HYUNDAI WIA

High Speed Vertical Machining Center

F510M/660M

High Speed & Productivity
Vertical Machining Center

Basic Structure

- **Bed**
- **Slide Way**
- **Spindle**

Peripheral Device

- **ATC & Magazine**
- **HW-MP I**
- **Peripheral Equipment**

Easy to Operate

- **HW-PGi F**
- **HW-TIDM**
- **HW-TM**

Advanced Technology, Compact Design, Next-Generation Vertical Machining Center

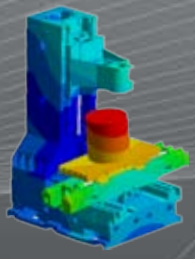
F510M/660M

The HYUNDAI-WIA Vertical Machining Center series was developed by applying the company' s accumulated know-how and cutting-edge technology. The series uses an angular contact ball bearing, a high-precision main spindle with heavy duty cutting power and minimal heat distortion, and achieves high accuracy, high rigidity and high precision.

BASIC STRUCTURE

That Boasts the Largest Working Area,
and The Highest Speed and Power

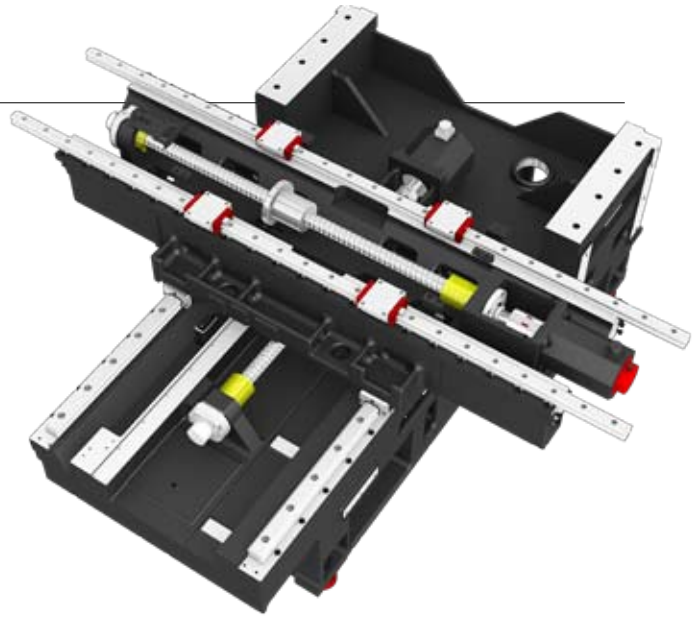
F510M



FEM Analysis

The technique to restrict the vibration in order to increase the processing roughness and degree is the most important factor in the bed structure.
The bed designed by minimizing the vibration with FEM technique guarantees the secure rocessing degree and maintenance of high degree in a long time as it restricts the machine vibration during acc./dec. in a high speed.

Slide Way



Pre-tensioned & Double Anchored Ball Screw

As the precise pressurized ball screw minimizes the tensile strength by heat, the rigidity has been strongly supplemented with double anchor supporting way.

Type of Direct Connection of Servo Motor

As the precise pressurized ball screw minimizes the tensile strength by heat, the rigidity has been strongly supplemented with double anchor supporting way.

Application of High Speed LM Guide

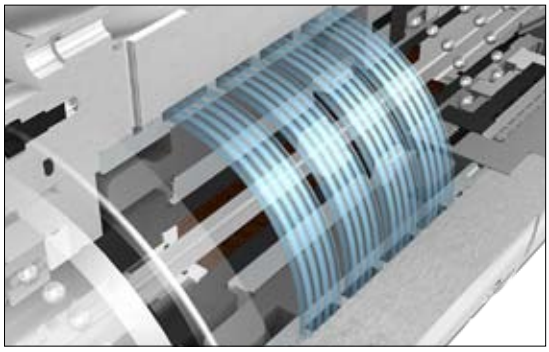
As LM Guide has been adapted to the guide surface of each axis, a small frictional resistance contributes to save the quick trans-mission time and the excellent repeat location determination degree enables the product processing.

Main Spindle

15,000r/min Built-in

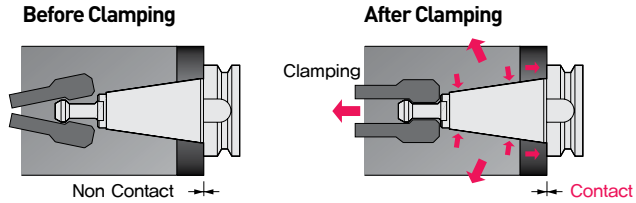
By designing with ultra precision class and high speed of angular ball bearing for accelerating the main spindle, the max. rotation speed (15,000r/min) of high speed processing has been realized and it gives the outstanding performance when processing the molding products. In addition, the correct bearing pressure setting increases the rigidity of main spindle and the life cycle of bearing as well as prevents the temperature increases on rotation.

Spindle Oil Cooling



The oil cooling system of main spindle adapted as a standard keeps the temperature of main spindle in a steady level so that it is able to maintain the secure processing capacity.

