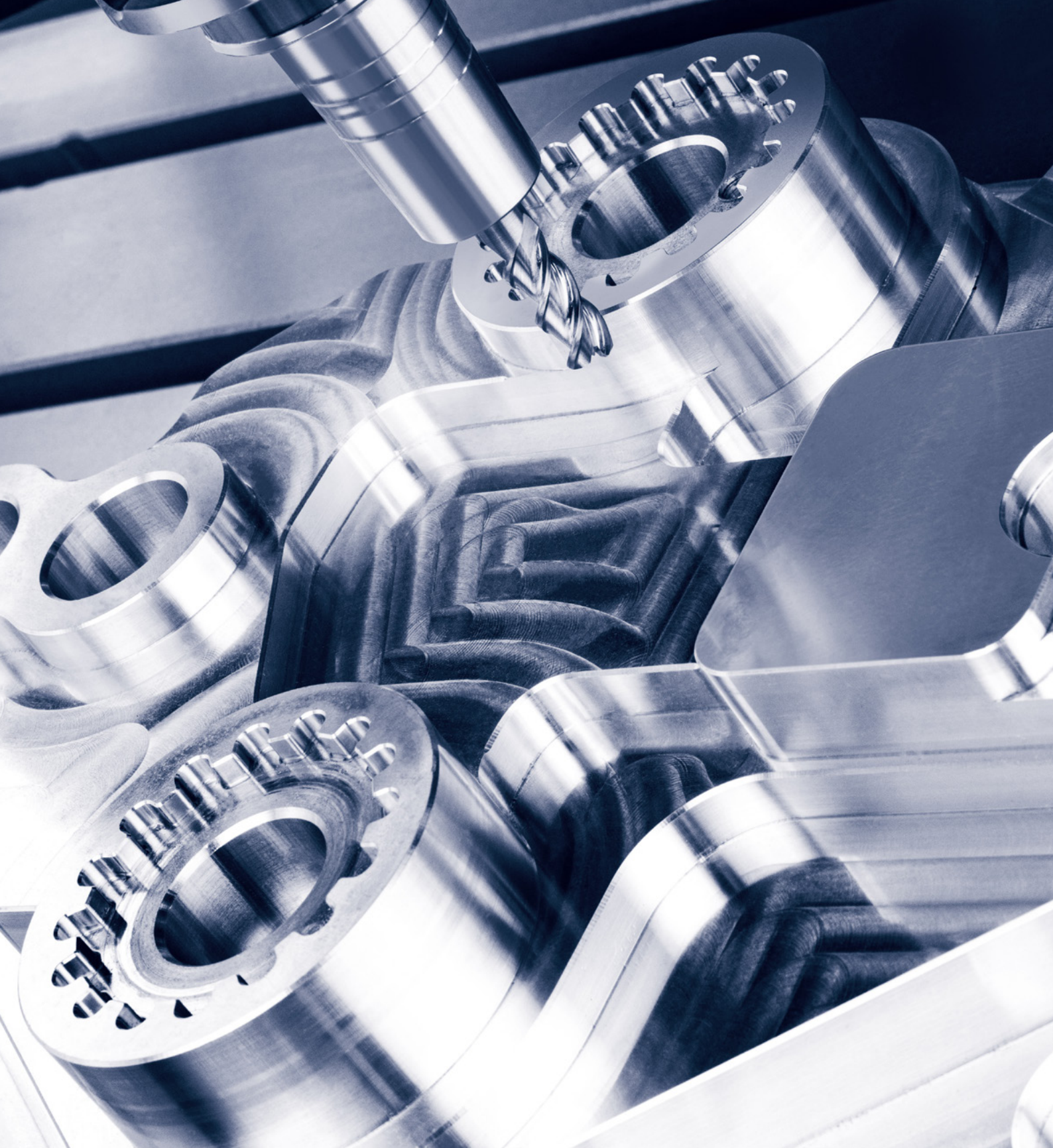




VESTA-1650

Software Optimized Vertical Machining Center



Contents

Product Overview

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Detailed Information

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750mm Y-axis Vertical Machining Center with Software Function for Enhanced Productivity and Precision

VESTA-1650 is recommended for powerful cutting based on its stable structure. It is equipped with Hwacheon's proprietary technologies such as productivity enhancement software (HECC, HTLD and OPTIMA) and precision enhancement software (HTDC and HAI) and provides differentiated quality different from existing machining center for parts.



Enhanced User Convenience

- ① Reduction in work fatigue (Front Two-door)
- ② Pendant arm type operator panel
- ③ The tempered safety glass ensures machining visibility

Easy Maintenance

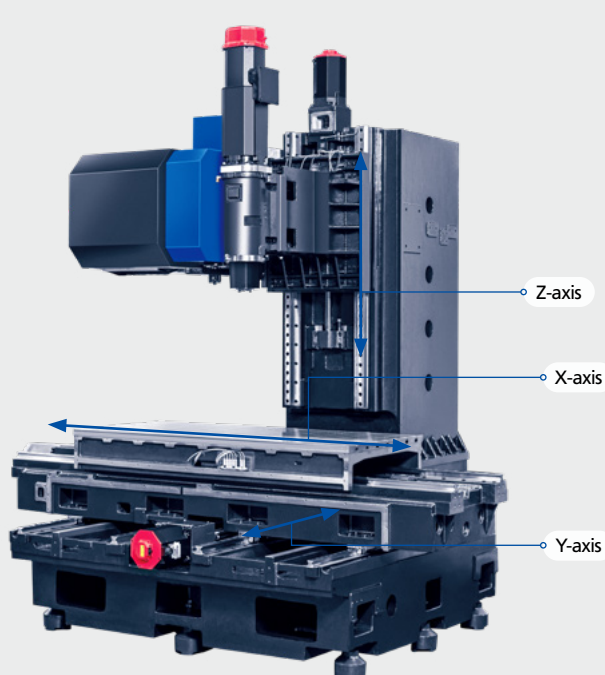
- ① Back & Side type chip conveyor
 - STD : Side chip bucket
 - OPT : Back & Side type lift-up chip conveyor
- ② Wide side door for user convenience

