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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 a 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.
Disclaimer

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The mention of any product does not constitute an endorsement by Kinova. This manual is furnished under a lease agreement and may only be copied or used within accordance with the terms of such lease agreement. Except as permitted by such lease agreement, no part of this publication may be reproduced, stored in any retrieval system, or transmitted, in any form or by any means, electronic, mechanical, recording, or otherwise, without prior written consent of Kinova.

The content of this manual is furnished for informational use only, is subject to change without notice, and should not be construed as a commitment by Kinova. Kinova assumes no responsibility or liability for any errors or inaccuracies that may appear in this document.

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 Controller allows control of Kinova grippers and actuators.

⚠️ Do not modify this equipment without authorization of the manufacturer.

⚠️ The Normal Use Definition contains some fundamental information to the proper operation of the robotic arm.

⚠️ It is not recommended to use the arm under heavy rain or snow.
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.
## Controller specifications

This section describes the specifications of the Controller.

### Table 1: Controller specifications

<table>
<thead>
<tr>
<th>Ports</th>
<th>Details</th>
</tr>
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<tbody>
<tr>
<td>Joystick</td>
<td>1 Mbps CANBUS</td>
</tr>
<tr>
<td>Power Supply</td>
<td>18 to 29 VDC</td>
</tr>
<tr>
<td>USB 2.0 (API)</td>
<td>12 Mbps</td>
</tr>
<tr>
<td>Ethernet</td>
<td>100 Mbps</td>
</tr>
</tbody>
</table>

### Control System Frequency

- **High-level API**: 100 Hz (High level API)
- **Low-level API**: up to 500 Hz (Low level API)

### CPU

- 360 MHz

### SDK

- **APIs**: High and low level
- **Compatibility**: Windows, Linux (Ubuntu) & ROS
- **Port access**: USB 2.0, Ethernet
- **Programming**: C++

### Control modes

- Force, Angular, and Cartesian
Controller Installation

This section describes the installation of the controller.

The controller installation consists of three steps:

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

This section describes the mechanical integration of the controller.

The Controller can be installed simply on a flat surface. If you are expecting a lot of movement of the controller in your system, fix it to a flat surface with the mounting holes under the controller.

After, install the PCB interconnect board in a secured location. The connections between the PCB interconnect board and Kinova’s products using the flat flex cable are weaker and should then be enclosed in a rigid structure.
Controller electrical integration

This section describes the electrical integration of the controller.

About this task
You will need:
- Controller
- PCB interconnect board (Molex 43650-0809 to Molex 52207-2033)
- Microfit cable
- 20 pin flat flex cable

Procedure

1. Connect the micro fit cable in the controller’ Molex 43650-0809 connector on one end and in the PCB interconnect board connector at the other.

2. Take a 20 pins flex flat cable and connect it to the Molex 52207-2033 connector on the PCB interconnect board connector by gently opening with your fingers the brown latch, completely inserting the 20 pins flex flat cable (blue side facing down) and gently closing with your fingers the brown latch. For additional robustness of the connection, we suggest to add hot melt adhesive on the connector.

3. Connect the power supply or battery power cord in the Controller in the power connector.
Control integration

This section describes the controls integration for Kinova robotic applications, whether for Kinova robotic arms or custom-built applications.

Once the mechanical and electrical integration are completed, you can power on the robot by flipping the power switch on the back of the controller to ON. To control the robot, you can use either the Kinova API or Kinova's joystick.

**API** - Connect the USB cable supplied with your package. Connect one end to the controller USB port, and the other to a USB port on the development computer. Install and open the Kinova SDK Development Center on the development computer and follow the procedure and documentation included in the SDK.

**Note:** Refer to the Development Center user guide and the Kinova API documentation for more guidance on controlling the robotic arm via the API.

**Kinova Joystick** - Connect the joystick to the joystick port or to the C connector if you are using a "Y" cable. Refer to Kinova's Joystick section in the user guide for all the details regarding the use of the joystick.
Normal Use Definition

The definition of normal use includes that you do not exceed the product specifications.
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