



SIRIUS-5AX

Total Solution 5-Axis Universal Machining Center





TOTAL SOLUTION 5-AXIS UNIVERSAL MACHINING CENTER

This highly precise machining center is capable of performing 5-axis machine on entire production process with a single setting

Hwacheon SIRIUS-5AX can work on a complex workpiece which requires many different production processes with just a single setting. Coupled with the Hwacheon Total Solution, it is the ultra-precision 5-axis production solution you've been looking for everything from tool selection to final product.

1 LCD Back Cover (Core) / Home appliances / NAK80 2 Mission Case / Automobile / KP4M 3 Head Lamp / Automobile / KP4M
4 Part or Head Light / Automobile / KP4M 5 Slide Core / Automobile / KP4M



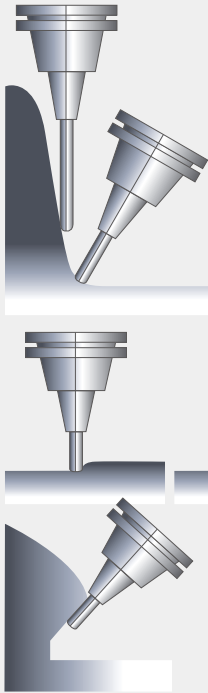
HWACHEON TOTAL SOLUTION MEETS MACHINING EXCELLENCE

Find out what we mean by machining optimization

Hwacheon's universal 5-axis center gives you the total machining solution everything from tool selection to final product.

Also, the Machining Optimization system configures itself to fit your machining condition and application to give you the best product result. The 2-axis rotary table at $\varnothing 500$ lets you create a product either by 5-axis or 3+2 axis processing method. SIRIUS-5AX is built from 3D FEM analysis, and the software components specially created in-house by Hwacheon will increase the machine's productivity and process speed. The machine comes with many functional options that will make your production more efficient.





Z-axis saddle
(2 LM Guide way, 6 LM Block)
Powerful feed performance
from 6 roller LM blocks



Highly efficient multi-axis machining

Not only can a 5-axis machine move in the same three directions of a 3-axis machine, but the cutting tool can also rotate to approach the work from any direction, enabling easy access to the undercuts that a 3-axis machine can't reach. Also, the end mill sweeping provides significant savings in machining time up to one fifth of the time it would take for the ball-end mill to be fed back and forth along a curvilinear path at close intervals when producing complex three-dimensional surfaces. Another benefit behind a 5-axis system is that the length of the tools can be compact, which used to be made longer to match the size and shape of workpieces; and the cutting is done with the side of the ball end mill, not just with the tip of it, which increases the life of the tool and results in the cut surface that is ultra fine.

Spindle assembly

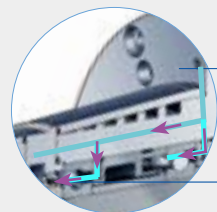
The Hwacheon clean room assembly facility, where the super-precision, super-speed spindle built inside SIRIUS-5AX is manufactured, maintains optimal temperature and humidity, and is kept free of any foreign substances. Only the most skilled master engineers are allowed in the assembly facility, in the production of only the best equipment to comply with the toughest quality standard in the industry.

Oil-jet Cooling System

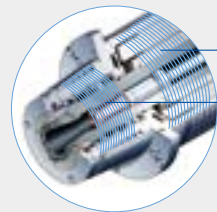
The jet of oil is injected directly onto the spindle bearing for effective cooling, and the motor and the spindle assembly are jacket-cooled to limit the displacement caused by heat.

Rigid bilateral gate structure machine frame

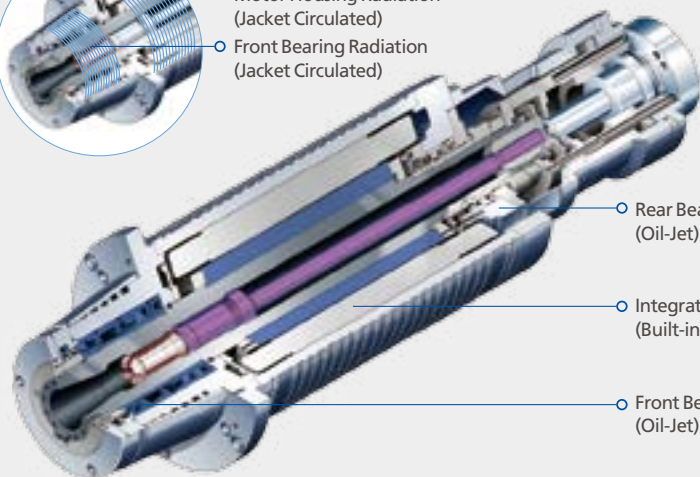
The gate structure firmly supports the x-axis drive and diverts the load, vibration, and heat from the upper section of the machine evenly throughout the frame-the feature which helps to keep the feed drive stable after hours of operation. Also, the short distance between the X-axis drive and the tool's contact point is a plus for maintaining the rigidity and for enhancing the machining precision.