Upgrades for Enhanced Machining Performance

- ① The table wide enough to mount multiple workpieces
- ② Various direct-coupled main spindle specifications (STD: 10,000rpm / OPT: 12,000 , 15,000 , 8,000rpm)
- ③ Various magazine specification (BT-40: 30, 40, 60ea / BT-50: 24, 32, 40ea)
- ④ Enhanced chip to chip time
- ⑤ Hwacheon's proprietary software

Basic Information

Basic Structure



"Machining Stability Ensured"

- Stable machine structure
(Outstanding rigid base and column structure ensured)
- C type structure for work accessibility
- High rigid LM guide for all axis
 - X-axis: Distributed load structure for 6ea LM Block
 - Y-axis: 4 columns LM guide for saddle rigidity

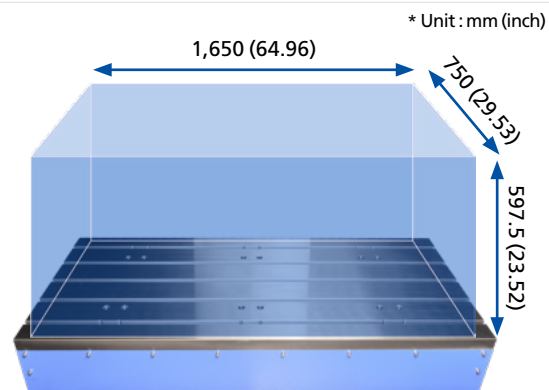
Stroke mm (inch)			Rapid Speed m/min (ipm)		
X-axis	Y-axis	Z-axis	X-axis	Y-axis	Z-axis
1,650 (64.96)	750 (29.53)	675 (26.57)	30 (1,181)	30 (1,181)	24 (945)

Table

"Wide Workpiece Mounting"

Possible to set workpieces and vices in various sizes

Table Size mm (inch)	T Slot W x P mm (inch)	Max Loading Capacity kg, (lb.)
1,700 x 750 (66.93 x 29.53)	18 x 100 (0.71 x 3.94) Number of T Slot: 7ea	1,500 (3,307)

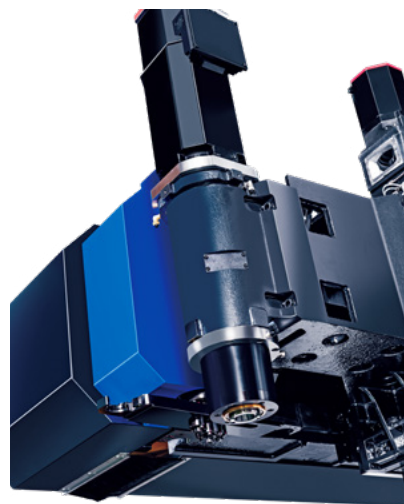


Spindle

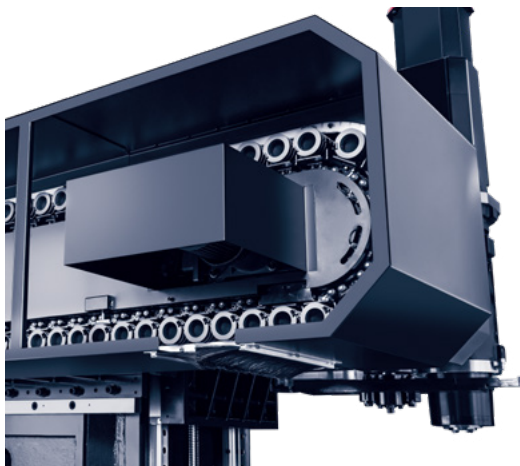
Meeting the customer's machining purposes

"Various Specifications for Direct-Coupled Spindles"

Max Spindle Speed rpm		FANUC		SIEMENS	
		Power kW	Torque Nm	Power kW	Torque Nm
BT-40	10,000 (STD)	Regular Type	18.5	-	-
		CTS Type			
	12,000	Regular Type			
		CTS Type			
BT-50	15,000	Regular Type	15	20.9	120.5
		CTS Type			
	8,000	Regular Type			
		CTS Type			



Magazine



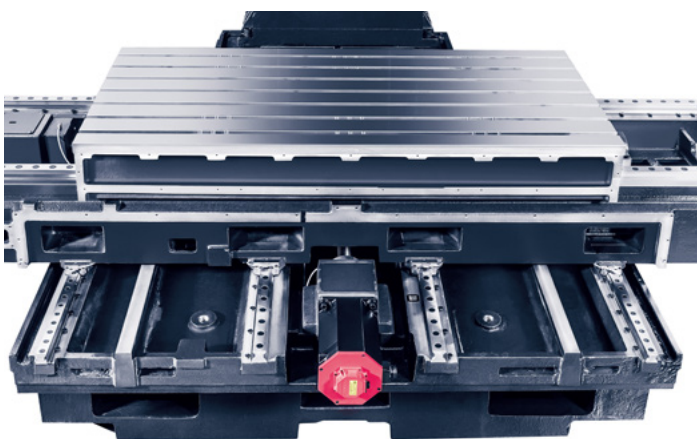
※ BT-40 60 Tools Magazine

"Magazines in Various Specifications"

