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Materials and specifications are subject to change without notice.
The “duAro” Dual-arm SCARA Robot by Kawasaki Robotics:
A Brand-new Offering that Realizes the Concept of an Innovative Dual-arm SCARA Robot

Features:

Coexistent operations with people
Low-power motors and a speed-reducing function helps the duAro to coexist with people in customers’ work operations. Also, in the event of a collision with people and other object, the collision detection function will help to make the duAro’s movement stop.

In order to reduce risk, customers shall, at their own responsibility, establish and implement a risk assessment to coexist with people in customers’ work operations before and during use of the duAro.

Saves space
The duAro dual-arm robot, with its two coaxial arms controlled by a single controller, can fit into a single-person space. The coaxial dual-arm configuration makes it possible to perform coordinated movement, which has been impossible for even two SCARA robots, in addition to dual-arm operations.

Ease of introduction
The wheeled base on which the arms are placed accommodates the controller. This enables the user to move the robot together with its base to any location desired.

Ease in teaching operation
Direct teaching by holding the robot’s arms allows the user to easily teach the robot the movements required of them.

Various options
Teaching operations can be conveyed via tablet or teaching pendant, both of which can be connected to multiple robots. A vision system and standard gripper options are also available.

Occupying only a space equal to one person, the dual-arm SCARA robot works well with people.

Set up a working range to help to coexist with people.
The duAro’s arm is 76 cm long, similar to an average person’s working range.

No line changes required to introduce duAro
One duAro occupies only the space of a person, so no line changes are necessary for the robot.

Collision detection function
If the duAro detects contacts and collisions with people or other object, its collision detection function will help to make the duAro’s movement stop promptly.

The collision detection function is designed to reduce the risk of accident. However, this function has its limitation and cannot prevent all accidents, and it is not a substitute for safe and attentive use. It is the customers’ responsibility to set up, use and operate the duAro, and please be careful at all times.
**Specifications**

<table>
<thead>
<tr>
<th>Application</th>
<th>Assembly, Material handling, Machine tending, Dispensing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of freedom (axes)</td>
<td>4 × 2 arms</td>
</tr>
<tr>
<td>Max. payload (kg)</td>
<td>2 (1 arm)</td>
</tr>
<tr>
<td>Positional repeatability (mm)</td>
<td>±0.05</td>
</tr>
</tbody>
</table>

**Motion range (°)**

<table>
<thead>
<tr>
<th>Arm 1 (lower arm)</th>
<th>Arm 2 (upper arm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-170 - +170 (JT1)</td>
<td>-140 - +500 (JT1)</td>
</tr>
<tr>
<td>-140 - +140 (JT2)</td>
<td>-140 - +140 (JT2)</td>
</tr>
<tr>
<td>0 - +150 (JT3)*</td>
<td>0 - +150 (JT3)*</td>
</tr>
<tr>
<td>-360 - +360 (JT4)*</td>
<td>-360 - +360 (JT4)*</td>
</tr>
</tbody>
</table>

**Number of controlled axes**

Max. 12

**Drive system**

Full digital servo system

**Types of motion control**

- **Manual mode**: Coordinated movement of dual arms, Individual movement of one arm (Interpolation mode), Joint, Base, Tool
- **Auto mode**: Coordinated movement of dual arms, Individual movement of one arm (Interpolation mode), Joint, Linear interpolated motion

**Programming**

- Direct teaching method
- Simple teaching method through tablets, Interpolation mode

**Memory capacity (MB)**

4

**I/O Signal**

- General input (Number of input): NPN model: 12 (Max 28) / PNP model: 6 (Max 16) / Cubic-S model: 6 (Max 16)
- General output (Number of output): NPN model: 4 (Max 12) / PNP model: 10 (Max 24) / Cubic-S model: 0 (Max 14)

**Power requirements**

AC200-230V ±10%, 50/60Hz±2%, 1ø, Max. 2.0kVA

Class-D earth connection (Earth connection dedicated to robots), leakage current: maximum 10mA

**Mass (kg)**

about 200

**Installation**

Floor

**Environmental condition**

- Temperature (°C): 5 - 40
- Humidity (%): 35 - 85 (No dew, nor frost allowed)

**Specifications**

1: Specification varies in case of other options or conversion
2: Excluding the signal No. which is occupied by the dedicated signal. Indicated Max signal number is optional

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**Motion range & dimensions**

![Motion range & dimensions diagram]

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**Features**

### Easy to introduce

![Easy to introduce diagram]

Using only a power line and an air hose, the robot can replace one worker within the space for a person.

