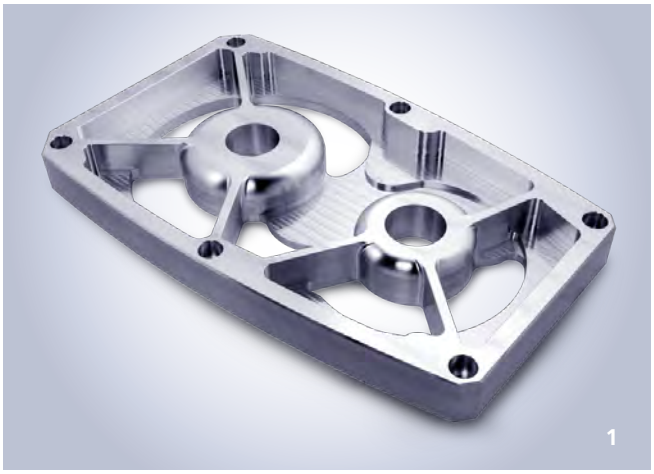
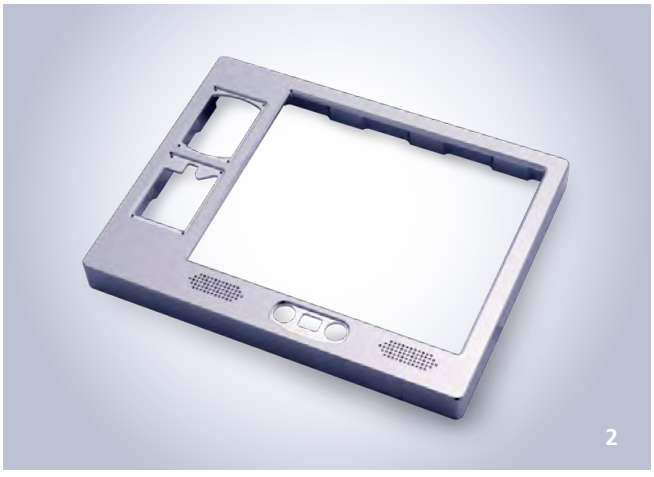
L Series

Optimized Double Column Machining Center

HWACHEON

Contents





1 Compressor Parts
2 Monitor Frame

Double Column Machining Center Optimized for Light Duty Machining of Industrial Components

L Series, optimized for machining of non-ferrous metal and IT / semiconductor equipment components,
achieves high machining quality with a stable double column structure designed through 3D design and FEM. Also, Hwacheon Software provides customers with high shape accuracy and productivity improvement.

High Performance & High Productivity

1. Highly rigid roller type linear guideways on all axes
2. Two side chip augers & rear discharge chip conveyor
3. Extra wide working table allows multiple workpieces to be setup
4. Hwacheon Software maximizes machine performance

Optimized for Light Duty Cutting

1. High speed roughing & Finishing
2. Specialized in aluminum machining

Maximum Operator Convenience

1. Full enclosure design preventing chips and coolant from splashing outside the machine
2. Wide door opening for easy loading/unloading of large workpieces
3. Convenient and ergonomic operator access
4. Chip conveyor and straight shape coolant tank designed for easy cleaning and maintenance
5. Distance from floor to table surface 700mm, excellent access to table with no step platforms required

Basic structure

Basic Structure

"Highly Stable & Durable Double Column Structure"