Various specifications are available based on users' tool types

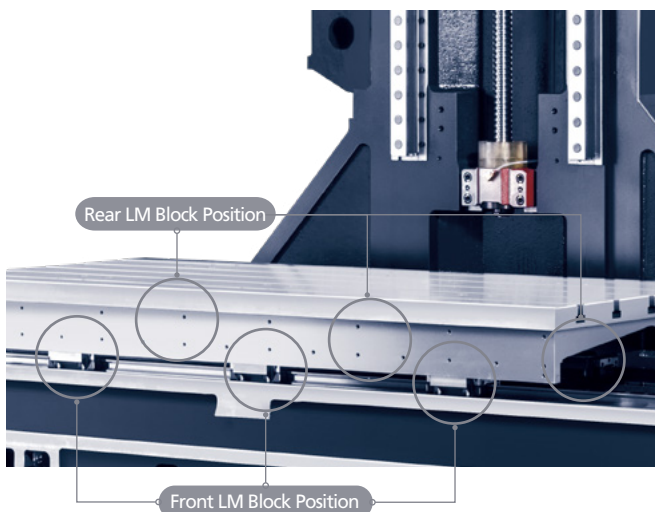
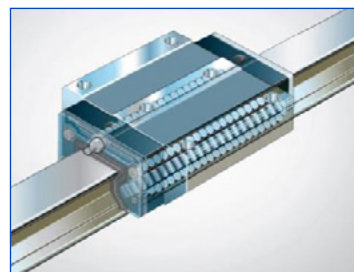
Item	Tool Shank		BT-50 (OPT: CAT-50, SK-50)	
	BT-40 (OPT: CAT-40, SK-40)			
Tool Storage Capacity	30ea	40, 60ea	24ea	32, 40ea
Magazine Type	Drum Type	Chain Type	Drum Type	Chain Type
Method of Tool Selection	Memory Random			
Tool Change Type	Swing Arm			

Feed System



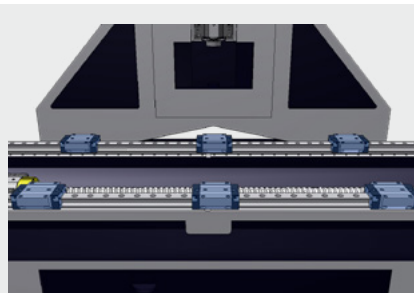
"Improved rigidity in feed system"

Y-axis has 4 columns LM guide for saddle rigidity

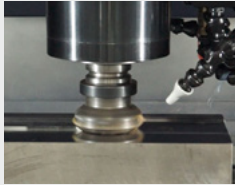


"X-Axis Structure for load distribution"

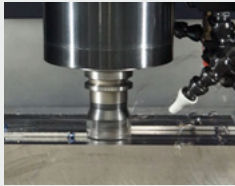
6 High-rigid LM Block



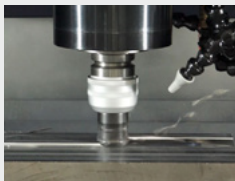
BT-40 Cutting Performance



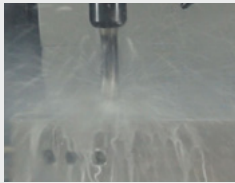
Face mill, Carbon Steel (SM45C)					
Tool Dia mm (inch)	Material Removal Rate cm ³ /min	Spindle Speed rpm	Feed mm/min (ipm)	Axial Depth mm (inch)	Radial Depth mm (inch)
80 (3.15)	246	1,500	820 (32.28)	5 (0.2)	60 (2.36)



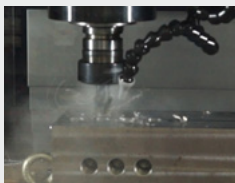
Face mill, Carbon Steel (SM45C)					
Tool Dia mm (inch)	Material Removal Rate cm ³ /min	Spindle Speed rpm	Feed mm/min (ipm)	Axial Depth mm (inch)	Radial Depth mm (inch)
60 (2.36)	310	1,500	1,550 (61.02)	5 (0.2)	40 (1.57)



Face mill, Carbon Steel (SM45C)					
Tool Dia mm (inch)	Material Removal Rate cm ³ /min	Spindle Speed rpm	Feed mm/min (ipm)	Axial Depth mm (inch)	Radial Depth mm (inch)
50 (1.97)	320	1,500	1,600 (62.99)	5 (0.2)	40 (1.57)



U-Drill, Carbon Steel (SM45C)			
Tool Dia mm (inch)	Spindle Speed rpm	Feed mm/min (ipm)	Spindle Load %
30 (1.18)	1,500	360 (14.17)	100



Tap, Carbon Steel (SM45C)			
Tap Size	Spindle Speed rpm	Feed mm/min (ipm)	Spindle Load %
M28 x P3.0	300	900 (35.43)	100

* The machining results above are examples based on the factory test standards, and are subjected to the changes in conditions.

