

DOOSAN



PUMA TT2500 series

Multi-Axis Turning Center



PUMA TT2500 series

PUMA TT2500S

PUMA TT2500MS

PUMA TT2500SY

**MACHINE
GREATNESS™**

**Multi-axis turning center combines
Y-axis function, two spindles and
upper & lower turret in a machine**

PUMA TT 2500 series



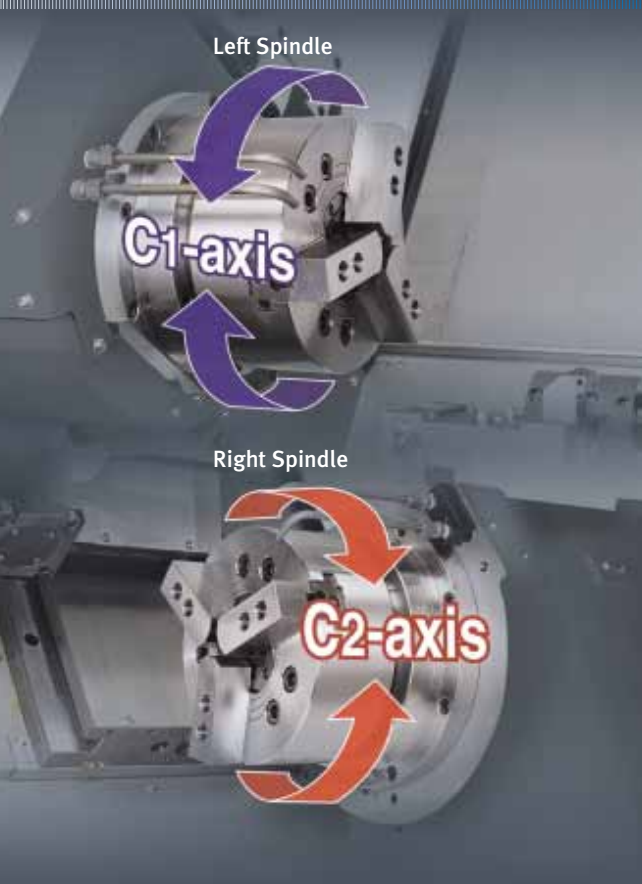
High performance turning center featuring first & second spindle that have the same power and capacity, with upper & lower turrets on the grounded box type bed. Simultaneous machining on two faces with both spindles and turrets and virtual realization of Y-axis function will bring you double productivity.

■ PUMA TT2500 Series

Model	Left spindle (C1)	Right spindle A (C2)	Upper turret X1, Z1, (Y)	Lower turret X2, Z2	Number of axis
PUMA TT2500S	●	●	●	●	5-axis
PUMA TT2500MS	● [+C1]	● [+C2]	● (+M)	● (+M)	7-axis
PUMA TT2500SY	● [+C1]	● [+C2]	● (+M, Y)	● (+M)	8-axis



Main Spindle



PUMA TT 2500S/MS/SY

Max. spindle speed

3500 r/mim

Motor (30 min)

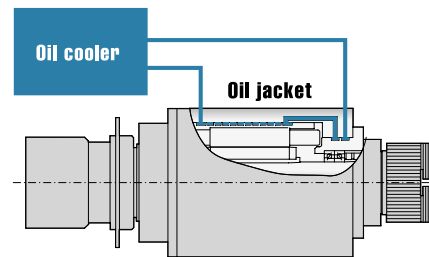
26 / 22 kW
(34.9 / 29.5 Hp)

Perfect integral motor driven spindles.

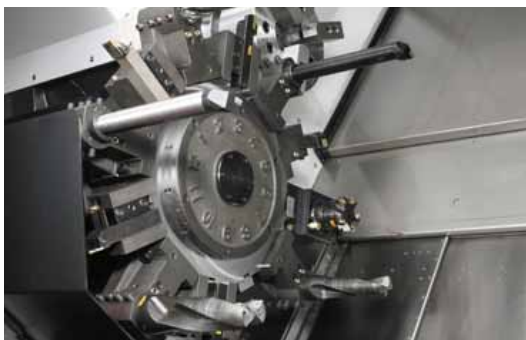
Both Left and Right spindle are designed to minimize maleffects of thermal distortion which can hit continuous machining precision seriously. Especially the same capacity of both spindles improves productivity remarkably of single machine.

