TAKUMI When Precision Matters

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HURCO COMPANIES, INC.

U-01-EN-202206

TAKUMI

U Series

5-Axis Double Column Machining Center

U400
U600

CONTENTS

High rigidity frame structure

The solid one-piece bed, column and cross rail design with no weldments, provides excellent support. The base width provides stability for large table loads. Cross rail saddle carries a constant weight which results in excellent part finish at fast cutting speeds.

High speed, high accuracy

The U Series meet the requirement of high accuracy and high speed simultaneously thanks to the optimal mechanical structure, high response axial transmission system, low vibration and excellent thermal controlled spindle.

Superior surface finish

Intelligent Spindle Thermal Compensation (*i* Spin-TC™) controls the heat generated during machining. The predictable spindle growth will be automatically compensated for the temperature changes and guarantees a high precision cutting performance.

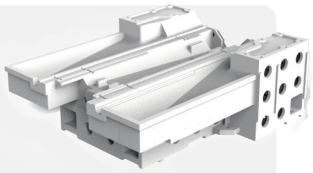
U Series

The Takumi U Series 5-axis double column machining center are designed for high precision finishing of small and medium size part in market such as dynamic die and mold, aerospace and medical applications. The U Series has an extremely robust structure to ensure enough stiffness to perform semi-finishing and finishing and offer the ideal dynamic, speed and accelerations.

*The actual appearance of the U600 may differ from the picture above.

Basic Structure

01



High rigidity frame structure

High rigidity one-piece bed, column and cross rail providing excellent stability as the casting absorbs the thrust forces of high rapids, while the "ladder" design of the cross rail, enables the spindle to be stable and powerful at high speeds.

02

High speed built-in spindle

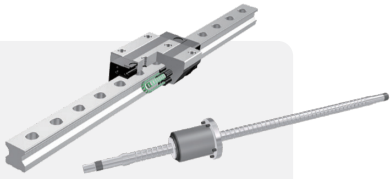
The high-power built-in spindle limits vibration, noise and power loss during high speeds to achieve superior part finish. The helical cooling channel design minimizes thermal distortion and enables precision over extended cycle times.

03

Intelligent Spindle Thermal Compensation (*i* Spin-TC™)

Sophisticated thermal control system achieves precision despite variations in ambient temperature.

04



High speed, stable axis structure

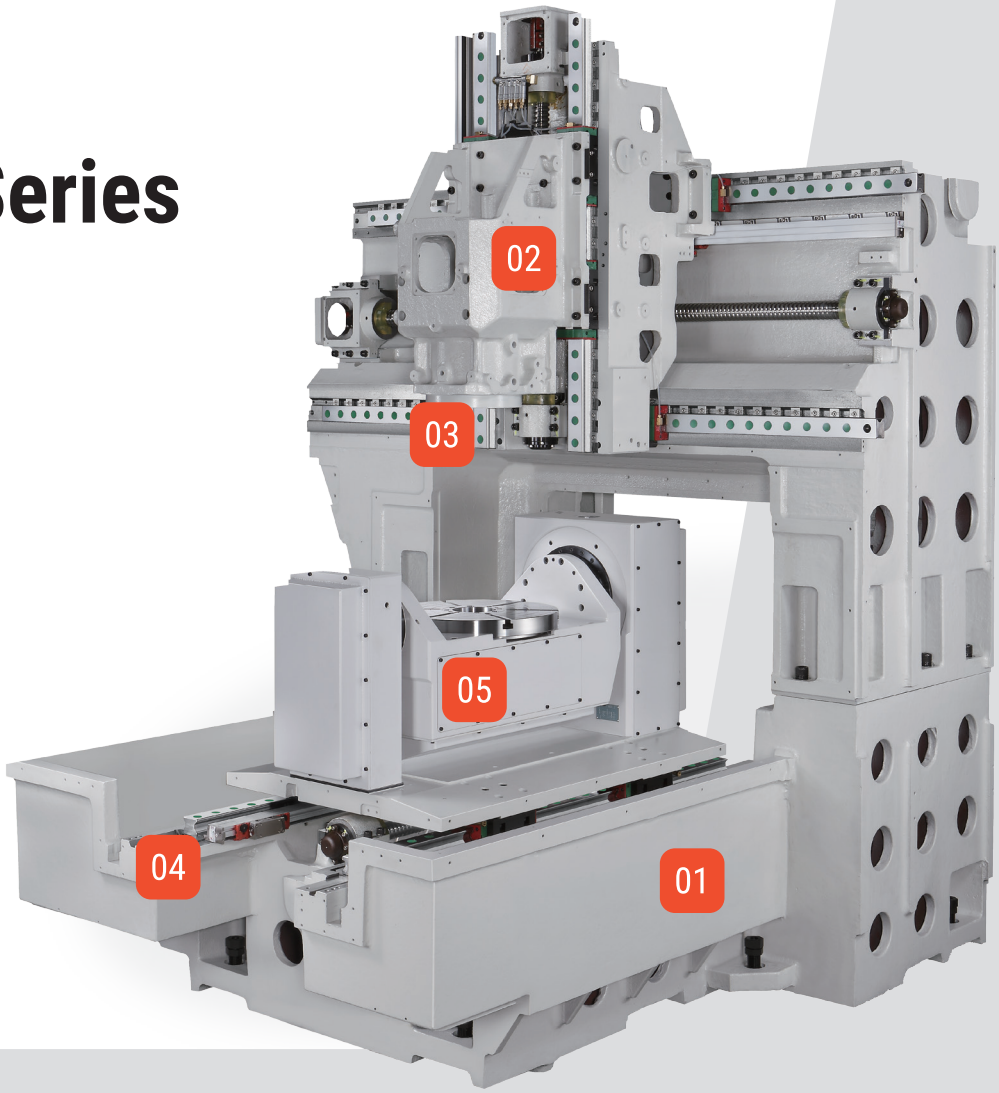
The U Series are equipped with roller type LM guideways that offer the best combination of high speed and superior rigidity. High precision ballscrews are connected directly to axis motors.