Standard / Optional Accessories Status

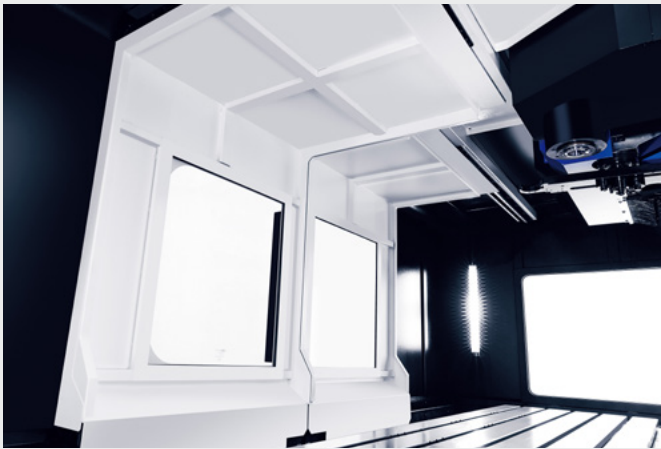
S : Standard O : Option

NO.	Item	Description				VESTA-1650	
1	Spindle	#40	FANUC	10,000rpm	18.5 / 11kW	117.7Nm	S
2				10,000rpm (CTS Type)			O
3				12,000rpm			O
4				15,000rpm			O
5		SIEMENS	15,000rpm	20.9 / 11kW	120.5Nm	O	
6		#50	FANUC	8,000rpm	15 / 11kW	287Nm	O
7				8,000rpm (CTS Type)			O
8	Magazine	#40	30 Tools Magazine				S
9			40, 60 Tools Magazine				O
10		#50	24, 32, 40 Tools Magazine				O
11	Tool Shank	#40	BT-40				S
12			CAT-40, SK-40				O
13		#50	BT-50, CAT-50, SK-50				O
14	Coolant Function	Head Coolant Pump (0.05MPa, 0.4kW)					S
15		CTS Coolant Device			3MPa	2.2kW	O
16		(Available when applying a back filter for non-aqueous)			7MPa	2.2kW	O
17		Oil Mist (Semi dry cutting system)					O
18	Chip Removal Function	Air Blower					S
19		Coil Conveyor (2ea)					S
20		Air Gun					O
21		Coolant Gun					O
22		Lift-up Chip Conveyor			Hinge Type		O
23					Scraper Type		O
24					Mesh-drum Type		O
25		Mist Collector (Separately Mounting)					O
26		Linear Scare (X / Y / Z)					O
27	Precision Maching Function	Hwacheon Thermal Displacement Control System (HTDC)					S
28		Hwacheon Efficient Contour Control System (HECC)					S
29		Hwacheon Artificial Intelligence Control System (HAI): 200 Block					S
30		Hwacheon Artificial Intelligence Control System (HAI): 400 Block					O
31		Lubrication System					S
32		Spindle Cooler (Jacket Cooling)			Fan Cooler Type (10,000rpm / 8,000rpm)		S
33					Oil Cooler Type (12,000rpm / 15,000rpm)		O
34	Measuring & Automation Function	Tool Measuring System: Renishaw / Blum (Touch Type, Laser Type)					O
35		Workpiece Measuring System: Renishaw / Blum (Touch Type)					O
36		Tool Life Management					O
37		Auto Door					O
38		Hwacheon Tool Load Detect System (HTLD)					S
39		Cutting Feed Optimization System (OPTIMA)					S
40	Convenient Functions	Ethernet Interface					S
41		MPG Handle (1ea)					S
42		MPG Handle (3ea)					O
43		Signal Lamp with 3 Color (R, G, Y)					S
44		Display Unit			15" Display		S
45					15" Touch Display (Fanuc i-HMI)		O
46		Tool Box					S
47		NC Cooler					O
48		Oil Skimmer					O
49		Air Dryer			10,000rpm / 8,000rpm		O
50					12,000rpm / 15,000rpm		S
51		Door Interlock					S
52		Workpiece Coordinate System			48 pairs		S
53					300 pairs		O
54		Lubrication Oil Separation Tank					S
55		Perfect Base Around Splash Guard					S
56		Part Program Storage Length 5,120m (2MB)					S
57		Data Server (256MB, 1GB, 2GB, 4GB, 16GB, 32GB)					O
58		Data Server Interface					O
59		Transformer					O
60		Manual Guide i					S
61		Monitoring Solution of Real-time Operational Status (M-VISION Plus)					O
62		Operation Managing and Monitoring Solution of Real-time Operational Status (M-VISION Pro)					O
63		4-Axis Interface					O

USER FRIENDLY DESIGN, A WIDE RANGE OF OPTIONAL FEATURES

User convenience and various additional function

VESTA-1650 system offers a user friendly design and a wide variety of upgrade options for a faster, more precise machining performance, so you can concentrate on what you do best : creating quality products.



"Improved work environment"

Totally enclosed cover design prevents scattering of chips and coolant while processing, maintaining pleasant work environment



"Excellent Chip Disposal"

Wide and Steeply slanted slide cover structure that are located at the left and right provide excellent chip disposal performance

[STD]

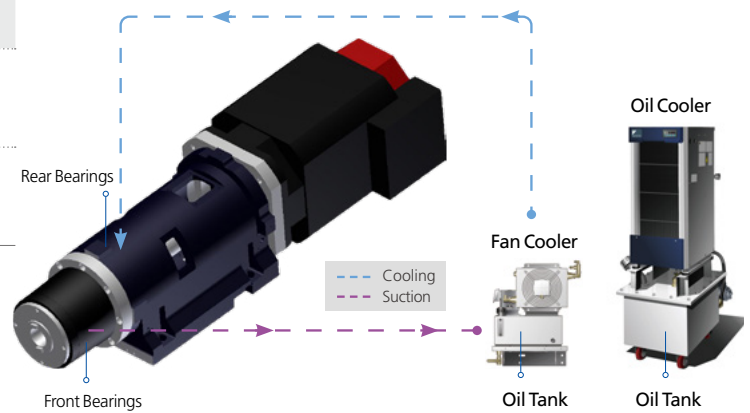
- 2 Coil Conveyor (Front, Right Side)
- Chip Flushing

[OPT]

- Lift-up Chip Conveyor
(Hinge Type, Scraper Type, Mesh-drum Type)

Cooling System

	Jacket Cooling	Bearing Lubrication
10,000 rpm (STD)	Fan Cooler	Grease Type
8,000 rpm		
12,000 rpm	Oil Cooler	Air-Oil Type
15,000 rpm		



Maintenance

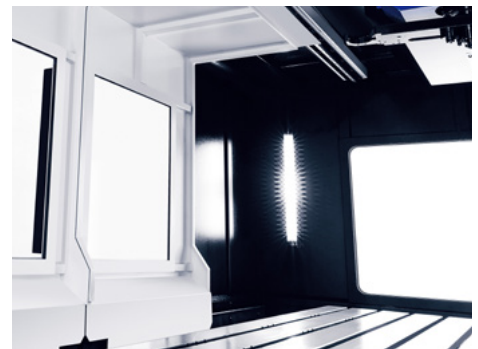


Convenient Maintenance

Improved the manageability of machine through the integration of peripheral devices for required maintenance.

LED Work Light

Long-life LED work lights at three places ensures comfortable working environment and minimizes heat generation.



Excellent Coolant Tank and Chip Removal

"Possible to Select Type of Chip Conveyor"

- Hinge Type Chip Conveyor
- Scraper Type Chip Conveyor
- Mesh-drum Type Chip Conveyor

External Coolant Tank Tank Capacity : 500ℓ (132.09 gal)

- High capacity tank is positioned on the right side of machine for easier coolant change, tank cleaning and pump maintenance and etc.

