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Okuma Corporation
Manufacturing Research Dept.

5-axis machining center that “achieves both high accuracy and decarbonization (energy saving)”

GENOS M560V-5AX

Okuma Corporation has developed the **GENOS M560V-5AX**, 5-axis machining center with a ϕ500 mm table.
We have developed the compact and easy-to-use GENOS M560V-5AX, which unprecedently “achieves both high accuracy and decarbonization (energy saving)”, for the European and U.S. markets, where demand for decarbonization and process intensive machining is high. This model will make high-accuracy 5-axis machining easier than ever. The highly accurate process intensive machining through its one-chucking and multi-sided machining will help to improve our customers' productivity and profitability.

Background

The Russia-Ukraine crisis, the increased friction between the U.S. and China, the acceleration of inflation around the world, and other factors have disrupted the global economy. Despite these issues, growth markets, centering on the semiconductor manufacturing equipment market and including the energy and EV sectors, are strong, and the aerospace sector is recovering. Not only these sectors but the monozukuri industry as a whole will increase demand for lower cost, shorter delivery time, and higher quality.

At the same time, both domestic and foreign manufacturing sites are finding it extremely difficult to secure skilled workers. Moreover, the trend toward decarbonization is driving up energy prices, which are steadily spreading to small and medium-sized enterprises.

Because the monozukuri industry is confronted with these societal issues, there is a demand for 5-axis machining centers that fully utilizes the advantages of 5-axis machining, achieves high productivity with the lowest possible cost, has the smallest possible installation space, and makes it easy for operators to “achieve both high accuracy and decarbonization (energy saving)”.

Development Goals

The newly developed GENOS M560V-5AX “achieves both high accuracy and decarbonization (energy saving)” while maintaining the ease of use of the GENOS series. It is more compact than other 5-axis machining centers in its class, and has a large machining area and high machining capacity. For this purpose, the model is equipped with advanced intelligent technology and energy-saving technology are its standard features.

To make this model a 5-axis machining center that improves productivity, meets decarbonization needs, and makes it easy to introduce even for customers who are integrating their processes with 5-axis machining for the first time, it has been developed along the following concepts:

(1) Achieve both high-accuracy 5-axis machining and decarbonization (energy saving). Support factory decarbonization.

(2) A large machining area capable of handling a wide variety of workpieces with the smallest possible floor space.

(3) High machining capacity and highly rigid machine construction to achieve highly efficient production.

(4) Made to be as easy to use as possible to minimize the burden on operators.

Features and Realized Technologies

(1) Achieve both high-accuracy 5-axis machining and decarbonization (energy saving). Support factory decarbonization.

- The **"Thermo-Friendly Concept"**, an intelligent technology that allows machines to autonomously and stably maintain high accuracy.

  In addition, the energy-saving technology **"ECO suite plus"** that applies the Thermo-Friendly Concept is also a standard feature.

- A high dimensional stability is demonstrated without the need for machine cooling systems or excessive air conditioning control.

  Operating time needed for warming-up and dimensional compensation is greatly reduced, thereby reducing power consumption.

  Both high-accuracy 5-axis machining and reduction of CO_2 emissions are achieved to provide strong support for the decarbonization of factories.

- A "Sludgeless Tank" (optional) that dramatically reduces the frequency of coolant tank cleaning.

  The flow of coolant in the tank is controlled to prevent sedimentation so that the sludge in the coolant is automatically and efficiently recovered.

  Sludge recovery rate 96% (actual value when the material is aluminum)

  No cleaning of the coolant tank for 3 years, no replacing the coolant for 3 years (actual figures from our in-house machines)

  The conventional need for stopping machines and manually cleaning the tanks is dramatically reduced.

- Stabilization of accuracy has been achieved on 5-axis machining centers, which are generally considered difficult to stabilize accuracy.

  "5-Axis Auto Tuning System (Europe and U.S standard kit)" allows the user to derive the accuracy of 5-axis machining centers to the utmost in less than 10 minutes.

(2) A large machining area capable of handling a variety of workpieces with the smallest possible floor space

- A compact machine supporting a maximum workpiece diameter of **ϕ700 mm** that can be installed in most spaces.

