



KINOVA™ Gripper series





User Guide

KINOVA
Achieve Extraordinary

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About this document

-  Read all instructions before using this product.
-  Keep these instructions for future reference.
-  Read all warnings on the product and in this guide.
-  Follow all instructions.

This document contains information regarding product setup and the operation. It is intended for:

- Field service, customer support and sales employees of authorized Kinova distributors
- Kinova product end users

Symbols, definitions, and acronyms



Important information regarding the safety related to the product and the user.



Tip on the maintenance, operation and manipulation of Kinova's products.



Refer to accompanying documents.



Direct current.



Alternating current.



Operating temperature range.



Compliance with WEEE2 directive.



Compliance with ROHS3 directive.



Type BF Applied Part device.

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 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 replace the Products in accordance with this section, it will 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 End User and 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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Changes are periodically made to the information herein; these changes will be incorporated into new editions of this publication. Kinova may make improvements and/or changes in the products and/or software programs described in this publication at any time.


Address any questions or comments concerning this document, the information it contains or the product it describes to:


support@kinovarobotics.com

Kinova may use or distribute whatever information you supply in any way it believes appropriate without incurring any obligations to you.

General Information

The KINOVA™ Gripper KG-Series are light-weight and under-actuated with a set of flexible fingers.

 Do not modify this equipment without authorization of the manufacturer.

 The Normal Use Definition contains some fundamental information to the proper operation of the KG-Series grippers.

 It is not recommended to let the KG-Series grippers be under heavy rain or snow.

KG-Series grippers components

This section describes the components of the KG-Series grippers.

KINOVA™ KG-Series Grippers come in two configurations:

- KG-3
- KG-2

The KG-3 gripper has three fingers. The opening and closing movement of the fingers is driven by three linear actuators, one for each finger. The actuators are housed within the carbon fiber shell of the hand. These actuators are connected in a daisy-chain using flat flex cable within the gripper. A 10-pin flat flex cable coming out of the base of the gripper from the first actuator can be connected to either a Kinova robotic arm or a standalone controller to power and control to the actuators.

The KG-2 gripper has a similar setup, but with only two fingers.

The following images show the (external) components of each gripper.



