

# Ball Spline Type LBS

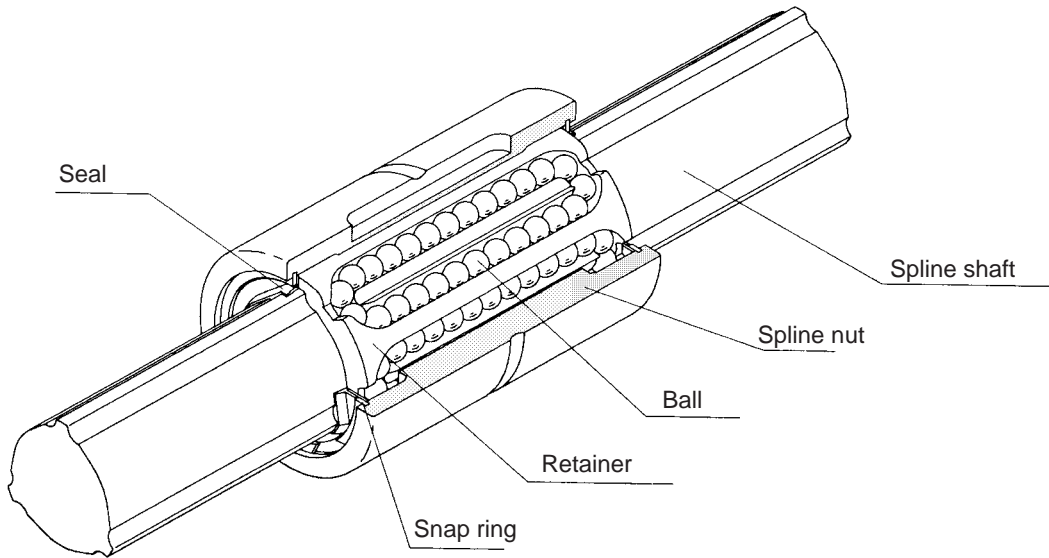


Fig. 1 Construction of Ball Spline Type LBS

## Construction and Features

In Ball Spline type LBS, as shown in Fig. 1, the spline shaft has three crests positioned equidistantly at  $120^\circ$ , on both sides of which a total of six trains of load-bearing balls are arranged so as to hold the crests from both sides.

The raceways are precision-ground into R-grooves so as to have a radius approximately the same as the ball radius. When the Ball Spline receives torque from the spline shaft or spline nut, the three trains of balls in the torque loading direction bear equal parts of the load,

and as a result the center of rotation is set automatically. With the rotation reversed, the other three trains of balls in the opposite direction bear the load.

As the trains of balls are held in place so that they are caused to circulate in line by the retainer built into the spline-nut interior, the balls do not fall off if the spline shaft is removed.

## Zero angular backlash

The construction of type LBS, as described above, can minimize angular backlash (clearance in the rotational direction). Preloading on a spline nut can reduce angular backlash to zero if necessary, thereby increasing rigidity.

Unlike conventional types of Ball Splines designed with a circular-arc or Gothic groove, type LBS has eliminated the need to twist two spline nuts in order to bear a preload, thereby facilitating compact design.

## High rigidity and accurate positioning

Type LBS has a wide contact angle and is capable of bearing a preload with a single spline nut. Therefore, the initial displacement is limited, providing the system with high rigidity and high positioning accuracy.

## High-speed linear motion and rotation possible

The retainer, with its low friction, superior lubricant-retaining structure, and high rigidity, helps ensure low-maintenance, high-speed linear with grease lubrication alone. Furthermore, as the radial distance to loaded balls and that to free balls are virtually equal, the centrifugal force exerted on the balls is insignificant even during high-speed rotation. These characteristics combine to provide smooth linear motion.

## Compact design

In type LBS, free balls do not circulate in the outer tracks as they formerly did in conventional types of Ball Splines, enabling the spline-nut outer diameter to be kept low. The LBS design can therefore be made compact, so that relatively little space is required for installation.

## Simple assembly

Even if it is necessary to remove the spline shaft due to special mounting conditions, such as the need to use blind holes or attach a Ball Spline to a complicated structure, the balls will not fall off. As a result, assembly, maintenance, and checking are simple to perform.

## A linear bush can be used for heavy loads

The raceways on which balls roll are round-grooved to a radius approximately the same as that of the ball, thereby allowing the balls and raceway to contact each other over a wide range. Type LBS therefore has a high load-bearing capacity against radial and other loads.

## Two parallel axes integrated into a one-axis configuration

In type LBS, a single axis can bear loads in both the torque-applying and radial directions. Therefore, an installation that formerly required two parallel axes can be configured using only one axis. This simplifies installation procedures and saves space.

## Uses

Ball spline LBS is a highly reliable linear motion system applied to:

industrial-robot supporting pole and arm / automatic loader / transfer machine / automatic conveyance system / tire-molding machine / spot-welding-machine spindle / high-speed automatic-painting-machine guide shaft / riveting machine / wire winder / electric-discharge-machine work head / grinding-machine spindle drive shaft / various speed-change gears / precision indexing shaft