



HAND-E **C10**

Original Notice

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Robotiq Hand-E C10
for Universal Robots



Instruction Manual

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Revisions	6
1. General Presentation	8
1.1. Object picking	9
1.2. Setup and control	10
2. Safety	11
2.1. Warning	11
2.2. Intended Use	12
3. Installation	13
3.1. Scope of Delivery	13
3.1.1. Robotiq Hand-E C10 Gripper UR Standard Kit	13
3.1.2. UR Wrist connection Kit for CB-Series	14
3.2. Required Tools and Equipment	15
3.3. Environmental and Operating Conditions	16
3.4. Mechanical Installation	16
3.4.1. Installing the Gripper on the Robot	16
3.4.2. Installing Stepped Fingers on the Gripper	24
3.4.3. Installing extenders on the Gripper	25
3.4.4. Installing stop plate on the Gripper	25
3.5. Electrical Setup	27
3.5.1. Electrostatic Discharge Safety	27
3.5.2. Pinout Interface	27
3.5.3. Coupling to Controller	28
3.5.4. Coupling to Tool Connector for I/O Coupling	30
3.5.5. Coupling to Wrist for e-Series	30
3.6. Testing the Gripper with the Robotiq User Interface (RUI)	31
3.7. Installation for Universal Robots	32
3.8. URCap Package	33
3.8.1. Installing URCap Package	34
3.8.2. Uninstalling URCap Package	39
4. Control	42
4.1. Overview	42
4.2. Gripper Register Mapping	43



4.3. Robot Output Registers & Functionalities	44
4.3.1. Register: ACTION REQUEST	44
4.3.2. Register: GRIPPER OPTIONS	45
4.3.3. Register: GRIPPER OPTIONS 2	45
4.3.4. Register: POSITION REQUEST	45
4.3.5. Register: SPEED	46
4.3.6. Register: FORCE	46
4.4. Robot Input Registers and Status	46
4.4.1. Register: GRIPPER STATUS	46
4.4.2. Register: RESERVED	48
4.4.3. Register: FAULT STATUS	48
4.4.4. Register: POSITION REQUEST ECHO	49
4.4.5. Register: POSITION	49
4.4.6. Register: CURRENT	49
4.5. Picking Features	50
4.5.1. Force control	50
4.5.2. Re-Grasp	50
4.5.3. Object detection	51
4.5.4. Brake engagement	52
4.6. Control Logic Example	52
4.7. Modbus RTU Communication	52
4.7.1. Connection Setup	53
4.7.2. Read input registers (FC04)	54
4.7.3. Preset multiple registers (FC16)	55
4.7.4. Master read and write multiple registers FC23	55
4.7.5. Modbus RTU example	57
4.8. Hand-E C10 Gripper and I/O Coupling communication	65
4.9. Control over Universal Robots	66
4.9.1. Control with the Standard Coupling Kit	66
4.9.2. Control with the Wrist Connection Kit (I/O Coupling)	66
4.9.3. Gripper Dashboard	70
4.9.4. Limiting your Gripper Force and Speed	74
4.9.5. Visual Cues of Force and Speed Limitation	75



4.9.6. Gripper Calibration menu and wizard	75
4.9.7. Gripper Toolbar	80
4.9.8. Gripper Node	85
5. Specifications	99
5.1. Technical dimensions	99
5.1.1. Hand-E C10 Gripper	99
5.1.2. Center of Mass, Tool Center Point and Moment of Inertia	100
5.1.3. Couplings	102
5.1.4. Stepped Fingers	103
5.2. Mechanical Specifications	105
5.2.1. Hand-E C10 Gripper	105
5.2.2. Friction Grip Payload	108
5.2.3. Moment and Force Limits for Standard Fingertips	109
5.3. Electrical specifications	110
6. Maintenance	111
6.1. Gripper cleaning	112
6.2. Periodic inspection	114
7. Spare Parts, Kits and Accessories	115
8. Troubleshooting	118
8.1. Using the LED of the Hand-E C10 Gripper	118
8.2. Using the LED of the USB to RS485 converter	119
8.3. Using the Robotiq User Interface (RUI)	119
8.4. Troubleshooting Universal Robots Models	120
8.4.1. From the Universal Robots teach pendant	120
8.4.2. For CB-Series: Troubleshooting the I/O Coupling	120
9. Warranty and Patent	122
9.1. I/O Coupling Warranty	123
10. Harmonized Standards, Declarations and Certificates	124
10.1. EC declaration of incorporation	124
10.2. Applied standards	124
10.3. Ingress Protection Certificate	125
11. License Agreement	126



12. Contact	129
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Revisions

Robotiq may modify this product without notice, when necessary, due to product improvements, modifications or changes in specifications. If such modification is made, the manual will also be revised, see revision information. See the latest version of this manual online at robotiq.com/support.

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1. General Presentation

The terms "Gripper", "Robotiq Gripper", "Hand-E C10 Gripper" and "Hand-E C10" used in this manual are used interchangeably to designate the "Robotiq Hand-E C10 Gripper". The Robotiq Hand-E C10 Gripper is a robotic peripheral designed for industrial applications. It is a unique robotic end-of-arm tool designed to quickly pick, place and handle parts in a broad range of sizes and shapes.

The following key features must not be considered as appropriate operation. Safety guidelines must be read and understood before any operation is attempted.



INFO

This manual uses the metric system. Unless otherwise specified, **all dimensions are in millimeters**.

Gripper nomenclature



INFO

Refer to the **Scope of Delivery** section and **Spare Parts, Kits and Accessories** section for details on standard and optional parts.

The Hand-E C10 Gripper is a concentric gripper. Its 3 stepped fingers are actuated by a single motor. The basic gripper unit includes stepped stainless steel fingers.

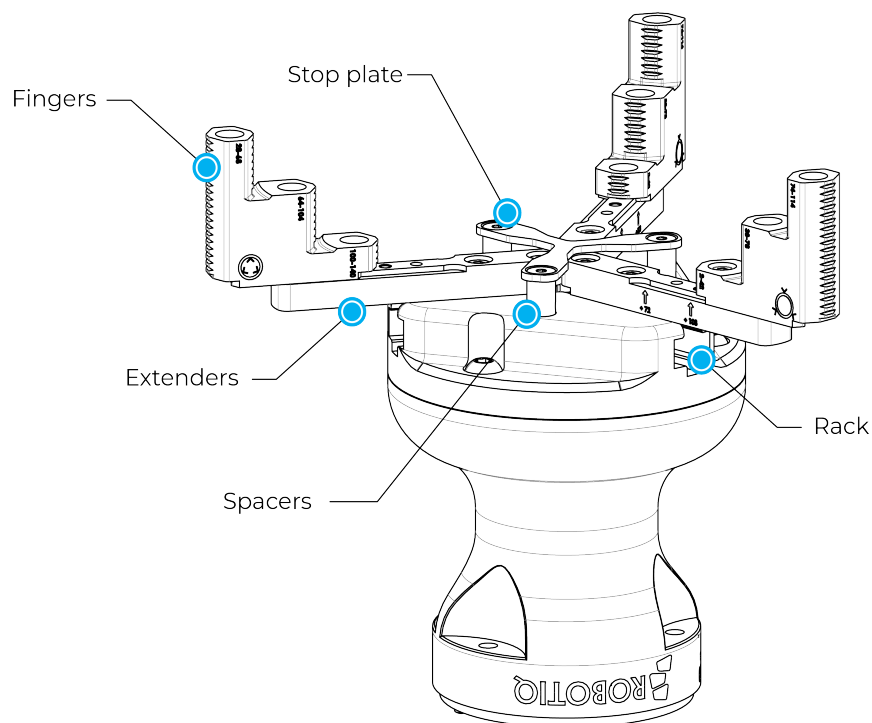


Fig. 1-1: Robotiq Hand-E C10 Gripper



The user can install fingers directly on the racks, or fasten fingertips to fingertip extenders, which are in turn installed on the racks. Refer to the **Installing the Gripper on the Robot** section for more information on how to integrate custom fingers and fingertips to Hand-E.

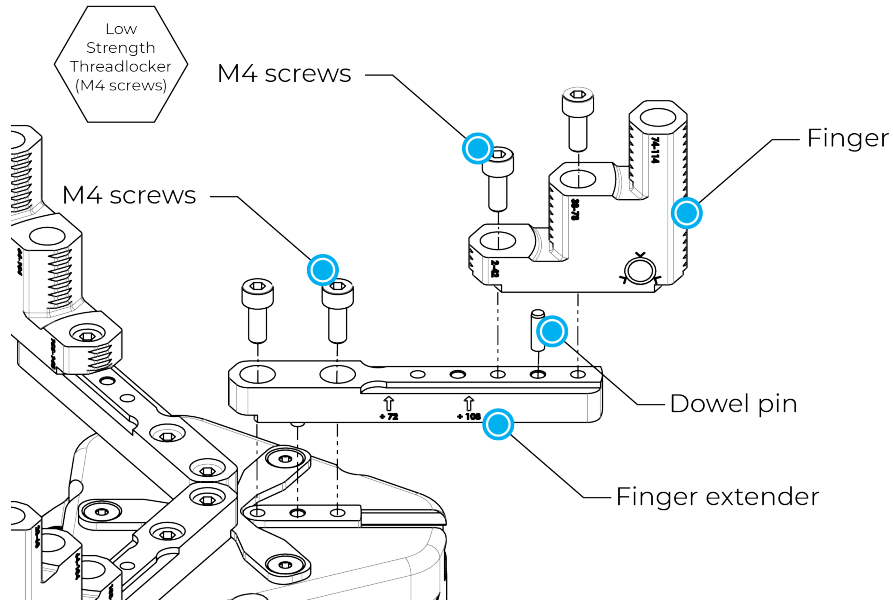


Fig. 1-2: Mounting a Finger on a Rack

Depending on the fingers configuration used, the user can install the stop plate directly be on top of the gripper or on spacers.



TIP

Fingers and fingertips are customizable (for example, mount fingers on racks and fingertips on fingertip holders).

1.1. Object picking

The Hand-E C10 Gripper has a single actuator for opening and closing the fingers. It also allows internal and external gripping. The fingers can pick hollow parts from the inside by applying pressure with the outer surface of the fingers. The fingers can be flipped in order to accommodate internal or external gripping.

Refer to the **Picking Features** section for details on available position commands.

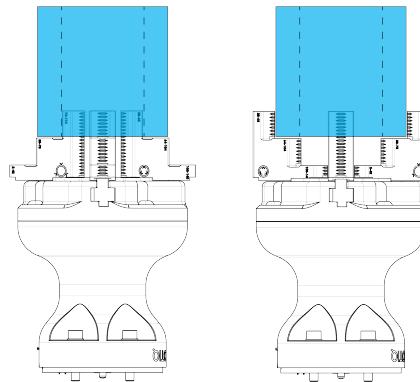


Fig. 1-3: Hand-E C10 Gripper Internal and External Gripping

1.2. Setup and control

The gripper is powered and controlled directly via a single device cable that carries a 24V DC supply and a Modbus RTU communication over RS-485.

Refer to the **Electrical Setup** section for wiring information and the **Control** section for control of the gripper.

A gripper coupling is required for using Hand-E C10 to provide mechanical and electrical connectivity.

Refer to the **Mechanical Installation** section for installation of the coupling, to the **Specifications** section for technical drawings, and to the **Spare Parts, Kits and Accessories** section for available couplings.

The Hand-E C10 Gripper has an embedded object detection feature using indirect sensing methods. When picking an object with the "go to" command, the gripper status allows you to know whether an object is picked via a simple object detection bit (0 or 1):

when detected, the gripper stops.

when dropped, the gripper automatically closes. It keeps the object until detected or until the position target from the "go to" command is reached.

Refer to the **Control** section for details on object detection.



2. Safety



WARNING

The operator must have read and understood all of the instructions in the following manual before handling the RobotiqHand-E C10 Gripper.



INFO

The term "operator" refers to anyone responsible for any of the following operations on the Robotiq Hand-E C10 Gripper:

- Installation
- Control
- Maintenance
- Inspection
- Calibration
- Programming
- Decommissioning

This documentation explains the various Robotiq Hand-E C10 Gripper components. It includes all general operations regarding the whole life-cycle of the product.

The drawings and photos in this documentation are representative examples. Discrepancies may be observed between those and the delivered product.

2.1. Warning



CAUTION

Using the gripper in noncompliance of any warning is inappropriate and may cause injury or damage.



WARNING

- Properly secure the gripper before operating the robot.
- **Do not** install or operate a gripper that is damaged or lacking parts.
- **Never** supply the gripper with an alternative current source.
- Make sure all cord sets are always secured at both ends: the gripper and the robot.
- **Always** meet the recommended keying for electrical connections.
- Make sure no one is in the robot and/or gripper path before initializing the robot's routine.



- **Always** meet the gripper's payload specifications.
- Set the gripper's pinch force and speed based on your application.
- Keep fingers and clothes away from the gripper while the power is on.
- **Do not** use the gripper on people or animals.
- Make sure there are no gripper parts on the ground path of the welding power source.
- Make sure to wear safety glass when working next to the robot and/or gripper.
- Reduce the maximum robot acceleration and speed when manipulating heavy workpiece.

Risk assessment and final application

The Robotiq Hand-E C10 Gripper is meant to be used on an industrial robot. The robot, gripper, and any other equipment used in the final application must be evaluated with a risk assessment.

It is the robot integrator's duty to ensure that all local safety measures and regulations are met. There may be risks that require additional protection or safety measures. For example, the work-piece the gripper is manipulating might be inherently dangerous to the operator).

2.2. Intended Use



CAUTION

Always comply with local and/or national laws, regulations, and directives on automation safety and general machine safety.

The gripper unit is designed for gripping and temporarily securing or holding objects. It is intended for installation on a robot or other automated machinery and equipment. The unit should be used exclusively within the range of its technical data.

Any other use is deemed improper and unintended use. Robotiq is not liable for any damages resulting from any improper or unintended use.



3. Installation

WARNING

Before installing:



- Read and understand the safety instructions.
- Verify your package according to the **Scope of Delivery** section and your order.
- Have the required parts, equipment, and tools listed in the requirements readily available.

When installing:

- Meet the recommended environmental conditions.
- Do not operate the gripper, or even turn on the power supply, before it is firmly anchored and the danger zone is cleared. The fingers of the gripper may move and cause injury or damage.

3.1. Scope of Delivery

CAUTION

The following is not included as part of a standard delivery:



- Options, such as adapter plates or couplings for mounting on various industrial robots, fingertips, or finger pads.
- Hardware required for options, accessories or fixtures for the gripper, unless specified.
- Power supply units
- Power supply wiring or fuses.

INFO



When bought as a kit, the gripper comes in a package with the appropriate coupling, fingers or fingertips and cabling.

Refer to the **Spare Parts, Kits and Accessories** section.

3.1.1. Robotiq Hand-E C10 Gripper UR Standard Kit

Standard upon delivery for CB Series and e-Series

- Robotiq Hand-E C10 basic gripper unit (HND-C10-GRP)
 - Hand-E C10 gripper
 - Hand-E C10 stepped fingers



- Hand-E C10 fingers extenders
 - Hand-E C10 stop plate and spacers
 - 90° gripper bracket
 - Screw kit
- Hand-E Fingertip Starting Kit (**HND-TIP-START-KIT**)

For CB-Series

- USB to RS485 signal converter (**ACC-ADT-USB-RS485**)
- Coupling for connection to the robot controller (**GRP-CPL-062**)
- Robotiq device cable (**CBL-COM-2065-10-HF**)

For e-Series

- Gripper Coupling Kit (**GRP-ES-CPL-062**)
 - Wrist connection protector
 - Coupling for connection to robot wrist



INFO

Refer to the **Spare Parts, Kits and Accessories** section for a list of available couplings.

3.1.2. UR Wrist connection Kit for CB-Series

Hand-E C10 Wrist Connection Kit for CB-Series (**HND-UR-KIT-W**)

Standard upon delivery

- Robotiq Hand-E C10 basic gripper unit (**HND-C10-GRP**)
 - Hand-E C10 gripper
 - Hand-E C10 stainless steel stepped fingers
 - Hand-E C10 fingers extenders
 - Hand-E C10 stop plate and spacers
 - Screw kit
- I/O Coupling Kit (**IO-CPL-UR-CB-KIT**) :
 - I/O Coupling (**IO-CPL-CB**)
 - Screw Kit to install on the robot
 - Micro-USB to USB cable



3.2. Required Tools and Equipment

The following tools are required to install the Hand-E C10 Gripper:

- 4 mm hex key to mount the gripper onto its coupling
- Metric hex key according to your coupling to mount the coupling onto the robot
- 3 mm hex key to install the wrist connection protector (on e-Series only) and to adjust fingers
- 2,5 mm hex key to adjust the gripper's stop plate

The gripper needs to be supplied by a DC voltage source, which is not included with the gripper. Required power supply must match the Robotiq device. The following table shows the specifications with regards to the power supply required to operate the gripper and the optional Robotiq Controller.

SPECIFICATION	VALUE
Output voltage	24 V DC $\pm 10\%$
Output current	1 A
Overcurrent	Recommended power supply with internal protection, otherwise fusing is required. 2 A fuse at 25°C [77°F] ¹

¹ Suggested fuse is a: Phoenix Contact # 0916605 2 A thermal, use AWG #20 wiring.

Table 3-1: Hand-E C10 Power Supply Requirements



WARNING

If the power exceeds the specified regulation, over-voltage protection is required.

Robotiq recommends using the following power supplies:

- For the 1A output current:
 - TDK-Lambda DPP Series
 - 100W Single Output DIN Rail Mount Power Supply: **DPP30-24**



TIP

Optional Robotiq Universal Robots can use the same power supply.



3.3. Environmental and Operating Conditions

CONDITION	VALUE
Minimum storage temperature	-30°C [-22°F]
Maximum storage temperature	70°C [158°F]
Minimum operating temperature	-10°C [14°F]
Maximum operating temperature	50°C [122°F]
Humidity (non-condensing)	20-80% RH
Maximum vibration (storage/transit)	5G
IP Rating	IP 67
Other	• Free from corrosive liquids or gases • Free from explosive liquids or gases • Free from powerful electromagnetic interference

Table 3-2: Environmental and Operating Conditions of the Hand-E C10 Gripper

3.4. Mechanical Installation

3.4.1. Installing the Gripper on the Robot

Single Gripper Installation

Instructions

You must use a coupling to attach the gripper on the robot:

1. Reorient the robot tool flange upwards. Adjust its height to make it suitable for working.
2. Secure the gripper coupling on the robot wrist and use the coupling dowel pin to align parts. Tighten the four (4) M6 screws to 8 Nm.
3. Secure the gripper to the coupling. Tighten the M5 screws to 3 Nm.
4. Install the wrist connection protector (for e-Series only) and tighten the two (2) M4 screws to 1.5 Nm.



CAUTION



When no tooth lock washer is present, lock screws in place using medium strength threadlocker.

Tooth lock washers provide grounding for the casing of the gripper through the mounting screws. Refer to the **Electrostatic Discharge Safety** section.



INFO

The following images display the Hand-E Gripper, but the same structure applies.

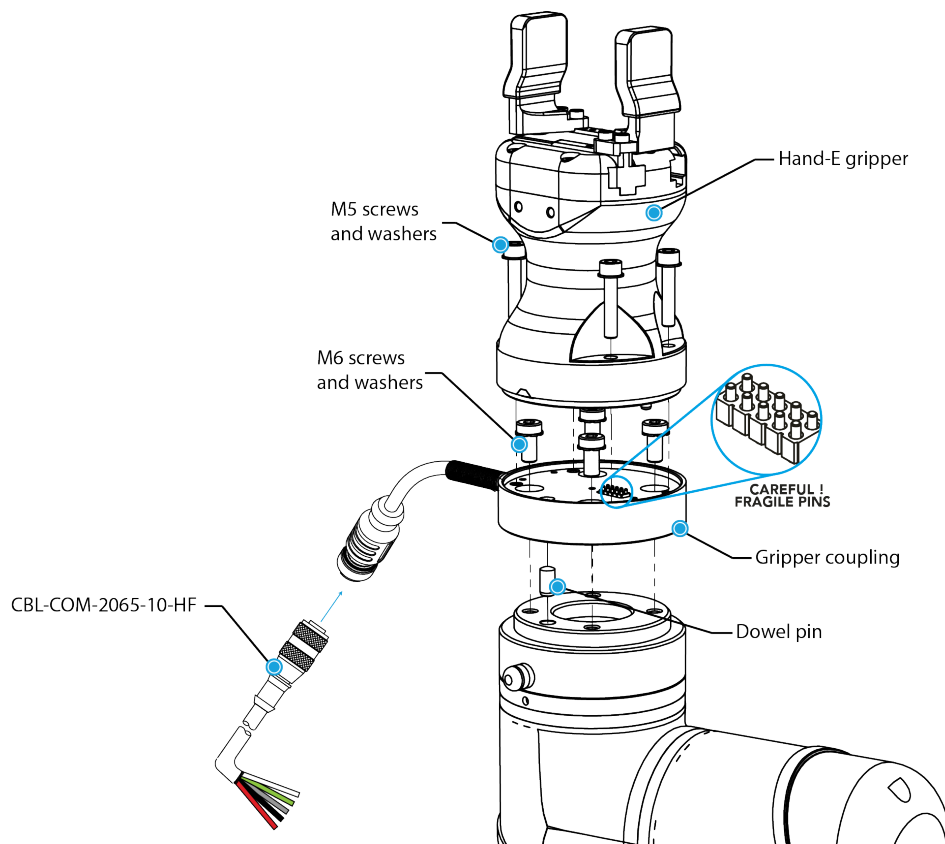


Fig. 3-1: Installing Hand-E C10 on the Robot Tool Flange for CB-Series



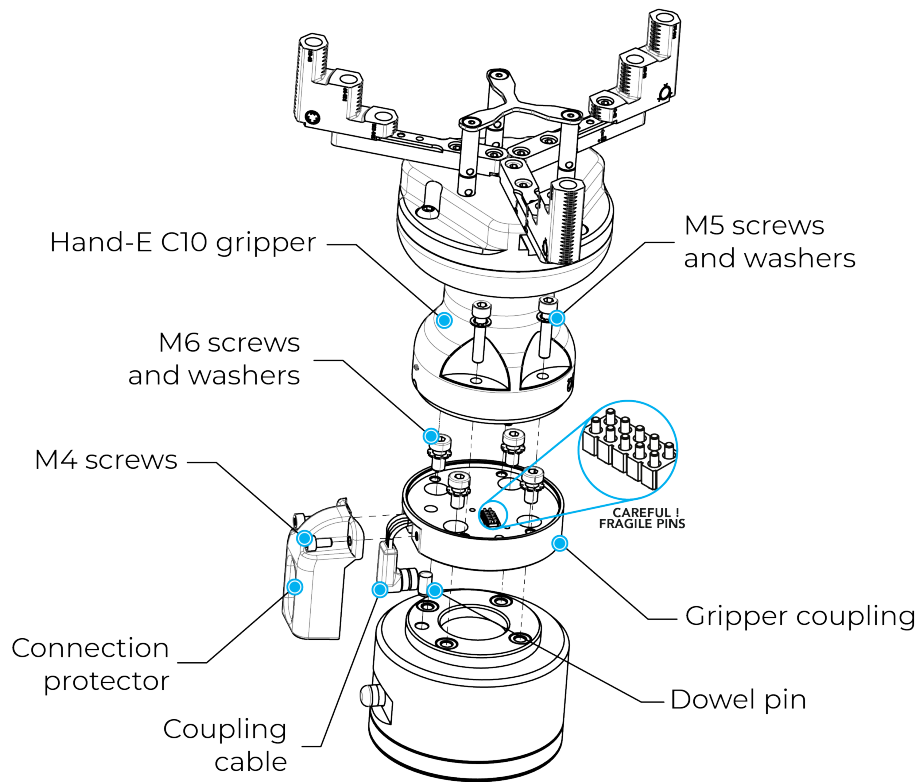


Fig. 3-2: Installing Hand-E C10 on the Robot Tool Flange for e-Series

Installation with the UR Wrist connection Kit for CB-Series (I/O Coupling)

I/O Coupling: Overview and Nomenclature

The **Robotiq I/O Coupling** is a robotic peripheral designed to allow a direct connection of the Robotiq Hand-E C10 Gripper to the Universal Robots CB-Series tool flange. It discards any cable management and avoids downtime caused by cable issues.

The robot sends I/O signals to the coupling which sends Modbus RTU commands to the gripper based on four (4) possible presets. These presets are determined by the I/O signals.

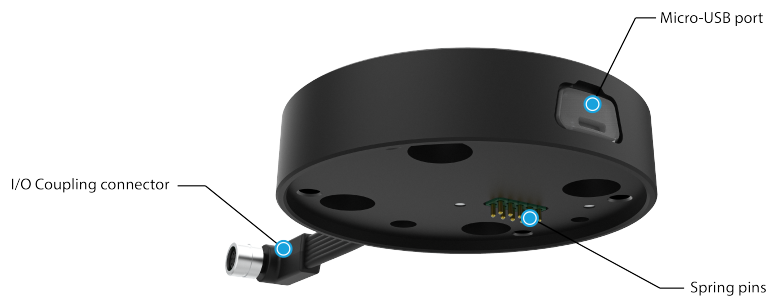


Fig. 3-3: Robotiq I/O Coupling

The status LED, integrated in the micro-USB port presented in the figure above, will be:

- **Solid blue/red** when booting
- **Solid red** when looking for product or waiting for communication
- **Solid blue** when powered with no errors (while communication is active)
- **Solid green** when communicating with USB



INFO

The object detection feature remains available with the I/O Coupling.

The position feedback is not available due to the robot tool connector nature.

The I/O Coupling comes with four (4) factory presets, as shown in the table below. These presets can be reconfigured on a computer before using them on a robot.

To configure presets, follow the instructions in the Robotiq User Interface (RUI) manual, available on support.robotiq.com.

	Preset 1	Preset 2	Preset 3	Preset 4
Position	100	0	100	0
Speed	100	100	0	0
Force	100	100	1*	1*

*To preserve object lost detection, force is not set to 0.

Table 3-3: Presets for Hand-E Gripper

Installing the I/O Coupling

Mounting the I/O Coupling

1. Reorient the robot tool flange upwards. Adjust its height to make it suitable for working.
2. Insert the provided dowel pin into the tool flange.
3. Mount the I/O Coupling on the robot tool flange. Align it properly with the dowel pin.
4. Use the provided M6 screws, the M6 tooth lock washers, and the 4 mm hex key to secure the I/O Coupling. Tighten the four (4) M6 screws to 8 Nm.

Mounting the Gripper onto the I/O Coupling

1. Fasten the gripper onto the I/O Coupling using the M5 screws and the gripper tooth lock washers. Tighten the four (4) M5 screws to 3 Nm.



CAUTION

Pins are fragile. Any abrupt movement can damage them and lead to product malfunction.

2. Plug the I/O Coupling connector into the robot tool flange connector.



CAUTION

Close the silicone door of the I/O Coupling micro-USB port to prevent any dust or liquid infiltration.



3. Make sure the voltage is set to 24V to operate the gripper:
 - i. Select the **I/O Tab**.
 - ii. On the bottom right corner of the page, select **Robotiq_Wrist_Connection** in the *Controlled by* drop down menu.
 - iii. In the **Installation** tab, click **Save**.

Firmware Update



WARNING

Make sure you have the latest gripper firmware version installed.

1. Connect the Hand-E C10 Gripper to your computer via the I/O Coupling using the USB cable. If the I/O Coupling is wet, make sure the micro USB port is properly dried before connecting the USB cable.
2. Run the Robotiq User Interface (RUI) to update the firmware.

Four (4) factory presets on the I/O Coupling are available. Programming and saving custom presets is also possible. Refer to the Robotiq User Interface Manual available at robotiq.com/support.

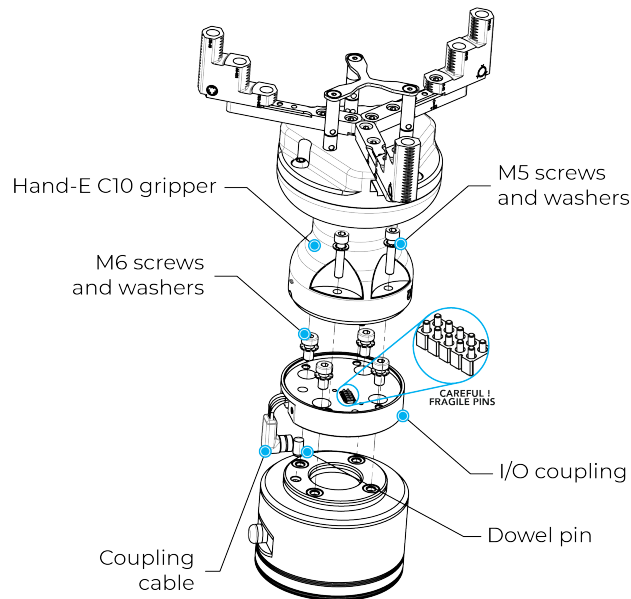


Fig. 3-4: Mechanical Installation of the I/O Coupling and the Hand-E C10 Gripper

90° Gripper Bracket Installation

1. Reorient the robot tool flange upwards. Adjust its height to make it suitable for working.
2. Install the 90° gripper bracket on the robot arm using the provided M6 x 12 mm screws and tooth lock washers. Make sure to install the dowel pin between the robot flange and the 90° bracket. Tighten the screws to 8 Nm.
3. Mount the gripper coupling on the 90° gripper bracket using the provided M6 x 12 mm screws and tooth lock washers. Tighten the screws to 8 Nm.
4. Mount the gripper onto the coupling using the provided M5 x 25 mm screws and tooth lock washers. Tighten the screws to 3 Nm.



