

# Complexity Without Compromise

Five-axis machining provides high-speed, high-accuracy for the future of part design

Matthew Jaster, Director, Editorial Content

There's a growing list of challenges facing manufacturers today that goes beyond supply chain, energy and workforce obstacles. Many machinists and engineers cite customer requests for shorter lead times, tighter tolerances and improved part quality as imperative to future success. Unfortunately, many standard machine tools lack the necessary functions and capabilities to overcome uneven tool paths, complex surface geometries and long machining times.

Here's where 5-axis machining provides an excellent option for complex parts. When a part requires multiple setups machine operators prefer less handling, fewer errors and better surface finishes. Quality and efficiency are also critical to get the best return on your machine investment. As gear manufacturers continue to diversify their product portfolios, there's a growing need for precision that outperforms traditional machining methods. Here's a rundown of some reliable and efficient 5-axis machine tools today. Some are new in 2026; others have been around for years and come highly recommended by machinists for their reliability and production capabilities.

## DMG Mori Introduces Enhanced DMU 65 H monoBLOCK2



Applications for the DMU 65 H monoBLOCK2 include workpieces on high clamping towers, complex 5-axis geometries, and reliable deep hole drilling. (Image: DMG Mori)

Horizontal machining centers impress with their performance, stability, and process reliability—reasons for the continued popularity of the DMU H series from DMG Mori. The machine tool manufacturer presented the enhanced machine at its open house in Pfronten, Germany earlier this year. The powerful, efficient, and universal 5-axis horizontal machining center

creates all the conditions necessary for successful Machining Transformation (MX). Process integration, flexible automation solutions, and digital tools ensure efficient and resource-saving production. This benefits industries such as die and mold, aerospace, and general mechanical engineering applications.

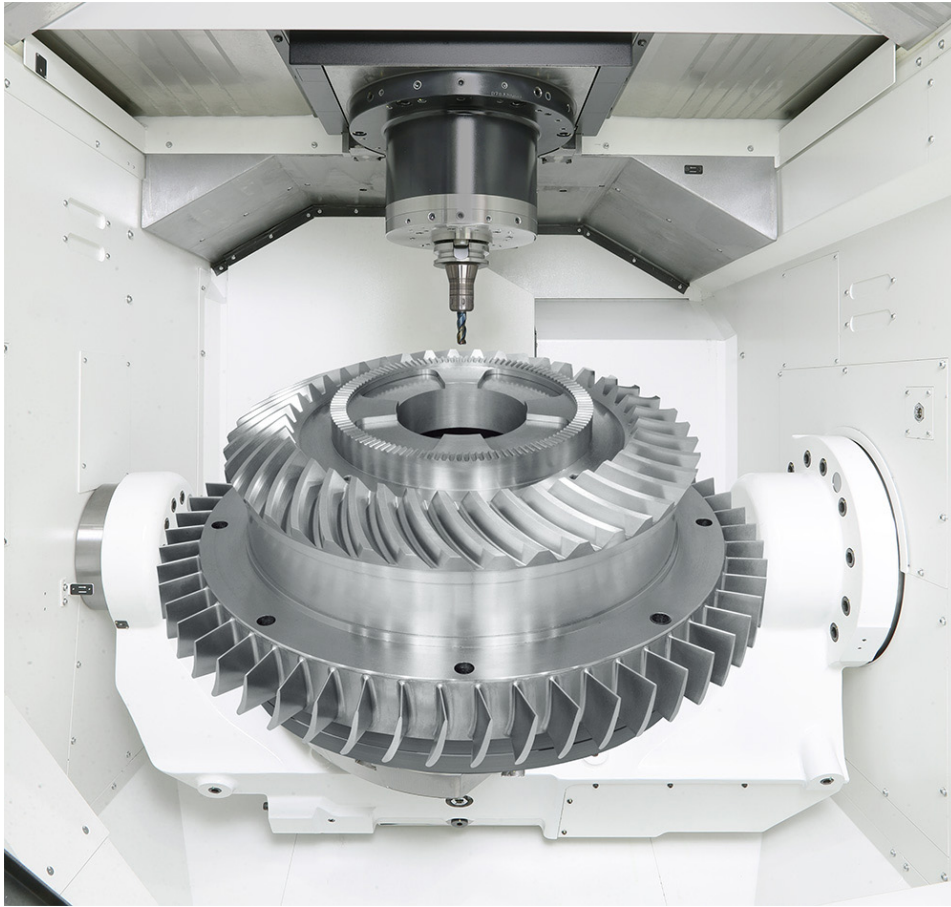
The rigid cast iron machine bed with 3-point support and three guides in the  $x$ -axis provides the DMU 65 H monoBLOCK 2 with an optimal basis for powerful heavy-duty machining. Together with the thermos-symmetrical design and extensive cooling measures, it achieves a continuous accuracy of up to  $5\ \mu\text{m}$  even in the standard version. The robust moving column design with low moving masses ensures high dynamics with acceleration of up to  $8.5\ \text{m/s}^2$ . The large working area allows for a wide range of machining operations. The application spectrum includes workpieces on high clamping towers, complex 5-axis geometries, and reliable deep hole drilling. The E-Pallet further supports the variety of machining operations. The smart interface provides power for fully electric clamping devices and sensors as well as hydraulics and pneumatics. This upgrades the classic machine table and enables the use of smart clamping devices and intelligent software. Due to the horizontal design, machining benefits from optimal chip removal and good heat dissipation, resulting in maximum process reliability.

