Kawasaki Robot

CAUTIONS TO BE TAKEN TO ENSURE SAFETY

- For those persons involved with the operation / service of your system, including Kawasaki Robot, they must strictly observe all safety regulations at all times. They should carefully read the Manuals and other related safety documents.
- Products described in this catalogue are general industrial robots. Therefore, if a customer wishes to use the Robot for special purposes, which might endanger operators or if the Robot has any problems, please contact us. We will be pleased to help you.
- Be careful as Photographs illustrated in this catalogue are frequently taken after removing safety fences and other safety devices stipulated in the safety regulations from the Robot operation system.

ISO certified in Akashi Works and Nishi-Kobe Works.
Kawasaki’s innovative dual-arm collaborative robot, duAro enables humans and robots to work together in the same workspace.

Features:

**Space-Saving**
With its two co-axial arms, duAro can fit into a single-person space, and provides a wide collaborative working range.

**Easy Introduction**
The wheeled base that accommodates the arms and controller enables the user to move the robot to any location.

**Easy Teaching**
Direct teaching with dedicated tablet software enables non-skilled operators to teach and operate the robot intuitively.

**Safety**
In the event of a collision with the worker, the collision detection function will stop the duAro safely. In addition, the soft materials on the arm surfaces also reduce shocks.

**Caution!**
This function can reduce damage in case of an accident, but will not prevent accidents from occurring. Users are required to carry out safety risk management before use.
A wide range of application fields

- Various parts insertion
- Circuit board loading/unloading
- Handling of FPCs (flexible printed circuit boards)
- Screw tightening
- Gate cutting
- Box packing
- Liquid dispensing
- Rice ball tray packing
- Putting lids on lunch bowls

Advantages of dual-arm robots

- Handling of various types and sizes of workpieces is possible, unlike with single-arm robots.
- Each arm can perform different tasks simultaneously, shortening the cycle time considerably.
- Tightening screws with a screw driver
- Holding a workpiece

System Packages

**Easy to Use**

Standardized systems of peripheral equipment make the introduction of robots easier.

**Quick Installation**

Thanks to the pre-designed system packages, installation and startup are quicker, even when some items have to be customized.

**Low Cost**

The overall costs associated with system building can be reduced due to the use of common components.

**High Quality**

Pre-evaluated and tested systems provide stable quality.

System Package Example (screw-tightening & assembling)

- **Packaged Components:** Base chuck, screw feeder, electric screw driver, package software
- **Customized parts:** Gripper for substrate transfer, workpiece setting

Package Software

- **Programming Not Required:** A standard set of operations for tightening screws has been developed and is readily available. Users can choose it on the tablet screen.

Easy Setting

To carry out the operational setting, all you have to do is input the parameters according to the specific screw to be handled. Tool changing can easily be made by changing the parameters only.

Applications for the System Packages

- Various parts insertion
- Circuit board loading/unloading
- Handling of FPCs (Flexible Printed Circuit boards)
- Screw tightening
- Gate cutting
- Box packing
- Sealing
- Rice ball tray packing
- Putting lids on lunch bowls
duAro 1

Standard Specifications

Tasks such as part assembling and screw tightening can be performed on the same work bench and conveyors that human tightening can be performed on the same work bench and conveyors that human

<table>
<thead>
<tr>
<th>Specifications / Motion range &amp; dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>duAro 1 Standard Specifications</strong></td>
</tr>
<tr>
<td><strong>Structure</strong></td>
</tr>
<tr>
<td>Horizontal articulated type</td>
</tr>
<tr>
<td><strong>Degree of freedom (axes)</strong></td>
</tr>
<tr>
<td>4 × 2 arms</td>
</tr>
<tr>
<td><strong>Max. payload (kg)</strong></td>
</tr>
<tr>
<td>2 × 2 arms</td>
</tr>
<tr>
<td><strong>Max. reach (mm)</strong></td>
</tr>
<tr>
<td>760</td>
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<td><strong>Positional repeatability (mm)</strong></td>
</tr>
<tr>
<td>± 0.05</td>
</tr>
<tr>
<td><strong>Motion range</strong></td>
</tr>
<tr>
<td>Arm rotation (°)</td>
</tr>
<tr>
<td>-170 - 170 (JT1)</td>
</tr>
<tr>
<td>-140 - 140 (JT2)</td>
</tr>
<tr>
<td>Arm-up/down (mm)</td>
</tr>
<tr>
<td>0 - 150 (JT1)</td>
</tr>
<tr>
<td>0 - 150 (JT2)</td>
</tr>
<tr>
<td>Wrist swivel (°)</td>
</tr>
<tr>
<td>-360 - 360 (JT4)</td>
</tr>
<tr>
<td>-360 - 360 (JT6)</td>
</tr>
<tr>
<td><strong>Moment (N·m)</strong></td>
</tr>
<tr>
<td>Wrist axis (JT4)</td>
</tr>
<tr>
<td>5.9</td>
</tr>
<tr>
<td><strong>Position of inertia (kg·m²)</strong></td>
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<td>Wrist axis (JT4)</td>
</tr>
<tr>
<td>0.06</td>
</tr>
<tr>
<td><strong>Mass (kg)</strong></td>
</tr>
<tr>
<td>Approx. 230 (including controller, excluding options)</td>
</tr>
<tr>
<td><strong>Installation</strong></td>
</tr>
<tr>
<td>Floor mount</td>
</tr>
<tr>
<td><strong>Environmental conditions</strong></td>
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<tr>
<td>Ambient temp (°C)</td>
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<td>F61 / 20VA</td>
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*Please consult with Kawasaki for operations beyond these conditions.*

duAro 2

Standard Specifications

Compared to duAro 1, the vertical stroke (Z-axis) has been extended to 550mm and the payload capacity to 3kg (each arm). Thanks to the long vertical stroke, packing into a deep box is possible with ease.

