

APPENDIX

1 SPECIFICATIONS

1-1 Machine Specifications

(1) Standard features

Item		Unit	Specification	Remarks
Capacity	Swing over slide cover	mm(in)	ϕ 390(15.35)	
	Swing over carriage	mm(in)		
	Distance between centers	mm(in)	1400(55.12)	
	Max. turning diameter	mm(in)	390(15.35)	Lower turret
	Max. turning length	mm(in)	1100(43.31)	
	Max. bar size	mm(in)	65(2.56)	OP 71(2.81), 90(3.54) 1)
	Chuck size	mm(in)	8(0.31) [10(0.39)]	2)
	Turret force (X1-axis)	KN	5	
	Turret force (Z1-axis)	KN	10	
	Turret force (Y-axis)	KN	6.5	
	Turret force (X2-axis)	KN	5	
	Turret force (Z2-axis)	KN	6	
Axis travel	Axis travel (X1-axis)	mm(in)	630(24.80)	
	Axis travel (Z1-axis)	mm(in)	1150(45.28)	
	Axis travel (Y-axis)	mm(in)	160(6.30) [+ 80(3.15) - 80(3.15)]	
	Axis travel (X2-axis)	mm(in)	255(10.04)	
	Axis travel (Z2-axis)	mm(in)	1150(45.28)	
Main spindle	Spindle speed	min ⁻¹	45 to 4500	OP 35 to 3500 3) 25 to 2500 1)
	Number of spindle speeds	Step	Stepless	
	Spindle nose		A2-6	OP A1-8 3) A2-8 1)
	Hole through spindle	mm(in)	80(3.15)	OP 85(3.35) 3) 107(4.21) 1)
	Front bearing inner diameter	mm(in)	120(4.72)	OP 130(5.12) 3) 150(5.91) 1)
	Hole through draw tube	mm(in)	66(2.66)	OP 72(2.83) 3) 91(3.58) 1)
	Spindle center height	mm(in)	1500(59.06)	
	Runout of spindle end face	mm	0.005 to 0.003	ISO230/1
	Runout in spindle radius direction	mm	0.005 to 0.003	ISO230/1

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	Item	Unit	Specification	Remarks
Sub spindle	Spindle speed	min ⁻¹	45 to 4500	OP 35 to 3500
	Number of spindle speeds	Step	Stepless	
	Spindle nose		A2-6	OP A1-8 3)
	Hole through spindle	mm(in)	80(3.15)	OP 85 (3.35) 3)
	Front bearing inner diameter	mm(in)	120(4.72)	OP 130 (5.12) 3)
	Hole through draw tube	mm(in)	66(2.60)	OP 72 (2.83) 3)
	Headstock travel	mm(in)	1150(59.06)	
	Headstock rapid feedrate	mm/min (in/min)	27000(1062.99)	
	Drive motor	kW	3.0	α C22
	Ball screw diameter	mm(in)	36(1.42)	
	Ball screw pitch	mm(in)	10(0.39)	
	Distance between spindle noses	mm(in)	1400(55.12)	
	Positioning accuracy	mm	0 to 0.032	ISO13041-4 (2004) 4)
C-axis	Index mechanism		Spindle motor	
	Max. Programmable index angle	°	± 9999.999	
	Least command increment	°	0.001	
	Least input increment	°	0.001	
	Rapid index speed	min ⁻¹	400	
	Cutting feedrate	° /min	4800	
	C-axis clamp		Disk clamp	
	Braking torque	N·m	1500 (Reference)	
	Index accuracy for rotating shaft	"	Within 63	ISO13041-4 (2004) 4)
Rotary tool spindle	Number of tool spindles		1	
	Spindle speed range	min ⁻¹	8000	OP 12000
	Number of spindle speeds	Step	Stepless	
	Tool spindle taper		1/10 short taper	
	Front bearing inner diameter	mm(in)	80(3.15)	