○ Cooling Oil In
○ Cooling Oil Out



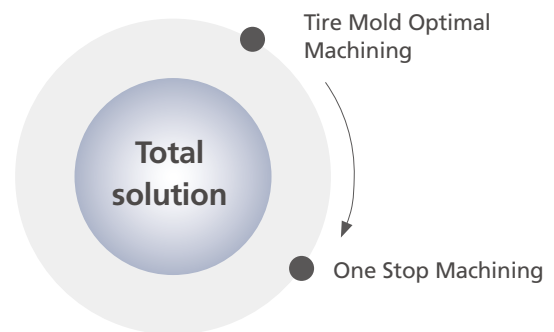
○ Motor Housing Radiation (Jacket Circulated)
○ Front Bearing Radiation (Jacket Circulated)



○ Rear Bearing Cooling (Oil-Jet)
○ Integrated Motor (Built-in)
○ Front Bearing Cooling (Oil-Jet)

UTILIZATION OF OPTIMAL MACHINING SYSTEM FOR THE CREATION OF TIRE MOLD

“Optimal Machining” is a part of Hwacheon’s Total Solutions, and the Optimal Machining System increases the productivity by up to 200%. From setting up a tire mold to quality inspection, the whole process can be achieved in one stop process. This was made possible with the creation of proprietary machining software for the purpose of making tire molds. The result Lowered worker dependency and defect rate; and increased product quality and productivity.



1 Benefits

*Increased productivity with "One-stop Machining."

*Set-up is easy even for the most complex shaped workpiece.

*Less dependent on the operator's skill

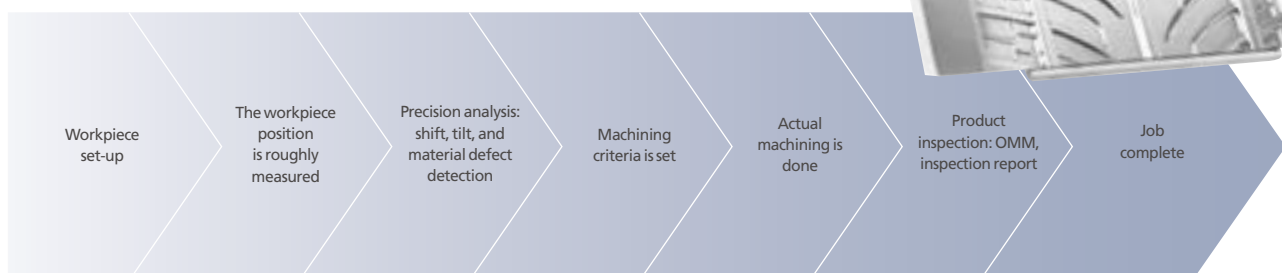
*Less work load per worker = increased productivity

*Defects are easily identified and found

*Reduced product defect

2 Process

In the tire mold machining process using a 5-axis machine, a casting material is virtually measured, and then the setup deviation is automatically calculated and corrected before actual machining.





MACHINING SOFTWARE

The Hwacheon Machining Software Components

The Hwacheon's developed machining software monitors different variables related to the work environment and machining conditions and makes adjustments for best quality results and optimum work efficiency.

+ RELIABILITY

HTDC (HSDC + HFDC)

Hwacheon Thermal Displacement Control System (HSDC + HFDC)

HTDC integrates the Hwacheon Spindle Displacement Control system and the Frame Displacement Control System.



HFDC

Hwacheon Frame Displacement Control System

HFDC is equipped with highly sensitive thermal sensors in the casting region where thermal activity is suspected; monitoring and correcting displacement.



