



VESTA-660/1000

Software-Optimized Advanced Vertical Machining Centers





SOFTWARE-OPTIMIZED VERTICAL MACHINING CENTER

Introducing the faster, more precise, more reliable vertical machining center for component machining.

Hwacheon's machining software monitors many environment and machining condition related variables and makes optimized adjustments for the best quality results at optimum work efficiency.

1 Engine Block / Auto mobile / Aluminum 2 Semiconductor equipment part / Semiconductor / Aluminum 3 Semiconductor equipment part / Semiconductor / Aluminum 4 Mani-Fold / Automobile / Aluminum 5 Aerospace Part / Aerospace / AL6061



SUPER FAST ROUGHING AND ULTRA PRECISE FINISHING PERFORMANCE

The VESTA series of machining centers are the result of Hwacheon's technological innovation.

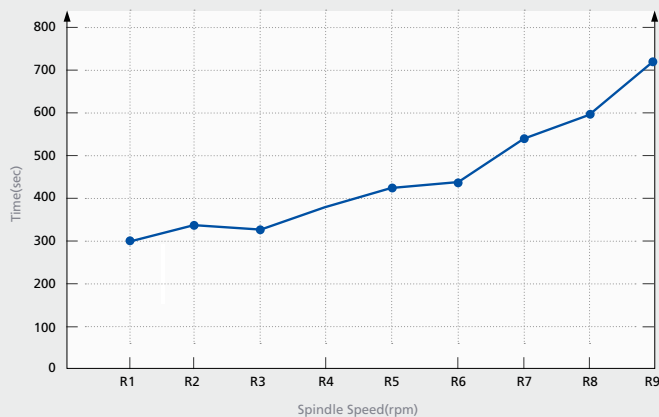
These high-performance machines are optimized for job shop machining applications, with the easy-to-use interface to maximize your productivity. HTLD increases the life of your tools; HECC provides perfect contour control for better machining efficiency; OPTIMA controls the feedrate and HTLD adjusts the temperature in real time. To minimize thermal displacement and to increase the life of the spindle assembly, the spindle unit is grease-lubricated and jacket cooled. The advanced feed drive complements the spindle for highly precise machining result every time. The super tough roller guide keeps its precision even at high speeds, and offers a variety of options for your convenience. Last but not least, VESTA's advanced chip removal and lube separation system help to save cost.



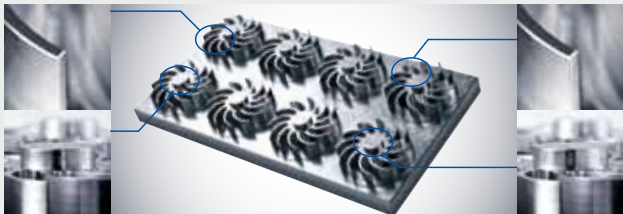


Machining example using HECC®

[Cutting time per HECC level]



HECC Mode	R1.00	R3.00	R6.00	R9.00
	← Time-weighted		Degree of process →	
Smooth function	R3.01	R3.03	R3.06	R3.09



You can program the HECC system to operate in Fast Mode to prioritize speed over precision such as roughing; or have it run in Precision Mode when finish cutting. Better yet, you don't need to modify parameters every time you change your work you can easily switch from one mode to another by entering the NC data. This feature works not just for speed and precision, but also for setting the level of smoothness of the surface on a workpiece.



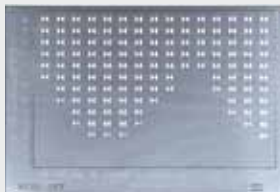
HTDC usage example



OFF



ON



Max.60µm / 24hr



Max.10µm / 24hr

HTDC monitors the temperature of different section of the machine with the highly sensitive sensors integrated within the spindle and the frame, to maintain the level of precision over long hours of operation. The left sample demonstrates how the precision level changes when the HTDC (Hwacheon Thermal Displacement Control) is turned off and on, to show that HTDC effectively helps to produces consistent machining results after 24 hours of operation.





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

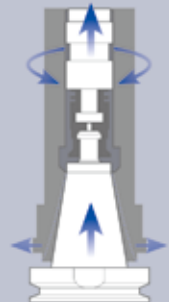
When the spindle rotates at high speed, the centrifugal force drives the taper to expand, causing errors in Z axis. HSDC constantly monitors the temperature at each spindle region and makes optimal prediction for thermal displacement. The system then makes necessary adjustments and effectively minimizing thermal displacement.

