Installation Guide

KINOVA® Gripper adapter kit
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About this document

This document contains information on the installation and operation of the KINOVA® Gripper adapter.

⚠️ Read all instructions before using this product.

⚠️ Read all warnings on the product and in this guide.

⚠️ Follow all instructions.

⚠️ Keep these instructions for future reference.

This document contains information regarding product setup and operation. It is intended for:
- Kinova product end users
- Field service, customer support and sales employees of authorized Kinova distributors
Symbols and definitions

⚠️ Important information regarding product safety.

--- Direct current.

🚫 Compliance with WEEE2 directive.
### Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>fps</td>
<td>frames per second</td>
</tr>
<tr>
<td>IR</td>
<td>Infrared</td>
</tr>
<tr>
<td>LED</td>
<td>Light-emitting diode</td>
</tr>
<tr>
<td>NTSC</td>
<td>National Television System Committee</td>
</tr>
<tr>
<td>PAL</td>
<td>Phase Alternating Line</td>
</tr>
<tr>
<td>ROHS3</td>
<td>Restriction of Hazardous Substances Directive 2015/863/EU</td>
</tr>
<tr>
<td>WEEE2</td>
<td>Waste Electrical &amp; Electronic Equipment Directive 2012/19/EU</td>
</tr>
</tbody>
</table>
Safety and warnings

⚠️ Do not open the chassis of the video adapter. The adapter is only to be opened by Kinova trained and certified service professionals.

⚠️ To avoid the possibility of serious damage to eyesight, do not look directly at the gripper adapter laser beam.

⚠️ Read the documentation from Robotiq for the gripper and observe all recommended safety precautions listed therein.

⚠️ Ensure that the ground connector of the video adapter is connected to ground.
Warranty

This section describes the Kinova warranty terms.

Subject to the terms of this clause, Kinova warrants to End User that the Products are free of defects in materials and workmanship that materially affect their performance for a period of two (2) years from the date Kinova ships the Products to the End User ("Delivery Date").

Kinova agrees to repair or replace (at Kinova's option) all Products which fail to conform to the relevant warranty provided that:

1. notification of the defect is received by Kinova within the warranty period specified above;
2. allegedly defective Products are returned to Kinova, (at the End User’s expense, with Kinova's prior authorization) within thirty (30) days of the defect becoming apparent;
3. the Products have not been altered, modified or subject to misuse, incorrect installation, maintenance, neglect, accident or damage caused by excessive current or used with incompatible parts;
4. the End User is not in default under any of its obligations under this Agreement;
5. replacement Products must have the benefit of the applicable warranty for the remainder of the applicable warranty period.

If Kinova diligently repairs or replaces the Products in accordance with this section, it will be deemed to have no further liability for a breach of the relevant warranty.

Allegedly defective Products returned to Kinova in accordance with this contract will, if found by Kinova on examination not to be defective, be returned to the End User. Kinova may charge a fee for examination and testing.

The warranty cannot be assigned or transferred and is to the sole benefit of the End User.

Where the Products have been manufactured and supplied to Kinova by a third party, any warranty granted to Kinova in respect of the Products may be passed on to the End User.

Kinova is entitled in its absolute discretion to refund the price of the defective Products in the event that such price has already been paid.
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www.kinovarobotics.com/support

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What's in the box?

This section describes the contents of the KINOVA® Gripper adapter kit.

The KINOVA® Gripper adapter kit ships with the following items:

- gripper adapter module
  - p/n KR11703-01 (PAL) or
  - p/n KR11703-02 (NTSC)
- video adapter (p/n KR11716)
- monitor RCA-RCA video cable (p/n 008177)
- robot to video adapter cable (p/n KR11995)
Gripper adapter kit overview

This section describes the Gripper adapter kit.

The KINOVA® Gripper adapter module is a peripheral designed for use as an integrated part of the KINOVA® Remote robotic manipulation system. The system allows remote manipulation of objects using an adapted robot arm (KINOVA® Gen2 Ultra lightweight robot) and gripper with a gamepad controller over an intervening communication network and aided by a built-in camera and other components in the gripper adapter.

The gripper adapter is offered for existing Kinova robot customers as part of this standalone installation kit to expand the capabilities of the Gen2 Ultra lightweight robot.