Spindle Taper

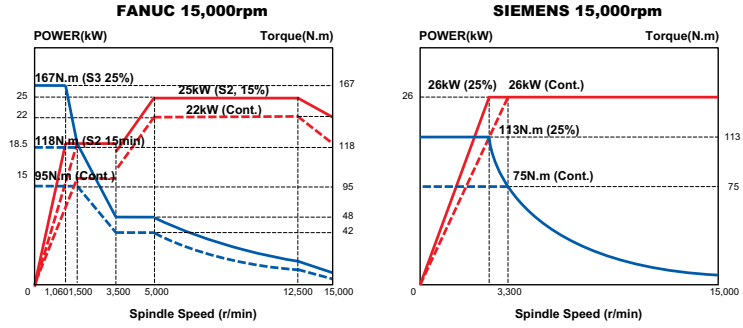


Application of 2 Faces Spindle

It is possible to cut at high level of precision or high speed as the clamping increase and the vibration decreases if the main spindle standard for 2 sides of restriction (BBT #50) which the main spindle and taper sections are simultaneously contacted is applied.

- Rigidity improved due to increases of reference diam.
- Improvement of ATC repeat precision
- Prevention of Z axis displacement when rotating in high speed
- Increased life cycle of tools

Spindle Power & Torque

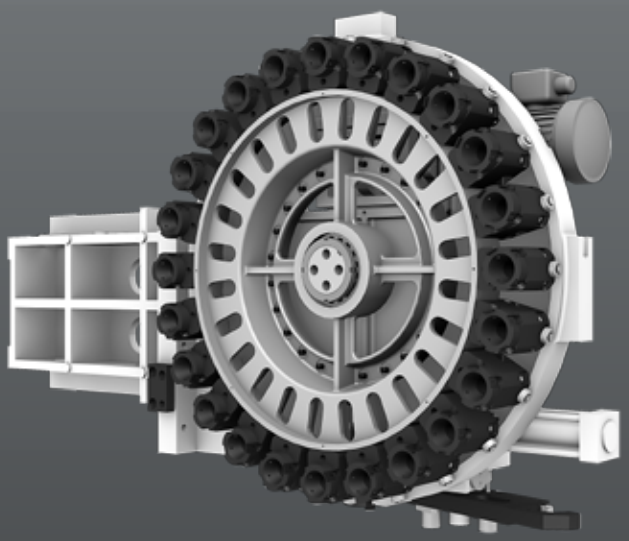


Specification of Main Spindle

[ ] : Option

ITEM		F510M/660M
Taper	–	*BIG PLUS #40*
Sp. Speed (rpm)	r/min	*15,000 [150~15,000]*
Sp. Motor (Max./Cont.)	kW(HP)	*25/22 (33.5/30) [26 (35)]*
Sp. Torque (Max./Cont.)	N.m	*167/95 [113/75]*
Driving Method	–	*BUILT-IN [BUILT-IN]*

PERIPHERAL DEVICE



ATC & Magazine

Magazine

The selective areas of processing tools have been increased by adapting the magazine which is able to attach 24 ea tools as a standard and 30 ea tools as an option, and the exchanging time of tools has been decreased as a result of using the selective way of tools randomly.

ATC

The composite cam way of twin arm guarantees the high speed of tool exchange and dramatically decrease the specific cutting time.

Specification of ATC

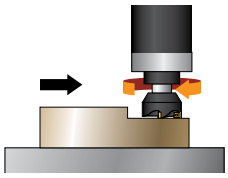
[ ] : Option

ITEM		F510M/660M
No. of Tool		*24EA [30EA]*
Tool Shank		*BBT40*
Max. Tool Dia. (W.T/W.O)		*ø90/ø150mm (3.5"/5.9")*
Max. Tool Length		*300mm (11.8")*
Max. Tool Weight		*8kg (17.6 lb)*
Tool Selection Method		*RANDOM*
Tool Change	T-T	*2.6 sec*
Time	C-C	*6.6 sec*

Machinig

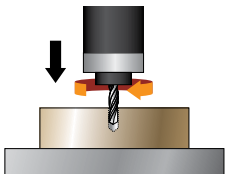
Machining Ability

F510M



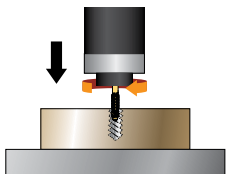
FACE MILL ⟨Material(JIS):S45C(Carbon steel)⟩

Tool diameter	ø80 mm x 6F
Spindle rpm	1,137 r/min
Cutting speed	1,000 mm/min
Cutting depth	5 mm
Cutting width	70 mm
Chip quantity	350 cc/min



DRILL ⟨Material(JIS):S45C(Carbon steel)⟩

Tool diameter	ø43 mm x MT4
Spindle rpm	199 r/min
Cutting speed	39 m/min
Cutting depth	60 mm
Chip quantity	57 cc/min



TAP. ⟨Material(JIS):S45C(Carbon steel)⟩

Tap spec./Pitch	M36xP4.0
Spindle rpm	70 r/min
Cutting speed	280 m/min
Cutting speed	54 mm

❖ The above result might be different by types of processing circumstance

HW-MP I (HYUNDAI WIA-MOLD PACKAGE I)

To achieve optimal effect of mold function for F510M/660M Series, apply the mold package as a standard.

