DOOSAN

Optimal Solutions for the Future

HP 4000Ⅱ / 5100Ⅱ series



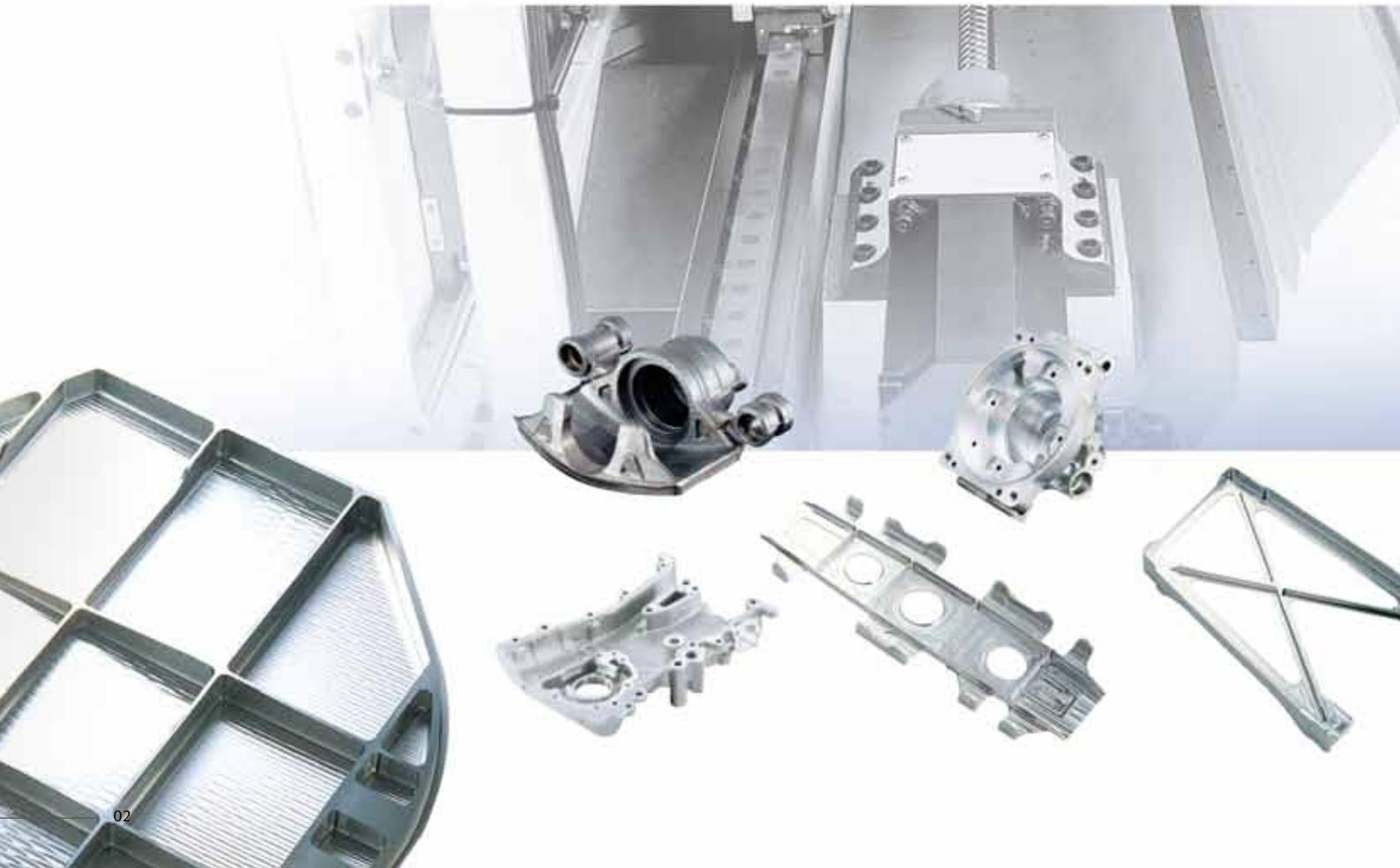
High Speed High Performance Horizontal Machining Center

HP 4000 Ⅱ series
HP 5100 Ⅱ series

ver. EN 160803 SU

HP 4000 Ⅱ / 5100 Ⅱ

Designed to implement highly fast and precise heavy-duty cutting, HP 4000 II & 5100 II use a roller type LM guide on all axes for a higher speed and rigidity. Also, the 22kw (29.5Hp) high torque spindle motor, high feed rate and fast tool exchange time help minimize non-cutting time and perform a variety of machining tasks with different tools and highly reliable operations without breakdown, enhancing your productivity significantly. The easy-to-use operation panel and zero leakage of cutting oil allow you to use this machine more easily.



High Speed and Productivity Horizontal Machining Center



High Productivity

HP 4000 II / HP 5100 II

High Speed Spindle

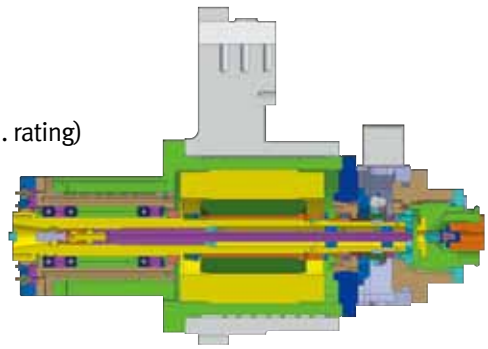
This machining center is designed to minimize vibration and heat when the spindle spins at a high speed and enable quick increase or decrease of speed. Also, the main spindle is supported by P4-level high precision bearings and maintains stable precision even under fast high-duty operations.

Max. Spindle Speed

14000 rpm

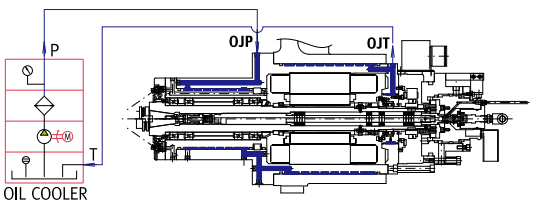
Spindle Motor (30-min. rating)

22 kW (29.5 Hp)



Oil cooler

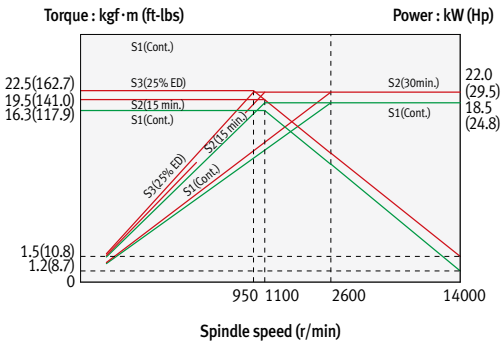
The refrigerated cooling system maintains a uniform spindle temperature required for high accuracy and minimizing thermal extension. Thermo sensors regulate the temperature of the oil which is circulated through oil jackets around the spindle bearing and motor housing.