Oil Cooling Unit for Spindles

Both left and right spindle have built-in motor spindles that wholly covered with oil cooling system to ensure remarkable range of applications from heavy duty cutting with high power at low speed to fine to finish cutting at high speed and optimize thermal displacement.

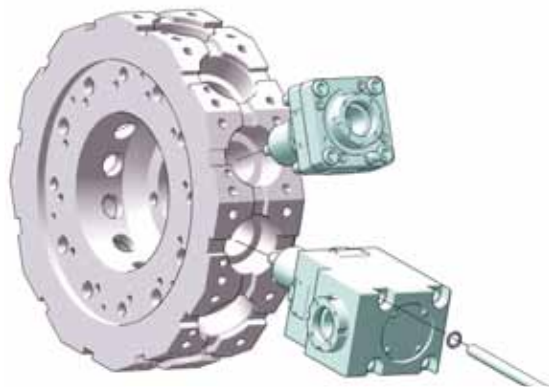


Turret



Radial BMT65P

The turret features BMT65P style tooling in which the toolholders are mounted directly to the turret's periphery using 4 large bolts.



Index time
(1-station swivel)

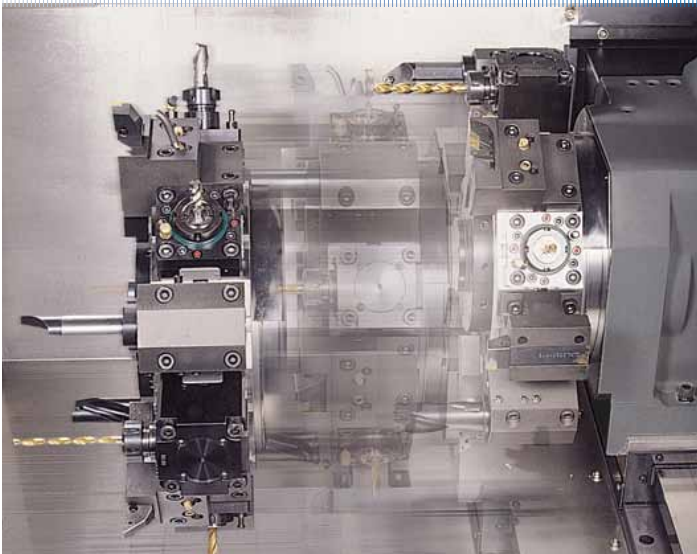
0.20 s

No. of tool station
(Upper+Lower turret)

24 (12+12)
st

Total of 24 tool stations upper and lower turret(BMT65P) make it possible to complete complicated parts requiring many tools in just one set-up. Reliable servo driven turrets reduce the total cycle time required to machine parts.

Rapid Traverse



X-axis

20 m/min
(787.4 ipm)

Z-axis

24 m/min
(944.9 ipm)



- Outstanding rigidity for high feedrates

Virtual y-Axis Function

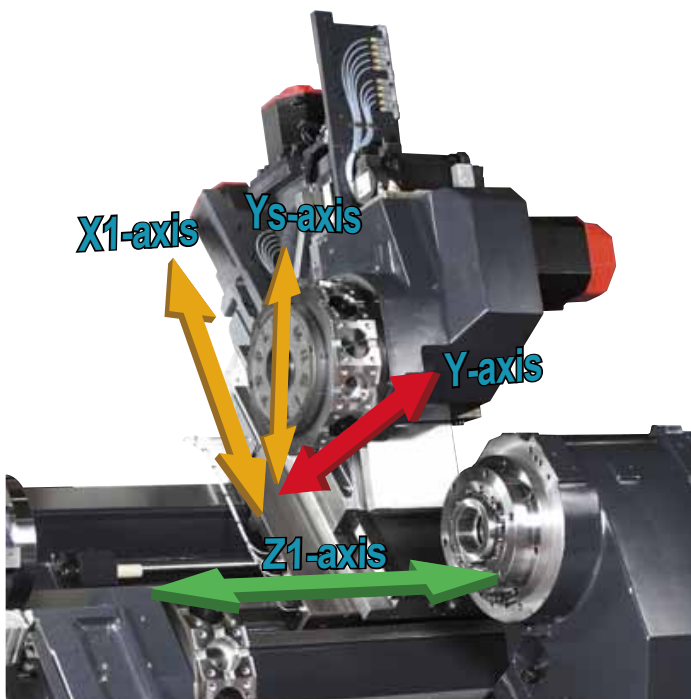
Y-axis addition to upper turret on SY series brings complex machining to completion in just one set-up. Synchronous interpolation of X1-axis and Ys-axis in double ways structure creates the Y-axis function.