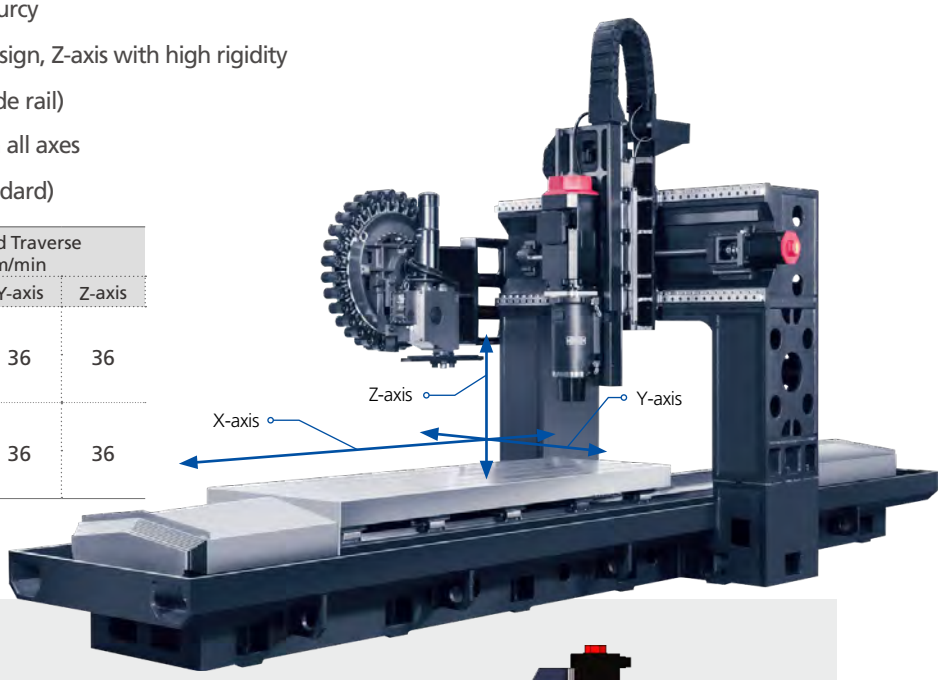
· Double column structure provides high accurcy

· High stability: Low center of gravity bed design, Z-axis with high rigidity (three blocks employed on each linear guide rail)

· Highly rigid roller type linear guideways on all axes

· Linear scale feedback on X / Y / Z axes (standard)

	Axis Travel mm			Rapid Traverse m/min		
	X-axis	Y-axis	Z-axis	X-axis	Y-axis	Z-axis
L1 1500	1,500	950	500	24	36	36
L1 2500	2,500					
L2 2500	2,500	1,100	500	24	36	36
L2 3000	3,000					



"Z-axis with High Rigidity"

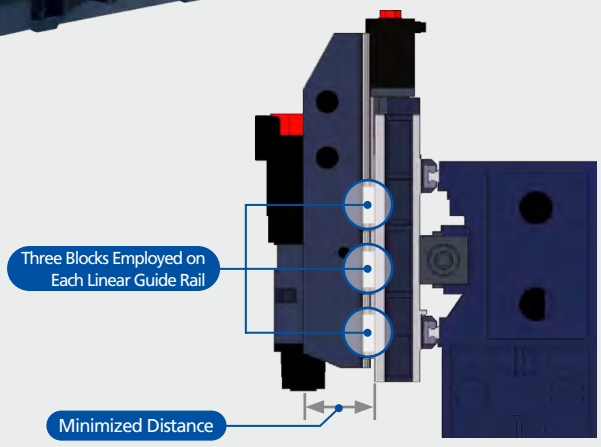
Z-axis with High Rigidity

· Three blocks employed on each linear guide rail minimize the deflection errors

· Minimizes Z-axis deflection

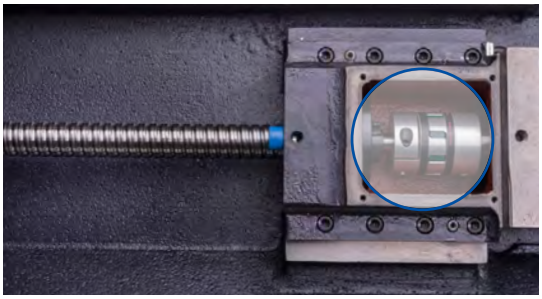
Minimized Distance between Center of Gravity of the Spindle and the Drive Point

· Enhanced accuracy by minimizing the distance between center of gravity of the spindle and the drive point



Feed Drive

"High Accuracy & High Performance Feed Drive"