Through the standard application of mold package, the high quality mold manufacturing can be achieved.

Main points of Mold packag

1. Apply the new HYUNDAI WIA FANUC i Series controller
2. Apply big 8.4" LCD
3. Apply AICC I package
4. Spindle thermal displacement compensation device
5. Automatic power cut-off device

What is the AICC I package?

- Machining condition selecting function
- Bell type acc./dec. before look ahead interpolation
- Bell shape acc./dec. after cutting feed interpolation
- AI contour control
- Smooth backlash compensation

Peripheral Equipment

Chip Conveyor

ⓄⓅ

Hinge Belt Type	Material	SS41, 45C, Steel casting	Chip	Roughly cut chips Synthetic chips
	Show highly efficiency when treating lots of chips synthetic chip treatment, collective chips			
Scraper Type	Material	SS41, 45C, Steel casting	Chip	Chips shortly cut and out
	Facilitate to treat chip shortly cut and out, facilitate to forward chips with 90 degree			
Drum Filter Type	Material	AL, casting, non-metal	Chip	Chips in low density and fine powder
	Have advantage in precision when processing aluminum because chips are not introduced to coolant nozzle			

Touch Sensor Tool

ⓄⓅ

The machining criteria of workpiece is measured through interface signal between instrument unit (Touch Sensor Tool) and workpiece, cooridinate value is automatically set in the basic coordinate system.

TLM

ⓄⓅ

The tool broken, wear-out degree and offset value can be automatically measured, ensuring working convenience.

Rigid Tapping

The rigid tapping adapted as a standard maximizes the improvement of productivity with prompt and correct tap processing. In addition, it has excellent in processing degree and extends the life cycle of tap tools.

Programming system for creating CNC programs easily.

Easy to Operate

HYUNDAI WIA's smart system is capable of more rapid program setting and readily maintaining,
and is optimal to the productivity of machine.

M-Code List Ⓞ Ⓟ

Calculator Ⓞ Ⓟ

Product Guide Ⓞ Ⓟ

HW-PGi F

Programming Guide i for Fanuc System

Realistic 3D solid animation

3D simulation

Example of easy programming

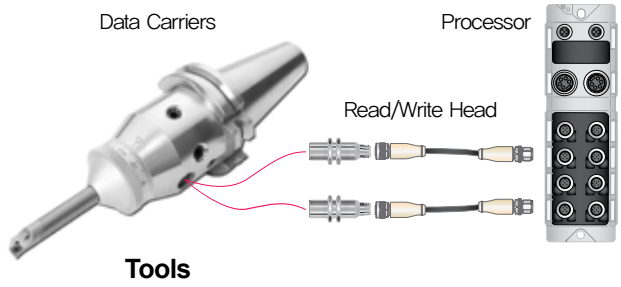
Readily programing with interactive type, without code

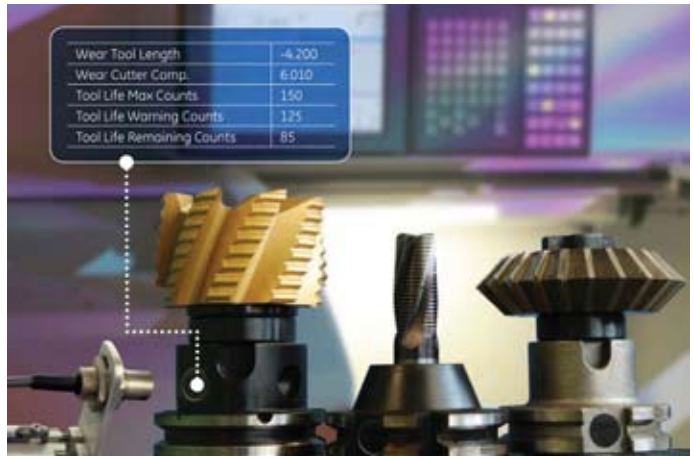
Engraving Cycle

when the character is only entered without separate program is programmed automatically.

