ABTech Inc. SP Series Spindles; Single Piece worktable, shaft, and thrust plate

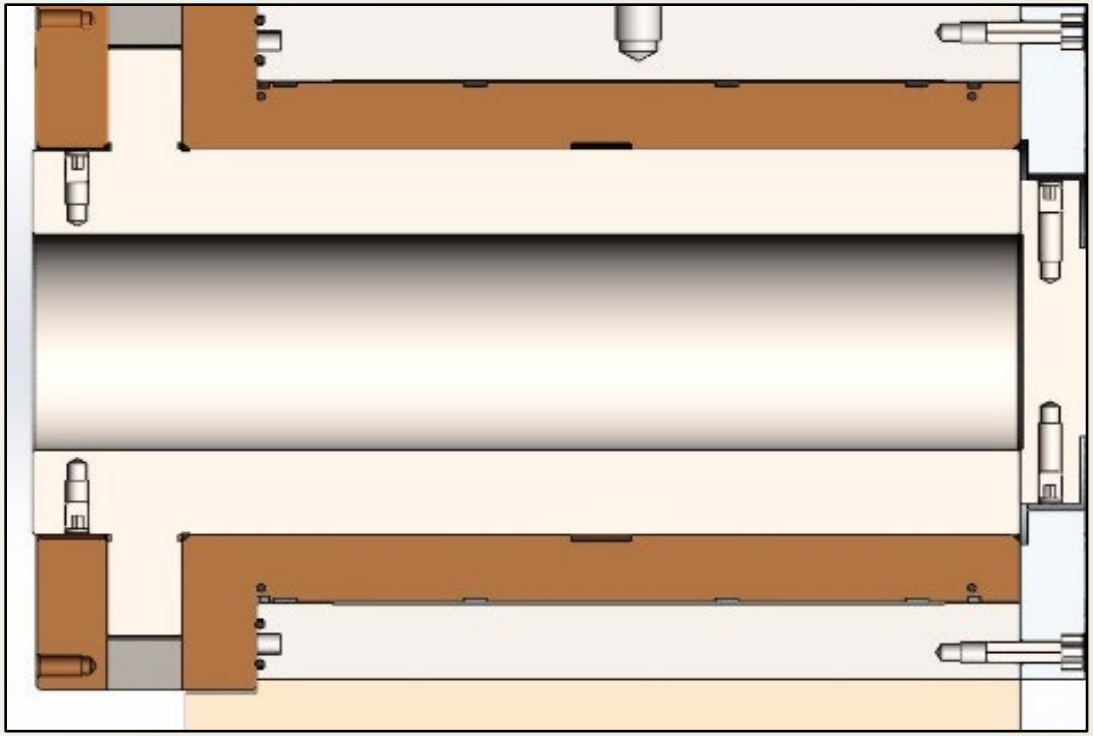
Rotary Table Types-SP Series

Design:

Single piece worktable, shaft and thrust plate with balancing

Benefits:

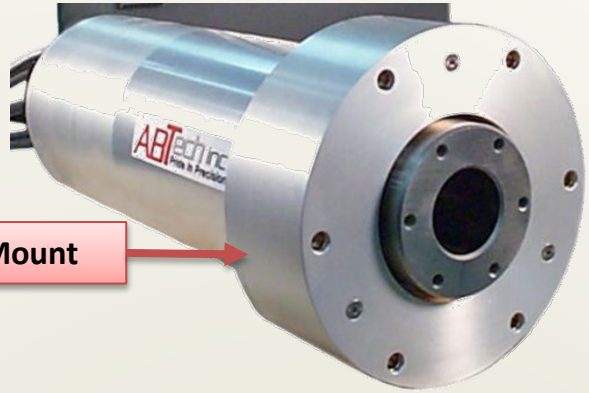
- Speed: 0-20,000 rpm (range set per design)
- Accuracy: Radial and Axial error motion <2 microinches
- Balancing provisions: Reduce vibrations and improve accuracy at high speeds
- Designed to customer specification so wide range of options and not limited in size, external housing design etc.
- Potential for high moment stiffness