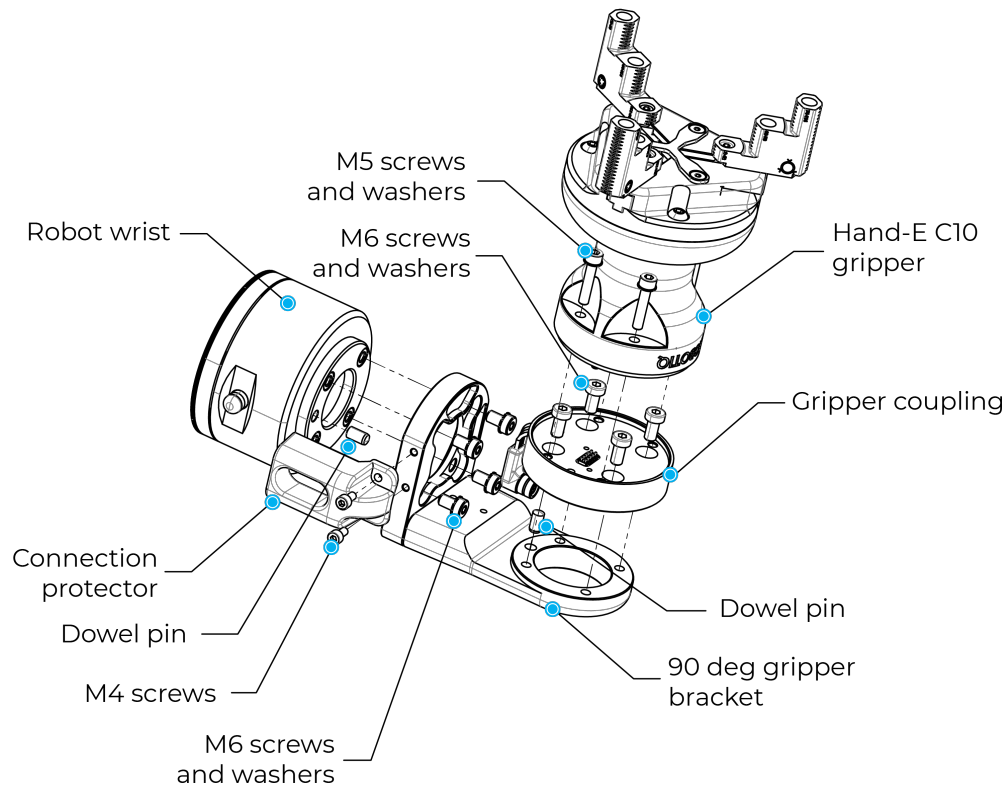


Fig. 3-5: 90° Bracket and the Hand-E C10 Gripper

Multiple Grippers Installation - Dual bracket (Y)

When installing multiple grippers on one robot, every gripper must have its own coupling:

For e-Series:

1. Fasten the M8 splitter (ACC-SPLIT-M8-2:1) to the dual gripper adapter plate (AGC-APL-159-002).
2. Tighten the two (2) M4 screws to 1.5 Nm.
3. Make sure the splitter is fastened on the side of the adapter plate that receives the dowel pin.

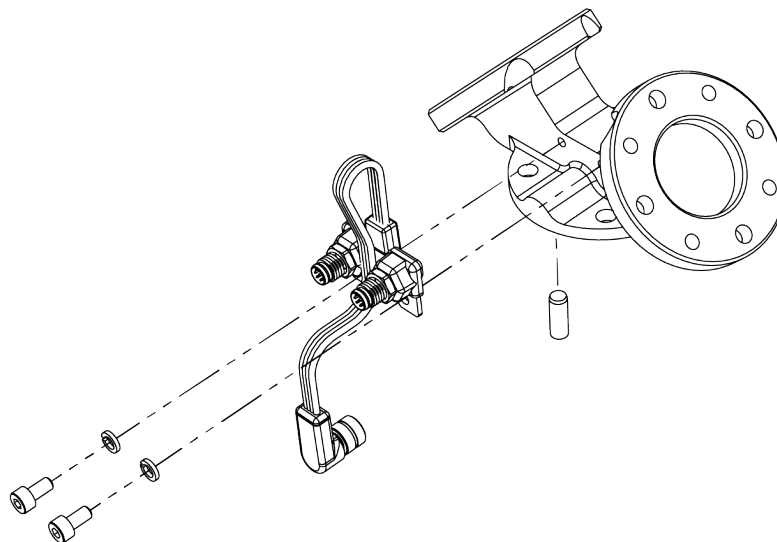


Fig. 3-6: Fastening the Splitter to the Dual Gripper Adapter Plate



4. Reorient the robot tool flange upwards. Adjust its height to make it suitable for working.
5. Mount each gripper's couplings on the dual bracket using the provided M6 x 12 mm screws and tooth lock washers. Tighten the M6 screws to 8 Nm.
6. Mount each gripper onto its coupling using the provided M5 x 25 mm screws and tooth lock washers. Tighten the M5 screws to 3 Nm.

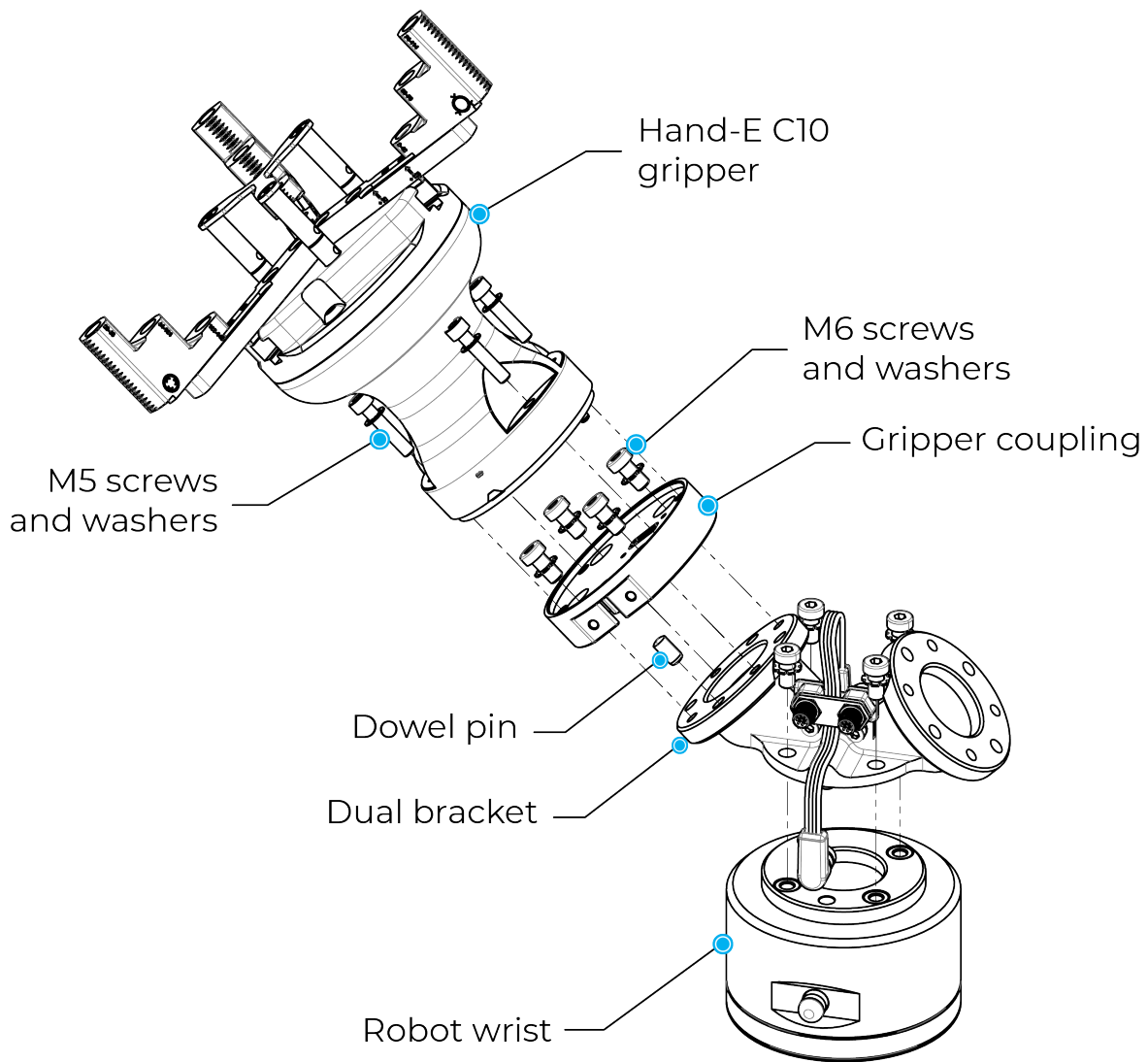


Fig. 3-7: Dual Bracket with Hand-E C10 Gripper

Multiple Grippers Installation - Compact Dual Bracket (X)

For e-Series:

1. Fasten the M8 splitter (ACC-SPLIT-M8-2:1) to the compact dual gripper adapter plate.
2. Tighten the two (2) M4 screw to 2 Nm.

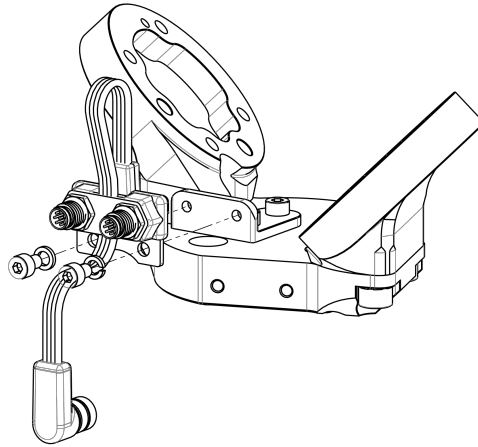


Fig. 3-8: Splitter on Compact Dual Bracket



INFO

When installing multiple grippers on one robot, every gripper must have its own coupling.

3. Reorient the robot tool flange upwards. Adjust its height to make it suitable for working.
4. Mount each gripper's couplings on the Compact Dual Bracket using the provided M6 x 12 mm screws and tooth lock washers.
5. Mount each gripper onto its coupling using the provided M5 x 25 mm screws and tooth lock washers.



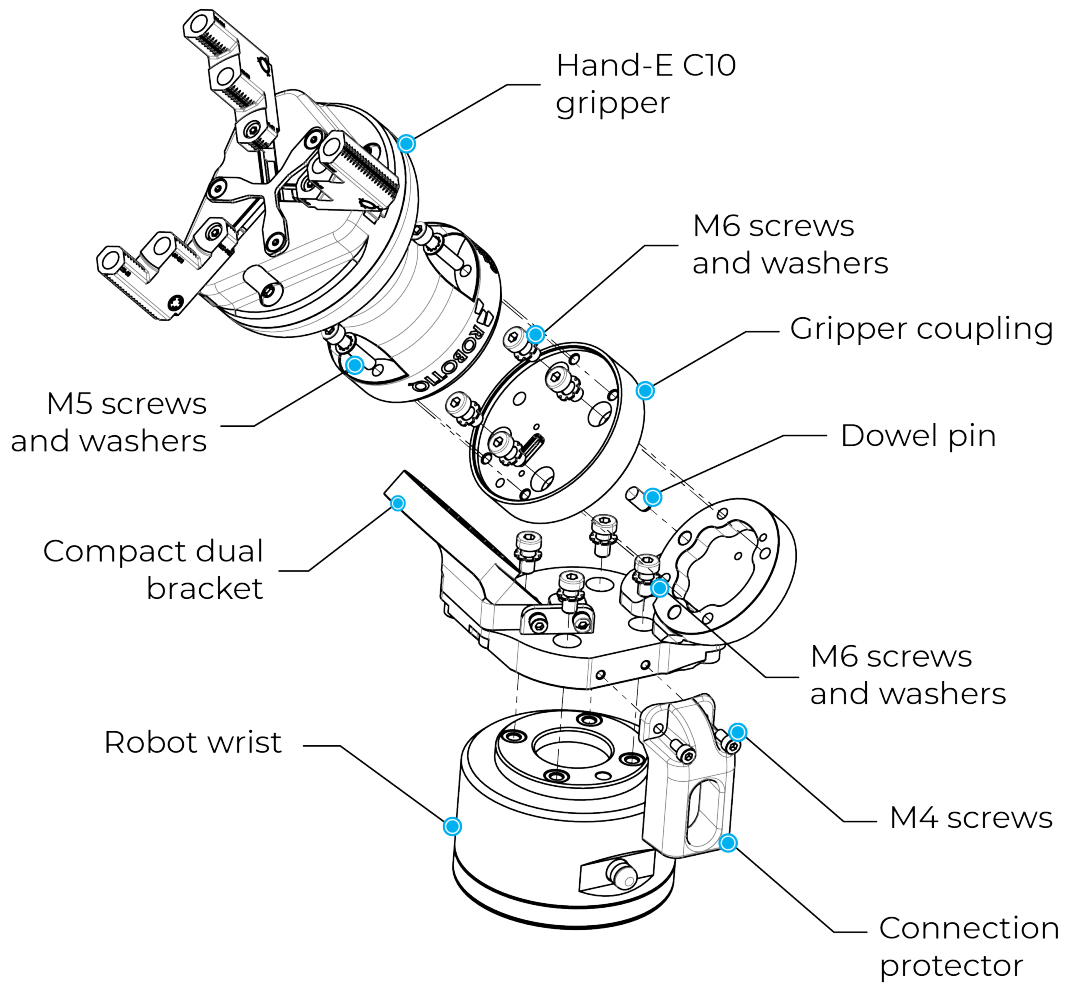


Fig. 3-9: Compact Dual Bracket with 90° Bracket

3.4.2. Installing Stepped Fingers on the Gripper

1. Insert the dowel pin into the gripper's rack.



INFO

Stepped fingers can be installed in 2 different orientations: external grip orientation or internal grip orientation.

2. Align the proper finger dowel pin hole with the dowel pin on the rack.
3. Apply low strength threadlocker on the provided M4 screws and secure the finger to the rack.
4. Tighten the two (2) screws to 3 Nm.
5. Repeat for the second and third fingers

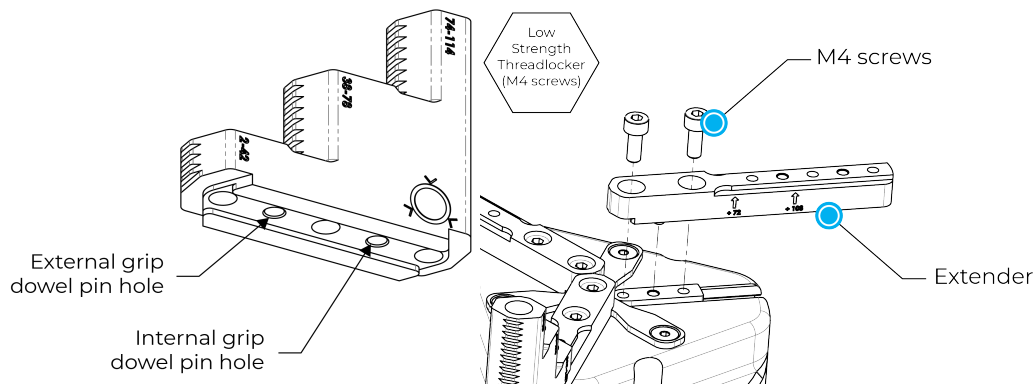


Fig. 3-10: Hand-E C10 Stepped Finger

3.4.3. Installing extenders on the Gripper

1. Insert the dowel pin into the gripper's rack.
2. Align the extender dowel pin hole with the dowel pin on the rack.
3. Apply low strength threadlocker on the provided M4 screws and secure the finger extender to the rack.
4. Tighten the two (2) screws to 3.5 Nm.



INFO

Stepped fingers can be installed in 2 different positions: +72 mm and +108 mm.

5. Insert the stepped finger dowel pin into the proper extender dowel pin hole.
6. Repeat for the second and third finger extenders.
7. Follow steps 2, 3, and 4 of the **Installing Stepped Fingers on the Gripper** section.

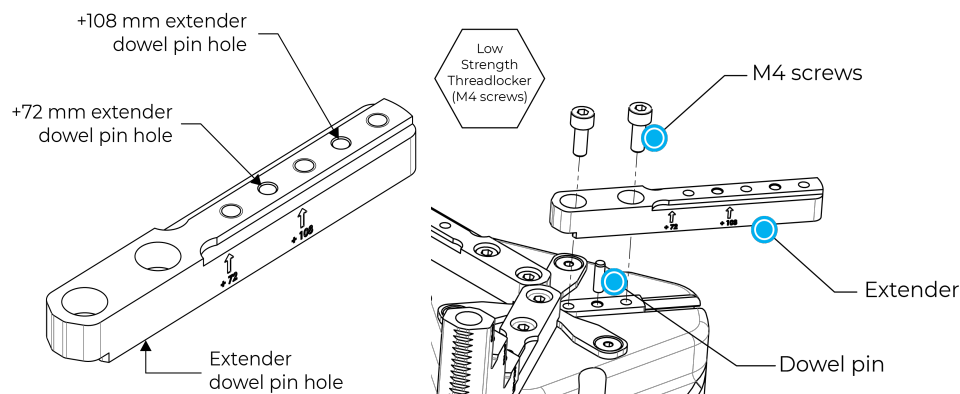


Fig. 3-11: Hand-E C10 Extender

3.4.4. Installing stop plate on the Gripper

1. Stop plate can be installed at four (4) different height that depend on the finger step used and also on finger extender combination. Select the appropriate stop plate height by maximizing parts engagement into the fingers.



2. If spacers are needed, apply low strength threadlocker to the male threads of the spacer. Tighten the three (3) spacers to 2Nm.
3. Provided 2.5 mm hex key can be inserted in through hole to tighten the spacer.
4. Align the stop plate clearance holes with the thread mounting holes.
5. Apply low strength threadlocker on the provided M4 screws and secure the stop plate. Tighten the three (3) M4 screws to 2Nm.
6. Ensure that the fingers are not in contact with the stop plate by closing the gripper.

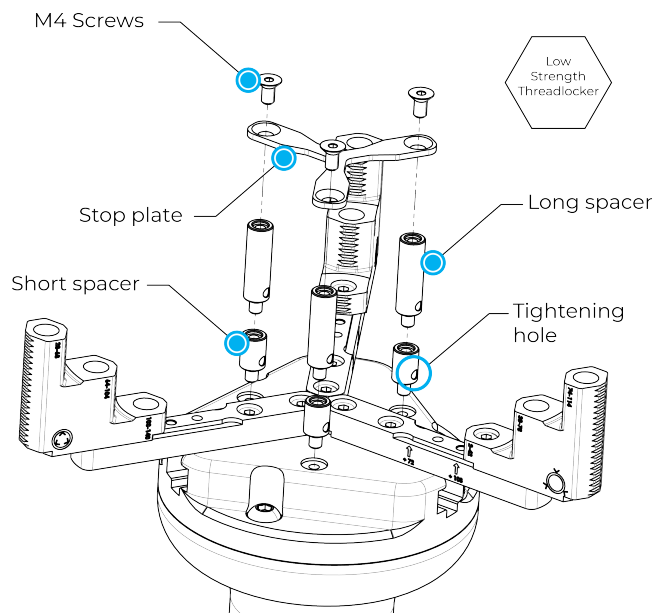
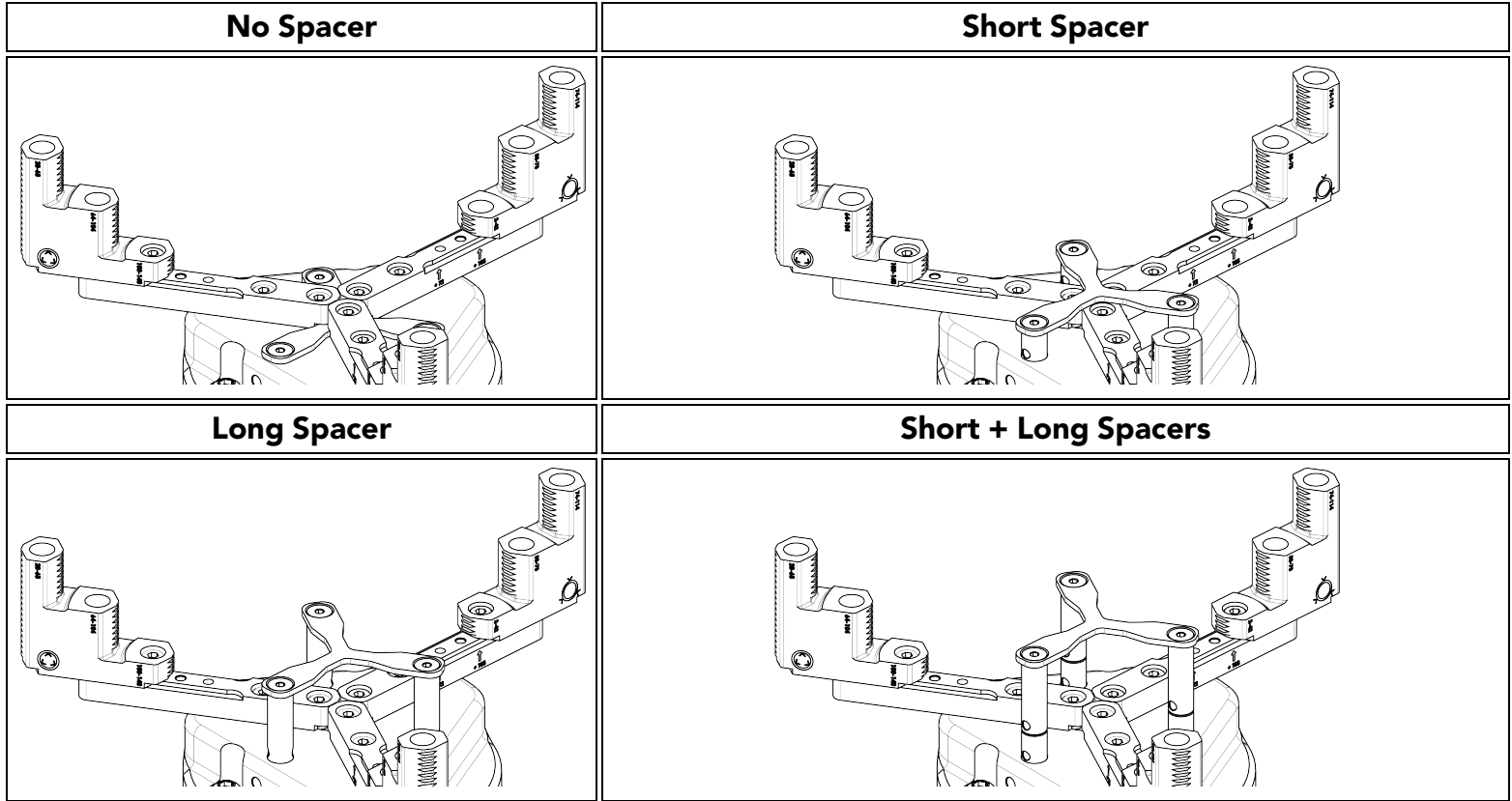


Fig. 3-12: Installing Hand-E C10 Stop Plate

3.5. Electrical Setup

Power and communication are established with the Hand-E C10 Gripper via a single device cable. The device cable provides a 24V power supply to the gripper and enables serial RS485 communication to the robot controller.



INFO

RS485 signals (485+, 485-, and 485 GND) are isolated from the main 24V power supply. GND can be connected to any other ground reference as long as the voltage potential between the grounds does not exceed 250V. Grounding reference is at the user's discretion.

3.5.1. Electrostatic Discharge Safety

Robotiq Hand-E C10 Gripper is **not** ESD safe.

When installed properly using the tooth lock washers, the casing and internal mechanism are grounded through the screws used to mount the gripper on the coupling. The top six (6) screws, the stepped fingers, and rails are isolated from the rest of the Hand-E C10 Gripper. It is not possible to discharge any electrostatic charge that would build up on the part through the gripper.

3.5.2. Pinout Interface

The gripper interfaces with its coupling via a 10-spring pin connector located on its outer surface.

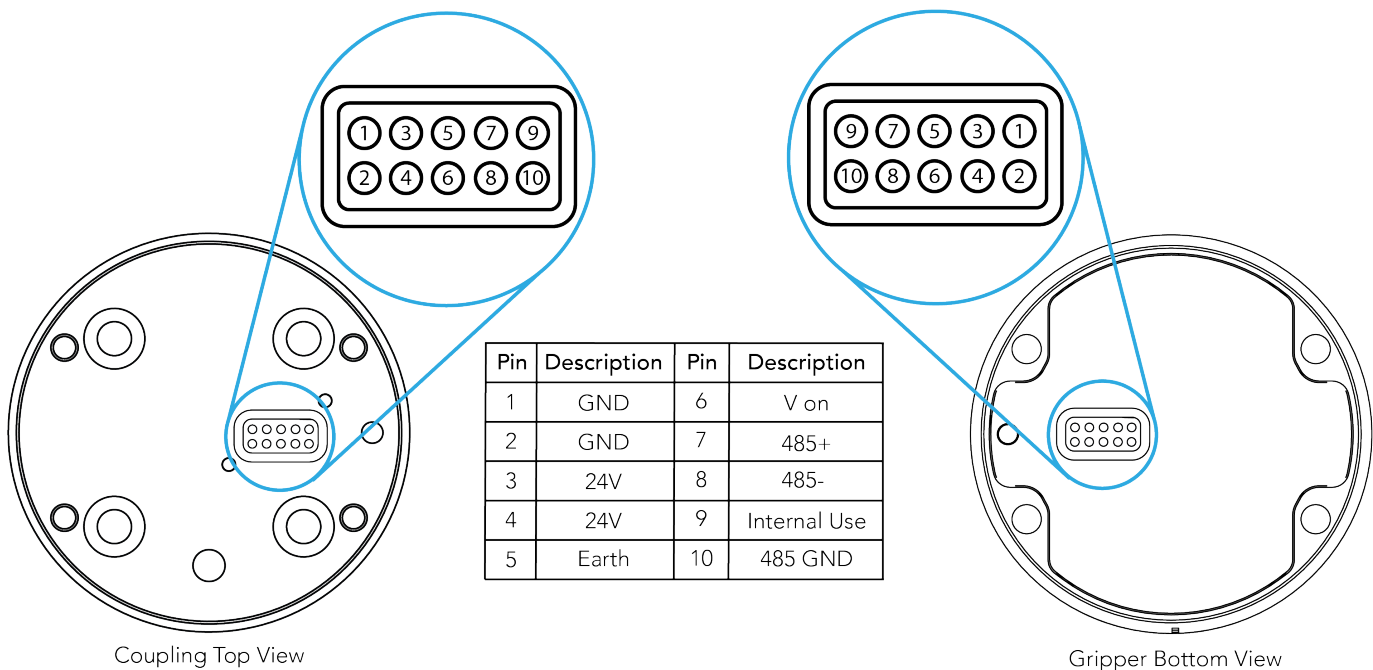


Fig. 3-13: Pinout to the Hand-E C10 Gripper Cable-to-Wrist Coupling



3.5.3. Coupling to Controller

CAUTION



Use proper cabling management.

Make sure to leave enough slack in the cabling to allow movement of the gripper along all axes without pulling out the connectors. Always protect the controller side (robot side) connector of the cable with a strain relief cable clamp.

The figure below illustrates the Hand-E C10 Gripper pigtail connector from the coupling (GRP-CPL-062 or AGC-CPL-XXX-002), the device cable on the robot side (CBL-COM-2065-10-HF), and their associated pinout.

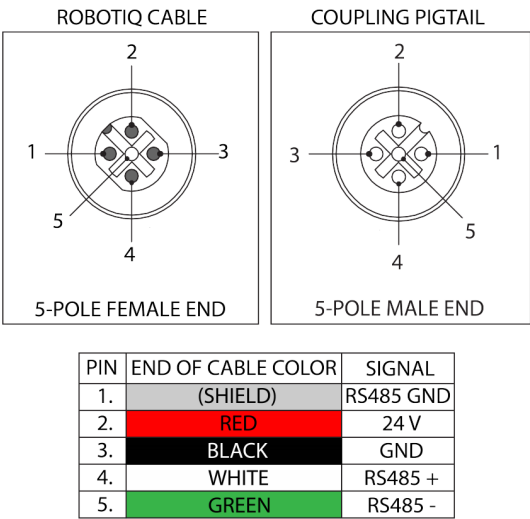


Table 3-4: Pinout of the Hand-E GripperHand-E C10 Gripper Pigtail and Device Cable

If additional cables are used, suggested cable specifications are as follows:

Power supply, fusing:

Minimum #22 AWG TEW, 300 V, or 600 V

RS485 signal

Minimum #24 AWG TEW, 300 V, or 600 V

A and B signals must be balanced at 120 Ohms.

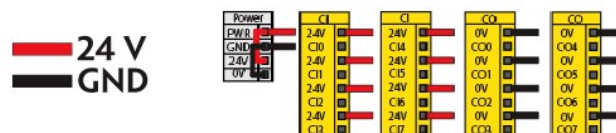
Single Gripper (for CB-Series)

Prior to any software installation on Universal Robots, connect the white, blue, and bare wires to the Robotiq RS-485 signal converter (ACC-ADT-RS485-USB).

Also connect the red (24V) and black (0V) wires in the terminal blocks of the robot controller.



POWER SUPPLY WIRING (ACCORDING TO UR CONTROLLER MODEL)



COMMUNICATION WIRING

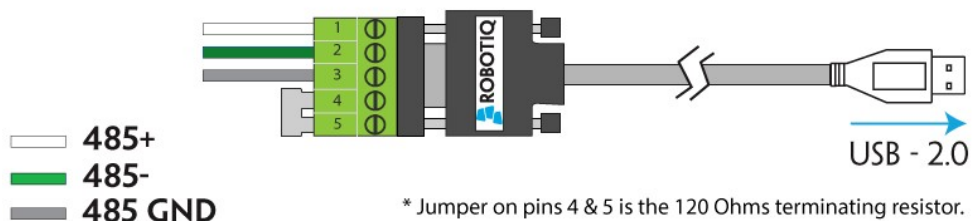


Fig. 3-14: Hand-E C10 Gripper Wiring to Universal Robots Controller

Multiple Grippers (for CB-Series)

Connecting and controlling up to four grippers on the same robot is possible.

Only one USB to RS485 converter (ACC- ADT-USB-RS485) must be used. Use M12 splitters (ACC-SPLIT-M12-2:1) to connect all the grippers pigtails to one 10 m cable (CBL-COM-2065-10-HF) that connects to the RS485 to RS232 converter.