Coolant Pump Specifications

CTS Coolant Pump (OPT)

- Pressure : 3, 7 MPa

- Power : 2.2 kW

Head Coolant Pump - Power : 0.4 kW

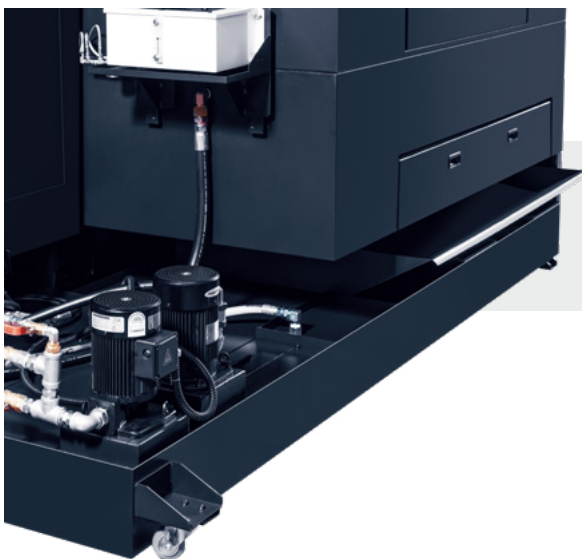
Coolant Gun Pump - Power : 0.4 kW

Chip Flushing - Power : 1.1 kW

* CTS Coolant Pump : Available when applying a back filter for non-aqueous

Micro Chip Separation

Chip filter is used to remove micro chips and keep the coolant tank clean.



Convenient Operator Panel

Pendant Arm Type Operator Panel (STD)



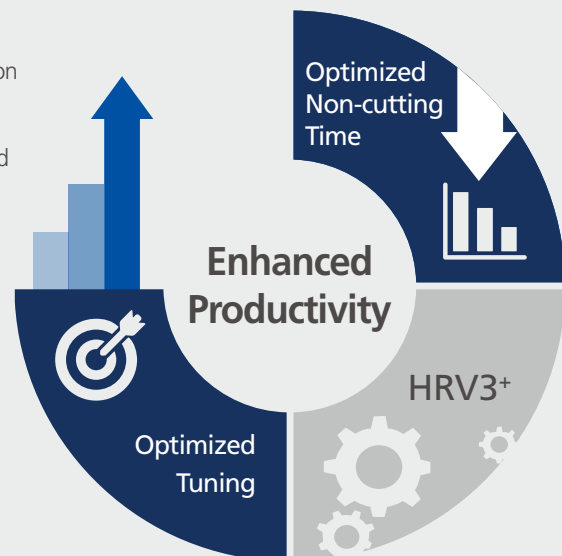
The operator panel is newly designed from the operator's viewpoint and thus enhances the operator's convenience.

"User Friendly Design"

- 15" display as standard (USB and PCMCIA cards as standard)
- Enhanced operability by optimizing the layout and improving the touch feeling of control buttons
- QWERTY Key MDI enhance user convenience.
- Separately mounting MPG for workpiece setting convenience.
- Long time continuous DNC operation with the CF card even without the data server.

Machine Optimization (STD)

- Smart rigid tap function applied for machining time reduction.
- The cycle machining as well as the operating time and the acceleration / deceleration speed of feeding system are optimized.
- High-level precision, speed and smoothness are realized by enhanced processing performance of tiny segments.
- Dramatically reduced non-cutting time during machining ensures optimal productivity.
- The latest machining technology adopted.
- Machining surface quality enhanced by HRV3+ control. (HRV3+: effectively prevents machine oscillation by controlling the servo current to enhance the machining surface quality.)



"Enhanced Productivity"

Operating Convenience Function

<M-CODE LIST>



M-CODE LIST

- The screen provides easy and quick search and utilization.

(However, it is necessary to discuss with factory in advance to add and / or change M-codes.)

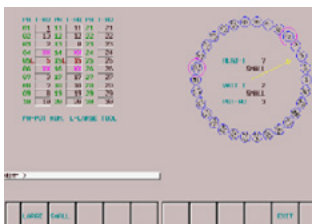
<GUI (Graphical User Interface)>



- Graphic interface for tool / workpiece measurement
- Automatic offset update function
- Tool setting and damaged tool detection, Workpiece setup and measuring while machining
- Optimized time and failure rate
- High competitiveness

<Tool Management>

Large / Small Diameter Tool Management System



- Magazine tool management system
- Magazine tool check in real time
- Large / small diameter tools setting

<Tool View>



- Head mounted tool check in real time
- Waiting pot mounted tool check in real time

Manual Guide i

With the Manual Guide i, the operator is able to create a machining program for the desired geometry including the pattern simply if he / she enters numeric values for the basic machining geometry.



- Programming in convenient functions and rich machining cycles



- It displays the machine status and the tools in use while machining.



- The realistic machining simulation checks the program.

Hwacheon Software



Hwacheon Tool Load Detect System (HTLD)

HTLD constantly monitors the tool wear to prevent accidents and collisions that may result from worn or broken tools. It also helps to prevent the work piece from being damaged or scrapped.

Prevent processing defects

Prevention of the defective tool breakage

Able to quickly respond to wear and tear of tools

When tool breakage alarm



Hwacheon Efficient Contour Control System (HECC)

Workpiece and the desired mode selected depending on the need to shorten processing time / improve contour accuracy / enhanced tool life.

