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UCT-250 | UCT-600 | UCH-660 | UGT-800

VORTEX SERIES

5-AXIS Vertical Machining Center

SIGMA®

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Accuracy x Speed x Rigidity

Assembly Perspective Course

Accuracy Variation Measurement
During Assembly

Linear Axis Machine
Spatial Accuracy Measurement (6D)
and Analysis

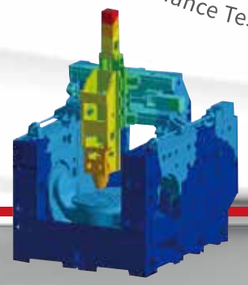
Rotary axis / Tilting axis
Error Measurement

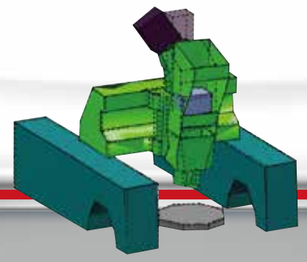
Mechanical System Dynamic Test of
Frequency Scan of Feed Axis Motor

Impact Hammer Excitation
Mechanical System Modal Test

Feed System Excitation Acceleration
Natural Frequency Impact Assessment

Accuracy Performance Evaluation
of Dynamic Tracking Contour

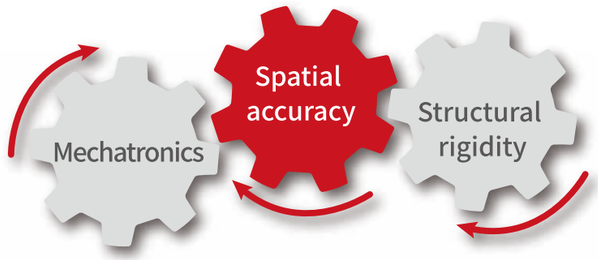


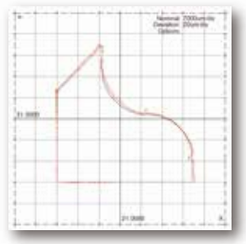


Structural Rigidity

- Dynamic performance test for high-performance machining needs.
- Analyze the modal shape of the machine structure subjected to cutting forces.
- Analyze the modal shape of the whole machine structure driven by feed.

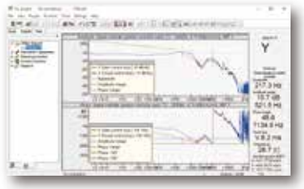
5-Axis Concept Introduction → Basic Technology Development → Assembly Concept Establishment → Mechatronics Upgrade → Practical Measurement Analysis → Structural Status Analysis → 5-Axis Dynamic Knowledge





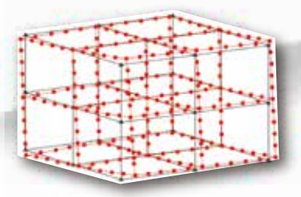
Mechatronics

- Feed system frequency response test
- Analyze the response of the load to the feed system
- High gain, high performance response servo control parameter adjustment



Spatial Accuracy

- Discussion and measurement of 43 geometric error sources of five-axis machine.
- Apply high-precision spatial accuracy measurement equipment to the assembly process.
- Implement precision assembly technology to eliminate errors



VORTEX UCT-250

World Advanced Machine

Design Concept

Column traveling structure

- Separated axes movement and machining areas.
- Compact dimensions for minimum floor space requirement .
- Multiple units connected to set up production line for mass production.

Zero malfunction

- Cam type tool clamping.
- Coil spring for spindle clamping mechanism, instead of disc spring.
- Spindle to tool magazine direct tool changing, without arm mechanism.
- Reinforced spindle water-proof design avoids bearing damage.

High Efficiency
High Stability
High Productivity

A/C axis table

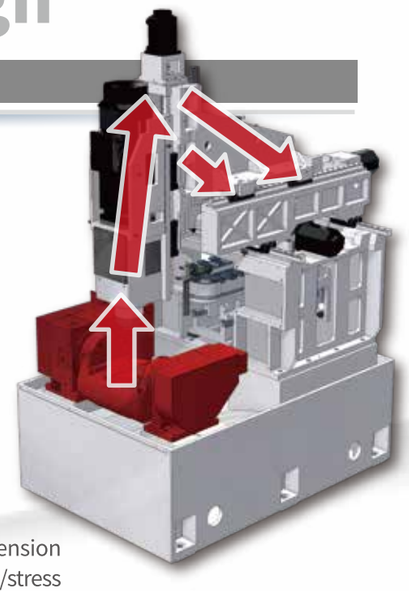
Adopts A/C axis table to enable 4+1 axis contour machining.

Effective Design

Designed by Abbe' s principle

Realizing heavy duty cutting with high rigidity and accuracy :

The overlapped-3 axes, travelling-column structural design features deviation-free movement while Y axis and X axis are travelling. The spindle is mounted on Z axis with minimum distance and suspension. Therefore, the variable loading on spindle is controlled in a low range for best possible dynamic balance.

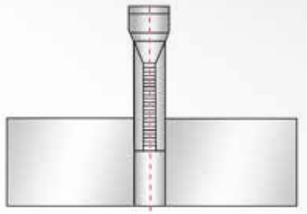


VORTEX UCT-250 model design eliminates suspension structures on the 3 axes; thereby reducing loading/stress on the axes. Such stress is caused by the counter force generated when machining the workpiece.

Cutting Capacity

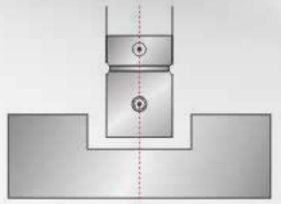
Material : Aluminum

Tapping



Diameter(mm)×Pitch(mm/rev)
M12/M16-M20

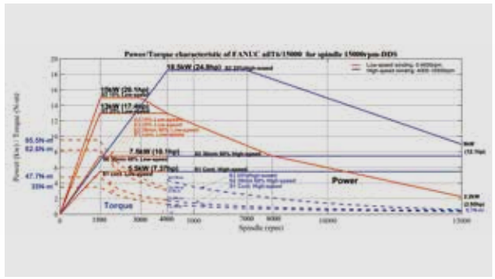
Boring



Width(mm)×depth(mm/rev)×feedrate(mm/min)
ϕ60×10×3000

Spindle

FANUC ailT6/15000 for spindle 15000rpm-DDS



- Spindle taper **#30**
- Spindle bearing **ø60**
- Transmission **DDS**

- Speed
  15,000 RPM
- Power (cont. /30min)
  5.5 / 7.5KW

· 2-face Tool Holding (BBT30)

2-face tool holding provides excellent dynamic rigidity and accuracy.

