

Thermal analysis of spindle and bearing

The heat source of spindle system is divided into two types: external heat source and internal heat source. The external heat source mainly refers to the heat transmitted by the surrounding environment through the convection of the air and the environmental heat sources, such as sunlight, lamps and lanterns, heaters and so on. In actual production, the external conditions are relatively stable, but in the long time continuous processing, such as day and night continuous processing, because of the large temperature difference, the thermal deformation of the spindle system can not be ignored. The internal heat source is mainly the heat generated by cutting heat and bearing friction for ordinary CNC machine tools. In recent years, with the continuous development of motorized spindle technology, more and more new CNC machine tools adopt high speed motorized spindle system. Compared with the old gear or belt drive, it has an unparalleled advantage, but at the same time, it also produces another spindle system heat source, one motor heating. The influence of the internal heat source on the spindle system is the heat generated by the numerical control machine which affects the main heat source of the spindle system as the friction of the spindle bearing.

During the working process of bearings, especially under the condition of positioning and pretightening, the heat output of bearings will increase sharply with the increase of spindle speed, which will cause the temperature of the bearing to increase obviously and cause thermal deformation, thus affecting the normal work of the bearing. It is very important for high-speed and precision bearings.

The calculation of the calorific value of bearings depends mainly on experimental and empirical formulas, while the heat generated by bearings is mainly the friction heat generated by rolling bodies and inner and outer rings. Therefore, the study of the friction torque of bearings is of great significance for more accurate calculation of the heat output of bearings. Because the motion relationship of bearing is very complicated, it is difficult to describe the friction torque accurately.

The moment of friction of ball bearings refers to the moment of resistance formed by various friction factors on the rotation of ball bearings, not only related to the parameters of bearing structure, size, geometric accuracy, material and heat treatment performance, but also related to parameters such as working load, assembly accuracy, lubrication conditions and environment. Cheng is complicated.