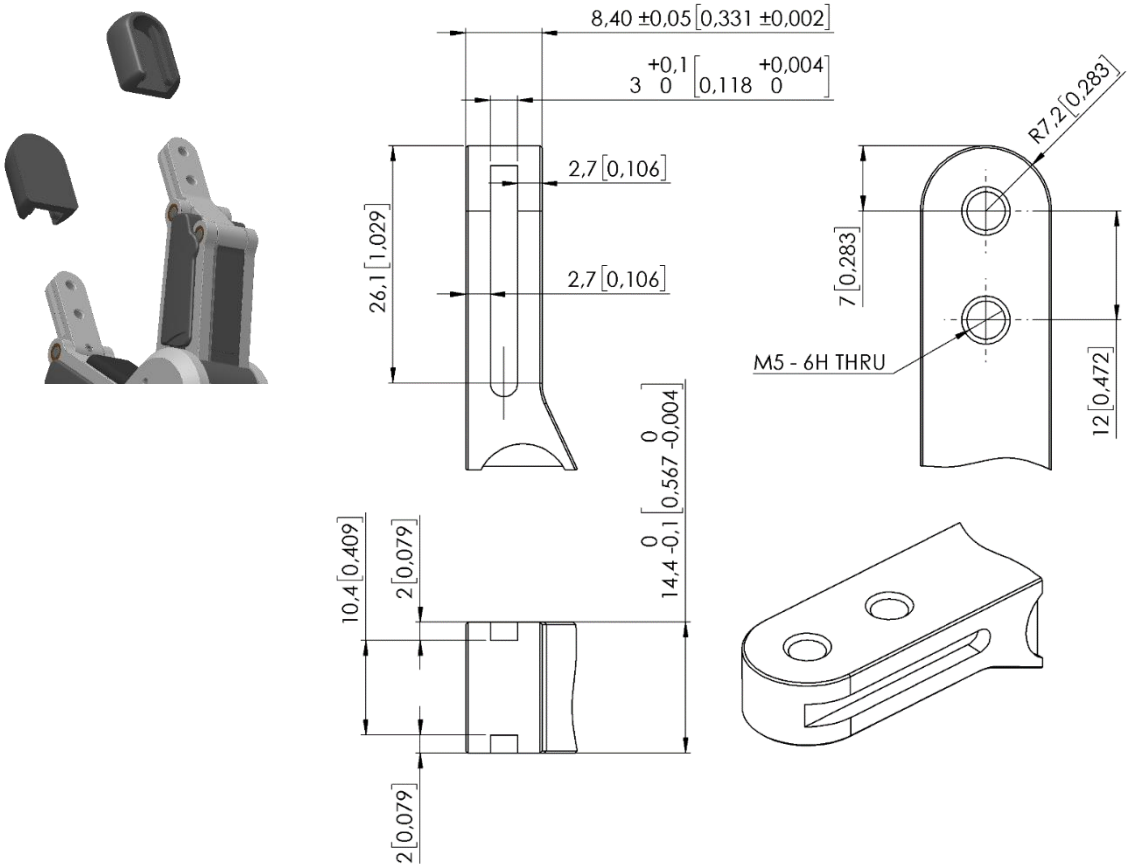


Gripping on long objects can unintentionally activate the Safety switches. The maximum workpiece height (calculated from the end of the fingertips) is dependent on the gripping width (w). For various width values the height (h) limit is given below:



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:



VG10

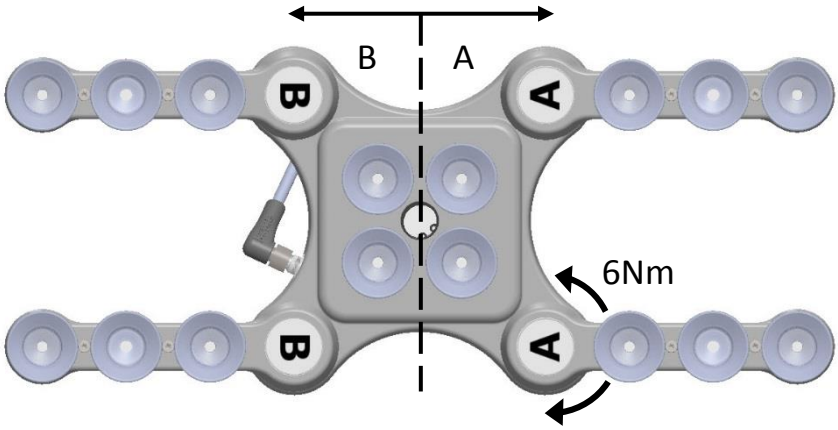
General Properties		Minimum	Typical	Maximum	Unit
Vacuum		5 % -0.05 1.5	- - -	80 % -0.810 24	[Vacuum] [Bar] [inHg]
Air flow		0	-	12	[Nl/min]
Arms adjustment		0	-	270	[°]
Arm holding torque		-	6	-	[Nm]
Payload	Rated	10 22			[kg] [lb]
	Maximum	15 33			[kg] [lb]
Vacuum cups		1	-	16	[pcs.]
Gripping time		-	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 32	- -	50 122	[°C] [°F]
Relative humidity (non-condensing)	0	-	95	[%]
Calculated MTBF (operating life)	30.000	-	-	[hours]

Positioning the VG10 arms

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 10 kg payloads.

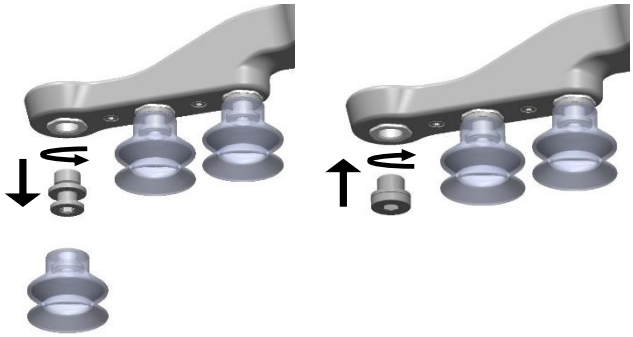
The VG10 suction cups are grouped into two independent channels.



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.

Vacuum cups and fittings

It is possible to change suction cups simply by pulling them off the fittings. 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. Use a 3 mm Allen key for changing to blind screws or another type of fitting.



The thread size is the commonly used G1/8”; allowing for standard fittings, blinders and extenders to be fitted directly to the VG10 arms and housing, see mechanical details in the 9.2.

Choosing the right vacuum cups for your application is essential. The VG10 comes with common 30 mm silicone vacuum cups 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. Below is a table with general recommendations.

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.

Payload, vacuum and air flow

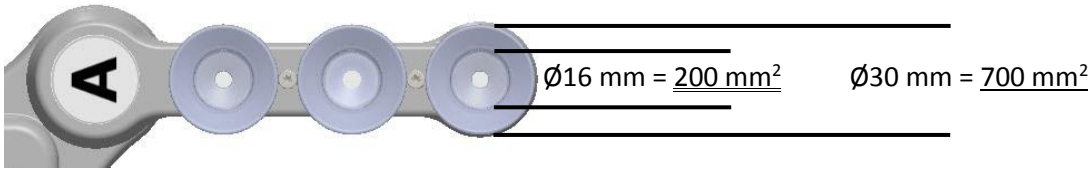
The lifting capacity (payload) of the VG10 depends primarily on the following parameters:

- Suction area
- Vacuum
- Air flow

These three parameters are explained in the following subsections.

Suction area

The higher suction area, the higher lifting capacity. Be aware that the actual suction area is smaller than the outer diameter of your vacuum cups, as the vacuum cup libs forms around the workpiece, the actual suction area is reduced (see figure below)



With a typical vacuum of 60% and one vacuum cup with a 200 mm2 suction area, the lifting force is:

$$F_{cup} = p \cdot A = [\Delta Pa] \cdot [m^2] = 60\% \cdot 101.3kPa \cdot 10^3 \cdot 200\ mm^2 \cdot 10^{-6} = 12.2\ N$$

With this force per vacuum cup, to lift 10 kg and accelerate with 2g’s, this many vacuum cups are needed:

$$Number\ of\ cups = \frac{m \cdot a}{F_{cup}} = \frac{[kg] \cdot \left[{}^{m}/_{s^2} \right]}{[N]} = \frac{10 \cdot 2 \cdot 9.81}{12.2} = 16 \text{ vacuum cups}$$

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.

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 percentage 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.