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	Item	Unit	Specification	Remarks
Auto tool changer (ATC)	Tool shank type		KM63,CAPTO C6	
	Number of stored tools		24	OP 40,80,120
	Max. tool diameter	mm(in)	90(3.54)	
	Max. tool diameter (without adjacent tool)	mm(in)	120(4.72)	
	Max. tool length	mm(in)	300(11.81)	
	Max. tool weight	kgf	8	
	Tool moment load	N·m	6.5	
	Exchange time	s	1.5	
B-axis unit	Index mechanism		Servo motor + cam	
	Index speed	min ⁻¹	37.5	
	Index angle	°	230(± 115)	
	Least command increment	°	0.001	
	Least input increment	°	0.001	
	B1-axis clamp			Curvic coupling (5°)
			Brake (0.001°)	
Turret	Number of turret heads		1	
	Turret head type		Dodecagon	
	No. of tool stations		Max. 24	5)
	Tool size	mm(in)	25(0.98)	
	I. D. turning tool mounting bore diameter	mm(in)	32(1.26)	
	Index time (1 ST/Half rotation)	s	0.9	
	Index time (1 ST)	s	0.27	
	Number of turret index position		24	
	Turret head outside diameter	mm(in)	480(18.90) (Distance across flats)	
	Turret thickness	mm(in)	100(3.94)	
	Turret index motor		Servo motor + reduction gear	
	Turret index/positioning mechanism		Curvic coupling	
	Tooling clearance	mm(in)	720(28.35)	

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Item		Unit	Specification	Remarks	
Rotary tool spindle (Lower turret)	Number of tool spindles		12		
	Spindle speed range		min ⁻¹	27 to 3600	
	Number of spindle speeds		Step	Stepless	
	Types of holder and tool size			Straight holder φ 20	
			Cross holder φ 20		
Saddle	Configuration		°	60	
	Ball screw diameter	(X1-axis)	mm(in)	40(1.57)	
		(Z1-axis)	mm(in)	50(1.97)	
		(Y-axis)	mm(in)	50(1.97)	
		(X2-axis)	mm(in)	40(1.57)	
		(Z2-axis)	mm(in)	40(1.57)	
	Ball screw pitch	(X1-axis)	mm(in)	10(1.39)	
		(Z1-axis)	mm(in)	12(0.47)	
		(Y-axis)	mm(in)	10(1.39)	
		(X2-axis)	mm(in)	10(1.39)	
		(Z2-axis)	mm(in)	16(0.63)	
	Positioning accuracy	(X1-axis)	mm(in)	0 to 0.025	ISO13041-4 (2004) 4)
		(Z1-axis)	mm(in)	0 to 0.032	ISO13041-4 (2004) 4)
		(Y-axis)	mm(in)	0 to 0.022	ISO13041-4 (2004) 4)
		(X2-axis)	mm(in)	0 to 0.022	ISO13041-4 (2004) 4)
(Z2-axis)		mm(in)	0 to 0.032	ISO13041-4 (2004) 4)	
Cutting feedrate	Rapid traverse	(X1-axis)	mm/min (in/min)	16000(62.99)	
		(Z1-axis)	mm/min (in/min)	27000(1062.99)	
		(Y-axis)	mm/min (in/min)	16000(62.99)	
		(X2-axis)	mm/min (in/min)	16000(62.99)	
		(Z2-axis)	mm/min (in/min)	27000(1062.99)	
	Cutting feed	(Each axis)	mm/rev (in/rev)	0.0001 to 500 (0 to 19.69)	
	Jog feed	(Each axis)	mm/min (in/min)	0 to 1260 (0 to 49.61)	