05

High accuracy and rigidity tilting rotary table

The table is made from a special alloy having high mechanical strength and features higher than steel or cast iron. With precision ground worm shafts and special composition main gears designed for longer life.

U Series



U400

36/36/36
m/min Rapid traverse (X/Y/X-axis)

25/25
rpm Rotation speed (A/C-axis)

580/950/500
mm Travel (X/Y/Z-axis)

+30 ~ -110/360°
deg. Rotation range (A/C-axis)

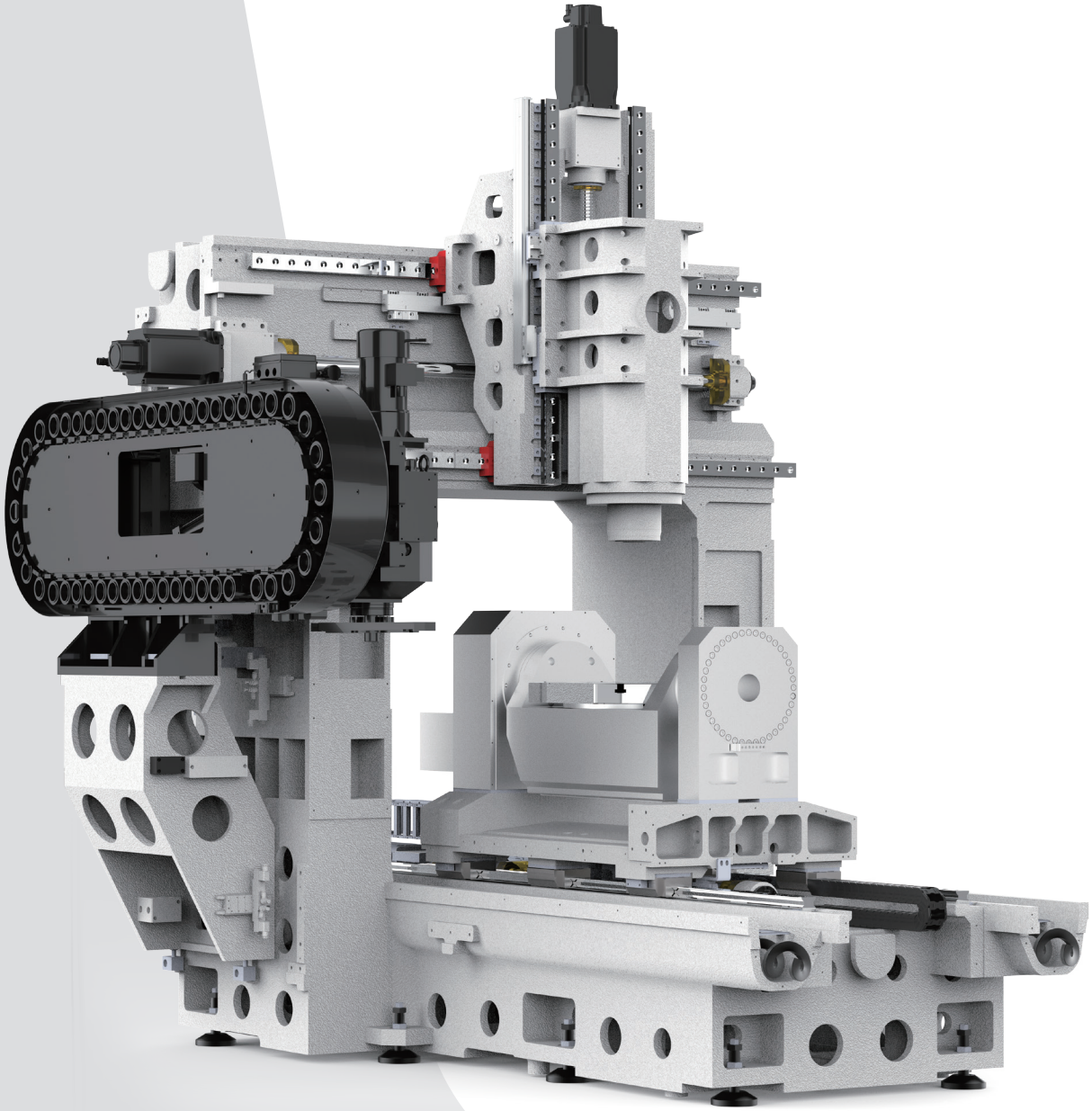
U600

36/36/36
m/min Rapid traverse (X/Y/X-axis)

25/33
mm Rotation speed (A/C-axis)

890/1050/580
mm Travel (X/Y/Z-axis)

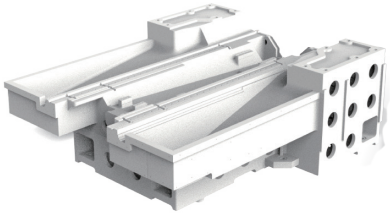
+30 ~ -110/360°
deg. Rotation range (A/C-axis)

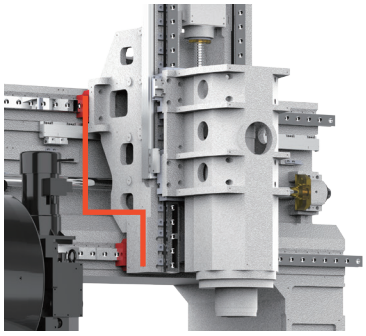


01 U Series Frame

Robust one-piece casting bed

Integrated bed frame ensures high rigidity, excellent vibration absorption and outstanding surface finishes, especially when compared to separate structures. The base width provides stability for heavy table loads even when operating at high speed.