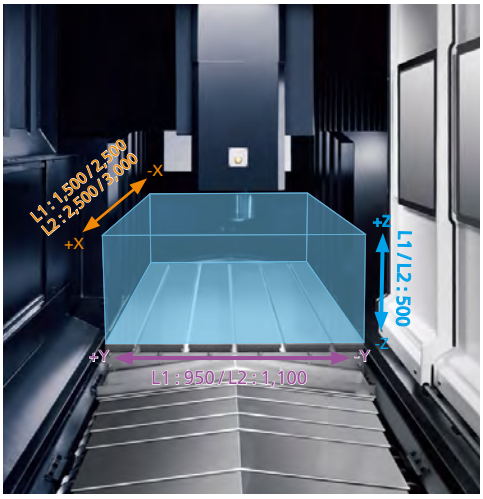
Direct Coupled Servo Motor

· Direct coupling between a servo motor and a ball screw eliminates backlash

Pre-tensioned Ball Screw

· Ball screw is pre-tensioned will angular contact ball bearing. It minimizes the effect caused by the thermal deformation of a ball screw, maintaining high accuracy under long operating hours.

Table



"Large Work Area"

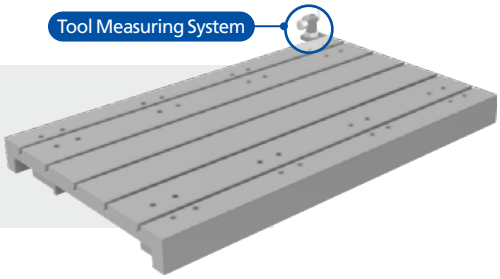
· Extra wide working table allows different sizes of workpieces and vices

· Specialized in thin aluminum plate machining for LCD / LED industry

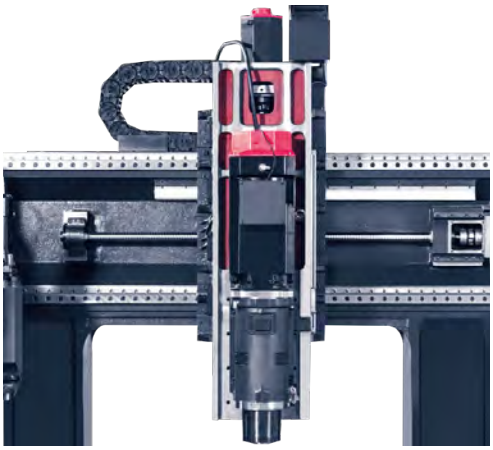
	Table Size (W x L) mm	T-slot mm	Max. Loading Capacity kg_f
L1 1500	1,500 x 900	18 x 160 - 5ea	2,000
L1 2500	2,500 x 900		
L2 2500	2,500 x 1,100	18 x 130 - 7ea	
L2 3000	3,000 x 1,100		

Tool Measuring System Installed Outside the Machine

- Tool measuring system installed outside the machine to provide sufficient machining area



Spindle



"Direct Drive Spindle"

· Direct drive spindle suitable for various applications

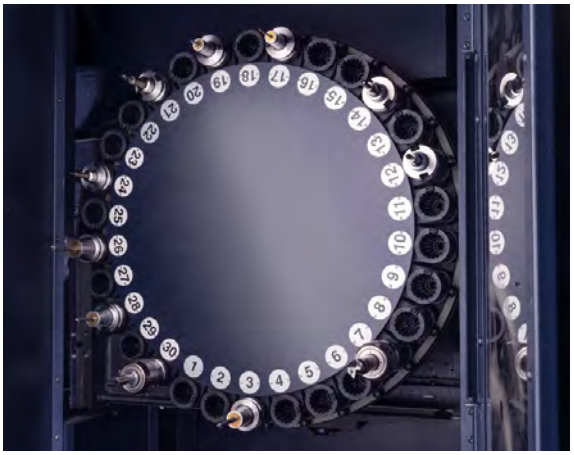
	Max. Spindle Speed rpm		Spindle Motor kW	Max. Torque Nm
BT-40	12,000	STD	18.5 / 11	117.7
		CTS (OPT)		