  Only requires **8.2 m²** of floor area (**down 25%** from conventional models)

  The space required is similar to that of a vertical machining center, so that even small and medium-sized factories can install it easily.

- Has the largest machining area in its class that can handle workpieces with a maximum diameter of ϕ700 mm with ease.

X-axis travel: **1,050 mm**, Y-axis travel: **560 mm**, Z-axis travel: **460 mm**

(3) High machining capacity and high-rigidity machine construction that makes highly efficient production possible

- Capable of heavy machining of a wide variety of materials and has a powerful standard spindle that reduces machining time.

  Maximum spindle speed **15,000 min^{-1}**, maximum output **22 kW**

  Maximum cutting capacity **672 cm^3/min**
  (Material to be cut: S45C steel, end mill machining)

- Highly rigid machine construction has been adopted to stably support heavy cutting loads.

  Highly rigid double-column construction adopted from proven double-column machining centers.

  A high-rigidity trunnion table supported on both ends provides strong support for workpieces up to a maximum of **400 kg**.

(4) Made to be as easy to use as possible to minimize the burden on operators.

- 5-axis machining with the same ease of use as a vertical machining center.

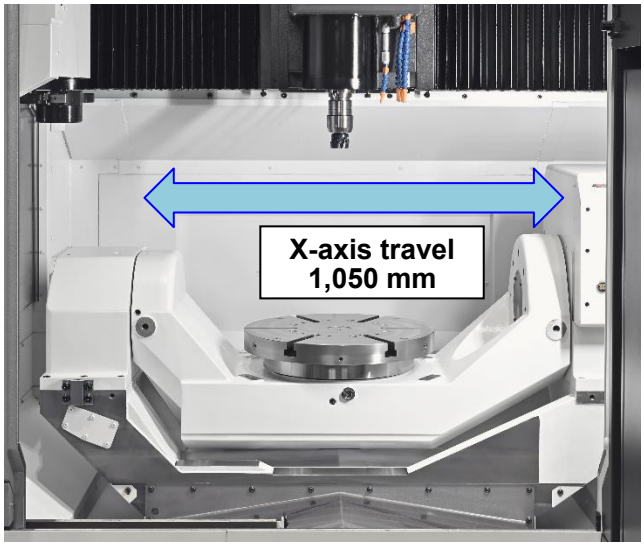
  A highly visible trunnion table that makes it easy to see workpieces while they are being machined.

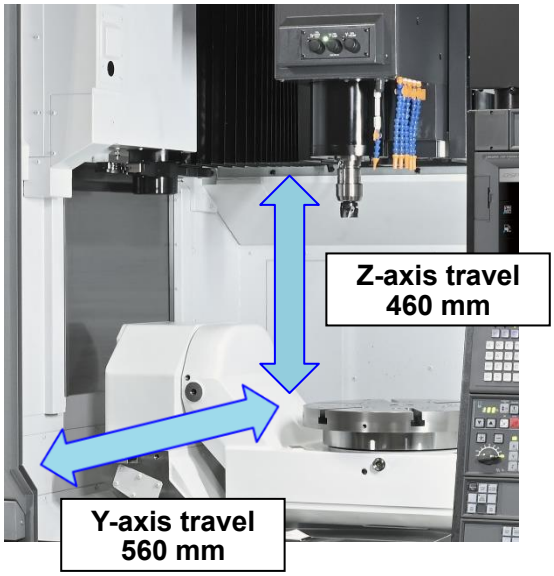
- A user-friendly machine construction that allows comfortable setup work.

  Good approachability that makes it easy to reach tables.

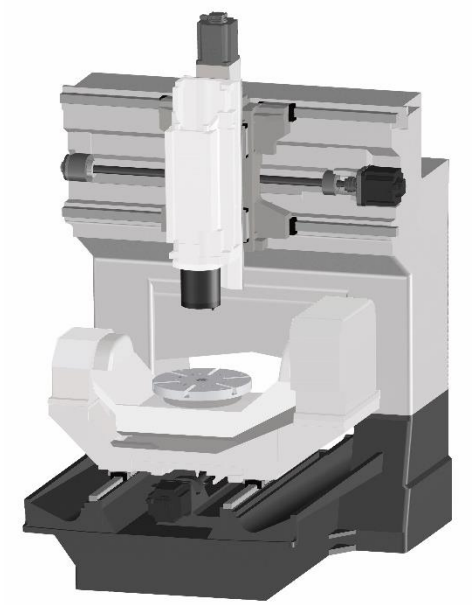
  The distance from the front of the machine to the center of the table is **495 mm**.

