AW MILLER
TECHNICAL SALES, INC.

EAST AURORA, NY 716.652.8282 | HARMONY, PA 724.453.1690 | STE-LAURENT, QC 514.333.9174 | HARLEYSVILLE, PA 215.256.8281

Mazak

VARIAXIS i

SERIES

VARIAXIS i SERIES

Manufacturing innovation - a 5-axis machining center with AI, digital twin and automation

Shown with optional equipment

VARIAXIS i-600

2-pallet changer
Shown with optional equipment

VARIAXIS i-700

The transformation of production processes utilizing data and digital technology is progressing rapidly in the manufacturing sector.
Mazak's new VARIAXIS i series has been developed to take a production site to the next level.
The evolution of 5-axis machining center provides highly efficient digital manufacturing solutions that incorporate AI and digital twin technology to respond quickly to ever-changing production demands.

MAZATROL SmoothAi

Shown with optional MAZATROL SmoothAi dual monitor

Ai

- Optimum compensation for vibration control and heat displacement control by AI analysis
- Stable high accuracy and high quality machining

Digital Twin

- MAZATROL TWINS software utilizing digital twin technology replicates digital screen in office set-up
- Provides a reduced set-up time for machines and improves the efficiency of machining the initial product and prototype

MPP (18PC)
VARIAXIS i-600

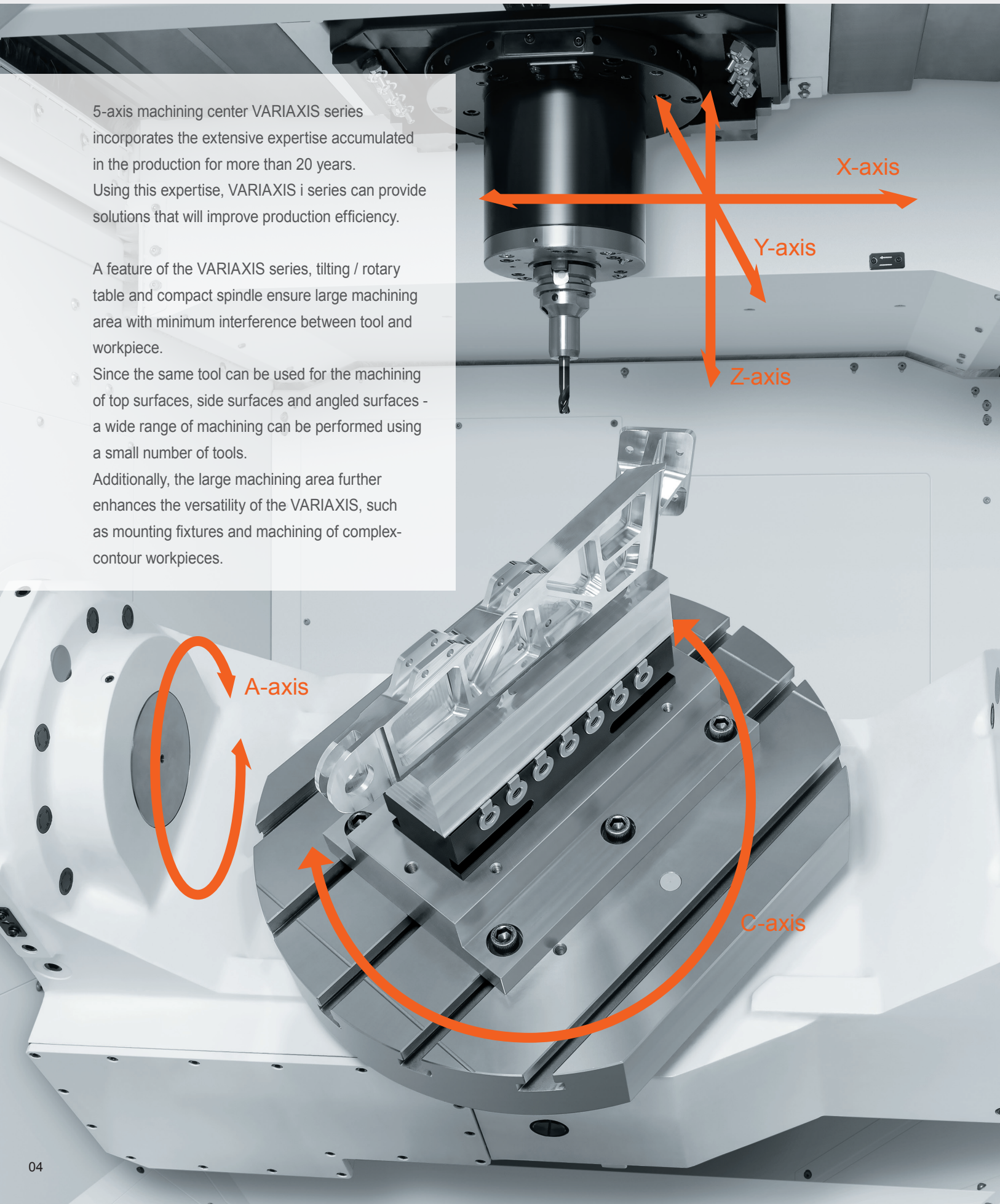
Automation

- Wide variety of automation equipment available - such as a 2-pallet changer, MPP (MULTI PALLET POOL) , modular PALLETECH flexible manufacturing system and a robot system

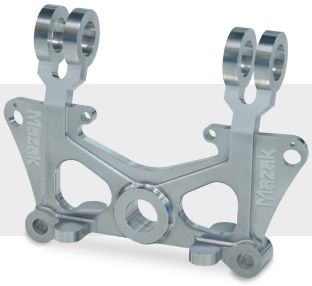
Applications

5-axis machining center VARIAXIS series incorporates the extensive expertise accumulated in the production for more than 20 years.
Using this expertise, VARIAXIS i series can provide solutions that will improve production efficiency.