Magazine

"Various Types of Tool Magazine"

Available for different types of tool holders

Item \ Tool Shank	STD : BT-40 OPT : BBT-40, CAT-40, HSK-A63, SK-40
Max. Tool No.	30
Tool Magazine Drive	Servo Motor
Method of Tool Selection	Memory Random (OPT. Fixed Address)
Tool Change type	Swing Arm



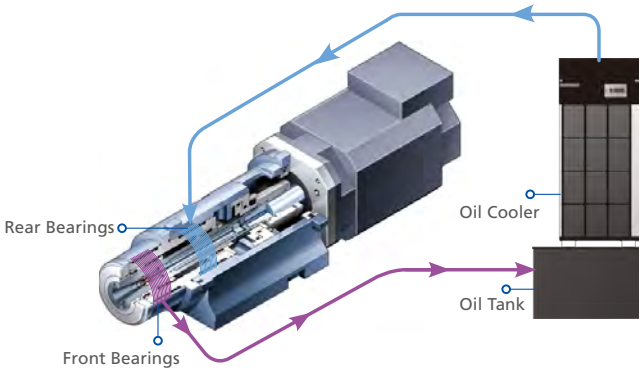
Basic structure

Cooling System

· Permanent grease-packed spindle

· Jacket cooling by circulating temperature-controlled oil minimizes thermal distortion

Max. Spindle Speed (rpm)	Jacket Cooling	Bearing Lubrication
12,000	Oil Cooler	Grease Type



User Convenience

Convenient and Ergonomic Operator Access

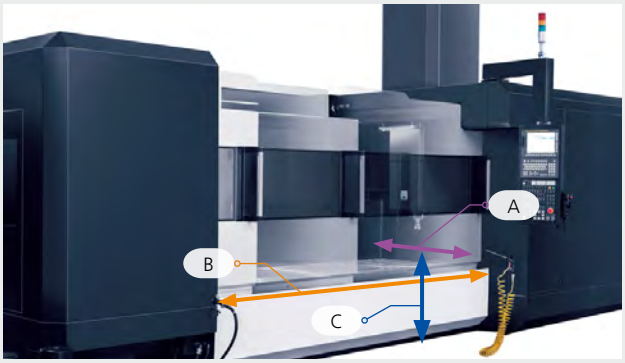
· Distance from floor to table surface 700mm, excellent access to table with no step platforms required

· Reduce the risk of occupational accident (jobs can be performed in a seated postion)

Wide Door Opening

· Door opening is wider than X-axis travel

· Workpieces which have the same length as the table can be loaded/unloaded through the ceiling



	A (Effective Width Between Columns) mm	B (Door Opening) mm	C (Distance from Floor to Table Surface) mm	Table Size (L x W) mm
L1 1500	1,150	1,550	700	1,500 x 900
L1 2500		2,550		2,500 x 900
L2 2500	1,350	2,550		2,500 x 1,100
L2 3000		3,050		3,000 x 1,100

Chip Disposal

"Excellent Chip Disposal"

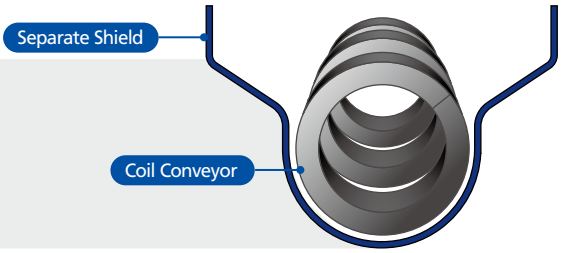
· Wide and rigid slideway covers

· Coolant gun for easy cleaning (STD)

· Two side chip augers offer outstanding chip disposal (STD)

Minimized the Effect of Heat & Vibration Transfer Caused by Chip Augers

· Separate shield isolates the chip augers to prevent heat and vibration from being transferred to the cutting area.