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	Item	Unit	Specification	Remarks
Drive motor	Spindle drive motor	kW	22/18.5 (For L-side ϕ 90specification (OP)30/22)	S2 30min/S1 Cont.
	Rotary tool spindle drive motor	kW	18.5/11	S2 10min/S1 Cont.
	Rotary tool spindle drive motor	kW	5.5/3.7	S3 40%/S1 Cont.
	X1-axis drive motor	kW	4.0	α 22
	Z1-axis drive motor	kW	4.0	α 22
	Y-axis drive motor	kW	4.0	α 22
	X2-axis drive motor	kW	3.0	α C22
	Z2-axis drive motor	kW	3.0	α C22
	B1-axis drive motor	kW	3.0	α 12
	Index drive motor	kW	1.2	α C8
	Hydraulic unit pump motor	kW	2.2	2 pcs.
	Lubrication pump motor	kW	0.005	
	Coolant pump motor	kW	0.5/0.85	2 pcs. (50Hz/60Hz)
	Coolant pump motor (For removing chips)	kW	0.4	1 pcs.
Power requirements	Power supply	kVA	83.5 (91.0)	For standard specification (L-spindle 22/18.5kW) 7)
		kVA	86.5 (94.1)	OP(L-spindle 30/22kW) 7)
		V	200/220 AC (+ 10% to - 15%)	
		Hz	50/60	
	Air pressure supply	NI/min	400	
Tank capacity	Hydraulic unit	L(gal.)	202(53.37)	ISO VG32
	Lubrication unit	L(gal.)	4.6(Effective 2.8) [1.22 (Effective 0.74)]	ISO VG68
	Coolant unit	L(gal.)	500(132.10)	6)
	Oil cooling unit	L(gal.)	25(6.61)	ISO VG2

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Item		Unit	Specification	Remarks
Pump delivery	Hydraulic pump delivery	L/min	50Hz 21 × 2, 38	3 pcs.
			60Hz 25 × 2, 45	
	Hydraulic pump delivery pressure	MPa	5	
	Lubrication pump delivery	cc/min	3.3cc/min (5-min cycle)	
	Lubrication distribution	mm	Proportional distribution	
	Coolant pump delivery	L/min	40/50	50Hz/60Hz
General	Machine height	mm(in)	3171 (214.84)	
	Floor space	mm(in)	3656 × 5855 (143.94 × 230.51)	
	Maintenance space	mm(in)	4500 × 6500 (177.17 × 255.91)	
	Weight	kg(lbs)	21700(47848.5)	
Others	Noise level	dBA	74	8)
	Vibration level (Workhead)	V	Within 10	
	Vibration level (Saddle)	V	Within 10	
Machine work light	Type		LED	One for each (L/R)
	Operating voltage	V	24 DC	
	Power consumption	W	12.5	
	Flux of light	lm	840	
	Headstock illuminance	lx	200	

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Item	Unit	Specification	Remarks
<p>1) Max. bar size: ϕ 90 specification. Chuck cylinder thrust force is limited.</p> <p>2) There may be restrictions to mount a chuck exceeding 10 inches; therefore, additional estimate will be required.</p> <p>3) Max. bar size: ϕ 71 specification</p> <p>4) JIS B 6331-4 (2006)</p> <p>5) The number of tool stations depends on tools to be mounted.</p> <p>6) Precautions for selecting coolants Some types of coolant are harmful to machine components, causing damages such as peeling of paint, cracking of resin, expanding of rubber, corrosion and rust build up on aluminum and copper. To avoid causing damage to the machine, never use synthetic coolants, or any coolants containing chlorine. In addition, never use coolants and lubricating oil which contain organic solvents such as butane, pentane, hexane and octane.</p> <p>7) Power is calculated by assuming that 60 % of the spindle motor rated current and the standard coolant pump (1.9 kVA) are used. For optional specifications, add the following power capacity. Values inside () are power capacity written in nameplate of the machine. Bar feeder (1.6kVA), BRINKMANN pump TH45/390 (7.6 kVA), Side-installed chip conveyor (0.2 kVA)</p> <p>8) The noise level when the machine is used or measured in the following conditions is 74dB(A). Cutting condition: Workpiece material: S45C, Milling machining, Milling motor: 5.5/3.7kW, Milling speed: 3200min⁻¹, Cutting depth “t”: 3mm, Feedrate: 0.4mm/rev, Tool: 3-bladed throw-away tool 20mm dia. Measuring conditions 1.6 m high from the floor and 1 m away from the machine cover</p>			

APPENDIX

1-2 NC Specifications

(1) Standard control features (FANUC 31i-B5)