A feature of the VARIAXIS series, tilting / rotary table and compact spindle ensure large machining area with minimum interference between tool and workpiece.
Since the same tool can be used for the machining of top surfaces, side surfaces and angled surfaces - a wide range of machining can be performed using a small number of tools.
Additionally, the large machining area further enhances the versatility of the VARIAXIS, such as mounting fixtures and machining of complex-contour workpieces.



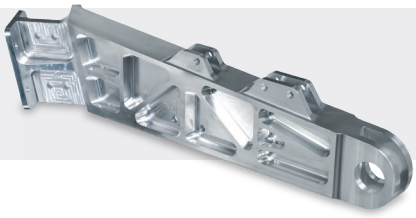
Extensive machining applications by VARIAXIS i series



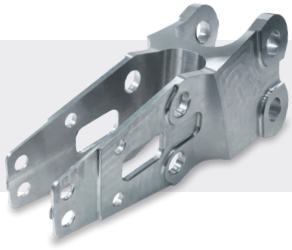
Aerospace component
Joint

Automotive component
Control arm

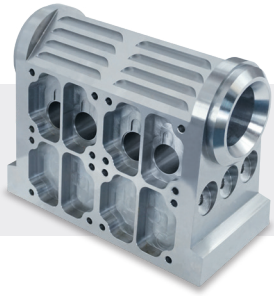
Aerospace component
Impeller



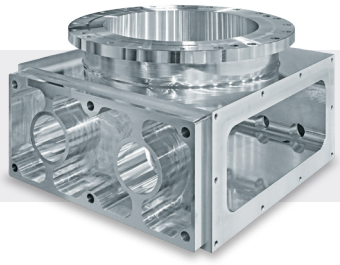
Aerospace component
Arm fitting



Aerospace component
Blade grip

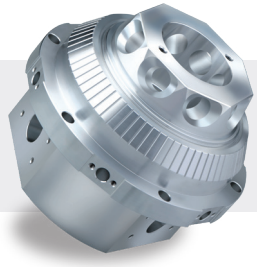


Industrial machinery
Industrial camera body

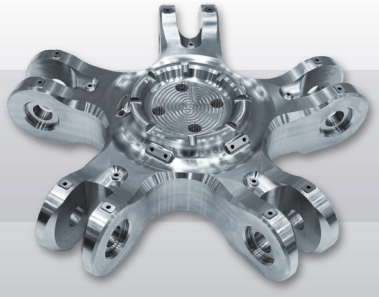


Semiconductor production equipment
Vacuum chamber

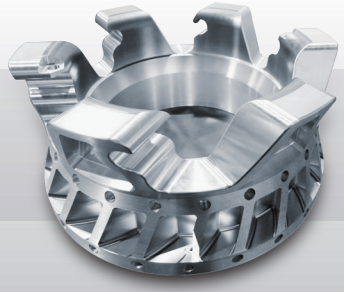
Construction machinery component
Housing



Industrial machinery
Optical device component



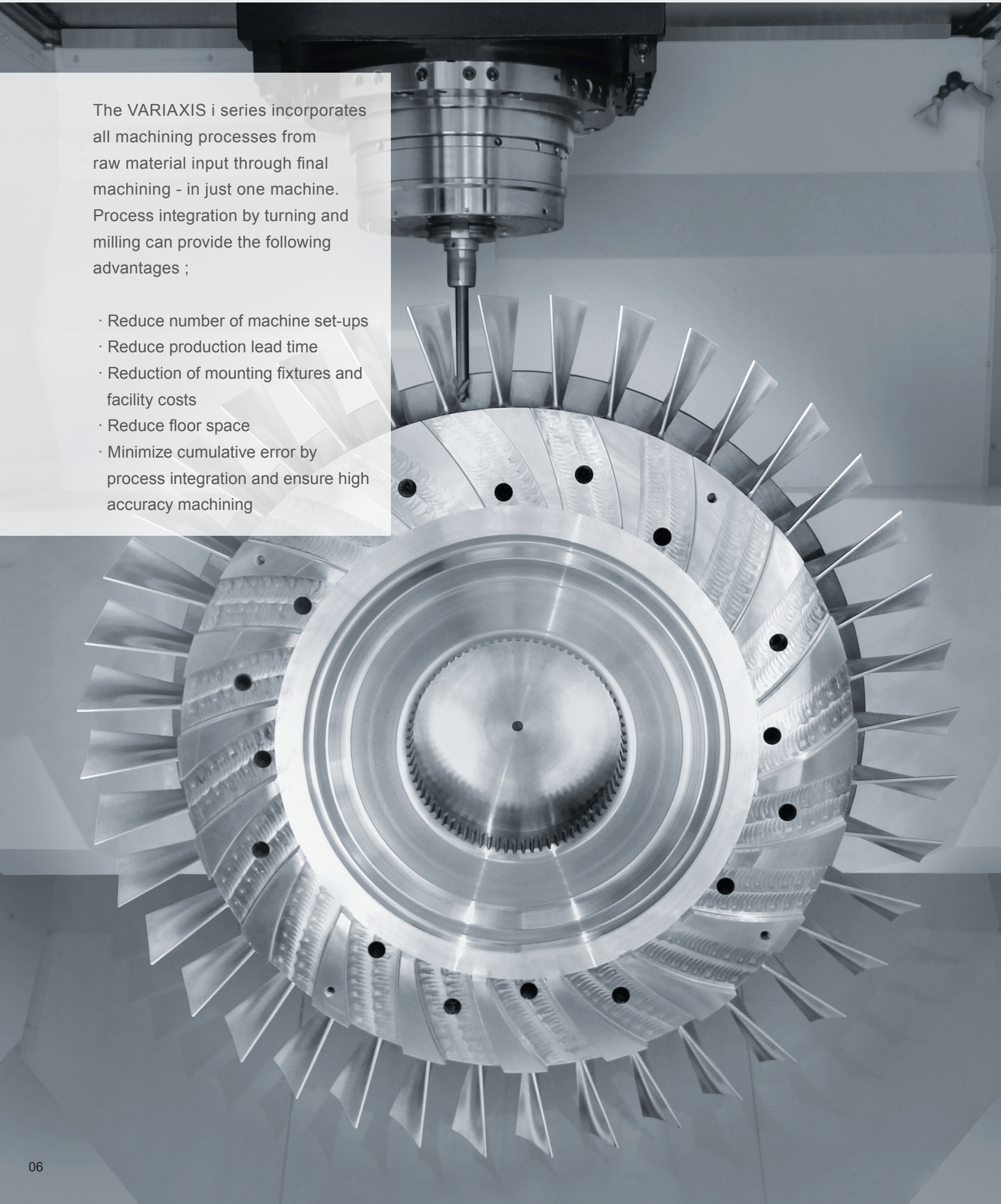
Aerospace component
Helicopter flapping hinge