Figure 1: KG-3 Gripper

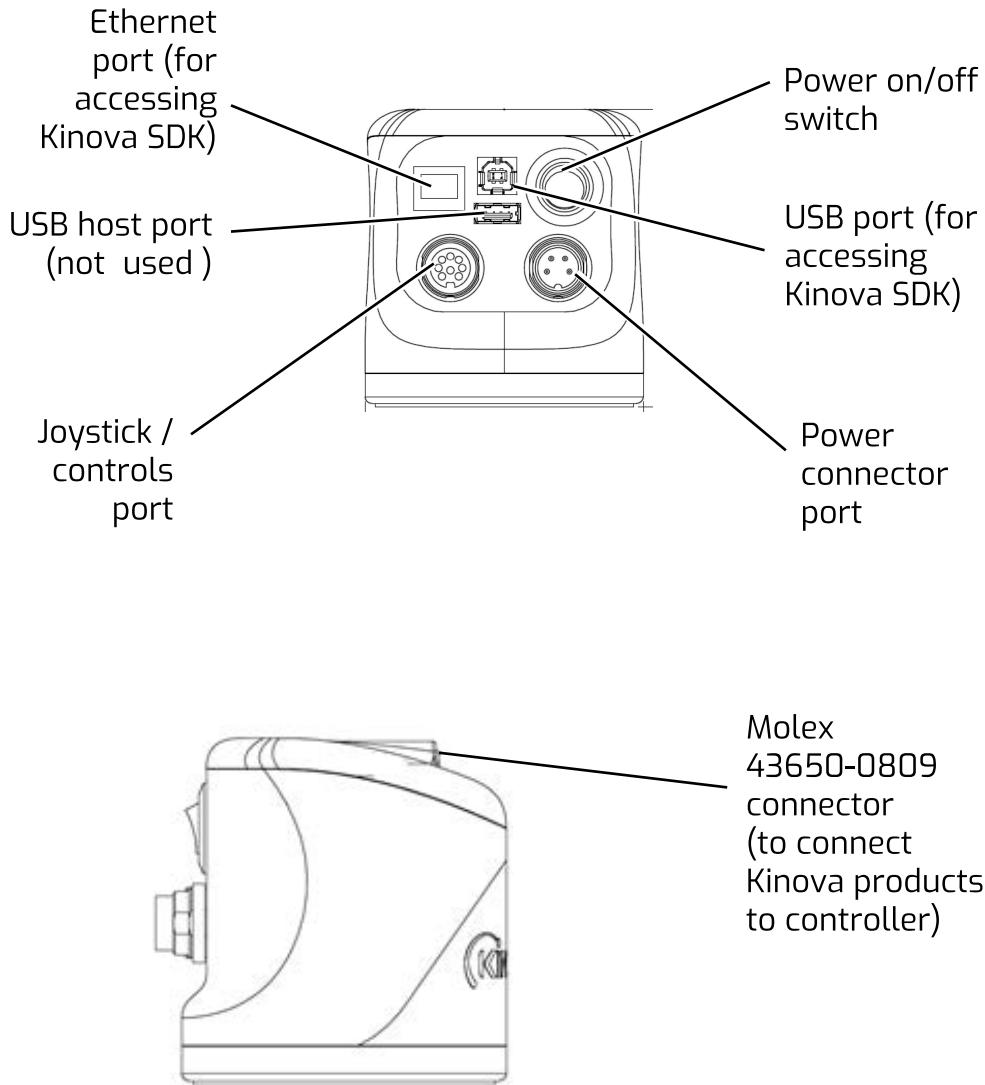


Figure 2: KG-2 Gripper

Controller external connectors

This section describes the external connectors of the Kinova controller.

The following figures show the external connectors located on the controller:



The panel at the back of the controller has four connectors and a power on / off switch.

The **power on /off switch** is used to power up or power down the robotic arm.

The **power connector** port is used to connect the robotic arm to electrical power. The power connector port has four pins

The **joystick / controls port** is used to plug in controls for the arm. The joystick / controls port has six pins.

The **USB port** is used to connect to a computer.

⚠ The control Port and Power Connector are intended to be connected only with a Kinova approved device. Connecting other devices may result in bad performance or even make your arm inoperable and void your warranty.

⚠ Do not override the safety purpose of the polarized or grounding type plug. If the provided cable does not fit in your outlet, consult an electrician for replacement of obsolete outlet.

⚠ To prevent risk of fire or electric shock, avoid overloading wall outlets and extension.

⚠ Protect the cords from being walked on or pinched.

Specifications

This section describes the specifications of the KG-Series grippers.

Table 1: KG-Series specifications

	KG-3	KG-2
Fingers quantity	3	2
Total weight	727 g	556 g
Gripping force	40 N	25 N
Minimum object diameter for cylindrical grip	45 mm	55 mm
Maximum object diameter for cylindrical grip	100 mm	
Actuation system	Under-actuated	
Actuators	One per finger	
Actuators sensors	Current Temperature Rotational encoder	
Opening (fingertip)	175 mm	
Minimum object diameter for object-on-the-ground pinch	8 mm	
Opening or closing travel time	1.2 sec	
Operating temperature	-10°C to 40°C	

Installation of KG-Series grippers

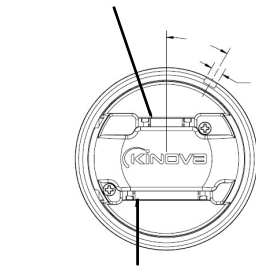
Installation of KG-Series grippers consists of three steps:

1. Mechanical integration
2. Electrical integration
3. Control integration

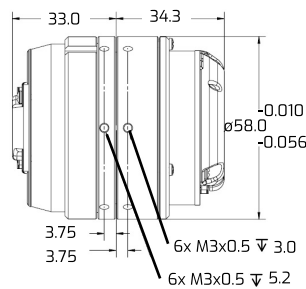
Mechanical integration

The procedure to mount a KG-2 or KG-3 on your robot is the same. In both cases, it should be attached to a structure identical to the KINOVA™ Actuator KA-58 actuator mounting location (highlighted in black). This structure should match the dimensions (mm) provided in the following drawing.

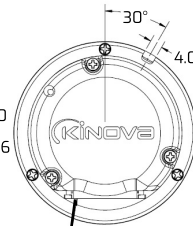
Connector:
Molex 52207-1033
or equivalent



Connector:
Molex 52207-2033
or equivalent



Radial holes
max screw
depth: 4 mm



Connector:
Molex 52207-2033
or equivalent

The attachment for the gripper should be a circular part with 6 x M3 screw holes. To facilitate the design of the end effector mounting part, download the CAD of the KA-58 actuator from the Kinova website.

⚠ Note that there is a 4.0 mm groove on the actuator to correctly align the gripper and have a reference alignment for the robot's inverse kinematics.

Electrical integration

This section describes the procedure to connect the gripper to a KINOVA™ Controller to send signals and power to the gripper.