Pendant Arm Type Operator Panel (STD)

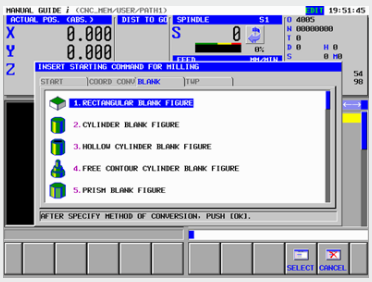
The operator panel is newly designed from the operator's viewpoint and thus enhances the operator's convenience.

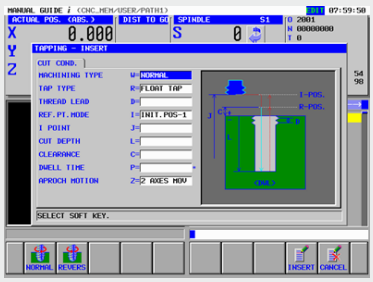
"User Friendly Design"

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

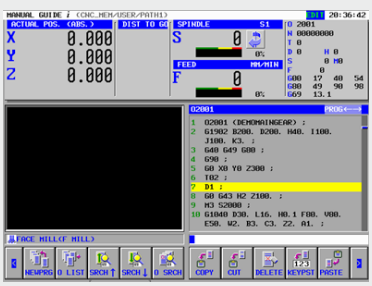
Manual Guide i (OPT)

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.

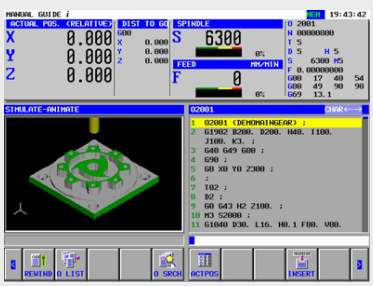




· Programming in convenient functions and rich machining cycles



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



·The realistic machining simulation checks the program.

Hwacheon Software

Hwacheon Software

Hwacheon Tool Load Detect System

"Detect and diagnose the most minute of tool-end point movement"

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.)

Hwacheon High Efficient Contour Control System

"Roughing quickly, finishing is precisely"

HECC offers an easy to use programming interface for different workpieces 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.

Cutting Feed Optimization System

"Maximize your productivity with intelligent 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 optimized.

Hwacheon Thermal Displacement Control System

"Hwacheon Spindle Displacement Control System + Hwacheon Frame Displacement Control System"

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

Hwacheon Spindle Displacement Control System

"Real-time correction for the displacement in the spindle"

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 eff ectively minimizing thermal displacement.

Hwacheon Frame Displacement Control System

"System for maintaining processing accuracy for a long period of machining"

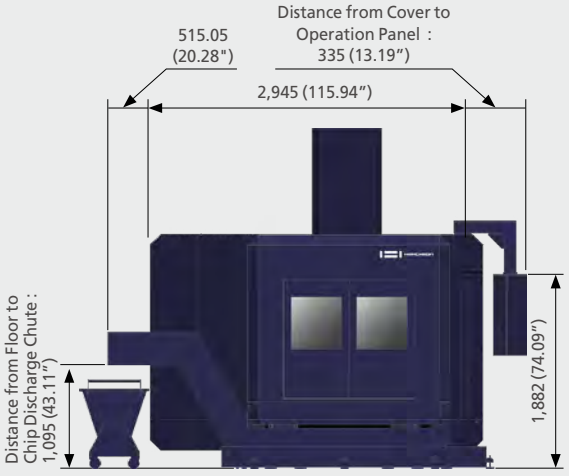
HFDC is equipped with highly sensitive thermal sensors in the casting region where thermal activity is suspected; monitoring and correcting displacement.