	Item	Specification
Controlled axes	Controlled axes	9 axes
	Simultaneously controlled axes	Upper turret 5 axes (X1, Z1, C1(C2), Y1, B1 axis) Lower turret 4 axes (X2, Z2, C2(C1), B2 axis)
Input command	Least input increment	X, Z, Y, B2: 0.001 mm/0.0001 inch (X-axis: Diameter program), B1, C: 0.001 deg
	Least command increment	X: 0.0005 mm, Z, Y, B2: 0.001 mm, C, B1:0.001deg
	Max. programmable dimension	±999999.999 mm/±39370.0787, ±999999.999 deg
	Absolute/Incremental programming	X, Z, Y, C, B1, B2 (Only for absolute programming)/U, W, V, H
	Decimal input	Available
	Inch/Metric conversion	G20/G21
	Programmable data input	G10
Interpolation functions	Positioning	G00
	Linear interpolation	G01
	Circular interpolation	G02/03, CW/CCW
	Polar coordinate interpolation	Available
	Cylindrical interpolation	Available
	Helical interpolation	Available
Feed function	Cutting federate	Per minute X,Z,Y axis: 1 to 8000mm/min, 0.01 to 315in/min C axis 1 to 8000 deg/min B1 axis 1 to 8000 deg/min B2 axis 1 to 4800mm/min, 0.01 to 188in/min
		Per revolution X,Z,Y axis: 0.0001 to 8000.0000mm/rev 0.000001 to 50.000000in/rev B2 axis 0.0001 to 4800.0000mm/rev, 0.000001 to 50.000000in/rev
		<i>The maximum feed rate is the value in AI contour control mode. Except AI contour control mode the maximum feed rate is:</i>
	Per minute X,Z,Y,B2 axis: 1 to 4800mm/min,0.01 to 188in/min C,B1 axis: 1 to 4800 deg/min	
	Per revolution X,Z,Y,B2 axis : 0.0001 to 4800.0000mm/rev, 0.000001 to 50.000000in/rev	
	Dwell	G04
	Synchronized feed (per minute/per revolution)	G98/G99

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	Item	Specification	
Feed function	Thread cutting	G32 + F	
	Thread cutting retract	Available	
	Continuous thread cutting	Available	
	Handle feed	Manual pulse generator	
			0.001/0.01/0.1mm (per div.)
	Automatic acceleration/deceleration	Available	
	Rapid override	LOW/25/50/100% (Setting is possible from 0 to 100% every 10% with the NT SETTING screen.)	
	Cutting override	0 to 150 %, every 10%	
	AI contour control I	G5.1	
	L-spindle override	50% to 120%, every 10%	
R-spindle override	50% to 120%, every 10%		
Tool spindle override	50% to 120%, every 10%		
Programming functions	Program storage capacity	1M byte 2560m (Rotary tool spindle, Turret(R): 1280m)	
	Program edit	Delete, insert, change	
	Program number search	Available	
	Sequence number search	Available	
	Address search	Available	
	Registerable programs	2000 programs (Rotary tool spindle, Turret(R): 1000 programs)	
	Program storage memory	Backed up by battery	
	Background editing	Available	
	DNC operation using memory card	Available (Only one turret head can access memory card at a time) (Memory card is not included. Making a special arrangement is required.)	
	Expanded program editing	Available (Replacement of word or address, cut & paste for word/character, cancel operation, copy or move the program)	
Program No. search	Available(Set on NT SETTING screen Specified range: 1 to 9999)		