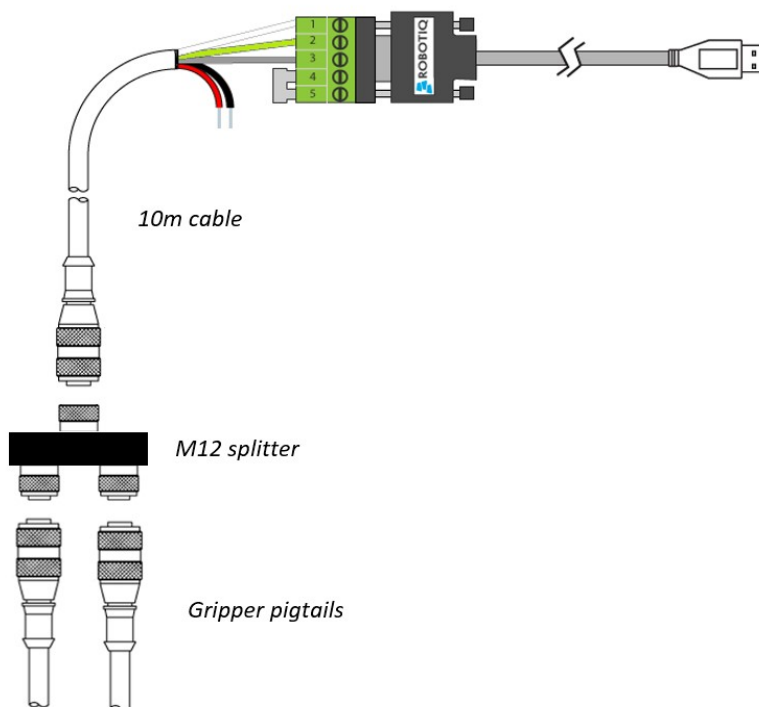


Fig. 3-15: Multiple Grippers Wiring



3.5.4. Coupling to Tool Connector for I/O Coupling

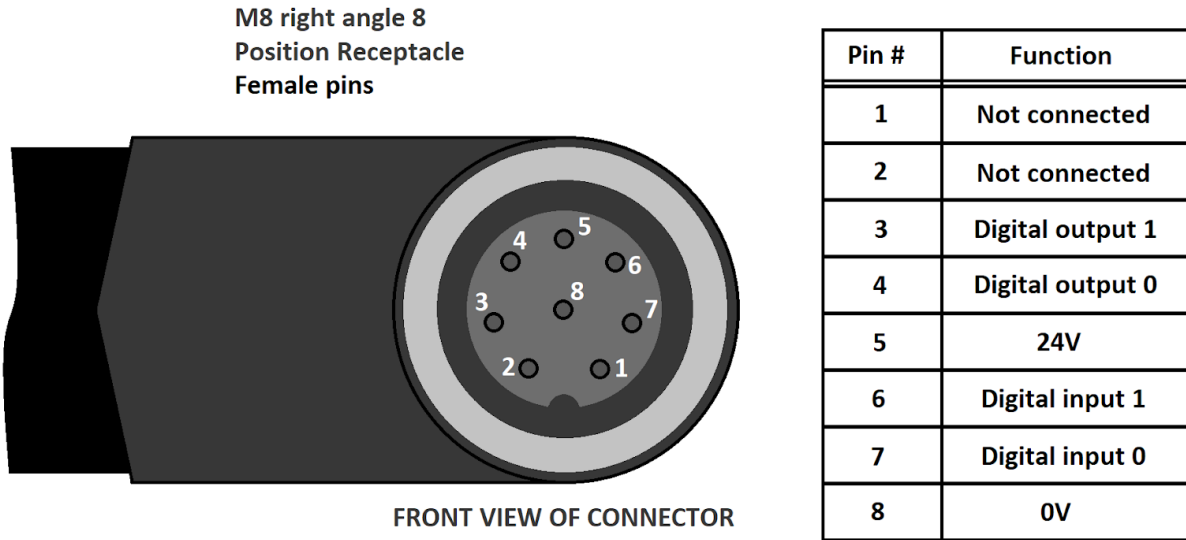


Fig. 3-16: Pinout of the I/O Coupling

3.5.5. Coupling to Wrist for e-Series

Single Gripper

The figure below represents the wiring schematic of Hand-E C10 with a coupling connecting directly to the robot wrist.



INFO

The following images display the Hand-E Gripper, but the same structure applies.

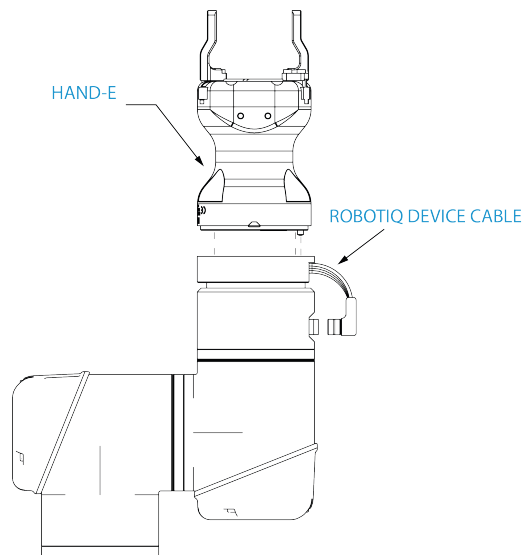


Fig. 3-17: Robotiq Hand-E C10 with Device Cable Wiring Scheme



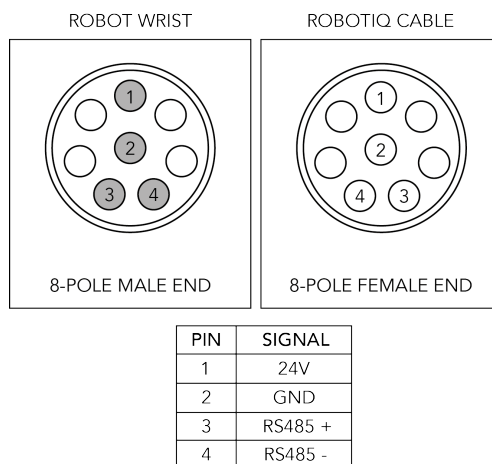


Fig. 3-18: Pinout of the Hand-E C10 Cable-to-Wrist Coupling



INFO

Power supply, communication signals, grounding, electrical resistance, and fusing are managed by the robot itself.

Multiple Grippers



CAUTION

For multiple gripper configurations, connect the M8 splitter to the robot wrist connector.

WARNING

To connect two (2) or more grippers at the same time on a robot, each gripper must have:



- a coupling for the transmission of power and communication signals
- a dual gripper adapter plate to mechanically mount the gripper on the robot arm
- a splitter

Refer to the **Spare Parts, Kits and Accessories** section for more details.

3.6. Testing the Gripper with the Robotiq User Interface (RUI)

Once installed and properly secured, your Robotiq Hand-E C10 Gripper should be tested with the Robotiq User Interface test software using the provided USB converter. Follow these instructions.

1. Install the Robotiq User Interface (RUI). For details, see the Robotiq User Interface manual, available at robotiq.com/support





INFO

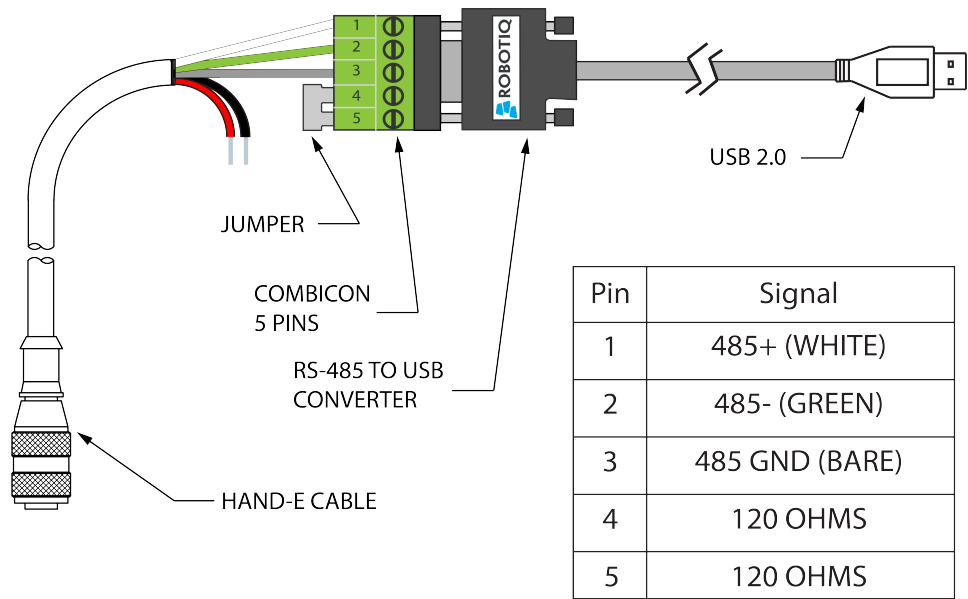
For CB-Series, use the provided RS-485 to USB converter ACC-ADT-USB-RS485 (see figure below) to plug into a PC with the Robotiq User Interface installed.

- 2. Power up your gripper with the previously recommended power supply.
- 3. Execute the RUI software and select "auto-connect" on the connection screen.
- 4. You are now connected to your gripper; you can click "activate" to begin using the gripper.



CAUTION

The **Activate** command initiates movement for the auto-calibration procedures.
Do **not** interfere with the gripper. Make sure robot safety measures are satisfied.



*24 V AND GND ARE NOT SUPPLIED VIA USB
*120 Ohms resistance JUMPER BETWEEN PINS 4 AND 5
Fig. 3-19: RS-485 to USB Converter ACC-ADT-USB-RS485 Pinout



TIP

With the RUI controlling the gripper, go to the **view** menu to see input and output register values, which help understanding how to command the gripper. Testing grasping objects with various speed and force settings is also possible.
Refer to the **Control** section for details.

3.7. Installation for Universal Robots

The table below shows which Robotiq software to use with your Universal Robots' controller. If you are using a CB3, CB3.1, or e-Series controller, it is recommended to use the Robotiq Grippers URCap Package.



Robotiq Software	Controller CB1	Controller CB2	Controller CB3	Controller CB3.1	e-Series Controller
Driver Package (includes Gripper toolbar)	Incompatible	Compatible	Compatible	Compatible	Incompatible
Robotiq Grippers URCap Package 1.2.1 and earlier versions	Incompatible	Incompatible	Compatible	Compatible	Incompatible
Robotiq Grippers URCap Package 1.3.0	Incompatible	Incompatible	Incompatible	Compatible	Incompatible
Robotiq Grippers URCap Package 1.3.1 and later versions	Incompatible	Incompatible	Incompatible	Compatible	Compatible

Table 3-5: Compatibility between Robotiq software and robot controller

Refer to the **URCap Package** section for the installation of the UR software package for Hand-E C10.

CAUTION



1. The robot's PolyScope version must be **3.5 or later** in order to install the URCap.
2. Prior to use over *Universal Robots*, adjust the payload and the center of gravity from the **Installation** tab. Refer to the **Mechanical Specifications** section.
3. Refer to the **Installing URCap Package** section to configure the grippers properly before controlling and programming them.
4. The most recent versions of the URCap are not compatible with CB-Series (PolyScope 3.x). Some features presented in this manual may differ or not be available on CB-Series.

3.8. URCap Package

Robotiq provides you with a Universal Robots URCap package that enables direct serial communication to your robot controller.



INFO

To download the Universal Robots controller URCap package, refer to robotiq.com/support (Software > Gripper Software > DOWNLOAD ZIP).

Make sure the Hand-E C10 Gripper is properly mounted to the robot arm.

Refer to the **Mechanical Installation** section for mechanical installation. Before installing the URCap package, make sure the Universal Robots controller is compatible with the package. Refer to the **Installation for Universal Robots** section.

The gripper URCap package installs:

- the gripper URCap
- the gripper toolbar
- the gripper nodes



Refer to the **Control** section for details on controlling the gripper.

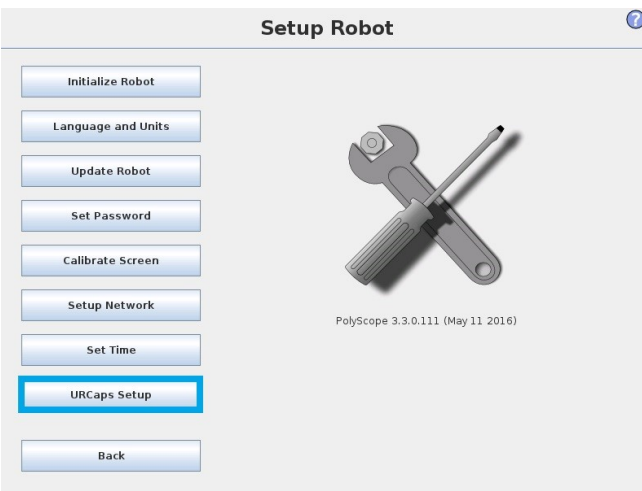
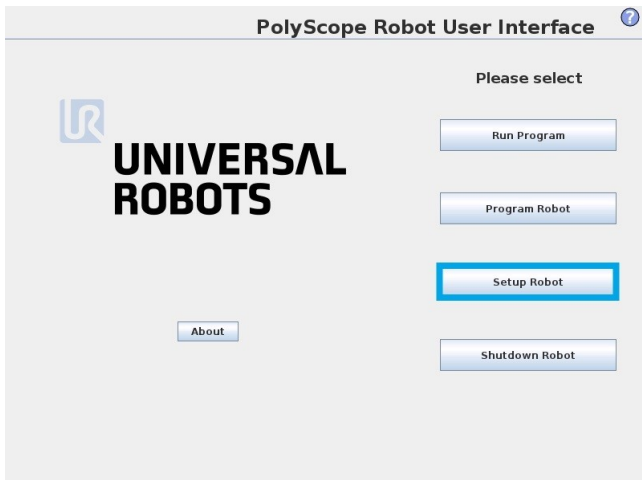


INFO

Refer to the **Control** section for details on programming with the URCap package.

3.8.1. Installing URCap Package

Installing URCap Package on CB-Series



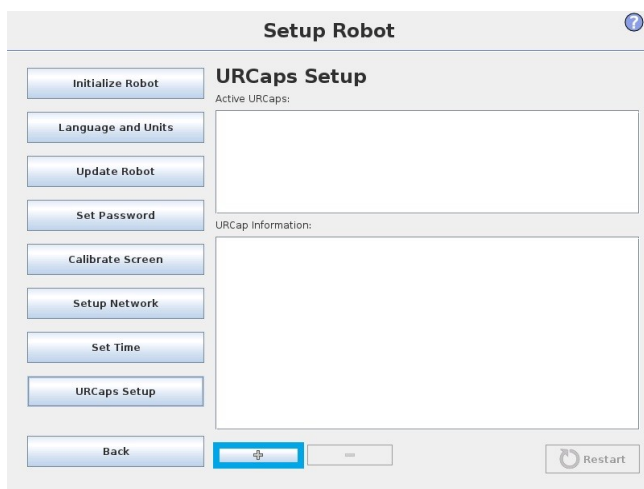
1. Make sure that PolyScope is up-to-date and that the Universal Robots controller is compatible with the gripper's URCap package.
2. Browse to support.robotiq.com and click **Select product > Hand-E Adaptive Gripper > Universal Robots > Software > Gripper Software**.
3. Download the **UCG-X.X.X** and extract its content on the root of a blank USB stick.
4. If an I/O Coupling is present, install the appropriate URCap by downloading the **UCH-X.X.X** in the **I/O Coupling Software** tab and extract its content on the root of a blank USB stick.
5. Insert the USB stick in the UR teach pendant or controller.
6. Access the **Setup Robot**.
7. Tap **URCaps Setup**.



TIP

To identify your PolyScope version, go to the PolyScope home page and tap **About**. A window containing the Universal Robots software version is then displayed.

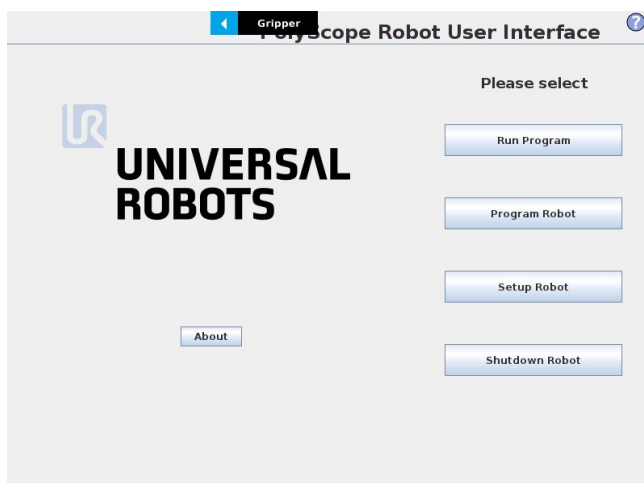




1. Tap the **plus** button (+) to add the gripper's URCaps package.
2. Open **Robotiq_Grippers-X.X.X.urcap** from the USB storage device.
3. If an I/O Coupling is present, tap the **plus** button (+) to add the Wrist Connection's URCaps package.
4. Open **Robotiq_Wrist_connection-X.X.X.X.urcap** from the USB storage device.



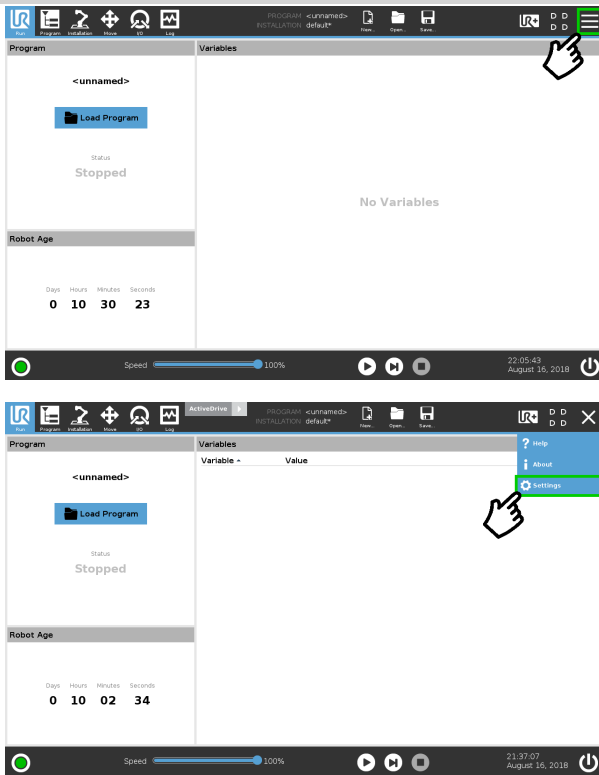
1. Restart PolyScope to complete the URCap installation. By doing so, you accept the License Agreement that is detailed in the URCap information text box (please refer to the **License Agreement** section).



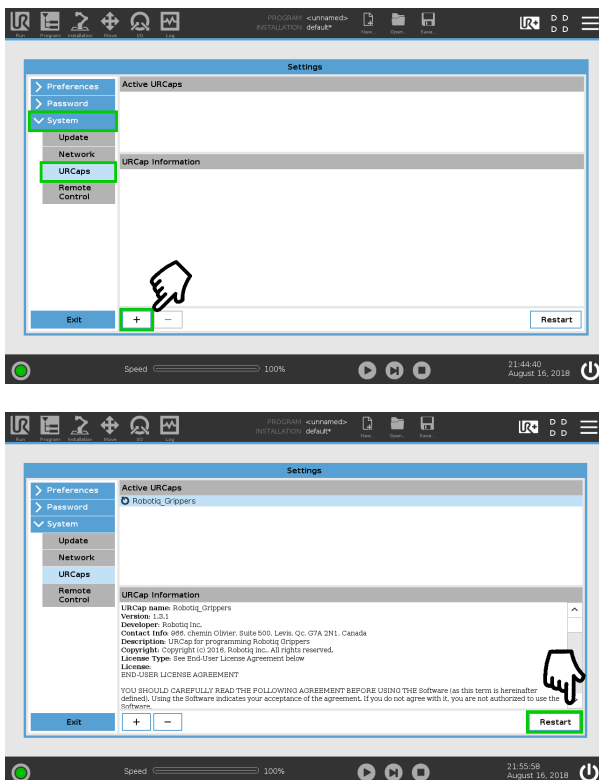
1. When PolyScope reopens, the Gripper Toolbar will appear on the screen.



Installing URCap Package on e-Series



1. Make sure that PolyScope is up-to-date and that the Universal Robots controller is compatible with the gripper's URCap package.
2. Browse to support.robotiq.com and click **Select product > Hand-E C10 Adaptive Gripper > Universal Robots > Software > Gripper Software**.
3. Download the **UCG-X.X.X** and extract its content on the root of a blank USB stick.
4. Insert the USB stick in the UR teach pendant or controller.
5. On the teach pendant, tap the **triple bar** icon in the upper right corner of the screen.
6. Tap **Settings**.



1. Tap the **System** button in the navigation pane on the left.
2. Select **URCaps** in the dropdown list.
3. Press the plus (+) button to look for the **.urcap** file in the available drives.
4. Once the file is selected, it displays in the **Active URCaps** box, next to a rounded arrow.
5. Tap the **Restart** button to activate the URCap.





TIP

To identify your PolyScope version, go to the PolyScopehome page and tap **About**. A window containing the Universal Robots software version is then displayed.

Activating a Gripper Connected to the Robot Wrist on a e-Series Robot

When connecting and activating a gripper to the robot wrist connector, set it up in PolyScope.

1. Mechanically mount the gripper on the robot. Refer to the **Installing the Gripper on the Robot** section
2. Go to **Installation > URCaps > Gripper > Dashboard**.
3. Check the **Gripper cable is connected to the wrist** box .

☒ Gripper cable is connected to the wrist

⚠ On first installation: go to **General > Tool IO > Controlled by "Robotiq_Grippers"**

☐ Limit gripper current

 Scan

☒ Show Gripper Toolbar

Fig. 3-20: *Gripper Cable is Connected to the Wrist Check Box*

4. Go to **Installation > General > Tool I/O**.
5. Go to the **I/O Interface Control** section and select **Robotiq_Grippers** in the **Controlled by** drop down list.

I/O Interface Control

Select how the Tool I/O interface is controlled. If a URCap controls the interface, user defined options will be overridden.

Controlled by: **Robotiq_Grippers**

Tool Analog Inputs

☐ Analog Inputs

analog_in[2]: Voltage

analog_in[3]: Voltage

☒ Communication Interface

The Tool Communication Interface allows communication with the tool without external wiring

Baud Rate: 115200

Parity: None

Stop Bits: One

RX Idle Chars: 1.5

TX Idle Chars: 3.5

Digital Output Mode

Tool Digital Output mode is defined based on the tool attached

Tool Output Voltage: 24

⚠ Setting the tool voltage to 24V may damage attached equipment if it is only configured to 12V

☐ Dual Pin Power

☒ Standard Output

Digital Output 0: Sinking (NPN)

Digital Output 1: Sinking (NPN)

Fig. 3-21: *I/O Interface Control*



TIP

To reload these settings when restarting the robot, save the **Installation** file.

6. Go back to the gripper **Dashboard**, and tap **Scan**. An icon should confirm your gripper is connected. To activate it, tap **Activate**. You can now use your gripper. Tap **E-Open** or **E-Close** to test it.





INFO

The number written in the gripper icon corresponds to the gripper ID.

Multiple Grippers

It is possible to connect and control up to four grippers on the same UR robot.

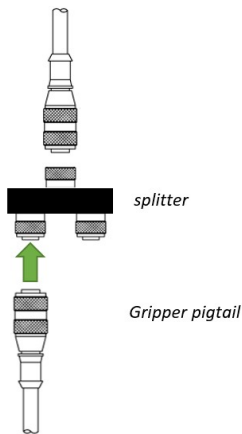
When installing multiple grippers on a UR robot, set an ID for each gripper.

CAUTION



Connect only one gripper at a time using the splitter.

Refer to the **Installing the Gripper on the Robot** section and the **Electrical Setup** section for details instructions. After a gripper has been identified by PolyScope, disconnect it and repeat the installation procedure for each additional gripper.



1. Connect only one gripper at a time using the splitter.



For CB-Series:

1. From the PolyScope home page, go to **Program Robot**; then, tap the **Installation** tab.
2. Tap **Gripper**.
3. Tap the **Dashboard** tab.
4. Tap the **Scan** button to detect grippers.

For e-Series:

1. Tap **Installation** in the top ribbon.
2. From the left navigation pane, tap **URCaps**.
3. Tap **Gripper**.
4. Tap the **Dashboard** tab.
5. Perform steps 3 to 6 listed under the **Activating a Gripper Connected to the Robot Wrist on a e-Series Robot** section.





Change ID ▼

- 2
- 3
- 4

Activate

E-Open

E-Close

1. Check that the gripper ID is different from the other grippers that will be connected to the robot. If required, select a different ID from the **Change ID** dropdown list.

CAUTION



Make sure that each gripper has a ID different from other grippers or communication issues will occur.

By default, Gripper ID is set to 1 in all grippers internal memory.

When you change gripper ID through PolyScope, it is committed to gripper memory.

2. Click **Activate** to activate the gripper.
3. Perform the same routine for all grippers.



Change ID ▼

Reactivate

E-Open

E-Close



Change ID ▼

Activate

E-Open

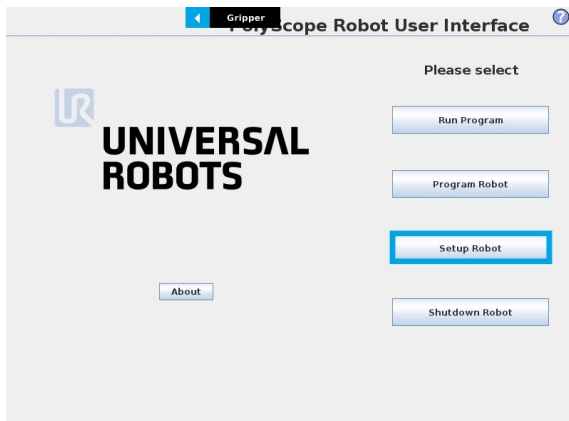
E-Close

1. Go back to the **Dashboard** tab and confirm that all grippers are recognized and can be controlled. Tap **E-Open** and **E-Close** to test each gripper.

3.8.2. Uninstalling URCap Package

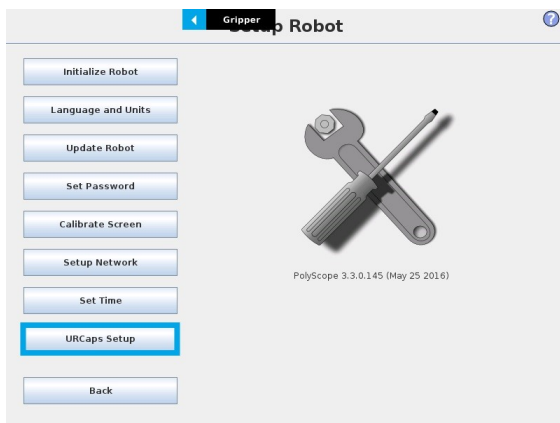
If you wish to uninstall the Hand-E C10 Gripper URCap, follow this procedure:

For CB-Series

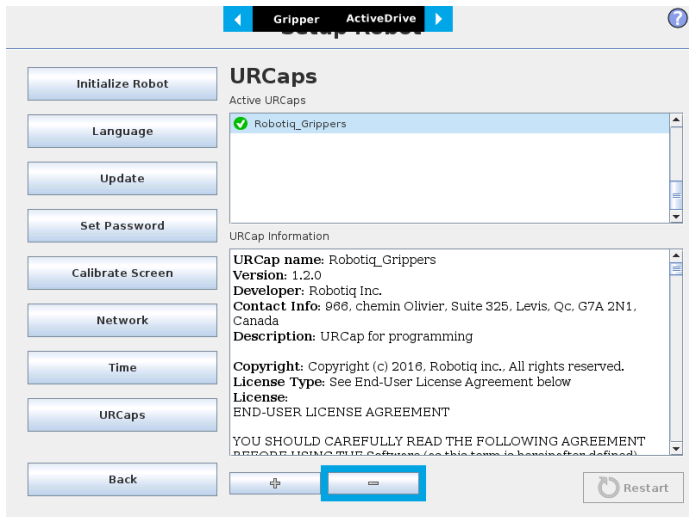


1. Go to **Setup Robot**.



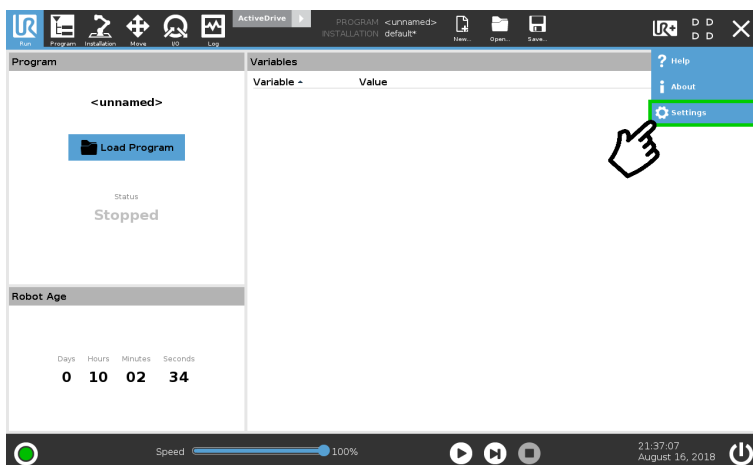


1. Tap URCaps Setup.



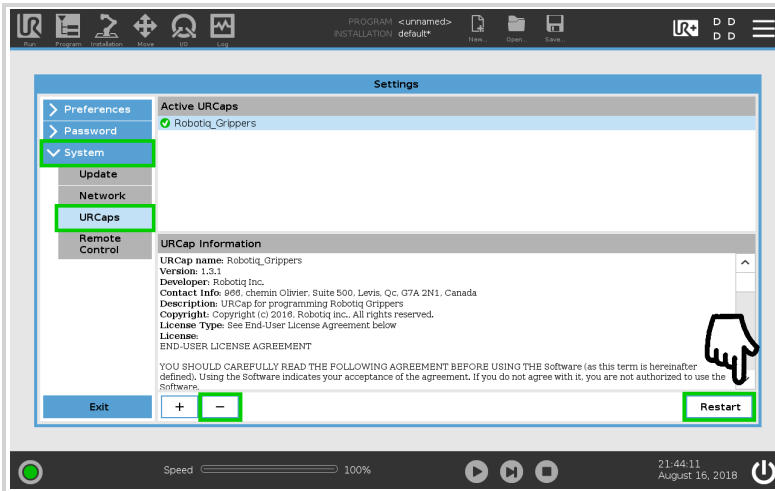
1. In the **Active URCaps** text box, tap the **Gripper** URCap.
2. The Gripper URCap should be highlighted.
3. Tap the **minus** button (-) to uninstall the URCap.
4. Restart PolyScope to complete the uninstallation process.

For e-Series



1. On the teach pendant, tap the **triple bar** icon in the upper right corner of the screen.
2. Tap **Settings**.





1. Tap the **System** button in the navigation pane on the left.
2. Select **URCaps** in the dropdown list.
3. Select the URCap to uninstall.
4. Press the minus (-) button to remove the URCap.
5. Tap the **Restart** button to deactivate the URCap.



4. Control



INFO

Unless specified, all values in this section are hexadecimal values.

4.1. Overview

The Robotiq Hand-E C10 Gripper is controlled directly via Modbus RTU using a RS485 signal.