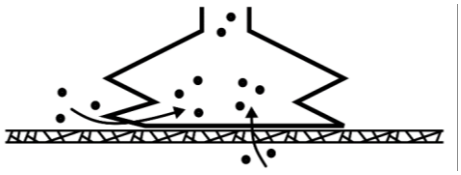
The pressure in the atmosphere varies with weather, temperature and altitude. The VG10 automatically compensates for altitudes up to 2km, where the pressure is about 80% of sea level.

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).

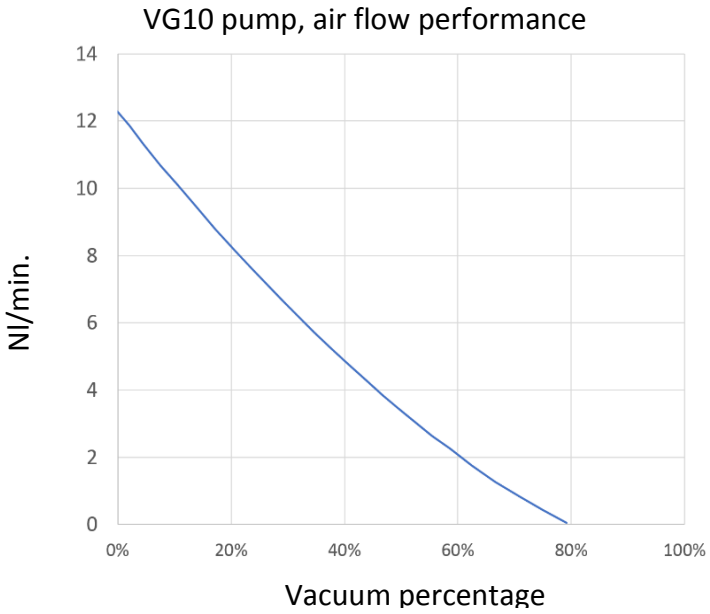


Leaking workpieces can be even harder to identify. Things that look completely tight might not be tight at all. A typical example is coarse cardboard boxes. The thin outer layer is often requiring a lot of air flow to create a pressure difference over it (see figure below).

Therefore, the users must be aware of the following:

- VG10 is 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 VG10 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 VG10.

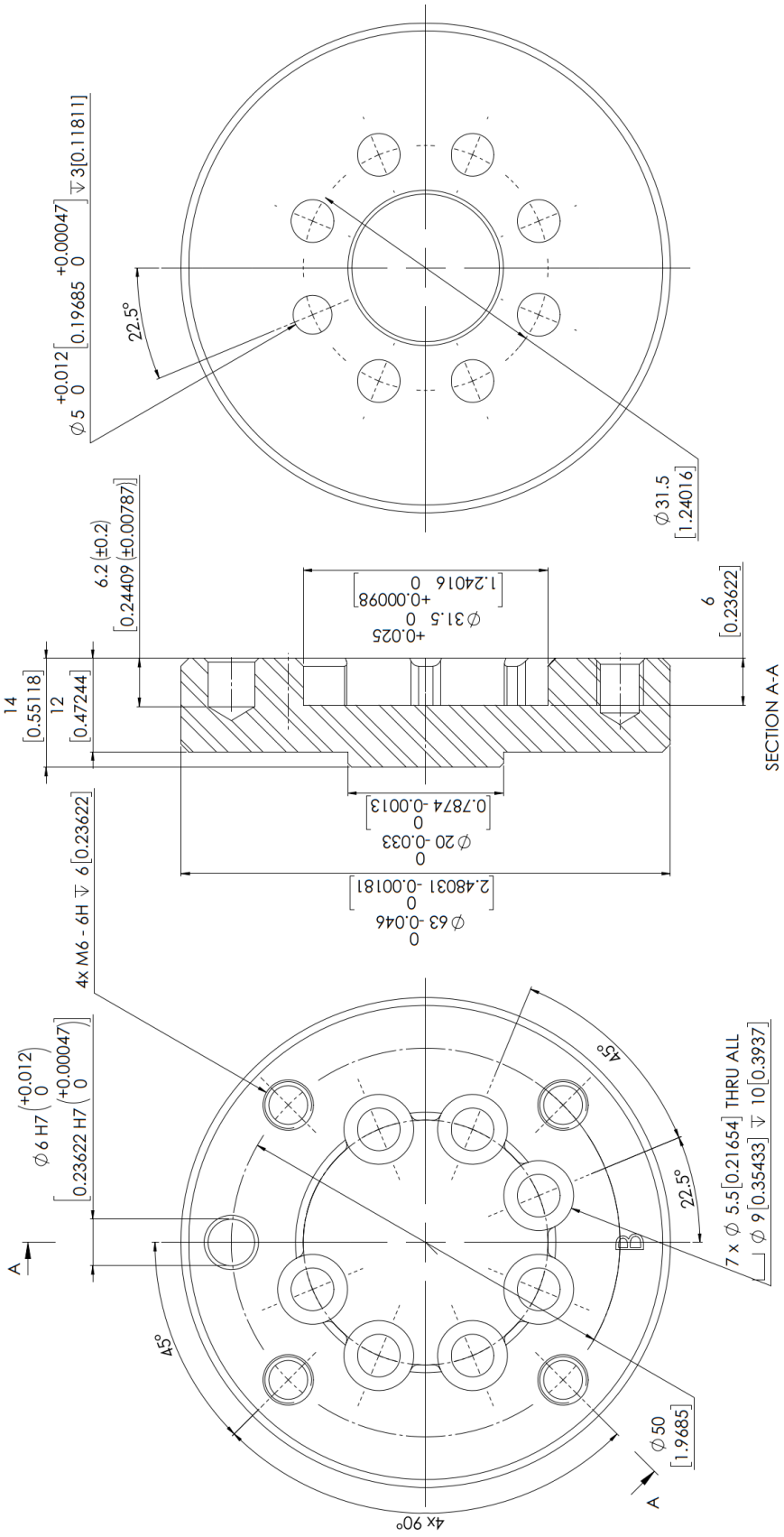
A high vacuum percentage setting does not give a higher lifting capacity on corrugated cardboard. In fact, a lower setting is recommended, e.g. 20%.

A low vacuum setting results in less air flow and less friction below the vacuum cups. This means VG10 filters and vacuum cups will last longer.

9.2 Mechanical Drawings

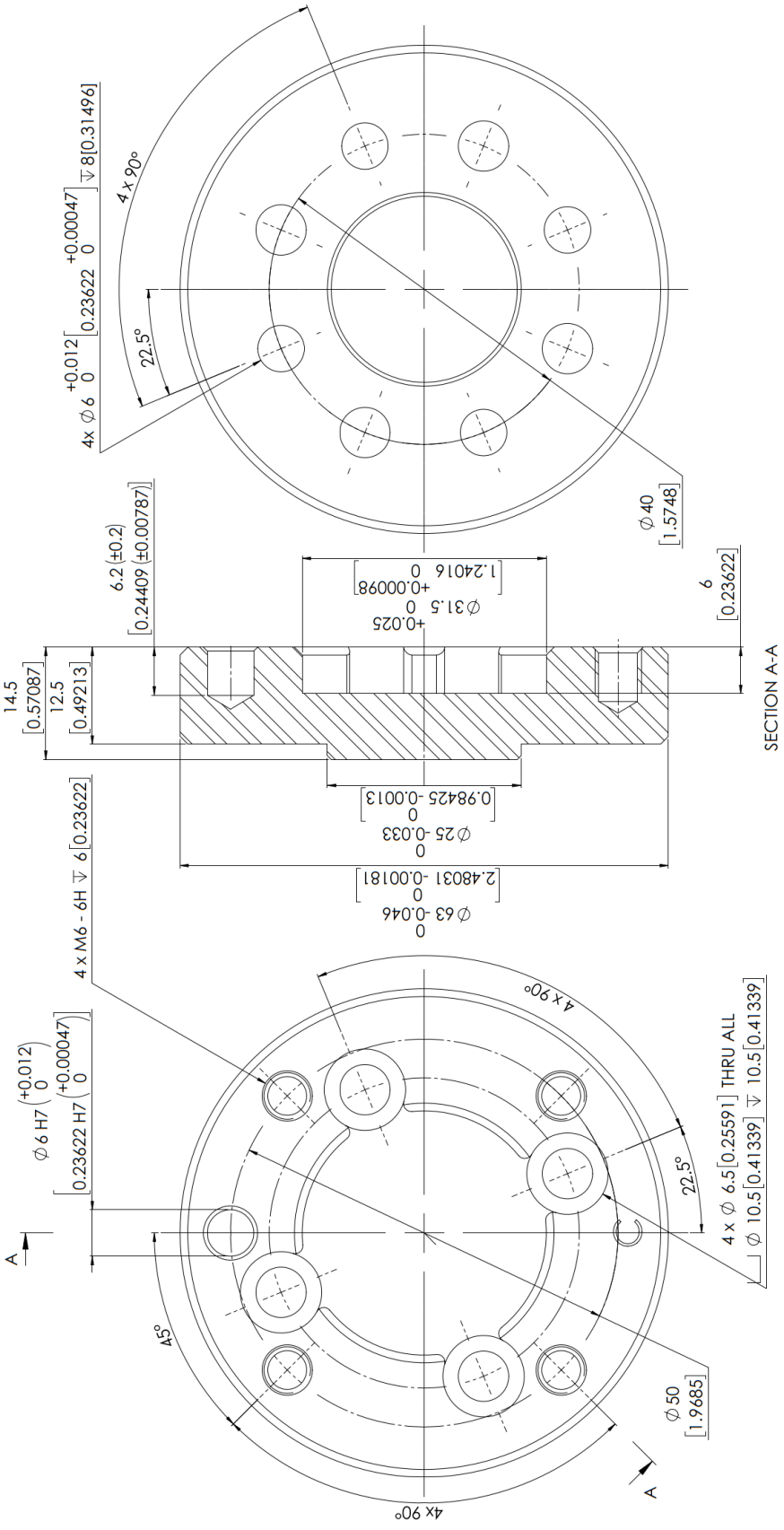
9.2.1 Adapter plate(s)