[Large machining area]



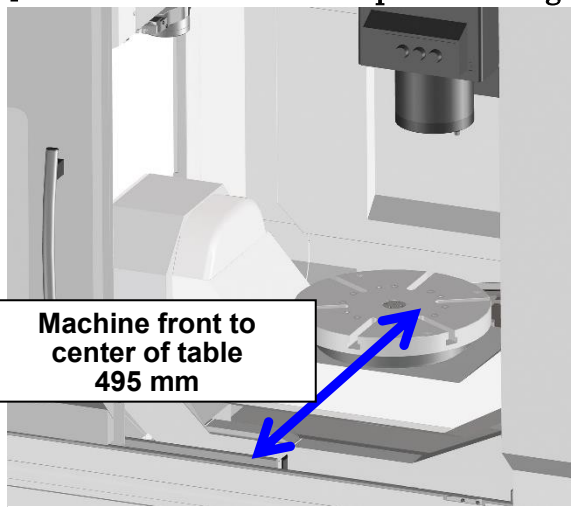


[High-rigidity construction]

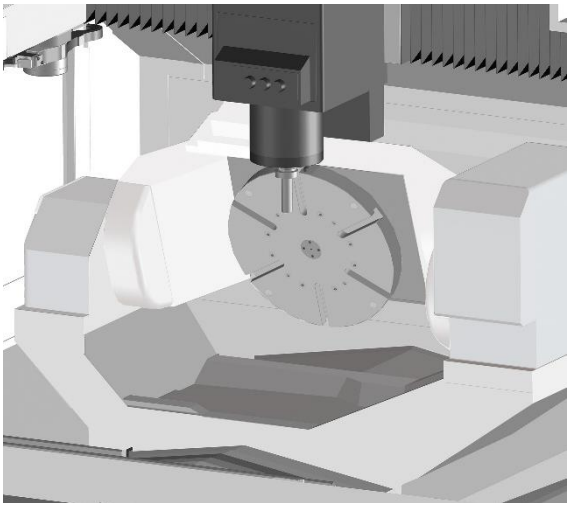


High-rigidity double-column construction, which has proven results in double-column machining centers

[Ease-of-use minimizes operator fatigue]



Easy access to the table



Good visibility even during machining

[Product specifications] [ ] indicates optional specifications.

Item		GENOS M560V-5AX
Travel	X-axis travel	1,050 mm
	Y-axis travel	560 mm
	Z-axis travel	460 mm
	A-axis travel	+20 to –110 degrees
	C-axis travel	360 degrees
Table	Table dimensions	ϕ500 mm
	Maximum workpiece dimensions	ϕ700 × H500 mm
	Maximum loading mass	400 kg
Spindle	Maximum rotation speed	15,000 min^{-1}
	Maximum output	22/18.5 kW (10 min/cont)
	Maximum torque	199/146 N·m (5 min/cont)
	Tapered holes	7/24 taper No.40
Feed rate	Rapid feed rate	X-axis: 40 m/min; Y-axis: 40 m/min; Z-axis: 32 m/min
		A-axis: 14,440 degrees/min (40 min^{-1}) C-axis: 18,000 degrees/min (50 min^{-1})
ATC	Tool storage capacity	48 tools [32 tools, 60 tools]
	Maximum tool diameter	ϕ125 mm (with adjacent tools: ϕ90 mm)
	Maximum tool length	300 mm
	Maximum tool mass	8 kg
Machine size	Machine height	3,045 mm
	Required floor size (Width x Depth)	2,515 × 3,263 mm (tool storage capacity: 32, 48 tools) [2,515 × 3,750 mm (tool storage capacity: 60 tools)]
	Machine mass	10,000 kg

End