



The evolution of the Hexapod 6 axis motion system is the Tripod integrated with nano precision stages and a rotary for 6 axes of True Nano™ precision. This platform due to basic physics can out perform Hexapod systems with Nano Precision™ while increasing the work envelope and significantly increasing the stiffness of the structure making this platform ideal for nano machining and thermal bonding applications where reactive forces are common. The ALIO product family of Linear Servo Tripods can be packaged from 3 axes to more than 6 axes while still maintaining the ALIO forward and inverse kinematic equations.

Hybrid Hexapods

Hexapods also known as PKM or parallel kinematic machines were designed many years ago for amusement rides and later mostly know as flight simulators for pilot training. Over the years new designs of the PKM's were developed for the micron precision world of manufacturing, laboratories motion needs and product inspection. Although many modern day Hexapod companies tout nanometer resolution or repeatability, the real issue with Hexapods for the new world of nano precision is 6-D Nano Precision®.

Hexapods have 12 joints or flexures at both ends of the 6 moving linear links each with on-axis and off-axis motion errors. These 6 links once integrated into the hexapod yield stiffness issues which also add to the total system error even when installing forward and inverse motion equations. The summation of all errors will not allow any hexapod to be a True Nano® positioning motion platform. In today's nano precision world the path or straightness of motion is critical. On the other hand PKM's still have real nano value when investigating tripods. ALIO has been designing and improving 6 and 3-axis PKM's for industry for the past 12 years with emphasis on the 3-axis tripod mounted on linear axes to improve the hexapod precision.

The ALIO linear motor Tripod has infinite resolution with less than 10 nm repeatability and accuracy less than 100 nanometers. Mounted on a Nano-precision linear XY motion system for 5-axis or with adding an optional rotary to provide full 6 axis "Hybrid Hexapod" motion. ALIO's Hybrid PKM Motion System offers significant advantages over the traditional hexapods from an order of magnitude more precision to increased work envelope with significant improvement in stiffness.

Novel or evolutionary 6-D Nano Precision® is a natural for nano precision systems for the present and future. ALIO's hybrid parallel kinematic motion solutions with forward and inverse kinematics allows for complex hexapod-like motion with simple tool center point programming. ALIO's offers G-code programming solutions for true CAD-Cam processing with True Nano® precision.

The ALIO Hybrid 6-D Motion Platform product line is scalable from 5 mm to over a meter of travel moving 100's of kilograms of mass. No matter the product size needed for the application the ALIO Hybrid 6-D Motion system will maintain precision to at least an order of magnitude better than stacked stages or traditional Hexapods. The simplicity of moving one axis verses six axes to make a straight line while increasing the work zone volume and stiffness of the structure is what the ALIO Hybrid was designed and built to excel at.

In conclusion, hexapods will still have many applications that they are well suited to handle just not in the 6-D Nano Precision® world of applications. True Nano® applications, especially ones that need flatness and straightness of motion plus stiffness for machining and bonding applications will be better served with an ALIO Hybrid system.