SIRIUS-5AX

Total Solution 5-Axis Universal Machining Center

HWACHEON

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.

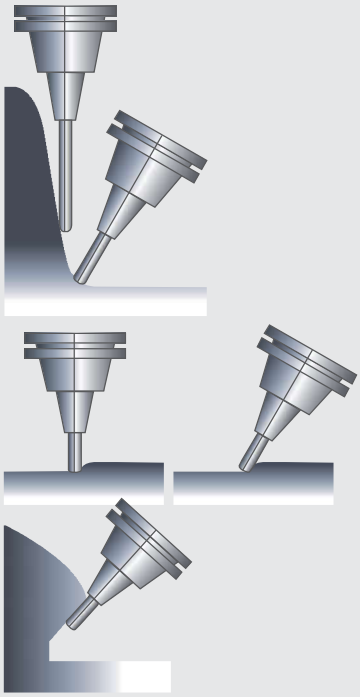
1 LCD Back Cover (Core) / Home appliances / NAK80 **2** Mission Case / Automobile / KP4M **3** Head Lamp / Automobile / KP4M
4 Part or Head Light / Automobile / KP4M **5** Slide Core / Automobile / KP4M

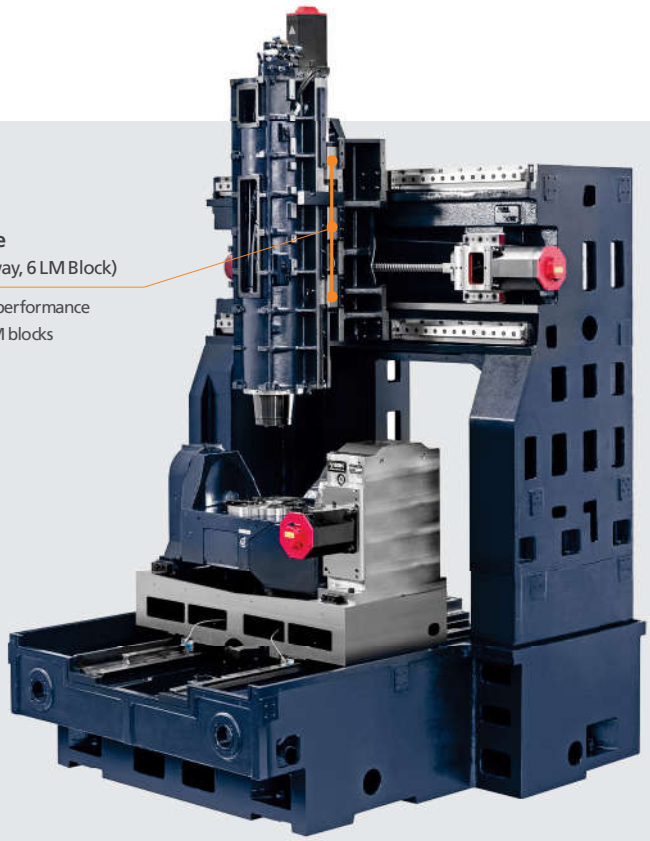
HWACHEON TOTAL SOLUTION MEETS MACHINING EXCELLENCE

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 ø500 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.





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.