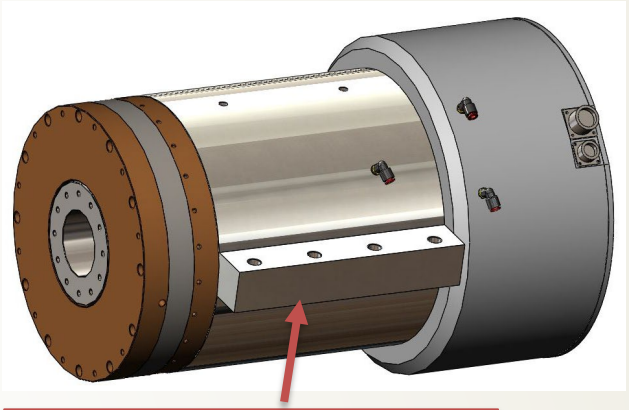
Spindles-Housing Designs

Several Mounting Designs are available and are selected during the engineering phase for optimal integration into the customer's existing/future platform

Foot Mount

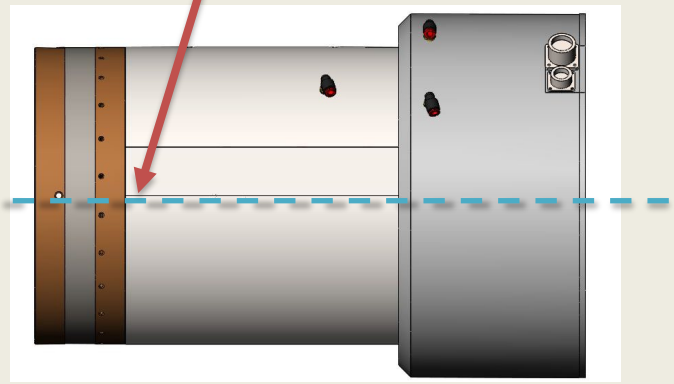


Flange/Front Mount



Centerline/Athermal Mount

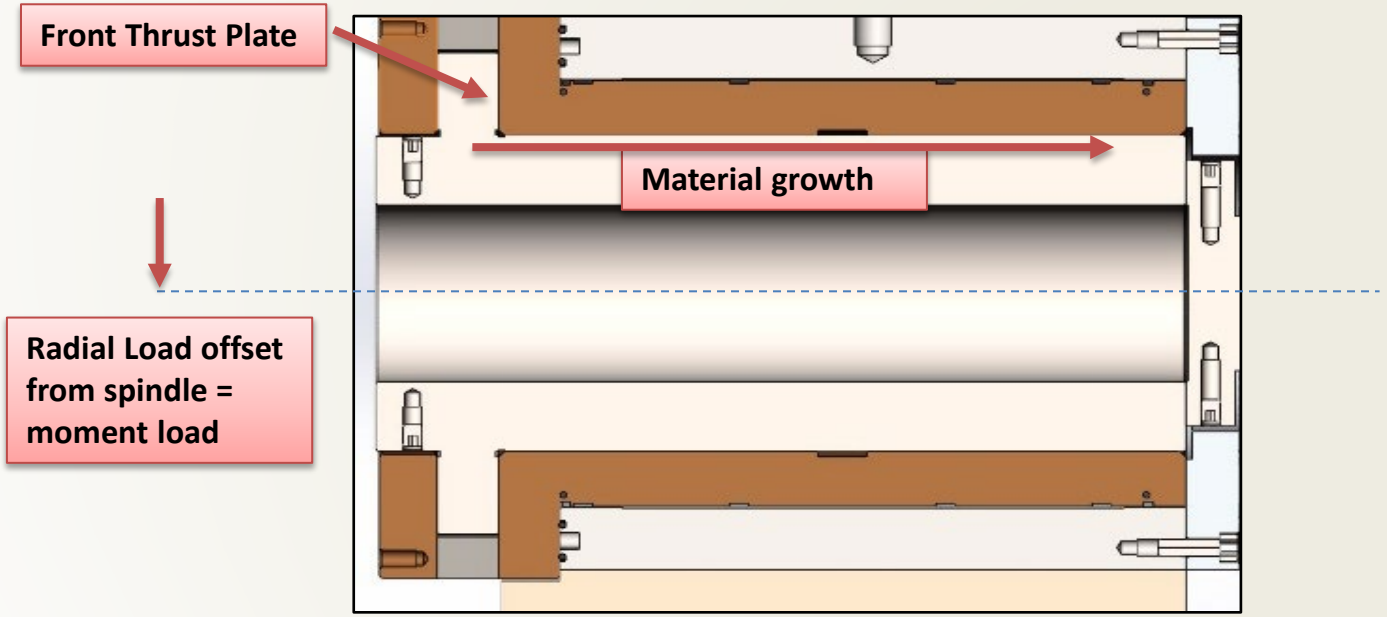
Centerline/Athermal Mount: The benefit here is that as the material temperature increases in the spindle (due to air shear and motor heat) the centerline of the spindle does not change in location. Compared to the foot mount design, where as the temperature changes the centerline moves up/down.