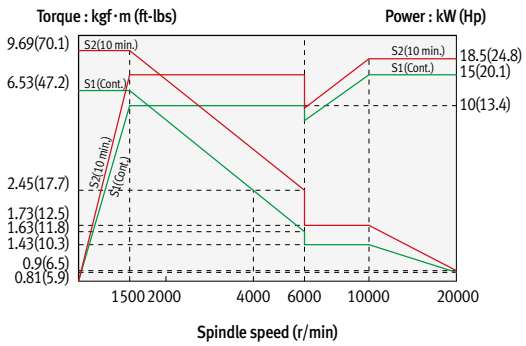


Spindle power - torque diagram

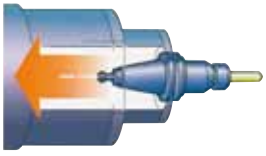
std. 14000rpm (18.5 / 22kW)



opt. 20000rpm (15 / 18.5kW)



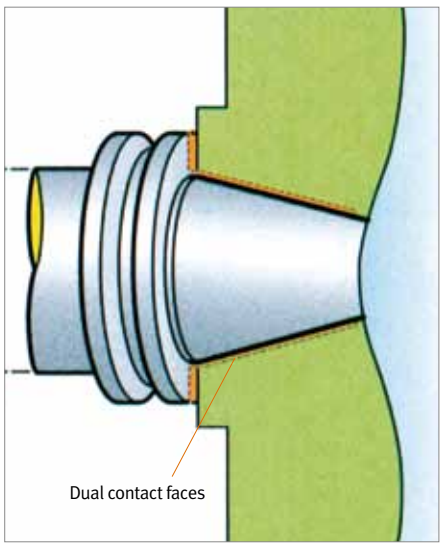
Tool clamping force



10000 N



Dual Contact System



Main features

This system makes it possible for simultaneous dual contact of the taper and spindle front side by using elastic deformation of the spindle and implementing perfect control of the gauge.

- The tool contacts the spindle front side and taper simultaneously. → Rigidity is enhanced and vibration reduced.
- The machining performance and surface roughness are improved under even the worst conditions.
- The existing tool can be used. (100% compatible)

Key benefits

- Higher rigidity
- Improved ATC repeatability, surface finish and higher precision
- Prevents displacement of Z axis in a fast spinning
- Increases the tool life

HSK Holder opt.



High precision, high efficiency, high quality

This holder helps keep productivity and precision at high levels when machining high value curved surfaces or difficult-to-cut materials (high performance parts). Also, as it disperses cutting heat along with chips, the holder helps minimize thermal deformation of workpiece.

Tool Magazine



Tool storage capacity

40 ea

[60/80/120/170/262 : opt.]

The ATC is composed of tool magazine and changer. The servo driven too magazine allows a quick movement to a specified tool. The tools are selected by a fixed address method. All tools are returned to the pots from which they were originally taken so that collision problems involving large-sized tools need to be considered only once when they are first mounted.

- The tool magazine is operated on:
  servo motor control

Automatic Tool Changer

Tool Change Time (Tool-to-Tool)

1.0 s



This changer is highly reliable and durable and helps minimize non-cutting time by using the CAM method.

(Tool to Tool 1.0 s,
Chip to Chip HP 4000 II : 3.6 s HP 5100 II : 4.0 s)

Max. Tool Diameter

Ø75 mm (3.0 inch)
(For continuous loading)

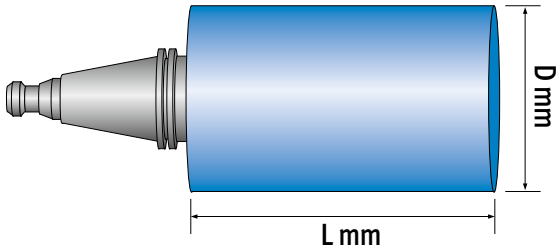
Ø140 mm (5.5 inch)
(When adjacent ports are empty)

Max. Tool Length

330 mm (13.0 inch) (HP 4000 II)
400 mm (15.7 inch) (HP 5100 II)

Max. Tool Weight

10 kg (22.0 lb)

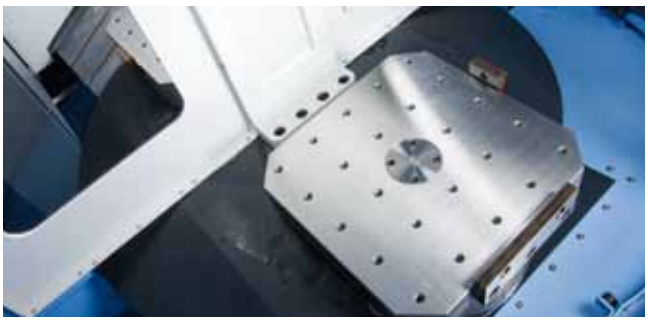


Automatic Pallet Changer

HP 4000 II / 5100 II are equipped with rotary shuttle type APC(Automatic Pallet Changer) as a standard feature. It provides high reliability and wide working area for easy setup.

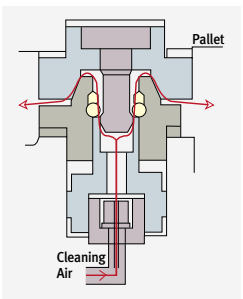
Pallet Change Time

7.0 s (HP 4000 II) 7.5 s (HP 5100 II)



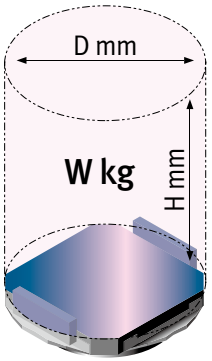
The possibility that chips might degrade the meshing accuracy of the pallet positioning mechanism increases during APC operation. On the HP 5100 strong jets of air are discharged from the tapered cones when pallets are changed to clean any chips for assuring accurate pallet positioning.