Rigid bilateral gate structure machine frame

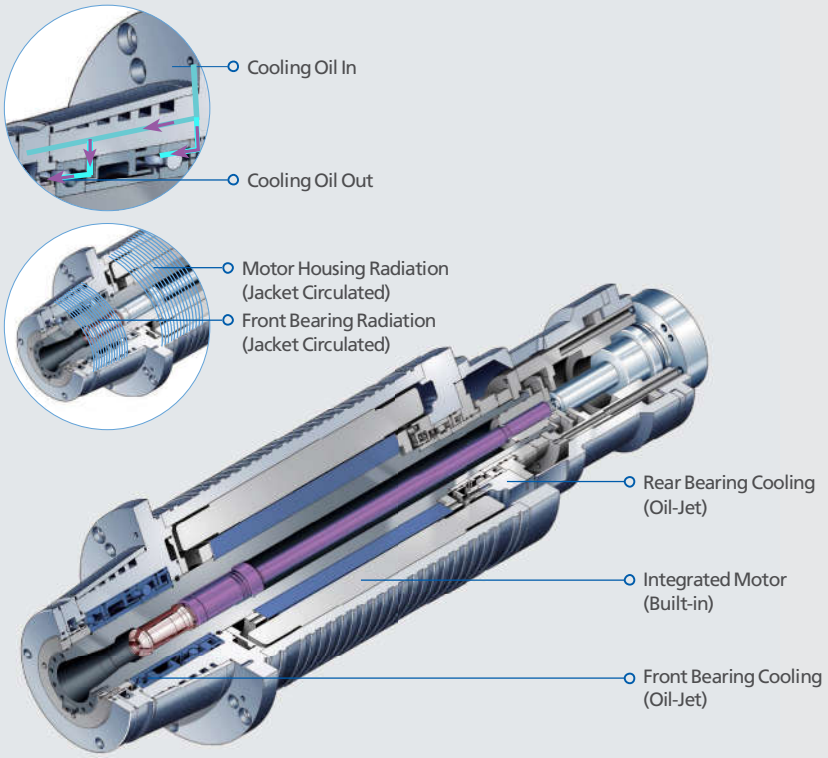
The gate structure firmly supports the x-axis drive and diverts the load, vibration, and heat from the upper section of the machine evenly throughout the frame-the feature which helps to keep the feed drive stable after hours of operation. Also, the short distance between the X-axis drive and the tool's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

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.

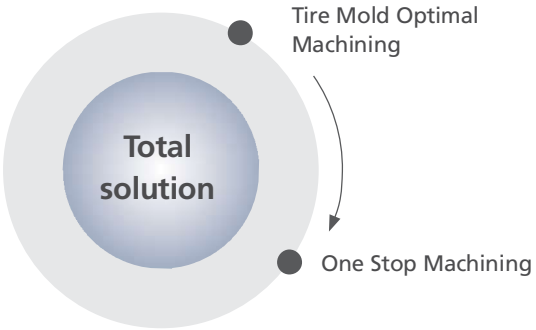
Oil-jet Cooling System

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.



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.

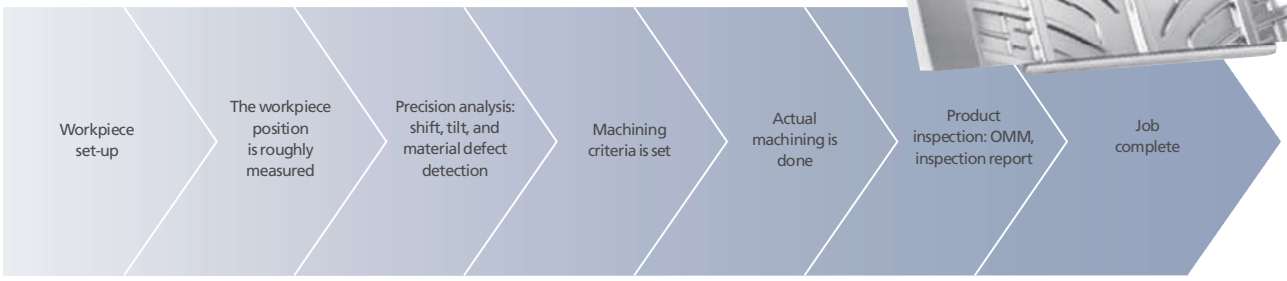


❶ Benefits

- *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

❷ 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.

HTDC™ Hwacheon Thermal Displacement Control

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.

HFDC™ Hwacheon Frame Displacement Control

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.

HSDC™ Hwacheon Spindle Displacement Control

Static displacement compensation

The HSDC system corrects the Z-axis error occuring 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)

HTLD™ Hwacheon Tool Load Detect

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.

HECC® Hwacheon Efficency Contour Control

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.

OPTIMA™ Cutting Feed Optimization

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 eviation of the rotation center.

HRCC™ Hwacheon Rotation Center Calibration System

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)