HSDC™

Hwacheon Spindle Displacement Control

Static displacement compensation

The HSDC system corrects the Z-axis error 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)

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 Efficiency
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

SPEED +

USER FRIENDLY DESIGN, A WIDE RANGE OF OPTIONAL FEATURES

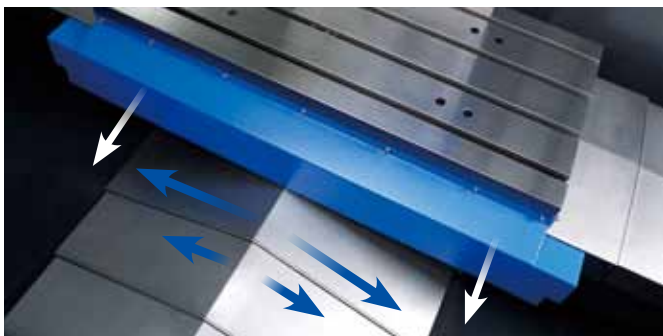
The VESTA-660/1000 system offers user friendly design and a wide variety of useful options for practical applications, so you can concentrate on what you do best: creating quality products without losing your valuable time to the worries of machine failure and safety. A wide variety of performance upgrade options are available for faster, more precise machining.

Index Table (Option)

Hwacheon's index table can be operated with ease without the need for additional 4-axis interface, and its 4.3 tons of clamping force and 5 degrees of division angle are ideal for hard turning.

Fast chip removal performance

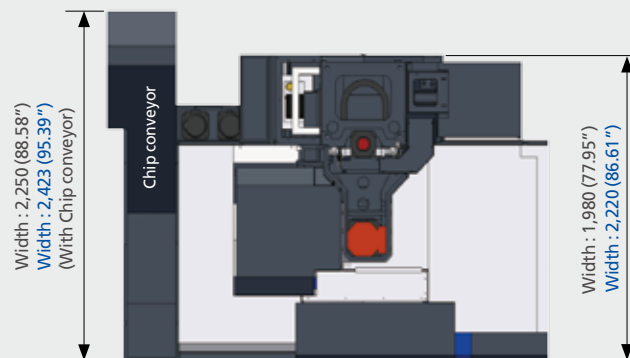
The chip removal section in VESTA series of machining centers are designed with a wide-angle sliding cover and the chip flushing nozzles on each side of the table; and the coil conveyor in front removes the chips quickly and effectively, to make your work more efficient.



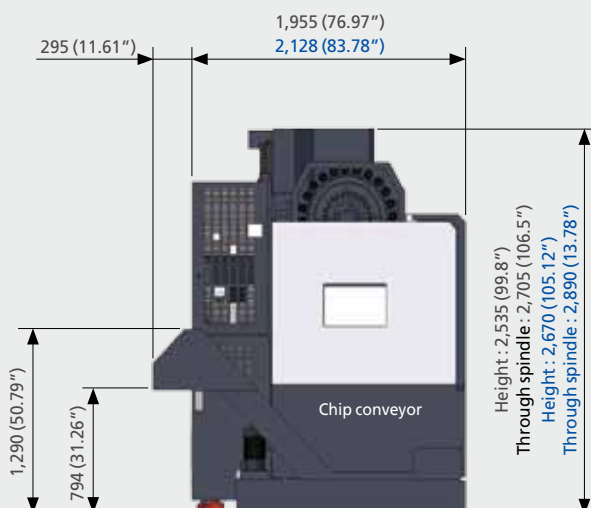
Product Data

■ VESTA-660 ■ VESTA-1000

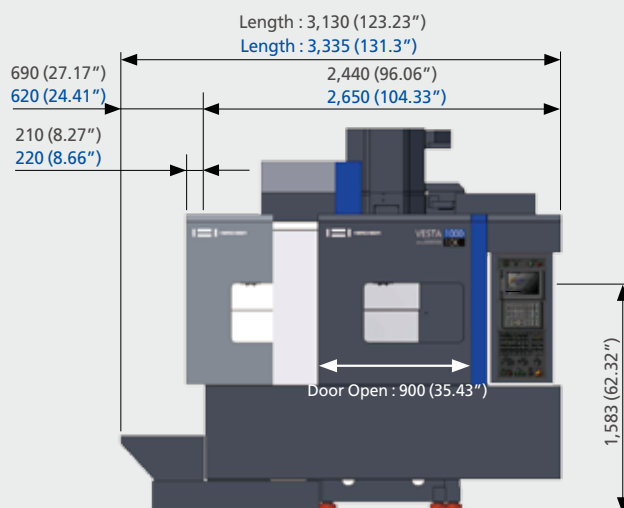
* Unit: mm(inch)