HW-TIDM : Tool ID Manager ⓄⓅ

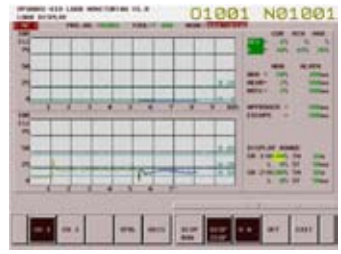
Tool ID System Diagram





- Customer oriented tool ID management system (ID MAP setting function)
- RS232C/PROFI DP protocol
- Tool counter function
- Tool management automation

HW-TM : Tool Monitoring System ⓄⓅ



HW-TM

- Real-time cut monitoring
- 2 Channel screen display
- Self learning for machining amount
- 3 stage of status monitoring (wear/break/no-load)

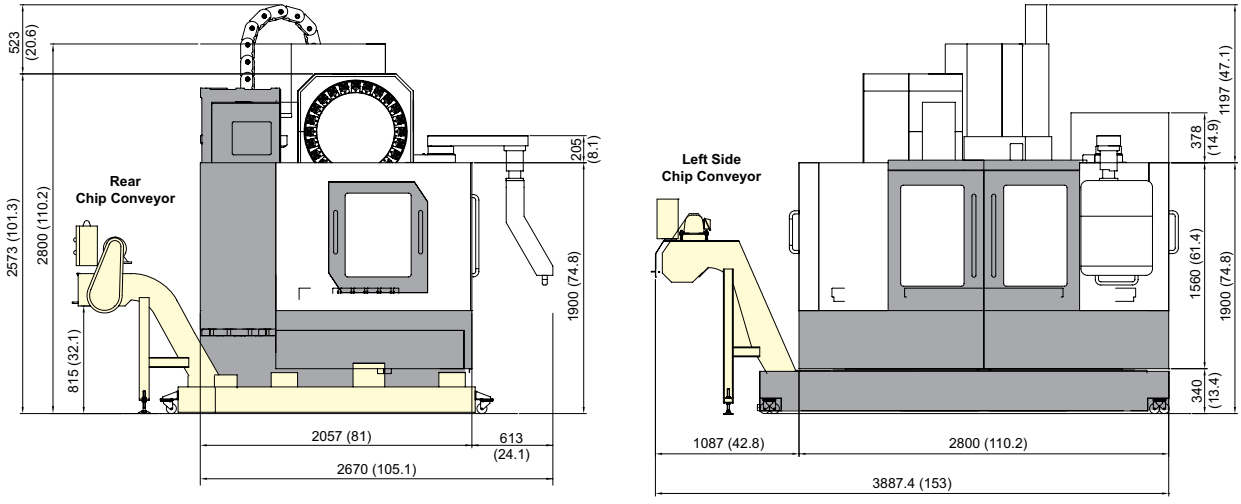
❖ If you order these options, Please contact sales person

Specifications

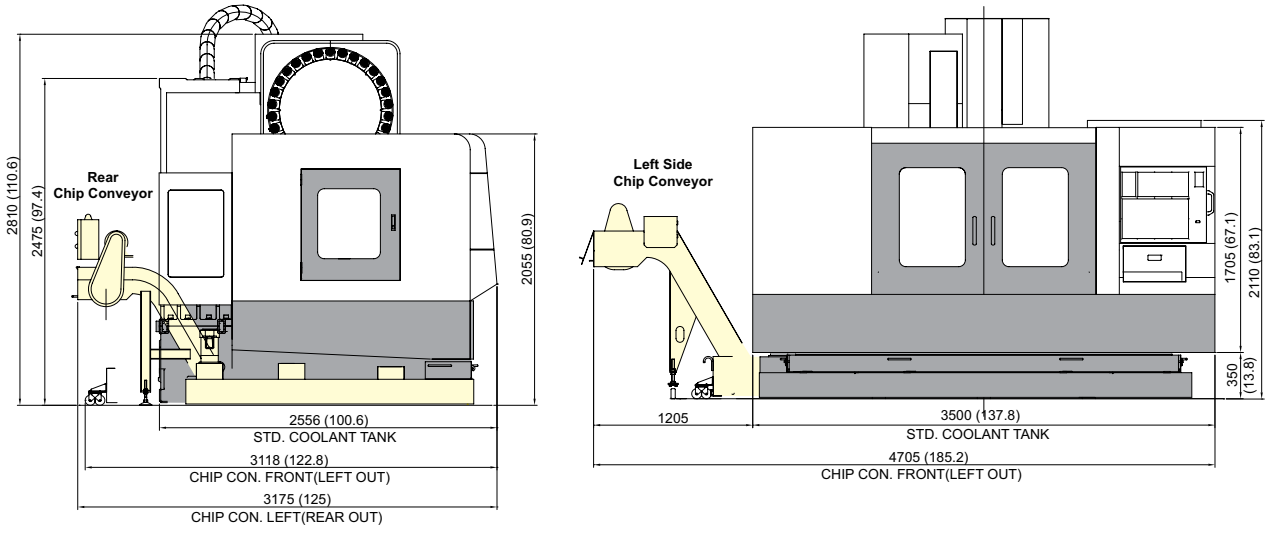
unit : mm(in)

