

Technology Brief

Success Story

KBM™ BRUSHLESS MOTORS MAXIMIZE PERFORMANCE IN NEW MACHINE TOOL, A 6-AXIS, 5- LINKAGE NC CUTTER GRINDER

Direct drive technology is increasingly being applied in machine tool applications to meet the need for higher output, precision and dynamic performance. Particularly, direct drive torque motors can significantly improve overall machine tool performance while also lowering overall operating costs, simplifying machine designs and reducing service and maintenance requirements.

Direct drive motors couple directly to the load to eliminate mechanical transmissions such as gearboxes, worm gears and timing belts. This direct connection provides highly dynamic performance, eliminates transmission gaps and delays, and provides the very high rigidity required by the machine tool processing industry.



KBM™ Series Frameless Brushless Motors

Dalian Kede Numerical Control Co., Ltd. and Dalian Guangyang Science & Technology Engineering Co., Ltd., together with well-known domestic cutter manufacturers and universities, co-developed the machine tool. Their cylinder-shaped machine tool adopts a balanced symmetrical design that provides a highly stable structure with uniform distribution of the

thermal field. The pedestal is made of artificial stone materials to promote vibration damping, high precision, good shock absorption, high thermal stability and corrosion resistance.

The principal axis of the grinding wheel is driven by dual inline motors with perfectly matched drives. The B and C axis use the direct drive torque motors for transmissions. The B axis can rotate $\pm 360^\circ$ which substantially improves processing efficiency and reduces the repeated cutter clamping times. The machine tool can process many standard and non-standard cutters such as 2-8 blade straight shank milling cutter, ball end milling cutter, drill, subland drill, screw tap as well as excircle and punch pin grinding.

The machine tool utilizes an optical bus-type Numerical Control System provided by Dalian Guangyang, with grinding software independently developed by Dalian Guangyang. There are currently two international patents for the machine tool in China, Australia, USA, Japan and EU.

Their technical parameters:

- Maximum grinding wheel diameter: $\Phi 200\text{mm}$
- Maximum grinding diameter: $\Phi 220\text{mm}$
- Maximum grinding length: 300mm
- X/Y/Z/B axis traverse: 460/250/300mm/ $\pm 360^\circ$
- Linear axis rapid traverse speed: 20m/min

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KBM™ Brushless Motors Maximize Performance

- Linear axis positioning precision: 0.003mm
- Linear axis repositioning precision: 0.0015mm (high precision)
- Maximum speed of the grinding wheel principal axis: 8000 rpm
- Maximum torque: 108 Nm
- Maximum power: 45Kw
- Maximum speed of the B axis: 100 rpm
- Maximum torque: 1200Nm
- Maximum speed of the C axis: 1000 rpm
- Maximum torque: 218 Nm
- Number of the controlled axis: 6-axis, 5-linkage
- Numerical control system: Dalian Guangyang GNC09/GNC60 optical bus-type high-end numerical control system
- Grinding software: Dalian Guangyang GTOOL Cutter Grinding Software System

Cutter Grinder

Increasing market demands for large quantities of various types of hard alloy cutters and high-precision grinding have encouraged the development of high-precision numerical control multi-axis linkage tool grinders, as well as the constant development of greater machine tool functions and performance that generally adopt advanced modular designs which include state of the art electrical control software systems, precision guide rail and lead screw motion systems, precision grating and servomotor feedback positioning systems, etc.

Applying Kollmorgen KBM™ Motors in the Model

In recent years, compact direct drive motors have been increasingly used in the principal axis of grinding wheels and work pieces. Utilizing [direct drive motors](#) in the principle axis eliminates the expensive precision worm gear system, saves installation space and guarantees system precision, stability and balance.

After determining in the early stages of machine development that direct drive motors were the best option, and determining the installation method, selecting the water-cooling material and performing an efficiency analysis, [Kollmorgen KBM™ Series Frameless Motors](#) were chosen which use the latest direct drive technology and feature:

- Fully encapsulated stator windings
- 155C internal winding temperature sustainability
- PTC thermistor (avalanche-type) overload protection
- Rare earth neodymium-iron-boron magnets

- Fail-safe bands over rotor magnets, RoHS compliant
- UL recognition, CE compliant
- Customizable rotor hub dimensions

There are obvious advantages for selecting KBM torque motors: little maintenance work, low maintenance cost, short downtime, long service life – in fact at least 10% longer than mechanical transmission devices such as a gearbox and timing belt system.

They also deliver extremely high-performance in a compact, footprint, enabling us to reduce the size of our machine and improve its performance.

In addition, these motors can drive high inertial loads with high inertial ratio between the driving rotors and loads and provide highly dynamic performance, very short acceleration time and deceleration time, all of which can further substantially improve machine performance.

In the 1950's, Kollmorgen, partnered with MIT (Massachusetts Institute of Technology) to develop the first direct drive torque motor in the world.

Over the past 70 years, Kollmorgen has applied all of its electromagnetic and electromechanical design experiences to perfecting their brushless permanent magnet direct drive motors, and has developed various ranges of high-performance maintenance-free direct drive rotary motors and linear motors to satisfy a wide range of performance needs.



Application of Kollmorgen KBM™ Motors in the Machine Tool Cutting Grinder

Being the first of its kind in China, this machine tool model has attracted wide industry attention starting with the 2011 Beijing Machine Tool Exhibition, and continues to receive significant attention from the marketplace.

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KBM™ Brushless Motors Maximize Performance

Because Motion Matters™

ABOUT KOLLMORGEN

Kollmorgen is a leading provider of motion systems and components for machine builders around the globe, with over 70 years of motion control design and application expertise.

Through world-class knowledge in motion, industry-leading quality and deep expertise in linking and integrating standard and custom products, Kollmorgen delivers breakthrough solutions unmatched in performance, reliability and ease-of-use, giving machine builders an irrefutable marketplace advantage.

For more information visit www.kollmorgen.com, email support@kollmorgen.com or call 1-540-633-3534.