Max. Workpiece size

Pallet size		
HP 4000 II	mm (inch)	400 (15.7) X 400 (15.7)
HP 5100 II	mm (inch)	500 (19.7) X 500 (19.7)
Max. workpiece size		
HP 4000 II	mm (inch)	Ø600 (23.6) X H 800 (31.5)
HP 5100 II	mm (inch)	Ø800 (31.5) X H 930 (36.6)
Max.workpiece weight		
HP 4000 II	kg (lb)	400 (881.8)
HP 5100 II	kg (lb)	500 (1102.3)



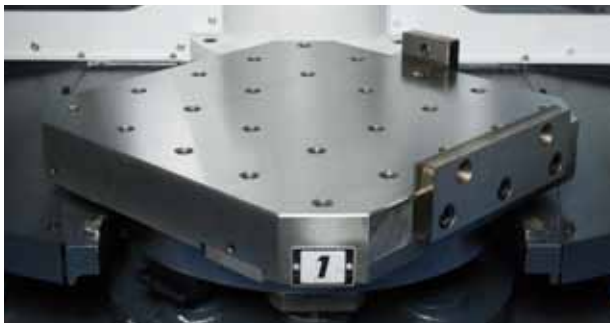
Table

Minimum table indexing angle

1°

Table indexing time

1.4 s (0 → 90°)



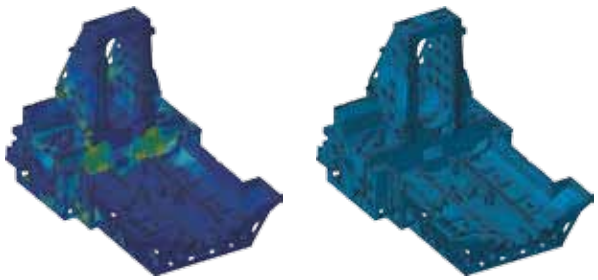
Rigidity Structure

HP 4000 II / HP 5100 II

Rigid Structure Bed and Column

The machine is designed to build rigidity into a stable body. The construction of the machine was thoroughly examined from the stage of basic design to ensure consistent high-speed and high-accuracy operation. The machine is optimized by FEM to prevent the deformation from machining force, axies travel and weight of workpiece.

FEM analysis



Feed axis

Unit : mm (inch)

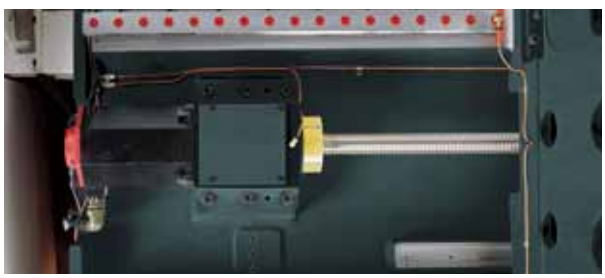
	HP 4000 II	HP 5100 II
X-axis	600 (23.6)	850 (33.5)
Y-axis	560 (22.0)	700 (27.6)
Z-axis	600 (23.6)	750 (29.5)

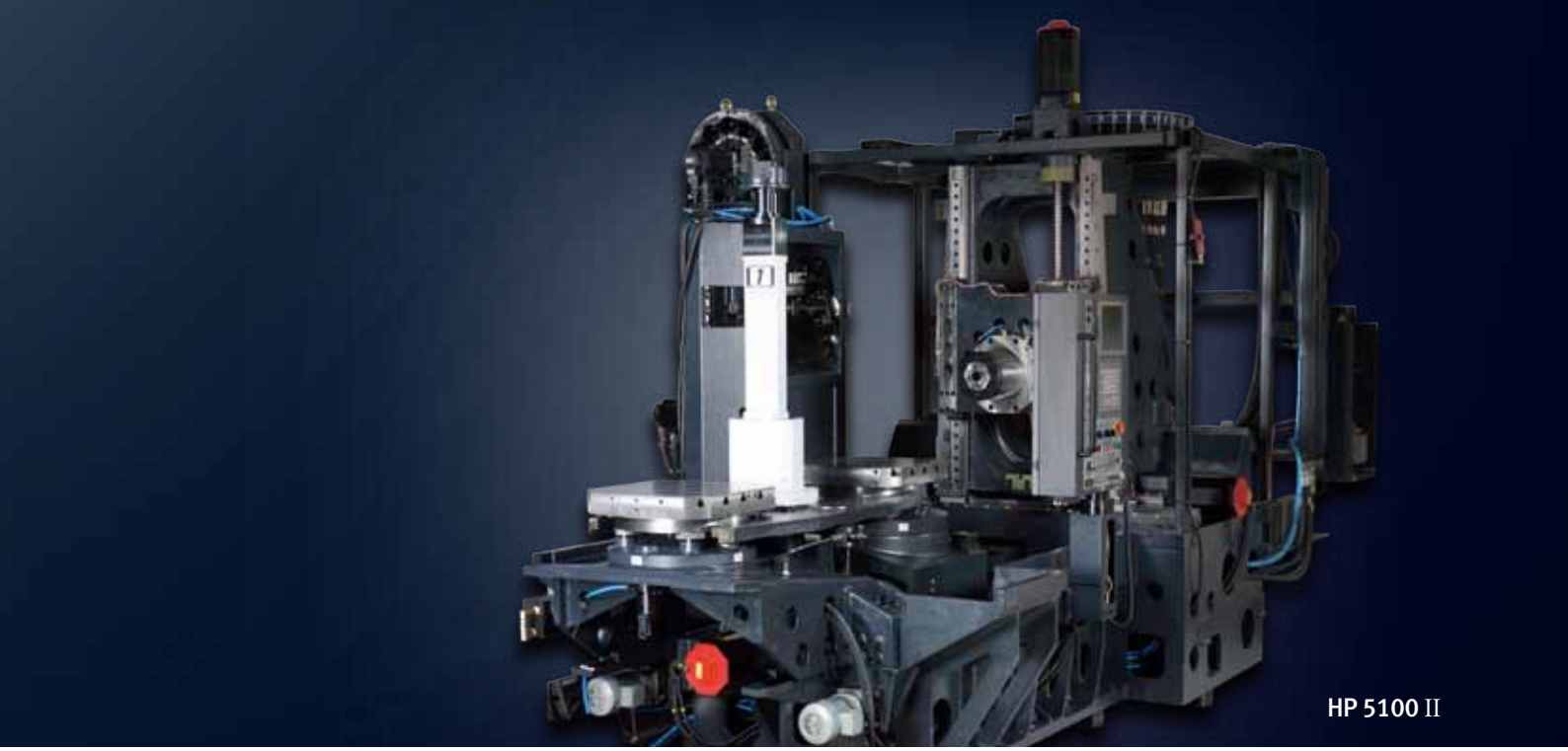
Guideways and Axis Travel System

The axis travel system adopt roller type LM guides that provide high speed axis travel and heavy duty machining.