Machine Size

* Unit: mm(inch)

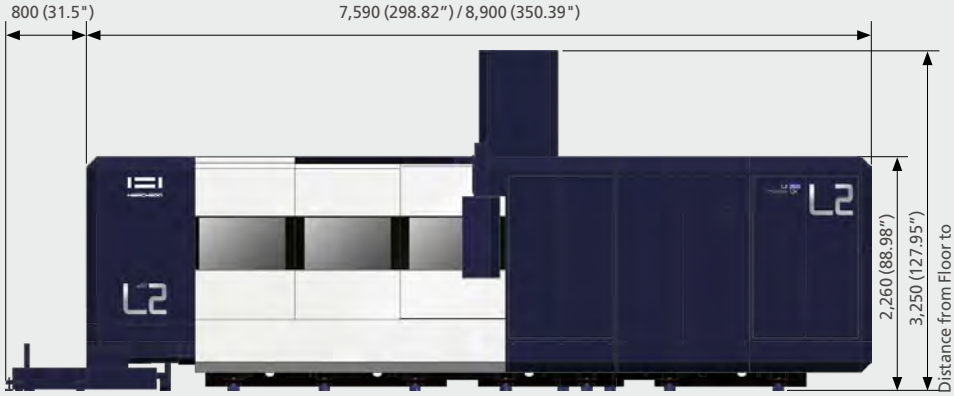
L1 1500 /2500

Front View

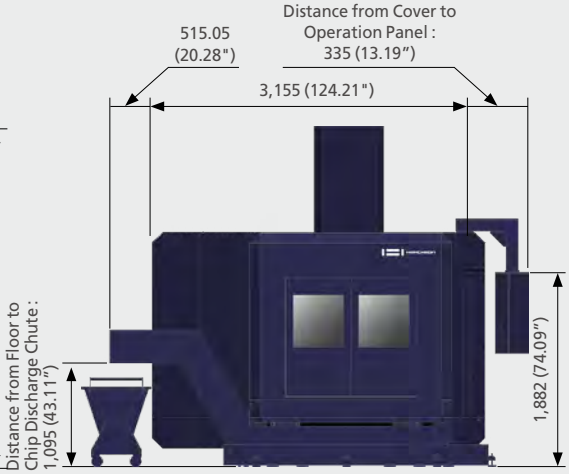


Left View

L2 2500 / 3000



Front View

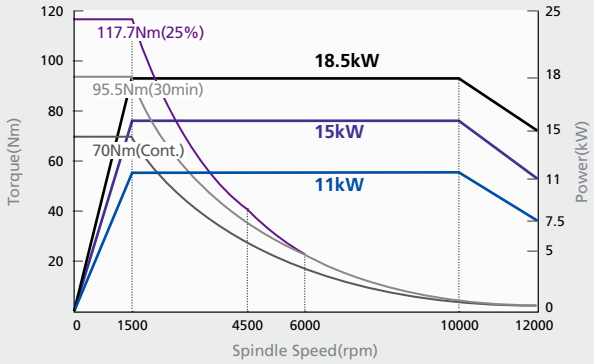


Left View

Spindle Power - Torque Diagram

STD (12,000rpm)

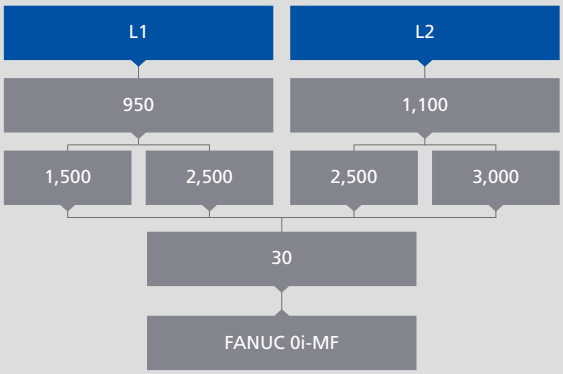
Spindle Motor: 18.5 kW / Max. Torque : 117.7 Nm