This gripper adapter kit augments the robot with the ability to integrate a 2-finger 85 mm Robotiq Gripper (sold separately - p/n KR ROB 0085) as end effector. The gripper adapter also incorporates an integrated video camera, LED lights and positioning laser. When combined with a communication network (KINOVA® Communication system, sold separately) and an optional user-supplied video transmission system, users can perform video-guided remote manipulation of objects.

Figure 1: Gripper adapter kit components

Gripper adapter module

This section describes the gripper adapter module.

The gripper adapter module enables the integration of a 2-finger 85 mm Robotiq gripper onto a KINOVA® Gen2 Ultra lightweight robot. The gripper adapter is located between the end of the robot and the gripper.
Figure 2: Gripper adapter module

The gripper adapter module includes the following integrated devices:

- video camera
- positioning laser
- four illumination LEDs (two white-light, two infrared)

The gripper adapter and its devices receive power and control signals from the robot. The gripper adapter also transmits power and control signals to the attached gripper.

Camera module overview

This section outlines the features of the camera module.

The camera module has the following features:

- PAL or NTSC composite video output (using video adapter)
- wide field of view > 100°

Laser overview

This section explains the features of the integrated tilting laser.

The purpose of the laser is to provide positioning guidance for any gripper-held tool. The tilting laser improves user depth perception and targeting, improving overall gripper manipulation. Its range extends from the tip of the gripper to 50 cm in front of it. At the tool tip, the laser beam diameter is less than 2.5 mm.

The laser angle can be adjusted mechanically on the back of the gripper adapter module using a 2.5 mm hex key, and ranges from horizontal (with respect to the gripper fingers) to approximately 30° below the horizontal.
The laser can be switched on using the KINova® Communication system gamepad.

**Light sources overview**

This section describes the light sources used for illumination.

The gripper adapter module includes four LED light sources for illumination purposes. At night or in other low-light situations, they make it easier to visualize objects when using the video camera.

There are four sources of illumination:
- two visible-spectrum LEDs (cool white light, 9000 K color temperature)
- two IR LEDs (infrared spectrum, 860 nm wavelength)

The light sources can be controlled using the gamepad in the KINova® Communication system. Using the gamepad, the IR and white light LED intensities can be adjusted in four steps from off to full intensity.

**Video adapter**

This section describes the features of the video adapter.

The video adapter converts the camera’s differential video signals into a single-ended PAL or NTSC composite video signal. This signal is output on the RCA connector on the side of the video adapter. It is mounted close to the robot support and is powered via a second cable connected to the expansion port of the robot base.

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**Figure 3: Video adapter**

**Robot to video adapter cable**

This section describes the robot to video adapter cable.

The robot to video adapter cable conveys the differential video signal and the power to the video adapter.

The cable connects the joystick / expansion connector of the robot to the power connector of the video adapter, and provides the differential video signal as well as the power to the video adapter.

The video stream is accessible from the video adapter via the RCA composite video output.
Connecting video adapter and Kinova joystick using splitter cable (Optional)

This section describes how to connect the video adapter and a Kinova joystick to the robot using an optional splitter cable.

The video adapter connects to the robot via the joystick / expansion connector on the arm. This connector can also be used for connecting the Kinova joystick controller that comes with the KINOVA® Gen2 Ultra lightweight robot. If you want to control the robot using the Kinova joystick while the video adapter is connected, this is possible using an optional splitter cable (Sold separately from the robot, P/N EH0M150001).

One end of the splitter cable connects to the robot joystick / expansion connector via a Lumberg 8-pin male connector. At the other end, the cable branches to give two Lumberg 8-contact female connectors. This provides connection points for the Kinova joystick cable and the robot to video adapter cable to connect just as they would with the robot base joystick / expansion port.

Note: Using the Kinova joystick, it will only be possible to control the movement of the robot and the opening and closing of the Robotiq gripper. The positioning laser, and light sources will NOT be controllable using the Kinova joystick alone.

Note: The separate KINOVA® Communication system allows the arm, gripper, and gripper adapter devices to be controlled using an Xbox One gamepad and communication adapter. This includes the option of tele-operation. Contact your Kinova representative for more details about the KINOVA® Communication System.
Robotiq gripper

This section describes the features of the Robotiq gripper.

The gripper adapter provides a means to connect a Robotiq 85 mm 2-finger gripper to a KINOVA® Gen2 Ultra lightweight robot. The gripper is integrated mechanically and electronically with the robot via the gripper adapter.