HSDC

Hwacheon Spindle Displacement Control System

When the spindle rotates at high speed, the centrifugal force drives the taper to expand, causing errors in Z axis.

HSDC constantly monitors the temperature at each spindle region and makes optimal prediction for thermal displacement. The system then makes necessary adjustments and effectively minimizing thermal displacement.



Static displacement compensation

The HSDC system corrects the Z-axis error occurring from the taper expansion during the spindle's high speed rotation.



PRECISION +



HTLD

Hwacheon Tool Load Detect System

HTLD constantly monitors the tool wear to prevent accidents, which may occur from a damaged tool and help to stop tool wear from deteriorating the workpiece. (The load is measured every 8 msec to ensure accuracy)



HECC

Hwacheon High-Efficiency Contour Control System

HECC offers an easy-to-use programming interface for different work-pieces and different processing modes. The system provides a precise, custom contour control for the selected workpiece, while prolonging the life of the machine and decreasing process time. The customizable display provides real-time monitoring and quick access.

- Program offers different options for different cutting speed and accuracy for roughness and shapes.
 - The customizable display provides real-time monitoring and quick, easy access.
- The program is executable on an existing NC DATA system and works with the G Code system.



OPTIMA

Cutting Feed Optimization System

OPTIMA utilizes an adaptive control method to regulate the feed rate in real time, to sustain the cutting load during a machining process. As a result the tools are less prone to damage and the machining time is reduced.



HRCC

Hwacheon Rotation Center Calibration System

Hwacheon's Rotation Center Calibration System automatically measures and sets the reference point of pivot in a 5-axis machine in under one minute, to lower the workpiece setup time and increase the machining quality. The system also creates and manages a database of the reference points for different temperature and time to limit the deviation of the rotation center.



SPEED +

USER FRIENDLY DESIGN, A WIDE RANGE OF OPTIONAL FEATURES

SIRIUS-5AX offers user friendly design and a wide variety of useful options for practical applications, so you can concentrate on what you do best: creating quality products-without losing your valuable time to the worries of machine failure and safety. A wide variety of performance upgrade options are available for faster, more precise machining.



Hwacheon Rotation Center Calibration System-HRCC(Option)

Hwacheon's Rotation Center Calibration System automatically measures and sets the reference point of pivot in a 5-axis machine in under one minute, to lower the workpiece setup time and increase the machining quality. The system also creates and manages a database of the reference points for different temperature and time to limit the deviation of the rotation center.

