



LIFE SCIENCE CASE STUDY

LOW FRICTION SEAL FOR ROBOT ARM JOINTS





OMNISEAL® SPRING-ENERGIZED SEALS

Low Friction Seal For Robot Arm Joints

Clara Soueve October 2023

FRICION & WEAR CONTROL MOTION PRECISION SEAL DESIGN

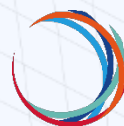
Environment

Accuracy and cleanliness are of paramount importance in healthcare settings that utilize precision robotic technology. These devices are designed to assist medical professionals to perform complex surgical procedures, diagnostics, and other medical tasks. For example, surgical robots are widely used in critical environments such as operating rooms where they aid surgeons in performing minimally invasive procedures with enhanced precision. Since they can make smaller incisions, the end patient result is reduced scarring, quicker recovery times and less pain.

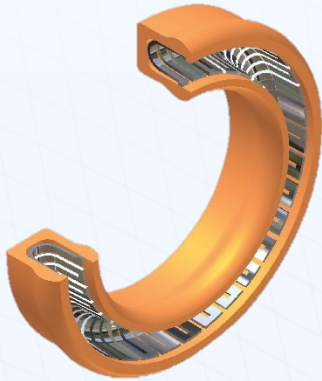
Challenge

Our life science customer faced several challenges while integrating seals to protect sensitive components at each robot arm joint, with the critical requirement of keeping friction under control in order to preserve the robot's motion precision and safety features. Key challenges included:

- Seal Integration: Design housing for integration of different seal dimensions (126 to 187 mm) for robot arm joints
- Dynamic Sealing: Ensure protection against dust and water
- Low-Friction Design: Minimize interference with arm motion
- Material Selection: Select the right material for low wear and friction against soft materials such as cast aluminum



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Solution

Our engineering team collaborated closely with the life science customer to develop a custom, dynamic sealing solution. The seal is a low-friction, Omniseal® 400A spring-energized seal (a U-spring-based design), which significantly reduced friction and minimized interference with the robot arm's motion. The high-performance polymer material A49, has been chosen for its low wear characteristics and friction control, ensuring smooth operation when running against soft materials such as cast aluminum.

Going Beyond With Precision Seals That Keep Robots Moving Safely, Longer & Efficiently.

While collaboration between seal manufacturers and medical robotic device manufacturers can lead to mutually beneficial outcomes, it also comes with challenges related to regulatory compliance, material selection, customization, quality control, and more. Sealing solutions were custom-designed for each joint of the robot arm, ensuring comprehensive protection against dust and water projection.

Benefits

- **Enhanced Protection:** The robot arm joints were effectively shielded against external contaminants, increasing the longevity and reliability of the equipment.
- **Motion Precision:** The low-friction seal design played a pivotal role in maintaining the robot's high level of precision during its various motions.
- **Safety Assurance:** The presence of numerous sensors on the robot arm was not compromised by the seals, ensuring continued safety features and real-time motion monitoring.
- **Customer Satisfaction:** The client's robots continued to excel in performance and reliability, further solidifying their position in the market.



Need Help To Solve The Insoluble?
Contact Our Experts!

Design Expertise & Tailor-made Solutions for Your Critical Applications

Omniseal Solutions is a global engineering leader with over 65 years of historical legacy, relentlessly dedicated to the design and manufacture of precision sealing and material solutions that protect critical applications in the most demanding environments and passionately driven to push *Beyond the Boundaries of Possible*.

Our Life Science Team



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Let's go **BEYOND** the
boundaries of **possible**

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