Aerospace component
Engine case

Aerospace component
Blisk

Process Integration



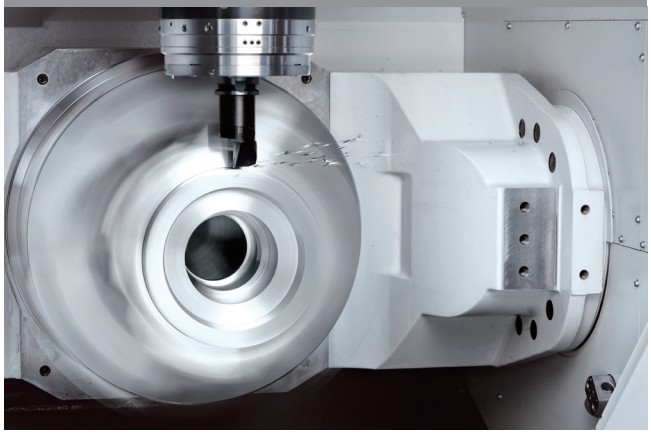
The VARIAXIS i series incorporates all machining processes from raw material input through final machining - in just one machine. Process integration by turning and milling can provide the following advantages ;

- Reduce number of machine set-ups
- Reduce production lead time
- Reduction of mounting fixtures and facility costs
- Reduce floor space
- Minimize cumulative error by process integration and ensure high accuracy machining

Process integration by VARIAXIS i-T series with turning capability

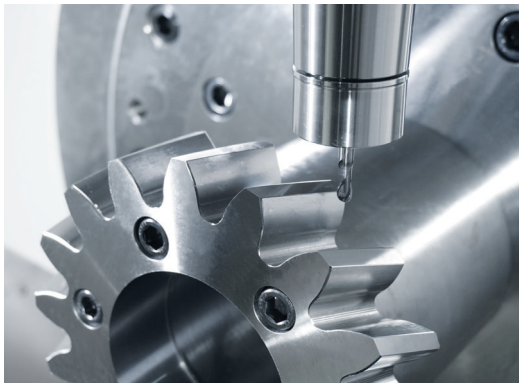
VARIAXIS i series performs all machining process from turning to milling in just one machine for continuous machining in a single setup.

Facing O.D and side surface machining



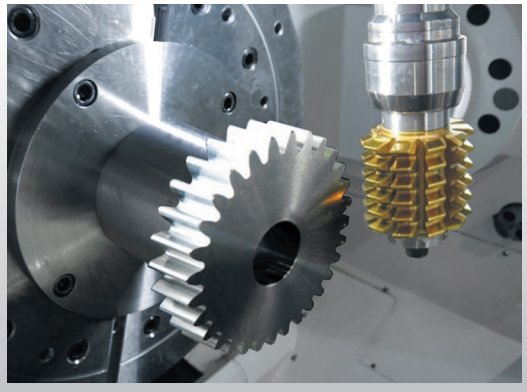
Boring O.D / I.D and side surface machining

Additional process integration - Gear machining



Smooth Gear Milling

Thanks to conversational input, gear machining programs can be easily made without expensive CAD / CAM software. Gear machining can be performed with standard endmills, expensive gear tooling is not required. Machining time and cost are considerably reduced for the production of gears in small size lots.



Smooth Gear Hobbing

By the simultaneous control of the tool axis and workpiece axis rotation, gear hobbing can be performed. Gear hobbing programs are quickly and easily made by conversational programming.

Extensive Series Range

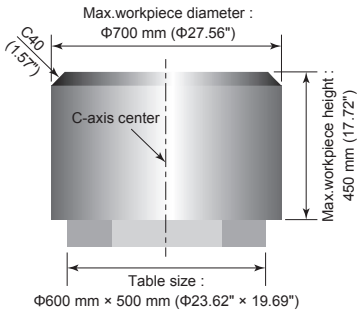
6 machine models available to meet a wide variety of machining requirements

5-axis machining center for process integration and higher productivity

VARIAXIS i-600

Travel
X-axis : 510 mm (20.08")
Y-axis : 910 mm (35.83")
Z-axis : 510 mm (20.08")
A-axis : -120° ~ + 30°
(table tilt)
C-axis : ±360° (table rotation)

Max.load : 500 kg (1102 lbs)

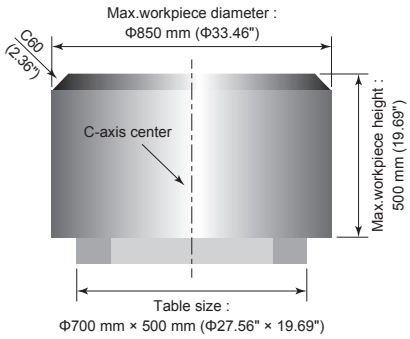


5-axis machining center for process integration and higher productivity

VARIAXIS i-700

Travel
X-axis : 630 mm (24.80")
Y-axis : 1100 mm (43.31")
Z-axis : 600 mm (23.62")
A-axis : -120° ~ + 30°
(table tilt)
C-axis : ±360° (table rotation)

Max.load : 700 kg (1543 lbs)