External Dimensions

F510M

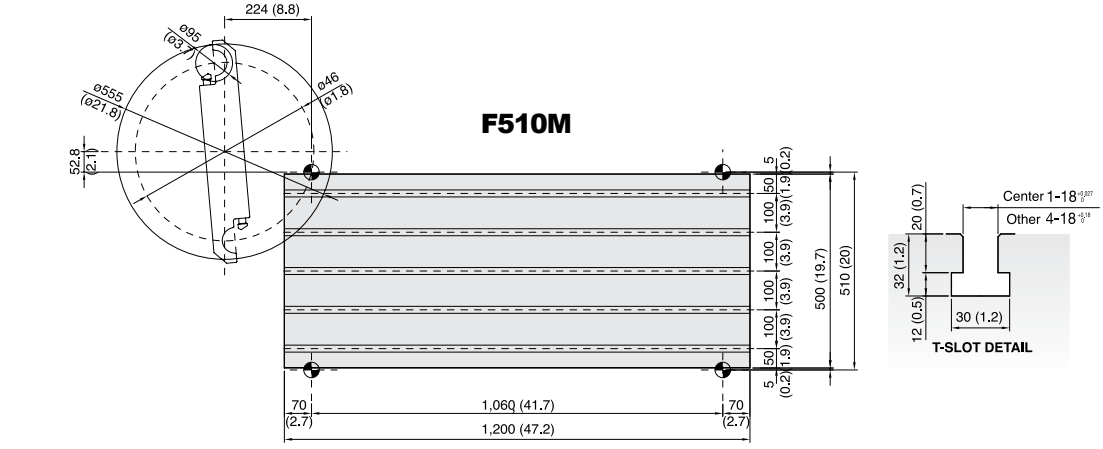


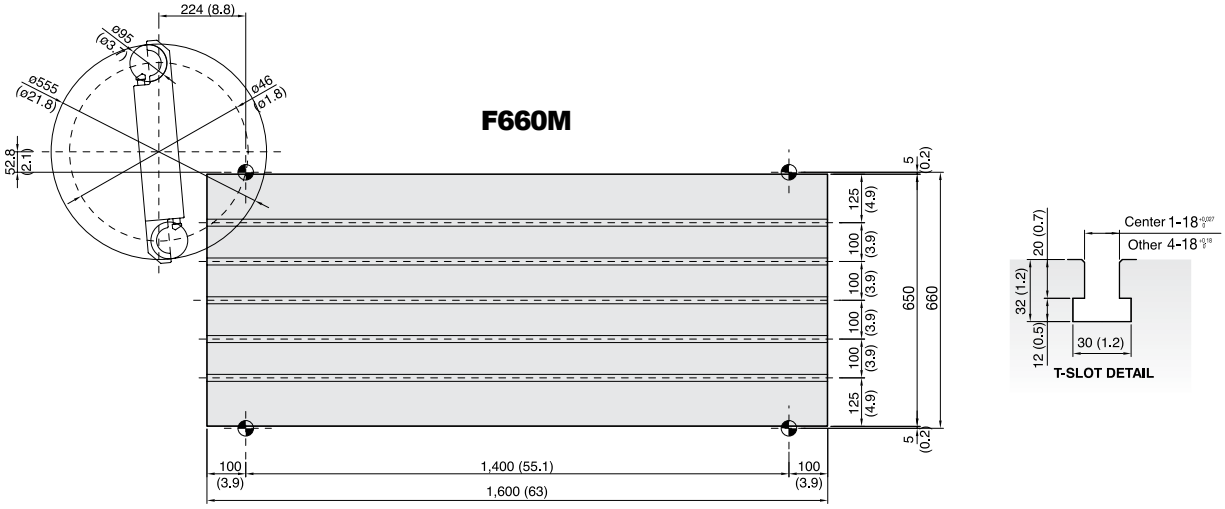
F660M



unit : mm(in)

Table Dimensions

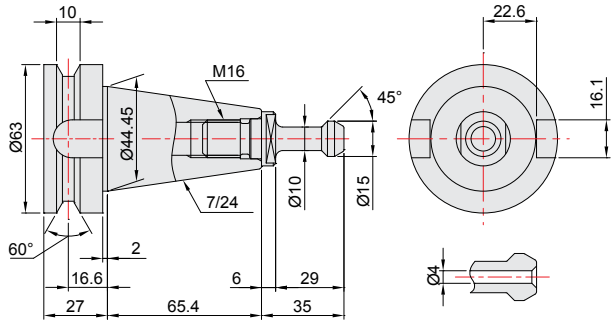




unit : mm

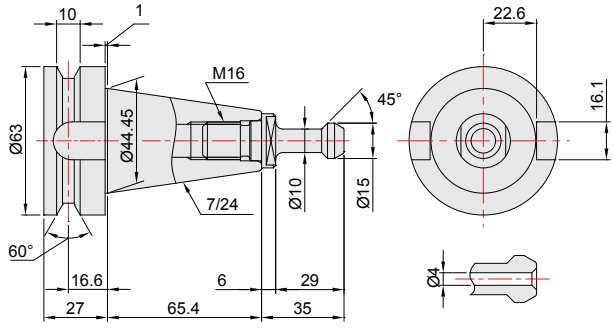
Tool Shank

BT40



Sp. Thru Coolant Pull Stud Bolt [BT40-45°]

BBT40, BIG PLUS



Sp. Thru Coolant Pull Stud Bolt [BT40-45°]