TIP

To test various gripper features such as object detection and force control, use the Robotiq User Interface. To download it, go to robotiq.com/support and click **Select product > Hand-E C10 Adaptive Gripper > [any robot brand] > Software > Robotiq User Interface > DOWNLOAD ZIP**.

The Robotiq Hand-E C10 Gripper has its own embedded controller. Use high-level commands such as **Go to requested position** to control it.

INFO

The operator can control force, speed, and position of gripper fingers.



- Finger movement is always synchronized.
- Finger movement is initiated via a single "Go to requested position" command.
- Object detection is built-in. Operator is notified after an object is picked once the "Go to" command has been initiated. The feature also works for lost or dropped objects, and the user can be alerted if an object is dropped after being detected.
- In case of emergency, auto-release is engaged (open or close).

Control using registers

Grippers share their internal memory with a robot controller. One part of the memory is for the robot output: **gripper functionalities**. The other part of the memory is for the robot input: **gripper status**. Two types of actions are then available to a robot controller:

1. Write in the **robot output** registers to activate **functionalities**;
2. Read in the **robot input** registers to get the **status** of the gripper.

The **Gripper Register Mapping** section maps the registers used to control the gripper or to read its status.

The **Robot Output Registers & Functionalities** section details the output (write) register functions.

The **Robot Input Registers and Status** section details the input (read) register status.

Refer to the **Control Logic Example** section for details.



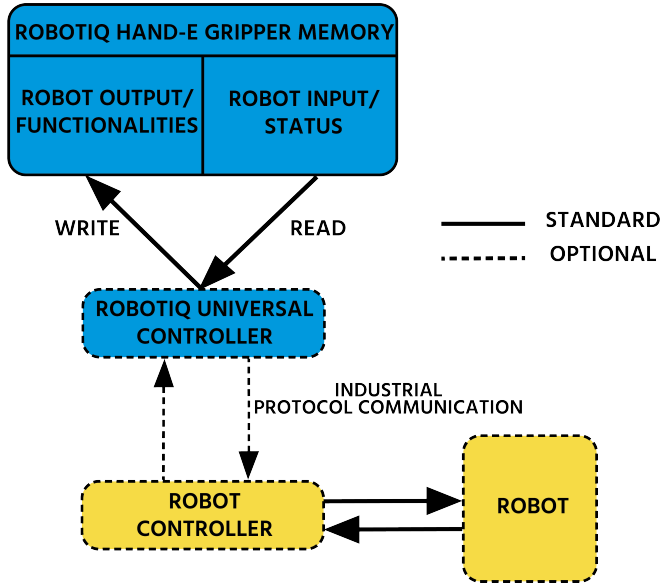


Fig. 4-1: Hand-E C10 Control Logic Overview

4.2. Gripper Register Mapping



CAUTION

Byte numbering starts at zero and not at 1 for the functionalities and status registers.

Register	Robot Output / Functionalities	Robot Input / Status
Byte 0	ACTION REQUEST	GRIPPER STATUS
Byte 1	RESERVED	RESERVED
Byte 2	RESERVED	FAULT STATUS
Byte 3	POSITION REQUEST	POS REQUEST ECHO
Byte 4	SPEED	POSITION
Byte 5	FORCE	CURRENT
Byte 6 to 15	RESERVED	RESERVED

Table 4-1: Registers of the Hand-E C10 Gripper



4.3. Robot Output Registers & Functionalities

4.3.1. Register: ACTION REQUEST

Address: Byte 0

Bits	7	6	5	4	3	2	1	0
Symbols	Reserved		rARD	rATR	rGTO	Reserved		rACT

rACT

First action to be made prior to any other actions; the **rACT** bit will activate the gripper. Clear the **rACT** bit to reset the gripper and clear any fault status.

- 0x0 - Deactivate Gripper.
- 0x1 - Activate Gripper (must stay on after activation routine is completed).



WARNING

When setting **rACT** ($rACT == 1$), the gripper will begin movement to complete its activation feature.



INFO

Power loss will set **rACT** ($rACT == 1$); the **rACT** bit must then be cleared ($rACT == 0$), then set again to allow operation of the gripper.



CAUTION

The **rACT** bit must stay on afterwards for any other action to be performed.

rGTO

The "Go To" action moves the gripper fingers to the requested position using the configuration defined by the other registers, **rGTO** will engage motion while bytes 3, 4 and 5 will determine aimed position, force and speed. The only motions performed without the **rGTO** bit are activation and automatic release routines.

- 0x0 - Stop.
- 0x1 - Go to requested position.

rATR

Automatic Release routine action slowly opens the gripper fingers until all motion axes reach their mechanical limits. After all motions are completed, the gripper sends a fault signal and needs to be reinitialized before any other motion is performed. The **rATR** bit overrides all other commands excluding the activation bit (**rACT**).



- 0x0 - Normal.
- 0x1 - Emergency auto-release.



CAUTION

The automatic release is meant to disengage the gripper after an emergency stop of the robot. The automatic release is not intended to be used under normal operating conditions. Automatic release requires the rACT to be cleared (rACT == 0) then set (rACT == 1).

rARD

Auto-release direction. When auto-releasing, **rARD** commands the direction of the movement. The **rARD** bit should be set prior to or at the same time as the **rATR** bit, as the motion direction is set when the auto-release is initiated.

- 0x0 - Closing auto-release
- 0x1 - Opening auto-release

4.3.2. Register: GRIPPER OPTIONS

Address: Byte 1

Bits	7	6	5	4	3	2	1	0
Symbol	Reserved							

4.3.3. Register: GRIPPER OPTIONS 2

Address: Byte 2

Bits	7	6	5	4	3	2	1	0
Symbol	Reserved							

4.3.4. Register: POSITION REQUEST

Address: Byte 3

Bits	7	6	5	4	3	2	1	0
Symbol	rPR							

This register is used to set the target position for the gripper's fingers. The positions 0x00 and 0xFF correspond respectively to the fully opened and fully closed mechanical stops. For detailed finger trajectory, see the **Specifications** section.

- 0x00 - Open position, 40 mm opening
- 0xFF - Closed
- Opening / count: ≈ 0.16 mm for 40 mm stroke



**INFO**

The activation will allow the gripper to adjust to any fingers/fingertips. No matter what is the size and/or shape of the fingers/fingertips, 0 will always be fully opened and 255 fully closed, with a quasi-linear relationship between the two values.

4.3.5. Register: SPEED

Address: Byte 4

Bits	7	6	5	4	3	2	1	0
Symbol	rSP							

This register is used to set the gripper closing or opening speed in real time, however, **setting a speed will not initiate a motion.**

- 0x00 - Minimum speed
- 0xFF - Maximum speed

4.3.6. Register: FORCE

Address: Byte 5

Bits	7	6	5	4	3	2	1	0
Symbol	rFR							

The force setting defines the final gripping force for the gripper. The force will fix the maximum current sent to the motor. If the current limit is exceeded, the fingers stop and trigger an object detection notification. Please refer to the **Picking Features** section for details on force control.

- 0x00 - Minimum force
- 0xFF - Maximum force

**INFO**

Register bytes 6 to 15 are reserved and should be set to 0.

4.4. Robot Input Registers and Status

4.4.1. Register: GRIPPER STATUS

Address: Byte 0

Bits	7	6	5	4	3	2	1	0
Symbols	gOBJ		gSTA		gGTO	Reserved		gACT



gACT

Activation status, echo of the **rACT** bit (activation bit).

- 0x0 - Gripper reset.
- 0x1 - Gripper activation.

gGTO

Action status, echo of the **rGTO** bit (**go to** bit).

- 0x0 - Stopped (or performing activation / automatic release).
- 0x1 - Go to Position Request.

gSTA

Gripper status, returns the current status and motion of the gripper fingers.

- 0x00 - Gripper is in reset (or automatic release) state. See Fault Status if gripper is activated.
- 0x01 - Activation in progress.
- 0x02 - Not used.
- 0x03 - Activation is completed.

gOBJ

Object detection status, is a built-in feature that provides information on possible object pick-up. Ignore if **gGTO** == 0.

- 0x00 - Fingers are in motion towards requested position. No object detected.
- 0x01 - Fingers have stopped due to a contact while opening before requested position. Object detected opening.
- 0x02 - Fingers have stopped due to a contact while closing before requested position. Object detected closing.
- 0x03 - Fingers are at requested position. No object detected or object has been loss / dropped.

CAUTION



In some circumstances the object detection feature may not detect an object even if it is successfully grasped. For instance, picking up a thin object may be successful without the object detection status being triggered. In such applications, the "Fingers are at requested position" status of register gOBJ is sufficient to proceed to the next step of the routine.



TIP

Checking for the correct position of the fingers (byte 4), **as well as** object detection (byte 0, bit 6 & 7) before proceeding to the next step of a routine is a more reliable method than object detection or finger position alone.

4.4.2. Register: RESERVED

Address: **Byte 1**

Bits	7	6	5	4	3	2	1	0
Symbol	Reserved							

4.4.3. Register: FAULT STATUS

Address: **Byte 2**

Bits	7	6	5	4	3	2	1	0
Symbols	kFLT				gFLT			

gFLT

Fault status returns general error messages that are useful for troubleshooting. Fault LED (red) is present on the gripper chassis, LED can be blue, red or both and be solid or blinking.

- 0x00 - No fault (solid blue LED)
- Priority faults (solid blue LED)
 - 0x05 - Action delayed; the activation (re-activation) must be completed prior to perform the action.
 - 0x07 - The activation bit must be set prior to performing the action.

Minor faults (solid red LED)

- 0x08 - Maximum operating temperature exceeded ($\geq 85^{\circ}\text{C}$ internally); let cool down (below 80°C).
- 0x09 - No communication during at least 1 second.

Major faults (LED blinking red/blue) - Reset is required (rising edge on activation bit (**rACT**) needed).

- 0x0A - Under minimum operating voltage.
- 0x0B - Automatic release in progress.
- 0x0C - Internal fault, contact support@robotiq.com
- 0x0D - Activation fault, verify that no interference or other error occurred.
- 0x0E - Overcurrent triggered.
- 0x0F - Automatic release completed.



INFO

While booting, status LED will be solid blue/red.



kFLT

See your optional controller manual (input registers and status).

4.4.4. Register: POSITION REQUEST ECHO

Address: **Byte 3**

Bits	7	6	5	4	3	2	1	0
Symbol	gPR							

gPR

Echo of the requested position for the gripper, value between 0x00 and 0xFF.

- 0x00 - Full opening.
- 0xFF - Full closing.

4.4.5. Register: POSITION

Address: **Byte 4**

Bits	7	6	5	4	3	2	1	0
Symbol	gPO							

gPO

Actual position of the gripper obtained via the encoders, value between 0x00 and 0xFF.

- 0x00 - Fully opened.
- 0xFF - Fully closed.

4.4.6. Register: CURRENT

Address: **Byte 5**

Bits	7	6	5	4	3	2	1	0
Symbol	gCU							

gCU

The current is read instantaneously from the motor drive, value between 0x00 and 0xFF, approximate current equivalent is 10 * value read in mA.



**TIP**

Built-in features like object detection and force control use the fingers' electrical current readings. The user does not need to create these features.

4.5. Picking Features

As stated in previous sections, object picking is done via a simple "Go To" command, **rGTO** bit calls for movement, while **rPR** byte is the aimed position, **rSP** and **rFR** will be the desired speed and force settings respectively. This section describes key features in object picking applications:

- Force control
- Re-grasp
- Object detection
- Object contact loss

4.5.1. Force control

The gripping force is controlled via the **rFR** byte (please refer to the **Robot Output Registers & Functionalities** section). The gripper behavior will change according to the **rFR** force requested.

- **rFR** = 0 : Very fragile objects
 - Lowest force
 - Re-grasp feature is off
- 1 **rFR** 255 : Fragile to robust objects
 - Re-grasp feature is on

Object type	Solid Fragile	Deformable Fragile	Solid Robust
rFR value	0	1	255
Force Level	Low Force		High Force
Re-grasp	OFF	ON	

4.5.2. Re-Grasp

Re-grasp feature is a built-in feature meant to prevent object lost due to slipping or inaccurate initial grip. The Re-grasp feature allows the gripper to initiate movement when an object is slipping or dropped. When Re-grasping, the gripper will attempt to close until it reaches the position request (**rPR**).

- This feature is automatically set according to the force request **rFR**.



**INFO**

Feature is off at force request $rFR = 0$, otherwise it is on.

- Re-grasp will keep the position setting:
 - Finger motion will stop when **rPR** position is reached, even if there is no object.
- Force and speed settings are not used, Re-grasp force and speed will automatically adjust to keep the object from being lost / dropped.

**INFO**

While your initial settings for force and speed are not used for Re-grasp, they will never be exceeded to prevent damaging the part.

**CAUTION**

The **rOBJ** status is cleared when a motion is detected.

4.5.3. Object detection

When the gripper grabs an object, the **gOBJ** status will allow you to know if contact with the object was successful. This is a built-in feature for adaptive grippers meant to be used by the robot controller (or PLC) commanding the overall application. The Object detection feature will change the **gOBJ** status and can be used inside your robot program.

As stated in the previous section:

gOBJ: Only valid if **gGTO** = 1.

- 0x00 - Fingers are in motion towards requested position. No object detected.
- 0x01 - Fingers have stopped due to a contact while opening before requested position. Object detected.
- 0x02 - Fingers have stopped due to a contact while closing before requested position. Object detected.
- 0x03 - Fingers are at requested position. No object detected or object has been lost / dropped.

Example of contact detected with an object:

1. Set position, speed and force at maximum (full closing):
 - a. **rPR** == 0xFF, **rSP** == 0xFF, **rFR** == 0xFF,
2. Set "go to requested" will initiate movement :
 - a. **rGTO** == 0x01
3. Then object detection status will be "in motion"
 - a. **gOBJ** == 0x00
4. Until an object is picked, object detection status will then be "stopped due to contact while closing"
 - a. **gOBJ** == 0x02



5. The user can now assume it is holding the payload, and proceed to the next step.

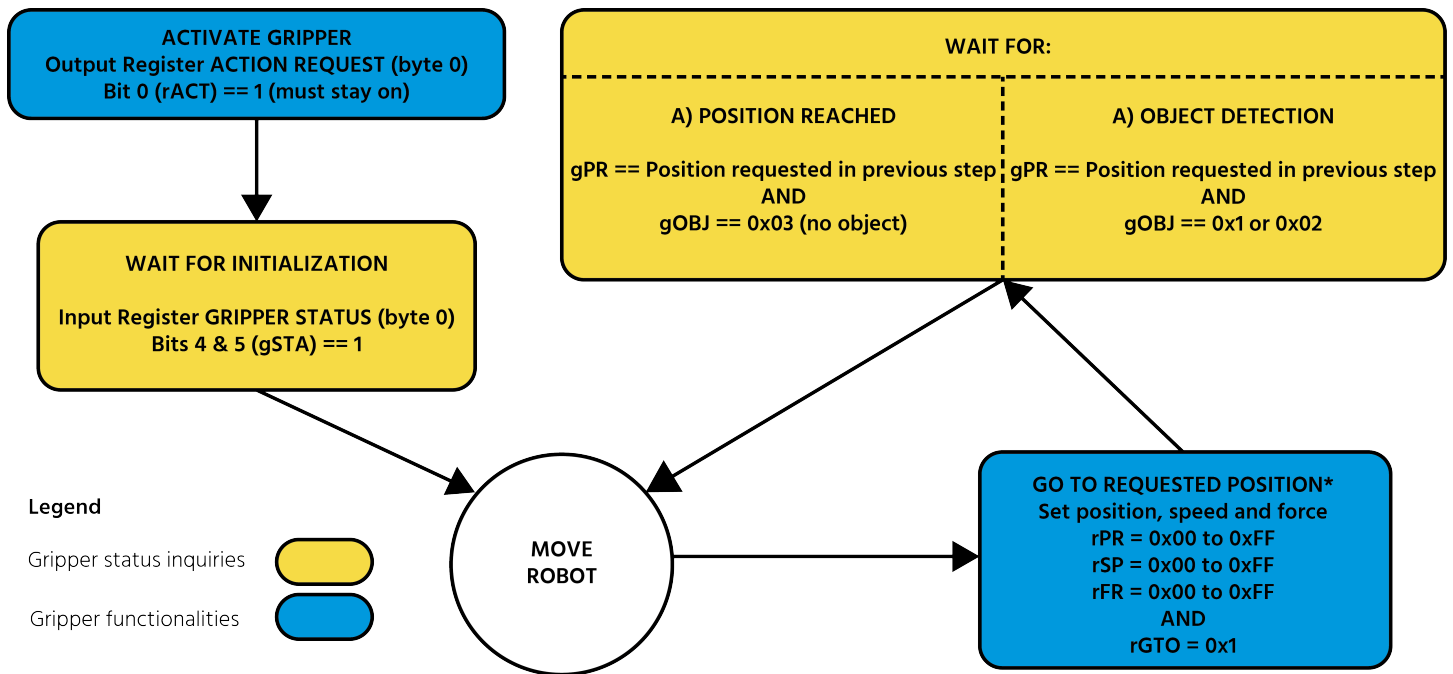
Example of contact lost with an object:

1. From the previous example, after an object is picked
 - a. `gOBJ == 0x02`
2. If the `gOBJ` status displays `0x03` after it was `0x02`, user can assume contact with the object has been lost.

4.5.4. Brake engagement

Hand-E C10 is equipped with a brake that engages at the end of every gripper move, and disengages between moves. For instance, when fully closing on an object, the gripper touches the object, activates the brake, and sends the object detection signal to the robot.

4.6. Control Logic Example



Go to requested position is used to open/close the Gripper until a contact with the object is detected, or the requested position is reached.

Fig. 4-2: Example of Gripper Control Logic with Corresponding Registers

4.7. Modbus RTU Communication

The gripper can be controlled by Modbus RTU directly with RS485 or over USB using the ACC-ADT-USB-RS485. This section is intended to provide guidelines for setting up a Modbus master that will adequately communicate with the gripper.

For a general introduction to Modbus RTU and for details regarding the CRC algorithm, the reader is invited to read the [Modbus over serial line specification and implementation guide](#).

For debugging purposes, the reader is also invited to download one of many free Modbus scanners such as the [CAS Modbus Scanner from Chipkin Automation Systems](#).



INFO

Modbus RTU is a communication protocol based on a Big Endian byte order. Therefore, the 16-bit register addresses are transmitted with the most significant byte first. However, the data port is in the case of Robotiq products based on the Little Endian byte order. As such, the data parts of Modbus RTU messages are sent with the less significant byte first.

**TIP**

Modbus RTU specifications and details can be found at www.modbus.org.

4.7.1. Connection Setup

The following table describes the connection requirements for controlling the gripper using the Modbus RTU protocol.

PROPRIETY	DEFAULT VALUE
Physical Interface	RS-485 ¹
Baud Rate ²	115,200 bps
Data Bits	8
Stop Bit ²	1
Parity ²	None
Supported Functions	Read Input Registers (FC04) Preset Multiple Registers (FC16) Master read & write multiple registers (FC23)
Exception Responses	Not supported
Slave ID ²	0x0009 (9)
Robot Output / Gripper Input First Register	0x03E8 (1000)
Robot Input / Gripper Output First Register	0x07D0 (2000)
Termination Resistor ²	120 ohms

¹ Various converters are available in the **Spare Parts, Kits and Accessories** section.

² These parameters can be adjusted using the Robotiq User Interface.

Each register (word - 16 bits) of the Modbus RTU protocol is composed of **2** bytes (8 bits) from the gripper. The first gripper output Modbus register(0x07D0) is composed from the first **2** Robotiq Gripper bytes (byte 0 and byte 1).



INFO

200 Hz is the maximum speed when commanding / reading from the Robotiq Gripper. It is therefore recommended to send commands with a minimum delay of 5 ms between them.

Maximum baud rate of **ACC-ADT-USB-RS485** is 115200 bps.

120 Ohms termination resistor is already present on the converter and the Gripper. If multiple grippers are connected in parallel on the same RS485 cable, termination resistor must be set to OFF in communication parameters.

4.7.2. Read input registers (FC04)

Function code 04 (FC04) is used for requesting the status of the gripper analog input register. Examples of such data are gripper status, object status, finger position, etc.

Example of an FC04 read function:

This message asks for register 0x07D0 (2000) and register 0x07D1 (2001) which contains Gripper Status, Object Detection, Fault Status and Position Request Echo.

Request is: 09 04 07 D0 00 02 70 0E

Bits	Description
09	SlaveID
04	Function Code 04 (Read Input Registers)
07D0	Address of the first requested register
0002	Number of registers requested (2)
700E	Cyclic Redundancy Check (CRC)

Response is: 09 04 04 E0 00 00 00 45 84

Bits	Description
09	SlaveID
04	Function Code 04 (Read Input Registers)
04	Number of data bytes to follow (2 registers x 2 bytes/register = 4 bytes)
E000	Content of register 07D0
0000	Content of register 07D1
4584	Cyclic Redundancy Check (CRC)



4.7.3. Preset multiple registers (FC16)

Function code 16 (FC16) is used to activate functionalities of the gripper (robot output). Examples of such data are action request, speed, force, etc.

Example of setting multiple registers FC16:

This message requests to set position request, speed and force of the gripper by setting register 0x03E9 (1002) and 0x03EA.

Request is: 09 10 03 E9 00 02 04 60 E6 3C C8 EC 7C

Bits	Description
09	SlaveID
10	Function Code 16 (Preset Multiple Registers)
03E9	Address of the first register
0002	Number of registers written to
04	Number of data bytes to follow (2 registers x 2 bytes/register = 4 bytes)
60E6	Value written to register 0x03E9
3CC8	Value written to register 0x03EA
EC7C	Cyclic Redundancy Check (CRC)

Response is: 09 10 03 E9 00 02 91 30

Bits	Description
09	SlaveID
10	Function Code 16 (Preset Multiple Registers)
03E9	Address of the first register
0002	Number of written registers
9130	Cyclic Redundancy Check (CRC)

4.7.4. Master read and write multiple registers FC23

Function code 23 (FC23) is used for reading the status of the gripper (robot input) and activating gripper functionalities (robot output) simultaneously. Examples of such data are gripper status, object status, finger position, etc. Action requests are speed, force, etc.

Example of reading and writing multiple registers FC23:



This message reads registers 0x07D0 (2000) and 0x07D1 (2001), which contains Gripper Status, Object Detection, Fault Status and Position Request Echo. It also sets the position request, speed and force of the gripper by writing to registers 0x03E9 (1001) and 0x03EA (1002).

Request is: 09 17 07 D0 00 02 03 E9 00 02 04 00 E6 3C C8 2D 0C

Bits	Description
09	SlaveID
17	Function Code 23 (read and write multiple registers)
07D0	Address of the first requested register, read
0002	Number of registers requested (2), read
03E9	Address of the first register written to
0002	Number of registers written to (2)
04	Number of data bytes to follow (2 registers X 2 bytes/registers = 4 bytes)
00E6	Value written to register 0x03E9
3CC8	Value written to register 0x03EA
2D0C	Cyclic Redundancy Check (CRC)

Response is: 09 17 04 01 00 09 E6 F6 C1

Bits	Description
09	SlaveID
17	Function Code 23 (read and write multiple registers)
04	Number of data bytes to follow (2 registers x 2 bytes/register = 4 bytes)
1000	Content of register 07D0
09E6	Content of register 07D1
F6C1	Cyclic Redundancy Check (CRC)



TIP

Response contents might change depending on gripper status.



**INFO**

Gripper executes the input command ("write" command), executes one cycle of motion, updates the output, then returns the Modbus response read.

4.7.5. Modbus RTU example

This section depicts the example from the **Control Logic Example** section, when programmed using the Modbus RTU protocol. The example is typical of a pick and place application. After activating the gripper, the robot is moved to a pick-up location to grip an object. It moves again to a second location to release the gripped object.

Step 1: Activation Request (clear and set rACT)

Request is (clear rAct): 09 10 03 E8 00 03 06 00 00 00 00 00 00 73 30

Bits	Description
09	SlaveID
10	Function Code 16 (Preset Multiple Registers)
03E8	Address of the first register
0003	Number of registers written to
06	Number of data bytes to follow (3 registers x 2 bytes/register = 6 bytes)
0000	Value to write to register 0x03E9 (ACTION REQUEST = 0x01 and GRIPPER OPTIONS = 0x00): rACT = 1 for "Activate Gripper"
0000	Value written to register 0x03EA
0000	Value written to register 0x03EB
7330	Cyclic Redundancy Check (CRC)



Response is: 09 10 03 E8 00 03 01 30

Bits	Description
09	SlaveID
10	Function Code 16 (Preset Multiple Registers)
03E8	Address of the first register
0003	Number of written registers
0130	Cyclic Redundancy Check (CRC)

Request is (set rAct): 09 10 03 E8 00 03 06 01 00 00 00 00 00 72 E1

Bits	Description
09	SlaveID
10	Function Code 16 (Preset Multiple Registers)
03E8	Address of the first register
0003	Number of registers written to
06	Number of data bytes to follow (3 registers x 2 bytes/register = 6 bytes)
0100	Value to write to register 0x03E9 (ACTION REQUEST = 0x01 and GRIPPER OPTIONS = 0x00): rACT = 1 for "Activate Gripper"
0000	Value written to register 0x03EA
0000	Value written to register 0x03EB
72E1	Cyclic Redundancy Check (CRC)



Response is: 09 10 03 E8 00 03 01 30

Bits	Description
09	SlaveID
10	Function Code 16 (Preset Multiple Registers)
03E8	Address of the first register
0003	Number of written registers
0130	Cyclic Redundancy Check (CRC)

Step 2: Read Gripper status until the activation is completed

Request is: 09 04 07 D0 00 01 30 0F

Bits	Description
09	SlaveID
04	Function Code 04 (Read Input Registers)
07D0	Address of the first requested register
0001	Number of registers requested (1)
300F	Cyclic Redundancy Check (CRC)

Response (if the activation IS NOT completed): 09 04 02 11 00 54 A1

Bits	Description
09	SlaveID
04	Function Code 04 (Read Input Registers)
02	Number of data bytes to follow (1 register x 2 bytes/register = 2 bytes)
1100	Content of register 07D0 (GRIPPER STATUS = 0x11, RESERVED = 0x00): gACT = 1 for "Gripper Activation", gSTA = 1 for "Activation in progress"
54A1	Cyclic Redundancy Check (CRC)



Response (if the activation IS completed): 09 04 02 31 00 4D 61

Bits	Description
09	SlaveID
04	Function Code 04 (Read Input Registers)
02	Number of data bytes to follow (1 register x 2 bytes/register = 2 bytes)
3100	Content of register 07D0 (GRIPPER STATUS = 0x31, RESERVED = 0x00): gACT = 1 for "Gripper Activation", gSTA = 3 for "Activation is completed"
4D61	Cyclic Redundancy Check (CRC)

Step 3: Move the robot to the pick-up location

Step 4: Close gripper at full speed and full force

Request is: 09 10 03 E8 00 03 06 09 00 00 FF FF FF 42 29

Bits	Description
09	SlaveID
10	Function Code 16 (Preset Multiple Registers)
03E8	Address of the first register
0003	Number of registers written to
06	Number of data bytes to follow (3 registers x 2 bytes/register = 6 bytes)
0900	Value written to register 0x03E8 (ACTION REQUEST = 0x09 and GRIPPER OPTIONS = 0x00): rACT = 1 for "Activate Gripper", rGTO = 1 for "Go to Requested Position"
00FF	Value written to register 0x03E9 (GRIPPER OPTIONS 2 = 0x00 and POSITION REQUEST = 0xFF): rPR = 255/255 for full closing of the Gripper
FFFF	Value written to register 0x03EA (SPEED = 0xFF and FORCE = 0xFF): full speed and full force
4229	Cyclic Redundancy Check (CRC)



Response is: 09 10 03 E8 00 03 01 30

Bits	Description
09	SlaveID
10	Function Code 16 (Preset Multiple Registers)
03E8	Address of the first register
0003	Number of written registers
0130	Cyclic Redundancy Check (CRC)

Step 5: Read Gripper status until the grip is completed

Request is: 09 04 07 D0 00 03 B1 CE

Bits	Description
09	SlaveID
04	Function Code 04 (Read Input Registers)
07D0	Address of the first requested register
0003	Number of registers requested (3)
B1CE	Cyclic Redundancy Check (CRC)



Example of response if the grip **is not completed**: 09 04 06 39 00 00 FF 0E 0A B6 6D

Bits	Description
09	SlaveID
04	Function Code 04 (Read Input Registers)
06	Number of data bytes to follow (3 registers x 2 bytes/register = 6 bytes)
3900	Content of register 07D0 (GRIPPER STATUS = 0x39, RESERVED = 0x00): gACT = 1 for "Gripper Activation", gGTO = 1 for "Go to Position Request" and gOBJ = 0 for "Fingers are in motion"
00FF	Content of register 07D1 (FAULT STATUS = 0x00, POSITION REQUEST ECHO = 0xFF): the position request echo tells that the command was well received and that the GRIPPER STATUS is valid.
0E0A	Content of register 07D2 (POSITION = 0x0E, FINGER CURRENT = 0x0A): the position is 14/255 and the motor current is 100mA (these values will change during motion)
B66D	Cyclic Redundancy Check (CRC)

Example of response if the grip **is completed**: 09 04 06 B9 00 00 FF BD 00 5C 9A

Bits	Description
09	SlaveID
04	Function Code 04 (Read Input Registers)
06	Number of data bytes to follow (3 registers x 2 bytes/register = 6 bytes)
B900	Content of register 07D0 (GRIPPER STATUS = 0xB9, RESERVED = 0x00): gACT = 1 for "Gripper Activation", gGTO = 1 for "Go to Position Request" and gOBJ = 2 for "Fingers have stopped due to a contact while closing"
00FF	Content of register 07D1 (FAULT STATUS = 0x00, POSITION REQUEST ECHO = 0xFF): the position request echo tells that the command was well received and that the GRIPPER STATUS is valid.
BD00	Content of register 07D2 (POSITION = 0xBD, FINGER CURRENT = 0x00): the position is 189/255 (can be used to validate the size of the seized object)
5C9A	Cyclic Redundancy Check (CRC)



Step 6: Move gripper to release location

Step 7: Open the Gripper at full speed and full force

Request is: 09 10 03 E8 00 03 06 09 00 00 00 FF FF 72 19

Bits	Description
09	SlaveID
10	Function Code 16 (Preset Multiple Registers)
03E8	Address of the first register
0003	Number of registers written to
06	Number of data bytes to follow (3 registers x 2 bytes/register = 6 bytes)
0900	Value written to register 0x03E8 (ACTION REQUEST = 0x09 and GRIPPER OPTIONS = 0x00): rACT = 1 for "Activate Gripper", rGTO = 1 for "Go to Requested Position"
0000	Value written to register 0x03E9 (GRIPPER OPTIONS 2 = 0x00 and POSITION REQUEST = 0x00): rPR = 0/255 for full opening of the Gripper (partial opening would also be possible)
FFFF	Value written to register 0x03EA (SPEED = 0xFF and FORCE = 0xFF): full speed and full force
7219	Cyclic Redundancy Check (CRC)

Response is: 09 10 03 E8 00 03 01 30

Bits	Description
09	SlaveID
10	Function Code 16 (Preset Multiple Registers)
03E8	Address of the first register
0003	Number of written registers
0130	Cyclic Redundancy Check (CRC)



Step 8: Read Gripper status until the opening is completed

Request is: 09 04 07 D0 00 03 B1 CE

Bits	Description
09	SlaveID
04	Function Code 04 (Read Input Registers)
07D0	Address of the first requested register
0003	Number of registers requested (3)
B1CE	Cyclic Redundancy Check (CRC)

Example of response if the opening **is not completed**: 09 04 06 39 00 00 00 BB 10 71 06

Bits	Description
09	SlaveID
04	Function Code 04 (Read Input Registers)
06	Number of data bytes to follow (3 registers x 2 bytes/register = 6 bytes)
3900	Content of register 07D0 (GRIPPER STATUS = 0x39, RESERVED = 0x00): gACT = 1 for "Gripper Activation", gGTO = 1 for "Go to Position Request" and gOBJ = 0 for "Fingers are in motion"
0000	Content of register 07D1 (FAULT STATUS = 0x00, POSITION REQUEST ECHO = 0x00): the position request echo tells that the command was well received and that the GRIPPER STATUS is valid.
BB10	Content of register 07D2 (POSITION = 0xBB, FINGER CURRENT = 0x10): the position is 187/255 and the motor current is 160mA (these values will change during motion)
7106	Cyclic Redundancy Check (CRC)



Example of response if the opening is **completed**: 09 04 06 F9 00 00 00 0D 00 17 AA

Bits	Description
09	SlaveID
04	Function Code 04 (Read Input Registers)
06	Number of data bytes to follow (3 registers x 2 bytes/register = 6 bytes)
F900	Content of register 07D0 (GRIPPER STATUS = 0xF9, RESERVED = 0x00): gACT = 1 for "Gripper Activation", gGTO = 1 for "Go to Position Request" and gOBJ = 3 for "Fingers are at requested position"
0000	Content of register 07D1 (FAULT STATUS = 0x00, POSITION REQUEST ECHO = 0x00): the position request echo tells that the command was well received and that the GRIPPER STATUS is valid.
0D00	Content of register 07D2 (POSITION = 0x0D, FINGER CURRENT = 0x00): the position is 13/255 (the fingers have reached their software limit)
17AA	Cyclic Redundancy Check (CRC)

Step 9: To grip additional objects, loop from step 3.