Y-axis travel

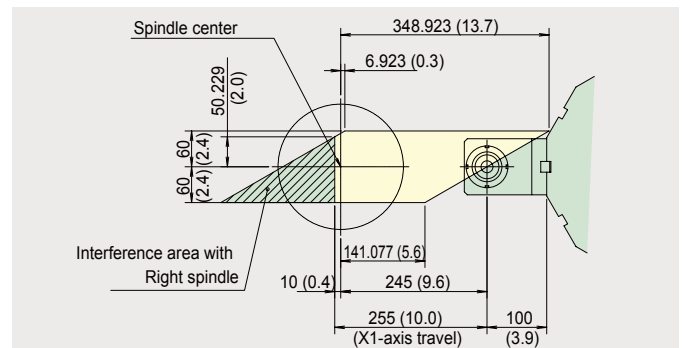
120 mm ($\pm 60\text{mm}$)
(4.7 (± 2.4) inch)

Y-axis rapid

7.5 m/min
(295.3 ipm)



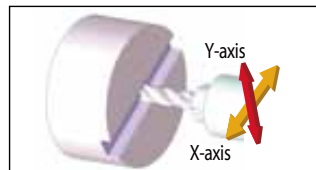
Y-axis Working Range



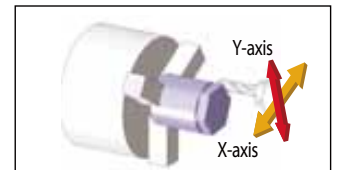
Angular Milling unit moving area

Y-axis Working Range

By simultaneous X-Y-Z-axis feed control and C-axis function to guide precise circular orientation of spindle, Y/X axes circular interpolation simplifies the machining of complex shapes in faster cycle time.