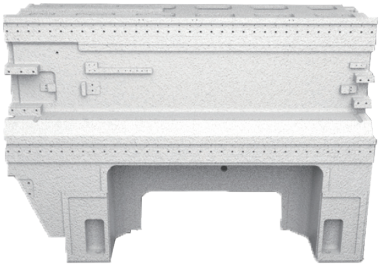


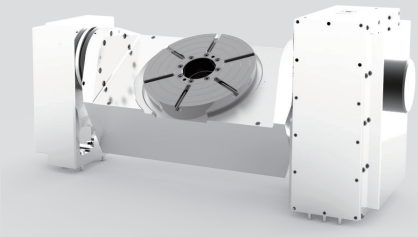
Outstanding ladder structure on the beam

The bridge utilizes a “ladder design” head casting and saddle which increases rigidity, reduces overhang and eliminates head deflection. The Y-axis cross rail saddle carries a constant weight, allowing for faster cutting while maintaining excellent part finish.

Double column structure

The one-piece design provides increased weight to absorb cutting vibration, and increased rigidity. The dual contact areas with the base eliminates pitch in the Y-axis and reduces the effect of machine leveling changes over time.

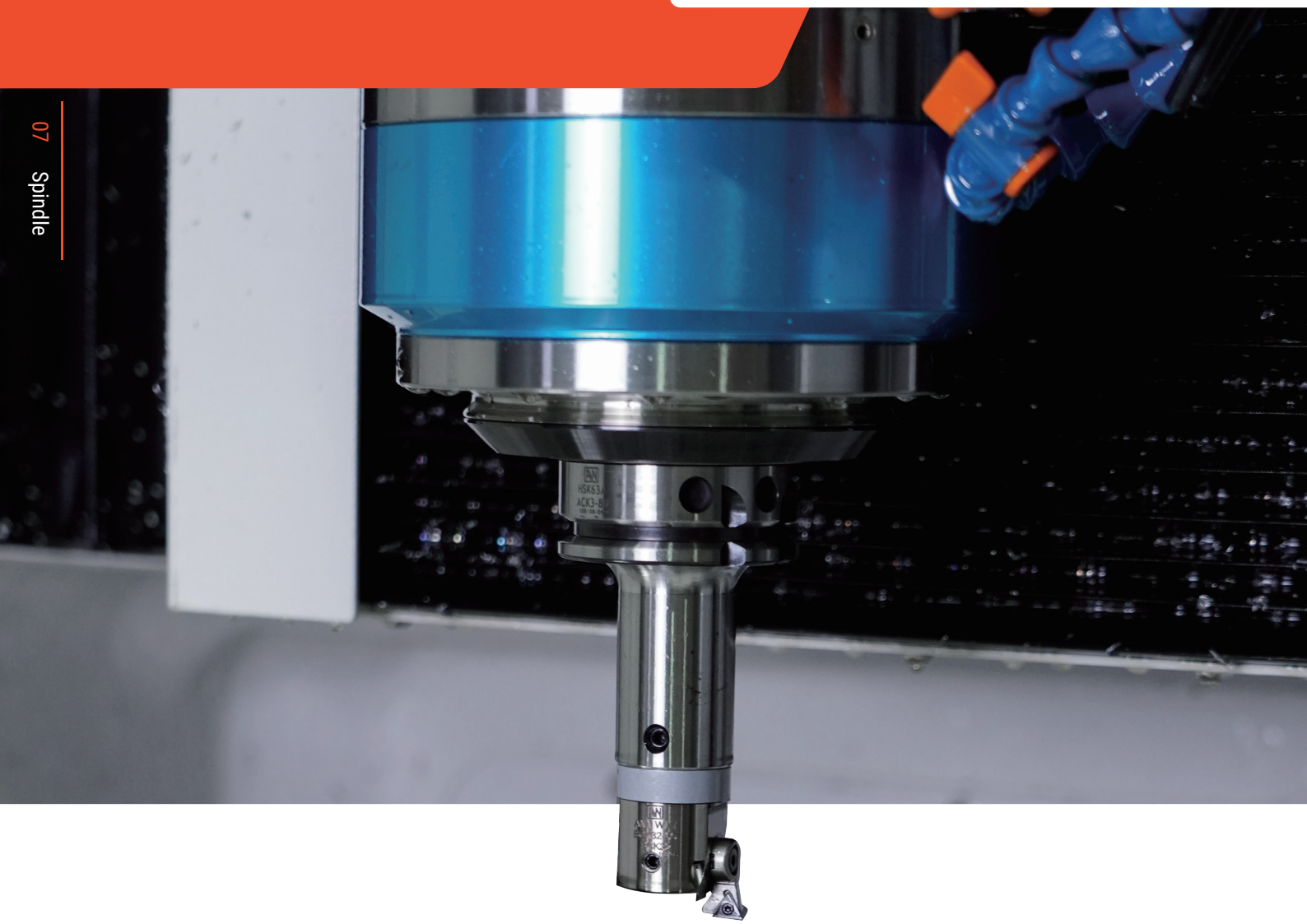




High performance rotary table

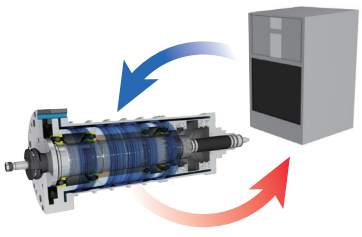
The U Series has a tilting rotary table which is designed to present high performance in heavy cutting and high speed machining. The table is made of a special alloy having high mechanical strength and features higher than steel or cast iron.

02 U Series Spindle



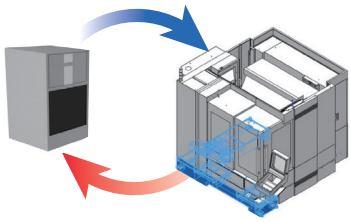
High Speed Built-in Spindle option

The high-power built-in spindle limits vibration, noise and power loss during high speeds to achieve superior part finish. The helical cooling channel design minimizes thermal distortion and enables precision over extended cycle times.



Stable Spindle Cooling Circulation

Spindle temperature is constantly controlled by oil chiller. Our test result have proven that the temperature of the circulating oil is controlled within certain variation. which minimizes thermal displacement during continuous operation at high speed.