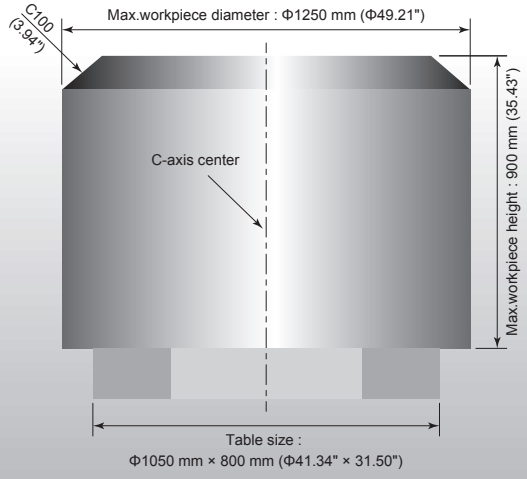


No. 50 taper spindle for large / heavy workpieces

VARIAXIS i-1050

Travel
X-axis : 1200 mm (47.24")
Y-axis : 1385 mm (54.53")
Z-axis : 900 mm (35.43")
A-axis : -150° ~ + 130°
(table tilt)
C-axis : ±360° (table rotation)

Max.load : 2000 kg (4409 lbs)



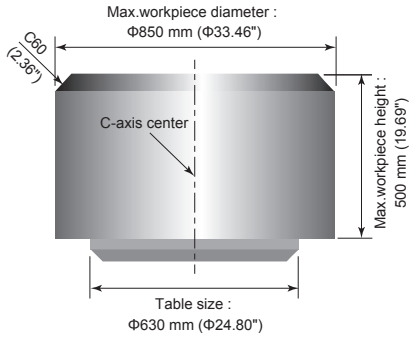
5-axis machining center with turning capability for process integration

Turning capability for additional process integration

VARIAXIS i -700T

Travel
X-axis : 630 mm (24.80")
Y-axis : 1100 mm (43.31")
Z-axis : 600 mm (23.62")
A-axis : -120° ~ + 30°
(table tilt)
C-axis : ±360° (table rotation)

Max.load : 700 kg (1543 lbs)

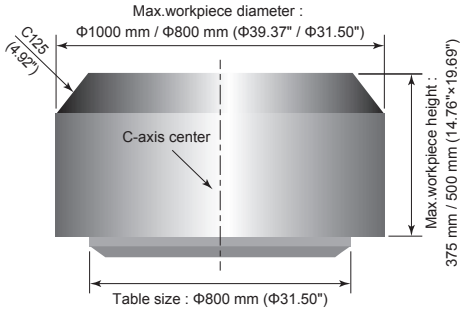


5-axis machining center with No. 50 taper spindle plus turning

VARIAXIS i -800T

Travel
X-axis : 730 mm (28.74")
Y-axis : 850 mm (33.46")
Z-axis : 560 mm (22.05")
A-axis : -130° ~ + 30°
(table tilt)
C-axis : ±360° (table rotation)

Max.load : 1000 kg (2205 lbs)

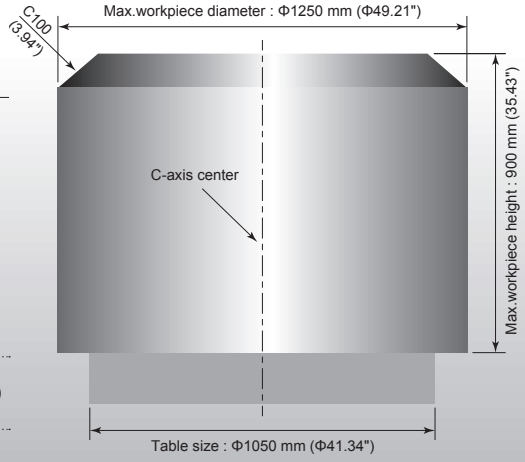


No. 50 taper spindle for large / heavy workpieces with turning requirements

VARIAXIS i -1050T

Travel
X-axis : 1200 mm (47.24")
Y-axis : 1385 mm (54.53")
Z-axis : 900 mm (35.43")
A-axis : -150° ~ + 130°
(table tilt)
C-axis : ±360° (table rotation)

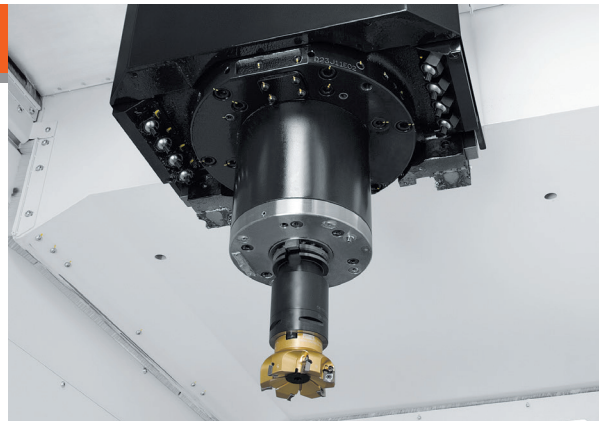
Max.load : 2000 kg (4409 lbs)



Higher Productivity

Spindle specifications to meet a wide variety of machining requirements

The high rigidity spindle can perform heavy duty machining of steel as well as high speed machining of non-ferrous materials such as aluminum. High speed, high torque and turning specifications are available.