Rapid traverse

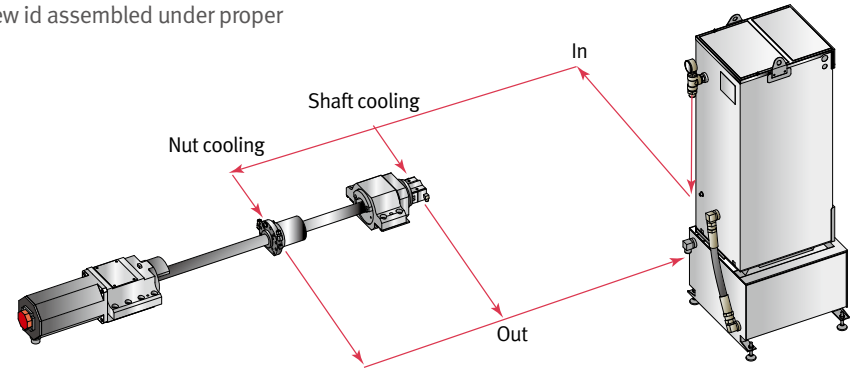
60 m/min (2362.2 ipm)





Minimum thermal deformation for high accuracy

Axis travel systems are designed for reducing thermal extension by nut cooling and shaft cooling(option) of hall screw. The ball screw id assembled under proper pretension to minimize thermal deformation.

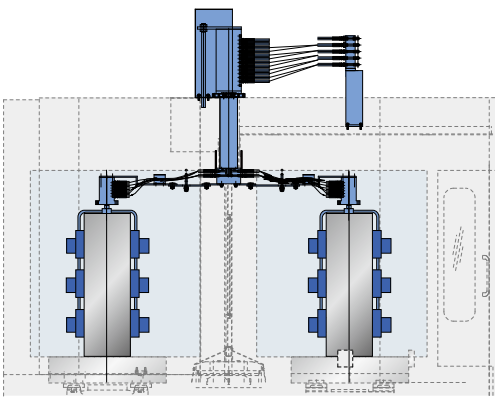


Interface for Fixture opt.



Fixture check list (for hydraulic/pneumatic fixtures)

- Oil & air pressure ports
  - A/B Line : 2, 4, 6, 8 Pairs
    (includes solenoid valve)
  - P/T Line : 2, 4, 6, 8 Pairs
    (does not include solenoid valve)
- Hydraulic power unit
  - 2.2 kW (3.0 Hp) / 7 MPa (1015.0 psi)
  - 3.7 kW (5.0 Hp) / 15 MPa (2175.0 psi)
  - 5.5 kW (7.4 Hp) / 21 MPa (3045.0 psi)
- Contact Doosan for more information



Easy Operation



User-friendly Operation Panel

Consolidate a variety of control panel into unified concept design to provide convenience of operation as user-friendly design.



Button for customized funtions can be placed, for example fixture clamp/ unclamp button, counter, timer or special optional buttons.



Partitions are placed between all buttons to prevent pushing an unintended button.

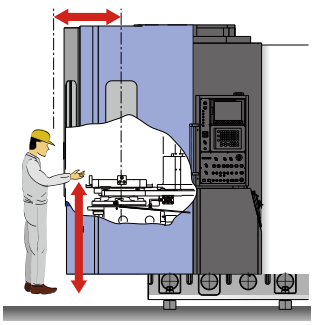
Swivelling operator's panel



The operation panel can be rotated up to 90 degrees and the detailed alarm messages about errors that occur in the control devices allow users to operate the machine more easily.

Ergonomic and Eco-Friendly Design

Easy setup



HP 4000 II

Distance to table
400 mm (15.7 inch)

Height to table
1130 mm (44.5 inch)

HP 5100 II

Distance to table
500 mm (19.7 inch)

Height to table
1140 mm (44.9 inch)

Collection of waste lubrication oil

Less waste lubrication oil extends the life time of the coolant and cut down the grime and offensive smell of the machine inside.

No coolant leakage

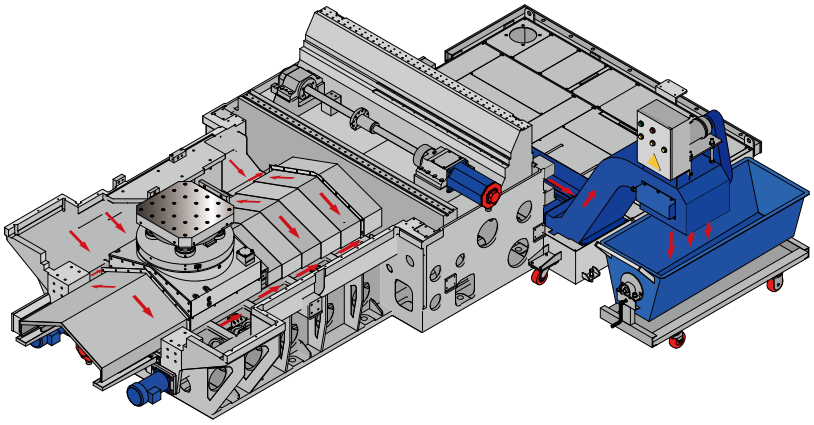
Rigorously designed, manufactured and tested machine covers do not permit coolant leakage in any condition. The factory always keeps our environment clean.

Oil skimmer opt.

Another suggestion to prolong the life time of the coolant. A belt-driven type oil skimmer picks up and removes waste oil from the coolant tank that is easily drained.



Chip Disposal





Improved chip disposal

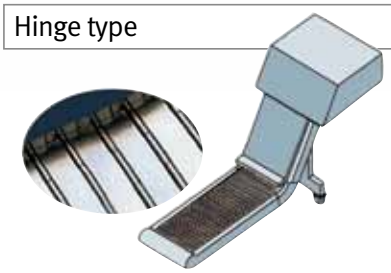
The X- and Z-axis slide cover, a hill-like table and the circular spindle shape help prevent chips from accumulating in main areas of the machine and any chips that fall onto the machine bed are ejected efficiently by two spiral conveyors on either side of the table.