Cutting Coolant Chiller option

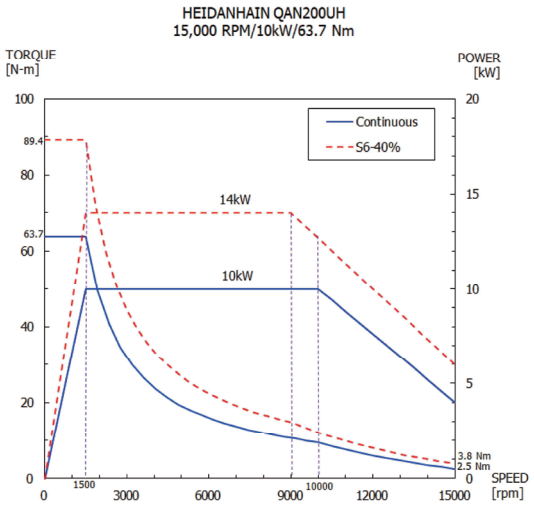
The coolant chiller reduces the temperature of the cutting fluid before it is circulated through the machine. The cooler has effectively reduced the deviation and leads to excellent accuracy of the workpieces and extends the life of cutting tool by stabilizing coolant temperature.

Spindle Power - Torque Curve

15,000rpm Direct drive spindle (ST:U400, U600)

10/14 **kW** Power (Cont./S6-40%)

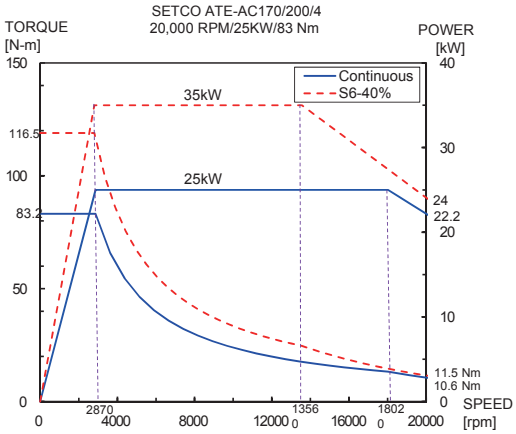
63.7/89.4 **N.m** Torque (Cont./S6-40%)



20,000rpm Built-in spindle (OP:U400, U600)

25/35 **kW** Power (Cont./S6-40%)

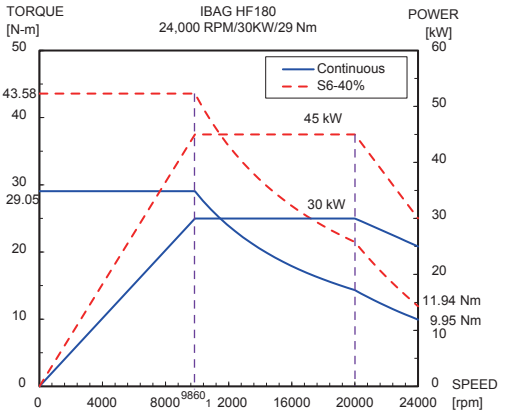
83.2/116.5 **N.m** Torque (Cont./S6-40%)



24,000rpm Built-in spindle (OP:U400, U600)

30/45 **kW** Power (Cont./S6-40%)

29.05/43.58 **N.m** Torque (Cont./S6-40%)



03

U Series

Intelligent Spindle Thermal Compensation Technology

TAKUMI's unique spindle thermal compensation technology minimizes the heat from generating and compensates thermal expansion, which ensures better surface finish over a long running times.

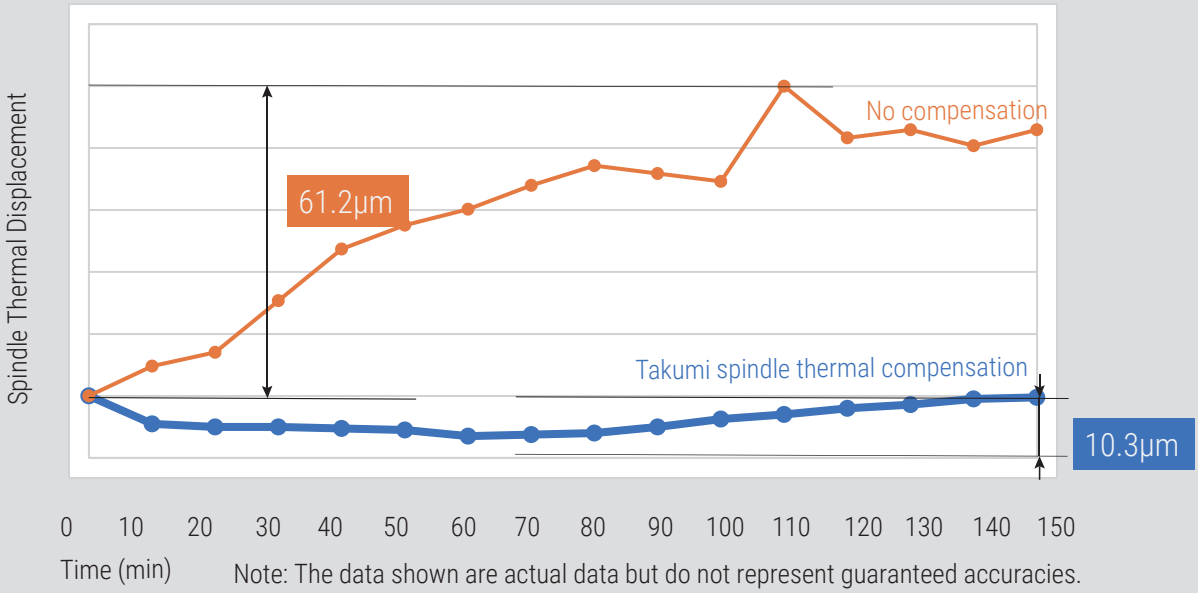
Your benefits

- **Machine warm-up is not needed**
- **High precision cutting performance is guaranteed**
- **High processing stability over continuous runs**
- **Save money and reduce the time and cost on cutting workpieces.**

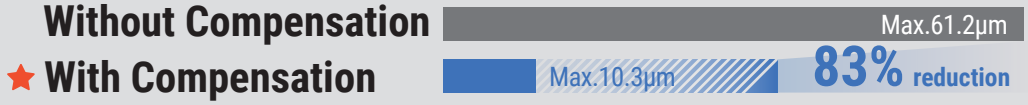
Deformation Precisely Control

There are several heat sources that can influence the performance of the machine tool. Three main thermal sources are spindle displacement, axis drive transmissions and structure. Among these sources spindle displacement is the most critical to overcome and address.

