

WEAR-FREE SPINDLE WITH MAXIMUM PRECISION AND EXCELLENT DAMPING

With spindles from Hyprostatik Schönfeld, the oil flows into the hydrostatic pockets is adjusted by means of PM flow controllers.

Currently, the field is dominated by rolling-element bearing systems. However, the growing demands for high precision, surface quality, cutting rates and dimensional accuracy are increasingly overburdening spindles and rotary tables with ball bearings or roller bearings. The ball bearing spindles are best when they are new, radial running in the 1- μm range. However, the running quality decreases with the duration of use, high loads and high speeds. Particularly, the highest speed internal grinding spindles need ball bearings replacement very often.

The damping of ball bearings is minimal. For this reason, the surface qualities achieved on the workpiece with ball bearing spindles are limited. These spindles have a marked resonance frequency, which negatively impacts the tool service lives and cutting performance. In addition, fast-running spindle bearings frequently get extremely heated, and the compensation of thermal displacements of the machine tools becomes time-consuming and costly.



Advantages Of Hydrostatic Spindles
To meet this challenge, hydrostatic spindles and rotary tables have been developed.

1 Wear-free

In hydrostatic spindles, the shaft floats in the bearings, regardless of the speed and load, in a non-contact and therefore wear-free manner. As a result, the properties of these bearings are retained regardless of the duration of use, the load or the speed.

2 Runout

Depending on the speed range, size of motor and spindle

construction, the runout of the hydrostatic spindle, regardless of the duration of use, is between 0.03 μm and 0.3 μm .

3 Damping

Hydrostatic spindles demonstrate damping values that are higher than ball bearing spindles by several orders of magnitude. Hydrostatic bearings have no resonance frequency. This high level of damping results in minimal surface flaws, shape imperfections, and a significantly increased tool service life. Cutting performance is also increased since rattling is prevented.



4 Temperature behaviour

Friction in the hydrostatic bearings occurs in the hydrostatic fluid. The heat transfer to the components is minimal. As a result, heat transfer that is several times lower can be observed in the hydrostatic spindle.

5 Amortisation

Thanks to higher machine availability, reduced maintenance costs, lower tool costs and shorter processing times, but also thanks to higher workpiece precision, the slightly higher purchase costs for hydrostatic spindles are generally recouped within a short time.

HYPROSTATIK® System With PM Flow Controllers

There are big differences between hydrostatic spindles. This is particularly apparent with the type

of regulation of the oil flow into the bearing pockets. Conventional hydrostatic spindles use capillaries, i.e. fixed resistors or gap restrictors as a series resistor between the pump and pocket. These spindles have relatively low stiffness, high friction and a big oil flow, in other words, high power dissipation and/or cooling capacity. With capillary tube hydrostatic bearings, the load-bearing capacity decreases with increasing speed.

With spindles from Hyprostatik Schönfeld, the oil flows into the hydrostatic pockets is adjusted by means of PM flow controllers. The PM flow controller increases oil flow into the pocket at increased load and reduces oil flow into the pocket at reduced load. By this means, the hydrostatic bearings have achieved three to six times greater gap stiffness and reduced oil flow

and power dissipation. In addition, the load-bearing capacity at high speeds versus low speeds is not limited.

Alongside this, Hyprostatik has calculation programs that it has developed itself, with the aid of hydrostatic spindles that are optimally designed not only with respect to static but also dynamic loads. Thanks to the high stiffness and damping of spindle bearings from Hyprostatik Schönfeld, balancing qualities in the range of G0.04 are possible. Balancing qualities G0.1 are guaranteed (the smallest balancing quality according to standard is G0.4).

Hydrostatic spindles are supplied as a complete unit with a hydraulic power unit. They may be driven via a belt or coupling, but for optimum processing results, motor-driven spindles are the most suitable. Sealing occurs even at medium speeds by means of contact-free and wear-free labyrinth seals. These are supported by means of sealing air in such a way that the hydrostatic fluid is blown into the bearing, and soiling is blown out.

The axis of rotation may be arranged horizontally, vertically or swivelling. The spindle housing is either round, and flanged to a spindle holder, or square and fixed on a level surface. For tool-holding and workpiece spindles, standard geometries with the customarily used holding fixtures for tensioning means and/or tool holders are available. Customer-specific adaptations are possible. For automatic tool changing, use is frequently made of HSK interfaces. In the event of a power cut, the spindle is slowed down in just a few seconds by the drive motor. During this time, the hydrostatic bearings are supplied with oil from hydraulic accumulators. www.hyprostatik.de