Adapter B



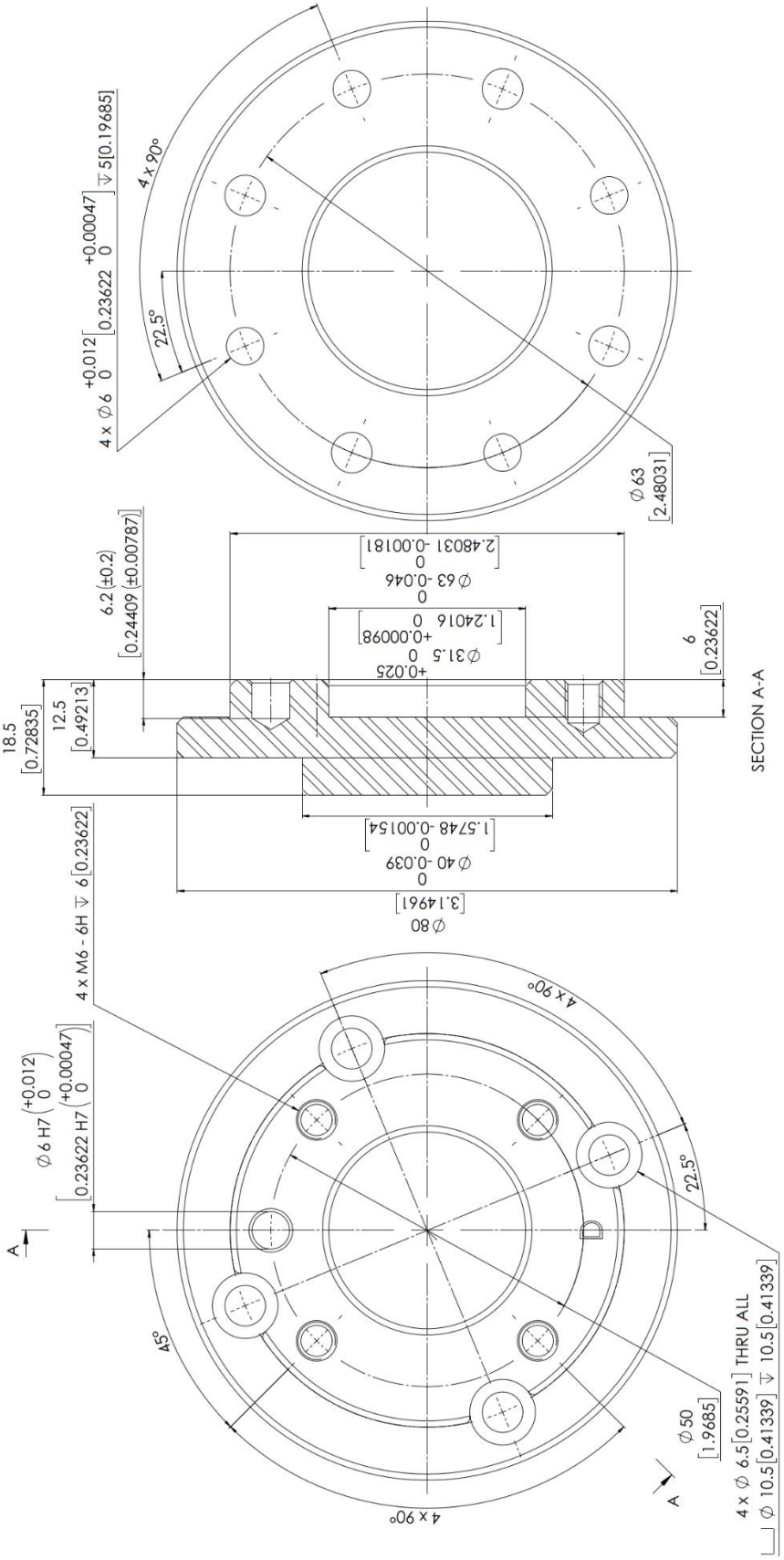
All dimensions are in mm and [inches].

Adapter C



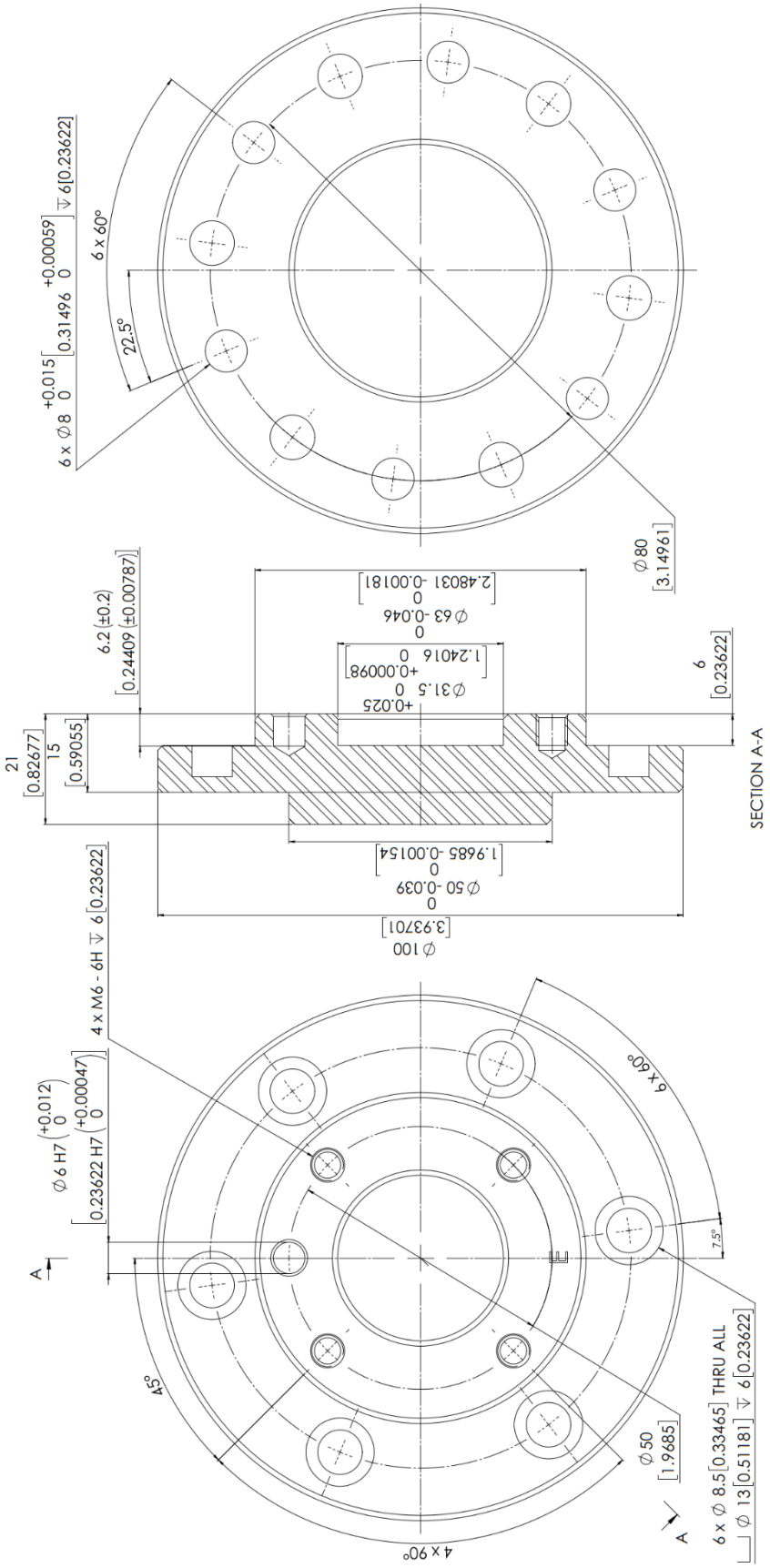
All dimensions are in mm and [inches].