VARIAXIS i-600, i-700

Speed	Standard	High torque OPTION	High speed OPTION		
	12000 rpm	12000 rpm	18000 rpm	25000 rpm	30000 rpm
Output [40% ED (30 min. rating)]	22 kW (30 HP)	22 kW (30 HP)	35 kW (47 HP)	23 kW (31 HP)	23 kW (31 HP)
Max. torque [40% ED (30 min. rating)]	71.6 N·m (53 ft·lbs)	118 N·m (87 ft·lbs)	134 N·m (99 ft·lbs)	22 N·m (16 ft·lbs)	22 N·m (16 ft·lbs)
Tool shank	BT-40 / BBT-40 / HSK-A63	BT-40 / BBT-40 / HSK-A63	BT-40 / BBT-40 / HSK-A63	HSK-A63	HSK-F63

VARIAXIS i-1050

Speed	Standard	High torque OPTION	High speed OPTION		
	10000 rpm	7000 rpm	18000 rpm	18000 rpm	25000 rpm
Output [40% ED (30 min. rating)]	37 kW (50 HP)	30 kW (40 HP)	55 kW (74 HP)	35 kW (47 HP)	23 kW (31 HP)
Max. torque [40% ED (30 min. rating)]	350 N·m (258 ft·lbs)	442 N·m (326 ft·lbs)	105 N·m (77 ft·lbs)	134 N·m (99 ft·lbs)	22 N·m (16 ft·lbs)
Tool shank	BT-50 / BBT-50 / HSK-A100	BT-50 / BBT-50 / HSK-A100	HSK-A100	HSK-A63	HSK-A63

VARIAXIS i-700T (turning)

Speed	Standard
	18000 rpm
Output [40% ED (30 min. rating)]	30 kW (40 HP)
Max. torque [40% ED (30 min. rating)]	122 N·m (90 ft·lbs)
Tool shank	BT-40 / BBT-40 / HSK-T63 / CAPTO C6

VARIAXIS i-800T, i-1050T (turning)

Speed	Standard	High torque OPTION	High speed OPTION
	10000 rpm	5000 rpm	15000 rpm
Output [40% ED (30 min. rating)]	37 kW (50 HP)	37 kW (50 HP)	56 kW (75 HP)
Max. torque [40% ED (30 min. rating)]	302 N·m (223 ft·lbs)	715 N·m (527 ft·lbs)	143 N·m (105 ft·lbs)
Tool shank	BT-50 / BBT-50 / HSK-T100 / CAPTO C8	BT-50 / BBT-50 / HSK-T100 / CAPTO C8	HSK-T100

See P27, 28 and 29 for spindle output / torque diagram

Compact spindle cartridge

The spindle is designed to provide an increased machining area and features a compact spindle cartridge for excellent workpiece accessibility with minimum interference. Additionally, the compact spindle cartridge allows workpieces to be efficiently machined at the optimum cutting conditions.

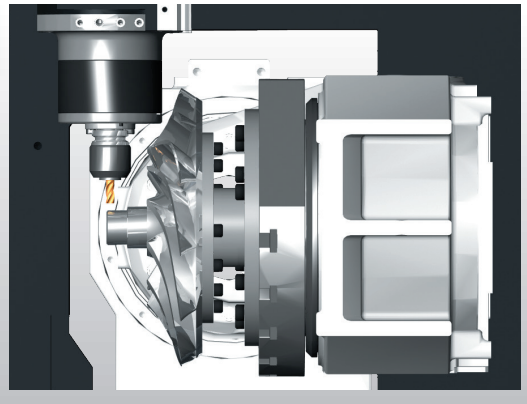


Table (VARIAXIS i-700T, i-800T, i-1050T)

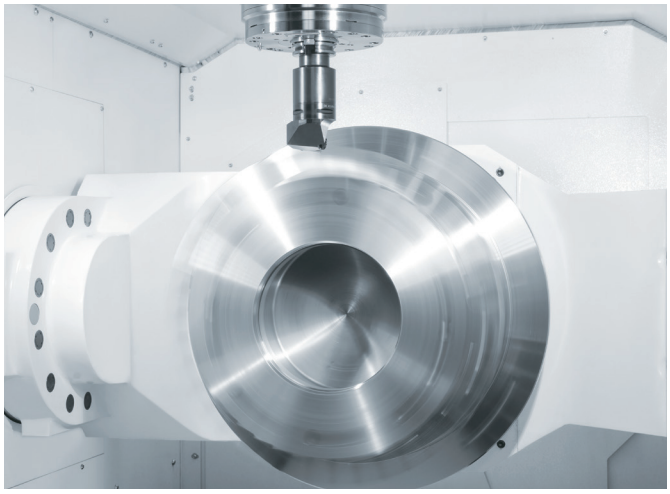
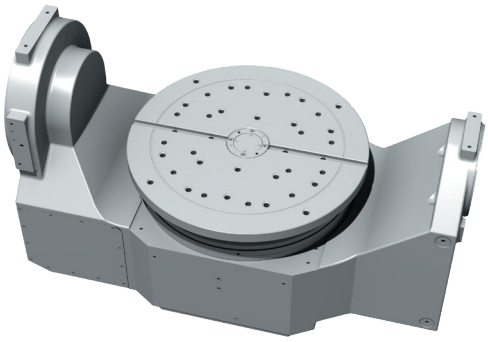


Table rotation speed	
VARIAXIS i-700T	1100 rpm
VARIAXIS i-800T	800 rpm
VARIAXIS i-1050T	500 rpm

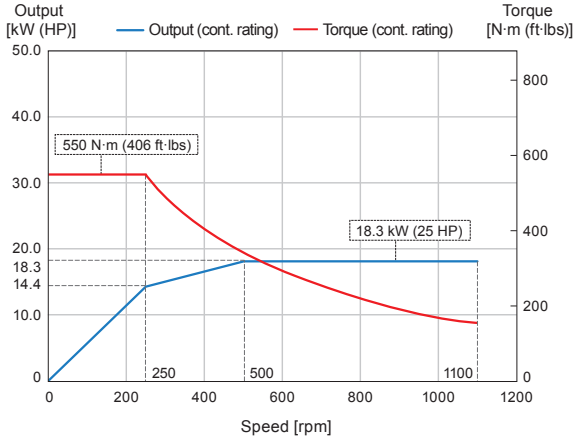
Direct drive motor

The rotary table (C-axis) is driven by a direct drive motor for both C-axis positioning and turning operation. Turning is performed with the A-axis in the 0 degree position or 90 degree position. Since the A-axis is rigidly clamped on a coupling in the 0 or 90 degree position for turning operations, high accuracy machining over extended periods of operation is ensured.