**Figure 6: Robotiq 2-finger 85 mm gripper**

When combined with the KINOVA® Communication system, the two gripper fingers can be controlled along with the robot and devices on the gripper adapter using a single controller device and adapter. This allows for grasping of objects (gripper opening has a width of 85 mm).
Installation

**Kinova gripper removal**

This section describes the procedure to remove the standard gripper from a Gen2 Ultra lightweight robot.

**Before you begin**

Ensure that the arm is powered down before beginning. You will need a 2 mm hex key, and the procedure will require touching the actuators; it is recommended that you wear an anti-static wrist strap to protect against ESD damage to the actuator electronic circuitry.

**About this task**

Removing the gripper is the first step to replacing a malfunctioning gripper or installing a different type of end effector. This procedure requires about 10 minutes to complete.

**Procedure**

1. Locate the last actuator at the end of the robotic arm.
2. Remove the plastic ring covering the actuator to expose the aluminum ring on either side of the actuator. You will see two sets of six evenly-spaced screws, one on each side of the actuator.
3. Remove the six screws on the output side of the actuator (the side toward the gripper).
   
   **Note:** Make sure to preserve the screws. You will need them to attach the gripper adapter, and also if you want to reattach the Kinova gripper later on.
   
   **Note:** Removing the screws on the other (input) side of the actuator will detach the last actuator from the arm shell. This is not necessary for removal of the gripper.
4. Gently pull the gripper away from the wrist.
   
   **Note:** Do not pull too hard. There is a flex cable connecting the last actuator to the gripper, and you might break the cable if you pull too hard.
5. Detach the flex cable from the Kinova gripper. There may be glue holding the cable in place - remove the glue, then pull out the small tabs on the side of the connector to loosen the cable. Pull the cable free from the connector to fully disconnect the gripper from the flex cable.
   
   **Note:** Keep the other end of the flex cable connected to the last actuator on the arm. You will need this later to connect the new gripper.

**Installing the gripper adapter**

This section describes the procedure to install the gripper adapter on the robot.

**Before you begin**

It is assumed that you have already removed the standard gripper that was previously mounted on the robot before starting.

**About this task**

This procedure allows you to install the gripper adapter onto the Gen2 Ultra lightweight robot. To install the gripper adapter, it will be necessary to:

- mechanically secure the gripper adapter on the robot
- electrically connect the gripper adapter to the last actuator of the robot using a flex cable

**Procedure**

1. Bring the open bottom end of the gripper adapter (opposite from the gripper) close to the end of the robot.
2. On the last actuator of the robot, locate the flat flex cable should already be connected to the exposed face of the last actuator on the robotic arm. (This would previously have been connecting the last actuator to the standard gripper)
3. Locate the flex cable connector on the inside face of the gripper adapter.
4. Connect the free end of the flex cable to the flex cable connector inside the gripper adapter. Pull open the tabs on the side of the connector, insert the end of the cable, and then close the tabs to secure the cable in the connector.

   **Note:** Ensure the blue side of the flex cable is not facing up in the cable connector. If the cable is inserted the wrong way you may damage the gripper and gripper adapter.

5. With the flex cable connected, slide the shell on the bottom of the gripper adapter over the exposed end of the last actuator.

   **Note:** Be careful not to pinch the flex cable.

6. The shell of the gripper adapter has six holes going around in a circle corresponding to the threaded holes on the actuator. Align the two sets of holes and insert the six screws loosely.

7. Torque the screws more tightly in sequence, following the ordering indicated by the star pattern:

   **Note:** Apply no more than 0.5 N·m (0.74 ft-lb) of torque to the actuator.

   ![Star pattern for screw torquing](image)

What to do next

**Install the Robotiq gripper.**

**Install a Robotiq gripper on the gripper adapter**

This section describes the procedure to install a Robotiq 2-finger 85 mm gripper on the gripper adapter.

**Before you begin**

This procedure assumes that you have already installed the gripper adapter on the robot. You will need:

- four Socket Head Cap Screws for mounting. The length of the screws to use depends on the newness of the gripper, as indicated by the serial number of the gripper:
  - older gripper model (with four digit serial number) - M5 x 40 screws
  - newer gripper model (with five digit serial number) - M5 x 30 screws
- a 4 mm hex key

**About this task**

This procedure describes the installation of a 2-finger 85 mm Robotiq gripper on the gripper adapter. This mechanically mounts the gripper on the gripper adapter and integrates the gripper with the robot in terms of electrical power and control. The gripper adapter has 4 mounting holes corresponding to the bolt pattern on the gripper. The gripper adapter interface also has ten spring-loaded pins to mate with a contact plate on the inside of the Robotiq gripper. This electrical interface is for electrical supply and controls.
Procedure

1. Align the interface surface of the Robotiq gripper with the interface surface of the gripper adapter such that the holes are aligned with the correct reference orientation.