Adapter D



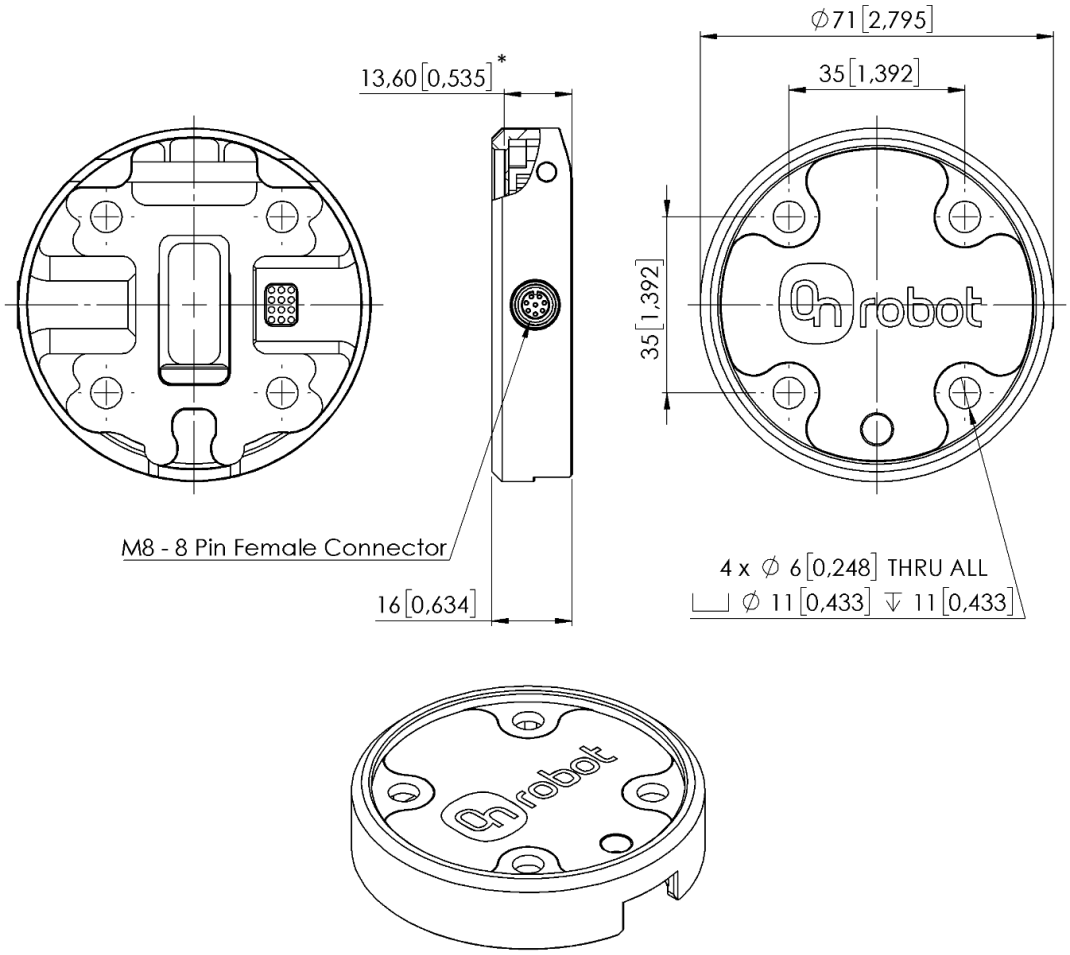
All dimensions are in mm and [inches].

Adapter E


6 x Ø8 +0.015 0 [0.31496 +0.00059 0] ↧ 6 [0.23622]
6 x 60°
22.5°
Ø80 [3.14961]
Ø63 -0.046 0 [2.48031 -0.00181 0]
6.2 (±0.2) [0.24409 (±0.00787)]
Ø31.5 +0.025 0 [1.24016 +0.00098 0]
6 [0.23622]
21 [0.82677]
15 [0.59055]
SECTION A-A
Ø50 -0.039 0 [1.9685 -0.00154 0]
Ø100 [3.93701]
4 x M6 - 6H ↧ 6 [0.23622]
Ø6 H7 (+0.012 0) [0.23622 H7 (+0.00047 0)]
A
9 x 60°
7.5°
E
45°
4 x 90°
Ø50 [1.9685]
A
6 x Ø 8.5 [0.33465] THRU ALL
⌴ Ø 13 [0.51181] ↧ 6 [0.23622]

9.2.2 Mountings

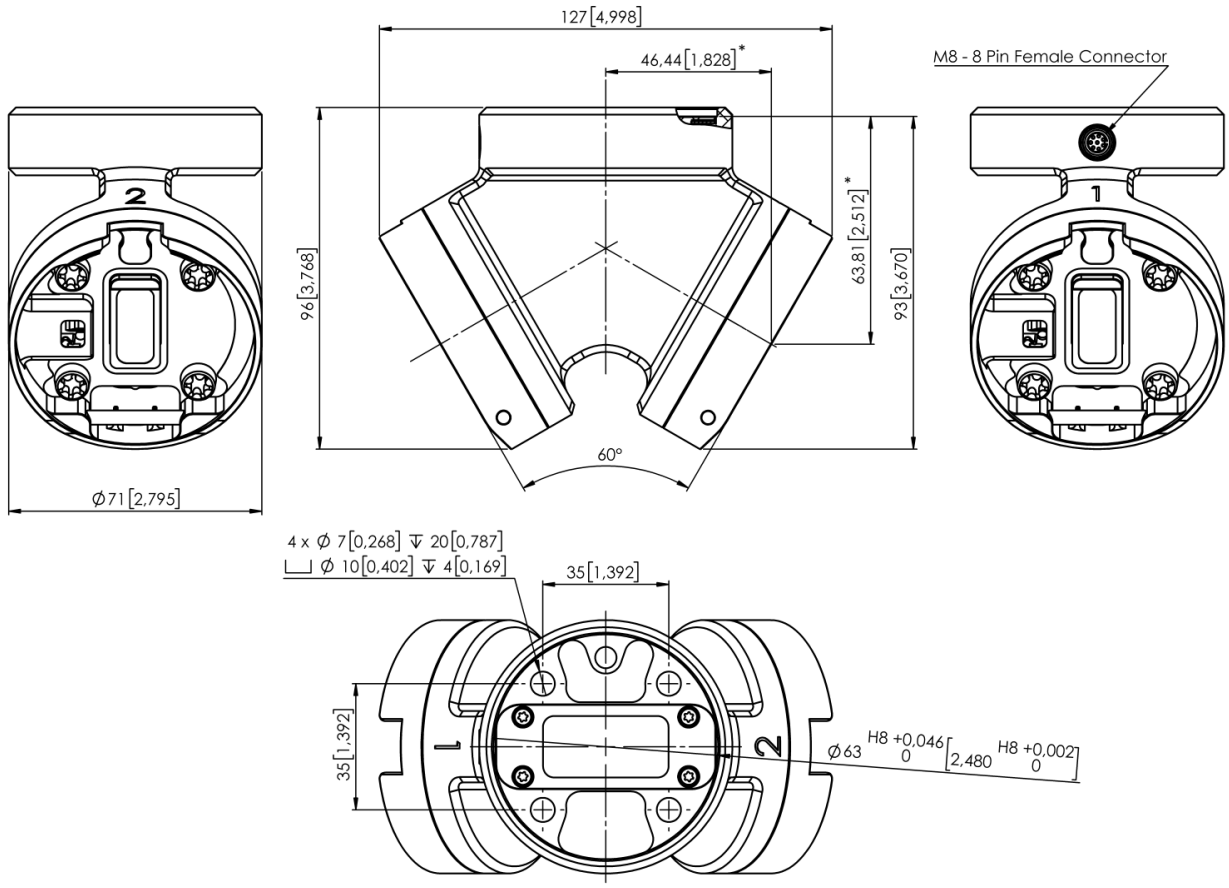
Quick Changer - Robot side



* Distance from Robot flange interface to OnRobot tool.