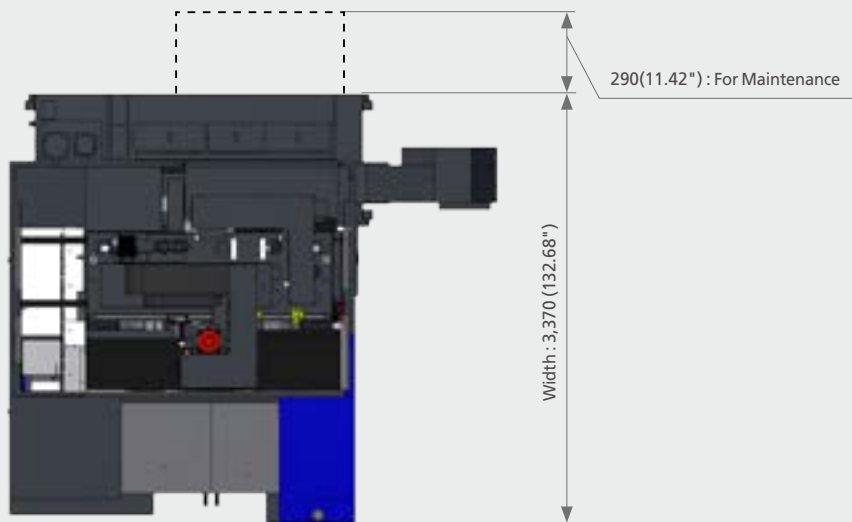


2-Axis Tilting rotary table for extra stability

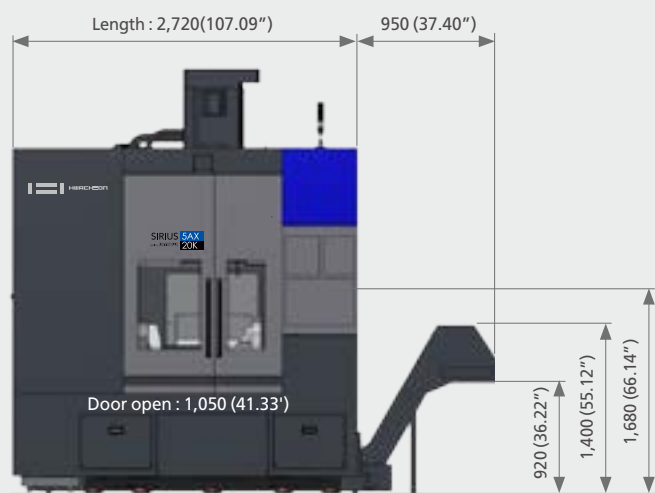
The fixed OTT worm gears and rotary encoder allow for 0.001 degree of high-precision angle division and consecutive rotation cut; and the powerful hydraulic brake system with 4,670Nm of force provides the rigidity more than sufficient for any 3+2 axis job.

Machine Size

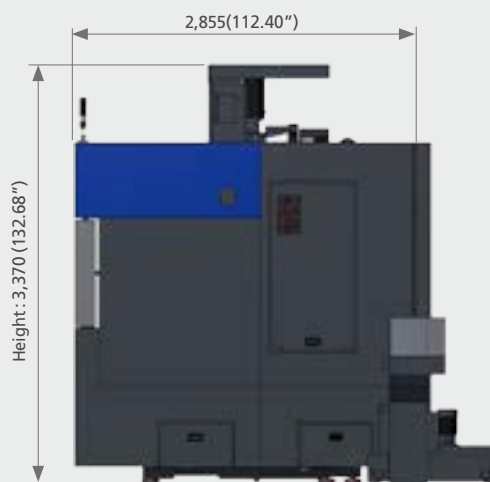
* Unit: mm(inch)



Top



Front



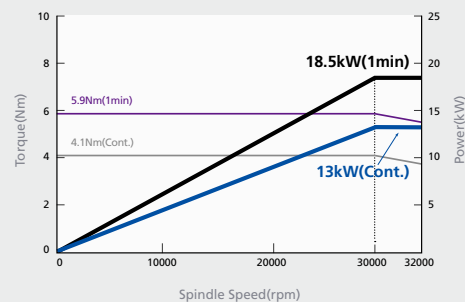
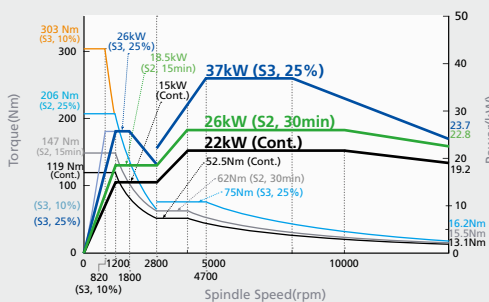
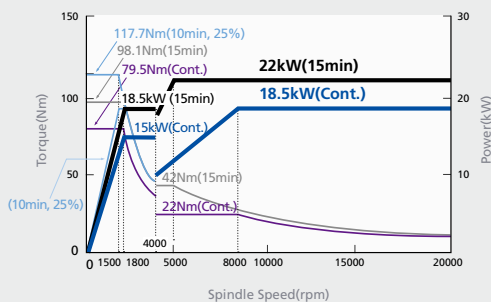
Side

Torque Diagram

Standard (20,000rpm)