Spindles-Internal Design

Temperature:
ABTech SP Spindles utilize a front thrust plate. This is so that as the spindle heats up from motor heat and air shear, the spindle grows out the back of the spindle, minimizing the change in location of the spindle nose. Liquid cooling is also designed into our spindles to minimize/control the temperature changes.

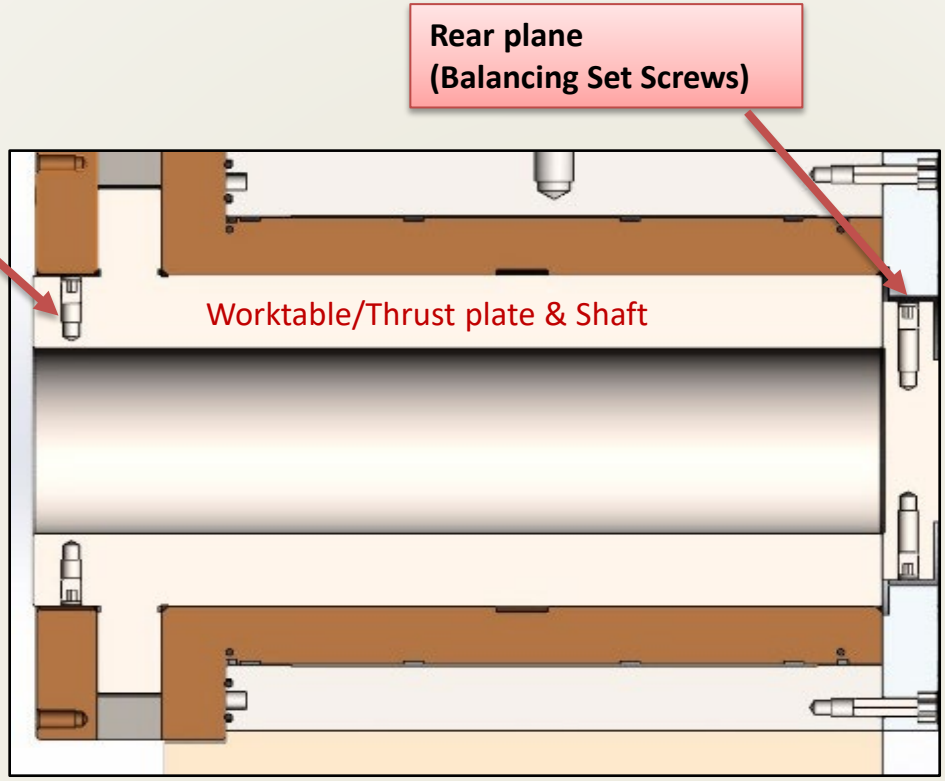
Stiffness:
The easiest way to tell an AT apart from an SP is the overall length. SP's utilize much longer shafts/journal. This is to increase radial and moment stiffnesses, typically seen in the finish-machining/grinding/polishing applications. As we determine the right fit for the customer, we will need to be concerned with the forces applied on the spindle (magnitude, location, direction). I.E. if the spindle is going to hold a grinding wheel, where is the grinding wheel located in relation to the spindle nose and how much force will it see in operation?