All dimensions are in mm and [inches].

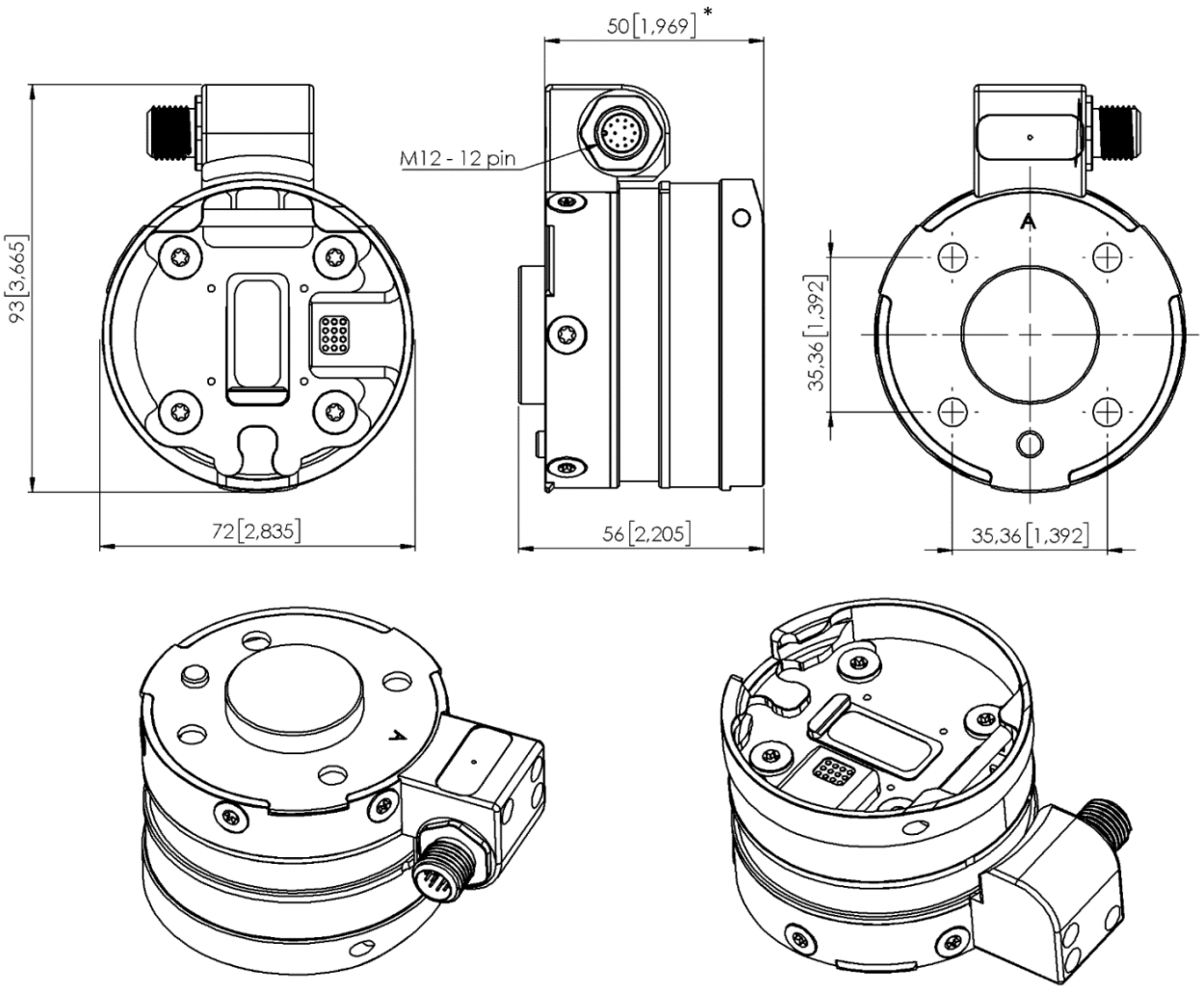
Dual Quick Changer



* Distance from Robot flange interface to OnRobot tool

All dimensions are in mm and [inches].

HEX-E QC

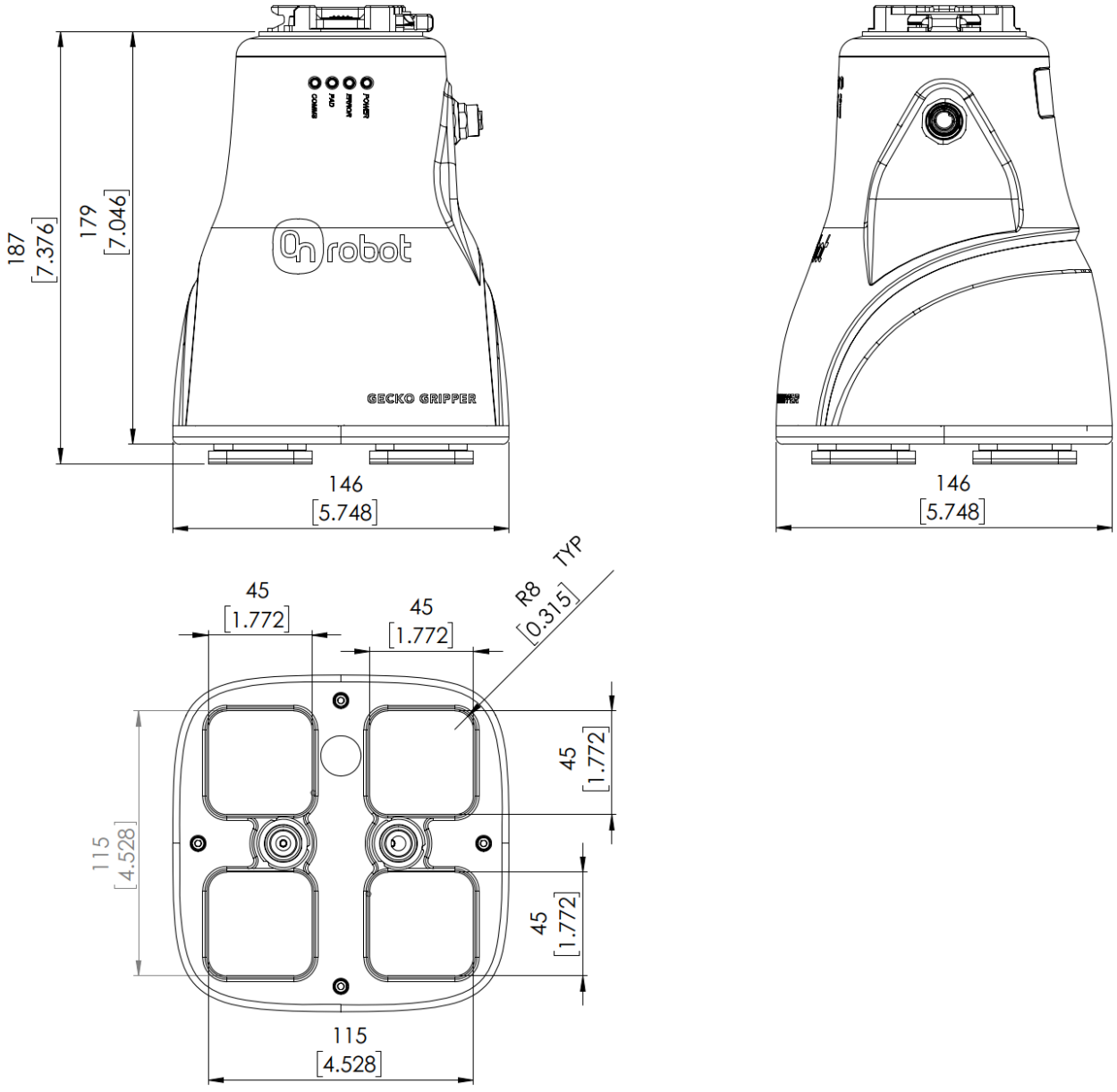


* Distance from Robot flange interface to OnRobot tool

All dimensions are in mm and [inches].