Machine Details

Product Configuration

Each product can be configured to fit your application



Machine Specifications

ITEM		L1		L2	
Travel					
Axis Travel (X / Y / Z)	mm(inch)	1,500 / 950 / 500 (59.06" / 37.4" / 19.69")	2,500 / 950 / 500 (98.43" / 37.4" / 19.69")	2,500 / 1,100 / 500 (98.43" / 43.31" / 19.69")	3,000 / 1,100 / 500 (118.11" / 43.31" / 19.69")
Effective Width Between Columns	mm(inch)	1,150 (45.28")		1,350 (53.15")	
Distance from Table Surface to Spindle Gauge Plane	mm(inch)	100 ~ 600 (3.94" ~ 23.62")			
Table					
Table Size (W x L)	mm(inch)	1,500 x 900 (59.06" x 35.43")	2,500 x 900 (98.43" x 35.43")	2,500 x 1,100 (98.43" x 43.31")	3,000 x 1,100 (118.11" x 43.31")
Max. Loading Capacity	$kg_f(lb_f)$	2,000 (4,409)			
T-Slot (Size x Space - ea)	mm(inch)	18 x 160 (0.71" x 6.3") - 5ea		18 x 130 (0.71" x 5.12") - 7ea	
Spindle					
Max. Spindle Speed	rpm	12,000			
Spindle Motor	kW(HP)	18.5 / 11 (24.81 / 14.75)			
Type of Spindle Taper Hole	-	ISO#40, 7/24 Taper (BT-40)			
Spindle Bearing Inner Dia.	mm(inch)	Ø70 (Ø2.76")			
Feedrate					
Rapid Traverse (X / Y / Z)	m/min(ipm)	24 / 36 / 36 (944.88" / 1417.32" / 1417.32")			
Cutting Feedrate (X / Y / Z)	mm/min(ipm)	1 ~ 20,000 (0.04" ~ 787.4")			
ATC					
Type of Tool Shank	-	MAS-403 BT-40			
Type of Pull-Stud	-	MAS-P40T-1 (45°)			
Tool Storage Capacity	ea	30			
Max. Tool Dia. [with / without Adjacent Tools]	mm(inch)	Ø75 / Ø150 (Ø2.95" / Ø5.91")			
Max. Tool Length	mm(inch)	350 (13.78")			
Max. Tool Weight	kg(lb)	8 (18)			
Method of Tool Selection		Memory Random (opt. Fixed Address)			
Method of Operation (Swing Arm)	-	Servo Motor			
Motor					
Servo Motor (X / Y / Z)	kW(HP)	6 / 4 / 4 (8.05 / 5.36 / 5.36)			
Coolant Motor (Spindle)	kW(HP)	1.1 (1.48)			
Spindle Cooling Motor (50 / 60Hz)	kW(HP)	2.8 / 3.2 (3.75 / 4.29)			
Power Source					
Power Capacity	kVA	45			
Compressed Air Supply (Pressure x Consumption)	-	0.5 ~ 0.7 MPa x 690 N ℓ/min			
Power Specification	-	220V, 60Hz			
Machine Size					
Machine Height	mm(inch)	3,250 (127.95")			
Main Body Size (W x L)	mm(inch)	6,000 x 2,945 (236.22" x 115.94")	7,590 x 2,945 (298.82" x 115.94")	7,590 x 3,155 (298.82" x 124.21")	8,900 x 3,155 (350.39" x 124.21")
Weight	kg(lb)	13,000 (28,660)	16,000 (35,274)	17,000 (37,479)	19,000 (41,888)
NC Controller		FANUC 0i-MF			