"Roughing quickly, finishing is precisely"

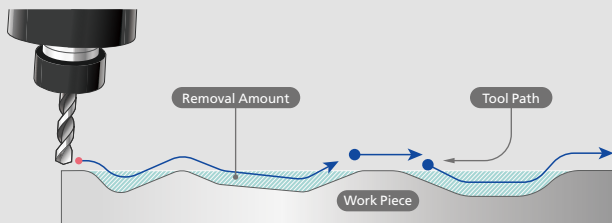
Level(R)	1.0	1.1	1.2	~	8.8	8.9	9.0
• Cutting time	Fast (1.5~3.0 Times)				Slow (1.0 Times)		
• Surface	No Good				Good		
• Process	Rough				Finish		
• Tool life	Good				No Good		



Cutting Feed Optimization System (OPTIMA)

Prevent damage to the tool in real time by automatically controlling the feed rate to maintain a constant cutting force during the machining process which typically results in reduced cycle times.

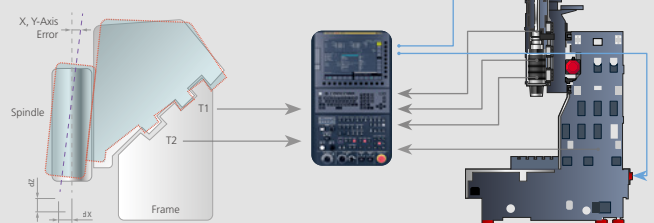
"Maximize your productivity with intelligent system"



Hwacheon Thermal Displacement Control System (HTDC)

The high sensitivity temperature sensors are installed at integral elements to capture and display real-time data while processing.

"Hwacheon Spindle Displacement Control System(HSDC)"
+
"Hwacheon Frame Displacement Control System(HFDC)"



Monitoring Solution of Real-time Operational Status (M-VISION Plus / Pro)

Real-time operational status monitoring system for the User's factory machine management.

M-VISION Plus

- Monitoring of real-time operational status
- Mobile app supported
- Machining history saving, retrieving and statistics
- Statistics on operational efficiency and history by equipment



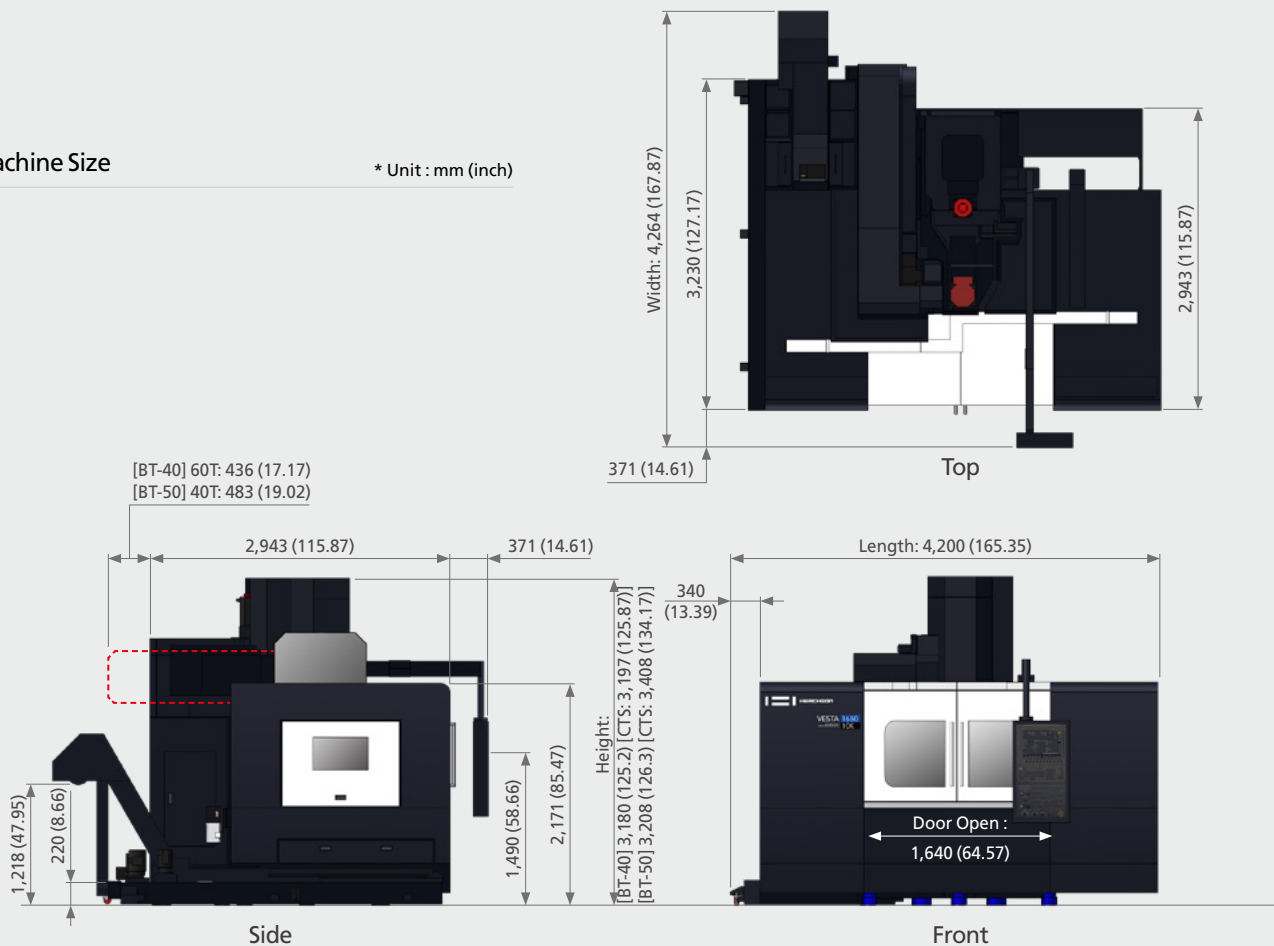
M-VISION Pro

- Real-time machine operation status monitoring
- Mobile app supported
- Saving machining/alarm history, retrieving and statistics
- Statistics on operational efficiency and history by equipment/by equipment in total, operator, and arbitrary set period
- Machining Management