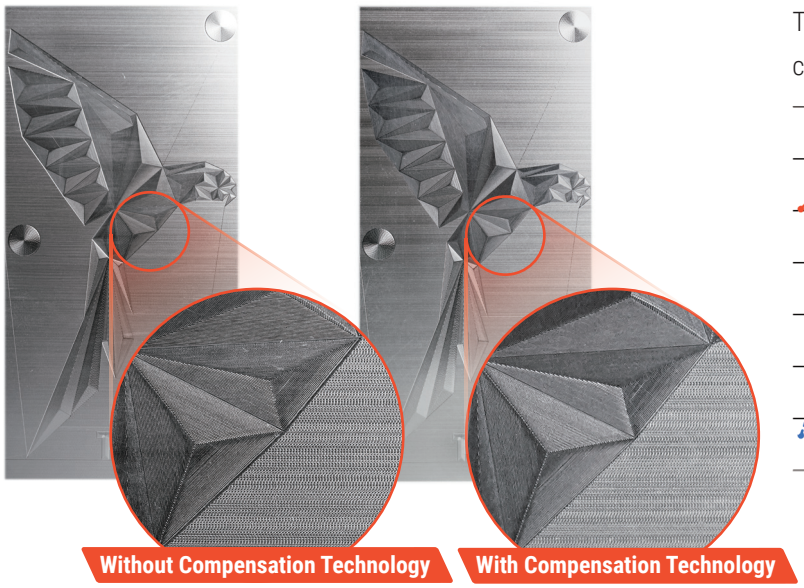
■ H10 with HEIDENHAIN TNC640; 15,000rpm direct drive; no machine warm up.



Note: The data shown are actual data but do not represent guaranteed accuracies.

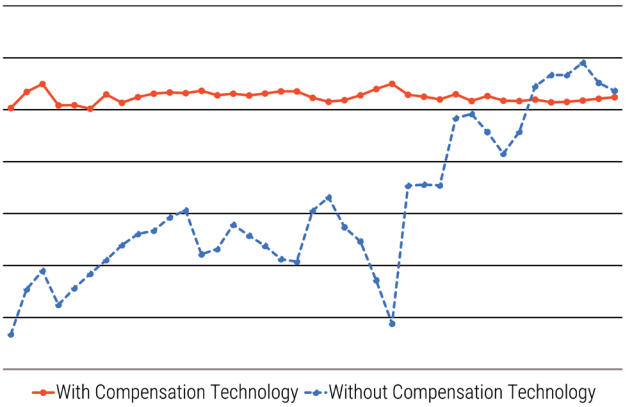


Spindle Thermal Compensation Real Cutting



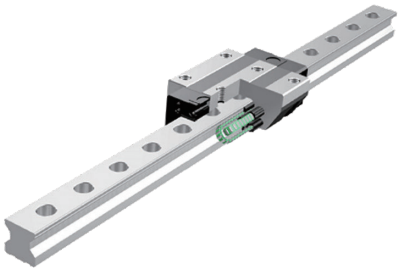
The edges between each areas are obvious before compensation. Whereas the edges on the workpiece after compensation are not obvious because the error is much smaller.

The real cutting results shown with Takumi spindle thermal compensation, the thermal deformation is less than **5μm**.



Double Anchored Ballscrew

To eliminate lost motion, the ballscrews are anchored on both ends and pre-tensioned. The motors are directly coupled to the ballscrews.

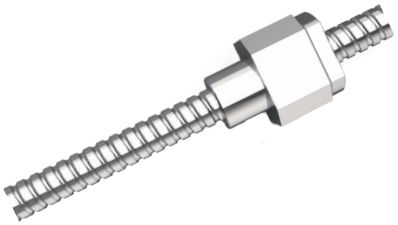


Roller Type LM Guideway

The U Series are equipped with Φ45 mm wider LM roller guideways. These features higher load capacity and greater rigidity even at high acceleration. Additionally, they have greater contact area to support faster feeds, higher rigidity and higher weight bearing capability.

High Precision Ballscrews

U Series are equipped with high precision ballscrews, featuring high load capacity while also providing high durability and rigidity during heavy duty cutting.



High Accuracy Linear Scales

Linear scales are standard on all 3 axis. Mounted to the table, cross rail and head they take a direct reading of the true position of the axis. This compensates for thermal growth, mechanical flex and backlash, for improved accuracy and repeatability.

04 U Series Feed Axis

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U Series Rotary Table 05

A/C rotation range

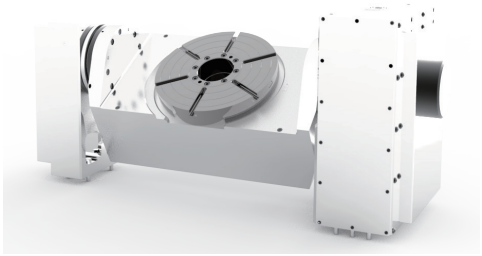
+30°~ -110°/360°

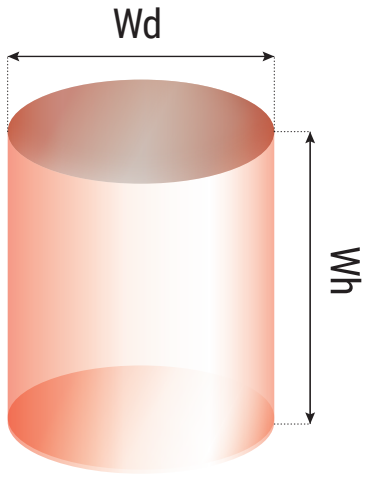
U400 A/C rotation speed

25/25 rpm

U600 A/C rotation speed

25/33 rpm





Maximum machining area (Wd x Wh)