![Figure 7: Gripper adapter interface](image)

**Figure 7: Gripper adapter interface**

**Note:** There is a positioning hole on the gripper adapter interface which corresponds to a positioning pin on the gripper. Ensure that the pin lines up properly with the hole for the correct orientation.

**Note:** With the screw holes and positioning pin aligned, the electrical interface pins and their contact points will also be aligned.

2. From the front face of the gripper, insert the four mounting screws, tightening each one in sequence until they are all snug (do not overtighten).

What to do next

⚠️ For your personal safety, it is strongly recommended that you read the user documentation for the Robotiq gripper before use.

Installing the video adapter

This section describes the mounting of the video adapter.

Before you begin

You will want to analyze your particular setup to determine the most convenient location to mount the video adapter. The mounting location needs to be close to that of the arm arm support to allow for a video cable connection to the robotic arm mounted in the arm support.

**Note:** The video adapter must be installed with the connectors facing down (+/-) 15° to protect against water ingress.

About this task

The video adapter can be mounted with four M5 screws to a flat surface through pre-drilled holes on the mounting flanges of the adapter.
**Procedure**

1. Drill four holes in a flat mounting surface using the mounting hole pattern of the video adapter mounting flanges as a guide.

   ![Figure 9: Video adapter flange mounting holes (measurements in mm)](image)

2. Secure the video adapter to the surface using four M5 screws (and nuts, if applicable).

3. One of the mounting holes has an exposed grounding connection. Connect this to ground.

4. Connect the video cable from the robotic arm base to the power / video in connector of the video adapter.

5. Connect the video out RCA connector to your video monitor.

**Viewing the video adapter output**

This section describes how to view the video output.

**Before you begin**

You will need a monitor or television with an RCA composite input.

**About this task**

The gripper adapter camera produces an analog video signal. This video signal is accessible at the video adapter. This procedure allows you to view the video.

**Procedure**

1. Power on the security arm system using the power switch on the base of the robotic arm.

2. Connect one end of a RCA composite video cable to the RCA out connector on the video adapter.

3. Connect the other end of the RCA composite video cable to the RCA composite input of the monitor/television.
4. Power on the monitor/television and select the RCA composite video input for display.

Results
You should be able to view the video from the gripper adapter camera on the screen.

Adjusting the laser angle
This section describes how to adjust the laser angle.

The tilt angle of the laser on the gripper adapter can be adjusted between 0 degrees (horizontal position) and 30 degrees downward.

The tilt angle can be adjusted with a 2.5 mm hex key by turning a screw on the back of the gripper adapter.

Turning the screw clockwise will move the screw inward and tilt the laser beam downward.

Turning the screw counterclockwise will move the screw outward and raise the laser beam upward.

Note: While the screw will stop at the forward limit of the laser in the clockwise direction, there is no limit in the counterclockwise direction. Be careful not to turn the screw too far counterclockwise, or the screw will come out all the way.
Controlling gripper and gripper adapter

Controlling the gripper and gripper adapter with KINOVAtm Communication system gamepad (Optional)

This section describes how to control the gripper and gripper adapter with the KINOVAtm Communication system.

The KINOVAtm Communication system (sold separately) allows the option of controlling the Robotiq gripper and gripper adapter using an Xbox One gamepad. The following sections describe the control modes available when using the communication system and how to control the gripper and gripper adapter within these control modes.

Controlling the gripper and gripper adapter using Xbox gamepad

This section describes how to control the gripper and the gripper adapter using an Xbox gamepad.

Introduction

The gripper and gripper adapter are operated using an Xbox One gamepad.

There are several actions that can be taken related to the gripper and gripper adapter. These actions are mapped to the controls:

- selection of the control mode
- movement of the gripper - in Cartesian mode: translation and orientation
- opening and closing the gripper
- turning the positioning guidance laser on / off
- turning the white and infrared LED illumination sources on / off

Gamepad controls

The gamepad offers the following controls:

![Gamepad Controls Diagram]

Gripper and gripper adapter control modes

This section describes the gamepad control modes for the gripper and gripper adapter and how to change the control mode.