Specifications

Specifications

ITEM				F510M	F660M
TABLE	Table Size		mm(in)	1,200×500 (47.2″×19.7″)	1,600×650 (63″×25.6″)
	Maximum Load Capacity		kg(lb)	800 (1,764)	1,300 (2,866)
SPINDLE	Spindle Taper		–	BIG PLUS #40	
	Spindle RPM		r/min	15,000 [150~15,000]	
	Spindle Power Output (Max./Cont.)		kW(HP)	25/22 (33.5/30) [26 (35)]	
	Spindle Torque (Max./Cont.)		N.m	167/95 [113/75]	
	Spindle Driving Method		–	BUILT-IN [BUILT-IN]	
FEED	Travel (X/Y/Z)		mm(in)	1,060/510/635 (41.7″/20.1″/25″)	1,400/660/635 (55.1″/26″/25″)
	Distance from Table Surface to Sp.		mm(in)	150~785 (5.9″~30.9″)	
	Distance from Column to SP. center		mm(in)	615 (24.2″)	765 (30.1″)
	Rapid Feed Rate (X/Y/Z)		m/min	36/36/30	
	Cutting Feed Rate (X/Y/Z)		m/min	15	
	Slide Type		–	LM GUIDE	
ATC	Number of Tools		EA	24 [30]	
	Tool Shank		–	BBT40	
	Max. Tool Dia. (W.T / W.O)		mm(in)	Ø90/Ø150 (3.5″/5.9″)	
	Max. Tool Length		mm(in)	300 (11.8″)	
	Max. Tool Weight		kg(lb)	8 (17.6)	
	Tool Selection Method		–	RANDOM	
	Tool Change Time	T-T	sec	2.6	
		C-C	sec	6.6	
TANK CAPACITY	Coolant Tank		ℓ (gel)	350 (92.5)	
	Lubricating Tank		ℓ (gel)	4 (1.1)	
	Hydraulic Tank		ℓ (gel)	15 (4)	
POWER SUPPLY	Air Consumption (0.5MPa)		ℓ /min(gel/min)	110 (29.1)	
	Electric Power Supply		KVA	30	
	Thickness of Power Cable		Sq	OVER 35	OVER 50
	Voltage		V/Hz	220/60 (200/50)	
MACHINE	Floor Space (L×W)		mm(in)	2,800×2,670 (110.2″×105.1″)	3,500×2,556 (137.8″×100.6″)
	Height		mm(in)	2,800 (110.2″)	2,810 (110.6″)
	Weight		kg(lb)	7,700 (16,976)	9,500 (20,944)
NC	Controller		–	HYUNDAI WIA FANUC i Series [SIEMENS 828D]	

❖ Specifications are subject to change for improvement without notice.

[ ] : Option

Standard & Optional

● : Standard ○ : Option ☆ : Prior Consultation X : Non Application – : Impossible

Spindle		F510M	F660M
15,000rpm (25/22kW)	BUILT-IN	○	○
15,000rpm (25/22kW)	BUILT-IN	○	○
Spindle Cooling System		●	●
ATC			
ATC Extension	24	●	●
	30	○	○
Tool Shank Type	BT40	○	○
	BBT40	●	●
	HSK-A63	○	○
U-Center	D'andrea	○	○
Stud Bolt Collet Change	45°	●	●
	60°	○	○
	90°	○	○
Table & Column			
APC		X	X
Tap Type Pallet		X	X
T-Slot Pallet		●	●
NC Rotary Table		☆	☆
High Column	300mm	○	○
Coolant System			
Std. Coolant (Nozzle)		●	●
Bed Flushing Coolant		●	●
Spindle Thru Coolant	20bar	○	○
	30bar	○	○
	70bar, 15 ℓ	○	○
	70bar, 30 ℓ	☆	☆
TOP COVER(Only for Spindle Thru Coolant)		○	○
Jet Coolant		○	○
Gun Coolant		○	○
Side Oil Hole Coolant		○	○
Air Gun		○	○
Spindle Air Blow		○	○
Tool Measuring Air Blow (Only for TLM)		○	○
Air Blow for Automation		☆	☆
Thru MQL Device (Without MQL)		☆	☆
Coolant Chiller		☆	☆
Power Coolant System (For Automation)		☆	☆
Chip Disposal			
Coolant Tank	350 ℓ	●	●
Chip Conveyor (Hinge/Scraper)	Front (Left)	○	○
	Left (Rear)	○	○
Special Chip Conveyor (Drum Filter)		☆	☆
Chip box	Standard(180 ℓ)	○	○
	Swing(200 ℓ)	○	○
	Large Size(330 ℓ)	☆	☆
	Customized	☆	☆
Safety Device			
Total Splash Guard		●	●
S/W			
Machine Guidance		☆	☆
HWTM (Tool Monitoring System)		○	○
DNC Software		○	○
Dialogue Program		○	○
Tool ID Manager		○	○
Spindle Heat Distortion Compensation		●	●
Spindle Warm up Function		☆	☆
ETC			
Tool Box		●	●
Customized Color	Need Munsel NO.	☆	☆
CAD&CAM Software		☆	☆
Electric Device			
Call Light	1 Color : ■	●	●
Call Light	3 Color : ■ ■ ■	○	○
Call Light & Buzzer	3 Color : ■ ■ ■ B	○	○