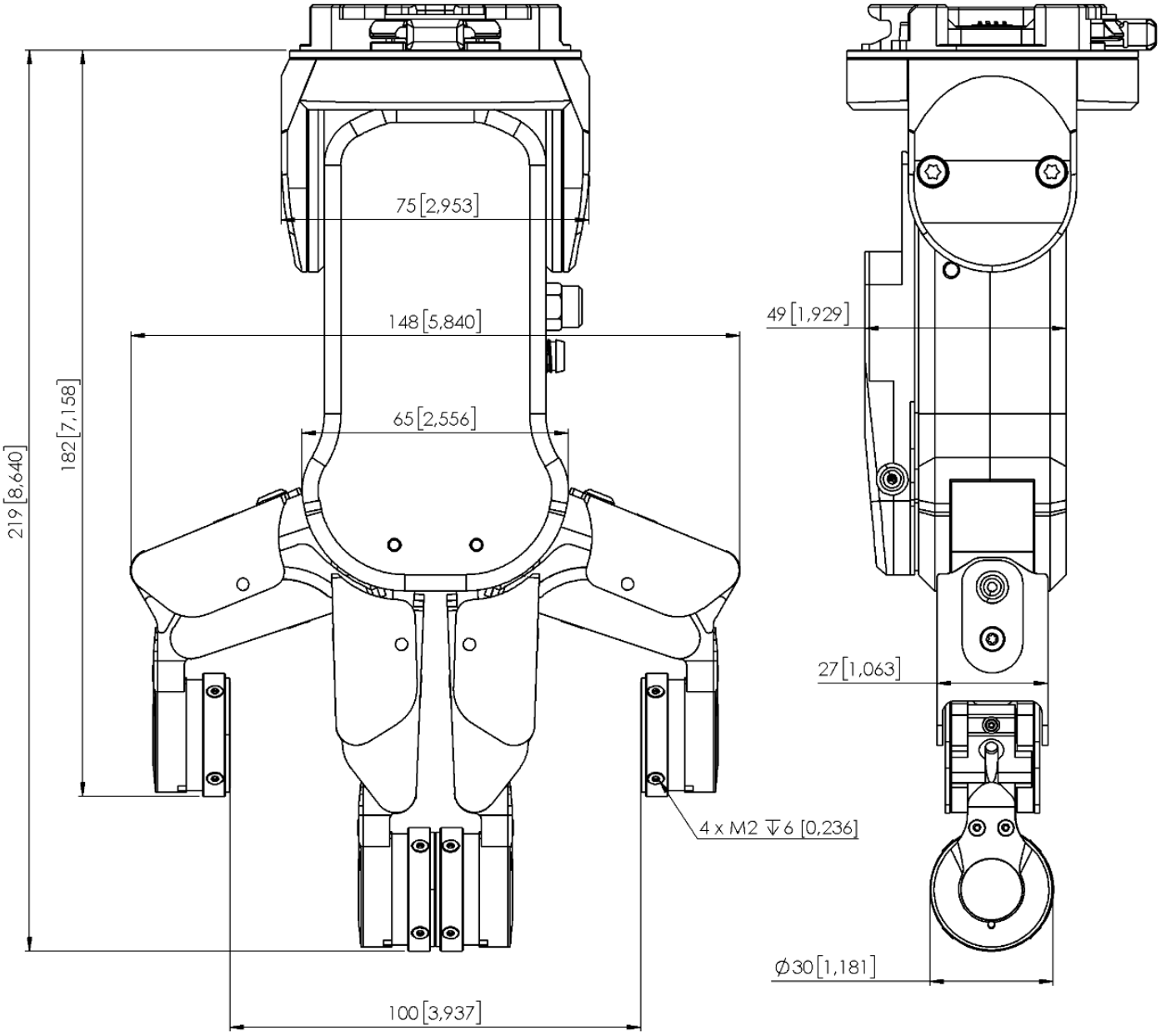
9.2.3 Tools

Gecko



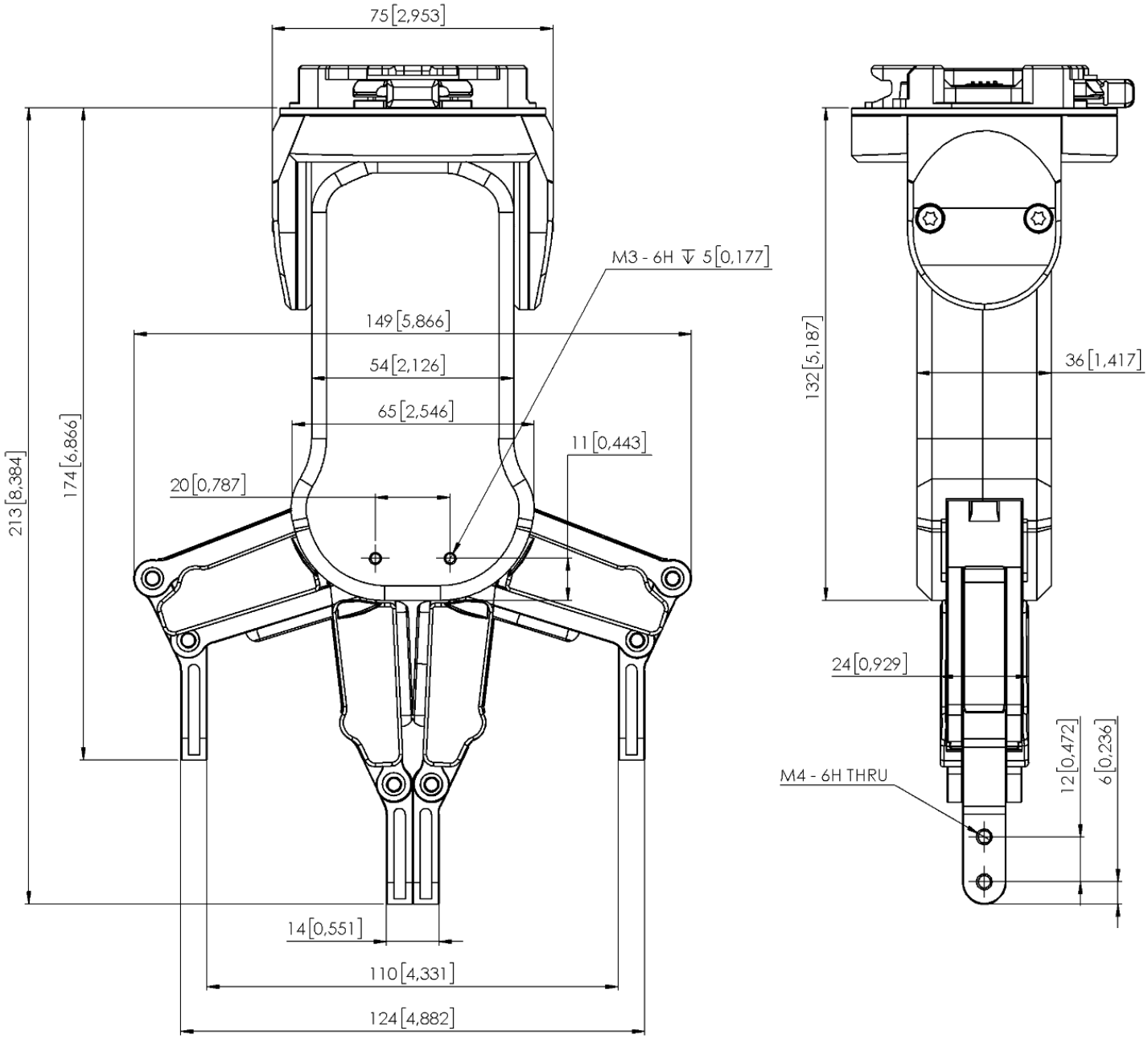
All dimensions are in mm and [inches].