· Coolant through spindle (CTS)

Increase deep hole capability, coolant with high pressure through spindle and tools upon cutting point.

· Roller Type Guide Rails

Roller type guide rails on X/Y/Z axes provide optimal rigidity and reliability.

Chip Flushing

Main flushing flows on 2 sides and nozzle on the bottom provide effective and strong chip removal. Chips are discharged from the center channel.

Easy Maintenance

Lube and valves are placed together for easy maintenance.

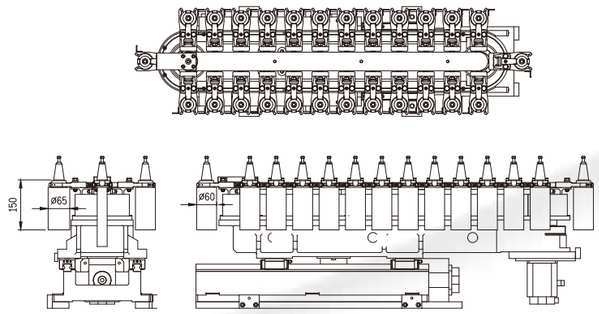
Centralized chip removal

High efficiency of chip removal from a center channel. Perfect solution for mass production.

Control Box

Swivel upper arm of the control box allows flexible positioning of the control box for operational needs.

Wine Rack ATC Mechanism

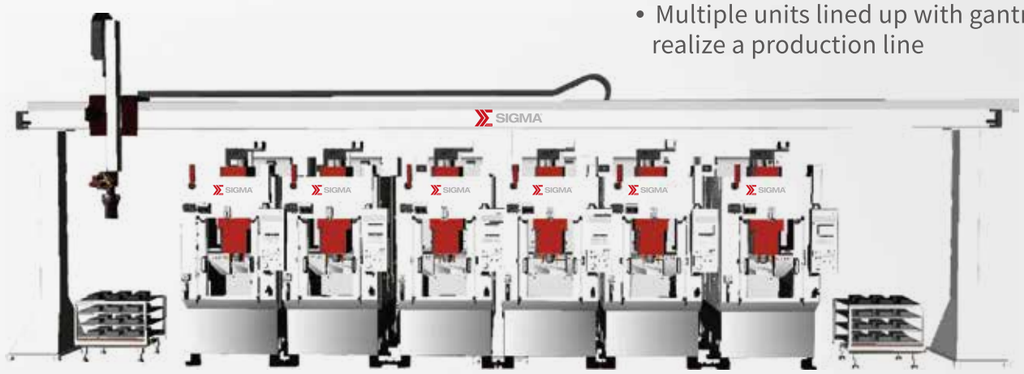


26 tools servo of ATC (STD.)

Robot Automation system

Automation and Lineup Mass Production

- Automated, unmanned production when robots are employed
- Multiple units lined up with gantry robot to realize a production line



VORTEX UCT-600

Intelligent Machining Function

Wide Operation Area (Patent: M436520)

The operation area is defined with 2 sliding doors granting wide open space. The user can operate from 2 directions corner facilitating the operations and monitoring the workpiece processing. This design also favors the loading/unloading, featuring excellent access.

One-piece Base-Column: (Patent:M441538)

The base and column are structured as one-piece casting, which eliminates possible tolerance of the jointing interfaces. The tool magazing is directly mounted onto this one-piece structure so that torque twist is decreased and stability is increased. Box-structure casting and optimal span realize exceptional rigidity and stability.
Large hole on the back offers convenience for assembling and maintenance.

Automotive

3C Products

Medical Products

Parts of Aerospace

Automotive
Motorcycle
Parts

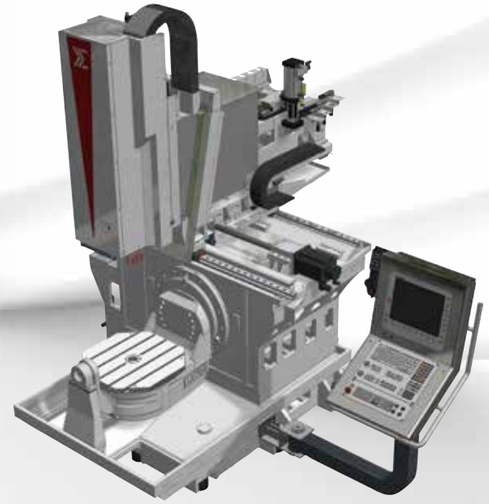
Intelligent Machining Function

5-axis Machining Feature: (Patent: M437221)

Different from general BC-type, the U-600P is designed as AC type for extensive machining capacity that allows workpiece diameter larger than axis travel. Additionally, such configuration favors view and access.

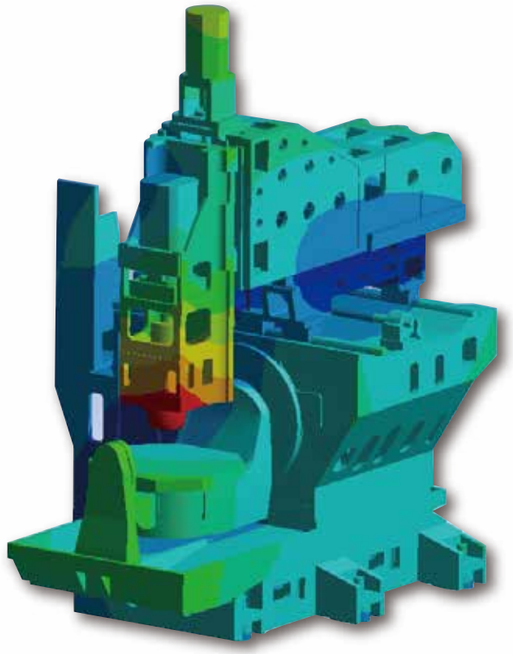
3 Overlapped Axes with 2 Rotating Axes:

Axes of linear movement and rotation are separated so that during 5-axis machining, curve tolerance or error can be controlled and adjusted rather easily.



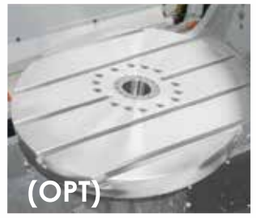
The three-axis motion area is separated from the machining area

The motion area and machining area of the three-axis feeding system are separated from the upper and lower parts of the machine respectively, which effectively improves the efficiency of machine chip removal, and improves the anti-chip and anti-dust capabilities, preventing coolant, cutting oil and chip from entering the mechanism feeding system, thereby increasing the life of the machine, prompting the mechanism to stabilize and extending machine life further to provide excellent machining quality.



Finite Element Method

SIGMA utilizes Finite Element Method (FEM) software for rigidity and FEM analysis. The end result is superior machines with optimum combination of structure, price/performance ratio, accuracy and reliability.