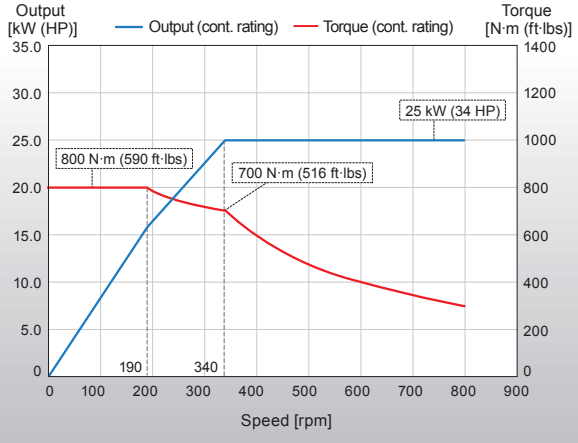
VARIAXIS i-700T

1100 rpm direct drive motor output / torque diagram



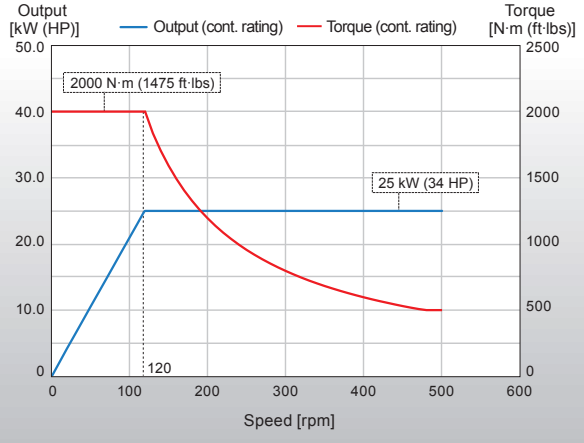
VARIAXIS i-800T

800 rpm direct drive motor output / torque diagram



VARIAXIS i-1050T

500 rpm direct drive motor output / torque diagram

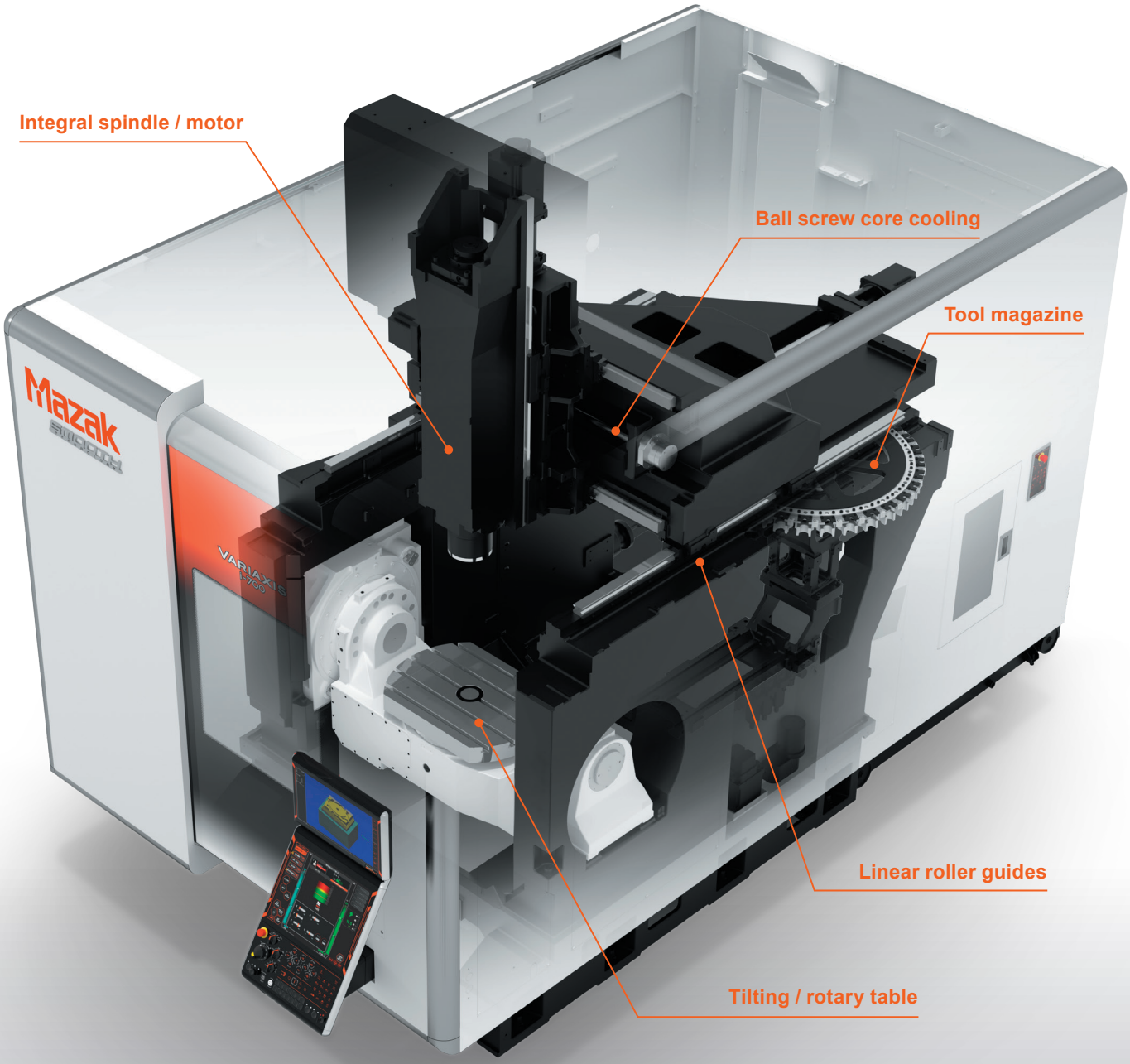


Machine Design

High rigidity construction ensures high speed machining with high accuracy over extended periods of operation

Full gantry construction without overhang

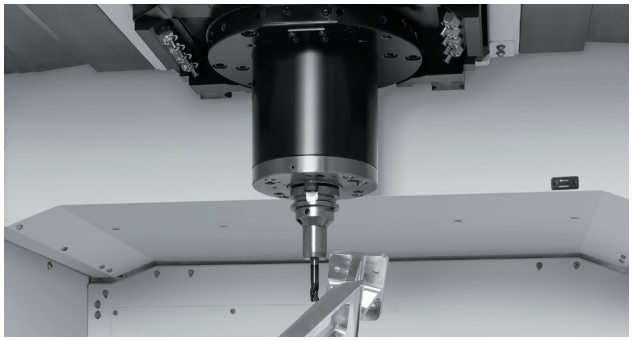
Machine construction was designed utilizing FEM analysis. Vibration is minimized during acceleration / deceleration to ensure high accuracy machining stability.