Types of conveyors specific to chip shape opt.

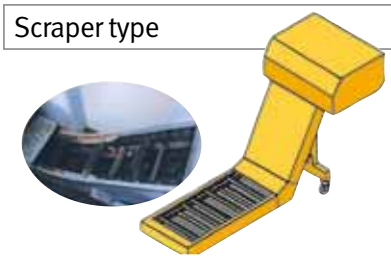
Category	Steel	Cast	Aluminum and nonferrous metals	Compound
Chip shape				
Hinge type	○	△	×	×
Scraper type	×	○	△	○
Drum Filter type	○	○	○	○

○ : Applicable × : Not applicable, △ : Applicable, but not recommended
Some types of chips may not be completely removed from the chip conveyor.

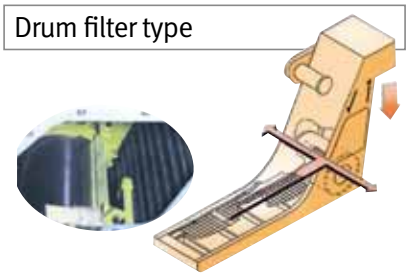
Hinge type



Scraper type



Drum filter type



Coolant System

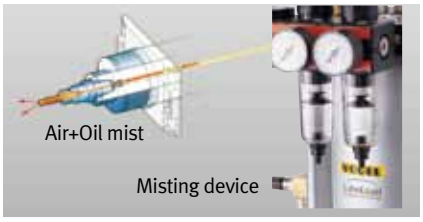
Through-spindle coolant system opt.



Oil mist collector



Minimum Quantity Lublication



Shower coolant opt.



Flood coolant



Coolant gun opt.



Improved Units for Maintenance

Single-stage Slide Cover

The single-stage slide cover helps not only enhance precision and durability but also minimize minor breakdowns caused by chips in the coolant device and transfer system.

X-axis (HP 4000 II)

Z-axis APC part (HP 4000 II / 5100 II)



Double filter air serve unit

This machine uses a dual filter air service unit to remove dust and foreign materials generated during machining and has an automatic drainer installed as a standard unit for higher durability and usability.



Large lubrication pump & tank

The lubrication device is located at the place where operator can easily. Also, a warning signal appears when lubricant runs out so that the exact amount of it can be automatically applied to all guide-ways and ball screws.



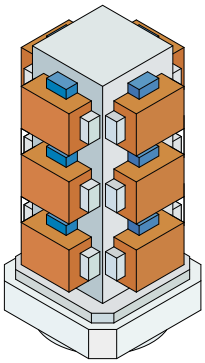
Machining Performance

Machining performance enhanced by 7% compared with the previous model

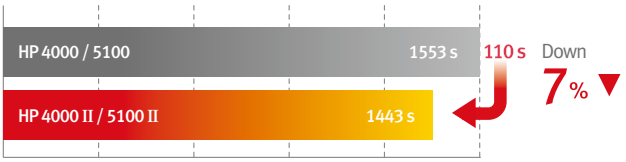
Productivity

7% higher than the previous model

- ABS block
- Made of : Aluminum alloy
- Number of used tools 16ea

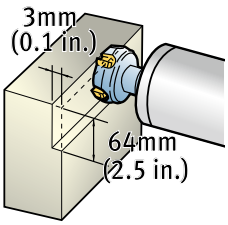


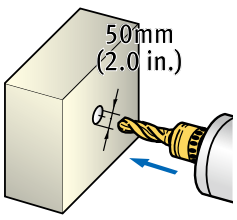
Cycle time

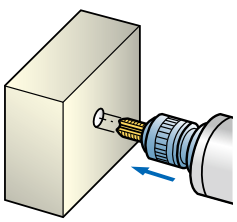


Cutting Performance

HP 4000 II / 5100 II

Face mill Carbon steel (SM45C)	Ø80mm (3.15 in.) Face mill (6Z)
	
Machining rate	614 cm³/min (37.5 in³/min)
Spindle speed	950 rpm
Feedrate	3200 mm/min (126.0 ipm)

Tap Carbon steel (SM45C)	d50 U-drill(2Z)
	
Machining rate	490 cm³/min (29.9 in³/min)
Spindle speed	955 rpm
Feedrate	250 mm/min (9.8 ipm)

Drill Carbon steel (SM45C)	Ø38mm (1.5 in.) Drill (2Z)
	
Tool	M42×P4.5
Spindle speed	120 rpm
Feedrate	540 mm/min (21.3 ipm)

※ The results, indicated in this catalogue are provides as example. They may not be obtained due to differences in cutting conditions and environmental conditions during measurement.

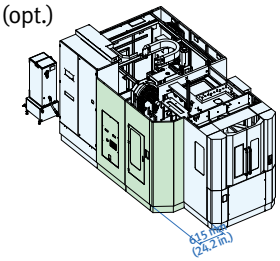
Doosan Multi-Pallet System [MPS]

Compared to a standard twin-pallet machine, the MPS offers a long period of unmanned operation and flexibility to produce many different workpieces using the work scheduling function. This system can be easily retrofitted to existing machines in the field.

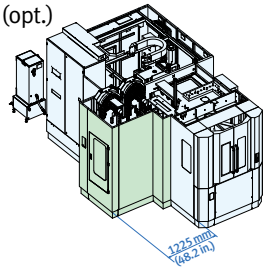


7-station roof-type multi-pallet magazine

60-tool (opt.)



120-tool (opt.)



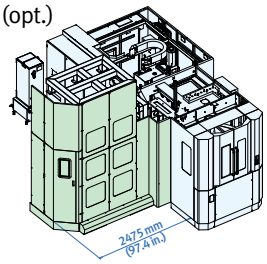
Doosan Linear Pallet System [LPS]

LPS is designed to provide the most optimized system for the customer. The customer can choose the most suitable package solution to their output and workspace. System expansion and changes in layout are easy.

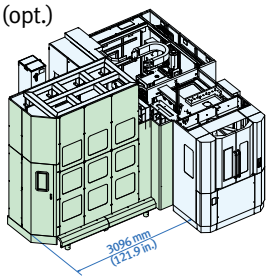
- Easily scalable up to 3 HMCs, 2 setup stations
- High efficiency of workpiece load space
- Quick installation
- Easy extension of system by modulized storage rack
- Stable and efficient system operation
- Easy-to-use operation system
- Retrofit, easy to repair



170-tool (opt.)



