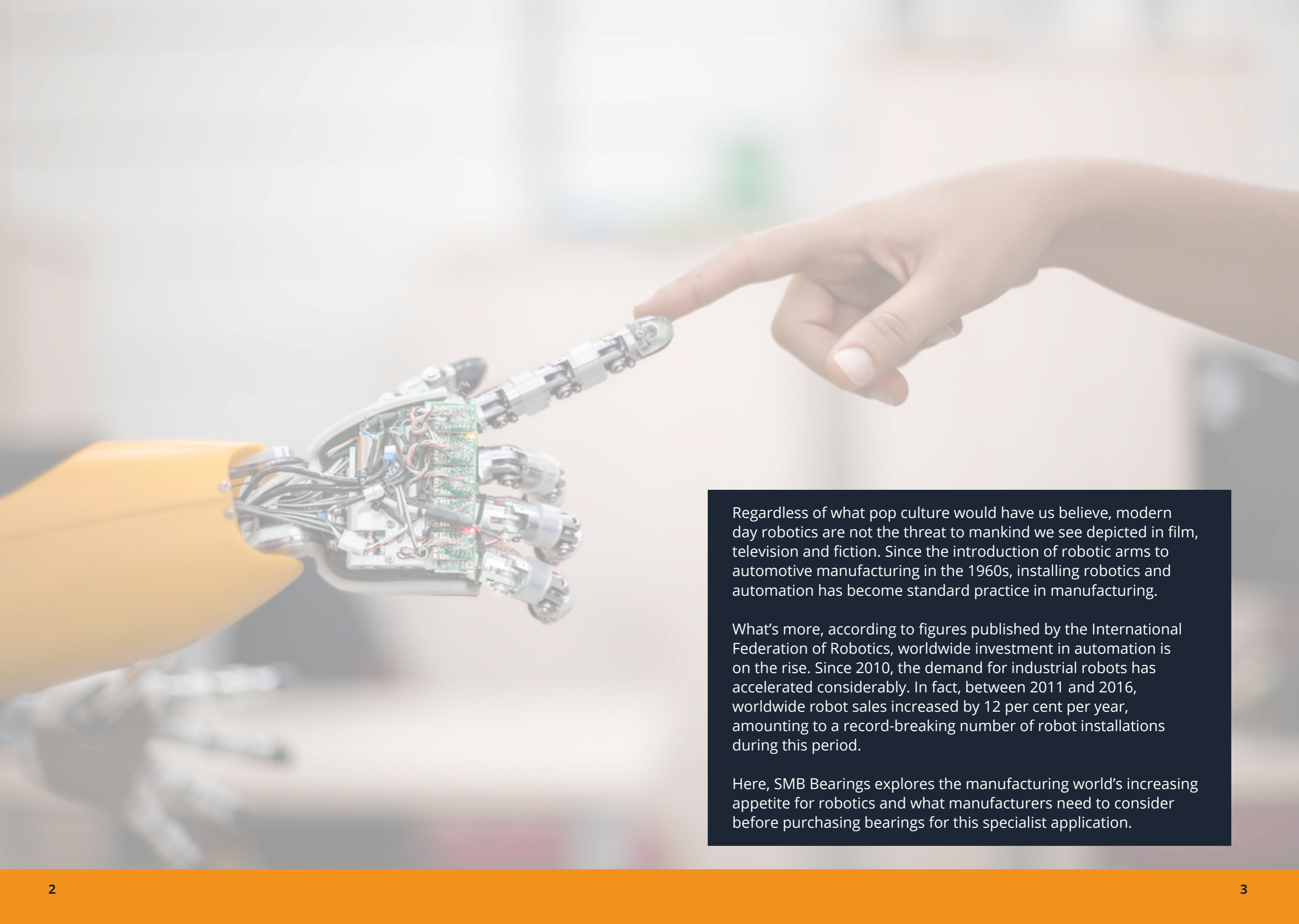


Bearings for **ROBOTICS**

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Regardless of what pop culture would have us believe, modern day robotics are not the threat to mankind we see depicted in film, television and fiction. Since the introduction of robotic arms to automotive manufacturing in the 1960s, installing robotics and automation has become standard practice in manufacturing.

What's more, according to figures published by the International Federation of Robotics, worldwide investment in automation is on the rise. Since 2010, the demand for industrial robots has accelerated considerably. In fact, between 2011 and 2016, worldwide robot sales increased by 12 per cent per year, amounting to a record-breaking number of robot installations during this period.