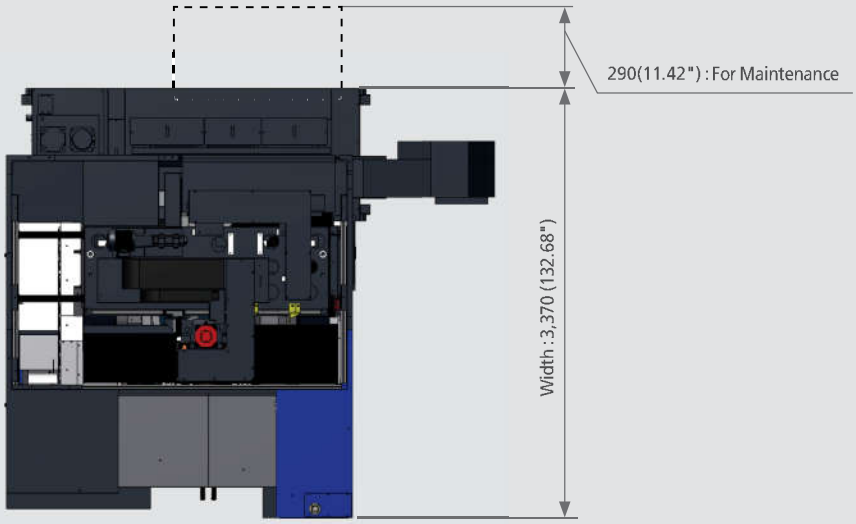
Hwacheon's Rotation Center Calibration System automatically measures and sets the reference point of pivot in a 5-axis machine in under one minute, to lower the workpiece setup time and increase the machining quality. The system also creates and manages a database of the reference points for different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

2-Axis Tilting rotary table for extra stability

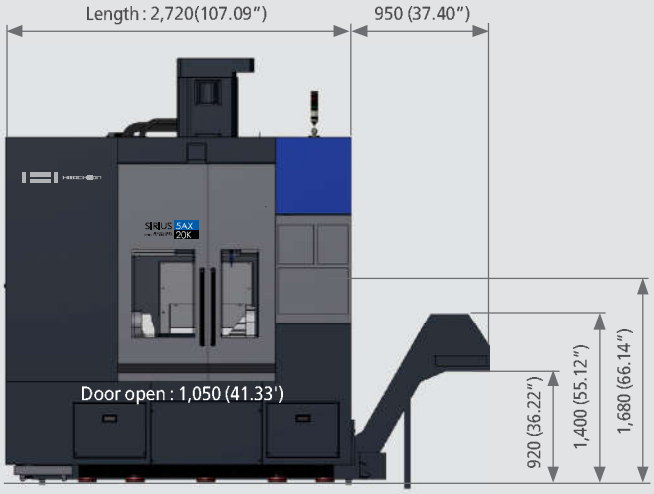
The fixed OTT worm gears and rotary encoder allow for 0.001 degree of high-precision angle division and consecutive rotation cut; and the powerful hydraulic brake system with 4,670Nm of force provides the rigidity more than sufficient for any 3+2 axis job.

Machine Size

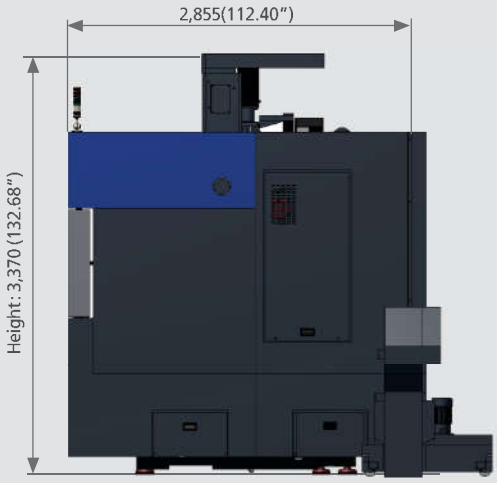
* Unit: mm(inch)



Top



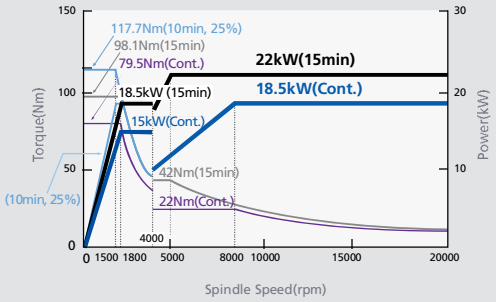
Front



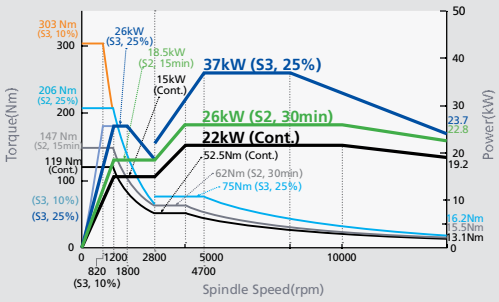
Side

Torque Diagram

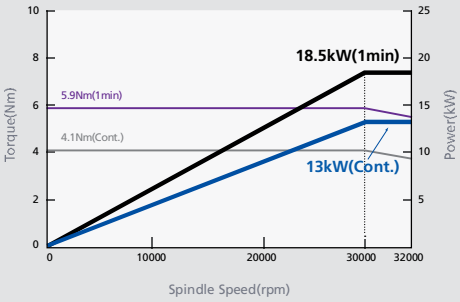
Standard (20,000rpm)