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Software for duAro offers easy programming with intuitive touch operation.

User-friendly touch panel is used to teach and operate the robot. A wireless connection eliminates the need for complicated wiring. Switching between the cooperative and individual operations of the arms can also be done from the tablet.

The application can build 3D models of robots, peripherals, and products to verify various system configurations. Verification of operation time of robots and interference with surrounding objects ahead of introduction can reduce the risks associated with the initial system launch. The tool also has rich support functionality to create motions and programs for the robots, thereby contributing to a reduction in working hours.

Kawasaki Robot’s offline programming tool enables a variety of production configurations

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Robot simulation technology

- The virtual robot controller technology that Kawasaki has developed over the years can estimate motion trajectories and cycle times as accurately as the hardware robot controllers.
- The same tablet as one used for the real robot can be used.

Layout design

- Capture data from 3D-CAD to arrange the products (STL format).
- Interference check function allows for checking if there is a contact among models.
- Interactive wizard ensures reliable operations even for those who are unfamiliar with layout design.

Operation environment

- Available in Windows environments. Supported OS: Windows 7, 10 (x86, X64)
- On a 64-bit computer, it runs in the 32-bit compatible mode.
- Available in Japanese, English, German, and Chinese (simplified characters)

Teaching and programming

- Teach point modeling facilitates checks for working positions and moves robots to their working positions.
- Coordinated movement setting allows for teaching multiple arms easily.
- The status of robot operations and I/O signals can also be checked.

Tablet System Requirements

- Item | Specification
- --- | ---
- OS | Android 5.1.1 to 8.0
- DP | Width of the smallest side of the 600 dp or greater**
- Network | Wi-Fi
- Processor | ARM (ARMv7)

** Refer to the Android Developer section of the Google website for further information about dp (Density-independent pixel).

This function may result in a shorter service life for the mechanical elements and reduced positional repeatability of the robot. The service life could be shortened by 20 to 30% depending on the operating condition.
Easy vision system setup using a tablet

It is possible to carry out initial setup, calibration and programming using a tablet. The time required for setting up the vision system can be considerably reduced.

Built-in Vision System (for the F Controller)

The vision processing software can be installed inside the F controller, which eliminates the need for an external vision PC. This offers a low-cost, space-saving solution. The vision system can be operated from a tablet or PC.

Specifications for the F Controller vision system

- Camera
  - Built-in vision system
    - Up to 6 M million pixels, mono/HDMI/color
- Number of cameras
  - Up to 4
- Detecting method
  - Feature recognition by pattern matching
  - Recognition of characteristics by linear detection
- Number of points to be registered
  - Up to 300
- Language
  - English, Japanese, Chinese (simplified characters)

Mounting a hand-eye camera

- A camera can be mounted directly on the duAro's JT4 axis.
- Typical accessories such as a camera, lens, lighting equipment and bracket are purchased as a set.
- By mounting the camera on the robot arm, pictures can be taken close to the workpiece (Standard camera: focal length 100mm, field of vision 30-60mm).
- The mounting angle can be altered ±30° and ±60°.
- Depending on the position of the 2-axis (JT3), please be careful about possible interference with the other arm.

Mounting a fixed camera

- This camera is mounted on a separate stand, not on the robot.
- Typical accessories such as a camera, lens, and lighting equipment are purchased as a set.
- The camera mounted at distance can capture wide angle pictures.

Vision System Applications

- An example of a 2-point measurement

- Table-compatible vision systems

- Customer-specific third party vision systems

- High-end vision software using an external PC is also available.

Using the optional conveyor tracking function

- Taking an upstream picture of a workpiece on the conveyor.
- Requiring after simultaneous calibration of both the gripping and positioning errors.

Safe Robot Operation Monitoring

By monitoring the robot operation, safety features can be configured for the human workers in the shared workspace.

- Space-saving is possible by controlling the robot workspace.
- The safety features can be altered according to safety signal inputs.
- Certifications: IEC61508 (SIL2), ISO10218-1 and 13849-1 (PLd/Category 3).

Speed monitoring

- Monitoring the speed of the robot at specified positions to ensure that it is below a predetermined value.

Force monitoring

- Monitoring the force applied to the robot at specified positions to ensure it is below a predetermined value.

Collision detection

- Monitoring the impact applied to the robot at specified positions to ensure it is below a predetermined value.

Cubic-S

Supervise Safety Smart

By monitoring the robot operation, safety features can be configured for the human workers in the shared workspace.

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- The safety features can be altered according to safety signal inputs.
- Certifications: IEC61508 (SIL2), ISO10218-1 and 13849-1 (PLd/Category 3).

System configuration

- Standard I/O
  - 16 points

- Optional I/O
  - 10 points
  - Brake release box
  - Primary power cable
  - Ethernet
  - Built-in vision system
  - Teach pendant

- Option: 13 and 23 points each

- Fieldbus
  - DeviceNet slave
  - CC-Link slave
  - PROFINET slave

- EtherCAT
  - EtherCAT

- Work space/speed monitoring

- Optional items
  - Brake release box
  - Primary power cable
  - Ethernet
  - Built-in vision system
  - Terminal software

- Cubic-S
  - Safety intelligent controller

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