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	Item	Specification
Operation and display	Operation panel: Display Keyboard	19-inch SXGA LCD (color) touchscreen QWERTY keyboard
	Display functions	Actual position, commands, offset data, parameter data, etc. (Japanese, English, German, French, Chinese, Italian, Korean, Spanish, Dutch, Danish, Portuguese, Polish, Hungarian, Swedish, Czech, Russian, Turkish, and Finnish.)
	Manual data input (MDI)	Available (Max. 511 letters)
	Run time & number of parts display	Available
	System name display	Available
	Clock function	Available
I/O device	I/O interface	Memory card input/output (CF card)
		Built-in ETHERNET (10/100 Base-T) (NC side)
		ETHERNET (10Base-T/100Base-TX/1000 Base-T) (PC side)
		USB × 2
S, T, M functions	Spindle function (S-function)	S-5 digit (direct designation)
	Constant surface speed control	G96/G97
	Tool function (T-function)	T 4-digit (First 2 digits ...Tool number Last 2 digits ...Offset number)
	Miscellaneous functions (M-functions)	M 4-digit
Tool offset	Tool geometry and wear offset	T-function (Last 2 digits: Wear, Geometry)
	Tool nose R compensation	G41/G42/G40
	Number of tool offset pairs	Upper: 99 pairs, R-turret: 99 pairs (ATC 24-, 40-tool type)
		Upper: 300 pairs, R-turret: 99 pairs (ATC 80-, 120-tool type)
	Direct input of measured offset value	Available (Available to set for using the position record on the tool setting screen.)
Y-axis offset	Available	
Work coordinate system	Manual return to reference point	Available
	Automatic return to reference point	G28
	Return to 2nd reference point	G30
	Reference point return check	G27
	Automatic system setting	Available
	Coordinate system setting	G50
	Work coordinate system shift	Available
	Direct input of system shift	Available
Work coordinate system	G52 to G59	

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	Item	Specification
Operation assist functions	Label skip	Available
	Single block	Available
	Optional stop	Available
	Optional block skip	Available (/1)
	Dry run	Available
	Machine lock	Available (Change over on NT SETTING screen)
	Chuck OD/ID changeover	Available (Change over on NT SETTING screen)
	Manual absolute	Available (Parameter setting)
	Program check	Available (Change over on NT SETTING screen)
	Manual handle retrace function	Available
	Control in/out	Available (Comment insert function)
	Machining check function	Available
	Jump program	Available
PC unit	O/S	Windows XP Embedded (Available applications to be installed are limited.)
	Display functions	Language: Japanese, English, German, French, Italian, Spanish
	Storage device	SSD 32GB
	CPU	Dual Core 2.2GHz
	Memory	2GB
	Pointing device	Touchpad
Programming assist functions	Direct R designation for circular interpolation	Available
	Direct R designation for corner rounding	Available (Change over on setting parameter)
	Canned cycle	G90, G92, G94
	Multiple repetitive cycle	G70 to G76
	Multiple repetitive cycle II	G71, G72
	Canned cycle for drilling	G80 to G89
	Synchronous mixture control	Available (Used for R-side C-axis control from tool spindle.)
	Subprogram	Available
	Help function	Available
	Balance cutting	G68, G69
	Polygon function	Available
	Custom macro	Available
	Addition of custom macro common variables	Available (After addition: #100 – #199, #500 – #999 available)
3-dimensional coordinates conversion function	Available	
3-dimensional rigid tapping function	Available	

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	Item	Specification
Programming assist functions	NT NURSE	<p>Available</p> <p>NT NURSE is the software to support machining, operation and automation, including the following functions:</p> <ul style="list-style-type: none"> • Tool counter function • Spare tool index function • Work counter function • Load monitor function • Software work pusher function • Software cut-off detection function • Software quill pusher function • Offset conversion function (Automatic tool offset conversion depending on the position of swing B-axis) • Quick offset input function • Transfer cycle function • Quantitative offset function • Involute curve machining cycle function • Drill breakage detection with high accuracy • Peck drilling cycle function (Step according to machining load) • Arbitrary axis torque limit function • Modal G code initialization function • Work coordinate system renewal function • Bar feeder cycles • Tool setter cycle function • Idling operation function • Slope circular-interpolation cycle • Power saving function • Package input and output of data • Offset history display function

