

# Universal Joints

## B. UNIVERSAL JOINTS

### 1.0 GENERAL

A universal joint is a positive, mechanical connection between rotating shafts, which are usually not parallel, but intersecting. They are used to transmit motion, power, or both.

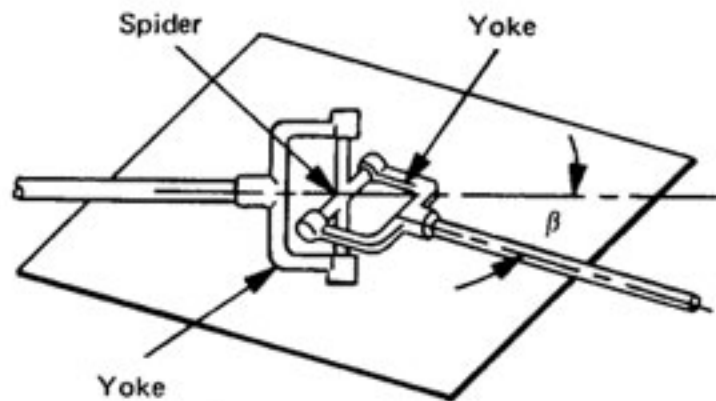


Figure 1 Single Universal Joint

The simplest and most common type is called the Cardan joint or Hooke joint. It is shown in Figure 1. It consists of two yokes, one on each shaft, connected by a cross-shaped intermediate member called the spider. The angle between the two shafts is called the operating angle. It is generally, but not necessarily, constant during operation. Good design practice calls for low operating angles, often less than  $25^\circ$ , depending on the application. Independent of this guideline, mechanical interference in the construction of Cardan joints limits the operating angle to a maximum (often about  $37\frac{1}{2}^\circ$ ), depending on its proportions.

### 2.0 APPLICATIONS

Typical applications of universal joints include aircraft, appliances, control mechanisms, electronics, instrumentation, medical and optical devices, ordnance, radio, sewing machines, textile machinery and tool drives.

Universal joints are available in steel or in thermoplastic body members.

Universal joints made of steel have maximum load-carrying capacity for a given size. Universal joints with thermoplastic body members are used in light industrial applications in which their self-lubricating feature, light weight, negligible backlash, corrosion resistance and capability for high-speed operation are significant advantages.

Universal joints of special construction, such as ball-jointed universals are also available. These are used for high-speed operation and for carrying large torques. They are available both in miniature and standard sizes.

### 3.0 GENERAL CHARACTERISTICS OF THE CARDAN JOINT

A basic characteristic of the Cardan joint is the nonuniformity of motion transmission through the joint. The angular-velocity ratio between input and output shafts varies cyclically at two