VARIAXIS i-700 with standard 30-tools magazine and optional MAZATROL SmoothAi dual monitor are shown

Integral spindle / motor

Thanks to the integral spindle / motor design, vibration is minimized during high speed operation. For high accuracy machining, temperature controlled cooling oil is circulated around the spindle bearings and headstock to minimize any thermal change to the spindle.



Tool magazine

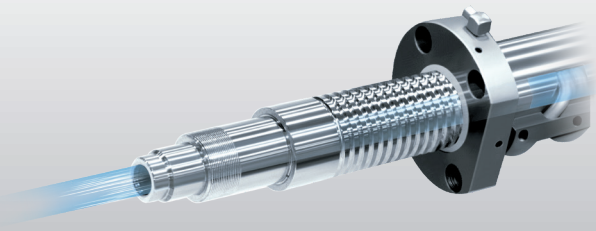
The standard tool magazine has a storage capacity of 30 tools - 40, 80, 120 tools are optionally available.
The generous magazine capacity provides ample tool storage for complex workpieces and high-mix production as well as spare tools for prolonged continuous operations.

High rigidity table

The A-axis features a trunnion design to provide high rigidity. Additionally, A-,C-axis utilizes a roller gear cam for high speed and high accuracy machining.

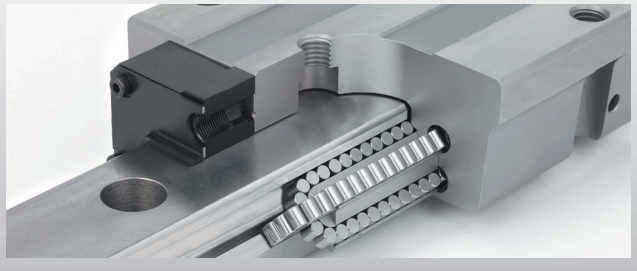
Ball screw core cooling

Temperature controlled cooling oil circulates through the ball screw cores to ensure stable machining accuracy over extended periods of high speed operation.



Linear roller guides

The linear roller guides on the X-, Y- and Z-axis utilized by the VARIAXIS i series provide high accuracy positioning. Additionally, with their high rigidity and considerably lower friction, high speed feederates can be used over a wide range of machining, from heavy duty to high speed cutting.

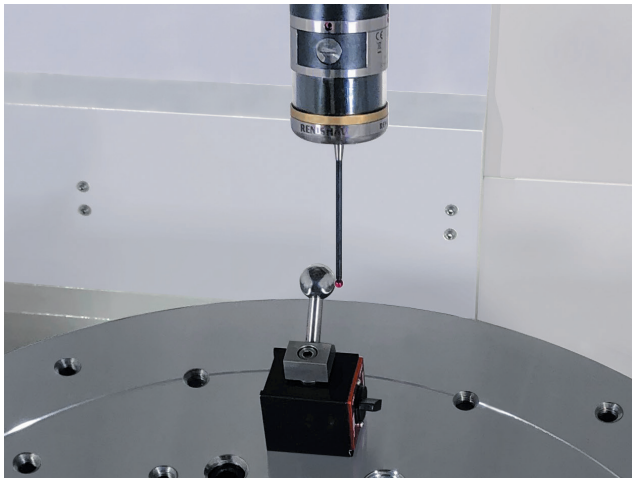


Higher Accuracy

For high accuracy 5-axis machining

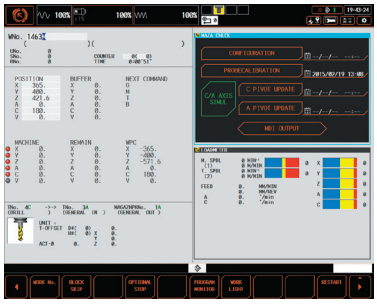
High accuracy 5-axis calibration - MAZA-CHECK

Position misalignment and incline of the rotary axes can automatically be measured and compensated to realize high accuracy 5-axis machining. The centers of rotation of both the C and B axes can be automatically measured and compensated.

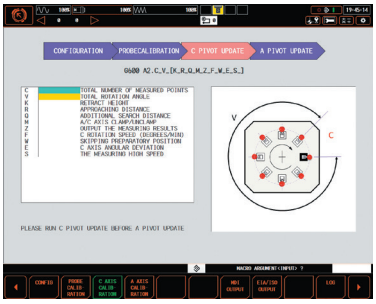


Wireless touch probe RMP600 is optional equipment.

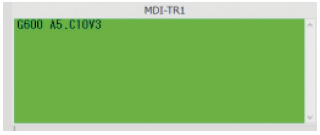
Measurement item selection



Measurement information setting



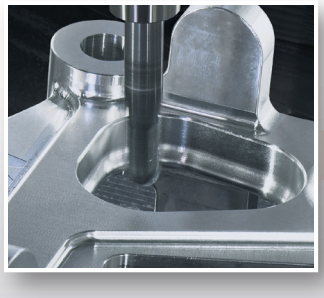
Automatic measurement program generation



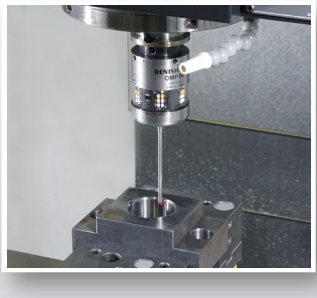
Convenient screen display assists measurement operation.