RG2-FT



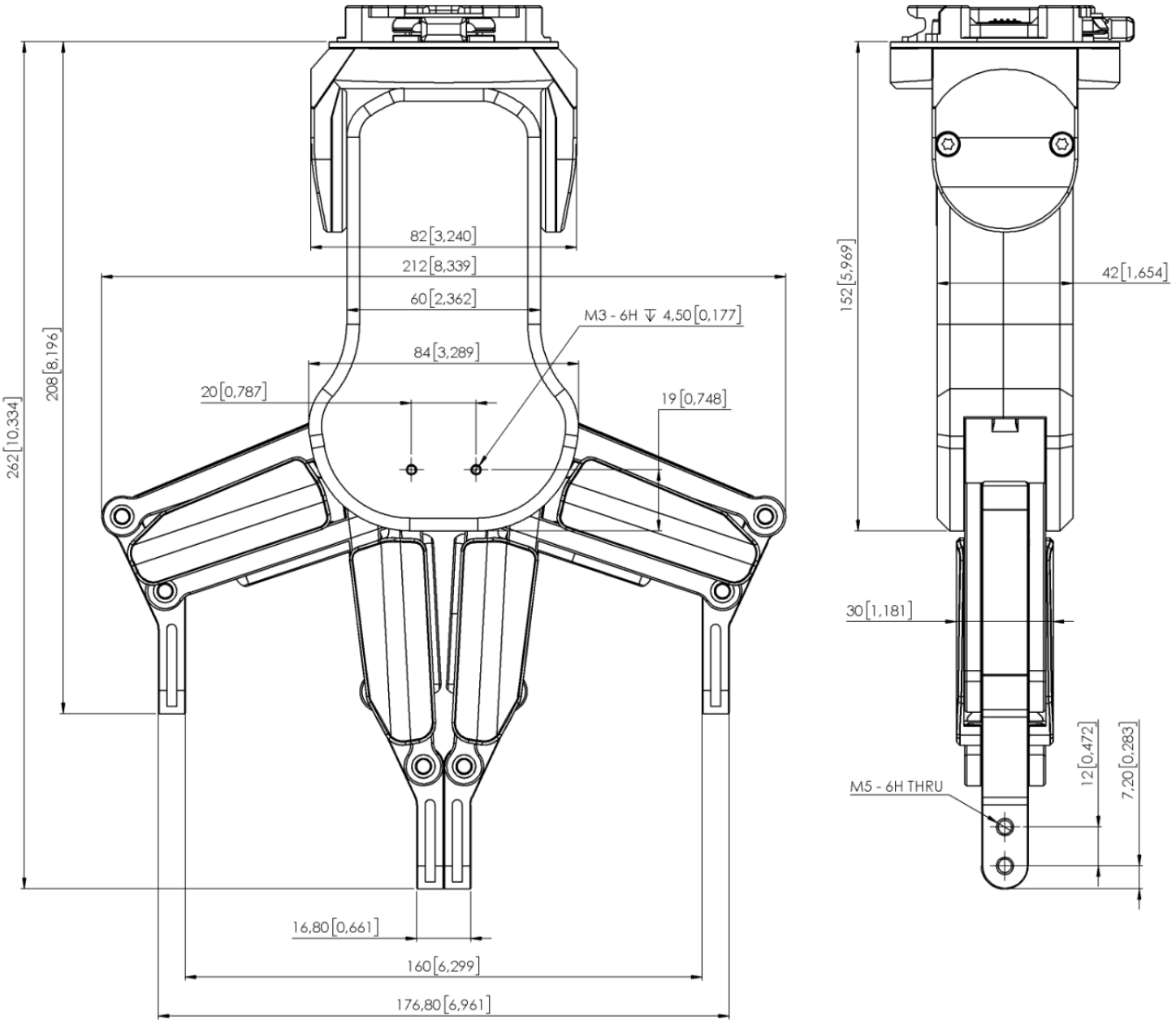
All dimensions are in mm and [inches].

RG2



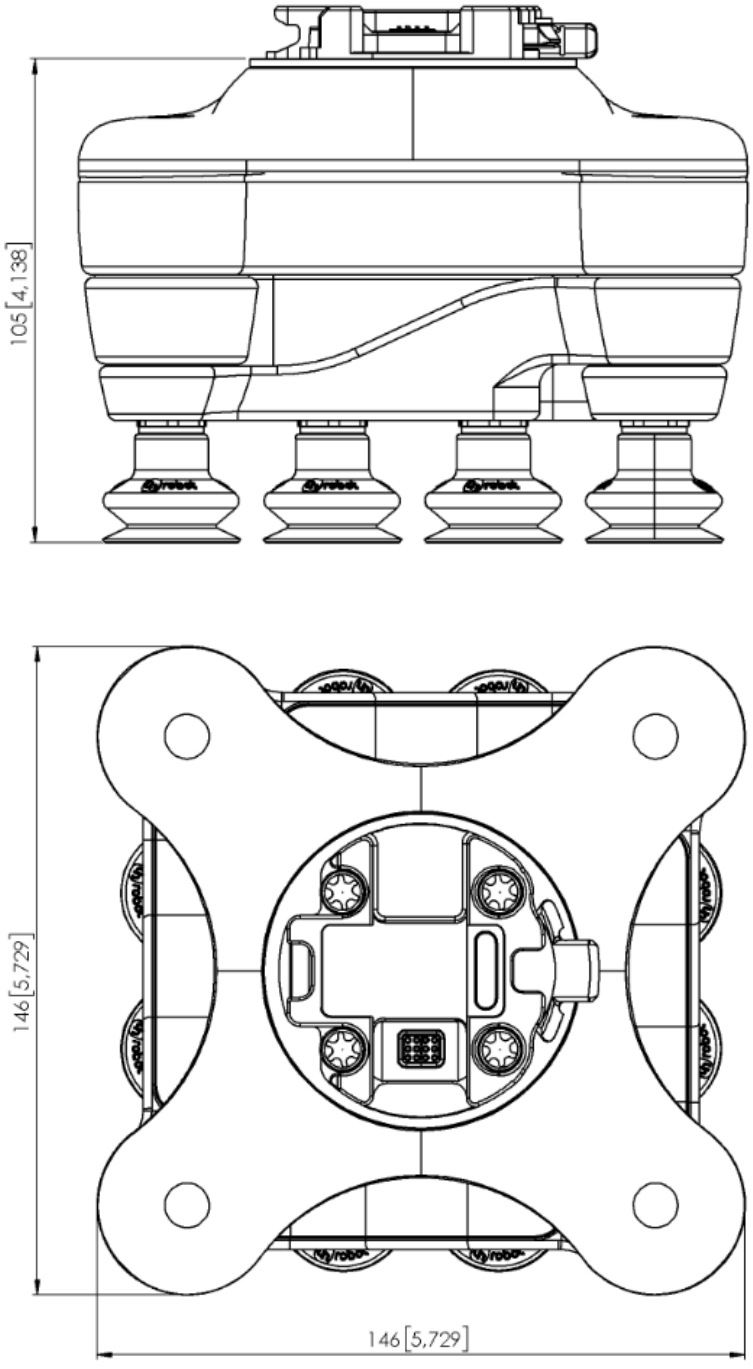
All dimensions are in mm and [inches].

RG6

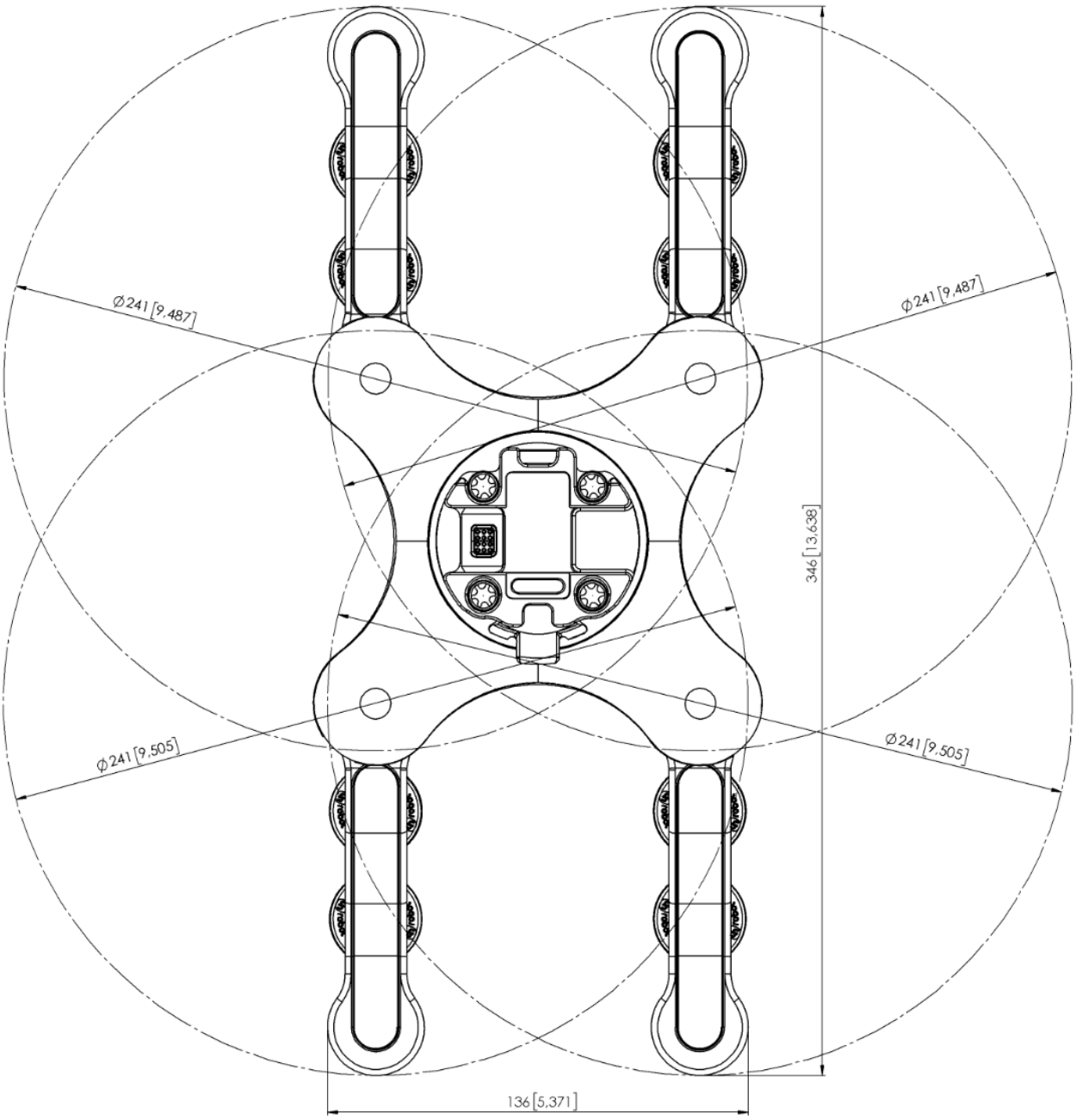


All dimensions are in mm and [inches].