Here, SMB Bearings explores the manufacturing world's increasing appetite for robotics and what manufacturers need to consider before purchasing bearings for this specialist application.

What are they used for?

From production and packaging to surgical environments, robots are performing increasingly complex and precise tasks, faster and more easily than ever before. In operating theatres, robots, some of them using EZO brand bearings, are now capable of performing complicated surgery with dramatically reduced impact on patients, improving recovery time.

On the factory floor, collaborative robots and automatic guided vehicles are breaking out of the cages that have traditionally confined automation and are beginning to be used. Sapporo Precision is now supplying EZO bearings to manufacturers of a newer branch of robotics.

Robotic exoskeletons are enabling warehouse workers to lift heavier weights and social care workers to lift people with greatly reduced risk of injury. In the food industry, robots are now being used in production environments, as well as packaging and palletising, something that represents genuine evolution in the sector.

These developments have been made possible by advancements in motor, bearing, actuator and sensor technology as well as software and communications. Hybrid chrome and steel bearings, ceramic bearings and slewing bearings are all common in robot applications, but thin section bearings are the option most commonly chosen by SMB Bearing's customers.

A GUIDE: THIN SECTION BEARINGS IN INDUSTRIAL ROBOTS

Much of the media coverage related to robotics focuses on consumer trend towards robot personal assistants — think Amazon's Alexa and humanoid machines designed to help us around the house. The idea of personal robots helping with the housework seems great, but we're a long way away from this technology being effective and affordable enough to see any uptake on a large scale.

Nevertheless, the precision and accuracy required by consumer robots has become possible thanks to the research and development conducted for industrial robotics and automation — using thin section bearings. So, what do design engineers, as well as end users specifying a robot, need to know about thin section bearings for robotics?

Why choose thin section?

Thin section bearings deliver higher speed, improved efficiency, and high levels of accuracy as well as reduced friction and impressive design flexibility. Because there is very little difference in size between the internal and external ring, they also reduce the weight and bulk of an application, making them an ideal choice for robotics, where both footprint and weight are premium items.

However, because they are so thin, you have to pay particular attention to the roundness of the ring itself. If you take a thin section bearing without any lubricant and spin the inner ring, a light squeeze of the outer ring between finger and thumb will stop the bearing in its tracks, thanks to the incredible flex in the device.

As a result, the manufacturing process has to be extremely precise to ensure the highest possible degree of roundness in both rings, as well as good noise levels in the bearing itself. This will normally call for fine grinding and machining, complimented by a very high level of quality in both the process and the raw materials. If the rings are not perfectly formed, even a minute discrepancy will stop the bearing running as smoothly, producing excess noise.

For example, the EZO range of thin section bearings is produced to such a high standard that every single item that comes off the production line is individually tested. Any tiny deficiency and it is rejected. This means you can be certain that the millionth bearing produced is as high in quality as the first.

These thin-section ball bearings can be supplied open, shielded or sealed

in SAE52100 chrome steel or 440 grade stainless steel and are designed to withstand radial loads as well as moderate thrust loads in both directions. Some of the smaller thin-section bearing sizes are available with a fibreglass reinforced nylon high speed synthetic retainer.



Thin section lubrication

You should choose a low torque, free turning and low noise grease, such as those used as standard in the EZO bearings re-sold in the UK by SMB Bearings. An overly stiff grease won't deliver the best results as it could increase bearing torque to unacceptable levels for a thin-section bearing.

A grease with a wide temperature range, perhaps -40 degrees centigrade to +150 degrees centigrade would be most suitable. This allows for the variety of applications in

which a robot is most likely to be used, from refrigeration to locations near a furnace. It's also important to select a food grade grease if the robot is going to be used in food or beverage production or packaging.

The right grease choice will result in a free running bearing, which in turn will reduce the power consumption of the machine itself, as well as the long-term maintenance costs. It is also one of the factors that can contribute to the overall speed of the robot arm.

A CASE STUDY: GRASPING THE NEXT GENERATION OF ROBOTICS

The Amazon Picking Challenge, set by global online retailer Amazon, challenged roboticists to create a robot that can pick and stow twelve products from a shelf, into a bag. The Shadow Robot Company, designer and manufacturer of state-of-the-art anthropomorphic robot hands, addressed the challenge with the help of SMB Bearings.