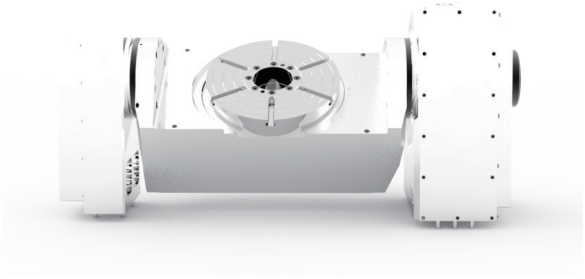
U400	Φ 400 x 320mm (Φ570 x 320mm conditional)
U600	Φ 600 x 500mm (Φ630 x 500mm conditional)

Maximum workpiece weight

U400	250kg
U600	500kg

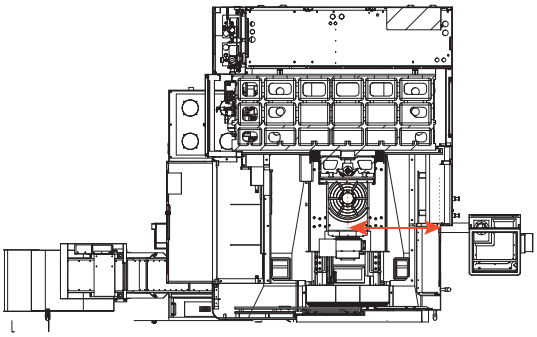
Rotary Table

Both axes are equipped with direct mounted ring encoders for precise ±5 seconds positioning and ±2 seconds repeatability. The rotary axes deliver twice the accuracy of competitive machines to achieve greater accuracy performance when machining away from the center of rotation.

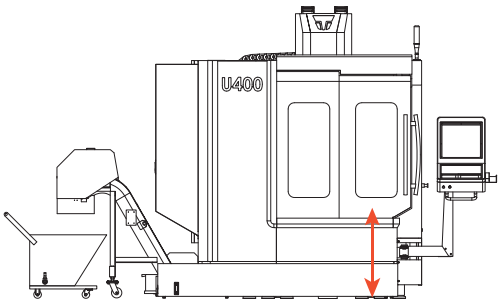


Ergonomic Design

Shorter access to the table make setup work such as fixture adjustment and maintenance easy.



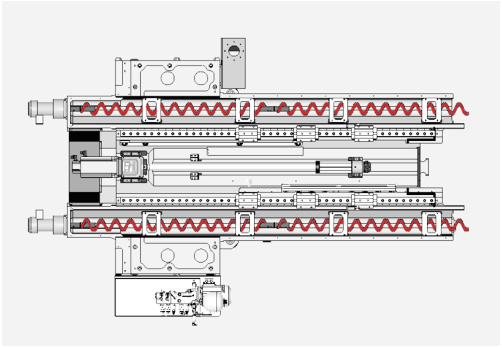
- **Distance to the center of the table:**
  - 722mm (U400)
  - 920mm (U600)



- **Distance from floor surface to pallet surface:**
  - 915mm (U400)
  - 1070mm (U600)

Dual Chip Auger

Chip removal efficiency is greatly enhanced thanks to the dual screw type augers on U600.



Large Door Opening

Large door opening to the working area gives the operator impressive freedom and handling space.

06 U Series User Convenience

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U Series 07

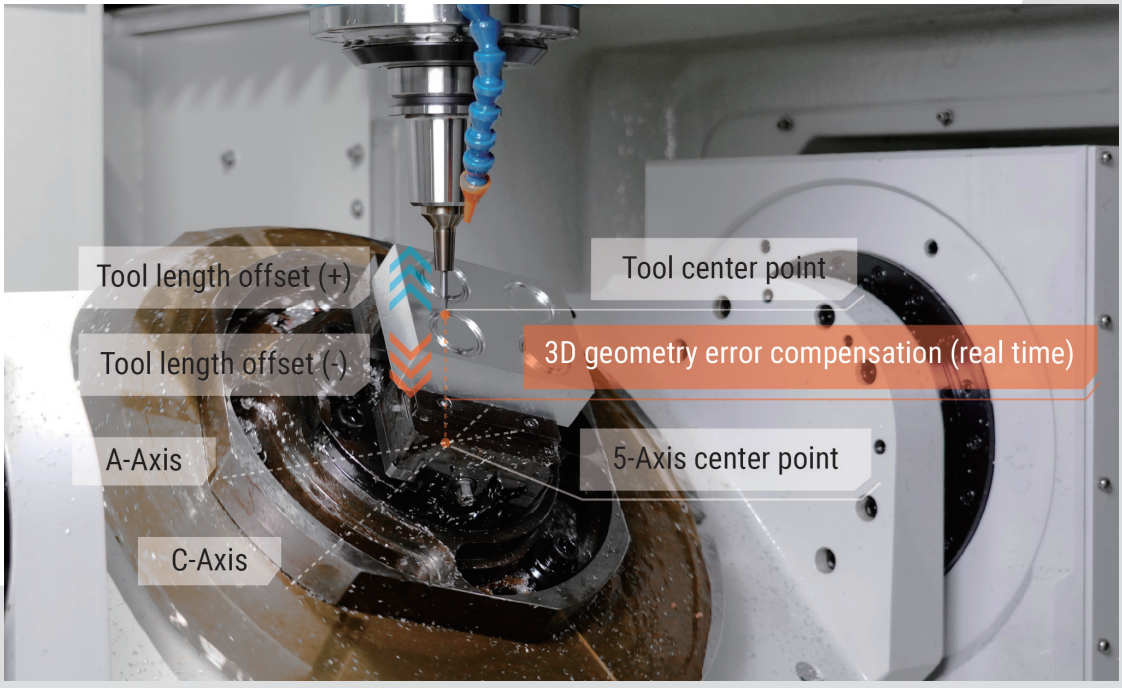
5XCDO
(5-Axis Center Dynamic Offset)

5-axis accuracy perfection by 5XCDO (5-Axis Center Dynamic Offset) option

In 5-axis machining, high accuracy of rotary axes is especially critical for it machines more complex components and parts that are for critical applications.