Overview of control modes

There are four control modes available for controlling the gripper and gripper adapter using the communication system gamepad.
1. Camera reference mode - translate and change the orientation of the gripper from the perspective of a Cartesian coordinate system attached to the gripper adapter camera. Also, open and close the gripper fingers. This control mode is useful when controlling the system with visual feedback from the video camera.

2. Robot base reference mode - translate and change orientation of the gripper in Cartesian coordinates from the point of view of a user standing behind the robot looking forward. Also, to open and close the gripper fingers.

3. Go-to position - Save a position or command the gripper to move to a defined position.

4. Laser control mode - Control the intensity level for white and IR LEDs and toggle the laser.

**Changing control mode**

In all control modes, the A, B, X, and Y buttons on the gamepad are set aside for the purpose of selecting / changing the control mode.

**Table 1: Mode Select control mapping**

<table>
<thead>
<tr>
<th>Control</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Go-to position mode</td>
</tr>
<tr>
<td>B</td>
<td>LED / laser mode</td>
</tr>
<tr>
<td>X</td>
<td>Camera reference mode (Cartesian)</td>
</tr>
<tr>
<td>Y</td>
<td>Base reference mode (Cartesian)</td>
</tr>
</tbody>
</table>

**Figure 10: Mode Select controls**

**Camera reference control mode**

Camera reference control mode controls the motion of the gripper in Cartesian coordinates with respect to the perspective of the view from the gripper adapter camera. This control mode controls both translation of the gripper in three dimensions and rotation on three axes. This mode can be activated by pressing the X button.

**Table 2: Camera reference control mode mapping**

<table>
<thead>
<tr>
<th>Control</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>triggers</td>
<td>left / right</td>
</tr>
<tr>
<td></td>
<td>backward / forward</td>
</tr>
<tr>
<td></td>
<td>translate gripper</td>
</tr>
</tbody>
</table>
Robot base reference control mode

Robot base reference control mode controls the motion of the gripper in Cartesian coordinates with respect to the perspective of the view from the back of the robot base, looking forward. This mode can be activated by pressing the Y button.

Table 3: Robot base reference control mode mapping

<table>
<thead>
<tr>
<th>Control</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>triggers</td>
<td>left / right</td>
</tr>
<tr>
<td></td>
<td>down / up</td>
</tr>
<tr>
<td>left stick</td>
<td>left / right</td>
</tr>
<tr>
<td></td>
<td>left / right</td>
</tr>
<tr>
<td></td>
<td>down / up</td>
</tr>
<tr>
<td></td>
<td>backward / forward</td>
</tr>
<tr>
<td>right stick</td>
<td>left / right</td>
</tr>
<tr>
<td></td>
<td>yaw left / right</td>
</tr>
<tr>
<td></td>
<td>down / up</td>
</tr>
<tr>
<td></td>
<td>pitch down / up</td>
</tr>
<tr>
<td>buttons</td>
<td>Menu (held)</td>
</tr>
<tr>
<td></td>
<td>robot arm + gripper init</td>
</tr>
<tr>
<td></td>
<td>home / retract robot and open gripper</td>
</tr>
<tr>
<td></td>
<td>View (held)</td>
</tr>
<tr>
<td></td>
<td>robot arm home / retract</td>
</tr>
<tr>
<td></td>
<td>home / retract robot without opening gripper</td>
</tr>
</tbody>
</table>

Figure 11: Camera reference controls diagram
<table>
<thead>
<tr>
<th>Control</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>bumpers</td>
<td>left / right</td>
</tr>
<tr>
<td>D-pad</td>
<td>left / right</td>
</tr>
<tr>
<td></td>
<td>open / close</td>
</tr>
<tr>
<td></td>
<td>increase / decrease</td>
</tr>
<tr>
<td>buttons</td>
<td>Menu (held)</td>
</tr>
<tr>
<td></td>
<td>robot arm + gripper init</td>
</tr>
<tr>
<td></td>
<td>home / retract robot and open gripper</td>
</tr>
<tr>
<td></td>
<td>View (held)</td>
</tr>
<tr>
<td></td>
<td>robot arm home / retract</td>
</tr>
<tr>
<td></td>
<td>home / retract robot without opening gripper</td>
</tr>
</tbody>
</table>

**Figure 12: Robot base reference controls diagram**

**Go to position control mode**

Go to position control mode allows you to save a position or command the gripper to go to a saved position. This mode can be activated by pressing the A button.

