The Next Generation of Collaborative Robots

The growth of collaborative robots that can safely work side-by-side with people makes automation accessible to a new generation of applications. However, this accessibility has often come at the cost of higher prices for special sensors, reduced repeatability and dramatically reduced cycle time. Precise Automation’s line of industrial collaborative six-axis articulated robots provides the features, price and repeatability offered by traditional robots with the ease of use of popular collaborative robots.

Collaborative robots allow for the creation of a mixed manufacturing environment where people can enter and efficiently work around robots without the loss of throughput. However, whenever users are near, most “collaborative” robots must move slowly or use a reduced speed collaborative mode, thereby losing productivity. Precise’s six-axis robots are designed so they can be easily programmed to move at higher speeds in free space and to limit speeds when collisions against a rigid surface are possible. This allows for the robot to move at speeds similar to people, even when users are present in the workcell, while still limiting forces to the ISO collaborative robot standard. Thus, operators can move freely around the robot without concerns for their safety or reducing productivity. The robust design of these robots provides industrial level repeatability and reliability and permits them to be easily switched and redeployed to operate in a traditional non-collaborative mode for even faster cycle times when there is no potential for an operator to be present.

To simplify setup for new users, many collaborative robots use a programming environment with limited features. Precise Automation’s collaborative robots offer the flexibility of both an easy to use web based interface as well as an optional advanced programming environment as capable as any industrial robot. The easy to use Guidance Motion interface is accessible from any web enabled device and allows technicians or operators to quickly and easily setup and teach the robot to perform real work. In addition, the powerful motion control enables the collaborative features without the use of expensive sensors providing industrial level performance at a cost less than other collaborative six axis robots.
### General Specifications

<table>
<thead>
<tr>
<th>Range of Motion &amp; Resolution</th>
<th>PAVP6</th>
<th>PAVIS6</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1 Axis</td>
<td>+/- 160 degrees</td>
<td>+/- 170 degrees</td>
</tr>
<tr>
<td>J2 Axis</td>
<td>+/- 120 degrees</td>
<td>+/- 135/-100 degrees</td>
</tr>
<tr>
<td>J3 Axis</td>
<td>+/- 160 + 19 degrees</td>
<td>+/- 166/-119 degrees</td>
</tr>
<tr>
<td>J4 Axis</td>
<td>+/- 160 degrees</td>
<td>+/- 190 degrees</td>
</tr>
<tr>
<td>J5 Axis</td>
<td>+/- 120 degrees</td>
<td>+/- 120 degrees</td>
</tr>
<tr>
<td>J6 Axis</td>
<td>+/- 360 degrees</td>
<td>+/- 360 degrees</td>
</tr>
<tr>
<td>Repeatability</td>
<td>20 microns at center of tool flange</td>
<td>30 microns at center of tool flange</td>
</tr>
</tbody>
</table>

### Performance and Payload

<table>
<thead>
<tr>
<th>Cycle Time</th>
<th>Collaborative Mode: 1.6 seconds for standard 25 mm x 300 mm x 25 mm cycle with 1kg payload</th>
<th>Collaborative Mode: 2.5 seconds for standard 25 mm x 300 mm x 25 mm cycle with 1kg payload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Payload</td>
<td>2.5kg if gripper pointed down within +/-45 degrees. 2.0kg if gripper tilted up more than +/-45 degrees.</td>
<td>7.0kg if gripper pointed down with +/-45 degrees. 6.0kg if gripper tilted up more than +/-45 degrees.</td>
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### Collaborative Forces

Precise collaborative robots have been tested for collision forces and the user manual contains a table of collision forces in free space and against rigid surfaces, using a spring plate that simulates the compliance of the human hand. Maximum speed collisions in free space are under the ISO force limits for operator safety. However, in order to use a robot in an application without safety shields, the application as a whole (including end effectors, operation methods, objects being handled and obstacles in the workcell) must be evaluated for safety. For more information on the evaluation of applications and workcells without safety shields, please contact Precise Automation.

### Interfaces

#### General Communications

- **RS-232 channel, 100 Mbps Ethernet port**

#### Digital I/O Channels

- 4 optically isolated inputs and 4 optically isolated outputs, 24 volts 100mA, available on facilities panel at base. Additional 12 isolated inputs and 8 isolated outputs available as option at facilities panel. Remote I/O also available.

#### Pneumatic Lines

- Four air lines, 71 PSI maximum, provided at outer link and routed internally to fittings on the Facilities Panel.

#### Operator Interface

- Web based operator interface supports local or remote control via browser connected to embedded web server

#### Programming Interface


#### Required Power

- Dual range: 90 to 132 VAC and 180 to 264 VAC, auto selecting, 50-60 Hz, 400 watts maximum, 200 watts typical operation

#### Weight

- 28 kg typical

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**PAVP6**

**PAVS6**

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**PRECISE AUTOMATION**

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Intelligent Automation Solutions

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