4.8. Hand-E C10 Gripper and I/O Coupling communication

The following communication parameters must be present:

- **Baud rate:** 115200 bps
- **Parity:** None
- **Data:** 8 bit
- **Stop bit:** 1 bit
- **Slave ID:** 1 to 9

Activation sequence

In order to activate the sequence:

- Wait at least 10 ms between steps
- The whole sequence can not exceed 5 seconds
- The gripper must be connected to the I/O Coupling. The I/O Coupling detection of the gripper has to be confirmed (led blue) before doing the sequence, otherwise it will not be valid.
- Doing the sequence once the I/O coupling is activated will reactivate the I/O Coupling.
- Activating the I/O Coupling triggers the activation sequence of the gripper.
- Activation of the I/O Coupling must be done each time you connect a new device or when a power cycle is done so you can use the connected device, otherwise it will do nothing.



Steps (> 10 ms between)	Digital Input 0	Digital Input 1
1	Low	Low
2	High	-
3	Low	-
4	-	High
5	-	Low

4.9. Control over Universal Robots

4.9.1. Control with the Standard Coupling Kit

The URCap package contains many features to program and control the gripper. The package provides:

- **Gripper Toolbar:** The Gripper Toolbar is automatically installed with the URCaps package. It allows jogging and testing of the gripper. It is a great tool to try grasps with the gripper while programming.
- **Gripper node:** The URCaps package adds a Gripper node that is used to add a Gripper command. A node can make the gripper move to a specific opening, grasp an object and modify the speed and force applied by the gripper.



CAUTION

Starting from Gripper URCap version 1.0.2, the gripper activation script command (`rq_activate()` or `rq_activate_and_wait()`) must be preceded by the reset command (`rq_reset()`). This will force the gripper's activation routine. If the gripper was already activated, it will activate again.

4.9.2. Control with the Wrist Connection Kit (I/O Coupling)



INFO

A Gripper firmware update is required to use your gripper with the I/O Coupling. Make sure you have the latest version installed. If an update is necessary on the I/O Coupling or the gripper, the Robotiq User Interface (RUI) will warn you and request the update.

To avoid confusion between the two URCaps, make sure to delete the old Gripper URCap before using the I/O Coupling URCap.

Make sure your Polyscope version is compatible with the URCap version. Visit robotiq.com/support for details.



Wrist Node

Multiple Wrist Nodes are available:

- Wrist Connection Activation
- Wrist Connection
- Wrist Grip Check

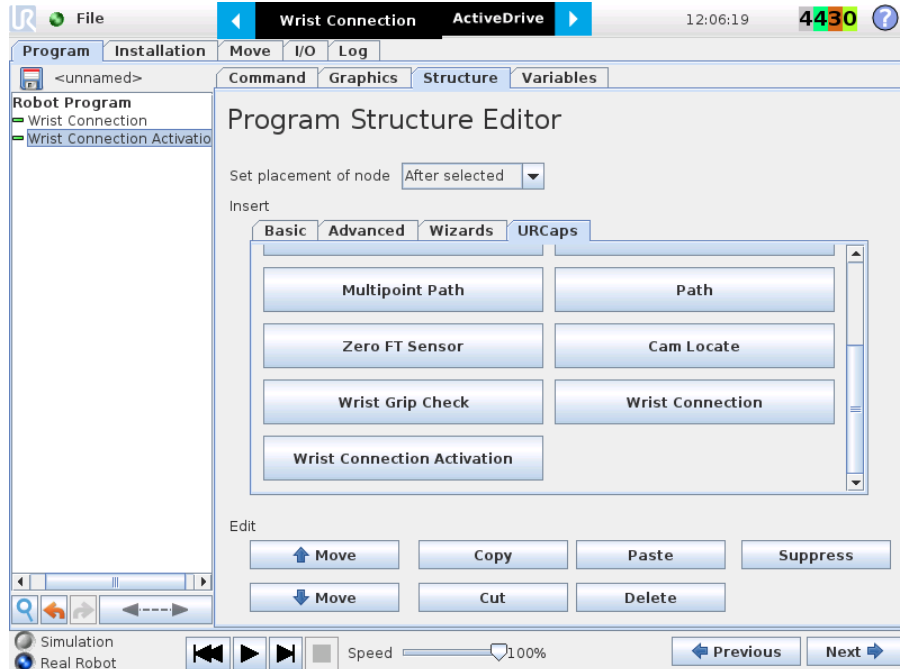


Fig. 4-3: Program Structure Editor

- The **Wrist connection Activation** node will activate the device in the program.



Fig. 4-4: Wrist Connection Activation Interface



- For each **Wrist connection** node, select the desired presets. Tap on the **Test** button to try each preset.

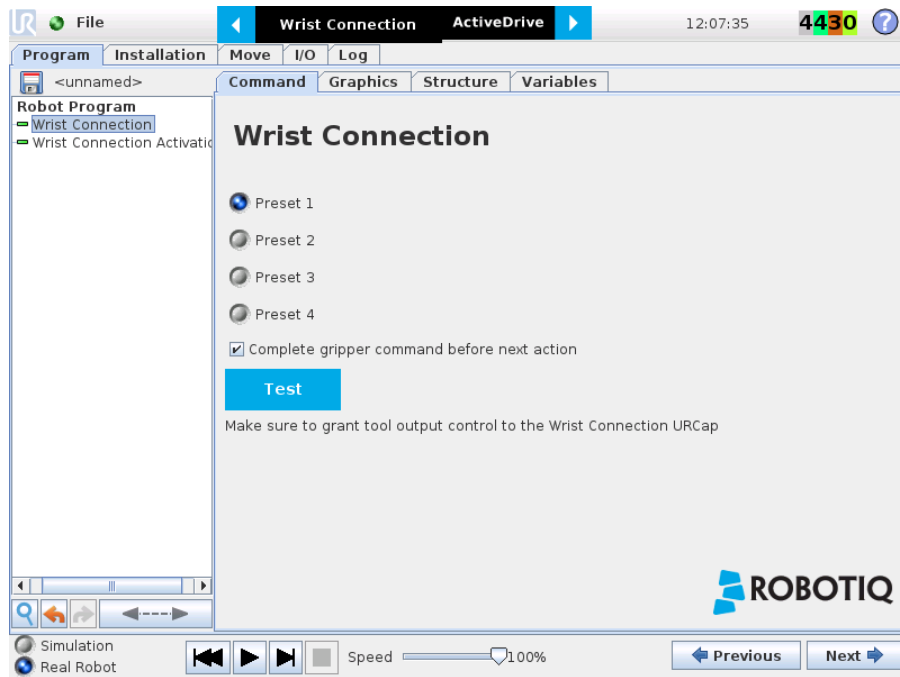


Fig. 4-5: Wrist Connection Node Interface

- The **Wrist Grip Check** node is pre-packaged as an *If statement* that prompts the user to select between if the object is detected and if the object is not detected.

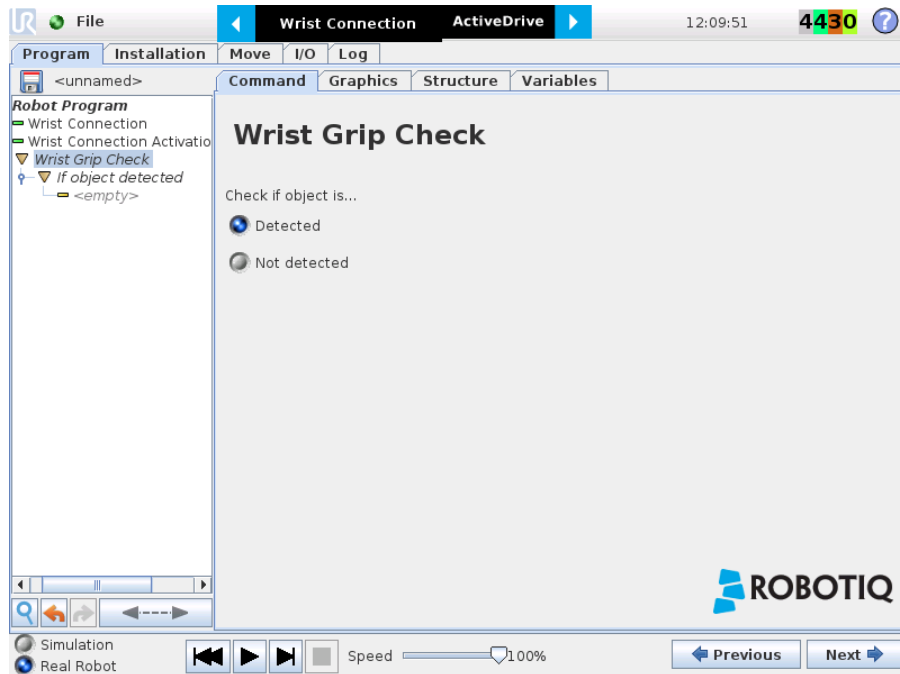


Fig. 4-6: Wrist Grip Check Node Interface



- In the **Wrist Connection Toolbar**, you can:
 - Test the 4 presets;
 - See the Object Detection Status;
 - Activate the Gripper

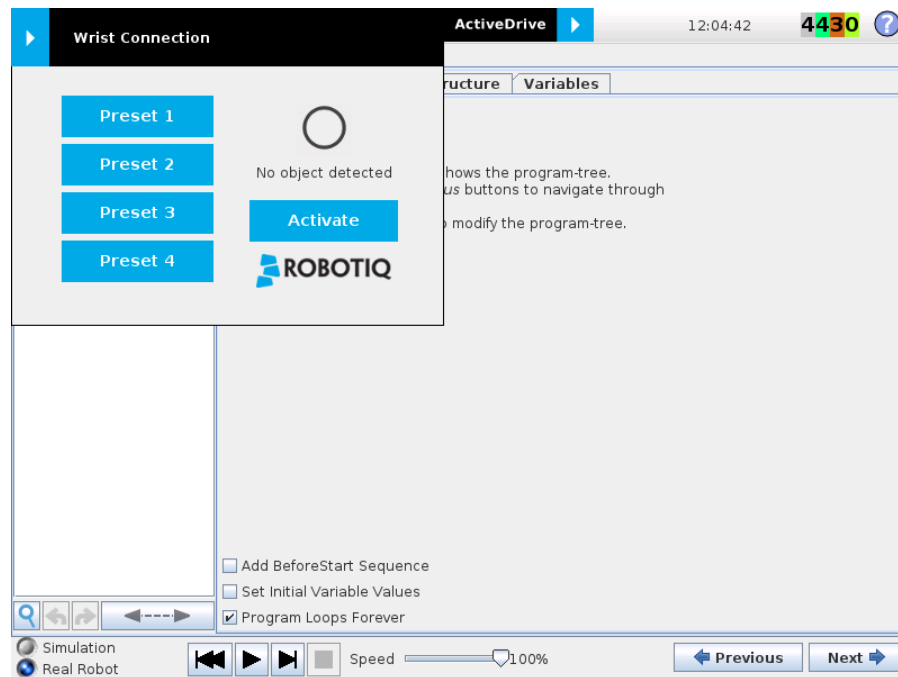


Fig. 4-7: Wrist Connection Toolbar Interface

4.9.3. Gripper Dashboard

Overview

Single Gripper for e-Series

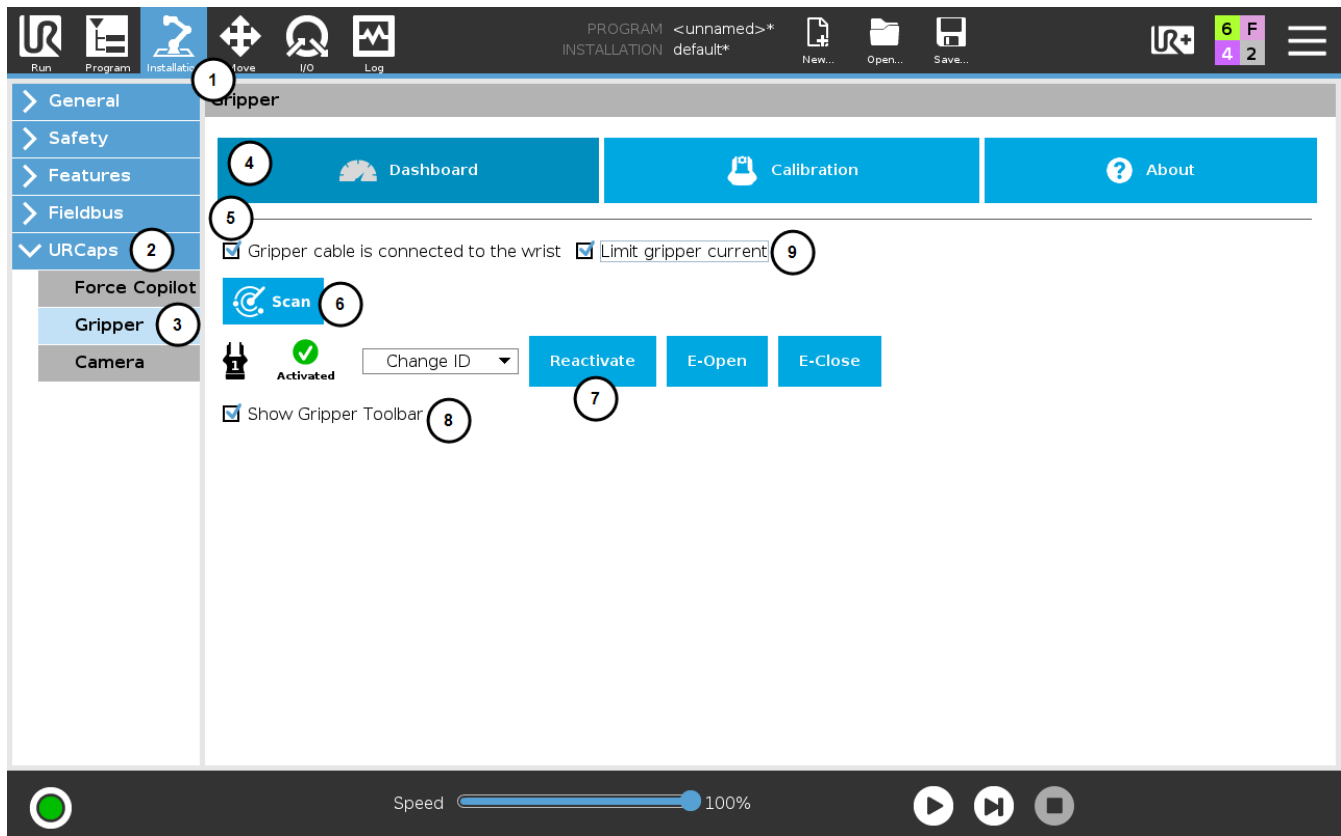


Fig. 4-8: Gripper Dashboard

1. On the teach pendant, tap the **Installation** button.
2. Select **URCaps** in the navigation pane on the left.
3. Tap the **Gripper** button.
4. Select the **Dashboard** tab.
5. If the gripper is connected to the robot wrist (and not to the robot controller or via a Robotiq Wrist Camera), tick the "**Gripper cable is connected to the wrist** box.
6. If no gripper is found, tap the **Scan** button to detect any gripper that might be connected to the robot.
7. Tap the **Activate/Reactivate** button.
8. In order to display the Gripper Toolbar in the UR+ menu of the top ribbon of PolyScope, tick the **Show Gripper Toolbar** box.
9. In order to prevent overcurrent conditions (for instance when grasping soft objects or using multiple grippers at the same time), tick the **Limit gripper current** box:
 1. Limits the current at 600 mA for a single gripper.
 2. Limits the current at 450 mA for each gripper connected in a multiple gripper configuration.





INFO

The default gripper ID allocated to the first device connected is 1.



Fig. 4-9: Gripper ID modification in the Gripper Dashboard



INFO

The **E-Open** and **E-Close** buttons allow the user to open and close the gripper even if it is not activated. These emergency commands use very low speed and force settings.

Single Gripper for CB-Series

Open or create a robot program

1. Tap the **Installation** tab.
2. Select **Gripper** in the left pane.
3. Tap the **Dashboard** button.
4. If no gripper is found, tap the **Scan** button to detect any gripper that might be connected to the robot.
5. Tap the **Activate** button.

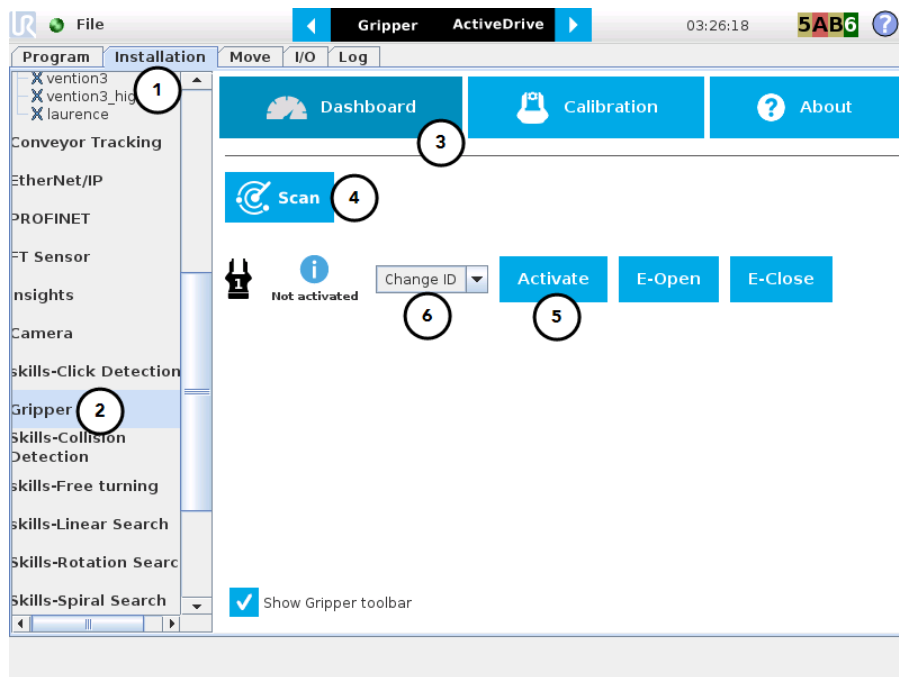


Fig. 4-10: Gripper Dashboard (steps highlighted)

6. If required, change the ID of the gripper; ID numbers range from 1 to 4





INFO

The default gripper ID allocated to the first device connected is 1.

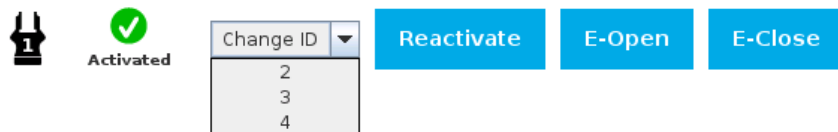


Fig. 4-11: Gripper ID modification in the Gripper Dashboard



INFO

The **E-Open** and **E-Close** buttons allow the user to open and close the gripper even if it is not activated. These emergency commands use very low speed and force settings.

Multiple Grippers



INFO

The URCap allows the user to connect and control up to **4** grippers at the same time.



CAUTION

If you wish to program using multiple grippers at the same time, connect them to the robot **one after the other**; each gripper connection requiring its own **scan** and **activation** before going on to the next.

For each gripper connected, follow the required steps in one of the two following sections depending on your robot model: the **Single Gripper for CB-Series** section or the **Single Gripper for e-Series** section



Features

Icon	Functionality Name	Description
	Dashboard	After selecting Gripper in the left pane of the Installation tab, tap this button to access the Gripper Dashboard.
 	Activate/Reactivate	The Activate and Reactivate buttons enables the corresponding gripper.
 	Not activated/Activated	Gripper status: One or the other of these icons is displayed next to the corresponding Gripper icon.
	Gripper	Label indicating the gripper's ID, ranging from 1 to 4.
	Scan	Command allowing for a detection of connected grippers. After tapping this button, the latter will display in the Gripper Dashboard.
	Change ID	Tap the arrow next to the text box to expand a list of available gripper IDs. Selecting an available number will allocate it to the corresponding gripper.
	E-Open	Tapping this button sends an emergency open command to the corresponding gripper, whether it is activated or not.
	E-Close	Tapping this button sends an emergency close command to the corresponding gripper, whether it is activated or not.



4.9.4. Limiting your Gripper Force and Speed

Grippers can have their force and speed limited at root-level when using the teach pendant. Follow these instructions to enable this.

The screenshot shows the 'Gripper' configuration interface with tabs for Dashboard, Configuration, Calibration, and About. Under the Configuration tab, there are input fields for 'Maximum speed' and 'Maximum force', both set to '100 %'. Below these is a 'Password' field and an 'Unlock' button. To the right, there is a note: 'Refer to the Gripper Instruction Manual to obtain the default password' and a 'Change password' button.

Fig. 4-12: Limiting the Gripper Force and Speed

- Depending on your robot:
 - For e-Series: Go to **Installation > URCaps > Gripper > Configuration**.
 - For CB-Series: Go to **Installation > Gripper > Configuration**
- Enter your password. Default is `rqsafe`.
- Tap **Unlock**.
- To set a maximum opening/closing speed for your grippers (noted as a percentage of its default speed), select the box next to the "Maximum Speed" field, and enter a value. You can also limit grip strength by setting a value under field "Maximum force". Values are set, tap **Lock**. This saves values you entered.

This screenshot is similar to Fig. 4-12, but the 'Lock' button is now visible at the bottom of the configuration area, indicating that the settings have been saved.

Fig. 4-13: Lock the Maximum Force and Speed

- To choose a new password, tap the **Change password** button, and follow instructions on screen. To save your new password, tap **Change**.

The screenshot shows the 'Change password' screen. It includes fields for 'Current password', 'New password', and 'Confirm new password'. There are 'Cancel' and 'Change' buttons at the bottom right. The 'Maximum speed' and 'Maximum force' fields are still visible on the left, set to 100%.

Fig. 4-14: Modification of the Current Password



TIP

Default password: `rqsafe`. If you lose your password, contact support team to reset it.



CAUTION



- This feature reduces the risk, but is not safety-certified.
- The values (%) stand as references only. The actual maximum force (in newtons) can vary depending on the application and needs to be measured by its user by an external measuring system on each gripper for high precision.

4.9.5. Visual Cues of Force and Speed Limitation

When a limitation is effective, some reminders appear in PolyScope. When adding gripper commands to a program or issuing them via the Adaptive Gripper tab, the label "Limited" will be shown under the Speed and Force icons, if they have been limited.

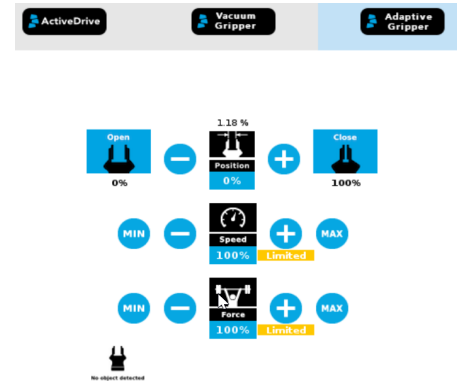
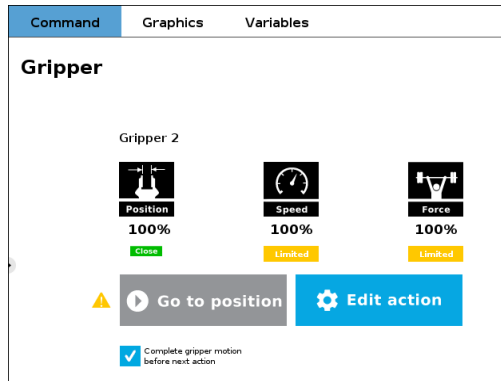


Fig. 4-15: "Limited" Label

4.9.6. Gripper Calibration menu and wizard

Depending on the fingers/fingertips used, the operator will calibrate the gripper and measure the stroke by defining the fully open and fully closed positions.

Make sure the gripper is activated.

For e-Series

1. On the teach pendant, tap the **Installation** button.
2. Select **URCaps** in the navigation pane on the left.
3. Tap the **Gripper** button.

For CB-Series

1. Go to the **Installation** tab.
2. Select **Gripper** in the left pane.



INFO

A gripper that has not been calibrated will display open and closed values in percentage.



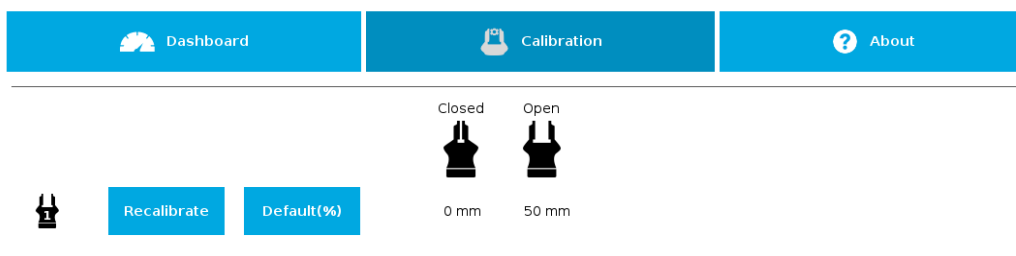


Fig. 4-16: Sequence Toward Calibration, Single Gripper

For both models:

1. Tap the **Calibration** tab.
2. Tap the **Calibrate** button corresponding to the gripper you want to calibrate.

Tapping the **Calibrate** button in the Gripper Calibration menu launches the **Calibration wizard**.

Follow the instructions on the screen of the teach pendant.



TIP

Depending on the PolyScope settings defined by the user, the units of measurement can either display according to the metric or imperial system.

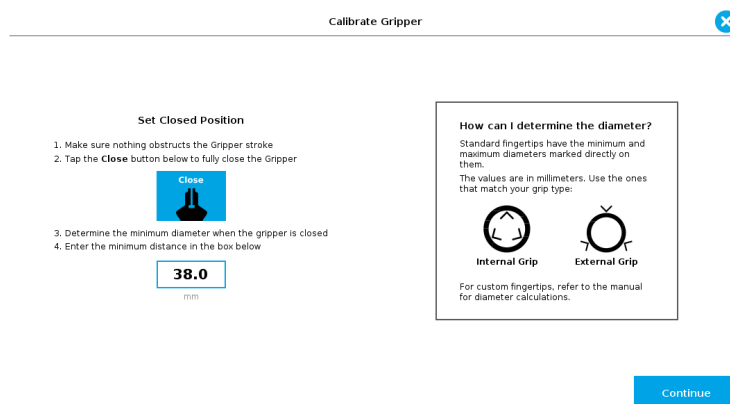


Fig. 4-17: Step 1 - Set Closed Position

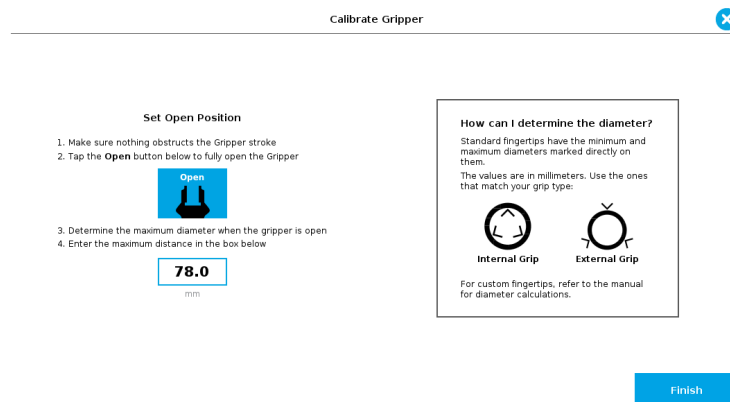


Fig. 4-18: Step 2 - Set Open Position



Following their respective calibration, the grippers will display their actual stroke, from the fully closed to the fully open position.

