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This document contains information on the installation and operation of the KINOV A JACO® Assistive robot.

⚠️ 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, 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.
Warnings

⚠️ It is not recommended to use the robot under heavy rain or snow.

⚠️ Never use the HOME/RETRACTED function when carrying liquid. The HOME position is preset and the wrist may rotate and drop the liquid.

⚠️ Do not manipulate cutting, very sharp or any dangerous tools or objects with the robot.

⚠️ When the power is turned off, the robot will fall down and may cause damage to itself, depending on its position at the time of disconnection. Be sure to support its wrist before turning the power off.

⚠️ Do not force the fingers beyond their maximal opening. This could damage some internal components.

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

⚠️ When lifting weight near the maximum load and reach, if the red lights of the controller blink, put down the object in the gripper, bring back the robot to HOME or RETRACTED position and wait until the warning goes away before using it again.

⚠️ The wheelchair mode (wheelchair / seat motorization / arm) must never be switched while operating the robot. There is a risk of user contact with the moving robot associated with switching the mode during operation.
Disclaimer

KINOVA® and Kinova's logo are trademarks of Kinova Inc., herein referred to as Kinova. All other brand and product names are trademarks or registered trademarks of their respective corporations.

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.

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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 through the Kinova website support page:

www.kinovarobotics.com/support

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 JACO® Assistive robot is a light-weight robot composed of six inter-linked segments. Through the controller or through a computer, the user can move the robot in three-dimensional space and grasp or release objects with the gripper (if a gripper is installed).

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

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

⚠️ It is not recommended to use the arm under heavy rain or snow.
6 DOF Curved Wrist Components

This section shows the components of the 6 DOF curved wrist robot.

- Elbow
- Upper arm
- Shoulder
- Actuator #1
- Controller
- Actuator #2
- Plastic ring
- Actuator #3
- Forearm
- Actuator #4
- Wrist segment #1
- Actuator #5
- Wrist segment #2
- Actuator #6
- Gripper
- Fingers
Robot external connectors

This section describes the external connectors on the base of the robot controller. The following figure shows the external connectors located on the base of the robot controller.

![Robot external connectors diagram]

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 four-pin power connector is used to connect the robotic arm to electrical power. The eight-pin joystick/controls/expansion port is used to connect wired controllers for the arm. The USB port is used to connect a computer for maintenance and configuration purposes.

⚠️ The control port and power connector are intended to be connected only with a Kinova-approved device. Connecting other devices may result in poor performance, make the 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 your outlet, consult an electrician for replacement of the obsolete outlet.

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

⚠️ Protect the cords from being walked on or pinched.
Specifications

This section describes the specifications of the KINOVA JACO® Assistive robot.

Table 1:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td>Total weight</td>
<td>5.2 kg</td>
</tr>
<tr>
<td>Reach</td>
<td>90 cm</td>
</tr>
<tr>
<td>Maximum payload</td>
<td>1.6 kg (mid-range continuous)</td>
</tr>
<tr>
<td></td>
<td>1.3 kg (full-reach peak / temporary)</td>
</tr>
<tr>
<td>Materials</td>
<td>Carbon fiber (links), Aluminum (actuators)</td>
</tr>
<tr>
<td>Joint range (software limitation)</td>
<td>± 27.7 turns</td>
</tr>
<tr>
<td>Maximum linear robot speed</td>
<td>20 cm / s</td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>18 to 29 VDC</td>
</tr>
<tr>
<td>Average power</td>
<td>25 W (5 W in standby)</td>
</tr>
<tr>
<td>Peak power</td>
<td>100W</td>
</tr>
<tr>
<td>Water resistance</td>
<td>IPX2</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-10 °C to 40 °C *</td>
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</tbody>
</table>

* The robot may be used outside this temperature, but for a limited time only. For more details, contact your local distributor.
Markings and labels

This section describes markings and labels on the robot.

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 the label affixed on the robot controller.
Normal use definition

This section describes the normal use of the robot.

The definition of a normal use of the robot includes that you can lift, push, pull or manipulate a maximum load of:

- **Continuously** 1.6 kg from minimum to middle reach (45 cm distance between actuator #2 and the load) for 6 DOF.
- **Temporarily** 1.3 kg from middle to full reach (90 cm distance between the actuator #2 and the load) for 6 DOF.

The robot is designed to be able to hold objects in the environment of the user, but it is a manipulator that in some positions and loads near the maximum reach and maximum loads holds for a long period, it can heat. When this occurs, before overheating and being dangerous for either the user or the robot, red lights on the joystick will blink. This is a warning. Simply put down any object in the gripper, and bring back the robot to the HOME or RETRACTED positions and wait until the warning goes away before using the robot.

If you don’t use a Joystick in your application, make sure to read all the error statuses and temperature of all actuators modules via the API to ensure that they do not go higher than recommended parameters. If this occurs, the robot should be held in an idle position near the base for a certain time without any object in the gripper to cool down the robot.

⚠️ When lifting weight near the maximum load and reach, if the red lights of the controller blinks, put down the object in the gripper, and bring back the robot to HOME or RETRACTED position and wait until the warning goes away before using it.

**Note:** During normal operation, the joints are subject to heating. The joints are normally covered with plastic rings which will protect the user from any danger that may be occurred by the heating of the metal parts.

The fingers of the robot are made flexible in order to protect the internal mechanism. When using the fingers to push on objects, the user must take special care not flex the fingers beyond their maximal opening as this could damage the internal mechanism.

⚠️ Do not force the fingers beyond their maximal opening as this could damage some internal components.
Electromagnetic interference from radio wave sources

This section describes electromagnetic interference considerations for the JACO robot.

Even if the product complies with all relevant standards, your robot 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-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.
Cleaning, maintenance and disposal

This section describes maintenance and disposal considerations.

Cleaning instructions

Only the external surfaces of the product may be cleaned. This is done using a damp cloth and a mild detergent. The following describes the steps for cleaning the product:

- Prepare a water/soap solution using about 2 ml of dish soap for 100 ml of water
- Immerse a clean cotton cloth in the solution
- Remove 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 undertaken with 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 six months.

⚠️ Refer all servicing to qualified service personnel. Servicing 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 if it has been dropped.

⚠️ The product has no user serviceable parts. Do not open.

Disposal

The product contains parts that are deemed to be hazardous waste at the end of 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.
Packing materials

The product packing material can be disposed of as recyclable material.

**Metal parts**

Metal parts can be disposed of as recyclable scrap metal.

**Electrical components, circuit boards, and carbon fiber**

Please contact your local distributor for 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 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.).