Machine Size

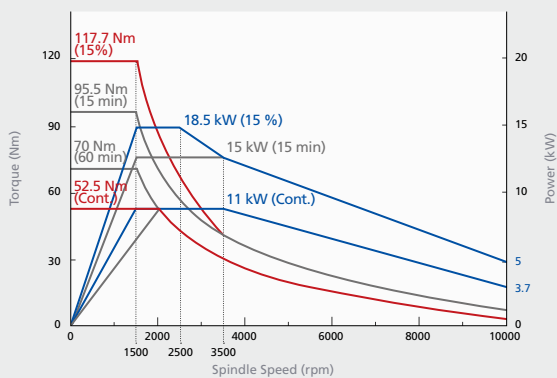
* Unit : mm (inch)



Spindle Power – Torque Diagram

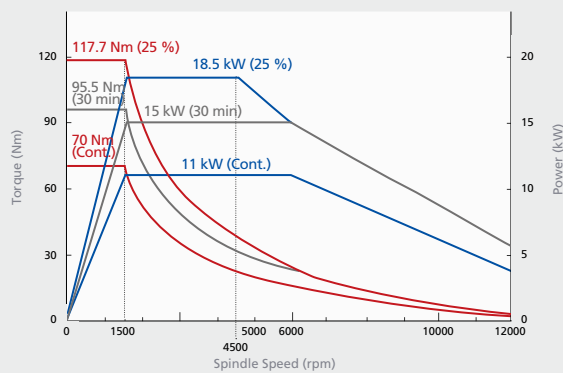
10,000 rpm (STD)