### System is easy to configure

![System is easy to configure diagram]

A tablet is available for teaching multiple robots.

### Benefits of introduction

#### Lower total cost

- The more automated, the more cost-effective

![Lower total cost diagram]

<table>
<thead>
<tr>
<th>#1</th>
<th>#2</th>
<th>#3</th>
<th>#4</th>
<th>#5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional robots</td>
<td>Cumulative cost</td>
<td>High</td>
<td>Cumulative cost image</td>
<td>Even simple hands are able to carry large workpieces by using both hands</td>
</tr>
</tbody>
</table>

The more automated, the more cost-effective

- The graph is a concept
- Number of changing lines
- Cumulative costs are lower than those of conventional robots, thanks to lower costs for line changes.

- Two arms perform different operations to reduce cycle time
- The coaxial configuration enables the robot to reach equipment at its back
- Even simple hands are able to carry large workpieces by using both hands

- Using only a power line and an air hose, the robot can replace one worker within the space for a person.

Gripping a workspace

Fastening specimens

Connect power supply

Connect an air hose

A tablet is available for teaching multiple robots.
### Application examples

#### Fastening screws

#### Arranging electronic parts in bulk

#### Part-mounting

#### Spray-coating / UV curing

#### Loading onto and unloading off of a board inspection device

#### Inspecting electronic chips

#### Bagging boards

#### Inspecting boards

#### Dispensing

#### Packaging plastic bottles in boxes

#### Packaging confections

#### Loading rice balls onto trays

### Options

#### Tablet and software

**Robot Teacher 2**

Offers an easy-to-teach method with intuitive touch operations. Tablet software for duAro

You can use familiar touch operations on a visually simple display to operate and teach your robots. Wireless support eliminates the need for complicated wiring. User-friendliness even for those with little experience operating a robot helps reduce working hours.

#### System requirement for tablets

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS</td>
<td>Android 4.3 or later&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>DP</td>
<td>Width of the smallest side of the Tablet in 600dp or greater&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Network</td>
<td>Wi-Fi</td>
</tr>
<tr>
<td>Processor</td>
<td>ARMv7</td>
</tr>
</tbody>
</table>

<sup>a</sup> From Android 5.0 to any version earlier than 7.0 shall be required for Cubic-S supported version.

<sup>b</sup> Refer to the Web site for the Google™ Android Developer for further information about dp (Density-independent pixel).

Supports RobotTeacher2 Revision7 or later.

Essential only for Cubic-S supported version.

### Tested Device

<table>
<thead>
<tr>
<th>Device</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZenPad 8.0</td>
<td>ASUS</td>
</tr>
<tr>
<td>ZenPad 10</td>
<td>ASUS</td>
</tr>
</tbody>
</table>

An intuitive and user-friendly display allows even beginners to easily operate the robot.

While monitoring the robot’s status, including its current state, you can easily stop or restart operation with the push of a button.
I/O Extension

External I/O signals are available for connecting external sensors, valves, switches and/or lamps. If the number of standard I/O signals (12 inputs, 4 outputs) is not enough, you can add a board to increase the number of signals. (1) Extension I/O board and/or (2) CC-Link board are available.

Additional Option = (A) Board + (B) Harness in the cart + (C) Connector panel

I/O extension board
This option provides an additional 16 inputs and 8 outputs for hardware signals (up to 28 input and 12 output ports, together with the standard I/O).

A 5m-long harness for supplying primary electricity can be linked with the cart connector.

CC-Link board
This option enables you to connect the robot controller to a CC-Link fieldbus network (as a remote device station).

Programming tool

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

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.

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.
- You can operate the same tablet as one used for the real machine.

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

Teaching and programming
- Teach point modeling facilitates checks for working positions and moves robots to their working positions.
- Coordinated movement setting allows you to easily teach multiple arms.
- You can check the status of robot operations and I/O signals.

