Flexure Pivot® Tilt Pad Bearing Technology

Flexure Pivot Radial Bearings

Standard tilt pad bearings achieve low cross-coupling through rocking or sliding motion. Flexure Pivot tilt pad radial bearings achieve the same low cross-coupling and high stability through flexure and rotation of the center post while eliminating any pivot wear and high contact stress.

Features

Minimizes Manufacturing Tolerance Stack Up
The integral pad-pivot-retainer design of the Flexure Pivot bearing eliminates most of the manufacturing tolerance stack up (Figure 1). This feature is a critical design parameter that has a direct impact on the rotor's stability, critical speed, and synchronous response characteristics.

Eliminates Pivot Wear and Contact Stresses
The Flexure Pivot tilt pad design eliminates the pivot wear and brinelling associated with standard tilt pad bearings. This prevents degradation in performance with time, maintains the desired bearing preload, and provides a narrower spread in the stiffness and damping coefficients.

Requires Minimal Radial Space
Flexure Pivot tilt pad bearings can be manufactured with a very low profile (Figure 2). This feature allows the upgrade of sleeve bearings with drop-in replacements that provide the performance benefits of tilt pad bearings.

Eliminates Pad Flutter and Spragging
The rotational stiffness increases the pad natural frequency and eliminates pad flutter and spragging that can be encountered on the unloaded pads in standard tilt pad bearings.

Retrofit Small and Miniature Bearings
The advanced techniques used in the manufacture of Flexure Pivot tilt pad bearings make them a good choice for retrofitting small and miniature fluid film and rolling element bearings.

Centering Capability for Minimum Radial Play
The Flexure Pivot design provides a means to hold the shaft centered in the bearing at low speeds, thus minimizing the radial play which is critical in some high-speed high-performance turbomachinery.

FIGURE 1

Standard Tilt Pad

Flexure Pivot Tilt Pad

+0.0005 (+.0127mm)
-0.0000

Resulting Set Dia.

Tolerance Stackup

Shell I.D.
+0.002 (+.0508mm)
-0.000

Set Dia.
+0.0005 (+.0127mm)
-0.0000

Typ.
+0.0005 (+.0127mm)
-0.0000

FIGURE 2

10 mm, 150 krpm

19 mm, 109 krpm

FIGURE 3
Flexure Pivot Thrust Bearings

Standard tilt pad thrust bearings form a converging wedge through the rocking motion of the pad pivot support. Flexure Pivot tilt pad thrust bearings form a wedge through flexure of the post support while eliminating the pivot wear and high contact stresses.

Features

Custom Design of the Flexure Pivot Post Support
The Flexure Pivot post support is designed to provide an optimum wedge ratio at design load conditions (Figure 4). This results in an increase in the load capacity and a significant reduction in the horsepower loss.

Simple Construction and Manufacturing
The construction of Flexure Pivot tilt pad thrust bearings is simple and contains fewer parts than standard tilt pad bearings. Manufacturing, assembly, maintenance, and inspection are much simpler than with other bearing types. The absence of moving parts eliminates wear and fretting in service.

Elimination of Pad Flutter
The rotational stiffness provided in the Flexure Pivot tilt pad bearing eliminates the pad flutter problem that can be experienced on the inactive side of standard tilt pad thrust bearings.

Easy Implementation of Hydrostatic Feature
Offset Flexure Pivot tilt pad thrust bearings can carry higher load capacities in reverse rotation than standard tilt pad bearings, giving them an additional benefit in certain high-load applications. The hydrostatic feature can be utilized through pivot post support.

Static and Dynamic Misalignment Capability
The Flexure Pivot design provides some amount of axial compliance to give forgiveness of static and dynamic misalignment.

Lower Lubricant Flow Requirements
Special surface preparation and material selection allow Flexure Pivot tilt pad thrust bearings to carry higher loads at lower oil flows, which makes them the bearing of choice for applications where lubricant availability is low.

No Limits on Material Selection
Any material can be used for Flexure Pivot thrust bearings due to the lack of wear and fretting.

Retrofit in Small Envelopes
The Flexure Pivot thrust pad design permits retrofitting in a small envelope where only taper land or flat thrust plates would typically fit. This is an advantageous design flexibility which allows space saving and load capacity upgrades for existing thrust bearings.