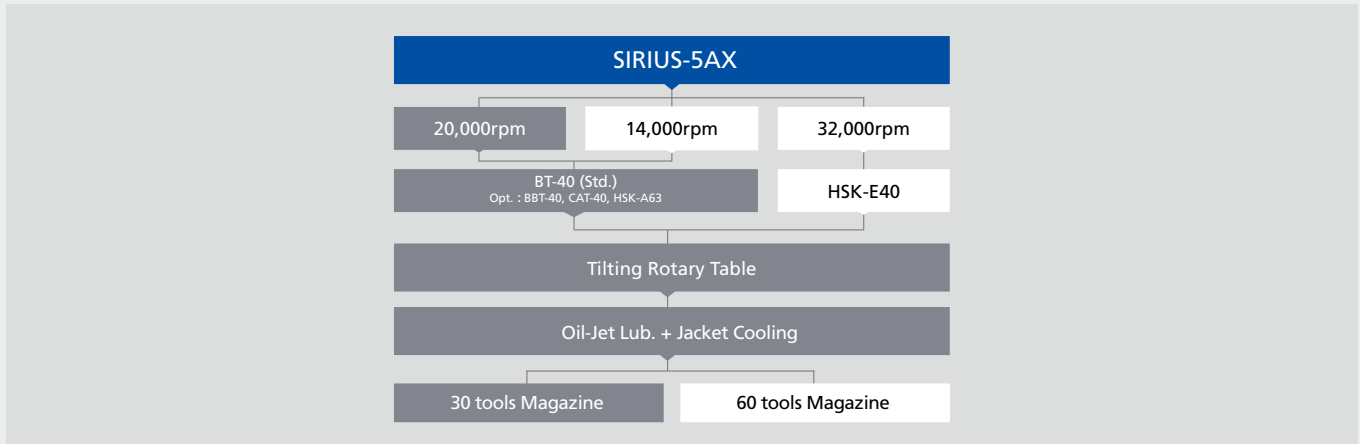
Option (14,000rpm)

Option (32,000rpm)



Machine Line-up

Each product can be configured to fit your application.



Machine Specification

ITEM	SIRIUS-5AX		
	20,000	14,000	32,000
Travel			
X-axis Stroke (longitudinal movement of Spindle)	mm(inch)	750 (29.53")	
Y-axis Stroke (Cross movement of Spindle)	mm(inch)	650 (25.29")	
Z-axis Stroke (Vertical movement of Spindle)	mm(inch)	520 (20.47")	
A-axis Stroke (Tilting)/C-axis Stroke (Rotary)	deg.	+30° ~ -120° / 360°	
Distance from table surface to spindle gauge plane	mm(inch)	75~595 (2.95" ~ 23.42")	
Distance between Columns to Spindle Center	mm(inch)	134 (5.27")	
Distance between Columns	mm(inch)	1,320 (51.97")	
Table			
Working Surface	mm(inch)	Ø500 (19.69")	
Table Loading Capacity	kg, (lb.)	300 (661.39)	
Table Surface Configuration (T slots WxP –No. of slots)	mm(inch)	14 x 80 (0.55" x 3.15") - 5ea	
Spindle			
Max. Spindle Speed	rpm	20,000	14,000
Spindle Motor	kW(HP)	22 / 18.5 (30 / 25)	37/22 (50/30)
Type of Spindle Taper Hole	-	ISO#40, 7/24 Taper (BT-40)	
Spindle Bearing Inner Diameter	mm(inch)	Ø70 (Ø2.76")	
Method of Spindle Lubrication & cooling	-	Oil-Jet Lub. + Jacket Cooling	
Feedrate			
Rapid Speed (X/Y/Z)	m/min(ipm)	48/48/48 (1,890 / 1,890 / 1,890)	
Rapid Speed (A/C)	rpm	8.3 / 33.3	
Feedrate (X/Y/Z)	mm/min(ipm)	1~24,000 (0.04~945)	
ATC			
Type of Tool Shank	-	BT-40 (Opt. : BBT-40, CAT-40, HSK-A63)	
Type of Pull Stud	-	MAS P40T-1 (45°)	
Tool Storage Capacity	ea	30 (Opt.: 60)	
Max. Tool Diameter [without Adjacent Tools]	mm(inch)	Ø90 (Ø3.54") / Ø170 (Ø6.69") [60T: Ø80 (Ø3.15") / Ø170 (Ø6.69")]	
Max. Tool Length	mm(inch)	300 (11.81")	
Max. Tool Weight	kg, (lb.)	8 (17.64)	
Method of Tool Selection	-	Memory Random	
Method of Operation (Magazine/Swing Arm)	-	Servo Motor/Servo Motor	
Motor			
Feed Motor (X/Y/Z)	kW(HP)	4.0/7.0/4.0 (5.4/9.5/5.4)	
Feed Motor (A/C)	kW(HP)	4.0/4.0 (5.4/5.4)	
Coolant Motor (Spindle/chip flushing)	kW(HP)	0.4/0.9 (0.54/1.2)	
Spindle Cooler (50/60Hz) – Inverter type	kW(HP)	5.0/5.6 (6.7/7.5)	
Power Source			
Electric Power Supply	kVA	65	
Compressed Air Supply (Pressure x Consumption)	-	0.5~0.7 MPa x 690N l /min	
Tank capacity			
Spindle Cooling / Hydraulic/ Lubrication	l (gal)	60 / 20 / 12 (15.85 / 5.28 / 3.17)	
Coolant	l (gal)	350 (92.46)	
Machine size			
Height	mm(inch)	3,370 (132.68")	
Floor Space (length x width)	mm(inch)	2,720 x 3,370 (108.27" x 132.68")	
Floor Space (length x width)	kg, (lb.)	12,000 (26,455)	
NC controller			
		Fanuc 31i-B5	

