GF16S-25 CBN Small Crankshaft Grinder

The production volume of small eccentric shaft components for robots and compressors is expected to increase due to the decrease of workforce in the future. Based on the development concepts of "high-speed and high-accuracy grinding" and "machine size that matches with the workpiece size", this grinder will contribute to the productivity improvement of the small eccentric shaft components. High-speed and high-accuracy grinding which improves the productivity was achieved by making the wheelhead lighter and center of gravity lower, raising the follow-up performance of the wheelhead.

Feature

- High-speed and high-accuracy grinding
- Space-saving

Details

(1) Productivity improvement through high-speed and high-accuracy grinding

This grinder performs by synchronous control of the wheelhead feed (X axis) and workpiece rotation (C axis), making the wheelhead follow up the eccentric portion of a workpiece (**Fig. 1**). The wheelhead feed of this type of grinder requires follow-up performance of high-speed and high-accuracy. A static pressure slide and linear motor feed mechanism are adopted for this wheelhead feed. Furthermore, direct drive method is adopted for the grinding wheel spindle drive making the wheelhead to have lighter weight and lower center of gravity than the conventional belt method (**Fig. 2**). As a result, the pitching displacement of the wheelhead that affects the grinding accuracy (roundness) was reduced by approximately 46% than the conventional wheelhead (**Fig. 3**), the roundness of the eccentric portion was 1 μm or less (**Fig. 4**), and higher work spindle rotation and shorter cycle time were achieved through the improvement of wheelhead follow-up performance (**Fig. 5**).

Furthermore, by optimizing the wheel specifications and dressing conditions, surface roughness of 0.08 μmRa was achieved.

The TOYODA STAT BEARING® (fluid bearing) is adopted to the grinding wheel spindle of this grinder. The heat from the fluid bearing and driving motor of the grinding wheel spindle causes thermal displacement of the wheelhead which affects the grinding dimension accuracy. To reduce the heat generation, we optimized the bearing design through heat analysis and also adopted the motor cooling structure to block the heat flow. These measures reduced the temperature rise of the grinding wheel spindle by approximately 34% than the conventional one (**Fig. 6**) and achieved grinding dimensional variation within 2 μm.

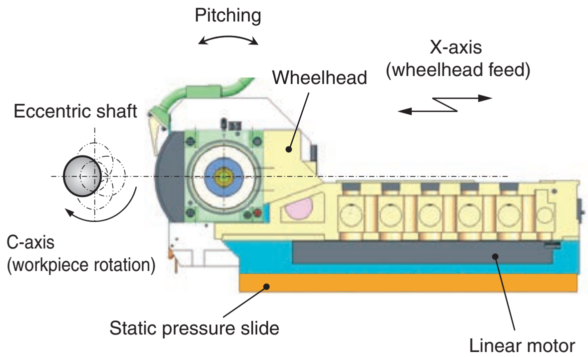

Fig. 1 Machine configuration

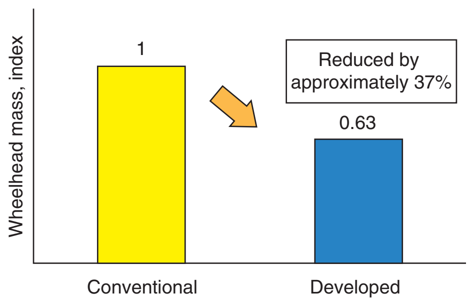

Fig. 2 Wheelhead mass

JTEKT CORPORATION

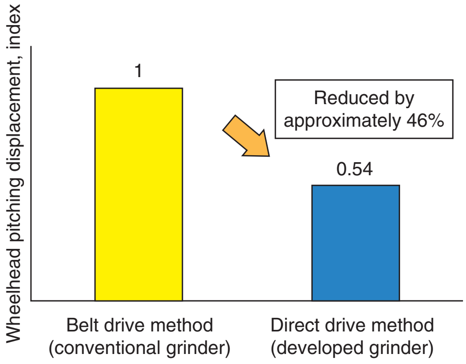

Fig. 3 Wheelhead pitching displacement

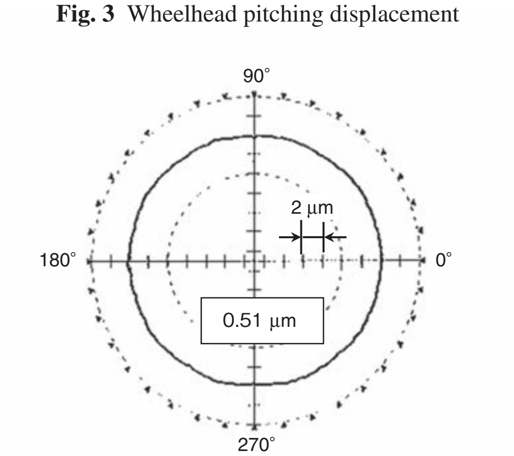

Fig. 4 Roundness

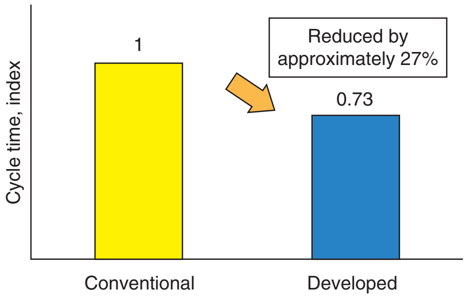

Fig. 5 Machining time

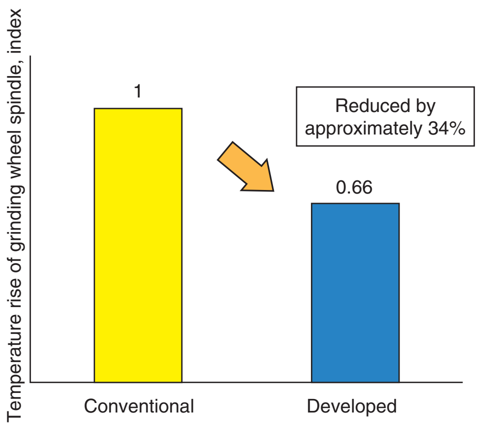

Fig. 6 Temperature rise of grinding wheel spindle

(2) Space-saving

Figure 7 shows the standard machine layout. Through downsizing of the main units (wheelhead, workhead, tailstock) and space-utilizing layouts of peripheral units (such as coolant tank), the floor space has been reduced by approximately 38% than the conventional grinders.

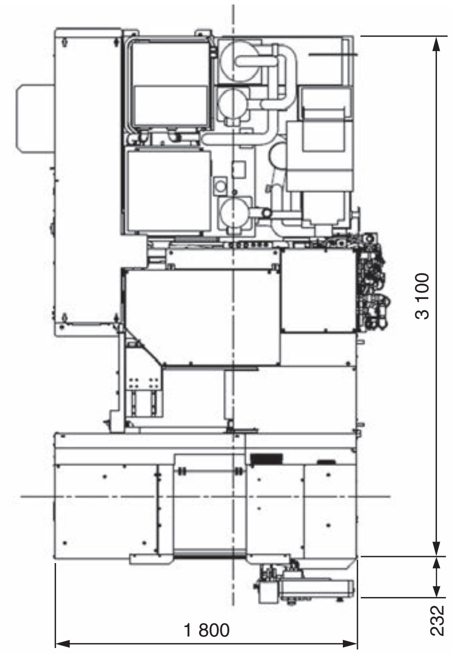

Fig. 7 Standard machine layout

(Machine Tools Development Dept., Machine Tools & Mechatronics Operations Headquarters)

JTEKT CORPORATION