Accessories

Standard Accessories		Optional Accessories	
• Air blow	• Door interlock	• Additional axis interface	• Tooling system : BBT-40
• Air gun	• Ethernet interface	• Air dryer	• Tooling system : CAT-40
• ATC : 30ea	• Full cover	• ATC : 40ea	• Tooling system : HSK-A63
• Automatic grease lubrication system	• Linear scale (X / Y / Z)	• CNC system : FANUC 31i B	• Tooling system : SK-40
• Automatic power off	• Leveling block set	• Coolant through spindle (30 bar)	• Tool Measuring System
• Cabinet fan	• Look ahead blocks (40)	• Cyclone Filter for Fine Chip	• Work probe
• Chip conveyor (lift-up type) & Chip bucket	• MPG handle (1ea / portable)	• Data server (1GB / 2GB / 4GB)	
• CNC system : FANUC 0i-MF	• Operatin manual & part list	• Data server interface	
• Coil conveyor (2ea)	• Signal lamp (R / G / Y, 3-color)	• High column (100mm / 150mm)	
• Coolant gun	• Spindle cooler (jacket cooling)	• Hydraulic power unit (for rotary table)	
• Coolant tank	• Tool box & kits	• Look ahead blocks	
• Data server (256MB)	• Tooling system : BT-40	• Manual guide i (for FANUC system)	
• Hwacheon soft ware system	• Work light	• NC cooler	
- Hwacheon Efficient Contour Control System (HECC)	• 10.4" LCD monitor	• Oil mist	
- Hwacheon Tool Load Detect System (HTLD)		• Oil skimmer	
- Hwacheon Thermal Displacement Control System (HTDC)		• Rotary table	
- Cutting Feed Optimization System (OPTIMA)		• Spindle set (built in / bearing oil lubricate type / coolant through spindle)	

NC Specifications [FANUC 0i-MF]

※ - : Not Available S : Standard O : Option

ITEM	SPECIFICATION	
Controlled Axis		
Controlled Axis	3-axis	S
Simultaneously Controlled Axis	3-axis	S
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 Deconds)	G04	S
Cylindrical Interpolation	4-axis Interface Option is Required	S
Helical Interpolation	Circular interpolation plus max 2-axis 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
Feedrate (mm/min)		S
Feedrate 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
Optoinal Block Skip	9 ea	S
Program Number	O4-digits	S
Sequence Number	N8-digits	S
Decimal Point Programming		S
Coordinate Dystem Detting	G92	S
Workpiece Coordinate System	G54 - G59	S
Workpiece Coordinate System Preset		S
Addition of Workpiece Coordinate Pair	48ea	S
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
Feedrate Control With Acceleration in Circular Interpolation		S

ITEM	SPECIFICATION	
Program Input		
Automatic Corner Override		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		O
Spindle Speed Function		
Spindle Serial Output		S
Spindle Override	50-150 %	S
Spindle Orientation		S
Rigid Tapping		S
Tool Function / Compensation		
Tool Function	T2-digits	S
Tool Offset Pairs	±6-digits / 400ea	S
Tool Offset Memory C		S
Tool Length Measurement		S
Cutter Compensation C		S
Tool Life Management		O
Tool Length Compensation		S
Editing Operation		
Part program Storage length	1,280 m (512 kB)	S
Number of Register Able Programs	400ea	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
Dynamic Garphic Display		O
Multi-language Display	Korean, English	S
Data Input / Output		
Reader / Puncher Interface CH1	RS232C	S
Data Server	256 MB / 1,024 MB	S
Data Server Interface		O
Ethernet Interface		S
Memory Card Interface		S
USB Interface		S
4-axis Interface Function (Option)		
Controlled Axis	Included 4-axis interface Option	O
Simultaneously Controlled Axis	Included 4-axis interface Option	O
Control Axis Detach	Included 4-axis interface Option	O
Others		
Display Unit	10.4" Color LCD	S
HWACHEON Machining Software		
Hwacheon Artificial Intelligence Control System (HAI): 40 Block		S
Hwacheon Artificial Intelligence Control System (HAI): 200 / 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) = Hwacheon Spindle Displacement Control System (HSDC) + Hwacheon Frame Displacement Control System (HFDC)		S

Hwacheon Global Network

Hwacheon Headquarters Hwacheon Europe Hwacheon Asia Hwacheon America

Please contact us for product inquiries.

www.hwacheon.com

The product design and specifications may change without prior notice.
The specifications in this catalogue are based on standard voltage requirements.
Read the operation manual carefully and thoroughly before operating the product,
and always follow the safety instructions and warnings labels attahed on the surfaces of the machines.

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