Special design base to mounted ATC can increase rigidity of structure and machining accuracy to reduce accumulated error.

Base with special support is easy to move and install machine with forklift. Machine can put in the ground and then put the leveling pads which don' t need to aim by technic.

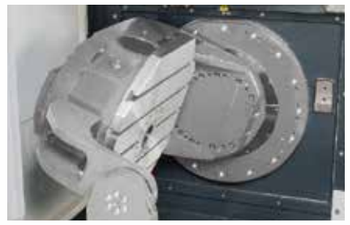
Front three slider design to increase rigidity.

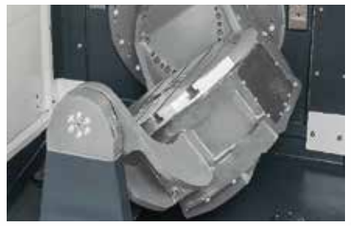
Three axes high precision roller type linear guide ways

CTS(OPT.)

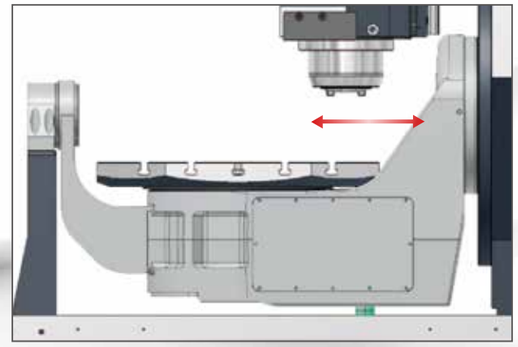
Spindle with CTS satisfies deep holes machining and adjust the pressure of coolant. It also has thermal compensation to increase efficiency of spindle.

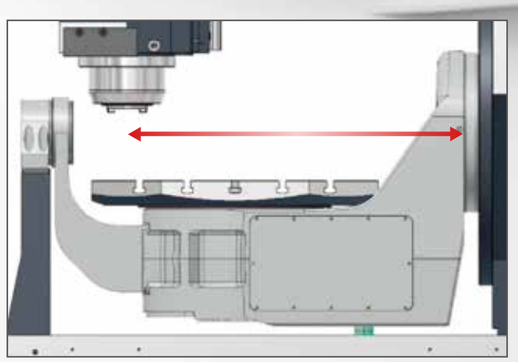
LCM rotary working table is made in Italy





Applicable loads	A axis	C axis
A/C axis	Tilting axis	Rotary axis
Rotation range	+110°/-90°	360°
Working torque	3810 Nm	613 Nm
Max rotation speed	25 rpm	25 rpm
Max allowable load	350 kg	





Short spindle hanging distance creates stable structure.
It reduces possibility of thermal drift and bending for cutting force.

Linear scale (STD)

Five axes can equip with Linear scale and thermal compensation technology on CNC machining center to increase the accuracy.

Sigma tool check

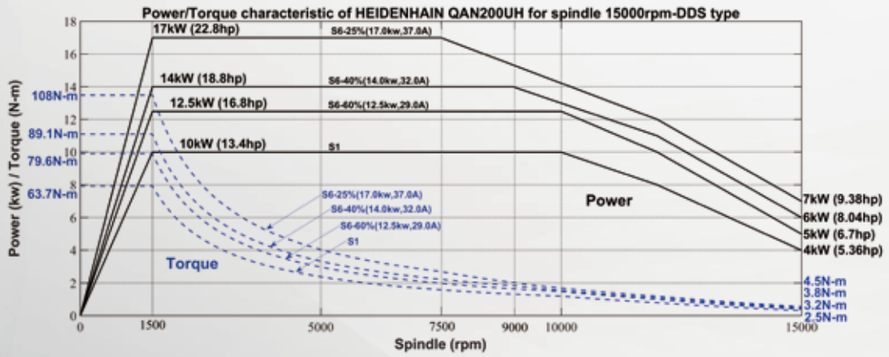
Electronic device dedicated to all operations related to direct call of tools, single tool management(assignment or modification of a tool code, display and modification of tool compensation data) and tool magazine instruction, for direct interface with the CNC, without stopping the working cycle.

※Only for UCT-600/UCH-660/UGT-800

High precision and High Power Spindle

The spindle is specially designed for aerospace, mold, die and automotive parts machining.
It provides the full power output at 1500 rpm/7.5kw for best performance on large scale of heavy milling. Spindle rotary accuracy is controlled within 4.0μm. It is also guaranteed for precise machining with modular spindle design which can provide various configurations for customers.

HEIDENHAIN QAN200UH for spindle 15000rpm-DDS type



Maintenance

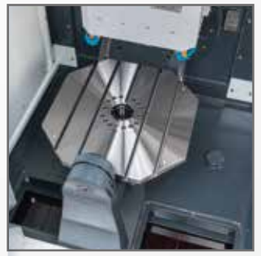
Large Hole

The large-sized opening at rear side of the base offers extra convenience for assembly and maintenance.

Controller Swing Arm

Swivel design

Dual side operation



Chip Discharge

Funnel type chip collection in single chip drop hole can increase the efficiency for chips removal.

Chip Flushing (STD)

Chips are flushed off and working area is kept clear without interference on work-piece and devices.

Full Top Cover (STD)

Corner sliding door design

Oil mist collector

Enlarged Maintenance Space

On the back and the side, the doors/covers can be detached for larger space.

Lubrication System

Lubrication System (hydraulic/pneumatic/electric),

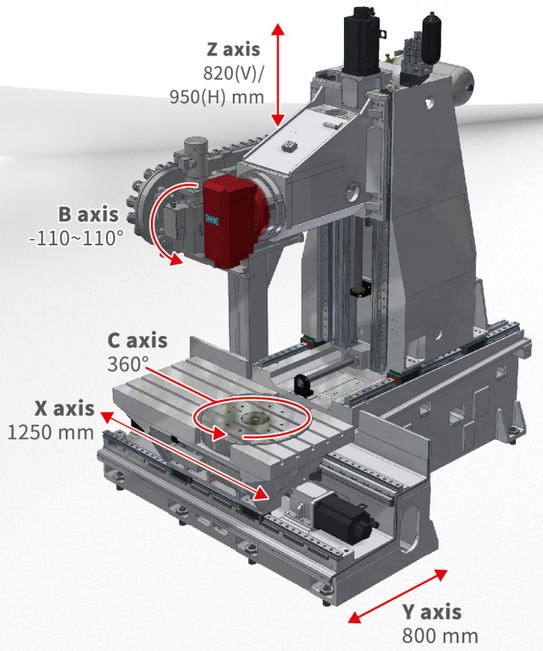
Hydraulic Unit

Hydraulic components assembly (hydraulic/pneumatic/electric)