Accessories

Standard Accessories		Optional Accessories	
• Adjust Bolt, Block & Plate	• Spindle Cooler	• Air Dryer	• Spindle Through Coolant, 30 bar/ 70 bar
• Air Blower	• Tool Kit & Box	• Air Gun	• Tool Life Management
• Coolant System	• Work Light	• Auto Door	• Tool Measuring System – Renishaw / Blum (Touch type, Laser type)
• Door Interlock	• Workpiece Coordinate System 48 Pairs	• CNC-Integrated 3-Dimensional Interference Check System	• Tool Radius Compensation for 5 axis
• Data Server (256MB)	• Workpiece Setting Error Compensation for 5 axis	• Coolant Gun	• Transformer
• Data Server Interface	• 5-axis Tool Cutting Point Control	• Coolant System (15 bar)	• Hwacheon Artificial Intelligence Control System (HAI):1,000 Block
• Hydraulic System	• 10.4" Color LCD	• Data Server (1,024MB)	• Hwacheon Rotation Center Calibration System (HRCC)
• Lubrication System	• Cutting Feed Optimization System (OPTIMA)	• Lift up Chip Conveyor (Hinge type, Scraper type, Drum type)	- Include work measuring system (Touch type)
• MPG Handle (1ea)	• Hwacheon Artificial Intelligence Control System (HAI): 600 Block	• Mist Collector	
• Operation Manual & Parts List	• Hwacheon Efficient Contour Control system (HECC)	• NC Cooler	
• Pneumatics System	• Hwacheon Tool Load Detect system (HTLD)	• NURBS Interpolation	
• Rigid Tapping	• Hwacheon Thermal Displacement Control system (HTDC)	• Nano Smoothing Interpolation	
• Scale (X/ Y/ Z/ A/ C)	- Hwacheon Spindle Displacement Control system (HSDC)+	• Oil Mist (Semi Dry Cutting System)	
• Signal Lamp (R, G)	- Hwacheon Frame Displacement Control system (HFDC)	• Oil Skimmer	
• Slant Control for 5-axis Guidance Installation		• Signal Lamp (R, G, Y)	

NC Specification [Fanuc 31i-B5]

