



The term hexapod describes an adjustable unit which can be freely adjusted in rotatory and translatory movement using 6 actuators. This means that the rotation and translation of an object can be adjusted individually in all axes.

We construct hexapods with a wide range of geometries to suit the customer's specific problem. A Torque or piezo stepper control block provides the electrical drive.

This example of a hexapod was designed for an optical application.

In this case, the legs consist of piezoceramic stack actuators which are prestressed and precisely positioned in ball joints. Integrated position measurement sensors (capacitive or inductive) allow controlled positioning processes and an extremely high virtual stiffness of the system. Dependent upon the individual usage, a six-canal electronic system in conjunction with a computer control the hexapod.

The axes are defined in a right-handed co-ordinates system in such a manner that the (x, z) plane is parallel to one of the stack pairs.

The matrix elements are numerically scaled so that the translations can be measured in  $\mu m$  and the rotations in *mrاد*.

The alteration in length of the individual stacks is given as  $\pm 35 \mu m$ . In the geometry shown, this leads to the following limits in possible movement for each individual degree of freedom:

$$\begin{aligned} \Delta x_{\max} &= 49.5 \mu m \\ \Delta y_{\max} &= 57.2 \mu m \\ \Delta z_{\max} &= 49.5 \mu m \\ \Delta \phi_{x \max} &= 1.47 \text{ mrad} \\ \Delta \phi_{y \max} &= 1.40 \text{ mrad} \\ \Delta \phi_{z \max} &= 1.80 \text{ mrad} \end{aligned}$$

There is a multitude of possible variations for the construction shown:

- increase in movement limits through longer stacks or translatory drives (e.g. double stack drives)
- by varying the support angles and the radius the transformation ratios of the individual co-ordinates can be differentially influenced
- Change in mechanical load through alterations in the stack cross-sections

### Application

- general positioning tasks
- precision processing
- semi-conductor technology

Identification	Release	Description
asy/hex	1.0	Hexapod