VORTEX UCH-660

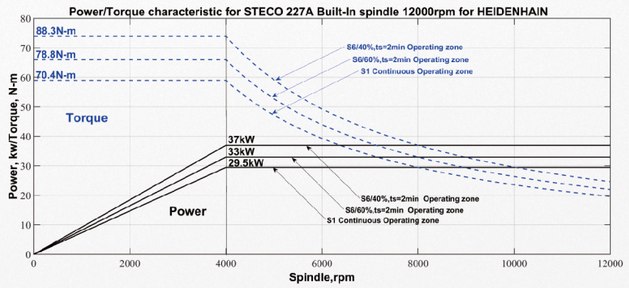
5-Axis High-Speed Precision Machining Extraordinary Performance

SIGMA five-axis machining center machines are specially designed for high-speed, high-precision machining and finishing. The UCH-660 has high rigidity with high feed rate capability to ensure the excellent cutting quality. It has the swing-head structure which reduces the machining interference area, as well as optimized structural configuration, including the box structure casting and cross column design, which greatly improves the rigidity and stability of the entire machine.

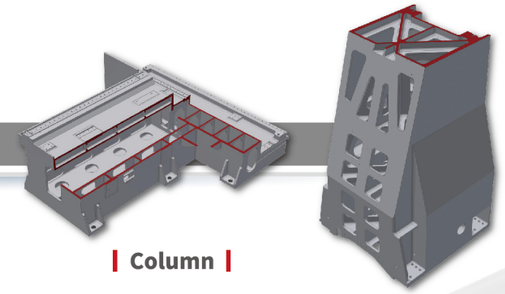


- Adopted with moving column structure to process large and heavy workpieces, with high precision and excellent dynamic performance.
- X-axis stroke of 1250 mm, suitable for processing long and complex workpieces, with large processing stroke and small machining area.
- The composite table can save the fixture installation space. For complex workpiece machining, it can be completed rapidly with only clamping once, which improves the efficiency and saving the machining time.

SETCO 227A Built-In Spindle 12000rpm for HEIDENHAIN



High Rigidity Base and Column

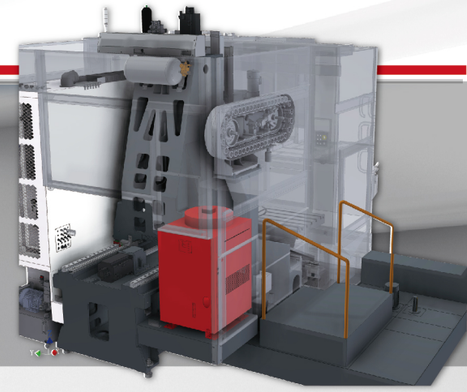


Vertical moving column structure: The M-shaped structure increases the bending resistance and strength of the column, the weight is supported by pneumatic cylinders, and the shape of the column is identical to a pyramid with a larger base to increase movement stability.

One-piece base structure: Optimized structure with excellent rigidity. The internal structure adopts with box structural design to greatly increase the supporting capability. The sand clear holes adopt with a circular shape to facilitate production and flow force improvement, and lastly, the table adopts with high and low rail design to increase rigidity.

Spindle/Swing-head/Table Cooling system

The temperature cooling system uses an inverter liquid cooler, which provides the spindle/ swing-head/ table to maintain stable operation at the optimal temperature, which increases the lifetime of major components, and promotes the machine tool system to be more stable during machining. The dimension and precision are more accurate, which shows the features of high efficiency and precision machining.

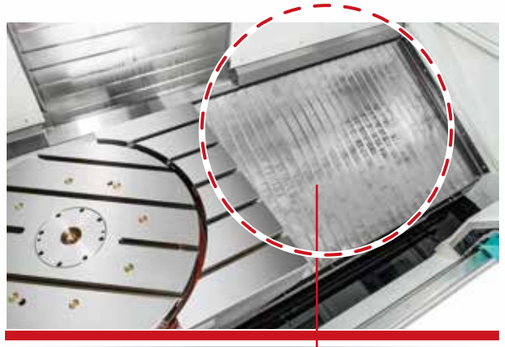


Water Cooler

Inverter type of water cooling system provides spindle, swivel head and rotary table to maintain stable operation at optimum temperature. Increasing the lifespan of key components, making the machine tool system more stable and more accurate in machining, which represents the features of high efficiency and high precision machining.

Pneumatic cabinet

Pneumatic component configuration box (oil, gas, and electric split configuration)



X-Axis Telescopic Cover

Bellow type telescopic cover with highly rigid stainless steel protection, low noise, high durability, high cutting temperature resistance ,and rapid traverse.

ATC Auto Door

Separate the tool magazine and working area, prevent contamination from chips and coolant.

Rotary Table

Complex table saves space for fixture installation, for complicated workpiece, which can be completed with just one clamp, increases efficiency and decreases processing time.

The advantages of built-in rotor & stator:

- High speed
- High torque/High acceleration
- High precision/High controllability
- Zero backlash for forward and reverse rotation
- No wear / Low noise

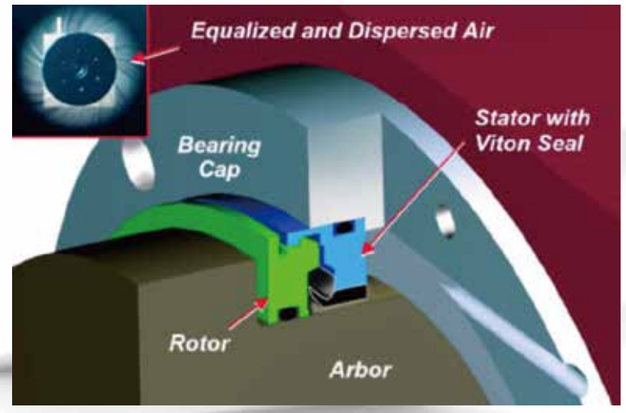
Chain Type Tool Magazine

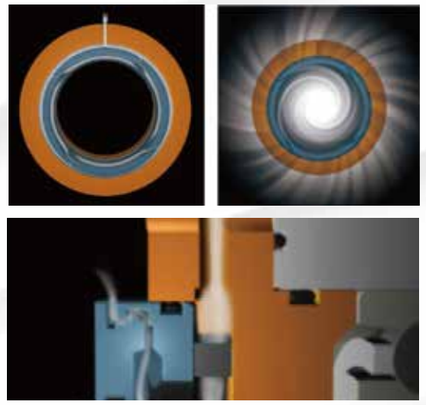
The tool magazine is structurally separated from the machine's dynamic area. This makes it easy to check and change tools directly, an absolutely safe tool chain, without stopping the work cycle.