Option (14,000rpm)

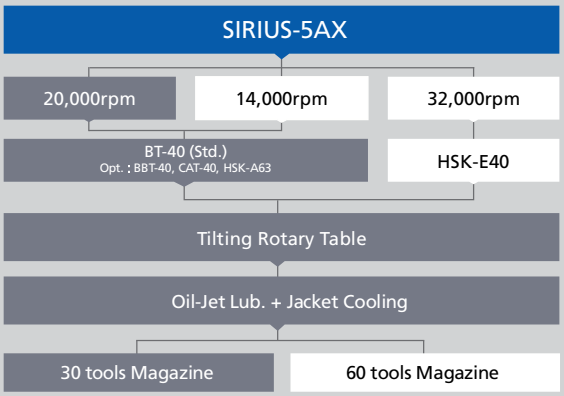


Option (32,000rpm)



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_f (lb_f)		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	32,000
Spindle Motor	kW(HP)	22 / 18.5 (30 / 25)	37/22 (50/30)	18.5 / 13 (25 / 18)
Type of Spindle Taper Hole	-	ISO#40, 7/24 Taper (BT-40)		HSK-E40
Spindle Bearing Inner Diameter	mm(inch)	Ø70 (Ø2.76")		Ø45 (Ø1.77")
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)		HSK-E40
Type of Pull Stud	-	MAS P40T-1 (45°)		-
Tool Storage Capacity	ea	30 (Opt.: 60)		30
Max. Tool Diameter [without Adjacent Tools]	mm(inch)	Ø90 (Ø3.54") / Ø170 (Ø6.69") [60T: Ø80 (Ø3.15") / Ø170 (Ø6.69")]		Ø60 (Ø2.36") / Ø90 (Ø3.54")
Max. Tool Length	mm(inch)	300 (11.81")		250 (9.84")
Max. Tool Weight	kg_f (lb_f)	8 (17.64)		3 (6.61)
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_f (lb_f)	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
• Door Interlock	• Workpiece Coordinate System 48 Pairs	• CNC-Integrated 3-Dimensional Interference Check System	(Touch type, Laser type)
• Data Server (256MB)	• Workpiece Setting Error Compensation for 5 axis	• Coolant Gun	• Tool Radius Compensation for 5 axis
• Data Server Interface	• 5-axis Tool Cutting Point Control	• Coolant System (15 bar)	• Transformer
• Hydraulic System	• 10.4" Color LCD	• Data Server (1,024MB)	• Hwacheon Artificial Intelligence Control System (HAI):1,000 Block
• Lubrication System	• Cutting Feed Optimization System (OPTIMA)	• Lift up Chip Conveyor	• Hwacheon Rotation Center Calibration System (HRCC)
• MPG Handle (1ea)	• Hwacheon Artificial Intelligence Control System	(Hinge type, Scraper type, Drum type)	- Indude work measuring system (Touch type)
• Operation Manual & Parts List	(HAI): 600 Block	• Mist Collector	
• Pneumatics System	• Hwacheon Efficient Contour Control system (HECC)	• NC Cooler	
• Rigid Tapping	• Hwacheon Tool Load Detect system (HTLD)	• NURBS Interpolation	
• Scale (X/ Y/ Z/ A/ C)	• Hwacheon Thermal Displacement Control system (HTDC)	• Nano Smoothing Interpolation	
• Signal Lamp (R, G)	- Hwacheon Spindle Displacement Control system (HSDC)+	• Oil Mist (Semi Dry Cutting System)	
• Slant Control for 5-axis Guidance Installation	- Hwacheon Frame Displacement Control system (HFDC)	• Oil Skimmer	
		• Signal Lamp (R, G, Y)	

NC Specification [Fanuc 31i-B5]