Thanks to Takumi's 5XCDO technology, within the X/Y/Z-axis travel and any angle range of the turntable (A/C-axis), the Z-axis tool offset (+ or -) at any position will be dynamically compensated based on the TCP (Tool Center Position) and the five-axis center point.

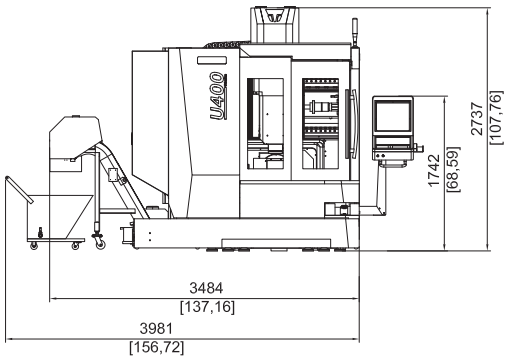
For high accuracy 5-axis machining, 5XCDO is recommanded. It improves workpiece contour machining accuracy by reducing 3-D geometry error. With 5XCDO solution, every component produced becomes an incomparible masterpiece.

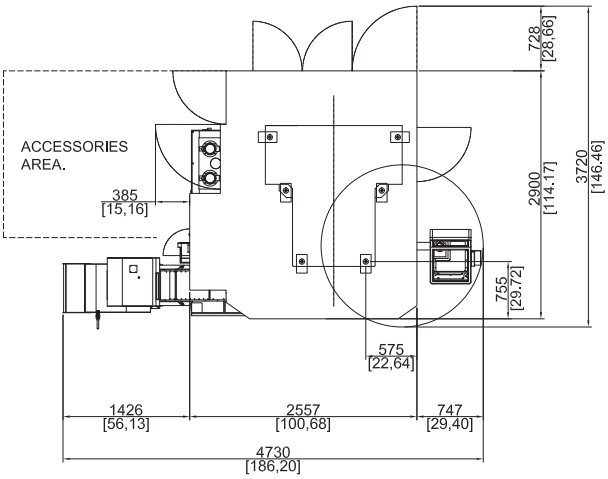


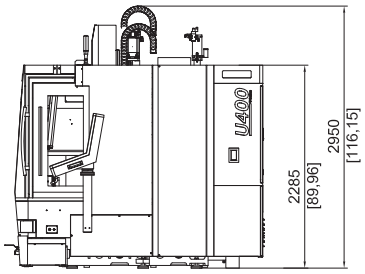
External Dimension

U400

Unit : mm

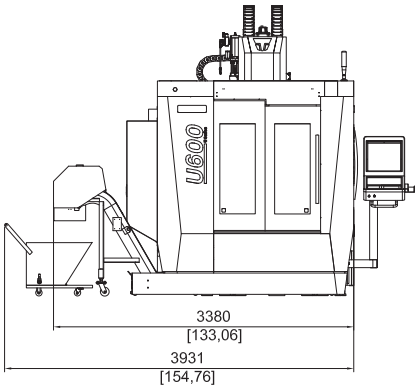


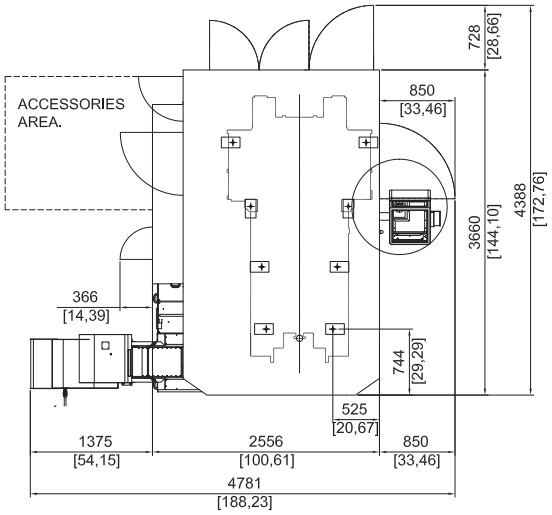




U600

Unit : mm





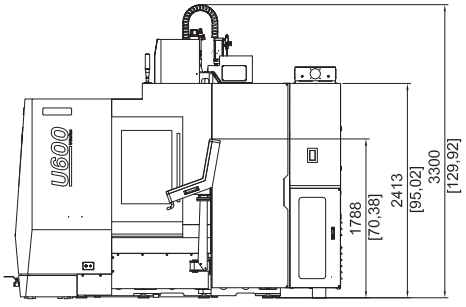
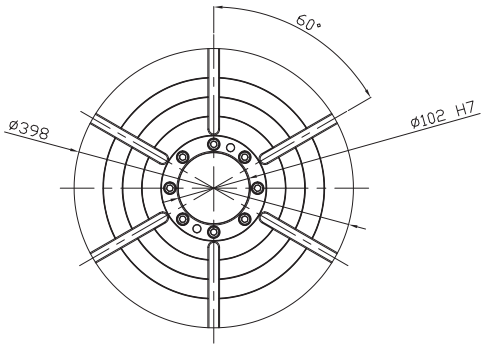
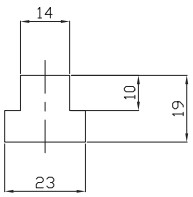
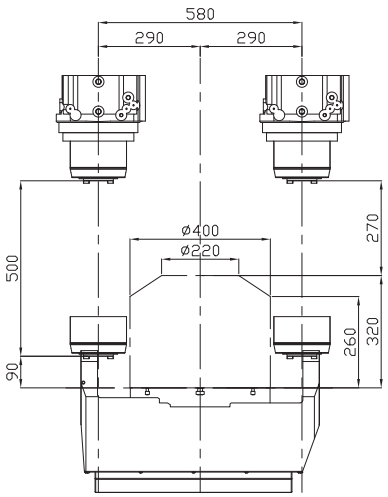