Inside the tool magazine, the machine is equipped with an automatic door for chip protection. Additional tool magazine door on the rear side of the machine for easy access.

Bearing Protection System (OPT)

Setco AirShieldTM airtight technology uses a specially designed dedicated air pipeline to redistribute the incoming air to the airflow and generate a uniform pressure under the seal ring to exclude external contamination and effectively eliminate the spindle failure caused by bearing contamination. This technology has been tested and used on many practical applications for many years.





Oil Mist Collector(OPT)

Reduce oil mist during the machining process, avoid poor visibility and reduce air pollution to improve the quality of the work environment.

Paper Filter (OPT)

Effectively separate the impurities in cutting fluid, improve machining accuracy, reduce the number of cutting fluid changes.

Oil Skimmer (OPT)

Separate oil and water, reduce turbidity of cutting fluid , reduce the possibility of environmental pollution.

VORTEX UGT-800

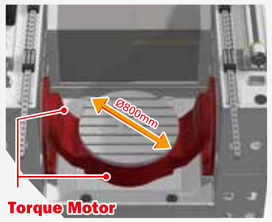
5-Axis High Speed Precision Machining, Unmatched Performance

Intelligent Machining Function

The SIGMA 5-axis machining center is designed specifically for high precision machining and creating extra fine finish.lts gantry type structure together with U-shaped base and column brings the structural stability to a new level. The swiveling rotary table diameter is 800mm and capable of resisting heavy loads. This machine is equipped with a 15,000rpm direct-drive spindle that fully satisfies customers expectation in high speed and high efficiency machining.

DDM Tilting Rotary Table (A/C axis)

Applicable loads	A axis	C axis
A/C axis	Tilting axis	Rotary axis
Rotation range	+120°/-120°	360°
Working torque	3340 Nm	1230 Nm
Max rotation speed	50 rpm	100 rpm
Max allowable load	1200 kg	



Features

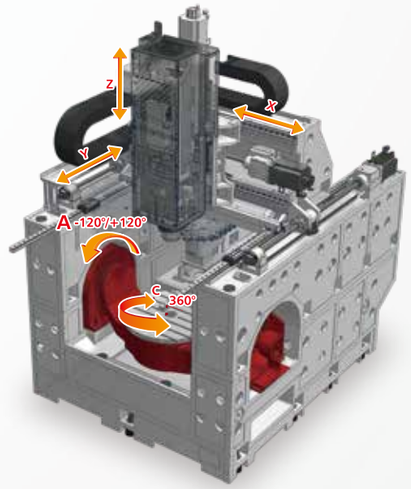
- No Backlash
- Rapid Rotation
- Durable

Efficient Chip Removal

With the one-piece fabricated hop-per-shape outlet port, chips in the machine can be quickly removed.

5-Axis Linear Scales

Standard only for Universaltype 5 axis machine.It provides a closed-loop feedback control and achieves the highest positioning accuracy.



Separated Design for Three Axes Moving Area and Machining Area

This design feature not only makes chip removal more convenient, but also enables better chip-prevention capability of the machine.

Gantry Type Structure

Designed with a gantry type structure, the SIGMA VORTEX UGT-800 5-axis machining center has the feature of spacious machining space, allowing large workpiece to be loaded and unloaded with ease. It is also convenient for operator to check the current machining condition at any time.

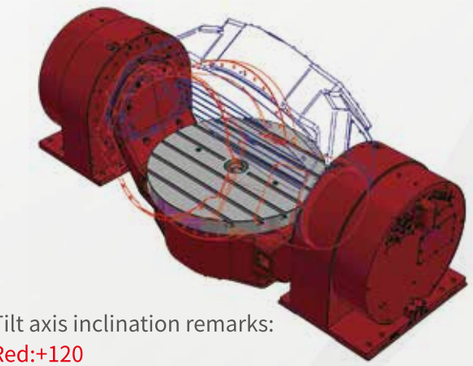
Three Axes Overlap and Separated fromTwo Rotary Axes

- This design avoids a distance between the machining point and the intersection point of two rotating axes.
- Easy to compensate for the errors of radius on rotating axes and movement on three linear axes to ensure the machine' s stability and accuracy.

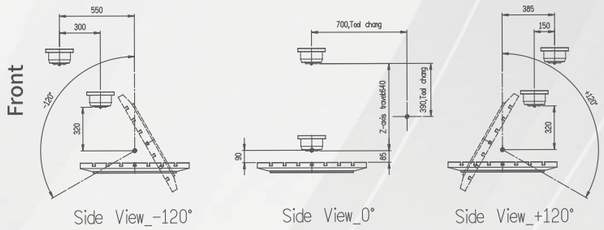
U-shaped Construction of Base and Column

- The advanced U-Shape structure significantly increases structural rigidity and machining accuracy.
- X.Y.Z-axis rapid traverse rate reaches 48m/min.

Suitble for equipping with a large diameter of rotary table.



Tilt axis inclination remarks:
Red:+120
Blue:-120

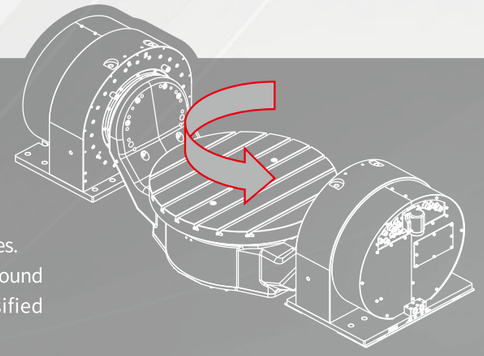


Tilt axis and rotation axis are on five axis tilting body

- Built-in double drive tilting turntable.
- Built-in high torque motor, with high loading, zero backlash and high precision.

Tilt axis & rotary axis : High speed milling and turning composite turntable

- The high-speed turntable is driven by a built-in direct-drive motor , which can reach up to 800rpm.
- Built-in direct-drive motors on tilt axis are with torque motor on both sides. For complex and diversified flexible production, the need for compound processing, meets the requirements of rapid proofing and diversified customization to quantify the increase in production utilization.
- Shorten the machining time, multi-axis to reduce the fixture costs, and continuous machining can improve the accuracy and quality.



Horizontal Type Tool Magazine

32 Tools Standard 48/60/64/96/120 tools optional

- Driven by a servo motor, the automatic tool changer provides fast tool change with extremely smooth motions.
- Horizontal type construction permits uniform weight distribution of the entire magazine unit.
- Light weight with simplified structure design reduces trouble to a minimum and increases convenience in maintenance.