※ — : Not available S : Standard O : Option

ITEM	SPECIFICATION	
Controlled Axis		
Controlled axis (Cs axis)	5 - Axes	S
Simultaneously controlled axes	5 - Axes	S
Least input increment	0.001mm, 0.001deg, 0.0001inch	S
Least input increment 1/10	0.0001mm, 0.0001deg, 0.00001inch	O
inch/metric conversion	G20, G21	S
Stored stroke check 1		S
Stored stroke check 2		S
Mirror Image		S
Stored pitch error compensation		S
Backlash compensation		S
Operation		
Automatic & MDI operation		S
DNC operation by memory card	PCMCIA card is required	S
Program number search		S
Sequence number search		S
Dry run, single block		S
Manual handle feed	1unit	S
Manual handle feed rate	x1, x10, x100	S
Handle interruption		S
Interpolation Function		
Positioning	G00	S
Linear interpolation	G01	S
Circular interpolation	G02, G03	S
Dwell (Per seconds)	G04	S
Cylindrical interpolation	4-axis interface option is required	O
Helical interpolation	Circular interpolation plus max.2axes linear interpolation	S
Nano smoothing		O
Reference position return check	G27	S
Reference position return	G28, G29	S
2nd reference position return	G30	S
Skip	G31	S
NURBS interpolation		O
Spindle Speed Function		
Spindle serial output		S
Spindle override	50-120%	S
Spindle orientation		S
Rigid tapping		S
Tool function / Compensation		
Tool function	T4-digits	S
Tool offset pairs	±6 digits, 200ea	S
Tool offset pairs	±6 digits, 400ea, 999ea	O
Tool offset memory C		S
Tool length compensation		S
Cutter compensation C		S
Tool life management		O
Tool length measurement		S
Editing Operation		
Part program storage length/ Number of register able programs	256kb/500ea	S
Part program storage length Number of register able programs	512kb/1,000ea, 1MB/1,000ea, 2MB/1,000ea	O
Background editing		S
Extended part program editing		S
Play back		O
Setting and Display		
Clock function		S
Self-diagnosis function		S
Alarm history display		S
Help function		S
Run hour and parts count display		S
Polar Coordinate System		O

ITEM	SPECIFICATION	
Graphic function		S
Dynamic graphic display		O
Multi-language display	(English, German, French, Italian, Chinese, Spanish, Korean, Portuguese, Polish, Hungarian, Swedish, Russian)	S
Feed Function		
Rapid traverse override	F0, F25, F50, F100	S
Feedrate (mm/min)		S
Feedrate override	0-150%	S
Jog feed override	0-4,000 mm/min	S
Override cancel	M48, M49	S
Program Input		
Tape code	EIA / ISO	S
Optional block skip	1ea	S
Program number	O4-digits	S
Sequence number	N8-digits	S
Decimal point programming		S
Coordinate system setting	G92	S
Workpiece coordinate system	G54-G59	S
Workpiece coordinate system preset		O
Additional workpiece coordinate pairs	48ea	S
Additional workpiece coordinate pairs	300ea	O
Extend program edit function	Copy/move/..	S
Manual absolute on and off		S
Chamfering / corner R		S
Programmable data input	G10	S
Sub program call	10 folds nested	S
Custom macro B		S
Addition of custom macro common variables	#100-#199, #500-#999	O
Canned cycles for drilling		S
Small-hole peck drilling cycle		O
Automatic corner override		O
Feedrate clamp based on arc radius		S
Scaling		O
Coordinate system rotation		S
Programmable mirror image		O
Tape format for Fanuc series 15		O
Others		
Display unit	10.4" color LCD	S
Data input/output		
Reader/Puncher interface CH1		S
Reader/Puncher interface CH2		S
Data server		S
Data server		O
Feedrate clamp based on arc radius		S
USB/Memory card interface		S
Auto data backup		S
HWACHEON Machining Software		
High-speed HRV3 function		S
Hwacheon Artificial Intelligence Control System (HAI): 600 Block (AI contour control II + High speed processing)		S
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
HECC (Hwacheon Efficient Contour Control System)		S
HTLD (Hwacheon Tool Load Detect)		S
OPTIMA (Cutting Feed Optimization System)		S
HTDC (Hwacheon Thermal Displacement System) - HSDC (Hwacheon Spindle Displacement Control System) + - HFDC (Hwacheon Frame Displacement Control System)		S
5Axis Intelligence		
Smooth Tool Center point control		S
Tilted working plane command with guidance for 5 axis		S
Work piece setting error compensation for 5 axis		S
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.

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