**Table 4: Go to position control mode mapping**

<table>
<thead>
<tr>
<th>Control</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>left stick</td>
<td>Hold down one second</td>
</tr>
<tr>
<td></td>
<td>save position 1</td>
</tr>
<tr>
<td>right stick</td>
<td>Hold down one second</td>
</tr>
<tr>
<td></td>
<td>save position 2</td>
</tr>
<tr>
<td>bumpers</td>
<td>left / right</td>
</tr>
<tr>
<td></td>
<td>saved position 1 / saved position 2</td>
</tr>
<tr>
<td></td>
<td>go to position</td>
</tr>
<tr>
<td>button</td>
<td>Menu (held)</td>
</tr>
<tr>
<td></td>
<td>go to shipping case pose (for ease of putting the robot back in the shipping case for transport)</td>
</tr>
</tbody>
</table>
Figure 13: Go to position controls diagram

LED / laser control mode

LED / laser control mode allows control of positioning laser and the LEDs for illumination. This mode can be activated by pressing the B button.

Table 5: LED / laser control mode mapping

<table>
<thead>
<tr>
<th>Control</th>
<th>Action</th>
<th>Action Details</th>
<th>Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>bumper</td>
<td>left</td>
<td>cycle white LED intensity</td>
<td>0 1 2 3 4</td>
</tr>
<tr>
<td>bumper</td>
<td>right</td>
<td>cycle IR LED intensity</td>
<td>0 1 2 3 4</td>
</tr>
<tr>
<td>button</td>
<td>Menu</td>
<td>toggle laser</td>
<td>on / off</td>
</tr>
</tbody>
</table>

Figure 14: LED / laser controls diagram

Controlling the Robotiq gripper with the Kinova joystick

This section describes how to control the Robotiq gripper using the Kinova joystick.

The Kinova joystick, which is used generally to control the Gen2 Ultra lightweight robot and an attached KINOVA® KG-Series gripper, can still be used to control the movements of the robot with the gripper adapter and Robotiq gripper connected.
Moreover, the gripper adapter electronics allow the joystick inputs which would normally control the opening and closing of the KG-Series gripper to control the opening and closing of the Robotiq gripper.

**Note:** While the joystick can be used to control the Robotiq gripper, it does NOT allow for control of the LEDs or the positioning laser. For control of the LEDs and the positioning laser, the only alternative to control via the Communication system is via the Kinova C++ API for the robot over a cabled Ethernet connection to the robot.

**Note:** The stream from the video camera is available via the robot base joystick / expansion connector. However, to use the joystick for control and access the video stream at the same time, a splitter cable is required.

### Controlling the Robotiq gripper and gripper adapter using the Kinova robot C++ API

This section describes how to control the gripper and gripper adapter using the Kinova API.

While the Robotiq gripper can be controlled using the Kinova joystick, the only way to control the LEDs and positioning laser without the Kinova communication system is via the Gen2 Ultra lightweight robot C++ API over a cabled Ethernet connection to the robot. This connection also allows control of the robot movements.

The Kinova SDK for the Gen2 Ultra lightweight robot can be downloaded from the Kinova Website technical resources page under 'Software' at: https://www.kinovarobotics.com/en/knowledge-hub/all-kinova-products.

Detailed guidance on how to use the C++ API to control the gripper and gripper adapter is beyond the scope of this document. However, for more information, please contact us via the Kinova support page on our website at: https://www.kinovarobotics.com/en/support.
Normal use definition

This section describes the normal use of the robot.

The definition of a normal use of the robot with gripper and gripper adapter includes lifting, pushing, pulling or manipulating graspable objects with mass up to a maximum load:

- **Continuous manipulation** 0.7 kg from minimum to middle reach

The robot is designed to be able to hold objects, but in some positions and loads near the maximum reach and maximum loads, the manipulator can overheat. Before overheating becomes dangerous for either the user or the arm, the robot status LED on the communication adapter will be solid yellow. This is a warning. If this warning indication appears, put down any object in the gripper as soon as possible, bring back the robot to the HOME or RETRACTED positions and wait until the warning goes away before continuing to use the arm.