Ai Thermal Shield

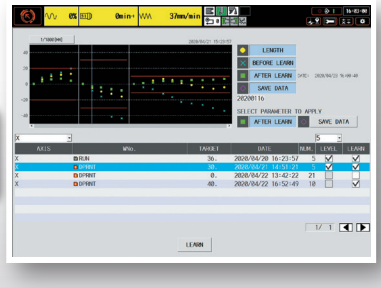
New algorithms automatically determine the amount of compensation to be automatically applied according to changes in the temperature to ensure even higher machining accuracy.



Machining



Workpiece inspection



Simulation

High rigidity construction combined with the MAZATROL SmoothAi ensure high accuracy machining

DBB (VARIAXIS i-600 test results)

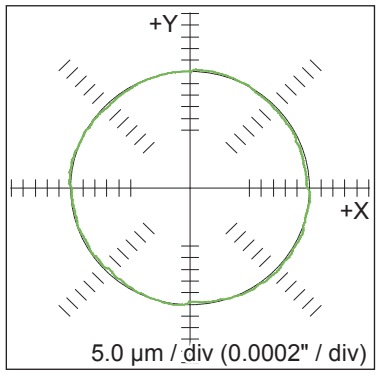
X-Y plane measured results

2.9 µm (0.00011") (CW)

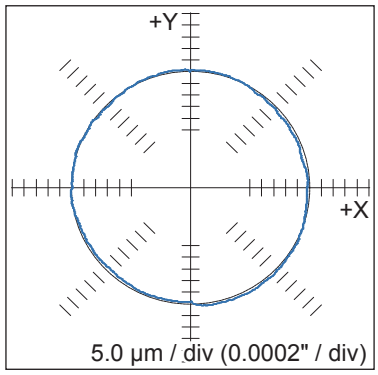
3.3 µm (0.00013") (CCW)

Machine	VARIAXIS i-600
Diameter	200 mm (7.87")
Feedrate	560 mm/min (22 IPM)

2.9 µm (0.00011") (CW)



3.3 µm (0.00013") (CCW)



Positioning accuracy and positioning repeatability (VARIAXIS i-600 test results)

Mazak precision results

Positioning accuracy	X-axis	3.05 µm (0.00012008")
	Y-axis	2.97 µm (0.00011693")
	Z-axis	2.44 µm (0.000096063")

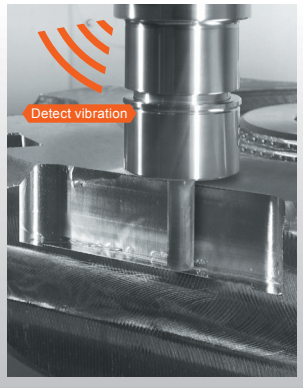
Positioning repeatability	X-axis	0.74 µm (0.0000291339")
	Y-axis	1.18 µm (0.0000464567")
	Z-axis	0.53 µm (0.0000208661")

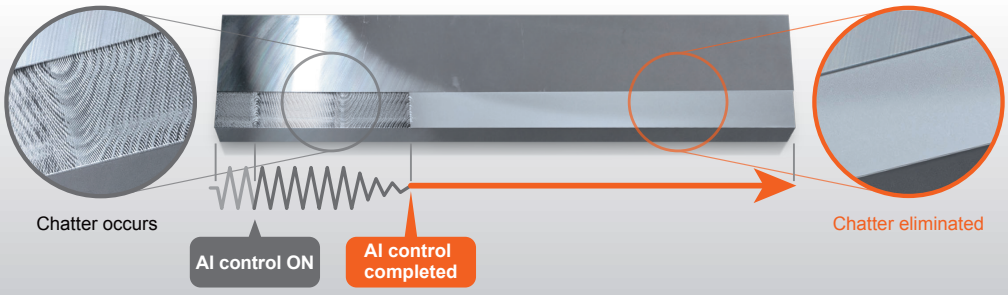
Note : The inspection is conducted according to ISO-230 on a recommended foundation with room temperature controlled to 22°C±1°C after the machine has reached operation temperature.

Smooth Ai Spindle OPTION

Using AI, milling spindle vibration is detected and machining conditions are automatically changed to produce unsurpassed surface finishes and high productivity. Thanks to AI, adjustments can be easily made in a short time without a skilled operator.

Ai SMOOTH Ai SPINDLE





Ergonomics

Design focus on ergonomics provides unsurpassed ease of operation

Excellent Accessibility

The operator has excellent access to the table from the front of the machine for convenient workpiece loading / unloading and machine setup.

Convenient operation when using an overhead crane

The VARIAXIS i series has unsurpassed access to the machine table for convenient workpiece loading / unloading.
An overhead crane can be easily used for the loading / unloading of heavy workpieces and fixtures thanks to the automatic retractable top cover.

Large window with easy-to-view machining status

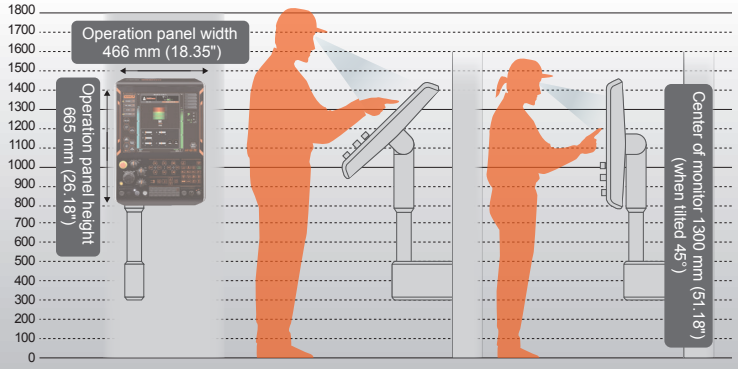
The large front window allows workpiece machining to be easily monitored by the operator.

Maintenance area

Items requiring frequent access for machine maintenance are arranged in one central location.

Adjustable CNC touch panel

Operation touch panel can be tilted and rotated to the optimum position for any operator's height to ensure ease of operation.



VARIAXIS i SERIES

Mazak

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