262-tool (opt.)

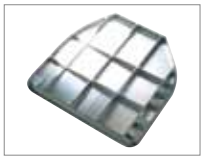


Sample Workpiece

X-frame



Inboard door



Ring-rib



Water pump cover



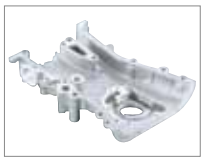
Control valve



Casting



Front cover



Brake caliper



Control valve



Pump body



Cylinder/Crank case



Grip arm



Standard feature

Oil cooler



Flood coolant



Operator call lamp
(red / yellow / green)



FANUC 31i-B controller



Portable MPG



Rigid tapping



APC operator's panel



Work light



Screw conveyor



Optional feature

Multi-pallet system [MPS]



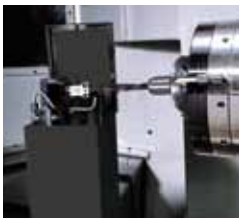
120 Tools



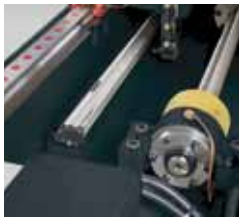
Matrix magazine
(170 / 262 tools)



Automatic tool length
measurement with sensor



Linear scale feedback system



Automatic measuring system



Built in Rotary Table (0.001°)



LPS



Through the spindle coolant



Chip conveyor / bucket



T-slot pallet



Shower coolant



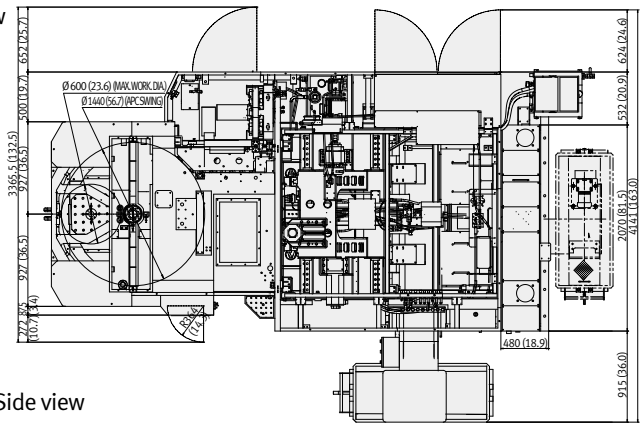
- Air gun
- Automatic power off
- Center Bush
- Coolant chiller
- Coolant gun
- Doosan Infracor tool monitoring system
- Hyd. cooling / Heating device
- Hydraulic line for fixture
- HSK tooling
- Rear type chip conveyor
- Test bar

External Dimensions

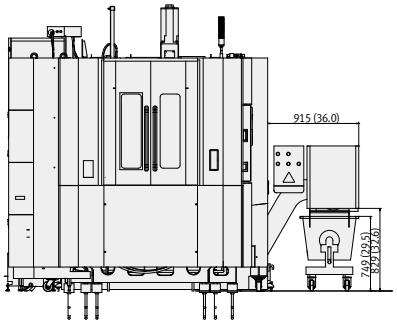
HP 4000 II

Unit : mm (inch)

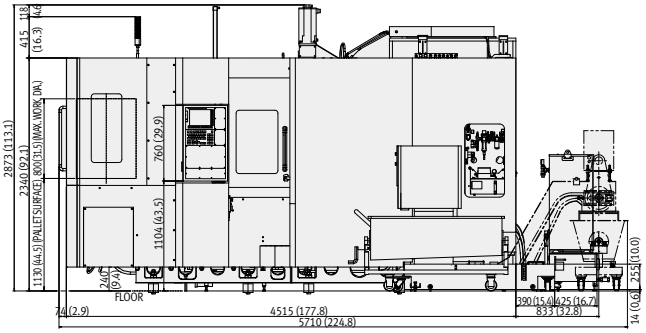
Top view



Front view

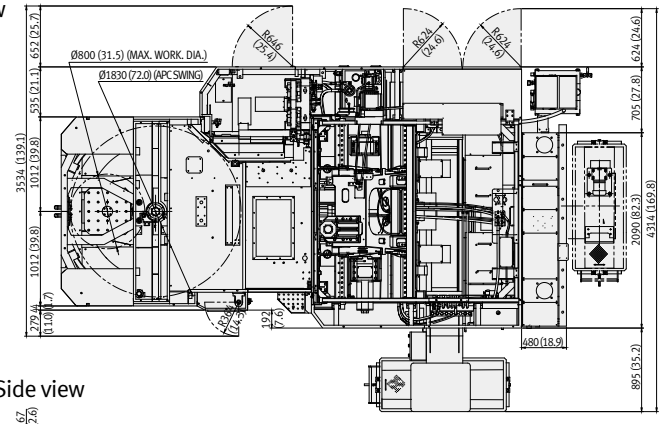


Side view

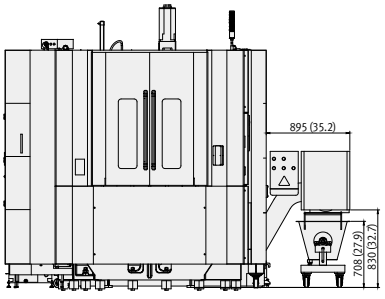


HP 5100 II

Top view



Front view



Side view

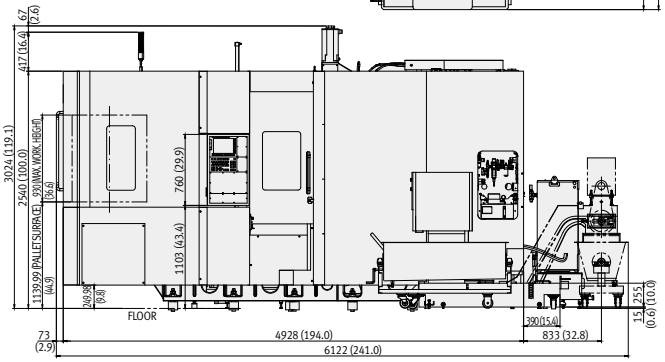
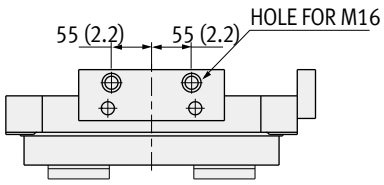
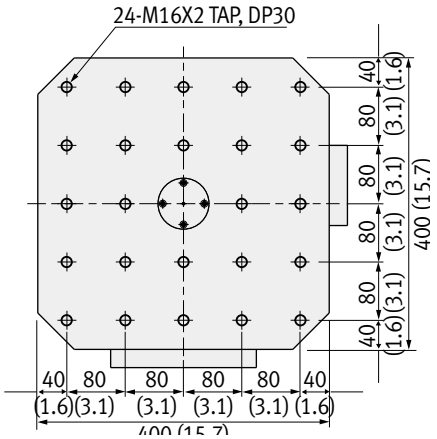