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	Item	Specification
	LUCK-BEI II	<p>Available</p> <p>LUCK-BEI II is the software to support NC program edit and creation based on FANUC Manual Guide i, including the following functions:</p> <ul style="list-style-type: none"> • Turning cycle creating function • Milling machining cycle creation function • 3-dimensional machining simulation using solid model • Tool path drawing • Fixed-form-sentence menu selecting function • NC statement edit function (cut, copy and paste) • Automatic determination of cutting conditions • Conversational programming of fixed form sentences
	<p>NT-IPS screen display function</p> <p>(NT-IPS screen display function is the software to support the total machine operation in order to ease the operators' burden such as checking or changing the machine statuses.) (Japanese, English, German, French, Italian, Spanish.)</p>	<p>Available</p> <p>Including the following functions:</p> <ul style="list-style-type: none"> • Status display screen • Load graph screen • Program check screen • NT SETTING screen • Tool setting screen • Coolant setting screen • Trouble guide screen • Maintenance screen
Mechanical error compensation function	Backlash compensation	Available
	Pitch error compensation	Available
	Compensatory pitch error compensation	Available
	Bi-directional pitch error compensation	Available
	Compensatory straight error compensation	Available
Machine side data processing assist function	Built-in PC	64000 steps (With GR210NEW: 100000 steps)
	Rigid tapping	Available
	Spindle synchronization control	Available
	C-axis synchronization control	Available
	Spindle orientation	Available
Automation assist function	NT work navigator	Available (The function to detect the position and phase of a material) (In standard, the Navi-stick for measurement is not attached. Place an order separately at the time of necessity.)
	Z-axis load monitoring function	Available

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	Item	Specification	
Safety and Maintainability	Emergency stop	Available	
	Edit key	Available(Change over on NT SETTING screen)	
	Stored stroke limit	Available	
	Overtravel detection	Available	
	Self diagnosis functions	I/O signal diagnose, etc.	
	Alarm history display	Available	
	Operation log display	Available	
	Interference check for rotary area	Available	
	Servo adjusting screen	Available	
	Monitoring detection	Available	
	Regular maintenance screen	Available	
	Maintenance information screen	Available	
	NT operation message display	Available	
	NT guidance display	Available	
	Stored stroke check 2, 3	Available This function is not available for the machines with NT Collision Guard function.	
	Automatic data backup	Available	
	NT collision guard	Available	
Enclosure and environmental requirements	Enclosure construction	Fully enclosed, dust-proof	
	Power supply	24VDC \pm 10% 4A	
	Environmental requirements	Temperature:	0 to 40°C
		Humidity relative:	Less than 75%(No condensation)
		Vibration:	Less than 5m/s (0.5G)
Temperature change:		1.1°C/min.	
Servo system	Servo motor	AC servo motor	
	Servo unit	Transistorized PWM control	
	Position encoder		Pulse encoder (absolute position encoder)
			C-axis: Relative position encoder

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(2) Control functions

Item	Specification
3rd, 4th reference point return	Available
Variable lead thread cutting	Available (G34)
Sequence number collation stop	Available
Spindle speed fluctuation detection	Available(G25, G26)
Tool compensation measured value direct input B	Available (Necessary for machine with Tool setter)
Automatic tool compensation	Available (Necessary for machine with Tool setter type C)
Tool compensation direct input B for twin spindle lathe	Available (Necessary for machine with Handy tool setter)
Floppy disk cassette directory display	Available
Program restart	Available
Interrupted type custom macro	Available
Hobbing function	Hobbing function is available for either of the follow-ings. <ul style="list-style-type: none"> • L-side C-axis + tool spindle • R-side C-axis + tool spindle
F15 tape format	Available
Tool evacuation / restoration function	Available
NET-MONI	Available This is the software to monitor machine through personal computer.
	• Operation monitor function
	• Operation graph function
	• Wear offset function
	• Custom macro function
	• Machining program management function
	• Mail notice function
• CNC screen display function	