Linking with a tablet
The tool can link with a tablet for actual robots.

Drawing
Interfering models are highlighted and a robot’s working position (teaching point model) and motion trajectories are displayed.

Program editing
Keeping those who are unfamiliar in mind, this tool allows you to add an item that offers instructions for editing a program. Comparing the programs before and after modification, you can review modification details during a programming operation.

Monitoring
The states of I/O signals are shown in graphs. You can monitor running program steps and robot status.

Power harness

A 5m-long harness for supplying primary electricity can be linked with the cart connector.

Options

Device type Slave (remote I/O device)

Baud rate Select one from 156 Kbit/s, 625 Kbit/s, 2.5 Mbit/s, 5 Mbit/s or 10 Mbit/s

I/O counts
Max. bit count Input: 224, Output: 224 (the last 16/16 bits are for system)
Max. word data Input: 32, Output: 32

Version Version 1.0 / 1.1 / 2.0

Communication service Polling

Transmission medium Cable exclusive for CC-Link

Configurable stations (address on CC-Link) 1-64

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</tr>
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<td>1-64</td>
</tr>
</tbody>
</table>
The easy operation menu customized for duAro enables those who handle industrial robots or vision devices for the first time to make full use of the functionality quickly (an advanced menu is also available according to customers’ applications). Also, you can use a tablet to make duAro conduct correction movements easily, with no need to edit any program. (Sophisticated processing, such as variety discrimination or barcode recognition, requires AS programs.)

Features

Pursuit for "Easy to Use"

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Embedded in duAro’s compact body

All vision devices are embedded in or can be attached to duAro; without any need to rearrange wiring after moving duAro.

Minimize burden of reconfiguration after movement of duAro

Reconfiguration of a robot is usually required after moving it or moving equipment around it. However, with the vision system, the “device correction” corrects the position information to restart duAro swiftly.

Device selection

According to the type of work and environment, select the combination of “camera,” “lens” and “light” from the choices below. Use the flowchart if you are not clear about selection criteria.

Mounted camera Option types

<table>
<thead>
<tr>
<th>Camera</th>
<th>Lens</th>
<th>Light</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monochrome</td>
<td>View 50mm</td>
<td>Ring light</td>
</tr>
<tr>
<td>Color</td>
<td>View 50mm</td>
<td>Bar light</td>
</tr>
<tr>
<td>Monochrome</td>
<td>View 80mm</td>
<td>Ring light</td>
</tr>
<tr>
<td>Monochrome</td>
<td>View 30mm</td>
<td>Ring light</td>
</tr>
<tr>
<td>Monochrome</td>
<td>View 50mm</td>
<td>Flat dome light</td>
</tr>
<tr>
<td>Monochrome</td>
<td>View 30mm</td>
<td>Flat dome light</td>
</tr>
</tbody>
</table>

Examples

- Camera types: Monochrome, Color
- Lens options: View 50mm, View 80mm, View 30mm
- Light types: Ring light, Bar light, Flat dome light

*The view is estimated with a distance of 100mm from an object. A view not less than 80mm is supported with a fixed camera. In this case, choose a suitable lens and suitable lights according to the view size.

Weight Feature

- Camera: 66g
- Lens: Pixel count: 1.3 million pixels
- View 50mm: 54g (resolution: 0.054mm/pix)
- View 80mm: 66g
- View 30mm: 51g
- Ring light: 130g
- Bar light: 75g
- Flat dome light: 270g

*The view is estimated with a distance of 100mm from an object. A view not less than 80mm is supported with a fixed camera. In this case, choose a suitable lens and suitable lights according to the view size.

Features

- A vision camera directly attached to duAro JT4 axis.
- Camera and fixture brackets set
- The angle is configurable to ±30° or ±60°.
- Supports ring lights, dome lights and bar lights.
- Depending on the height of Z axis (JT3), attention should be paid to interference with the second arm.

Examples

- Pattern-matching
- Binarization
- Color processing
- Vision correction
- Activate correction easily from a tablet
- Sophisticated menu supports diversified applications
- Vision processing software is embedded in duAro
- Cameras and lights can be easily attached

No display, mouse or keyboard is included in the accessories. Prepare your own if necessary.