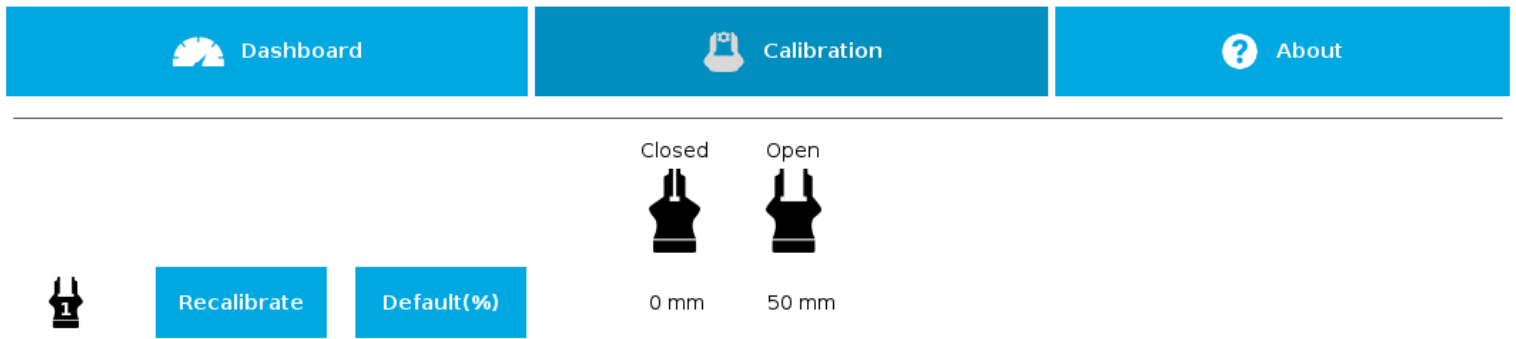


Fig. 4-19: Calibrated Single Gripper

Determine the Diameter with Standard Fingertips

The minimum and maximum diameter values are written directly on the fingertips:

1. Look on the side that has the icon corresponding to your grip type (external vs internal).
2. Use the numbers on the step of the finger you want to use.
3. If the fingers are mounted on extenders, add the number corresponding to the position of the finger on the extender.

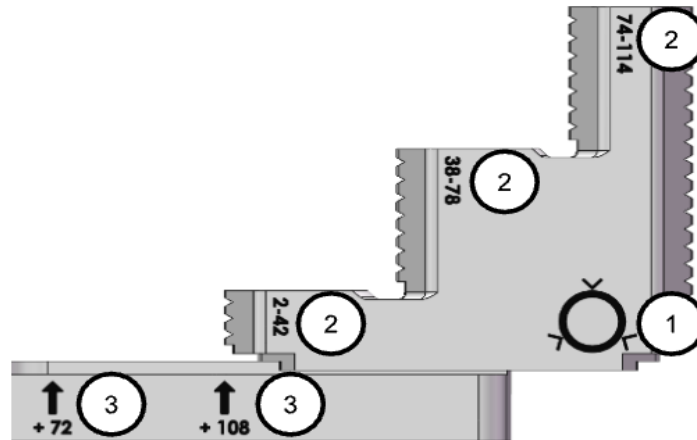


Fig. 4-20: Diameter Values on Standard Fingertips



CAUTION

The values written on the fingertips are in millimeters. They should be converted to inches if your PolyScope uses imperial units.

Measure the Diameter with Custom Fingertips

Method 1

1. On one of the fingertips, locate the middle of the side that would touch the object when gripping.
2. Measure the distance between that point and the same point on a second fingertip.
3. Use the following formula, where "A" is the measured distance:

$$\text{diameter} = \frac{2A}{\sqrt{3}} \text{ (or approximately } 1.1547 \times A \text{)}$$

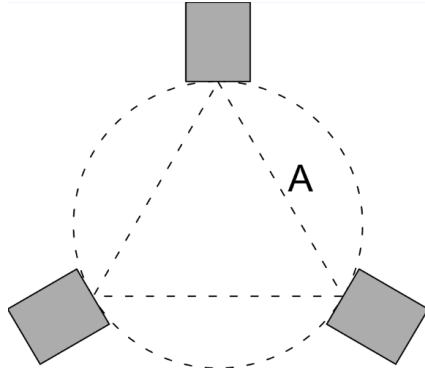


Fig. 4-21: Distance Between Two (2) Fingertips

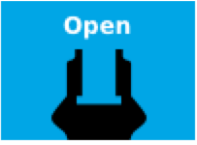
Method 2

1. Locate the center of the gripper.
2. On one of the fingertips, locate the middle of the side that would touch the object when gripping.
3. Measure the distance between those two points to obtain the radius.
4. Double that distance to obtain the diameter.

Features

Icon	Functionality Name	Description
 Calibration	Calibration	After selecting the gripper in the left pane of the Installation tab, tap this button to access the Gripper Calibration menu.
Calibrate Recalibrate	Calibrate/Recalibrate	The Calibrate and Recalibrate buttons launch the Gripper Calibration wizard.



Icon	Functionality Name	Description
	Default (%)	Following a calibration, tap this button to reset the calibration and return to the default percentage values. The button is greyed out if no calibration has been performed for the corresponding gripper.
	Gripper	Label indicating the gripper's ID , ranging from 1 to 4.
 Closed	Fully closed dimension table header	Visual aid above the fully closed dimensions in the Calibration menu.
 Open	Fully open dimension table header	Visual aid above the fully open dimensions in the Calibration menu
	Close	Tap this button to close the Gripper in the Calibration wizard.
	Open	Tap this button to open the Gripper in the Calibration wizard.
	Fully closed	Visual aid for entering the fully closed dimension in the Calibration wizard.
	Fully open	Visual aid for entering the fully open dimension in the Calibration wizard.

Icon	Functionality Name	Description
	Continue	Tap this button at the end of the first step of the Calibration wizard in order to go to the next step.
	Finish	Tap this button at the the end of the Calibration wizard to complete the calibration process for the corresponding Gripper.

4.9.7. Gripper Toolbar

The Gripper Toolbar is generally used to test and jog the gripper, meaning it has no effect on the programming of the robot.



INFO

The Gripper URCap package contains the Gripper Toolbar. Therefore, the toolbar is automatically installed with the URCap package.

Overview

Prior to using the Gripper Toolbar, the user needs to go to the Gripper Dashboard and tick the **Show Gripper Toolbar** box. Please refer to the **Gripper Dashboard** section

Following the proper installation of the Gripper URCap, the user can tap the **UR+** button at the top of the screen to expand the Gripper Toolbar.



Fig. 4-22: **UR+** Button to Expand the Gripper Toolbar

If the user has omitted to tick the Show Gripper Toolbar box in the Gripper Dashboard, tapping the UR+ button will display this message:

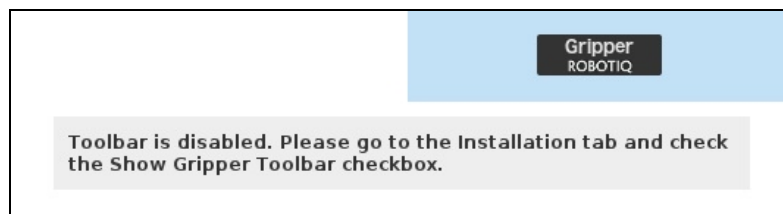


Fig. 4-23: Disabled Gripper Toolbar

On CB-Series, right after the installation of the Gripper URCap, a collapsed Gripper Toolbar will display at the top of the screen.



Fig. 4-24: Gripper Toolbar (collapsed)

An expanded Gripper Toolbar prior to the activation of the gripper looks like the figure below:



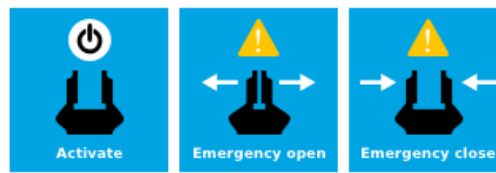


Fig. 4-25: Gripper Toolbar before activation



INFO

The **Emergency open** and **Emergency close** buttons allow the user to open and close the gripper even if it is not activated. The emergency commands use very low speed and force settings.

Tap the **Activate** button to enable the gripper.

Single Gripper



CAUTION

If the gripper has not been calibrated at this point, the Open and Close values will remain in percentage. Please refer to the **Gripper Calibration** menu and **wizard** section for instructions.

Once the gripper is activated, the toolbar can be expanded and used to test and jog the gripper.

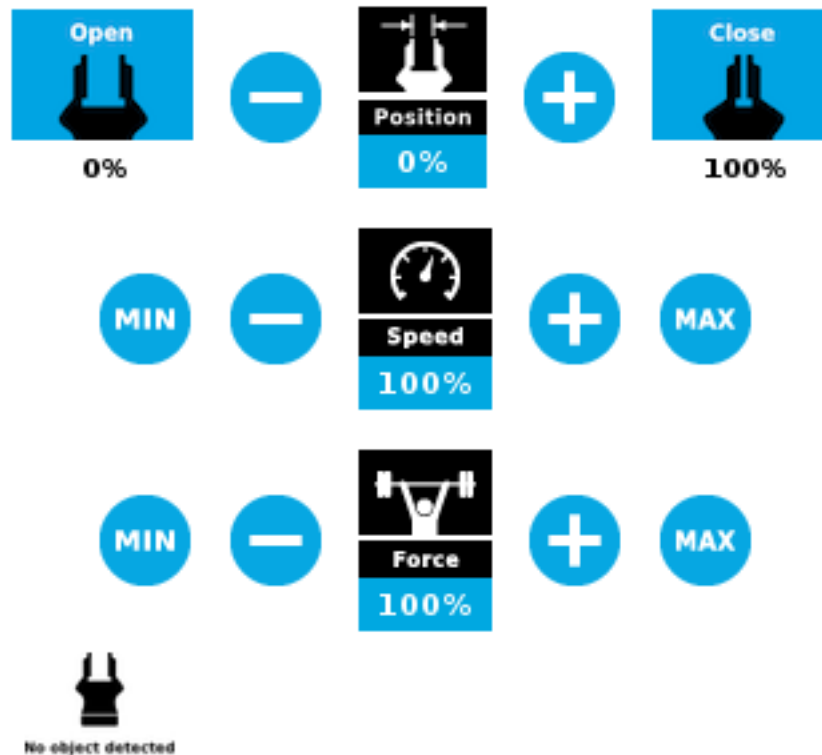


Fig. 4-26: Gripper Toolbar After Activation

Multiple Grippers

If multiple grippers are used, check one or several grippers and test their settings and features.



TIP

The first gripper selected is the "master", meaning that its settings will be copied over to the others when they are selected. In order to modify each gripper's settings individually, select a gripper, edit it, uncheck its box and carry on to the next gripper.



INFO

For consistency, selecting multiple grippers at the same time displays the open and close values in percentage since their stroke might be different.

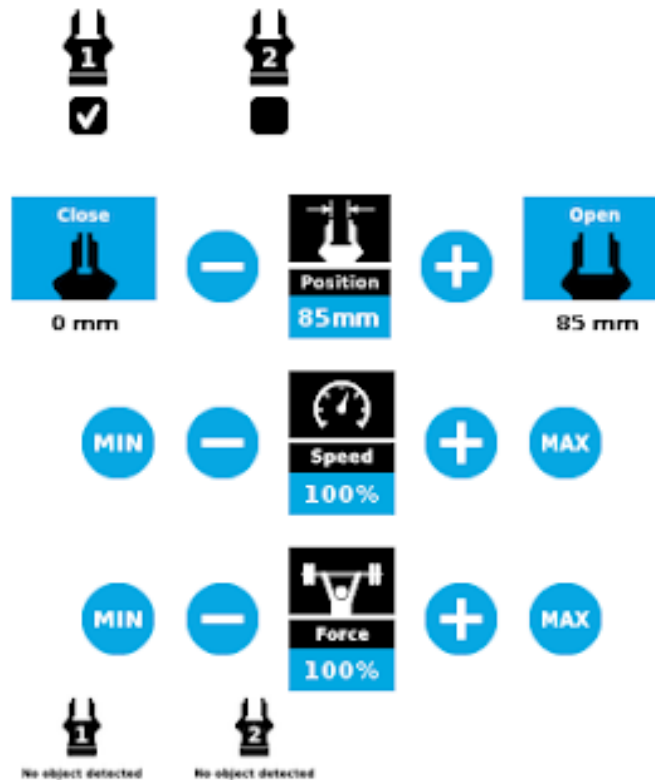
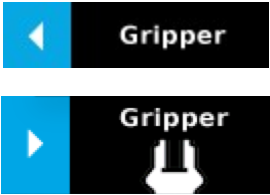


Fig. 4-27: Gripper Toolbar (Expanded, Multiple Grippers)



Features

Gripper activation

Icon	Functionality Name	Description
	CB-Series Gripper Toolbar	Tap to toggle between the expanded and collapsed Gripper Toolbar. When greyed out, the functionality is not available.
	e-Series UR+ Menu (Gripper Toolbar)	Tap to toggle between the expanded (blue) and collapsed (black) Gripper Toolbar.
	Activate	Tap to activate the gripper. The gripper will fully open and close to set the zero of the position value.
	Emergency open	Slowly moves the gripper to its fully closed position.
	Emergency close	Slowly moves the gripper to its fully open position.

Gripper operation window

Primary Icon	Functionality Name	Description
 	CB-Series Gripper Toolbar	Tap to toggle between expanded and collapsed Gripper Toolbar. When greyed out, the functionality is not available.
 	e-Series UR+ Menu (Gripper Toolbar)	Tap to toggle between the expanded (blue) and collapsed (black) Gripper Toolbar.
	Open	Tap to fully open the gripper.
	Close	Tap to fully close the gripper.
	Requested position	Shows the actual position of the gripper according to the system of units defined in PolyScope (imperial vs. metric). If the gripper is not calibrated, the values will display in percentage.
	Requested speed	Shows the actual speed set of the gripper. 0% = minimum speed 100% = maximum speed
	Requested force	Shows the actual force set of the gripper: 0% : minimum force, regrasp feature disabled 1% : minimum force, with regrasp feature enabled 100% : maximum force, with regrasp feature enabled
	Plus	Tap to increase the corresponding parameter.



Primary Icon	Functionality Name	Description
	Minus	Tap to decrease the corresponding parameter.
	No object detected	Icon shown when no object is detected during a grasp.
	Object detected	The icon shows a green checkmark when an object is detected during a grasp.

4.9.8. Gripper Node

To add and edit a **Gripper** node inside your robot program, follow the steps below:

For e-Series

1. On the teach pendant, at the top of the screen, tap the **New** icon to create a program or the **Open** icon to load a program.
2. Select **Program**.
3. Tap the **URCaps** menu in the navigation pane on the left.
4. Tap the **Gripper** button.
5. Select the node in the robot program and tap the **Command** tab.
6. Tap the **Edit** action button to edit the node's parameters.

For CB-Series

1. Tap **Program Robot**.
2. Open an empty program or load one.
3. Go to the **Structure** tab and tap the **URCaps** submenu.
4. Tap the **Gripper** button.
5. Go to the **Command** tab to edit the **Gripper** node inserted.
6. Tap the **Edit** action button to edit the node's parameters.

INFO



The gripper needs to be activated before it can receive a command. To do so, use the `rq_activate_and_wait()` function script at the beginning of the program or activate with the Gripper Toolbar. Starting from Gripper URCap version 1.0.2, the Gripper activation script command (`rq_activate()` or `rq_activate_and_wait()`) must be preceded by the reset command (`rq_reset()`). This will force the gripper's activation routine. Thus, if the gripper was already activated, it will activate again.

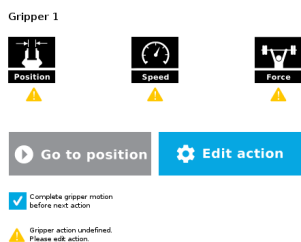


Command window

The Command window shows the requested action parameters for the **Gripper** node. Depending on the position, speed and force parameters, warning messages may display.

To edit the **Gripper** node, tap **Edit action** (please refer to the **Edit action screen** section for more details).

Gripper



When the node is not defined, the Command window shows warning messages. Tap **Edit action** to modify the gripper's action.

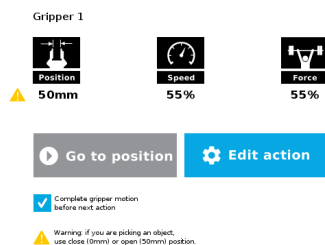
CAUTION



Tap the **Go to position** button prior to editing the action.

Whereas the command window displays the command that the gripper should execute in this particular node, the Edit action screen displays the current gripper position.

Gripper



When the node requests the gripper to close/open, the Command window warns that a partial opening/closing should not be performed for picking an object.

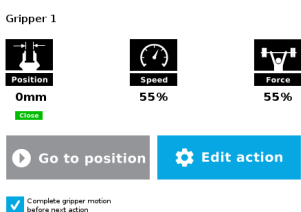
- For positioning and partial movement of the gripper, moving to a specific position (between the fully open and fully close positions) is suitable.
- To pick an object, use the close (or open) actions along with the object detection feature (please refer to the **Edit action screen** section).

INFO



When the action is set for multiple grippers, the header lists the selected grippers (e.g. Grippers 1,2,3,4)

Gripper

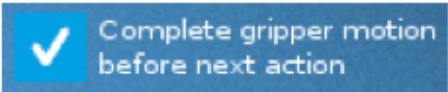
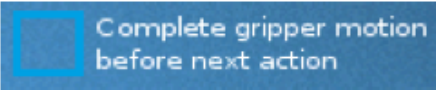


When the gripper action is set to **close**, a green "Close" icon appears.

When the gripper action is set to **open**, a green "Open" icon appears.



Features

Icon	Functionality Name	Description
 Position	Requested position	Shows the position requested for the current Gripper node. Read only.
 Speed	Requested speed	Shows the speed requested for the selected Gripper node. Read only.
 Force	Requested force	Shows the force requested for the selected Gripper node. Read only.
	Go to position	Sends all node parameters (position, force, speed) to the gripper. Note: This button is disabled (grey) when the gripper is already at the node position or when the gripper is not powered/activated.
	Edit action	Opens the Edit action screen, where you can edit the gripper's action parameters.
	Complete motion	Selected by default. Selected: The gripper completes its motion before executing the next action on the PolyScope program tree. This is slower but safer. Unselected: As soon as the gripper starts moving, PolyScope will execute the next action on the program tree. This allows you to move the gripper and robot at the same time.
	Robot compliance	Unselected by default. Can only be selected if the complete motion option is selected. Selected: A force mode will be used to allow the robot to move along the X and Y axes of the TCP frame during the gripper motion. This can help with immovable objects that are not perfectly centered in the Gripper, allowing the robot to align itself with the object. Unselected: No force mode will be used.

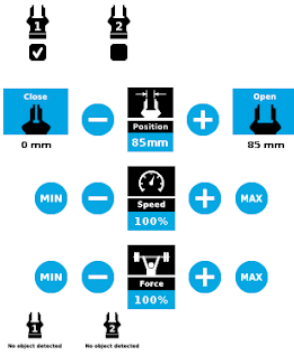


Icon	Functionality Name	Description
	Warning message section	-
	Gripper not activated	"Warning, the Gripper is not powered or not activated. The Gripper will not move." Make sure that the gripper is installed correctly and powered. You need to activate it using the gripper Toolbar before running Gripper commands.
	Gripper action undefined	"Gripper action undefined! Please edit action." When creating a new node, all action parameters are undefined. Tap the edit action button to define parameters.
	Object picking warning	"Warning, if you are picking an object, use close (100%) or open (0%) position." It is highly recommended to only use 0% or 100% position when trying to pick an object.
	Node name	Node name is automatically set to: - Gripper Open, when position = 0% or fully open value as defined in the Calibration wizard - Gripper Close, when position = 100% or fully closed value as defined in the Calibration wizard. - Gripper Move x%/mm/in, when position is between the fully open and fully closed values.
	Open request	When position requested is 0%, or the fully opened value defined in the Calibration wizard.
	Close request	When position request is 100%.

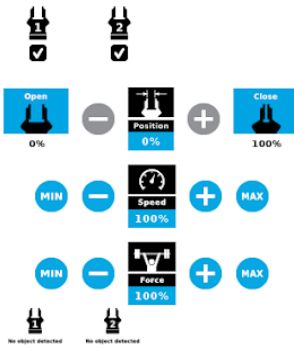


Edit action screen

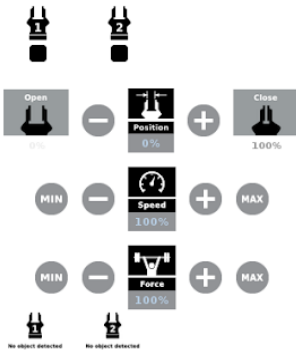
Tap **Edit action** from the Command window and use the **Edit action** screen to edit the gripper's parameters and adjust its position, speed and force. In normal usage conditions, the gripper will move as soon as you change the position setting. The gripper will not move if it is not properly powered, connected and activated.



- When selecting one gripper, all buttons are available. The action will apply to the selected gripper.
- When jogging the position, the selected gripper will move automatically.
- It is possible to jog the position (%).



- When selecting two or more grippers, it is not possible to jog the position.
- To jog the position, select only one gripper, jog the position and then select all grippers. The second gripper will move to the requested position.



- When no grippers are selected, the action cannot be edited.

Features

Primary Icon	Functionality Name	Description
	Open	Tap to fully open the gripper. Use this when you want to grip an object (internal grip), for example.
	Close	Tap to fully close the gripper. Use this when you want to grip an object (external grip), for example.
	Requested position	Shows the position request for the selected Gripper node.
	Requested speed	Shows the speed requested for the selected Gripper node. Use the Plus and Minus icons to modify.
	Requested force	Shows the force requested for the selected Gripper node. Use the Plus and Minus icons to modify.
	Plus	Tap to increase the corresponding parameter.
	Minus	Tap to decrease the corresponding parameter.
	Cancel	Cancels modifications and brings back the gripper node command screen.
	Save action	Saves settings into the selected Gripper node and brings back the Gripper node command screen. Note: This functionality is not available (grey) when the gripper has the same action parameters as the selected Gripper node.
	No object detected	Icon shown when no object is detected during a grasp.
	Object detected	Icon shows a green checkmark when an object is detected during a grasp.





WARNING

If the gripper is powered and activated, it will move as soon as a change to the parameter is made (position, speed, force).



TIP

Change speed and force when grasping fragile objects or other specific parts. In all other cases, it is recommended to use maximum speed and force.

Grip Check node

In order to add and edit a Grip Check node:

For e-Series

1. On the teach pendant, at the top of the screen, tap the **New** icon to create a program or the **Open** icon to load a program.
2. Select **Program**. The Program window will display.
3. Tap the **URCaps** menu in the navigation pane on the left.
4. Tap the **Grip Check** button.
5. Select the node in the robot program to edit it.

For CB-Series

1. Open a robot program or create one.
2. Go to the **Structure** tab.
3. Tap the **URCaps** submenu.
4. Select **Grip Check**.

The Grip Check node is pre-packaged as an If statement that prompts the user to select between if the object **is** detected and if the object **is not** detected.

Selecting the former option allows the user to check a box and choose whether or not the grasp should be validated according to the object's dimension (in percentage if the gripper is not calibrated, or in mm/in if the gripper is calibrated—depending on the PolyScope configuration).

Grip Check

Gripper ID 1
Check if object is...

☒ **Detected** ☐ **Not detected**

and...

☐ **Validate grip with dimension**

Fig. 4-28: Grip Check Node Interface



Grip Check

Gripper ID 1

Check if object is...

☒ Detected ☐ Not detected

and...

☒ Validate grip with dimension

22.00

mm

+

1.98

mm

22.00

mm

-

1.98

mm



Fig. 4-29: Grip Check Node Interface with Dimension Validation

Given that the Grip Check node is an If statement, tapping the actual node in the Command tab brings up the option to add an **Else** instruction to the program tree.

About

In this window, the user can access information such as the gripper's hardware, software and firmware versions, the number of cycles completed by the device and more.

1. Create or load a robot program.
2. Tap the **Installation** tab.
3. Select **Gripper** in the left pane.
4. Tap the **About** submenu.

 Dashboard
 Calibration
 About

URCap version: UCG-1.2.1
 PolyScope version: 3.5.4.10845
 Robot serial number: 2016352451

Gripper ID 2 ▼

Hand-E

Serial number: D-0065
 Firmware version: GD1-1.0.0
 Number of cycles: 1254



Visit support.robotiq.com to get the latest instruction manual and further information on how to use your product.

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Fig. 4-30: **About** Submenu



If the Gripper firmware version is obsolete, a warning message will display and an Upgrade firmware button will prompt the user to upgrade the firmware to the latest available version.

Error messages overview

If a program is running without the gripper being activated, the program will stop at the execution of a Gripper node and the following message will be displayed in a popup. Tap **Stop Program** and activate the gripper with the toolbar to continue or add an activation command in the program (see **Advanced Gripper Functions** section).



Advanced Gripper Functions

The use of Gripper URCap nodes allows to move the gripper and modify its speed and force. However, some advanced functions are only available through UR Script commands.

The functions listed below can be called using subprograms in PolyScope or with a script. Functions with the suffix **_and_wait** will wait for the gripper to complete its operation before going to the next step.

Single Gripper with I/O Coupling (UCH-1.0.0 +)

To use the **Object Detection** feature, the Tool Inputs can be used.

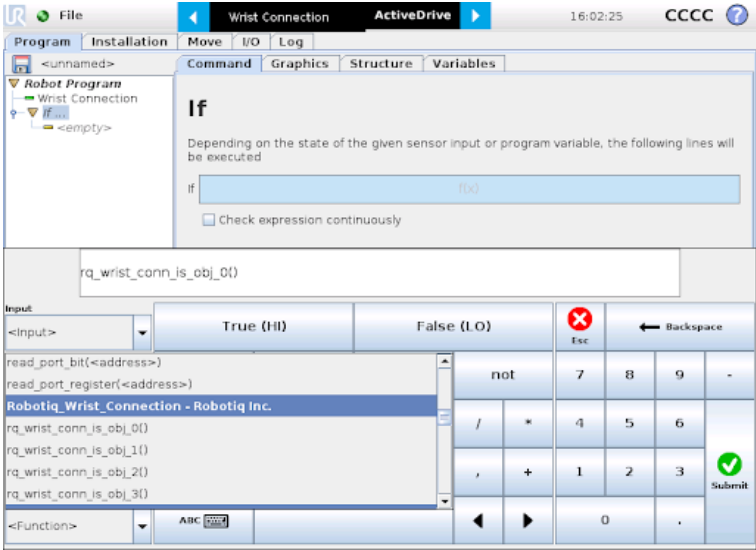


Fig. 4-31: Command Window

Tool Inputs configuration and **Object Detect** status are:

Name	Description
<code>rq_wrist_conn_is_obj_0()</code>	Fingers are in motion towards requested position. No object detected.
<code>rq_wrist_conn_is_obj_1()</code>	Fingers have stopped due to a contact while opening before requested position. Object detected opening.
<code>rq_wrist_conn_is_obj_2()</code>	Fingers have stopped due to a contact while closing before requested position. Object detected closing.
<code>rq_wrist_conn_is_obj_3()</code>	Fingers are at requested position. No object detected or object has been lost / dropped.

Single and Multiple Grippers (UCG-1.6.0 +)

All following functions require a final but optional parameter named `gripper_socket`. This parameter represents the gripper identifier as defined in the installation node. By default, the value of `gripper_socket` is 1. The admissible values are 1, 2, 3 and 4.

Name	Description
<code>rq_activate_and_wait()</code>	Sends the Gripper activation command. If it is already activated, nothing happens. Note that the gripper must be activated to complete any other operation. Program execution waits for the activation.
<code>rq_close_and_wait()</code>	Moves the gripper to its fully closed position and waits until the motion is completed to execute the next command.
<code>rq_current_pos_norm()</code>	Returns the current position of the fingers, normalized from 0% to 100%. Can be used to verify that the pick is successful, by comparing the finger position when the pick was taught with the similar-sized object.
<code>rq_current_pos_mm()</code>	Returns the current position of the fingers in millimeters, considering that the PolyScope configuration has been set to use the metric system as measurement system. Can be used to verify that the pick is successful, by comparing the finger position when the pick was taught with the similar-sized object.
<code>rq_current_pos_inches()</code>	Returns the current position of the fingers in inches, considering that the PolyScope configuration has been set to use the imperial system as measurement system. Can be used to verify that the pick is successful, by comparing the finger position when the pick was taught with the similar-sized object.
<code>rq_get_gripper_max_cur(current_mA)</code>	Returns the maximum supply current value of the appropriate gripper in mA.
<code>rq_gripper_led_off()</code>	Forces the LEDs to OFF status.



Name	Description
<code>rq_gripper_led_on()</code>	Allows the firmware to turn ON the LEDs when they have been force to OFF status.
<code>rq_is_object_detected()</code>	Returns True if the gripper motion has stopped due to an object. Returns False if gripper motion was not impeded by an object. Useful for verifying that an object has been picked correctly before going to the next step. Note: this function is not reliable for very small objects. Refer to the Object detection section for more details.
<code>rq_move_and_wait_norm(position)</code>	Moves the gripper to the position defined by the argument, normalized from 0% to 100%. Waits until the motion is completed.
<code>rq_move_and_wait_mm(position)</code>	Moves the gripper to the position defined by the argument.
<code>rq_move_and_wait_inches(position)</code>	Moves the gripper to the position defined by the argument.
<code>rq_open_and_wait()</code>	Moves the gripper to its fully opened position and waits until the motion is completed.
<code>rq_reset()</code>	Resets the gripper's activation status. Use after an autorelease before activating the gripper.
<code>rq_set_force_norm(force)</code>	Sets the gripper's force defined by the argument, normalized from 0% to 100%.
<code>rq_set_speed_norm(speed)</code>	Sets the gripper's speed defined by the argument, normalized from 0% to 100%.



Multiple Grippers

Here is an example of how to use the script commands with more than one gripper.