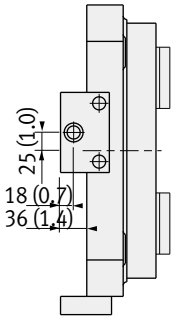
Table Shape

HP 4000 II

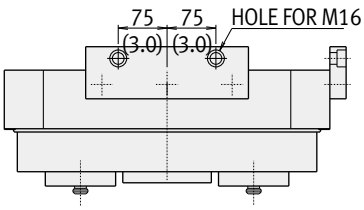
Unit : mm (inch)

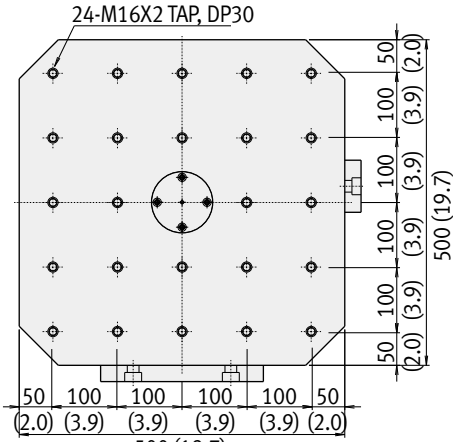


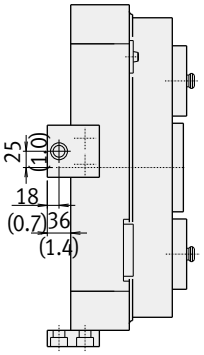




HP 5100 II



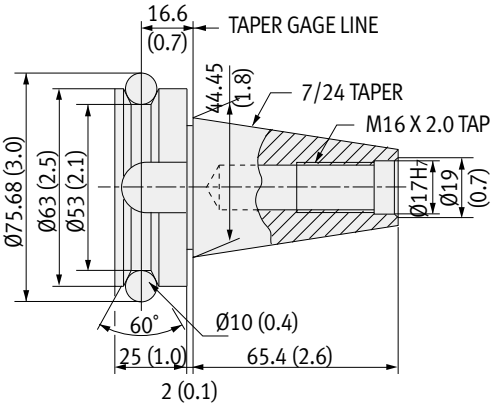




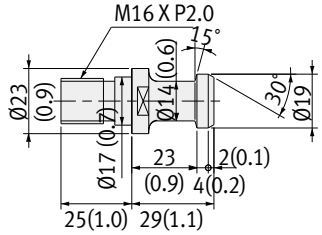
Tool Shank

Unit : mm (inch)

MAS403 BT40



PS-806 (NIKKEN)



Machine Specifications

	Description	Unit	HP 4000 II	HP 5100 II
Travels	X-axis (left and right of the column)	mm (inch)	600 (23.6)	850 (33.5)
	Y-axis (top and bottom)	mm (inch)	560 (22.0)	700 (27.6)
	Z-axis (front and rear of the pallet)	mm (inch)	600 (23.6)	750 (29.5)
	Distance from spindle center to pallet top	mm (inch)	50~610 (2.0 ~ 24.0)	50~750 (2.0 ~ 29.5)
	Distance from spindle nose to table center	mm (inch)	150~750 (5.9 ~ 29.5)	150~900 (5.9 ~ 35.4)
Feedrates	Rapid traverse rate (x/y/z)	m/min (ipm)	60 (2362.2)	
	Cutting feedrate (X/Y/Z)	mm/min (ipm)	30000 (1181.1)	
Table	Pallet size	mm (inch)	400 x 400 (15.7 x 15.7)	500 x 500 (19.7 x 19.7)
	Pallet loading capacity	kg (lb)	400 (15.7)	500 (19.7)
	Pallet type		24-M16×P2.0	
	Pallet index degree	deg	1 {0.001}	
Spindle	Max. spindle speed	rpm	14000 {20000}	
	Spindle taper		ISO#40 7/24Taper	
	Max. spindle torque	kgf·m (ft-lb)	22.5 {9.5} (162.7 {68.7})	
Automatic Tool Changer	Type of tool shank		MAS403 BT40	
	Tool storage capa.		40 {60/80/120/170/262}	
	Max. Tool diameter	mm (inch)	75 (3.0)	
	Max. Tool diameter without adjacent tools	mm (inch)	140 (5.5)	
	Max. tool length	mm (inch)	330 (13.0)	400 (15.7)
	Max. tool weight	kg (lb)	10 (22.0)	
	Tool selection		Fixed address	
	Tool change time (tool-to-tool)	sec	1.0 (Less than 7.5kg (16.5 lb)), 1.5 (more than 7.5kg (16.5 lb))	
	Tool change time (chip-to-chip)	sec	HP 4100 II : 3.6 (Less than 7.5kg (16.5 lb)), 4.0 (more than 7.5kg (16.5 lb)) HP 5100 II : 4.0 (Less than 7.5kg (16.5 lb)), 4.5 (more than 7.5kg (16.5 lb))	
Automatic Pallet Changer	Number of pallet	ea	2	2 {7/9/11/13}
	Type		Rotary type	
	Pallet change time	sec	7.0	7.5
	Pallet rotation in loading station	deg	90	
Motors	Spindle motor (10-min. rating)	kW (Hp)	18.5 / 22 (25%ED) (24.8 / 29.5)	
	Feed motor (X/Y/Z/B)	kW (Hp)	7.0 / 7.0 / 7.0 / 2.7 (9.4 / 9.4 / 9.4 / 3.6)	
Power source	Electric power supply(rated capacity)	kVA	68.1	
Machine Dimensions	Machine height	mm (inch)	2880 (113.4)	3025 (119.1)
	Machine dimension	mm (inch)	5080 x 2600 (200.0 x 102.4)	5380 x 2780 (211.8 x 109.4)
	Machine weight	kg (lb)	12500 (27557.4)	15000 (33068.9)