**Note**: During normal operation, the joints undergo heating. They are normally covered with plastic rings which protect the user from any injury that may occur from touching hot metal parts directly.

⚠️ For a setup with the robot mounted on a mobile platform, do not move the platform while the robot is in a full reach position. Vibration of the platform, particularly in rough terrain, could cause damage to the robot if the robot is in full reach. Always place the robot in a retracted position before moving the platform.
Markings and labels

This section describes markings and labels appearing on system components. Please note that these labels may slightly differ from the ones accompanying your device depending on your country. The following figure depicts the information about labels visible on components of the system.

**Figure 15: Labeling**

[Label diagram with annotations]

- Serial number
- Power requirements
- Read all accompanying documents
- Complies with WEEE directive
Electromagnetic interference from RF sources

This section describes EMI considerations for the gripper adapter.

Even though the product complies with all relevant standards, your arm may still be susceptible to EMI (electromagnetic interference) from RF sources such as radio and TV transmitters, amateur radio (ham), two-way radios, and cellular phones to name just a few. The interference (from RF sources) may cause the product to stop moving for a period of up to 10 seconds. In this case, the device will simply re-initialize and you will be able to continue to use it. In extremely rare cases, it can permanently damage the control system.

The intensity of the interference is measured in volts per meter (V/m). The product can resist EMI up to a certain intensity level, which is called the 'immunity level'. The higher the immunity level, the greater the protection. The current technology is capable of achieving at least a 20 V/m immunity level, which would provide effective protection from the more common sources of radiated EMI.

There are a number of sources of relatively intense electromagnetic fields in the environment. Some of these sources are obvious and easy to avoid. Others are not so apparent and exposure is unavoidable. However, we believe that by following the guidelines and warnings listed below, the risk of EMI will be minimized.

The sources of radiated EMI can be broadly classified into three types:

1. Gripper-held portable transceivers (e.g. transmitters-receivers with the antenna mounted directly on the transmitting unit, including CB [citizens band], walkie-talkie, security, fire/police transceivers, cellular phones, and other personal communication devices). Some cellular phones and similar devices transmit signals while they are switched on, even if they are not actively being used.

2. Medium-range mobile transceivers, such as those used in police cars, fire trucks, ambulances and taxis. These usually have the antenna mounted on the outside of the vehicle.

3. Long-range transmitters and transceivers, such as commercial broadcast transmitters (radio and TV broadcast antenna towers) and amateur (ham) radios. Other types of gripper-held devices, such as cordless phones, laptop computers, AM/FM radios, TV sets, CD players, cassette players, and small appliances, such as electric shavers and hair dryers are unlikely to cause EMI problems.

Because EM energy rapidly becomes more intense as one moves closer to the transmitting antenna (source), the EM fields from gripper-held radio wave sources (transceivers) are of special concern. It is possible to unintentionally bring high levels of EM energy very close to the control system while using these sorts of devices. Therefore, the warnings listed below are recommended to reduce the effects of possible interference with the control system.

⚠️ Do not operate a gripper-held transceiver (transmitter-receivers), such as CB (citizens band), or switch on personal communication devices, such as cellular phones, while the device is turned on.

⚠️ Be aware of nearby transmitters, such as radio or TV stations, and try to avoid coming close to them.

⚠️ Be aware that introducing accessories or components in proximity to the device may make it more susceptible to EMI.

⚠️ Report all incidents of unintended shutdown to your local distributor, and take note of the nearby sources of EMI.
Disposal considerations

This section describes disposal considerations.

Disposal

The product contains parts that are deemed to be hazardous waste at the end of the useful product life. For further information on recycling, contact your local recycling authority or Kinova distributor. In any case, always dispose of product via a recognized agent.

Additional procedures will be required if the equipment has been contaminated with hazardous agents, including chemical / neurological, biological, and radiological agents. Follow all decontamination and hazardous waste disposal regulations of your jurisdiction.
Contacting support

If you need help or have any questions about this product, this guide or the information detailed within, please contact Kinova through the support page of our website at www.kinovarobotics.com/support or by phone at 1 (514) 277-3777.

We value your comments!

To help us assist you more effectively with problem reports, please have the following information ready when contacting Kinova or distributor support:

- date and time the problem occurred
- environment where the problem occurred
- actions performed immediately before the problem occurred
- product serial number (this will allow the support agent to access the information regarding your product, such as software version, part revisions and characteristics, etc.).
There is no need too small.
No task too great.