VG10

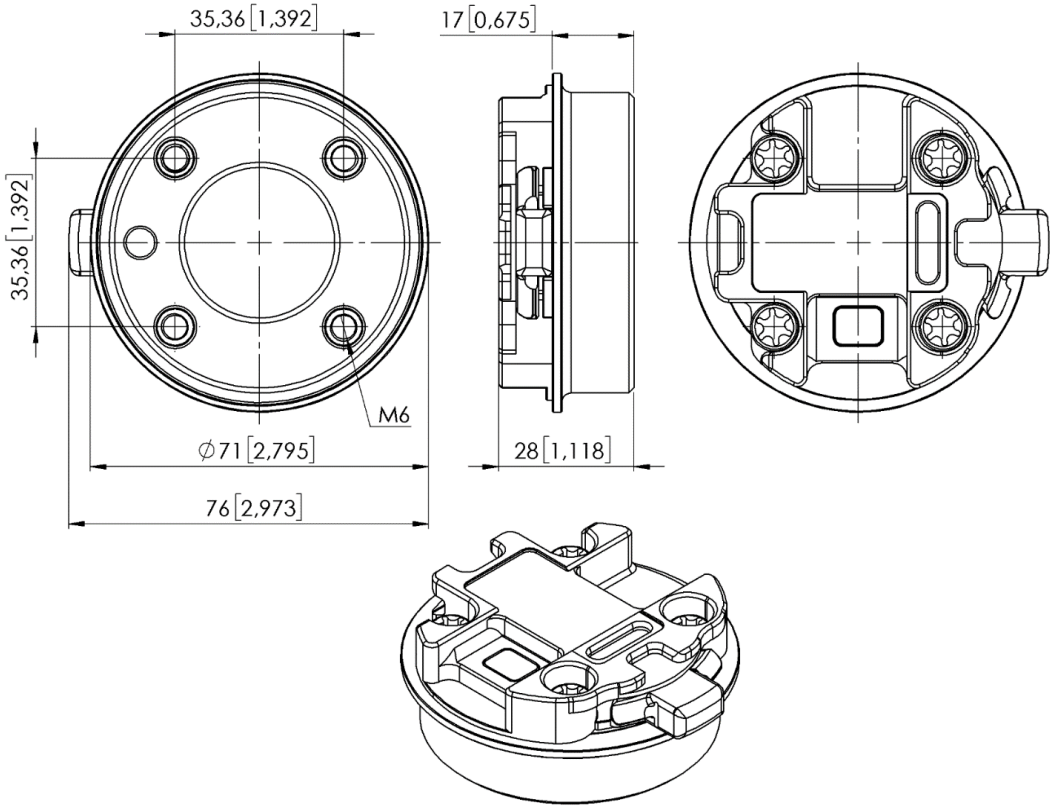


All dimensions are in mm and [inches].



All dimensions are in mm and [inches].

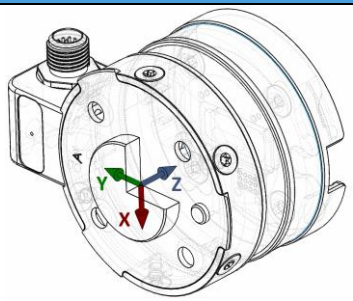
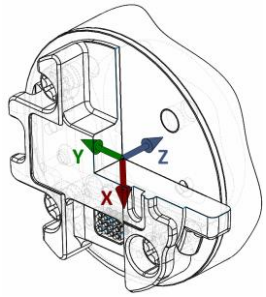
Quick Changer - Tool side



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):

Devices	Coordinate system	TCP [mm]	Center of Gravity [mm]	Weight
HEX-E/H QC		X=0 Y=0 Z=50	cX=0 cY=5 cZ=20	0.35 kg 0.77 lb
Gecko Gripper		X=0 Y=0 Z=187	cX=0 cY=0 cZ=113	2.83 kg 6.10 lb
RG2-FT*		X=0 Y=0 Z=205	cX=0 cY=0 cZ=65	0.98 kg 2.16 lb
RG2*		X=0 Y=0 Z=200	cX=0 cY=0 cZ=64	0.78 kg 1.72 lb
RG6*		X=0 Y=0 Z=250	cX=0 cY=0 cZ=90	1.25 kg 2.76 lb
VG10**		X=0 Y=0 Z=105	cX=15 cY=0 cZ=54	1.62 kg 3.57 lb

* Mounted at 0˚

** With arms folded back

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.

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.

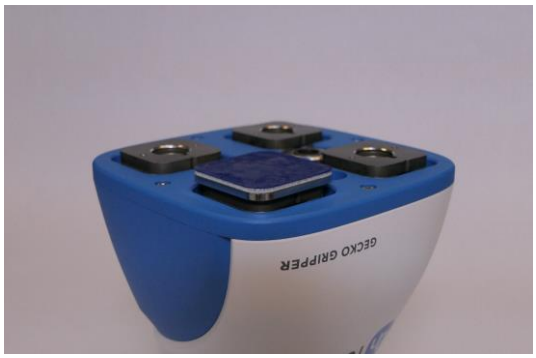
Part	Description of Maintenance	Frequency
Pad Cleaning	Routine cleaning: Cleaning Station	Dependent on operating conditions. Guidelines are: See Cleaning Station User Guide
Pad Wear	Replacement due to wear	150000 – 200000 for HIGH preload operation 200000 – 250000 for LOW preload operation

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.

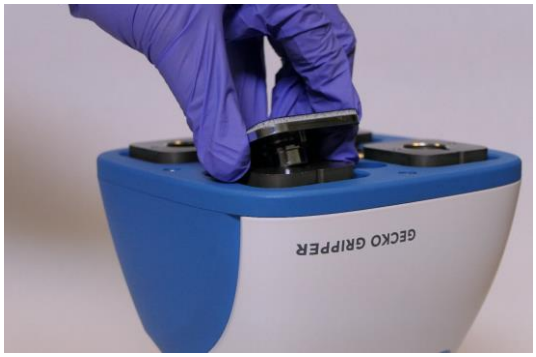
To replace the gripper pads, use the provided pad removal tool.

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



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.

VG10

The VG10 is equipped with one filter for each suction cup socket, and one filter for the exhaust. How often the filters need to be changed depends on the nature of the work piece and the working environment. The VG10 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 VG10 performance.

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

- Filter service kit, PN 100064

Neither use nor power on the VG10 without filters. Dust, hair and larger particles can get stuck in pump membranes and valve seats, causing permanent damage to the VG10.

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 VG10 must be performed regularly and at least once every 6 months.

Never power the VG10 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

TÜV NORD

CERTIFICATE

on the inspection of a product manufacturing facility
applied for TÜV NORD CERT approval marks

OnRobot A/S
Teglværksvej 47H
5220 Odense SØ
Denmark

Manufacturing facility:	**OnRobot A/S** **Teglværksvej 47H** **5220 Odense SØ** **Denmark**
Products:	**Gripper RG2 v2 and RG6 v2**
Date of inspection:	**07.05.2019**

Inspection summary:
The applicant was able to demonstrate that the manufacturing facility is technically equipped and managed in such a way that uniform production is guaranteed for the listed product(s).

Certificate Registration No. 44 786 190827
ZA-No. 3524 6146
Project-No. 8003006488

Validity
from 2019-05-07
until 2020-05-06

Certification Body
at TÜV NORD CERT GmbH

Essen, 2019-06-03

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