Sounds simple right? Well Amazon set this challenge because this is the only area of their warehousing process that isn't currently mechanised, due to the sheer variety of objects to be packed. This presents a gap in robotics for a smart grasper that is able to recognise and pick different objects effectively.

Grasping is a problem for many industries, not just picking up an object — but grasping it well and ensuring that each grasp is correct for the object that's being picked.

"More and more I've had people come up to me asking how we can improve robotic grasping," said Rich Walker, managing director at The Shadow Robot Company. "The market is pushing us to improve the technology."

Standard industrial grippers are built to pick up one thing, move it and put it down. If you have two different sets of objects, you'll need two different grippers to perform the task. Modern manufacturers are increasingly diverse, producing reams of different products, often with custom finishes.

Single use tooling is no longer sufficient to keep up with demand. There is a need for tooling that is easily adaptable to pick up many different types of objects.

The robot engineers at the Shadow Robot Company have had plenty of experience manufacturing dextrous robotic hands for academia and nimble work, but this type of robot isn't suitable for industrial applications. Instead, they looked to create a robust and reliable Smart Grasping System™, with the intelligence to recognise many different objects and select the appropriate grasp.

As part of the design process, the Shadow Robot Company needed specific bearings with very tight tolerances in dimensional accuracy. This is important for ease of installation and accuracy of the smart grasper's movements. So, the team contacted SMB Bearings as the business is well known for consistency and vast supply of non-standard bearings.

Based on the requirements of this unique project, SMB Bearings recommended and

supplied EZO thin-type precision bearings.

"The EZO thin-type precision bearings we provide have such accuracy as a result of EZO's advanced manufacturing techniques and quality control," explained Chris Johnson, managing director at SMB Bearings. "If every bearing that comes off the production line is not the same shape and size every time, then the accuracy of the robot joint positions and overall behaviour would be compromised."

With the support of SMB Bearings and using a small sample of the EZO thin-type precision bearings, the research and development team at the Shadow Robot Company trialled different grease levels to find the optimal grease fill. As robotic movements need predictable and accurate some friction is essential to ensure this control. A process of testing and trial and error demonstrated the correct friction coefficient and its corresponding percentage grease fill for optimum performance.

"These bearings were very easy to install," said Luke Moss, robot engineer at the Shadow Robot Company. "This is a direct result of the quality, tolerance and consistency of these bearings"

SMB bearings then supplied the full amount of bearings required to this exact specification.

"These bearings were very easy to install in our Smart Grasping System™," said Luke Moss, robot engineer at the Shadow Robot Company. "This is a direct result of the quality, tolerance and consistency of these bearings, something that is essential for repeated assembly and high precision across multiple robots. Additionally, as the essential core to the lifespan of any robot, we expect these bearings to outlive most other parts of the Smart Grasping System™."

Created to stand-out from standard graspers on the market, the Smart Grasping System is still in development, but ultimately will have built-in "smart" intelligence, allowing it to pick up many types of objects, reducing the need for numerous hands in a factory. Additionally, torque sensing on each joint will ensure the Hand can make the most accurate and reliable grasp of whatever object it picks up.

"Industry 4.0 is on everyone's lips at the minute, but we can't forget the basics," said Chris Johnson, managing director at SMB Bearings. "Bearings may not be considered smart, but if they enable the reliability and robustness of smart systems such as this Smart Grasping System™, then I guess that is as close to being smart as a bearing can get."



The world's appetite for robotics is not showing any signs of slowing down. In fact, manufacturers now employ around 74 robot units per 10,000 employees on average — up from 66 units in 2015.

"I'm calling it transformative, because I know it will transform the manufacturing industry," added Rich Walker, managing director at the Shadow Robot Company. "When companies have deployed robots in the past, they've used grippers that were designed to perform one function, so you get a robot that performs one function. The modern manufacturing industry needs more flexibility than this, and the Smart Grasping System™ will address this need."

The Smart Grasping System™ will reduce the need for manufacturers to keep investing in new grippers for different tasks. Changing machinery incurs huge costs, and takes up a lot of time. Equally, having many robots performing one single task is wasteful in terms of both capital costs and floor space. Together, SMB Bearings and the Shadow Robot Company are working to solve this real-world manufacturing problem, freeing up floor space for a more efficient production line.

If you are investing in robotics for your facility and need advice on selecting robotics bearings, speak to the experts at SMB Bearings.

The team can discuss the exact bearing specifications needed for your application to ensure you make the most of your robot investment. Call **01993 842555** or e-mail the team on sales@smbbearings.com.

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