Spindle Balancing

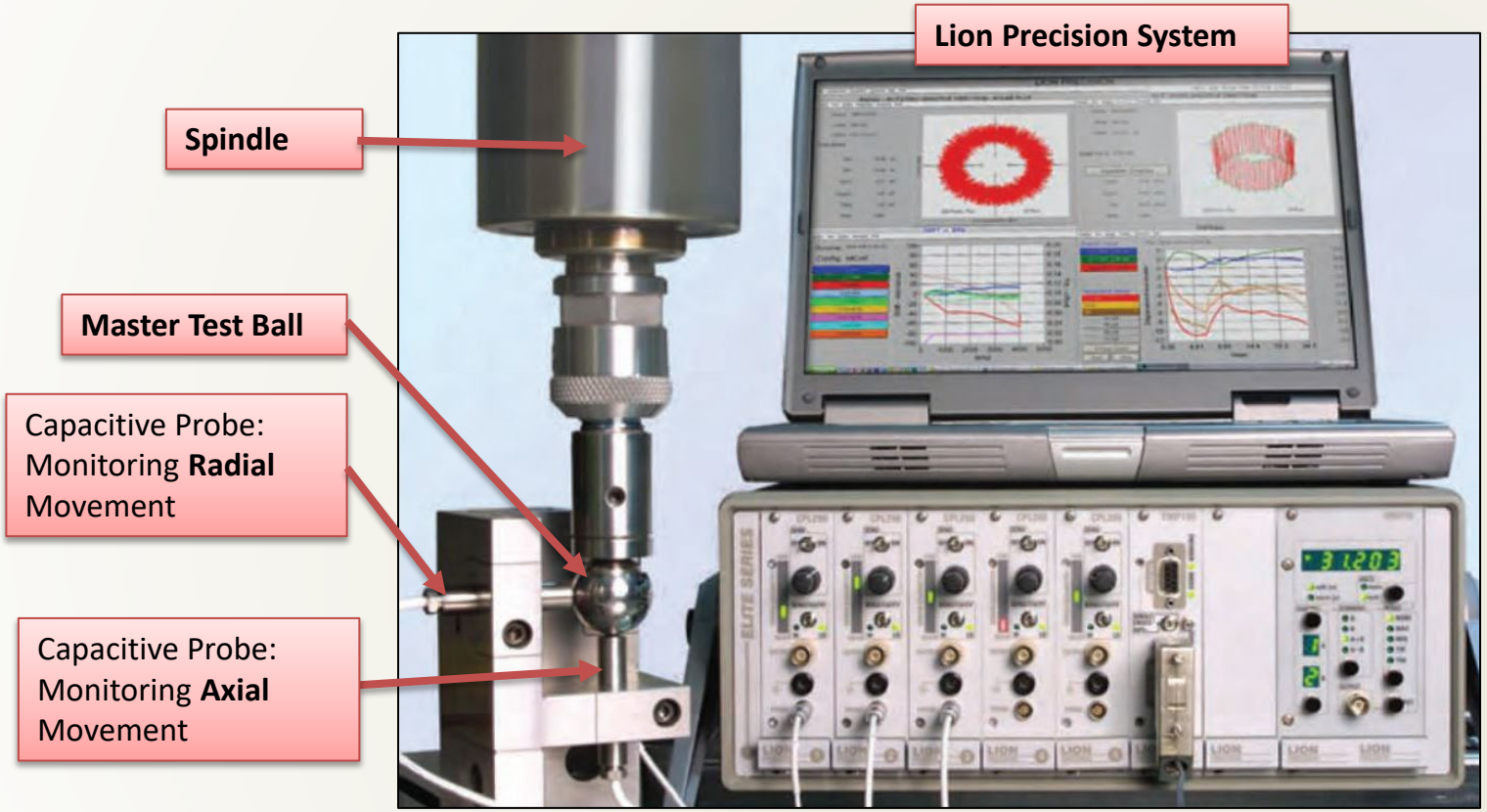
All ABTech SP Series spindles have dual plane balancing provisions. We use a Baladyne Balancing system to monitor the imbalance at the front and rear of the spindle. The Baladyne system tells us the amount of imbalance and at what angular location. We then add/remove weight at the specified location to reduce the imbalance. This is an iterative process and once complete the spindle will be balanced throughout the specified RPM range.