Top



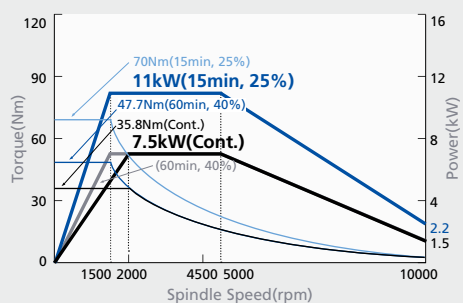
Left side



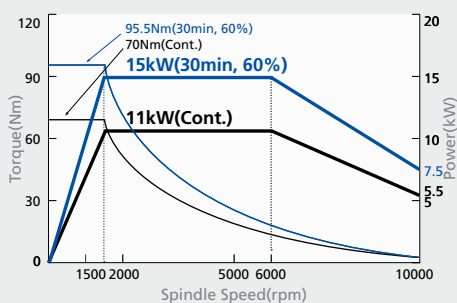
Front

Spindle Power – Torque Diagram

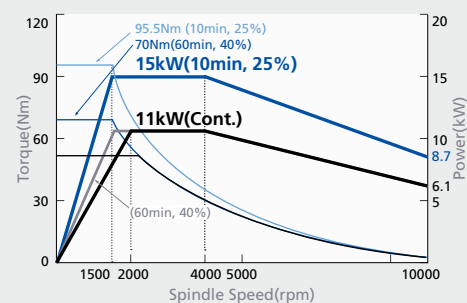
VESTA-660 (STD)



VESTA-1000 (STD)

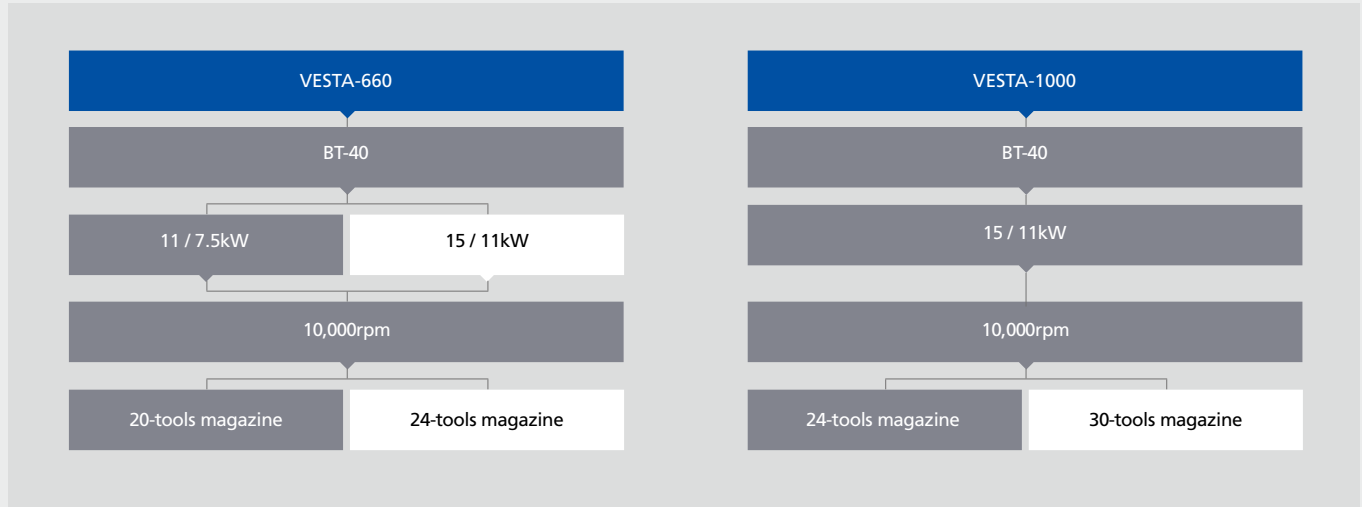


VESTA-660/1000 (Through-Spindle)



Product Configuration

Each product can be configured to fit your application.



