The Next Generation of Collaborative Robots
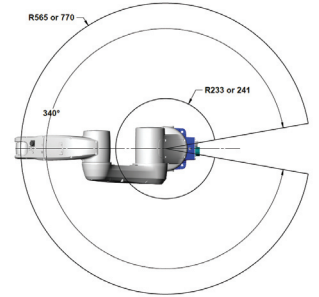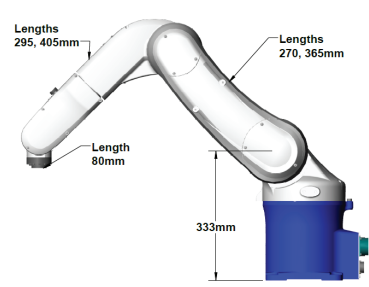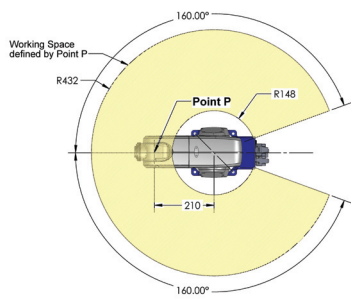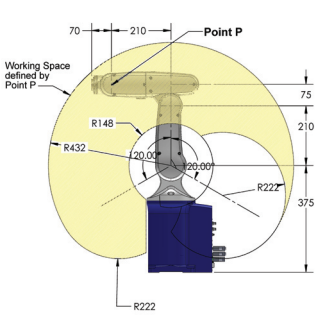
The growth of collaborative robots that can safely work side-by-side with people makes automation accessible to a new generation of applications. However, this accessibility has often come at the cost of higher prices for special sensors, reduced repeatability and dramatically reduced cycle time. Precise 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.

Measured against ISO Force Standards for 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.

PAVP6   **PAVS6**

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.

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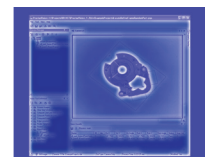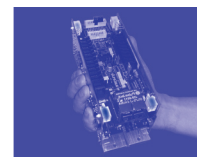
General Specifications	PAVP6	PAVS6
Range of Motion & Resolution		
J1 Axis	+/- 160 degrees	+/- 170 degrees
J2 Axis	+/- 120 degrees	+135/-100 degrees
J3 Axis	+/- 160 + 19 degrees	+166/-119 degrees
J4 Axis	+/- 160 degrees	+/- 190 degrees
J5 Axis	+/- 120 degrees	+/- 120 degrees
J6 Axis	+/- 360 degrees	+/- 360 degrees
Repeatability	20 microns at center of tool flange	30 microns at center of tool flange
Performance and Payload		
Cycle Time	Collaborative Mode: 1.6 seconds for standard 25 mm x 300 mm x 25 mm cycle with 1kg payload	Collaborative Mode: 2.5 seconds for standard 25 mm x 300 mm x 25 mm cycle with 1kg payload Standard Mode: < 1 second
Maximum Payload	2.5kg if gripper pointed down within +/-45 degrees. 2.0kg if gripper tilted up more than +/-45 degrees.	7.0kg if gripper pointed down with +/-45 degrees. 6.0kg if gripper tilted up more than +/-45 degrees
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.	12 optically isolated inputs and 8 optically isolated outputs, 24 volts 100ma, available on front panel of controller. 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.	Six 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	Three methods available: Guidance Motion (simple GUI for non-programmers using teach and repeat methods), embedded Guidance Programming Language (standalone, modeled after Visual Basic.Net), PC control using open source TCP/IP Command Server operated via Ethernet connection (TCP).	
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	Dual range: 90 to 132 VAC and 180 to 264 VAC, auto selecting, 50-60 Hz, 2000 watts maximum, 1000 watts typical operation
Weight	17 kg typical	36 kg typical

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automate with ease