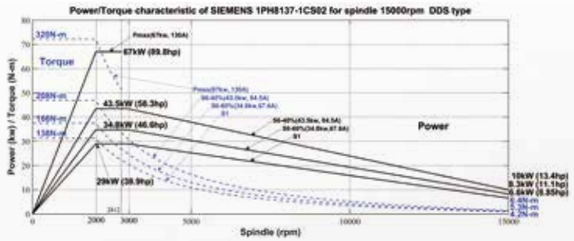
THK Roller Type Linear Guides

- Satisfy the requirements for high rigidity, high speed and high accuracy cutting.

15,000 rpm Direct Drive Spindle

Spindle Output And Torque

Torque chart for machine with spindle DDS 15,000 rpm



Workpiece	Turbine engine blades
Material	SUS304
Dimension	Ø600*H150
Cutting Tools	Ø25 End Mill cutter R5 Ball milling cutter
Feature	The workpiece is made of aerospace-grade stainless steel, with a high-horsepower spindle and a high-rigid body structure, showing the powerful and high-efficiency performance of the five-axis cutting.

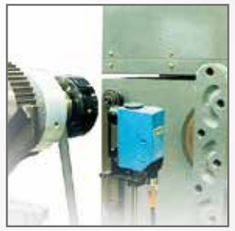
Workpiece	Internal gear cutting
Material	Aluminum
Cutting Tools	Gear Hobbing
Gear Hobbing	Machining external and internal gears on a machine which equipped with a synchronous spindle. a. Machining on diverse and complex gear shapes. b. Uses wide range of standard cutting tools and simple forming tools. c. High-Volume production.

Precision Inspection Accuracy Guaranteed

SIGMA, we have a strong commitment to provide the best possible machining centers that meet or exceed customers' expectations. Over the years, we have implemented a world class quality control system and the state-of-art inspection equipment.

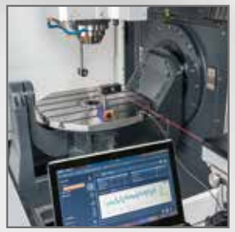
ZEISS 3D Coordinate Measuring Machine

SIGMA utilizes the 3D Coordinate Measuring Machine (CMM) to inspect critical parts enauring outstanding parts accuracy.



Spindle Dynamic Balance Test

A high precision balance tester is applied to inspect the spindle dynamic balance. It is also employed to inspect the spindle chattering at high speed & rigid cast iron.



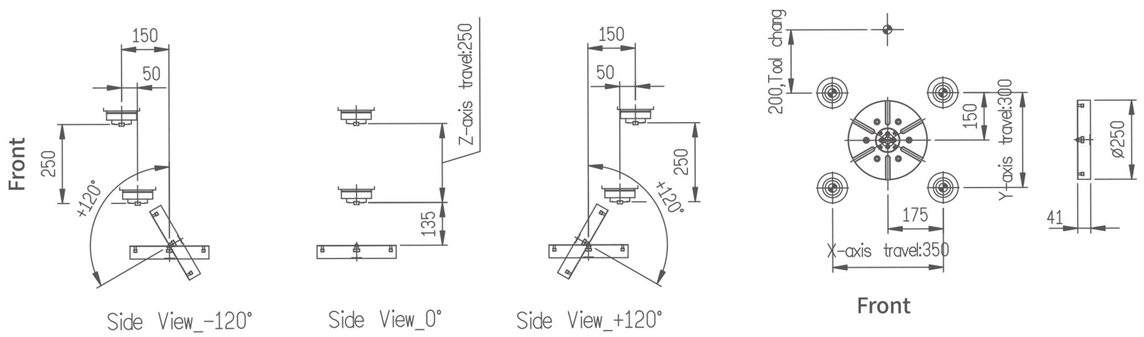
Laser Inspection

The laser equipment provides positioning accuracy inspections, ensuring machining accuracy and repeatability

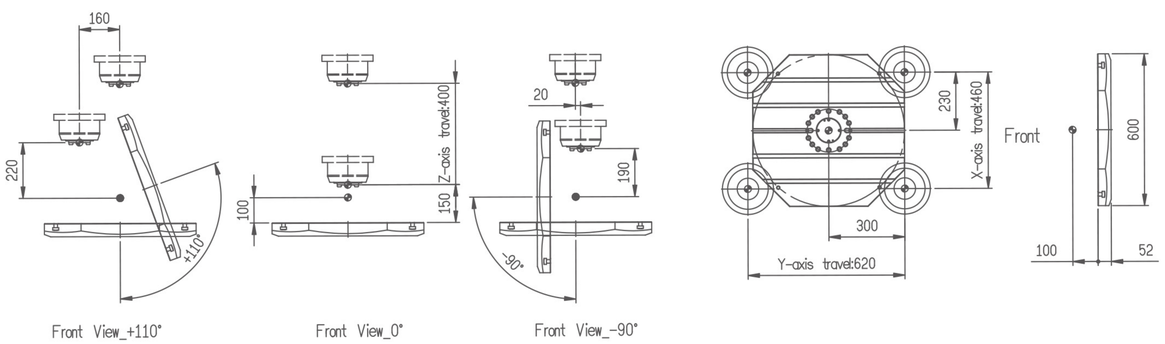
Ball Bar Testing

The ball bar tester is used to inspect the circularity accuracy for a servo axis running on a surface. This test will ensure circle cutting accuracy.