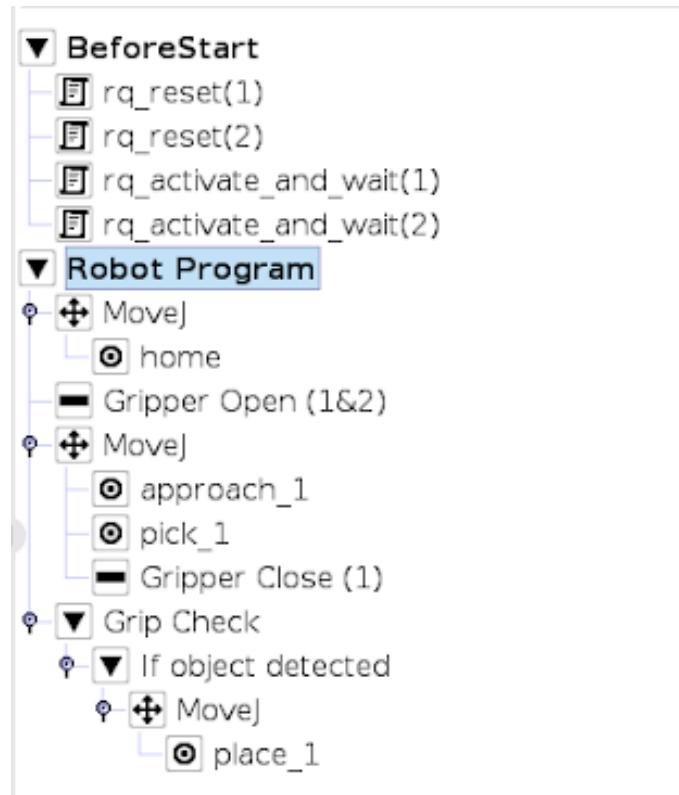


Fig. 4-32: Example of UR ScriptCommands with Multiple Grippers



Key script functions for use of the Gripper with a tool changer

Name	Description
<code>rq_reconnect_grippers(blocking,slave_ids)</code>	The function will resume the scanning mechanism of the software, allowing communication with the available grippers. When the function returns its argument, the user can expect communication and interaction with the grippers. If the grippers are not available in the 30 seconds following the request, the function will display a timeout error. This function should always be used directly after physically reconnecting the gripper or turning on the power. Parameters: • <code>blocking</code> (default = <code>TRUE</code>): If <code>True</code>, the reconnection function will block the program's execution until it is completed. If <code>False</code>, the function will return the argument immediately and be run in the background. This allows the user to move the robot and perform other tasks in the program while the reconnection occurs. In the robot program, any gripper interaction (open/close/other) reached before the reconnection is completed will be blocked. • <code>slave_ids</code> (default = <code>[]</code>): If an empty list is provided, as it is by default, the function will make sure you reconnect to all the grippers that were present when you last called the "<code>rq_disconnect_grippers()</code>" function. If the "<code>rq_disconnect_grippers()</code>" function had never been called before, it will wait until at least one gripper is available before activating it. If a specific list of <code>slave_ids</code> are provided, it will prompt the user to reconnect the grippers corresponding to the <code>slave_ids</code>. The slave id for the gripper identified as "1" in the user interface should be passed as the numeric value "9." Numbers 2, 3 and 4 can be passed directly.
<code>rq_disconnect_grippers()</code>	This instructs the Gripper software to disconnect from any connected gripper, but to remember which grippers were available and how to communicate with them. Also, this disables any "scanning" mechanism of the software until the current program is stopped or until the reconnection function is called. This ensures that if a device other than a Robotiq device is used, the software will behave as intended and will not attempt to communicate with said device, thus preventing hardware issues. This function should be used directly before physically disconnecting the grippers or turning their power off.

As mentioned in the descriptions of the script functions above, it is important to always turn on and off the power while using a tool changer. This action can be performed using the following UR script:

- `set_tool_voltage(voltage)` The voltage argument can be 0, 12 or 24. In the specific case of the Robotiq gripper, use 24 to turn the power on and 0 to turn it off.

To ensure a reliable tool change, Robotiq recommends using the following sequence in the program:

- Connection of the grippers:
 1. Physically connect the grippers
 2. Apply the required voltage using `set_tool_voltage(24)`



3. Call the `rq_reconnect_grippers(False)` function to launch the reconnection process in the background of the program
 4. Perform the rest of the program
- Disconnection of the grippers:
 1. Call the `rq_disconnect_grippers()` function
 2. Turn off the voltage using `set_tool_voltage(0;`
 3. Physically disconnect the grippers



5. Specifications



INFO

This manual uses the metric system. Unless otherwise specified, **all dimensions are in millimeters.**

5.1. Technical dimensions

5.1.1. Hand-E C10 Gripper

The figure below represents the gripper dimensions with axes X, Y, Z, and origin referenced for finger motion.



INFO

All technical drawings in the current section depict stepped fingers.

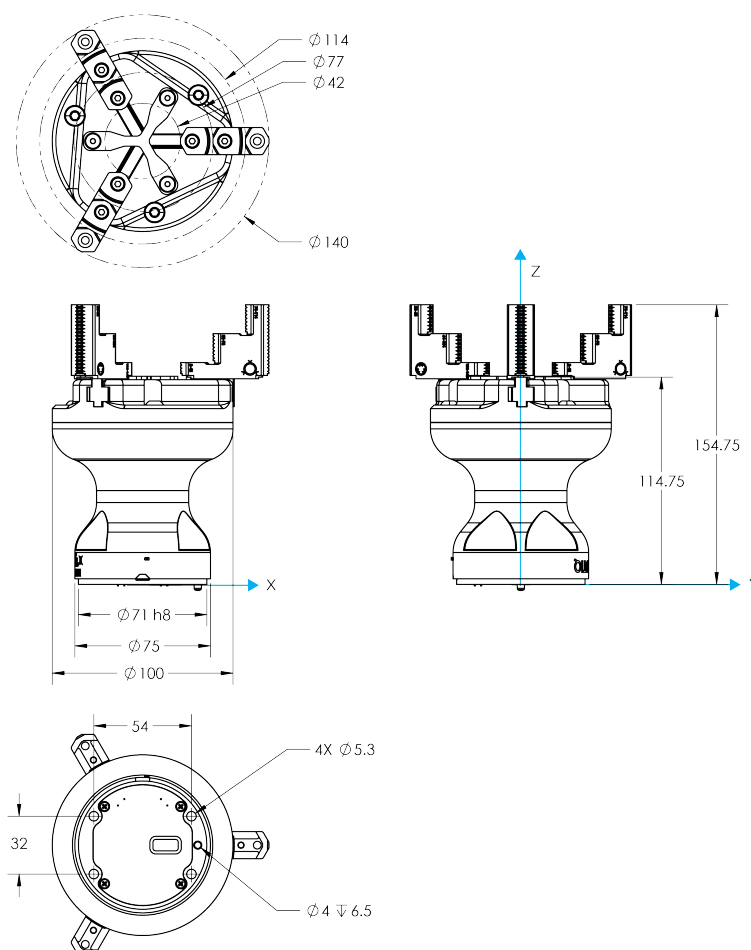


Fig. 5-1: General Dimensions of Hand-E C10 (open) with Flat Rubber (NPR) Stepped Fingers



5.1.2. Center of Mass, Tool Center Point and Moment of Inertia

This table presents the center of mass and TCP of different combination for the Hand-E C10 Gripper.

Product	With finger extender	Center of mass (mm) ¹			TCP (mm) ²			Mass (g)
		X	Y	Z	X	Y	Z	
Hand-E C10 Gripper	no	-0.11	-0.21	82.66	0.0	0.0	165.75	1695
	yes	0.10	-0.19	87.51	0.0	0.0	173.75	1875.22
Hand-E C10 on 90° bracket	no	-39.0	-0.5	78.7	-134.1	0.0	88.0	2010.2
	yes	-44.3	-0.4	79.9	-110.1	0.0	88.0	2230.6

¹ All mass and center of mass values include coupling, fasteners and stepped fingers.

² All given TCPs are located at the top of the larger diameter finger step.

This table presents the center of mass and TCP of different combination for the two (2) Hand-E C10 grippers.

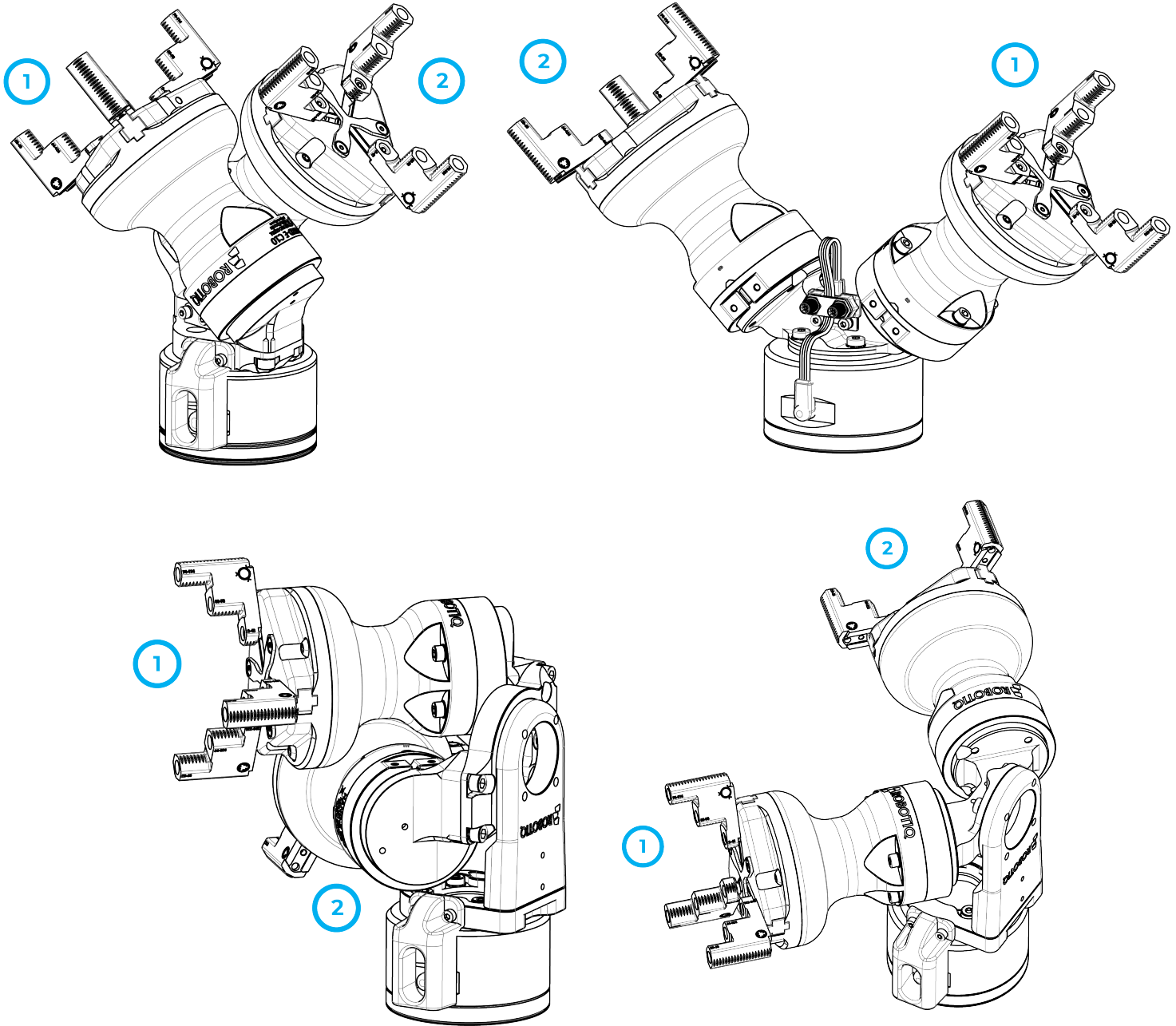
Product	With finger extender	Center of mass (mm) ¹			TCP (mm) ²						Mass (g)
					Gripper 1			Gripper 2			
		X	Y	Z	X	Y	Z	X	Y	Z	
Dual Hand-E C10 Gripper on Y bracket	no	0.1	-0.3	79.5	160.2	0.0	144.2	-160.2	0.0	144.2	3702.2
	yes	0.1	-0.3	83.2	165.9	0.0	149.9	-165.9	0.0	149.9	4062.2
Dual Hand-E C10 Gripper on X compact bracket	no	-0.2	-0.3	92.5	-78.5	-36.2	161.5	78.5	36.2	161.5	3861.3
	yes	-0.1	-0.3	96.4	-84.2	-36.2	167.2	84.2	36.2	167.2	4221.3
Dual Hand-E C10 Gripper on Y bracket installed on 90° bracket	no	-40.1	0.0	82.2	-112.5	-160.2	88.0	-112.5	160.2	88.0	4089.4
	yes	-44.1	0.0	82.6	-118.2	-165.9	88.0	-118.2	165.9	88.0	4449.4



Dual Hand-E C10 Gripper on X compact bracket installed on 90° bracket	no	-54.7	0.0	83.5	-129.8	-78.5	124.2	-129.8	78.5	51.8	4161.0
	yes	-58.8	0.0	83.8	-135.5	-84.2	124.2	-135.5	84.2	51.8	4521.0

¹ All mass and center of mass values include coupling, fasteners and stepped fingers.

² All given TCPs are located at the top of the larger diameter finger step.





INFO

For TCP and center of mass of the Hand-E C10 Gripper used in combination with other Robotiq products, refer to the specific table provided on our [support website](#).

The moment of inertia are calculated for a configuration where the fingers are fully open and includes the following component:

- Hardware and fasteners
- Gripper coupling
- Stepped fingers extender
- Stop plate including short and long spacers.

Here is the approximate moment of inertia matrix for the gripper:

$$I = \begin{bmatrix} I_{XX} & I_{XY} & I_{XZ} \\ I_{YX} & I_{YY} & I_{YZ} \\ I_{ZX} & I_{ZY} & I_{ZZ} \end{bmatrix} = \begin{bmatrix} 22281.1 & -4 & 35.2 \\ -4 & 22290.5 & 17.6 \\ 35.2 & 17.6 & 5310.7 \end{bmatrix} = \begin{bmatrix} 76.1 & 0 & 0.1 \\ 0 & 76.2 & 0.1 \\ 0.1 & 0.1 & 18.1 \end{bmatrix}$$

$\text{kg} \times \text{mm}^2$ $\text{lb} \times \text{in}^2$

Fig. 5-2: Inertia Matrix for Hand-E C10

5.1.3. Couplings

The Hand-E C10 Gripper requires a coupling provided by Robotiq to operate. The coupling is mandatory since it integrates electronics and electrical contacts.

Coupling for ISO 9409-1-50-4-M6

Bolt pattern for coupling GRP-CPL-062 and GRP-ES-CPL-062 (please refer to the **Spare Parts, Kits and Accessories** section) is compatible with:

- 50 mm pitch circle diameter:
 - (4) M6-1.0 low head socket cap screw clearance
 - (1) M6 dowel pin
 - ISO 9409-1 standard 50-4-M6

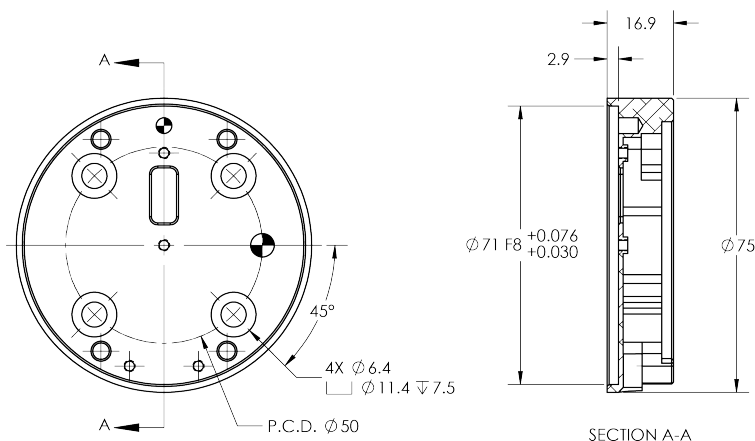


Fig. 5-3: Coupling for ISO 9409-1-50-4-M6.



5.1.4. Stepped Fingers

The contact grip points for Hand-E C10 are its three stepped finger.

Robotiq offers a selection of fingertips (see the **Spare Parts, Kits and Accessories** section), and users can create custom fingertips.

The figure below represents the fingertip holder, i.e., the permanent, non customizable part of the gripper finger on which the fingertip must be mounted.

As depicted in the technical dimensions of the Hand-E C10 Gripper, the distance between the base of the Gripper and the part on which the fingers are mounted is 114.75 mm.

Hand-E C10 is shipped mounted with stepped fingers.

Custom fingertip design must meet the following specifications:

- Forces exerted at the end of the fingertips must not exceed the values specified in the **Moment and Force Limits for Standard Fingertips** section, regardless of the direction.



WARNING

The following limits must be respected at all times.
Calculation of maximum moment and force should include robot acceleration and safety factors.

- Refer to the **Mechanical Specifications** section to evaluate the grip force according to your fingertip design.



INFO

You can install custom fingers directly on the rack or on the finger extenders.

Rack

Fingers are installed directly on a rack. You may customize your own fingers to mount them on this part. Stepped fingers are mounted directly onto it.

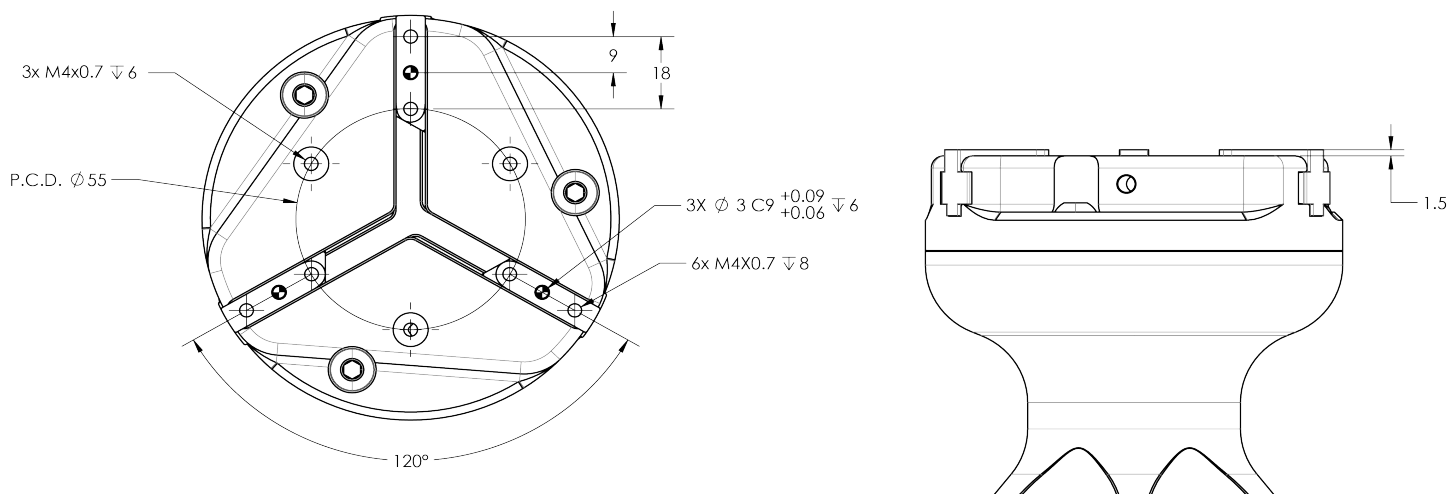


Fig. 5-4: Hand-E C10 Cotation Rack

Finger Extenders

The figure below represents the finger extenders. For details, see the **Spare Parts, Kits and Accessories** section. This extender allows to increase the diameter range of the gripper of 78mm or 102mm.

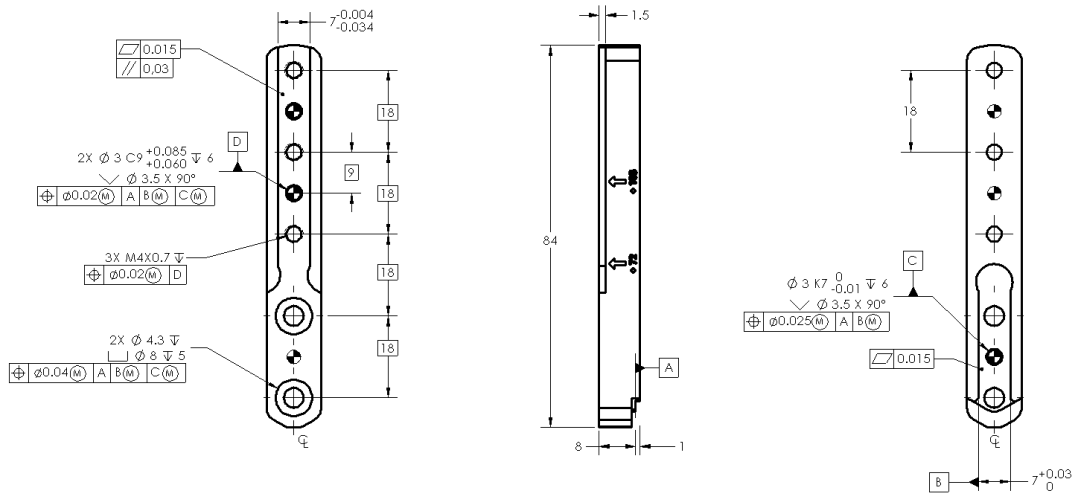


Fig. 5-5: Finger Extender

Stainless steel stepped finger

The figure below represents a Stainless steel stepped finger. For more details, refer to the **Spare Parts, Kits and Accessories** section. This finger allows the gripper to pick part diameter up to 114 mm (external grip) and 140 mm (internal grip).

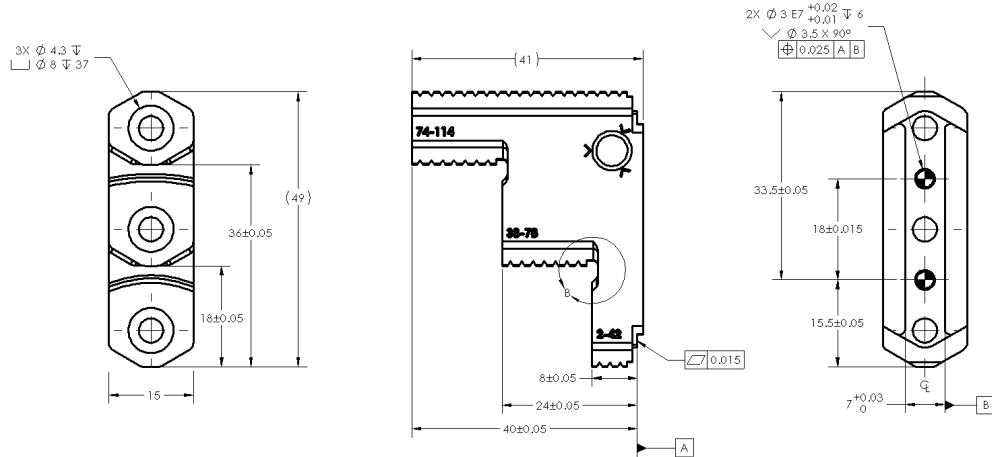


Fig. 5-6: Stainless Steel Stepped Finger

5.2. Mechanical Specifications

5.2.1. Hand-E C10 Gripper



INFO

The data shown in the table below is typical of newly manufactured product, and will vary with product use and wear.

Specification	Metric	Imperial
Stroke	20 mm	0.79 in
Grip force	50 N - 525 N	11.2 lbf - 118 lbf
Max recommended payload ¹	10 kg	22 lb
Max friction grip payload ²	3.7 kg	8.1 lb
Maximal robot TCP acceleration ³	5000 mm/s ²	196.85 in/s ²
Weight (with coupling)	1695 g	3.74 lb
Finger speed range	14 - 107 mm/sec	0.55 - 4.2 in/sec
Position repeatability ⁴	<0.04 mm	<0.002 in
Diametral position resolution ⁵	0.16 mm	0.006 in

Table 5-1: Mechanical specifications of the Hand-E Gripper fitted with coupling GRP-CPL-062 and stepped finger

¹ The maximum payload is defined as the maximum load (2 g) that the gripper is able to sustain without mechanical failure. To reach this max payload, there must be mechanical notches or fingers that engage deeply on the part combined with a high friction coefficient. This payload needs to be validated based on the information found in subsequent subsections of this manual.

² The maximum recommended payload in friction grip is defined as the maximum load (2 g) that the gripper oriented vertically can sustain without dropping the part. This payload has been obtained with the stainless steel stepped finger (friction coefficient of 0.13).

³ Exceeding this value can lead to reduced life time of the gripper

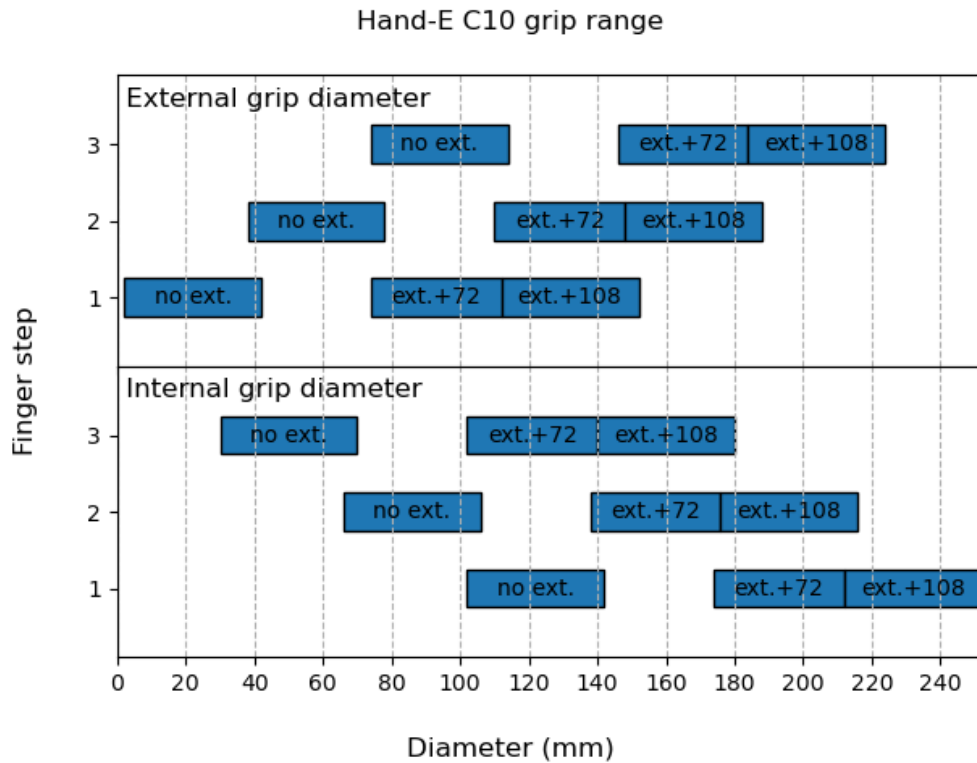
⁴ Repeatability is defined as the positional deviation resulting from the average displacement determined when picking an object using standard stepped finger. For more details, refer to the blog.robotiq.com article on repeatability. Position repeatability varies depending on product wear and operating conditions.

⁵ Resolution is the increment modified from a 1 bit difference of position/speed/force request (from 0 to 255).



Hand-E C10 diameter range

The Hand-E-C10 is provided with extender and stepped finger. As explained in the installation section, finger can be mounted in 2 different orientations and finger extender allow 2 positions. Here's a summary of the diameter range combined with the gripper's accessory.



Note that the finger step 1 is the one nearest the gripper rack.

Maximum payload determination

The maximum payload is defined as the situation that created the highest load on the gripper. The gripper payload is limited in different ways. To ensure that the max payload is not exceeded, assessment and validation based on the following criteria must be done.

- Validate load and eccentricity
- Validate friction grip payload

Load and eccentricity

The maximum load of the Gripper 10kg @2g (196 N) has to account for the entire robot trajectory, namely:

- The maximum acceleration of the robot (and potential decelerations, e.g., due to a stop)
- The direction of gravity in relation to the robot's trajectory
- The forces exerted on the Gripper (e.g., when putting down a grasped object on a surface using the Gripper)

The acceleration (or deceleration) times the mass of the object is a force exerted on the Gripper.

The sum of all forces must not exceed the maximum load of the Gripper (196 N).

$$\text{payloadmass} * (\text{acceleration} + \text{gravity}) + \text{externalforce} < 196N$$





TIP - Rule of Thumb

If the sum of all forces is higher than 196N, robot acceleration can be reduced. In most applications a acceleration of 9.8m/sec² by the robot is more than enough to reach proper cycle time. A proper robot acceleration would be around 5m/sec². For higher payload, robot acceleration can be reduce lower than 5m/sec²



WARNING

Robot acceleration must be accounted for in payload calculations.
Robot emergency stops will lead to major deceleration velocities.



INFO

The Gripper has a power off brake. When the force setting is reached, the brake automatically engages for power consumption efficiency and safety purposes.

Even without power, the gripping force is maintained.

The eccentricity of the load is the distance between the center of gravity of the load and the point at which the load makes contact with the Gripper fingers. (Z_{cg} in the figure below).

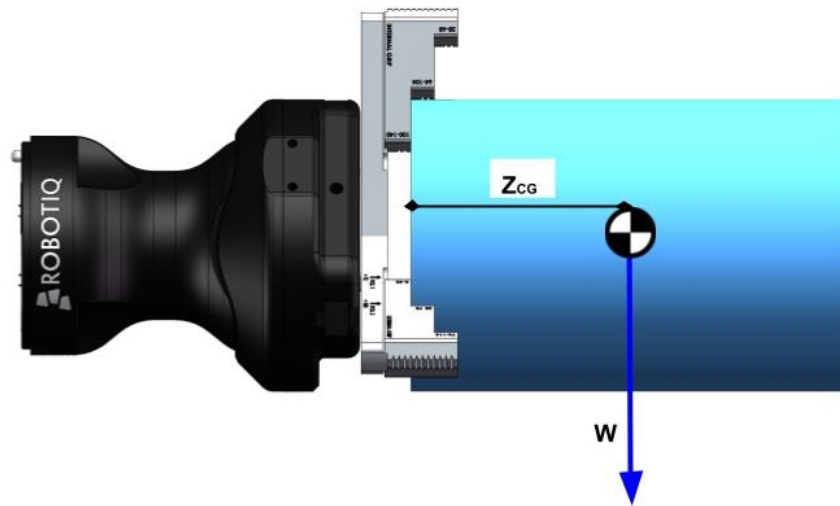
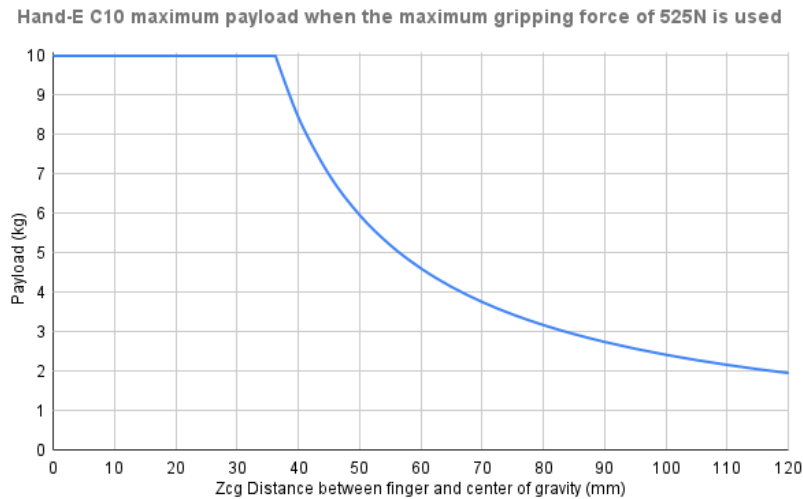


Fig. 5-7: Hand-E C10 Load Eccentricity

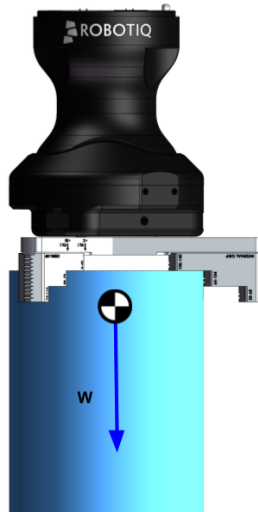


Use the following graphic to determine if the center of gravity of the object is properly positioned for the application.