Electric Device		F510M	F660M
Work Light		●	●
Electric Cabinet Light		○	○
Door Inter-Lock		●	●
Remote MPG		●	●
MPG	FANUC	○	○
	SIEMENS	X	X
Spindle Load Meter (LED Type)	FANUC	○	○
	SIEMENS	X	X
Spindle RPM Meter (LED Type)	FANUC	○	○
	SIEMENS	X	X
Work Counter	Digital	○	○
Total Counter	Digital	○	○
Tool Counter	Digital	○	○
Multi Tool Counter	6EA	○	○
	9EA	○	○
Electric Circuit Breaker		○	○
AVR (Auto Voltage Regulator)		☆	☆
Transformer & Cable	35kVA	○	○
Flash Memory Card		○	○
Auto Power Off		●	●
Back up Module for Black out		☆	☆
Measuring Device			
Air Zero	TACO	○	○
	SMC	○	○
Work Measuring Device		○	○
TLM	Touch	○	○
(Marposs/Renishaw/Bloom)*	Laser	○	○
Tool Broken Detective Device		☆	☆
Linear Scale	X/Y/Z Axis	○	○
Coolant Level Sensor (Only for Chip Conveyor)		☆	☆
Enviornment			
Air Conditioner		○	○
Dehumidifier		○	○
Oil Mist Collector		○	○
Oil Skimmer (Only for Chip Conveyor)		○	○
MQL (Minimal Quantity Lubrication)		☆	☆
Fixture & Automation			
Auto Door	Std.	○	○
	High Speed	○	○
Auto Shutter (Only for Automatic System)		☆	☆
Sub O/P		☆	☆
NC Rotary Tablel/F	Single	○	○
	Channel	☆	☆
Control of Additional Axis	1Axis	○	○
	2Axis	☆	☆
External M Code 4ea		○	○
Automation Interface		☆	☆
I/O Extension (In & Out)	16 Contact	○	○
	32 Contact	○	○
Hyd. Device			
Std. Hyd. Unit	40bar/15 ℓ	●	●
Center Hyd. Supply Device	2x3 (6Port)	☆	☆
	2x5 (10Port)	☆	☆
Hyd. Unit for Fixture	45bar	○	○
	70bar	○	○
	100bar	☆	☆
	Customized	☆	☆

❖ The specifications as above will only serve as a reference.

Controller

HYUNDAI WIA FANUC i Series

Axis control / Display unit	
Controlled axes	3 (X/Y/Z) axes
Simultaneous controllable axes	3 axes (G00 & G01 : 3 axes) (G02 & G03 : 2 axes)
Least input increment	X axis : 0.001mm (0.0001")
	Y axis : 0.001mm (0.0001")
	Z axis : 0.001mm (0.0001")
Least command increment	X axis : 0.001mm (0.0001")
	Y axis : 0.001mm (0.0001")
	Z axis : 0.001mm (0.0001")
Inch/Metric conversion	G20 / G21
Interlock	Each axis / All axes
Machine lock	All axis
Emergency stop	
Stored stroke check1,2,3	
Follow-up	
Servo off	
Backlash compensation	+/- 0~9999 pulse (rapid traverse & cutting feed)
Position switch	
Stored pitch error compensation	
LCD/MDI	8.4" color LCD
Operation	
Automatic operation (memory)	
MDI operation	
Search function	Sequence, Program
Program restart	
Dry run	
Single block	
Buffer register	
Handle interrupt	
Feed functions	
Manual jog feed	Rapid, Jog, handle
Manual handle feed-rate	x1, x10, x100
Feed command	F code feedrate direct command
Feedrate override	0~200% (10% Unit)
Jog feed	0~5,000 mm/min (197 ipm)
Rapid traverse override	F0, F25%, F50%, F100%
Override cancel	
Rapid traverse bell-shaped acceleration/deceleration	
Auto corner override	
Program input & Interpolation functions	
Label Skip	
Control in/out	
Interpolation functions	Positioning/Linear/Circular (G00/G01/G02/G03)
Exact stop mode/Exact stop	G61 / G09

Program input & Interpolation functions	
Dwell	G04, 0~9999.9999sec
Helical interpolation	
Threading / Synchronous feed	
Manual reference point return	G28
Reference point return	G27
Reference point return check	G30
2nd Reference point return	
3rd Reference point return	
4th Reference point return	
Program stop/end	M00, M01 / M02, M30
Tape code	EIA RS-244/ISO 840 (Automatic recognition)
Optional block skip	1 EA
Max. programmable dimensions	+/- 9999.9999 (+/- 8digits)
Program number	O4 digit
Absolute/incremental command	G90 / G91
Decimal point input	
Plane selection	G17,G18,G19
Work coordinate system setting	G52~G59
Work coordinate preset	
Additional work coordinate system	48 pairs
Manual absolute	"On" fixed
Programmable data input	G10
Sub program call	4 levels of nesting
Custom macro	
Addition to custom macro common variables	#100~#199, #500~#999
Circular interpolation	
Canned cycle	G73, G74, G76, G80~G89
Optional chamfering/ corner R	
Skip function	G31
Automatic coordinate system setting	
Coordinate system rotation	
Programmable mirror image	
Single direction positioning	G60
External data input	Tool offset / Message / Machine zero point shift
Cylindrical interpolation	
AI advanced preview control	G5.1
Polar coordinate command	