Machine Specifications

ITEM		VESTA-660		VESTA-1000
		BT-40		BT-40
		11 / 7.5	15 / 11	15 / 11
Travel				
Stroke (X / Y / Z)	mm(inch)	660 (25.98") / 430 (16.93") / 400 (15.75")		1,000 (39.37") / 550 (21.65") / 500 (19.69")
Distance from table surface to spindle gauge plane	mm(inch)	150 (5.91") ~ 550 (21.65")		130 (5.12") ~ 630 (24.8")
Table				
Working surface	mm(inch)	720 (28.35") x 400 (15.75")		1,100 (43.31") x 500 (19.69")
Table loading capacity	kg(lb)	560 (1,234)		700 (1,534)
Table surface configuration (T slots WxP – No. of slots)	mm(inch)	18 (0.71") x 100 (3.94") - 3ea		18 (0.71") x 80 (3.15") - 5ea
Spindle				
Max. Spindle speed	rpm	10,000		
Spindle Motor	kW(HP)	11 / 7.5 (15 / 10)	15 / 11 (20 / 15)	15 / 11 (20 / 15)
Feedrate				
Rapid Speed (X / Y / Z)	m/min(ipm)	36 (1,417) / 36 (1,417) / 30 (1,181)		
Feedrate (X / Y / Z)	mm/min(ipm)	1 (0.04) ~ 24,000 (945)		
ATC				
Type of tool shank	-	MAS-403 BT-40 (Opt.: CAT-40)		
Type of pull stud	-	MAS P40T-1 (45°)		
Tool storage capacity	ea	20 (24)		24 (30)
Max. Tool diameter [Without adjacent tools]	mm(inch)	Ø80 (3.15") / Ø150 (5.91")		
Max. Tool length	mm(inch)	300 (11.81")		
Max. Tool weight	kg(lb)	8 (17.64)		
Tool changing time (T to T / C to C)	sec	2.5 / 4		2.5 / 4.3
Motor				
Feed motor (X / Y / Z)	kW(HP)	1.8 (2.4) / 1.8 (2.4) / 3.0 (4.0)		
Coolant motor (Spindle / Chip flushing)	kW(HP)	0.4 (0.54)		
Spindle cooler (50 / 60Hz) – Inverter type	kW(HP)	0.18 (0.24)		
Power Source				
Electric power supply	kVA	25	30	30
Compressed air supply (Pressure x Consumption)	-	0.5 ~ 0.7MPa x 690Nℓ/min		
Tank Capacity				
Spindle cooling / Lubrication	ℓ (gal)	20 (5.28) / 6 (1.59)		
Coolant	ℓ (gal)	320 (84.54)		380 (100.39)
Machine Size				
Height	mm(inch)	2,535(99.8") [Opt.: 2,705(106.5")]		2,670(105.12") [Opt.: 2,890(113.8")]
Floor space (Length x Width)	mm(inch)	3,130 (123.23") x 1,980 (77.95")		3,335 (131.3") x 2,200 (86.61")
Weight	kg(lb)	5,000 (11,023)		6,500 (14,330)
NC Controller		Fanuc-0i MD		

Standard and Optional product components

Standard Accessories		Optional Accessories	
• Adjust bolt, block & plate	• Tool kit & box	• Air dryer	• Signal lamp (R / G / Y, 3 color)
• Air blower	• Work light	• Air gun	• Spindle cooler (Oil Con)
• Base around splash guard	• Workpiece coordinate system (48ea)	• Auto door	• Tool measuring system-Renishaw / Blum (Touch type, Laser type)
• Coolant system	• 10.4" Color LCD screen	• Coolant gun	• Transformer
• Coil conveyor (1ea)	• Hwacheon AI Nano Contour Control System (HAI) 40 block buffer	• Coolant through spindle (30bar, 70bar)	- VESTA-660:25kVA-11/7.5kW/30kVA-15/11kW
• Door interlock	• Hwacheon Efficient Contour Control System (HECC)	• Data server interface	- VESTA-1000:30kVA
• Ethernet Interface	• Hwacheon Tool Load Detect System (HTLD)	• Data server (256MB / 1,024MB)	• Workpiece measuring system
• Lubrication system	• Hwacheon Feed Optimization System (OPTIMA)	• High pressure coolant 6bar	- Renishaw / Blum (Touch type)
• Lub. Oil separation tank	• Hwacheon Thermal Displacement Control System (HTDC)	• Lift up chip conveyor (Hinge type, Scraper type)	• 4-axis interface
• MPG Handle (1ea)	- Hwacheon Spindle Displacement Control System (HSDC) +	• Linear scale (X / Y / Z)	• Hwacheon AI Nano Contour Control System (HAI) 200 Block Buffer
• Operation manual & parts list	- Hwacheon Frame Displacement Control System (HFDC)	• NC Cooler	
• Part program storage length 1,280m (512kB)		• Manual Guide i	
• Pneumatics system		• Mist collector	
• Rigid tapping		• MPG Handle (3ea)	
• Signal lamp (R / G, 2 color)		• Oil mist (Semi dry cutting system, Eco booster)	
• Spindle cooler (Fan Cooling)		• Oil skimmer	