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Item	Specification
PMS package	<p>Available “PMS Package” is the abbreviated name of “High Precision Milling Support Package”. The following functions are included.</p> <ul style="list-style-type: none"> • AI contour control II. (Acceleration/deceleration before multi-block look-ahead interpolation) • High speed processing • Acceleration control function. • Data server function. (Since a memory card is not included, purchase separately.) <p><i>Note: PMS package function can use only a rotary-tool spindle.</i></p> <p><i>Note: With PMS package function, following restrictions are given for program storage capacity and registerable programs.</i></p> <ul style="list-style-type: none"> • Program storage capacity 1 M byte (Total of Rotary tool spindle, Turret(R), Turret (L)) • Registerable programs 2000 programs (Total of Rotary tool spindle, Turret(R), Turret (L)) <p><i>Note: With PMS package function, in AI contour control mode, maximum buffer block numbers are as follows:</i></p> <ul style="list-style-type: none"> • Tool spindle: 600 blocks • R turret, L turret: 5 blocks
Available optional function for PMS package specification	<p>Scaling function</p> <hr/> <p>Coordinates rotation function</p> <hr/> <p>Programmable mirror image function</p> <hr/> <p>Smooth compensation function</p> <hr/> <p>NURBS-compensation function</p> <hr/> <p>Tool point control function</p>
Skip function	Available(G31 (Used for HAN-BED))
Program storage memory, Registrable program capacity	<p>2M byte 5120m (Rotary tool spindle/Turret(R): 2560m) 4000 programs (Rotary tool spindle/Turret(R):2000 programs)</p> <hr/> <p>4M byte 10240m (Rotary tool spindle/Turret(R):5120m) 4000 programs (Rotary tool spindle/Turret(R):2000programs)</p> <hr/> <p>8M byte 20480m (Rotary tool spindle/Turret(R):10240m) 4000 programs (Rotary tool spindle/Turret(R):2000 programs) The programs are not available with PSM package.</p>

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1-3 Optional features

Item	Description	Remarks
Tool magazine	40, 80, 120	
High speed rotary tool spindle	12000 min ⁻¹	
Tool setter	Manual handy type (Operated by tool setting screen)	L-side, R-side
Chip conveyor	Installed at the right side of the machine	
Chip bucket		
Chip conveyor intermittent timer		
Internal spindle air blow		L-side, R-side
Internal spindle coolant blow		L-side, R-side
Internal spindle air blow and coolant blow		L-side, R-side
Fixed air blow (Spindle)		L-side, R-side
Coolant pipe over spindle		L-side, R-side
Coolant non-return valve		
Automatic door		
Signal tower (1 indicator)	Select one from red, yellow, and green	Visible range is front side of the machine
Signal tower (2 indicators)	Red and yellow	Visible range is front side of the machine
Signal tower (3 indicators)	Red, yellow, green	Visible range is front side of the machine
Pump pressure interlock		Standard for export specification
1st and 2nd spindle bore size up (ϕ 71)		
1st spindle bore size up(ϕ 90)	L-side	Chuck cylinder force limited
Internal spindle urethane pipe		
Internal spindle iron pipe		
Auto power off		
Leak breaker		
Cycle end alarm buzzer		

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Item	Description	Remarks
Cycle end lamp or alarm lamp		
Work counter		
Bar feeder interface		Standard for export specification
MON-BEI interface		
Parts Catcher (carrying inside type)	Turret type(Operated by NT SETTING screen)	$\phi 65 \times L150 \times 3kg$ ($\phi 65 \times 39.63 \text{ gal.} \times 6.615 \text{ lbs}$)
Parts catcher (carrying outside type))	Turret type(Operated by NT SETTING screen)	$\phi 65 \times L150 \times 3kg$ ($\phi 65 \times 39.63 \text{ gal.} \times 6.615 \text{ lbs}$)
Parts Catcher (carrying inside type) [NTX(S)]	Swing type (For L-side workpiece ejection)	$\phi 65 \times L150 \times 3kg$ ($\phi 65 \times 39.63 \text{ gal.} \times 6.615 \text{ lbs}$)
Parts catcher (carrying outside type) [NTX(S)]	Swing type (For L-side workpiece ejection)	$\phi 65 \times L150 \times 3kg$ ($\phi 65 \times 39.63 \text{ gal.} \times 6.615 \text{ lbs}$)
Workpiece forcible ejector		
Workpiece ejection (spring type)		
Chuck pressure change switch (high/low)		
In-process measuring unit (HAN-BEI Mill)	Three-dimensional measurement available	
Drill breakage detection unit		
Gantry loader	GR210	
Steady rest unit	Turret mounting	
High-speed milling holder	MAX 20000 min ⁻¹	
Oil skimmer		
High pressure coolant pump	35kg/cm ² , 70kg/cm ² (77.175 lbs/cm ² , 154.35 lbs/cm ²)	Rotary tool spindle
Dry cutting specification	Fixed air blow (L/R)+ Air removing chips	

※ Chip conveyor (installed at the rear side of the machine) is not available.