Auxiliary / Spindle functions	
Miscellaneous function	M2 digits
Miscellaneous function lock	
Spindle speed command	S5 digits, binary output
Spindle speed override	50%~120% (10% unit)
Spindle orientation	
Rigid tapping	
Tool functions / Tool compensation	
Tool function	Max. T8 digits
Cutter compensation C	G40 ~ G42
Tool length measurement	
Tool length compensation	G43, G44, G49
Tool offset amount	+/- 6 digits
Tool offset pairs	400 pairs
Tool life management	
Data input / Output & Editing functions	
Reader/Puncher interface	RS232C
Memory card input/output	
Part program storage length	1280m (512Kbyte)
Registered programs	400 ea
Memory lock	
Back ground editing	
Extended part program editing	Copy, Move, Change of NC program
Setting, display, diagnosis	
Self-diagnosis function	
History display	Alarm & operator message
Help function	
Run hour / Parts count display	
Actual cutting feedrate display	
Spindle / Servo setting screen	
Multi-language display	
Erase LCD screen display	Screen saver
Option	
Additional 1 Axis	
Manual Guide i	With 10.4" color LCD
Dynamic graphic display	
Optional block skip add	9 EA (Application can be limited)
AI contour control (AICC)	
Data server	
FAST Ethernet	
DNC operation	

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ControL	
Max. configuration of axes	5 axes
Max. configuration of axes and sp.	6 axes (axes + spindle)
Least Command/input	0.0001mm / 0.00001inch
Feed Function	
Feedrate Override	0 – 120%
Rapid Traverse Override	F1, 5, 25/50, 100%
Acceleration with jerk limitation	
Programmable acceleration	
Follow-up mode	
Measuring system 1 and 2, selectable	
Separate path feed for corners and chamfers	
Travel to fixed stop	
Spindle Functions	
Spindle Override	50% – 120%
Spindle Orientation	
Spindle Speed Limitation	
Rigid Tapping	
Interpolations	
Linear interpolation axes	Max 4 axes
Circle via center point and end point	
Circle via interpolation point	
Helical interpolation	
Universal interpolator NURBS	
(non-uniform rational B splines)	
Advanced Surface	
Compressor for 3-axis machining	
Tool Function	
Tool Nose R Comp./Tool Radius Comp.	
Zero Offset (G54, G55, G56, G57 ,G58, G59)	
Programmable Zero Offset	
3D Tool Radius Compensation	
Tool management	
Display	
CRT / MDI	TFT 10.4″ Color
Screen saver	
Manual Operation	
Manual Handle/Jog Feed	
Reposition	
Reference Approach	Ref 1, 2 Approach
Spindle Control	Start, Stop, Rev, Jog, Ort.
Auto Operation	
Single Block	
Feed Hold	
Optional Block Skip	
Machine Lock	2D
Dry Run	
Simulation	

Diagnosis Function	
Alarm Display	
Spindle Load/rpm Meter	
PLC status/LAD display	
Programming Function	
Part Program Storage Length	5MB
Program Name	23 digits
Subroutine Call	7Level
Absolute/incremental Command	G90 – G91
Scaling, ROT	
Inch / Metric Conversion	
Conversational Cycle Program	
Block Search with / without Calculation	
Variable Program (Macro)	
Read / Write System Variable	
BackGround Editing	M – Code
Miscellaneous Functions	
Lable Skip	M00, M01, M02, M30
Program Stop / End	
Lookahead , Jerk Limitation Feed & forward control	AICC
ISO Dialect Interpreter (G291)	128/256
Maximum number of tools/cuttings	
Number of levels for skip blocks 1	
Protection Function	
Emergency Stop	Soft Limit
Over Travel	
Contour Monitoring	
Program Protection	
Automation Support Fun.	
Actual Speed Display(Monitor)	Time, Parts
Tool Life Management	Internal
Work Count Function	
Language Function	
Two Language switchable	Chinese Traditional, Czech, Danish, Dutch, Finnish, Hungarian, Japanese, Korean, Polish, Russian, Swedish, Portuguese, Turkish
Data Transfer	
RS 232C I/F	
Ethernet	Max 4
USB Memory Stick & CF Card	
Option	
DRF offset	
Load and save of MDI	
Teach-in	
Number of levels for skip blocks 8	
Simulation in 3-D display	
ShopMill	
TRACYL	
TRANSMIT	

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