



## Silicon Wafers Move Smoothly Through Production

*Reliable actuator needed for clean-room manufacturing environment*

*By Gene Prosin*

### Product Overview

A large, semiconductor equipment manufacturer needed an actuator that could gently but quickly lift a pedestal holding a silicon wafer in and out of a process chamber within a "clean-room" environment. The unit also needed to act as a sealed conduit for cooling lines, which run into the chamber and cool the pedestal.

A number of design challenges were presented. The unit would have to handle a 5-pound load off center 6 to 8 inches, while maintaining a smooth, vibration-free operation and a tight tolerance of the rod alignment. The component had to incorporate a hollow rod with adequate room for a fixed, stainless steel shaft containing cooling lines. It also had to provide for a stainless steel bellows to be attached directly to the rod, sealing the operation from atmosphere. All of these features needed to be addressed as well as keeping the unit at a competitive price.

### Product Solution

To meet the large oversized hollow rod and extreme force requirements, CAP design engineers began with the Model ARFHD3x12 (full husky, double rod, switch ready) cylinder. The cylinder features an oversized 3 inch diameter stainless steel rod with 2 inch hollow fabricated piston rod assembly; the unit is chrome plated to maintain a clean operating surface. A custom frame was designed utilizing "windows" cut into the frame, which allow access to attach the customer's bellows.

To accommodate a tight, but smooth and clean operation, a clearance tolerance of  $+.001 - .003$  maintained between the bushing and rod was utilized. Due to the extra large rod diameter relative to the bore size, special cushions had to be incorporated into the design. Furthermore, Compact's distributor attaches additional components to create a value added sub-assembly providing a plug-and-play solution to the end customer.

### Application Opportunity

This finished product has been well received by the customer and has provided Compact's local distributor with several other applications. This product has gone through several revisions the last few years, but has left the competition at the door even during more rigorous cost reduction periods. The customer has now produced nearly 500 of these units at cost levels of \$600 to \$800 each.