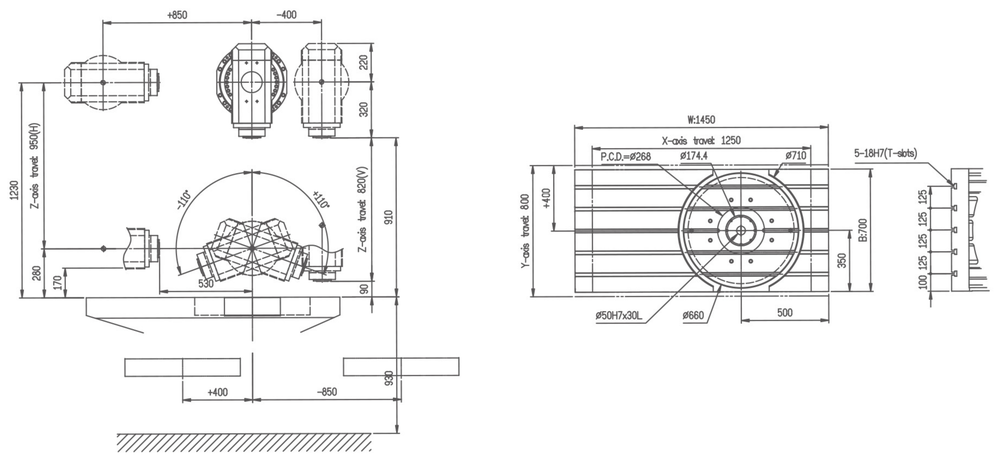
VORTEX UCT-250



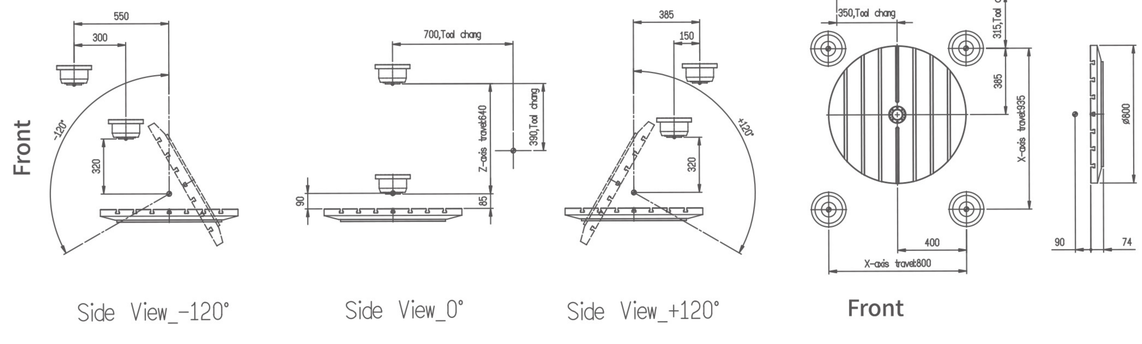
VORTEX UCT-600



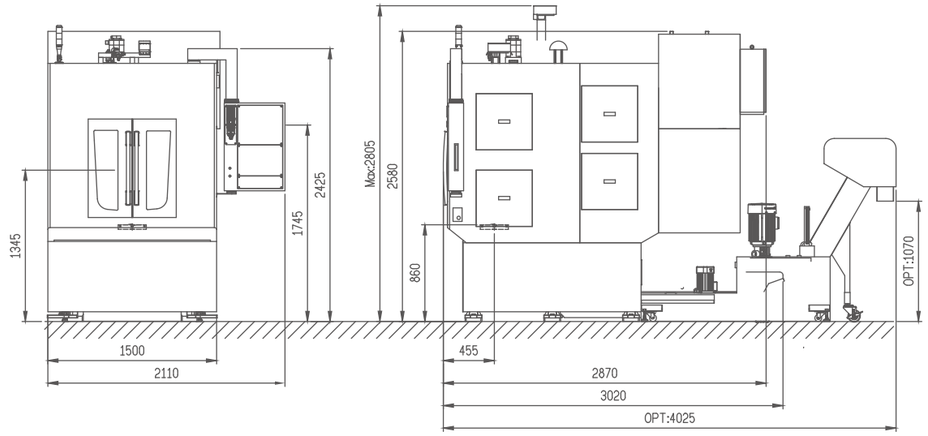
VORTEX UCH-660



VORTEX UGT-800



VORTEX UCT-250



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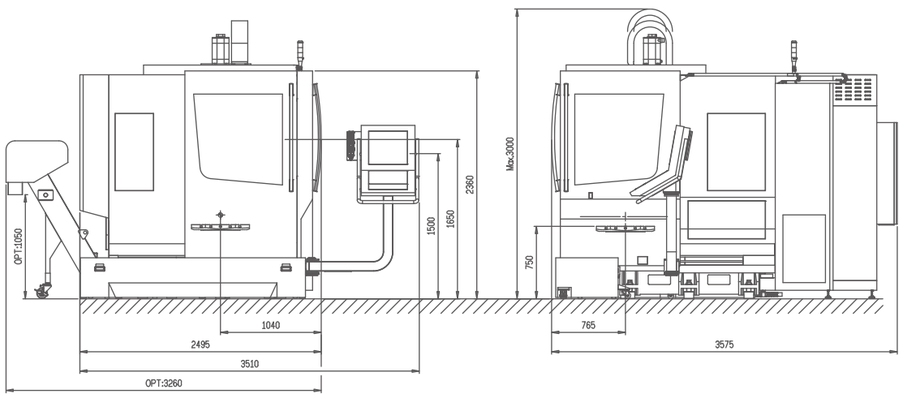
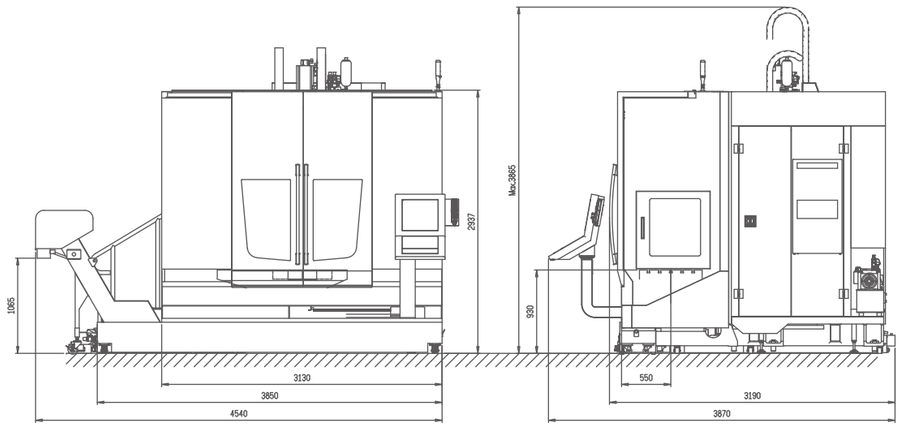
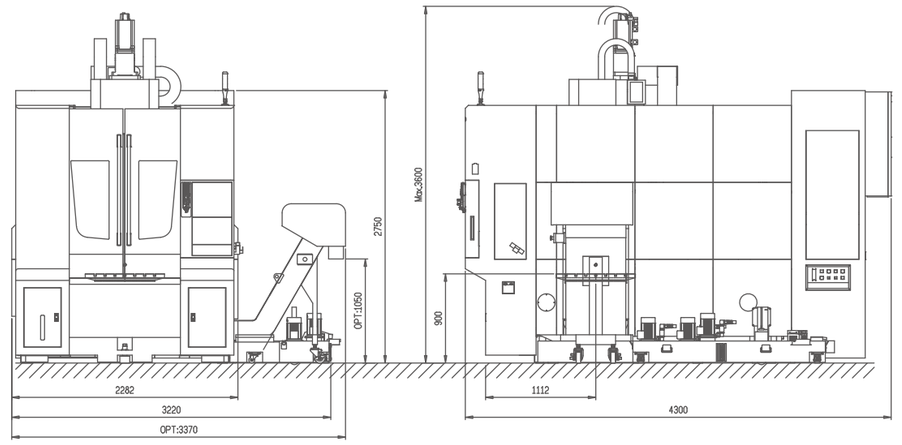