5.2.2. Friction Grip Payload

Assess and validate the weight of the workpiece to make sure it does not fall off the gripper when transported by the robot.



A friction grasp consists in the object (payload) being held by the Gripper's pads solely by friction in whichever part of the robot trajectory.

Calculate the friction force to determine the weight of the workpiece. The friction force depends on the friction coefficient between the finger and the object as well as the actual gripping force of the Gripper. The following equation can be used to calculate the maximum load that can be sustained during a friction grasp, where:

- W is the load force sustainable by the friction grasp
- F is the force applied on the load by the Gripper's finger pads (525 N if the force setting is at 100%)
- C_f is the friction coefficient between the Gripper's finger and the load
- S_f is a safety factor to be determined by the robot integrator

$$W = \frac{FC_f}{S_f}$$



The calculation of the payload mass has to account for the acceleration, the gravity and the external forces.

INFO Example—Consider the Following

- Stainless steel stepped fingers
- A lubricated workpiece (exposed to cutting oils in a machine tending application)
- A tested static friction coefficient of 0.3
- The maximum grasping force of 525 N
- A safety factor of 1.2



$$W = \frac{525N \cdot 0.128}{1.2}$$

$$W = 56N$$

- A robot acceleration of 10 m/s²
- No external forces

$$\text{workpiece weight} = \frac{56 - 0}{10 + 9.81}$$

$$\text{workpiece weight} = 2.83 \text{ kg}$$

TIP - Rule of Thumb



If workpiece weight is too low for the application, robot acceleration can be reduced. In most applications an acceleration of 10m/sec² by the robot is more than enough to reach proper cycle time. A proper robot acceleration would be around 5m/sec². For higher payload, robot acceleration can be reduced lower than 5m/sec².

CAUTION



The most important factor in payload and weight calculations is the **friction coefficient**. Robotiq recommends assessing, validating and testing the resulting friction coefficient.

5.2.3. Moment and Force Limits for Standard Fingertips

In some cases, custom finger design is required (mechanical notch, form fit grasp) to increase gripper's capacity. The maximum allowable moment and force values on the rack must not be exceeded. The maximum moment and force values are independent of the grasp force the Gripper applies on the payload (175N per finger).

Refer to the **Maximum payload determination** section.

WARNING



Always operate within range.

Calculation of maximum moment and force values should include robot acceleration and safety factors.



Parameter	Hand-E C10 Stainless Steel Stepped Fingers
F_x	292 N
F_y	802 N
F_z	1605 N
M_x^*	12 Nm
M_y^*	17 Nm
M_z^*	8 Nm

Table 5-2: Maximum moment and force values

*Moments in x, y, and z are calculated from the top of the rack.

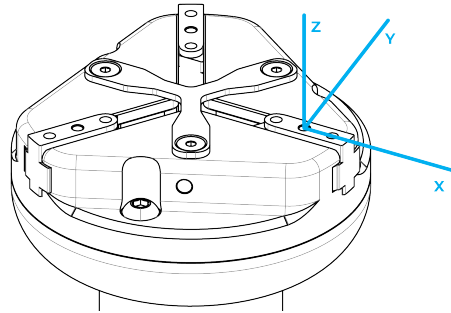


Fig. 5-8: Reference Frame for Maximum Force and Moment Values

5.3. Electrical specifications

SPECIFICATION	VALUE
Operating supply voltage	24 V DC $\pm 10\%$
Quiescent power (minimum power consumption)	1 W
Peak current	680 mA

6. Maintenance

The Hand-E C10 Gripper requires only external maintenance with limited downtime.

Maintenance is required after specified usage, measured in cycles (see Info box below for details about cycle definition).

Following the maintenance interval will ensure :

- Correct functioning of your gripper.
- Validity of your warranty.
- Proper lifetime for your gripper.



WARNING

Unless otherwise indicated, any **repairs** done on the gripper will be performed by Robotiq.



INFO

A cycle is defined as a **go to requested position** command that results in grip force being applied (closing the fingers on themselves or picking an object while opening or closing).

Operation	Daily	Weekly	1 M cycles	2 M cycles
Gripper Cleaning	Dirty conditions	Normal conditions		
Periodic Inspection			X	
Rack and pinion mechanism cleaning				X

Table 6-1: Maintenance Intervals



CAUTION

Always turn off the robot and the gripper power supply before performing any maintenance operations.

Maintenance operations are for the average normal usage of the gripper, the maintenance intervals must be adjusted according to environmental conditions such as:

- Operating temperature
- Humidity
- Presence of chemicals
- Presence of physical parts (debris, scraps, dust, grease etc.)



- Interaction with operated parts (sharp or rough)
- Dynamics of the operation (accelerations)

6.1. Gripper cleaning

Maintenance Interval	Tools You Need	Parts You Need
Weekly or daily in dirty operating conditions	• 4 mm hex key • 2.5 mm hex key • Dry tissue or towel • Low strength thread locker	None (unless damage is detected)



CAUTION

Always turn off the robot and the gripper power supply before performing any maintenance operations.

The maintenance operator must be grounded to prevent electrostatic discharge that could damage the gripper electronics.

1. Remove the gripper from its coupling using the 4 mm hex key to unscrew the four (4) M5-0.8 x 25 mm socket head cap screws. Note that each screw uses a tooth lock washer, do not lose them.
2. Remove the stop plate from the gripper using the 2.5 mm hex key.
3. Clean the gripper with a dry towel. Remove all debris, dirt, and dust from the surface of the gripper. Clean all pads, dry thoroughly. If debris are still present, blowing clean and dry air into the rack groove or into cleaning hole can help remove the remaining dirt.

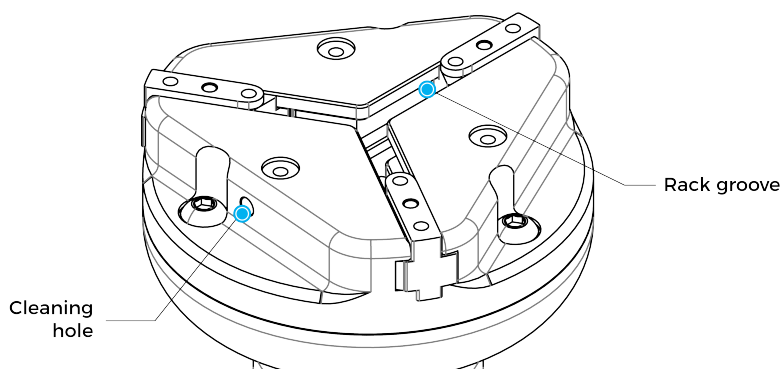


Fig. 6-1: Hand-E C10 Gripper Cleaning

4. Clean the coupling with a dry towel. Pay particular attention to the electrical contact.
5. Visually inspect the gripper and pay attention to any visible damage.
6. Install the stop plate back on the gripper with the three (3) M4. Apply low strength threadlocker and tighten the screws to 2 Nm.
7. Put the gripper back on and secure it with the four (4) M5-0.8 x 25 mm socket head cap screws and tooth lock washers. Apply low strength threadlocker and tighten the screws to 3 Nm.

When cleaning the gripper, verify that the following elements are still intact:

- Stepped fingers
- Finger extender
- Stop plate and spacers

If there is wear visible, you can change these components, using the ones provided by Robotiq or custom ones. See **Spare Parts, Kits and Accessories** section to order Hand-E C10 replacement parts.

In order to replace a finger and/or finger extender

1. Reorient the robot tool flange upwards. Adjust its height to make it suitable for working.
2. Turn off the robot and the gripper power supply before performing any maintenance operations
3. Remove the M4 screws that hold in place the components.
4. Clean the surface that mates with the worn part.
5. Place the new extender on the rack or the finger on extender.
6. Secure the components using the provided M4 screws, apply low strength thread locker to the M4 screw threads. Tighten the M4 screws to 3.5 Nm.
7. Repeat for remaining fingers.

In order to replace the stop plate and or spacer

1. Reorient the robot tool flange upwards. Adjust its height to make it suitable for working.
2. Turn off the robot and the gripper power supply before performing any maintenance operations
3. Remove the M4 screws that hold in place the stop plate.
4. If needed, remove the spacer.
5. Clean the surface that mates with the worn part.
6. Apply low strength thread locker to the M4 threads of the new spacers and tighten them to 2 Nm.
7. Place the new stop plate on the gripper and secure it with the 3 M4 screws. Apply low strength thread locker to the screw and tighten them to 2 Nm.

In order to replace a 90° bracket

1. Reorient the robot tool flange upwards. Adjust its height to make it suitable for working.
2. Turn off the robot and the gripper power supply before performing any maintenance operations.
3. Remove the M5 screws that hold in place the gripper to the coupling.
4. Remove the M6 screws that hold in place the coupling to the 90° bracket.
5. Remove the M6 screws that hold in place the 90° bracket to the robot tool flange.
6. Clean all surfaces that mates together.
7. Install the 90° gripper bracket on the robot arm using the provided M6 x 12 mm screws and tooth lock washers. Make sure to install the dowel pin between the robot flange and 90° bracket. Tighten the screws to 8 Nm.



8. Mount the grippers's couplings on the 90° gripper bracket using the provided M6 x 12 mm screws and tooth lock washers. Tighten the screws to 8 Nm.
9. Mount the grippers onto the coupling using the provided M5 X 25 mm screws and tooth lock washers. Apply low strength threadlocker and tighten the screws to 3 Nm.

6.2. Periodic inspection

Maintenance Interval	Tools You Need	Parts You Need
Monthly	• 4 mm hex key • 2.5 mm hex key • Dry tissue or towel	None (unless damage is detected)



CAUTION

Always turn off the robot and the gripper power supply before performing any maintenance operations.

1. Remove and clean the gripper following instructions in the **Gripper cleaning** section
2. Inspect the gripper:
 - Finger or fingertip wear must not affect gripping, if wear is visible and affects movement, change accordingly. Refer to the **Gripper cleaning** section.
 - Check for any collision damage. If damage is visible, contact support@robotiq.com.
 - Check for any sign of wear on the gripper chassis. If wear is present and may affect the gripper, contact support@robotiq.com.
3. Put back in place respecting to the instructions from the **Gripper cleaning** section
4. Finger movement must be symmetric and fluid. Test opening and closing of the gripper.



7. Spare Parts, Kits and Accessories



INFO

Unless specified, screws, dowel pins and other hardware are only included for grippers, and not for robots.

Item	Description	Ordering Number
Hand-E Concentric Gripper Unit	Hand-E C10 basic gripper unit only including stepped finger stop plate.	GRIPPER-HND-C10
Hand-E C10 Accessories Kit	Hand-E C10 stop plate spacers and finger extenders including fasteners and tools	HND-C10-ACC-KIT
Hand-E C10 Fingertips Kit	• 3 x Stainless steel fingertips • Hardware kit	HND-C10-FIN-KIT
Hand-E C10 Stopper Plate Kit	• 1 x Stopper plate • 3 x Spacer kit • Hardware kit	HND-C10-STP-PLATE-KIT
Hand-E C10 Extender Kit	• 3 x Extenders • Hardware kit	HND-C10-EXTENDER-KIT
Adaptive Gripper Screw Kit	The screw kit contains: • M5 screws • M5 Tooth lock washers	GRP-SCREW-KIT-P
Gripper 90° bracket	90° bracket	MT-PLM-COMP-90DEG-P
Gripper 90° bracket robot mounting SCREW KIT	The screw kit contains: • M6 screws • M6 tooth lock washers • 6 mm dowel pin	MT-PLM-COMP-90DEG-SCREW-KIT
UR e-series Coupling Protector kit	UR protector and fasteners	GRP-ES-CPL-PRO-P



Item	Description	Ordering Number
Hand-E C10 gripper kit for Universal Robots (e-Series)	- Hand-E Concentric Gripper Unit - Hand-E C10 Accessories Kit - Adaptive Gripper Screw Kit - Gripper 90° bracket - Gripper 90° bracket robot mounting screw kit - UR e-series Coupling Protector kit - Gripper Coupling Kit for UR e-Series - Coupling-SCREW-KIT-P	HND-C10-ES-UR-KIT
Controller	Optional controller for industrial communications. See Robotiq Universal Controller manual for more information.	UNI-CTR-XXXX
10 m Device Cable	10 m Robotiq device cable for power and communication. Straight M12 5-pins female on one side, single ended on the other, shielded	CBL-COM-2065-10-HF
USB to RS485 adapter	USB to RS485 adapter, can be used with device cable for USB connection	ACC-ADT-USB-RS485
End-Effector Coupling Kit	ISO 9409-1-50-4-M6 coupling for Adaptive Robot Grippers, with screws and tools for Gripper fixation and 1 m pigtail cable	GRP-CPL-062

To install Hand-E C10 on a robot that has a different bolt pattern than part GRP-CPL-062 (ISO 9409-1-50-4-M6), you can use one of the following. The couplings and adapter plates listed below fit with both Hand-E C10 and the 2-Finger Gripper.

Item	Description	Ordering Number
Blank coupling	Blank coupling for Adaptive Robot Grippers, with screws for Gripper fixation and 1 m pigtail cable	AGC-CPL-BLANK-002
ISO 9409-1-50-4-M6 coupling (cable-to-controller)	ISO 9409-1-50-4-M6 coupling for Robot Grippers with screws for Gripper fixation and 1 m pigtail cable	GRP-CPL-062
ISO 9409-1-50-4-M6 coupling (cable-to-wrist)	ISO 9409-1-50-4-M6 coupling for Robot Grippers with screws for Gripper fixation	GRP-ES-CPL-062
ISO 9409-1-31.5-4-M5 coupling	ISO 9409-1-31.5-4-M5 coupling for Adaptive Robot Grippers, with screws for Gripper fixation and 1 m pigtail cable	GRP-CPL-063



Item	Description	Ordering Number
ISO 9409-1-40-4-M6 coupling	ISO 9409-1-40-4-M6 coupling for Adaptive Robot Grippers, with screws for Gripper fixation and 1 m pigtail cable	GRP-CPL-064
56-8M4-1D4 coupling	Coupling for 56 mm PCD ¹ with (8) M4 and (1) 4mm dowel pin, with screws for Adaptive Robot Grippers fixation and 1 m pigtail cable	AGC-CPL-065-002
56-6M4-1D6 coupling	Coupling for 56 mm PCD ¹ with (6) M4 and (1) 6mm dowel pin, with screws for Adaptive Robot Grippers fixation and 1 m pigtail cable	AGC-CPL-066-002
60-4Ø5-1D5 coupling	Coupling for 60 mm PCD ¹ with (4) M5 thread and (1) 5mm dowel pin, with screws for Adaptive Robot Grippers fixation and 1 m pigtail cable	AGC-CPL-067-002
63-6M6-2D6 coupling	Coupling for 63 mm PCD ¹ with (6) M6 and (2) 6mm dowel pins, with screws for Adaptive Robot Grippers fixation and 1 m pigtail cable	AGC-CPL-068-002
40-4M5-1D3 coupling	Coupling for 40 mm PCD ¹ with (4) M5 and (1) 3mm dowel pins, with screws for Adaptive Robot Grippers fixation and 1 m pigtail cable	AGC-CPL-070-002
31.5-4M4 coupling	Coupling for 31.5 mm PCD ¹ with (4) M4, with screws for Adaptive Robot Grippers fixation and 1 m pigtail cable	AGC-CPL-071-002
Adapter plate to 63-4M6-71-2D3	Wrist adapter plate for use with AGC-CPL-064-002. Interface to 63 mm PCD ¹ with (4) M6 screws and 71 mm PCD ¹ with (2) M3 dowel pins	AGC-APL-151-002
Adapter plate to 63-4M6-61.4-2D6	Wrist adapter plate for use with AGC-CPL-064-002. Interface to 63 mm PCD ¹ with (4) M6 screws and 61.4 mm PCD ¹ with (2) M6 dowel pins	AGC-APL-152-002
Adapter plate to 80-6M8-2D82D8	Wrist adapter plate for use with AGC-CPL-064-002. Interface to 80 mm PCD ¹ with (6) M8 screws and (2) M8 indexing pins	AGC-APL-153-002

¹Pitch Circle Diameter



TIP

For legacy part replacement visit the documentation archives and the appropriate manual or consult your Robotiq distributor.



8. Troubleshooting

8.1. Using the LED of the Hand-E C10 Gripper

When using Hand-E C10 with a USB to RS485 serial converter, the color of the LED on your gripper can provide information on the issue you are facing.

LED status	Description	Solutions
Off	Gripper is not powered.	Check gripper power supply and electrical setup. See Electrical Setup section.
Solid blue and red	Gripper is in fault.	1. Disconnect the communication and power cycle the gripper. The led should turn solid red when powered. 2. While powered with red LED, connect the communication, LED should turn solid blue when connection is established.
Blinking blue and red	Gripper is in fault.	1. Gripper may be in auto-release, wait for auto-release to be completed, then turn off auto-release and initialize the gripper. 2. Gripper may have a major fault, check the error from fault status and contact support.
Solid blue	No fault, and communicating.	1. If you can control the gripper from the teach pendant , check your program structure. 2. If you can not control the gripper from the teach pendant, contact support.
Solid red	No fault, but gripper is not communicating.	Check the LED of the USB to RS485 converter. See table below for details.

Table 8-1: Troubleshooting Solutions Depending on Gripper LED Status



8.2. Using the LED of the USB to RS485 converter

When your Hand-E C10 Gripper LED is solid red, and you are using a USB to RS485 converter, refer to current subsection to troubleshoot. Check the LED on your converter, and read the table below for details.

LED status	Description	Solutions
Off	No USB communication.	1. Check USB connection. 2. Re-install drivers. 3. Contact support.
Solid red	Data sent from USB to RS-485 serial port.	Communicating. No problem.
Solid green	Data sent from RS-485 serial port to USB.	Communicating. No problem.
Slowly blinking, red	-	1. Check the DB-9 connector. 2. Check the cable. 3. Check the communication parameters from the Robotiq User Interface, and see recovery procedure. 4. Contact support.
Quickly blinking, red and green	-	1. Check fault status, maximum operating temperature could be exceeded. 2. Contact support.

Table 8-2: Troubleshooting Solutions Depending on USB to RS-485 Converter LED Status

8.3. Using the Robotiq User Interface (RUI)

Use the Robotiq User Interface to check that your gripper functions properly:

1. Install the Robotiq User Interface on a computer.
2. Connect your gripper to a computer USB port.
3. Send instructions to your gripper via the Robotiq User Interface. If this fails, check that all cables are connected to your gripper and to your computer.
4. Contact support@robotiq.com.



INFO

For details on the Robotiq User Interface, see its Instruction Manual, available on robotiq.com/support.



8.4. Troubleshooting Universal Robots Models

8.4.1. From the Universal Robots teach pendant

To install a URCap, see the **Installing URCap Package** section. In case the URCap is already installed, but Hand-E C10 cannot be controlled with the teach pendant, follow these instructions:

1. Hand-E C10 LED is not blue: see table **Troubleshooting Solutions Depending on Gripper LED Status** section
2. Hand-E C10 LED is blue: the latest version of the URCap is installed. Contact support@robotiq.com.

8.4.2. For CB-Series: Troubleshooting the I/O Coupling

To take the control back of the I/O Coupling, follow the steps:

1. Remove the USB cable;

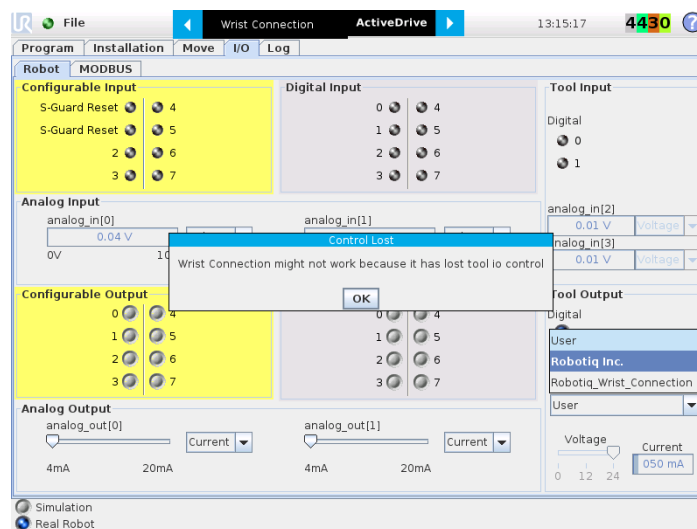


Fig. 8-1: Control Lost Message when Removing the USB Vable

2. Select **User** in the *Controlled by* drop down menu

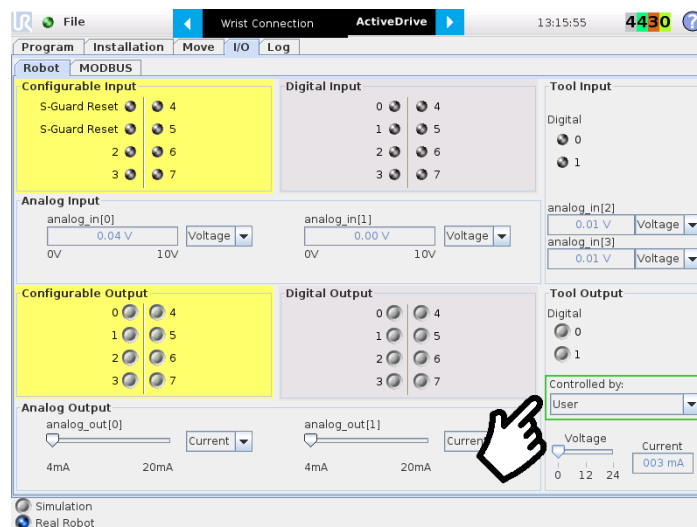


Fig. 8-2: Tool Output controlled by the user



- Use the 24V slider in the I/O tab under the **Tool Output** section to slide it to 0 and then back to 24V. It should enable the communication with the robot.

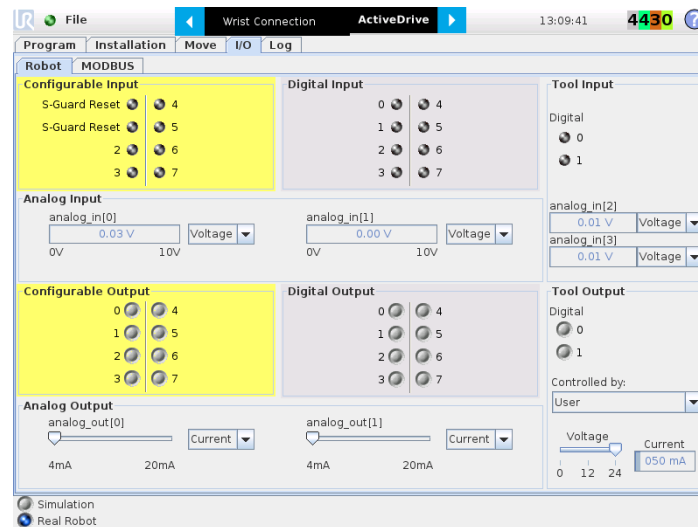


Fig. 8-3: Voltage Set to 24V

9. Warranty and Patent

Robotiq warrants Hand-E C10 against defects in material and workmanship for a period of one year from the date of reception when utilized as intended. Robotiq also warrants that this equipment will meet applicable specifications under normal use.

The warranty applies under the following conditions:

- Usage respects the operating and storage conditions specified in the **Environmental and Operating Conditions** section
- Proper installation of the Gripper specified in the **Installation** section and following subsections.
- Until one of these condition is reached:
 - 1 year
 - 5 000 000 cycle count¹
- Usage respects maintenance specified in the **Maintenance** section.
- Usage respects recommended payload and forces specified in the **Mechanical Specifications** section.

¹ Cycle count: One (1) cycle is defined as an object picking attempt, successful or not (open or closing onto an object, or closing on itself). It is calculated in the internal memory of the Hand-E C10 Gripper and can be seen on the teach pendant when using with Universal Robots or with the Robotiq User Interface.

During the warranty period, Robotiq will repair or replace any defective Hand-E C10 Gripper, as well as verify and adjust the Gripper free of charge if the equipment should need to be repaired or if the original adjustment is erroneous. If the equipment is sent back for verification during the warranty period and found to meet all published specifications, Robotiq will charge standard verification fees.

The unit is considered defective when at least one of the following conditions occurs:

- The Gripper fingers cannot close or open;
- The Gripper feedback necessary for the robot program is not accessible.

Parts that come into contact with the work piece and wearing parts such as the finger and fingertips are not covered by the warranty.

CAUTION

The warranty will become null and void if:

- The unit has been tampered with, repaired or worked on by unauthorized individuals.
- The warranty sticker has been removed (if present).
- The screws, other than as explained in this guide, have been removed.
- The unit has been opened other than as explained in this guide.
- Unit serial number has been altered, erased, or removed.
- Unit has been misused, neglected, or damaged by accident.



This warranty is in lieu of all other warranties expressed, implied, or statutory, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. In no event shall Robotiq be liable for special, incidental, or consequential damages.

Robotiq shall not be liable for damages resulting from the use of the Hand-E C10, nor shall Robotiq be responsible for any failure in the performance of other items to which Hand-E C10 is connected or the operation of any system of which the Gripper may be a part.

9.1. I/O Coupling Warranty

Robotiq warrants the I/O Coupling against defects in material and workmanship for a period of one year from the date of reception when utilized as intended. Robotiq also warrants that this equipment will meet applicable specifications under normal use.

Exclusions

This warranty excludes failure resulting from: improper use or installation, normal wear and tear, accident, abuse, neglect, fire, water, lightning or other acts of nature, causes external to the Gripper or other factors beyond Robotiq's control. It also excludes all consumable parts, such as fingertips and their normal wear.

Robotiq reserves the right to make changes in the design or construction of any of its products at any time without incurring any obligation to make any changes whatsoever on units already purchased.



10. Harmonized Standards, Declarations and Certificates

10.1. EC declaration of incorporation

The declaration of incorporation is available on support.robotiq.com.

10.2. Applied standards

This section describes all applied harmonized standards for the design and production of the Robotiq Hand-E C10 Gripper. Standards are applied where applicable, some points may not be applied if not applicable to this specific product. Conformity is not enforced by any laws, it is self-applied and the aim is to define normal safety and performance requirements for similar products.



CAUTION

Conformity of the product is only met if all instructions of this manual are followed. Among others: installation, safety measures and normal usage must be met.

The following standards have been applied:

- EN ISO 12100:2010 (Safety of machinery — General principles for design — Risk assessment and risk reduction)
- 2014/30/EU (EMC Directive)
 - EN 61000-6-2:2016
 - EN 61000-6-4:2007 + A1:2011
- 2011/65/EU + 2015/863 (RoHS Directive)
 - EN 50581:2012
- 2012/19/EU (WEEE Directive)
 - EN 50419:2005
- ISO 9409-1:2004 (Manipulating industrial robots — Mechanical interfaces — Part 1: Plates)
- ISO 14539:2000 (Manipulating industrial robots — Object handling with grasp-type grippers — Vocabulary and presentation of characteristics)



10.3. Ingress Protection Certificate



October 12th 2018

Purpose: Ingress Protection (IP67) – Hand-E Test Certificate

To whom it may concern,

This certificate is to attest that Ingress Protection (IP) tests were carried out by NTS Canada in the months of June and July 2018 on Hand-E units manufactured by Robotiq. No ingress of dust or water was observed inside the units after the tests. No insertion of the rod or induced damage was observed. No functional anomaly was noticed or reported by the Robotiq engineering representative on-site during the tests. This test certificate does not supersede the test report FTR0201898 Rev 00 issued by NTS Canada.

The acceptance status for the units tested is "PASS" for the following tests;

- Ingress protection against access to hazardous parts – Rod (code IP6X)
- Ingress protection against solid foreign objects - Dust (code IP6X)
- Ingress protection against immersion in water (code IPX7)

Sincerely yours,

**Jean-Pierre
Rioux**

Digitally signed by Jean-Pierre
Rioux
DN: cn=Jean-Pierre Rioux, o,
ou=NTS Canada Inc.,
email=Jean-
Pierre.Rioux@NTS.com, c=CA
Date: 2018.10.12 11:31:11 -0400

Jean-Pierre Rioux, P. Eng.
Lab Manager
National Technical Systems Canada inc.
2425 Industrial Blvd
Chambly, Quebec
J3L 4W3 Canada



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12. Miscellaneous.
 - a. This Agreement constitutes the entire understanding and agreement between the Licensor and the End-User and replaces any prior agreement relating to the same subject matter.
 - b. This Agreement shall be governed and construed in accordance with the laws of the province of Quebec and the federal laws of Canada applicable therein. Any legal action or proceeding between the Licensor and the End-User for any purpose concerning this Agreement or the parties' obligations hereunder shall be brought exclusively in a court of competent jurisdiction sitting in the judicial district of Trois-Rivières, Quebec.
 - c. The Licensor's failure to insist upon or enforce strict performance of any provision of this Agreement shall not be construed as a waiver of any provision or right. Neither the course of conduct between the parties nor trade practice shall act to modify any provision of this Agreement.
 - d. The Licensor may assign its rights and duties under this Agreement to any party at any time without notice to the End-User. The End-User may not assign this Agreement without the prior written consent of the Licensor.
 - e. If any part of this Agreement is null, illegal or non-enforceable, this Agreement shall be interpreted as if this part was never part of this Agreement.
 - f. The provisions of this Agreement are for the benefit of the Licensor and its officers, directors, employees, agents, licensors and suppliers. Each of these individuals or entities shall have the right to assert and enforce those provisions directly against the End-User on its own behalf. This Agreement is also for the benefit of, and binds, the End-User and its heirs, successors, legal representatives and permitted assigns.
 - g. Any rights not expressly granted herein are reserved.
 - h. The parties confirm that they have agreed that this Agreement and all related documents be drafted in English only. Les parties aux présentes confirment qu'elles ont accepté que la présente convention et tous les documents y afférents soient rédigés en anglais seulement.



12. Contact

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