The double-sided swivel rotary table is designed for components up to  $\varnothing 840 \times 770\ \text{mm}$  and 600 kg and allows flexible machining of workpieces—up to 5-in-1 process integration of milling, turning, grinding, measuring, and gear cutting. The wheel magazine has space for up to 453 tools with a maximum length of 650 mm, a diameter of  $\varnothing 280\ \text{mm}$ , and a mass of 22 kg. The spindle range offers variants up to 30,000 rpm as well as options for powerful machining with 288 Nm and HSK-A 100 tool holders.

[us.dmgmori.com](http://us.dmgmori.com)

## Mazak Offers Latest Variaxis Machine Models

The next generation Variaxis i-700 NEO Vertical Machining Center provides advanced multi-surface, 5-axis machining for parts with complex profiled surfaces. The machine handles parts up to 33.46 in. dia. and 19.69 in. high. A 40-taper spindle with compact nose design increases  $z$ -axis stroke while a rotary/tilt table with roller gear cam technology eliminates backlash.



*The Variaxis series offers a wide range of automation and tooling options. (Image: Mazak)*

The Variaxis i NEO series uses AI to detect milling spindle vibration and adjust machining conditions automatically to produce unsurpassed surface finishes and high productivity. With the AI, even a less-skilled operator can make adjustments easily in a short time.

Setup can optionally be supported with hydraulic fixtures that enable clamping/unclamping of the workpiece. The number of ports can be up to nine ports for the single table version, four ports inside the machine and eight ports on the workpiece setup station for the two-pallet changer version. Pneumatic fixtures are also available.

The pallet changer option provides rapid workpiece change-over for continuous machining operation. To achieve higher productivity, the next workpiece can be set up while the current operation is being machined. The two-pallet changer offers a compact design and is suitable for mass production.

Two Variaxis machine models, the Variaxis C-700 and Variaxis i-800T, will represent Mazak's vertical machining center technology at IMTS 2026. Both machines are solid first steps into 5-axis machining for shops and are highly capable machines with versatile sheet-metal enclosures ready for a comprehensive range of automation solutions. Mazak offers several spindle options for the machines to help shops find the ideal balance of speed and power. Furthermore, the "T" model of the Variaxis i-Series machines features turning capability on their tilt/rotary table.



*The new Variaxis i-800 Neo offers faster machining cycle times, expanded workpiece capacities and more automation options. (Image: Mazak)*

The new Variaxis i-800 Neo offers faster machining cycle times, expanded workpiece capacities and more automation options. When it comes to speed, the machine now achieves rapid traverse rates of 1,890 ipm (48 m/m) in the *x*, *y* and *z* axes that contribute significantly to reduced cycle times.

In addition to speed, the Variaxis i-800 Neo boasts an all new two-pallet changer that incorporates a four-cone clamping system for higher precision and speed. Beyond that, the Mazak Multi-Pallet Pool (MPP) compact multiple pallet stocker system and modular Mazak Palletech System both take the machine to entirely new levels of automation flexibility.