Spindle Balancing is tested according to ISO standards, with the highest grade of G0.4 (0.4mm/sec)
As air bearing spindles, ABTech SP's are balanced to 10x-20x better than G0.4



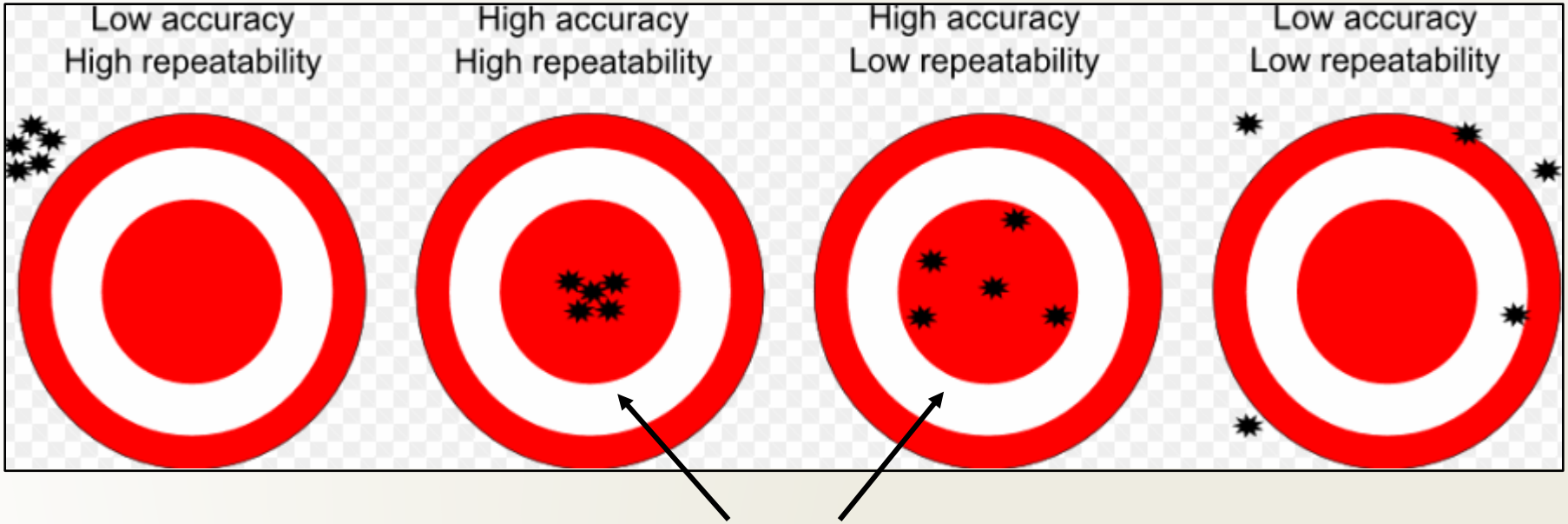
Spindle Error Motions (Accuracy)

High speed spindles cannot be tested with a standard roundness gage like the AT's and HDRT's due to the high RPM (contact measurement is insufficient). Furthermore most customers using high speed spindles (especially in diamond turning applications) need to know the asynchronous (non-repeating "noise") and synchronous (repeating) errors. To test ABTech SP's we use a Lion Precision Spindle Analyzer:



Accuracy, Repeatability, & Resolution

Accuracy-vs-Repeatability



Is there a difference between these two? They are both within the red circle so are they the same? It depends on your resolution. If all you care about is hitting the red circle then it doesn't matter.

Resolution; the smallest incremental measurement step detected by the encoder.