

Best bearing choices for robot applications

How do you select the right bearing for a robotic application to ensure you optimise robot performance? This was the question we put to the experts at RA Rodriguez

It is difficult to exaggerate the importance of bearing selection in robot performance, particularly in positioning accuracy. The correct choice is crucial. A partial list of robot performance elements directly affected by bearing selection includes total robot weight, compactness, power requirements, cost, payload, reach, positioning repeatability and responsiveness.

The inherent design and performance benefits of the Kaydon Reali-Slim thin section bearings makes them a popular choice for robot applications. Aside from their space and weight saving potential, high bearing stiffness and a large internal diameter to accommodate electrical, hydraulic and pneumatic services are the features that distinguish them.

High accuracy, simple design

A single four-point contact bearing is ideal for shoulder, elbow and wrist joints. The bearings are also available with integral gears and mounting holes, reducing the number of the components and tolerance build-up. This results in maximum accuracy and a simplified design.

The four-point contact bearing can accept combinations of radial, thrust and moment loads. This is possible due to the 'gothic arch' geometry of the raceways. The ball raceway in



each race has two radii that are larger than the ball radius and their centres are offset from the centre of the ball radius. This generates the 'gothic arch' configuration in each of the raceway's grooves, making it possible for the two raceways to contact the ball at four points.

Reali-Slim thin section bearings have a radial cross section that remains constant with bore diameter. They are considerably lighter in weight as bore diameter is increased than bearings with conventional cross sections. As a rule of thumb every kilo saved by bearing weight is usually accompanied by almost ten kilos less on structural weight. Such weight reductions in mechanical assemblies provide material and drive power economies that can significantly reduce the cost of a robot. The bearings are available with bore diameters from 20mm to 1m. By comparison, conventional

bearings are generally limited to bores less than 200mm in standard sizes. Also, for a given precision class, they are more accurate in large diameter sizes than standard-section bearings because tolerances do not increase as much with diameter.

Coping with increased loads

The Kaydon Reali-Slim range is widely used for light to medium loads at all robot joints, including the waist. When robot payloads exceed 113kg, a Kaydon turntable bearing is a good choice as it can handle combined loads at the waist without the need for pairs of standard-section bearings. Turntable bearings are ideal for supporting the intermittent rotating loads occurring at the waist of most robots.

A useful option is the Reali-Slim TT Series of miniature thin-section turntable bearings. They are significantly smaller than conventional alternatives and offer performance advantages. In particular, their reduce size allows far greater design versatility. The smallest bore is 39mm, the largest 152mm and the height only 6mm. Yet despite their small size they offer greater accuracy. The extended radial bearing cross-section increases rigidity and optional pre-load or clearances meet application torque or deflection requirements.

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