New with the Variaxis i-800 Neo is the Mazatrol SmoothAi CNC, with *Smooth Project Manager Gateway* software as an available option. In conjunction with external CAM software such as *Autodesk's Fusion 360*, this software provides access to internal machine data, which enables the *Fusion 360* programmer to query the machine for machine models, current tooling configuration, offset data, stroke limits and many other configuration parameters. This information can then be used at the CAM workstation to create more accurate machine programs configured to the limits and capabilities of the actual machine.

[mazak.com](http://mazak.com)

## Heavy-Duty Cutting with the Okuma MU-5000V

The Okuma Universal Center MU-V series provides the power of process-intensive machining and high-speed,

high-accuracy cutting through the combination of turning and 5-axis multitasking machining. The fast yet powerful trunnion table allows simultaneous 5-axis machining and one-chuck multi-sided machining of complex shapes. This machine tool is ideal for die and mold shops and highly complex aerospace components.

The MU-5000V 5-axis vertical machining center achieves high efficiency and high productivity in 5-axis, multi-sided machining. This CNC vertical machining center's highly rigid and accurate double-column structure and low center of gravity in workpiece movement (trunnion table) enable both heavy-duty cutting and high-speed finishing.

The MU-5000V can easily be adapted for use with APC, multiple ATC, automation, or FMS without compromising operability because this expansion takes place at the back of the machine. Built on a thermo-friendly structure, this machine will perform consistently from the first part to the last, regardless of warm-up time or ambient temperature. The larger MU-6300V of this series was honored with several awards.

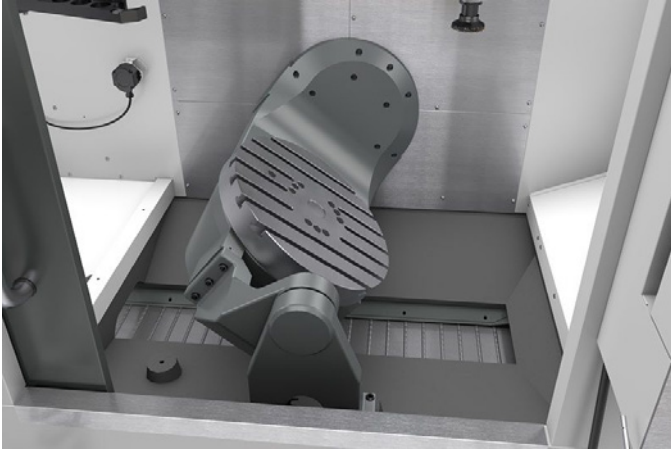
With the option to factory integrate any automatic pallet changer to these machining centers, this automation category delivers flexibility and productivity with as many pallets as you need. The pallet changer enables continuous production and spindle uptime with automated loading and unloading, increased hours of unattended machining, storage areas for finished parts and the pallet changers are supported by Okuma Factory Automation 24/7/365.

[okuma.com](http://okuma.com)



*The MU-5000V 5-axis vertical machining center achieves high efficiency and high productivity in 5-axis, multi-sided machining. (Image: Okuma)*

## The Haas UMC-750 Increases Accuracy and Part Capacity



The trunnion provides +120 and -35 degrees of tilt and 360 degrees of rotation to provide excellent tool clearance and large part capacity. (Image: Haas)

5-axis machining is an effective means to reduce setups and increase accuracy for multi-sided and complex parts. The Haas UMC Series universal machining centers are cost-effective solutions for 3+2 machining and simultaneous 5-axis machining. The UMC-750 has an integrated dual-axis trunnion table with a 500 mm diameter platter that features standard T-slots and a precision pilot bore for fixturing versatility. The trunnion

provides +120 and -35 degrees of tilt and 360 degrees of rotation to provide excellent tool clearance and large part capacity.

The Haas Pallet Pool family increases spindle run time, and allows for unattended automation, so machinists can run more parts. Offering up to 20+1 pallets, the pallet pool systems boost throughput and are available on a wide range of Haas machining centers.

The Haas-designed 120+1 side mount tool changer holds 120 tools, plus one in the spindle, providing plenty of locations for back-up tooling, or setting up tools for multiple jobs. It is the perfect choice for high-volume production, or for unattended, lights-out operation with a pallet pool, cobot, or robot. A remote load station with automatic lockout function allows tool inspection, loading, and unloading while the machine is cutting, simplifying tool maintenance, and eliminating the need to load tools through the spindle.

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