{ } option

Standard Feature

- Spindle cooler and oil cooler
- Cutting oil tank and coolant
- Rigid tapping
- Screw conveyor
- MPG
- Splash guard (totally enclosed cover)
- Patrol light (three-color signal tower type)
- Work light
- Parts for installation

Optional Feature

- Linear scale
- Air gun
- Auto. workpiece measurement
- Automatic power off
- Automatic tool measurement
- Coolant gun
- Chip conveyor / Bucket
- Test bar
- Shower Coolant
- Hyd. Fixture Interface
- Through spindle coolant (In Case of water soluble)

Type	Frequency(HZ)	Flux(L/min)	Pressure(MPa)
1.9 MPa T.S.C	50	8	1.76 (255.2 psi)
	60	10	1.91 (277.0 psi)
2.94 MPa T.S.C	50	12	2.74 (397.3 psi)
	60	16	2.94 (426.3 psi)
6.86 MPa T.S.C	50	22	6.86 (994.7 psi)
	60	30.7	6.86 (994.7 psi)

NC Unit Specifications

Fanuc 31iB

AXES CONTROL

- Controlled axes	4 (X,Y,Z,B)
- Simultaneous controlled axes	4 axes
	Positioning (G00) / Linear interpolation (G01) : 3 axes
	Circular interpolation (G02, G03) : 2 axes
- Backlash compensation	
- Emergency stop / overtravel	
- Follow up	
- Least command increment	0.001mm (inch) / 0.0001"
- Least input increment	0.001mm (inch) / 0.0001"
- Machine lock	all axes / Z axis
- Mirror image	Reverse axis movement
	(setting screen and M - function)
- Stored pitch error compensation	Pitch error offset compensation for each axis
	Overtravel controlled by software
- Stored stroke check 1	

INTERPOLATION & FEED FUNCTION

- Positioning	G00
- Linear interpolation	G01
- Circular interpolation	G02, G03
- 2nd reference point return	G30
- Dwell	G04
- Exact stop check	G09, G61(mode)
- Skip function	G31
- Reference point return	G27, G28
- 2nd reference point retur	G30
- Feed per minute	mm / min(ipm)
- Rapid traverse override	F0 (fine feed), 25 / 50 / 100%
- Feedrate override (10% increments)	0 - 200%
- Jog override (10% increments)	0 - 200%
- Override cancel	M48 / M49
- Manual handle feed (1 unit)	
- Manual handle feedrate	0.1/0.01/0.001mm(inch)
- Automatic acceleration/deceleration	
- Helical interpolation	
- DSQ1 (AICC II + Machine condition selection function	200 block preview
- Thread cutting, synchronous cutting	
- Program restart	
- Automatic corner deceleration	
- Feedrate clamp by circular acceleration	
- Linear ACC/DEC before interpolation	
(Specify AI Contour control II)	
- Linear ACC/DEC after interpolation	
- Rapid traverse bell-shaped acceleration	

SPINDLE & M-CODE FUNCTION

- M- code function	M 3 digits
- Spindle orientation	
- Spindle serial output	
- Spindle speed command	S5 digits
- Spindle speed override (10% increments)	10 - 150%
- Spindle output switching	
- Retraction for rigid tapping	
- Rigid tapping	G84, G74

TOOL FUNCTION

- Tool nose radius compensation	G40, G41, G42
- Number of tool offsets	200 ea
- Tool length compensation	G43, G44, G49
- Tool number command	T3 digits
- Tool life management	Geometry / Wear and Length / Radius offset memory
- Tool offset memory C	
- Tool length measurement	

PROGRAMMING & EDITING FUNCTION

- Absolute / Incremental programming	G90 / G91
- Auto. Coordinate system setting	200 ea
- Background editing	
- Canned cycle	G73, G74, G76, G80 - G89, G99
- Circular interpolation by radius programming	
- Custom macro B	
- Custom size	2MB
- Addition of custom macro common variables	
- Decimal point input	
- I / O interface	RS - 232C
- Inch / metric conversion	G20 / G21
- Label skip	
- Local / Machine coordinate system	G52 / G53
- Maximum commandable value	±99999.999mm
- No. of Registered programs	500 ea
- Optional block skip	
- Optional stop	M01
- Part program storage	256kb (640m)
- Program number	O4-digits
- Program protect	
- Program stop / end	M00 / M02, M30
- Programmable data input	Tool offset and work offset are entered by G10, G11
- Sub program	Up to 10 nesting
- Tape code	ISO / EIA Automatic discrimination
- Work coordinate system	G54 - G59

Others Funtion (Operation, Setting & Display, etc)

- Alarm display	
- Alarm history display	
- Clock function	
- Cycle start / Feed hold	
- Display of PMC alarm message	Message display when PMC alarm occurred
- Dry run	
- Ethernet function (Embeded)	
- Graphic display	Tool path drawing
- Help function	
- Loadmeter display	
- MDI / DISPLAY unit	10.4" color LCD, Keyboard for data input, soft-keys
- Memory card interface	
- Operation functions	Tape / Memory / MDI / Manual
- Operation history display	
- Program restart	
- Run hour and part number display	
- Search function	Sequence NO. / Program NO.
- Self - diagnostic function	
- Servo setting screen	
- Single block	
- External data input	
- Multi language display	

OPTIONAL SPECIFICATIONS

- 3-dimensional coordinate conversion	
- 3-dimensional tool compensation	
- 3rd / 4th reference return	
- Addition of tool pairs for tool life management	1024 pairs
- Additional controlled axes	max. 12 axes per 1path
- Additional work coordinate system	G54.1 P1 - 300 (300 pairs)
- Part Program Storage	512kb/1MB/2MB/4MB/8MB
- DSQ 2 (AICC II + Machine condition selection function + Data server + 1GB)	200 block preview
- DSQ 3 (AICC II with High speed processing + Machine condition selection function + Data server + 1GB)	600 block preview
- Automatic corner override	G62
- Chopping function	G81.1
- Cylindrical interpolation	G07.1
- Dynamic graphic display	Machining profile drawing
- Interpolation type pitch error compensation	
- EZ Guide i (Doosan infracore Conversational Programming Solution) with 10.4" Color TFT	

Doosan Machine Tools

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