Max Power : 18.5 kW (25 HP) / Max Torque : 117.7 Nm



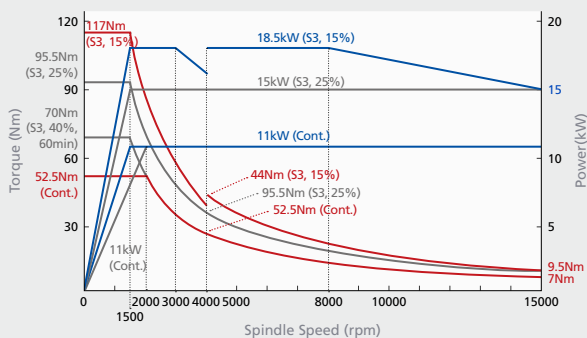
12,000 rpm

Max Power : 18.5 kW (25 HP) / Max Torque : 117.7 Nm



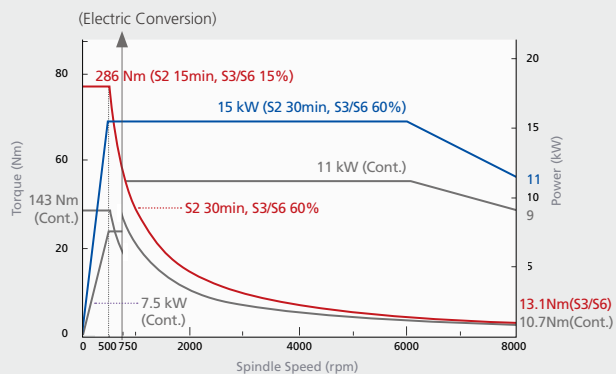
15,000 rpm

Max Power : 18.5 kW (25 HP) / Max Torque : 117.7 Nm

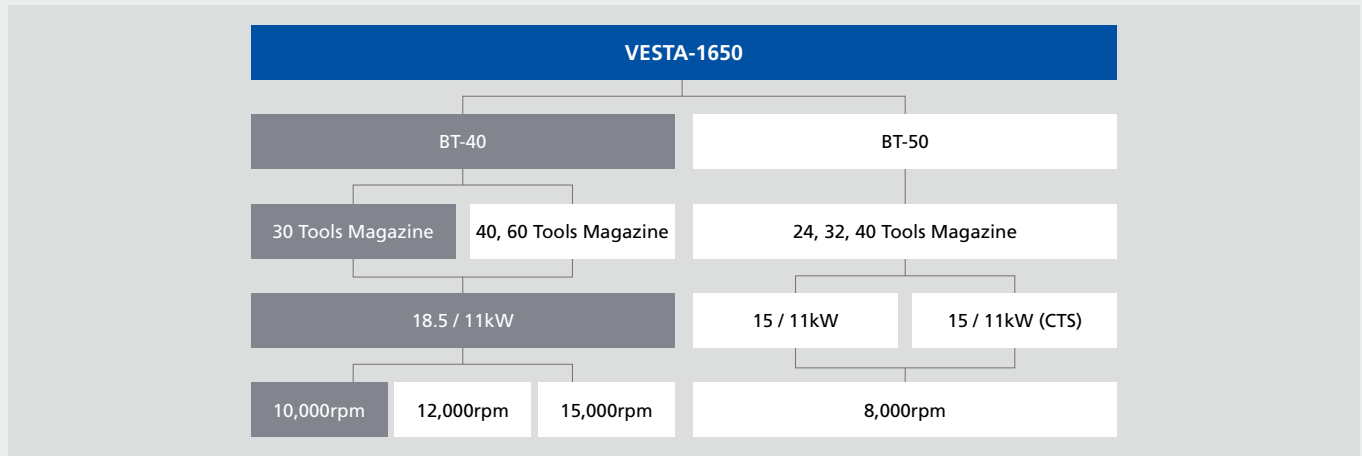


8,000 rpm

Max Power : 15 kW (20 HP) / Max Torque : 287 Nm



Product Line-up



Machine Specifications

Item		VESTA-1650			
Travel					
Stroke (X / Y / Z)	mm (inch)	1,650 / 750 / 675 (64.96 / 29.53 / 26.57)			
Distance from Table Surface to Spindle Gauge Plane	mm (inch)	150 ~ 825 (5.91 ~ 32.48)			
Distance between Columns to Spindle Center	mm (inch)	760 (29.92)			
Table					
Table Size	mm (inch)	1,700 x 750 (66.93 x 29.53)			
Table Loading Capacity	kg, (lb _r)	1,500 (3,307)			
T Slot (WxP / No. of slots)	mm (inch)	18 x 100 (0.71 x 3.94) / 7ea			
Spindle					
Max Spindle Speed	rpm	10,000 (STD)	12,000	15,000	8,000
Spindle Motor	kW (HP)	18.5 / 11 (25 / 15)		18.5 / 11 (25 / 15) SIEMENS: 20.9 / 11 (28 / 15)	15 / 11 (20 / 15) [CTS: 26 / 22 (35 / 30)]
Type of Spindle Taper Hole	-	ISO#40, 7/24 Taper			ISO#50, 7/24 Taper
Spindle Bearing Inner Diameter	mm (inch)	Ø70 (2.76)			Ø90 (3.54)
Feedrate					
Rapid Traverse (X / Y / Z)	m/min (ipm)	30 / 30 / 24 (1,181 / 1,181 / 945)			
Motor					
Feed Motor (X / Y / Z)	kW (HP)	3 / 3 / 3 (4 / 4 / 4)			
Coolant Motor (Spindle)	kW (HP)	0.4 (0.5)			
Spindle Cooler Motor	kW (HP)	0.18 (0.2)	2.8 / 3.2 (3.8 / 4.3)		0.18 (0.2)
ATC					
Type of Tool Shank	-	BT-40 (OPT: CAT-40, SK-40)			BT-50 (OPT: CAT-50, SK-50)
Type of Pull Stud	-	MAS P40T-1 (45°)			BT-50 (90°)
Tool Storage Capacity	ea	30 (OPT: 40, 60)			24 (OPT: 32, 40)
Max Tool Dia(with / without Adjacent Tools)	mm (inch)	Ø78 / Ø150 (3.07 / 5.91)			Ø110 / Ø220 (4.33 / 8.66)
Max Tool Length	mm (inch)	300 (11.81)			350 (13.78)
Max Tool Weight	kg, (lb _r)	8 (17.64)			20 (44.09)
Method of Tool Selection	-	Memory Random			
Power Source					
Electric Power Supply	kVA	45			45 (CTS: 55)
Compressed Air Supply (Pressure x Consumption)	-	0.5 ~ 0.7 MPa x 690 Nℓ/min			
Tank Capacity					
Spindle Cooling / Lubrication	ℓ (gal)	20 / 6 (5.28 / 1.59)			
Coolant	ℓ (gal)	500 (132.09)			
Machine Size					
Height	mm (inch)	3,180 (125.2) [CTS: 3,197 (125.87)]			3,208 (126.3) [CTS: 3,408 (134.17)]
Floor Space (Length x Width)	mm (inch)	4,200 x 4,264 (165.35 x 167.87)			
Weight	kg, (lb _r)	12,000 (26,455)			12,500 (27,558)
NC Controller		Fanuc 0i-MF Plus			

NC Specifications [Fanuc Oi-MF Plus]

※ S : Standard O : Option

ITEM	SPECIFICATION	
Controlled Axis		
Controlled Axis	4-axes	S
	5-axes (Max.)	O
Simultaneously Controlled Axes	3-axes	S
	4-axes (Max.)	O
Least Input Increment	0.001 mm, 0.001 deg, 0.000 1inch	S
Least Input Increment 1/10	0.0001 mm, 0.0001 deg, 0.0000 1inch	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	S
Helical Interpolation	Circular interpolation plus max 2 axes linear interpolation	S
Reference Position Return Check	G27	S
Reference Position Return	G28,G29	S
2nd Reference Position Return	G30	S
Skip Function	G31	S
Feed Function		
Rapid Traverse Override	F0, F25, F50, F100	S
Feed Rate (mm/min)		S
Feed Rate Override	0 - 200 %	S
Jog Feed Override	0 - 6,000 mm/min	S
Override Cancel	M48, M49	S
Program Input		
Tape Code	EIA / ISO	S
Optional Block Skip	9ea	S
Program Number	O4 Digits (1 - 9999)	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		S
Additional Workpiece Coordinate Pairs	48ea	S
	300ea	O
Extend Program Edit Function	Copy / Move / Etc.	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

ITEM	SPECIFICATION	
Program Input		
Automatic Corner Override		S
Feed Rate Clamp Based on Arc Radius		S
Scaling		S
Coordinate System Rotation		S
Polar Coordinate System		S
Programmable Mirror Image		S
Tape Format for Fanuc Series 10/11		S
Manual Guide i		S
Spindle Speed Function		
Spindle Serial Output		S
Spindle Override	50 - 150%	S
Spindle Orientation		S
Rigid Tapping		S
Tool Function / Compensation		
Tool Function	T4 Digits	S
Tool Offset Pairs	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	5,120m (2MB)	S
Number of Register Able Programs	Max. 1,000ea	S
Background Editing		S
Extended Part Program Editing		S
Play Back		S
Setting and Display		
Clock Function		S
Self-Diagnosis Function		S
Alarm History Display		S
Help Function		S
Run Hour and Parts Count Display		S
Graphic Function		S
Multi-language Display	Chinese, English, French, German, Hungarian, Italian, Korean, Polish, Portuguese, Spanish, Swedish, Russian	S
Data Input / Output		
Data Server	256MB, 1GB, 2GB, 4GB, 16GB, 32GB	O
Data Server Interface		O
Ethernet Interface		S
Memory Card Interface		S
USB Card Interface		S
Others		
Display Unit	15" Non-Touch Display	S
Fanuc i-HMI	15" Touch Display	
HWACHEON Software		
High Speed HRV3 [®] Function		S
Hwacheon Artificial Intelligence Control System (HAI): 200 Block		S
Hwacheon Artificial Intelligence Control System (HAI): 400 Block		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
M-VISION Plus (Monitoring of Real-time Operational Status)		O
M-VISION Pro (Operation Managing and Monitoring of Real-time Operational Status)		O

Hwacheon Global Network

 Hwacheon Headquarters  Hwacheon Europe  Hwacheon Asia  Hwacheon America



HWACHEON

Please contact 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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