NC Specifications [Fanuc 0i-MD]

※ — : Not available S : Standard O : Option

ITEM	SPECIFICATION	
Controlled axis		
Controlled axis	3 - Axes	S
Controlled axis	5 - Axes (Max.)	O
Simultaneously controlled axes	3 - Axes	S
Simultaneously controlled axes	4 - Axes (Max.)	O
Least input increment	0.001mm, 0.001deg, 0.0001inch	S
Least input increment 1 / 10 inch/metric conversion	0.0001mm, 0.0001deg, 0.00001inch G20, G21	O
Store Stroke Check 1 / 2, Mirror Image		S
Operation		
Automatic & MDI operation		S
DNC operation by memory card	PCMCIA card is required	S
Dry Run, Single Block		S
Manual handle feed / feed rate	1Unit / x1, x10, x100	S
Feed function		
Rapid traverse override	F0, F25, F50, F100	S
Feedrate (mm/min)		S
Feedrate override	0 ~ 150%	S
Jog feed override	0 ~ 4,000mm/min	S
Override cancel	M48, M49	S
Program input		
Optional block skip	1ea	S
Program number search	O4 - Digits	S
Sequence number	N5 - Digits	S
Decimal point programming		S
Coordinate system setting	G92	S
Workpiece coordinate system	G54 - G59	S
Workpiece coordinate system preset		S
Addition of workpiece coordinate pair	48ea	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	S
Canned Cycles for Drilling		S
Small-hole peck drilling cycle		S
Automatic corner override		S
Feedrate control with acceleration in circular interpolation		S
Scaling / Coordinate system rotation		S
Programmable Mirror Image		S
Tape format for Fanuc series 10 / 11		S
Manual Guide i		O
Spindle speed function		
Spindle override	50 - 120%	S
Spindle orientation		S

ITEM	SPECIFICATION	
Rigid tapping		S
Tool function / compensation		
Tool function	T4 - digits	S
Tool offset pairs	±6 - digits 400ea	S
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	1,280m (512kB)	S
Number of register able programs	400ea	S
Background editing		S
Extended part program editing / Play Back		S
Interpolation function		
Positioning / Linear interpolation / Circular interpolation / Dwell (Per seconds)	G00 / G01 / G02, G03 / G04	S
Cylindrical interpolation	4 - axis interface option is required	O
Helical interpolation	Circular interpolation plus Max.2axes linear interpolation	S
Reference position return check / return	G27 / G28, G29	S
2nd, 3rd, 4th reference position return / Skip	G30 / G31	S
Setting and display		
Display unit	10.4" Color LCD	S
Clock function		S
Self-diagnosis function / Alarm history display		S
Help function / Graphic function		S
Run hour and parts count display		S
Multi-language display	English, German, French, Italian, Chinese, Spanish, Korean, Portuguese, Polish, Hungarian, Swedish, Russian	S
Data input / output		
Reader / Puncher interface CH1	RS232C	S
Reader / Puncher interface CH2	RS232C	S
Data server	256MB / 1,024MB	O
Ethernet Interface		S
Memory card interface		S
HWACHEON Artificial Intelligence		
Hwacheon AI Nano Contour Control System (HAI) 40 Block Buffer		S
Hwacheon AI Nano Contour Control System (HAI) 200 Block Buffer		O
Hwacheon Efficient Contour Control System (HECC)		S
Hwacheon Tool Load Detect System (HTLD)		S
Cutting Feed Optimization System (OPTIMA)		S
Hwacheon Thermal Displacement Control System (HTDC)		S

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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