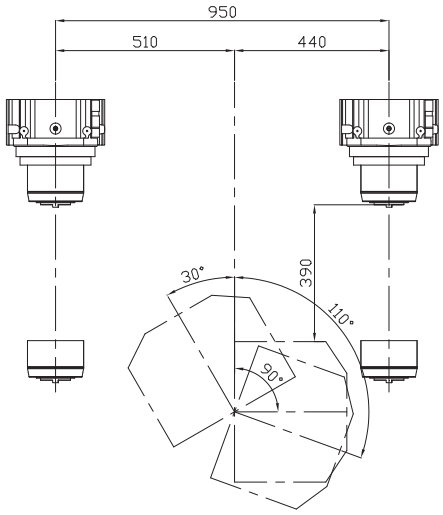
Table & T-Slot Dimension

Unit : mm

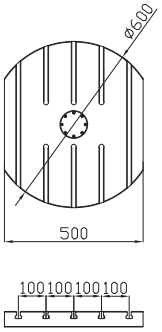


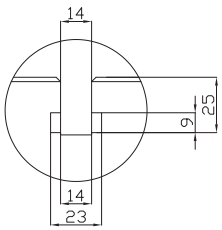


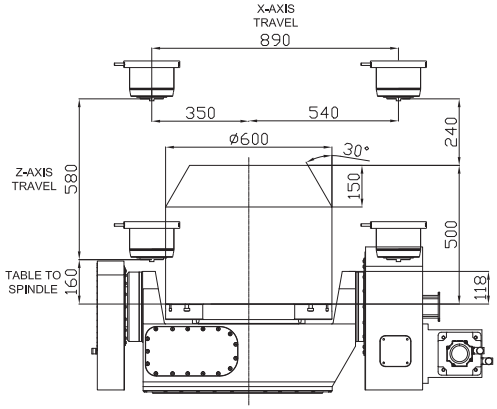


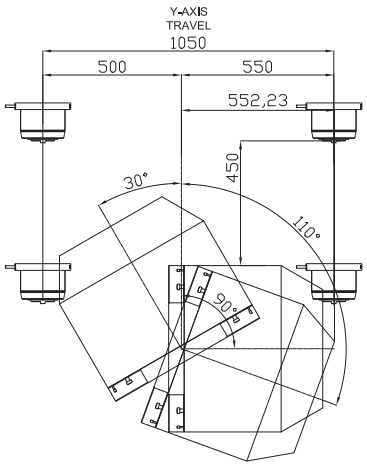


Unit : mm









Machine Specification

Travel	U400	U600
X/Y/Z-axis	580 / 950 / 500mm	890 / 1050 / 580mm
Distance from spindle nose to table	90-590mm	160-740mm

Table		
Dimension	Φ398mm	Φ600mm
Max. load	250kg	500kg
T-slot	N°6 WIDTH 14 - 60°	14 x 100 x 5mm

Spindle		
Spindle type	Direct-drive	
Spindle speed	15000rpm	
Spindle motor power	10kW/14kW (Cont./S6-40%)	
Spindle taper	BBT40	

Feed		
Rapid feed (X/Y/Z)	36/36/36m/min	
Cutting feed	20000mm/min	
Motor power (X/Y/Z)	5.1/5.4/5.1 kW	5.4/5.1/5.1kW

C-Axis		
Rotary table diameter	Φ398mm	Φ600mm
Rotation range	360°	360°
Positioning accuracy	±5"	±5"
Rotation speed	25rpm	33rpm
Rotation torque	756Nm	729Nm

A-Axis		
Rotation range	+30° ~ -110°	+30° ~ -110°
Positioning accuracy	±5"	±5"
Rotation speed	25rpm	25rpm
Rotation torque	756Nm	1404Nm

ATC & Magazine	
ATC type	Arm
Number of tools	30pcs
Max. tool diameter (next pockets epmty)	75/150mm
Max. tool length	300mm
Max. tool weight	7kg
Tool shank	BBT40

Supply	
Air pressure	6kgf/cm^2
Electric power supply	60kVA

Net weight		
Machine weight	9500kg	14000kg

TAKUMI

Standard & Optional

● : Standard ○ : Option × : Non Applicable

		U400	U600
Spindle			
15,000rpm		●	●
20,000rpm		○	○
24,000rpm		○	○
ATC			
ATC Extention	30T	●	●
	50T	○	○
	90T	○	○
Tool Shank Type	BBT40	●	●
	HSK-A63	○	○
Coolant System			
Coolant Through Spindle	30bar	○	○
	70bar	○	○
Air Through Spindle (without CTS)		○	○
Cutting Air Blast		●	●
Cutting Coolant Chiller		○	○
Chip Disposal			
Coolant Tank & Coolant Flushing System		●	●
Full Chip Enclosure		●	●
Chain Type Chip Conveyor		●	●
Feed Axes			
Linear Scales (X/Y/Z)		●	●
3-Axis Absolute Encoder Motors		●	●
3-Axis Ballscrew Cooling		○	○
Rotary Encoders for Rotary Axis		●	●
Electric Device			
3-Color Signal light		●	●
Working Light		●	●
Air Conditioner for Electric Cabinet		●	●
Measuring Device			
Workpiece Measurement		○	○
Tool Measurement		○	○
Environment			
Oil Skimmer		●	●
Oil Mist Collector		○	○
Oil Mist Device		○	○
Control			
Heidenhain TNC640		●	●
Transformer / Stablizer			
Transformer		○	○
Spindle Thermal Compensation			
i Spin-TC I™		○	○
i Spin-TC II™		○	○
i Spin-TC III™		○	○
ETC			
Dynamic Collision Monitoring		●	●
5-Axis Center Dynamic Offset		○	○
Leveling Block and Screws		●	●
Maintenance Tools		●	●
Manuals		●	●
Washing Gun & Air Gun		●	●
Manual Pulse Generator		●	●
Automatic Centralized Lubrication System		●	●
CE Certified		●	●