VORTEX UCH-660



VORTEX UGT-800



MACHINE SPECIFICATIONS

MODEL	unit	UCT-250	UCT-600	UCH-660	UGT-800
TRAVEL					
X-axis travel	mm	350	460	1250	800
Y-axis travel	mm	300	620	800	935+315
Z-axis travel	mm	250	400	820(V)/950(H)	640
A(B)-Axis rotation angle	degree	±120°	+110° ~ -90°	±110°	±120°
C-Axis rotation angle	degree	0°~360°	0°~360°	0°~360°	0°~360°
Spindle nose to table surface	mm	135~385	150~550	90~910(V)/280~1230(H)	85~725
Table surface to floor	mm	860 ± 5	750 ± 5	930 ± 5	900 ± 5
TABLE					
Table dimensions	mm	Ø250	Ø600	Ø660(1450x700)	Ø800
Table hole dimensions	mm	Ø20H7	Ø60H7	Ø50H7	Ø60H7
T-slots	mm	6 × 12	5 × 14	5 × 18	7 × 14
Max. table load	kg	100	350	1500(C axis:1000)	1200
Working Torque A(B) axis(Tilting Axis)	N-m	1800	3180	993	3340
Working Torque C axis(Rotary Axis)	N-m	600	613	869	1230
Max. rotation speed A(B) axis(Tilting Axis)	min^{-1}	33.3	25	50	50
Max. rotation speed C axis(Rotary Axis)	min^{-1}	50	25	85	100
Max. diameter of workpiece	mm	Ø350×250(H)	Ø600×400(H)	Ø660×800(H)	Ø800×640(H)
SPINDLE					
Spindle speed	min^{-1}	Direct-drive type 15000	Direct-drive type 15000	Builit-in type 12000	Direct-drive type 15000
Spindle taper	-	7/24 Taper NO.30	7/24 Taper NO.40	7/24 Taper NO.40	7/24 Taper NO.40
Spindle power	Kw	5.5/7.5	10/17	29.5/37	29/67
FEED RATE					
X-axis rapid traverse	m/min	36	30	50	48
Y-axis rapid traverse	m/min	36	30	50	48
Z-axis rapid traverse	m/min	36	30	50	48
ATC					
Tool changer	-	Drum type	Arm type	Arm type	Drum type
No. of Tools	-	26(F)、28(H、S)	24 (30、40、60)	40(50)	32 (48、60)&*2
Pull stud	-	P-30T (45°)	P-40T (45°)	P-40T (45°)	P-40T (45°)
Max. Tool weight	Kg	3	7	7	7
Max. Tool length	mm	150	280	350	300
Max. Tool diameter	mm	Ø60	Ø80	Ø76	Ø75
Max. Tool diameter (No adjacent tool)	mm	Ø65	Ø150	Ø150	Ø125
OTHER					
FLOOR SPACE	mm	2110(W)×3020(D)	3510(W)×3575(D)	3850(W)×3870(D)	3220(W)×4300(D)
MACHINE WEIGHT	Kg	4600	8850	12530	18500
MAX. MACHINE HEIGHT	mm	2805	3000	3865	3600
POWER CAPACITY	KVA	25	35	90	90
AIR SOURCE	bar	6~8	6~8	6~8	6~8

* Specifications are subject to change without prior notice.

MACHINE ACCESSORIES

NO.	ITEM	UCT-250	UCT-600	UCH-660	UGT-800
1	HEIDENHAIN (For 5 axes)	○	●	●	●
2	SIEMENS (For 5 axes)	○	○	○	○
3	FANUC (For 4+1 axes)	●	○	-	-
4	3-Axis pre-tensioned ballscrew	●	●	-	●
5	LHL Automatic lubrication system(Grease)	●	●	●	●
6	Direct-drive spindle #30_10000rpm	○	-	-	-
7	Direct-drive spindle #30_15000rpm	●	-	-	-
8	Direct-drive spindle #40_12000rpm	-	○	-	○
9	Direct-drive spindle #40_15000rpm	-	●	-	●
10	Built-in spindle #40_12000rpm	-	○	●	○
11	Built-in spindle #40_18000rpm	-	○	○	○
12	Built-in spindle #40_20000rpm	-	○	-	○
13	Mechanical rotary table (Worm gear & Pulley)	●	●	-	-
14	Built-in rotary table (Rotate stators)	-	○	●	●
15	CTS interface	●	●	●	●
16	Spindle oil cooler	●	●	●	●
17	Air blast	●	●	●	●
18	Spindle air sealing	●	●	●	●
19	3 Axes coolant through	-	○	-	○
20	Nos.ATC #40-24T	-	●	-	-
21	Nos.ATC #40-30T	-	○	○	-
22	Nos.ATC #40-40T	-	○	●	-
23	Nos.ATC #40-60T	-	○	○	-
24	Horizontal type magazine #30-26T	●	-	-	-
25	Horizontal type magazine #30-28T	○	-	-	-
26	Horizontal type magazine #40-32T (32 * 1)	-	-	-	●
27	Horizontal type magazine #40-48T/60T/64T/96T/120T	-	-	-	○
28	Linear scale on X/Y/Z-axis	○	●	●	●
29	Angle encoders on 4/5-axis	○	●	●	●
30	Air condition	●	●	●	●
31	Dust-tight electrical cabinet	●	●	●	●
32	Hydraulic unit	●	●	●	●
33	Air blow (M Code)	●	●	●	●
34	Flushing system	●	●	-	●
35	Ethernet interface	●	●	●	●
36	Levelling bolts & Plates	●	●	●	●
37	Chip conveyor	●	●	-	-
38	Left Chip conveyor	-	-	●	○
39	Right Chip conveyor	-	-	-	●
40	Chip cart	●	●	●	●
41	Front shower tube	-	-	-	●
42	Top roof	-	●	-	○
43	Automatic top roof	-	-	-	●
44	CE	○	●	●	●
45	Coolant gun	●	●	●	●
46	LED Working light	●	●	●	●
47	3-color signal light	●	●	●	●
48	Workpiece measurement	○	●	●	●
49	Tool length measurement	○	○	○	○
50	Automatic door	○	○	○	○
51	Oil water separator	●	●	●	●
52	Oil water skimmer	-	○	○	○
53	Heidenhain function kinematics	○	●	●	●
54	Calibration ball	-	●	●	●
55	Lifting interface	●	●	●	●
56	Operation & Maintenance manual	●	●	●	●
57	Turning function	-	-	○	○

● Standard ○ Optional - Not applicable