Before you begin

You will need:

- KINOVA™ Controller
- PCB interconnect board (This board comes with the controller)

Procedure

1. Connect the PCB interconnect board to the controller.
2. The gripper has a 10-pin flat flex cable coming out of it. One end of this cable connects, inside the gripper, to the first finger actuator unit. Connect this cable to the Molex 52207-1033 connector on the PCB interconnect board.
 - a. Gently open the brown latch on the connector with your fingers.
 - b. Insert the cable completely into the connector.
 - c. Gently close the brown latch on the connector with your fingers.

Note: When you insert the cable into the connector, the side with the metallic pins must be facing up and the blue face must be facing down.

Note: For additional robustness of the connection, we suggest adding hot melt adhesive on the connector.

Control integration

This section describes the control integration. This applies to both KA-Series actuators and KG-Series grippers.

Once previous integration steps are completed, you can power on the gripper by flipping the power switch on the Controller to ON. To control the gripper and access the sensors data, you need to use the API. Connect the USB cable supplied with your package to the USB port. Install and open the Kinova SDK and follow the procedure and documentation included in the SDK.

Electromagnetic interference from radio wave sources

This section describes electromagnetic interference considerations for the JACO robotic arm.

Even if the product complies with all relevant standards, your arm may still be susceptible to electromagnetic interference (EMI), which is interfering electromagnetic energy (EM) emitted from sources such as radio stations, TV stations, amateur radio (HAM) transmitters, two way radios, and cellular phones. The interference (from radio wave sources) can cause the product to stop moving for a period of 10 seconds. In this case, the device will simply re-initialize and you will be able to continue to use it. In extremely rare case, it can also permanently damage the control system.


The intensity of the interfering EM energy can be measured in volts per meter (V/m). The product can resist EMI up to certain intensity. This is called “immunity level”. The higher the immunity level is, the greater is the protection. At this time, current technology is capable of achieving at least a 20 V/m immunity level, which would provide useful protection from the more common sources of radiated EMI.


There are a number of sources of relatively intense electromagnetic fields in the everyday environment. Some of these sources are obvious and easy to avoid. Others are not apparent and exposure is unavoidable. However, we believe that by following the warnings listed below, your risk to 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 citizens band (CB) radios, walkie-talkie, security, fire and police transceivers, cellular phones, and other personal communication devices). Some cellular phones and similar devices transmit signals while they are ON, even if not being actively 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, so far as we know, are not likely to cause EMI problems to your device.

Because EM energy rapidly becomes more intense as one move 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 gripper-held transceivers (transmitter's receivers), such as citizens band (CB) radios, or turn 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 adding accessories or components, close to the device may make it more susceptible to EMI.

 Report all incidents of unintended shut down to your local distributor, and note whether there is a source of EMI nearby.

Maintenance and Disposal

This section describes maintenance and disposal considerations.

Cleaning instructions

Only the external surfaces of the product may be cleaned. Cleaning may be done using a damp cloth and light detergent. The following described the steps for the cleaning the product:

- Prepare a water/soap preparation using a proportion of about 2ml of dish soap for 100ml of water
- Immerse a clean cotton cloth in the preparation
- Take out the cloth and wring out thoroughly
- Gently rub the external surface to be cleaned

⚠ Do not wash more than three times per day.

⚠ Do not immerse any part of the product under water or snow.

⚠ The product is not intended to be sterile. No sterilization process should be applied to the product.

⚠ Do not rub the external surfaces with abrasive materials.

Preventive Maintenance

The product requires no maintenance. Fingers should be cleaned and lubricated every 6 months.

⚠ Refer all services to qualified service personnel. A service is required when the apparatus has been damaged in any way, for example if the power-supply cord or plug is damaged, if the product does not operate normally or has been dropped.

⚠ There is no “home serviceable” part inside the product. Do not open..

Disposal



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

Packing Materials

The product packing material can be disposed as recyclable material.

Metal parts

Metal parts can be disposed as recyclable scrap metal.

Electrical parts, circuit boards, and carbon fiber

Please contact your local distributor to have information regarding disposal of such parts. You can also address questions directly to Kinova through our website (see Contacting Support).

Contacting support

If you need help or have any questions about this product, this guide or the information detailed in it, please contact a Kinova representative at support@kinovarobotics.com.

We value your comments!

To help us assist you more effectively with problem reports, the following information will be required when contacting Kinova or your distributor support:

- Product serial number (This will allow the support agent to have all the information regarding your product as the software version running in the device, the part revisions and characteristics, etc.)
- Date/Time of the problem
- Environment where the problem occurred
- Actions performed immediately before the problem occurred



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