※ — : Not available S : Standard O : Option

ITEM	SPECIFICATION	ITEM	SPECIFICATION
Controlled Axis		Graphic function	S
Controlled axis (Cs axis)	5 - Axes	Dynamic graphic display	O
Simultaneously controlled axes	5 - Axes	Multi-language display	S (English, German, French, Italian, Chinese, Spanish, Korean, Portuguese, Polish, Hungarian, Swedish/Russian)
Least input increment	0.001mm, 0.001deg, 0.0001inch	Feed Function	
Least input increment 1/10 inch/metric conversion	0.0001mm, 0.0001deg, 0.00001inch G20, G21	Rapid traverse override	F0, F25, F50, F100
Stored stroke check 1		Feedrate (mm/min)	S
Stored stroke check 2		Feedrate override	0-150%
Mirror Image		Jog feed override	0-4,000 mm/min
Stored pitch error compensation		Override cancel	M48, M49
Backlash compensation		Program Input	
Operation		Tape code	EIA / ISO
Automatic & MDI operation		Optional block skip	1ea
DNC operation by memory card	PCMCIA card is required	Program number	O4-digits
Program number search		Sequence number	N8-digits
Sequence number search		Decimal point programming	S
Dry run, single block		Coordinate system setting	G92
Manual handle feed	1unit	Workpiece coordinate system	G54-G59
Manual handle feed rate	x1, x10, x100	Workpiece coordinate system preset	O
Handle interruption		Additional workpiece coordinate pairs	48ea
Interpolation Function		Additional workpiece coordinate pairs	300ea
Positioning	G00	Extend program edit function	Copy/move/..
Linear interpolation	G01	Manual absolute on and off	S
Circular interpolation	G02, G03	Chamfering / corner R	S
Dwell (Per seconds)	G04	Programmable data input	G10
Cylindrical interpolation	4-axis interface option is required	Sub program call	10 folds nested
Helical interpolation	Circular interpolation plus max.2axes linear interpolation	Custom macro B	S
Nano smoothing		Addition of custom macro common variables	#100-#199, #500-#999
Reference position return check	G27	Canned cycles for drilling	S
Reference position return	G28, G29	Small-hole peck drilling cycle	O
2nd reference position return	G30	Automatic corner override	O
Skip	G31	Feedrate clamp based on arc radius	S
NURBS interpolation		Scaling	O
Spindle Speed Function		Coordinate system rotation	S
Spindle serial output		Programmable mirror image	S
Spindle override	50-120%	Tape format for Fanuc series 15	O
Spindle orientation		Others	
Rigid tapping		Display unit	10.4" color LCD
Tool function / Compensation		Data input/output	
Tool function	T4-digits	Reader/Puncher interface CH1	S
Tool offset pairs	±6 digits, 200ea	Reader/Puncher interface CH2	S
Tool offset pairs	±6 digits, 400ea, 999ea	Data server	S
Tool offset memory C		Data server	O
Tool length compensation		Feedrate clamp based on arc radius	S
Cutter compensation C		USB/Memory card interface	S
Tool life management		Auto data backup	S
Tool length measurement		HWACHEON Machining Software	
Editing Operation		High-speed HRV3 function	S
Part program storage length/ Number of register able programs	256kb/500ea	Hwacheon Artificial Intelligence Control System (HAI): 600 Block (AI contour control II + High speed processing)	S
Part program storage length/ Number of register able programs	512kb/1,000ea, 1MB/1,000ea, 2MB/1,000ea	Hwacheon Artificial Intelligence Control System (HAI): 1,000 Block (AI contour control II + High speed processing + Lock-ahead blocks are up to 1,000 blocks)	O
Background editing		HECC (Hwacheon Efficient Contour Control System)	S
Extended part program editing		HTLD (Hwacheon Tool Load Detect)	S
Play back		OPTIMA (Cutting Feed Optimization System)	S
Setting and Display		HTDC (Hwacheon Thermal Displacement System)	
Clock function		- HSDC (Hwacheon Spindle Displacement Control System) + - HFDC (Hwacheon Frame Displacement Control System)	S
Self-diagnosis function		5Axis Intelligence	
Alarm history display		Smooth Tool Center point control	S
Help function		Tilted working plane command with guidance for 5 axis	S
Run hour and parts count display		Work piece setting error compensation for 5 axis	S
Polar Coordinate System		Tool radius compensation for 5 axis	O

Hwacheon Global Network

 Hwacheon Headquarters  Hwacheon Europe  Hwacheon Asia  Hwacheon America



HWACHEON

Please call us for product inquiries.

www.hwacheon.com

The product design and specifications may change without prior notice.
Read the operation manual carefully and thoroughly before operating the product,
and always follow the safety instructions and warnings labels attached on the surfaces of the machines.

HEAD OFFICE

HWACHEON MACHINE TOOL CO., LTD.

123-17, HANAMSANDAN 4BEON-RO, GWANGSAN-GU, GWANGJU, KOREA
TEL: +82-62-951-5111 FAX: +82-62-951-0086

SEOUL OFFICE

46, BANGBAE-RO, SEOCHO-GU, SEOUL, KOREA
TEL: +82-2-523-7766 FAX: +82-2-523-2867

USA

HWACHEON MACHINERY AMERICA, INC.

555 BOND STREET, LINCOLNSHIRE, ILLINOIS, 60069, USA
TEL: +1-847-573-0100 FAX: +1-847-573-9900

SINGAPORE

HWACHEON ASIA PACIFIC PTE. LTD.

21 BUKIT BATOK CRESCENT, #08-79 WCEGA TOWER, SINGAPORE 658065
TEL: +65-6515-4357 FAX: +65-6515-4358

GERMANY

HWACHEON MACHINERY EUROPE GMBH

JOSEF-BAUMANN STR. 25, 44805, BOCHUM, GERMANY
TEL: +49-234-912-816-0 FAX: +49-234-912-816-60