



Low Friction Seals for Industrial Robotics

Bal Seal® spring-energized seal: superior protection, plus smooth, consistent performance

The Bal Seal spring-energized seal lets you achieve the perfect balance between sealing effectiveness and friction. In critical robot components and systems, our seal guards against leakage and ingress while eliminating stick-slip and promoting accurate, consistent movement over thousands of cycles.

With material, energizer, and geometry options that are nearly limitless, the Bal Seal can be customized to meet the toughest wear and serviceability requirements.





In robot end effectors, joints, actuators and motors, no other seal can match the superior protection against leakage and contamination and low friction performance of the Bal Seal®. Here's why:

Bal Seal® feature	Why is it relevant?	What's the benefit?
PTFE Seal Material	<ul style="list-style-type: none"> • Low friction and stiction • Media compatibility • Tolerates wide temperature range 	<ul style="list-style-type: none"> • Allows precision movement of joints and end effectors consistently over a high number of cycles • Helps prevent jitter that could impact performance of sensors & other feedback mechanisms • Promotes minimal wear to extend service life of robot • Achieves low friction performance without lubrication • Seals effectively against water, dust, oils and other media, preventing corrosion and contamination • Meets FDA compliant specification • Performs well in temperatures ranging from cryogenic up to 500 °F
Bal Spring® Energizer	<ul style="list-style-type: none"> • Spring force customization • Nonlinear spring behavior • Compensates for large tolerances and stack-up 	<ul style="list-style-type: none"> • Enables the optimal balance between friction and sealing • Helps friction consistency • Ensures effective sealing throughout the life of the robot • Provides greater design flexibility • Promotes consistent sealing pressure over large tolerance range
Unique Bal Seal® Geometry	<ul style="list-style-type: none"> • Design flexibility • Greater frictional consistency over operating range 	<ul style="list-style-type: none"> • Profiles to meet robot environmental requirements, including IPX ratings • Offers improved friction control of dynamic seal lip • Optimizes lip contact to seal effectively with minimal stiction • Reduces wear for prolonged service life • Compensates for thermal expansion
Custom-Engineered Locking Ring	<ul style="list-style-type: none"> • Consistent sealing despite thermal cycling 	<ul style="list-style-type: none"> • Prevents seal jacket shrinkage • Eliminates unwanted seal movement which can lead to leakage

Factors Impacting Robot Seal Design

FRICITION

- Presents challenges for consistent & accurate movement
- Impacts feedback response of other system components
- Influenced by temperature, pressure and hardware surface finish
- Decreases equipment life due to promoting early seal wear

ENVIRONMENTAL CONDITIONS

- Operate in demanding production environments such as automotive, electronics, agricultural, food & beverage, pharmaceutical, transportation & logistics
- Tasked with long service intervals for optimal productivity
- Perform repetitive movements, requiring accurate, consistent positioning
- Encounter broad temperatures (-40 °F to >180 °F)
- Exposed to water, dust, sand, fuels, oils, and other media
- May be subject to FDA compatibility requirements

Key Robot Seal Design Considerations

- Low and stable friction and low stiction to enable accuracy, minimize jitter that could adversely affect sensors, other feedback mechanisms
- Sealing effectiveness to inhibit contamination or corrosion and meet IPX and serviceability requirements
- Long seal service life to maximize robot uptime

Get a custom seal proposal in 3 working days and a prototype in 4-6 weeks. Leverage our engineering expertise, to save time and money in development and testing.

REQUEST A DESIGN



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