On-center face groove



Poly-side machine



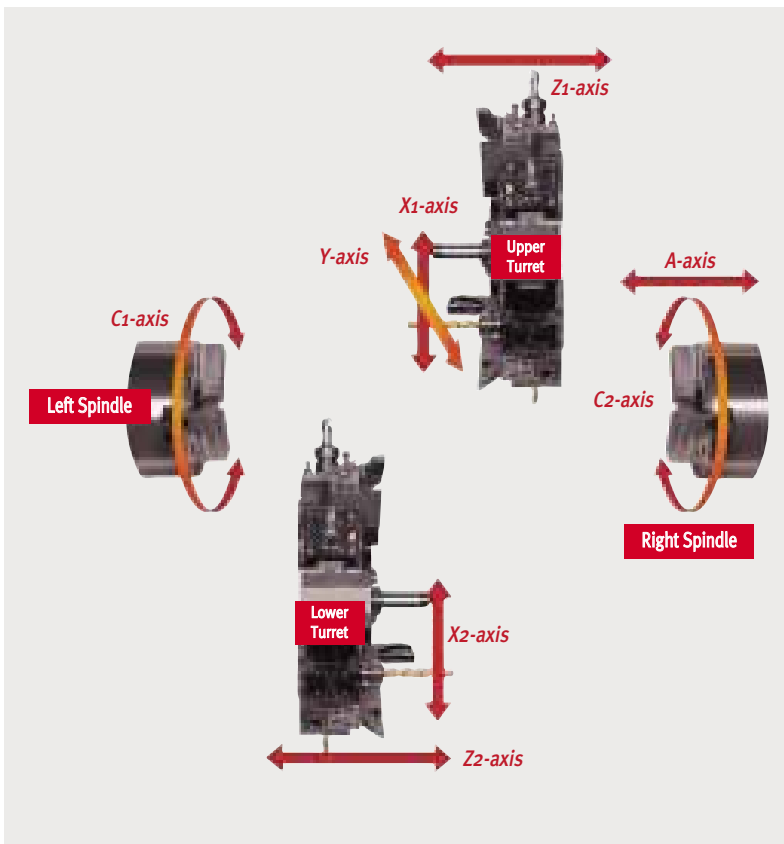
Off-center side groove



Y&X-axis circular interpolation

Axis Features

Travel



X1-axis (Upper turret)

255 mm
(10.0 inch)

X2-axis (Lower turret)

190 mm
(7.5 inch)

Z1-axis (Upper turret)

800 mm
(31.5 inch)

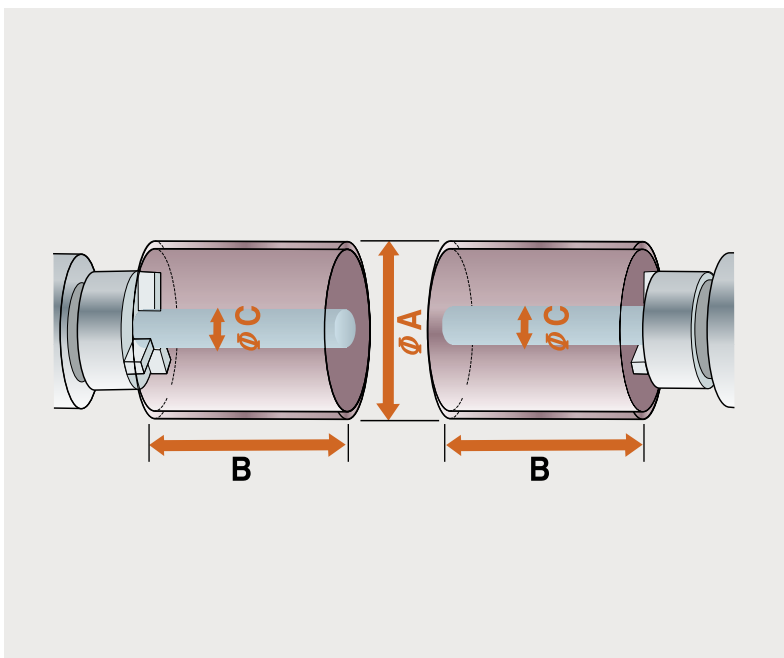
Z2-axis (Lower turret)

900 mm
(35.4 inch)

A-axis

810 mm
(31.9 inch)

Machining range



A : Max. turning dia.

on Upper turret

390 mm
(15.4 inch)

on Lower turret

300 mm
(11.8 inch)

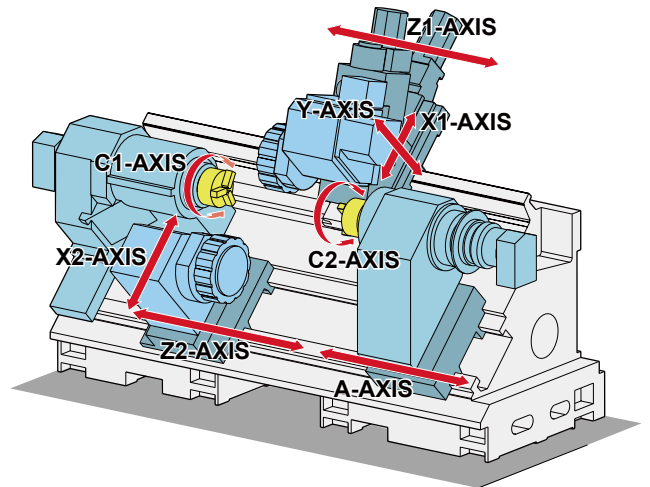
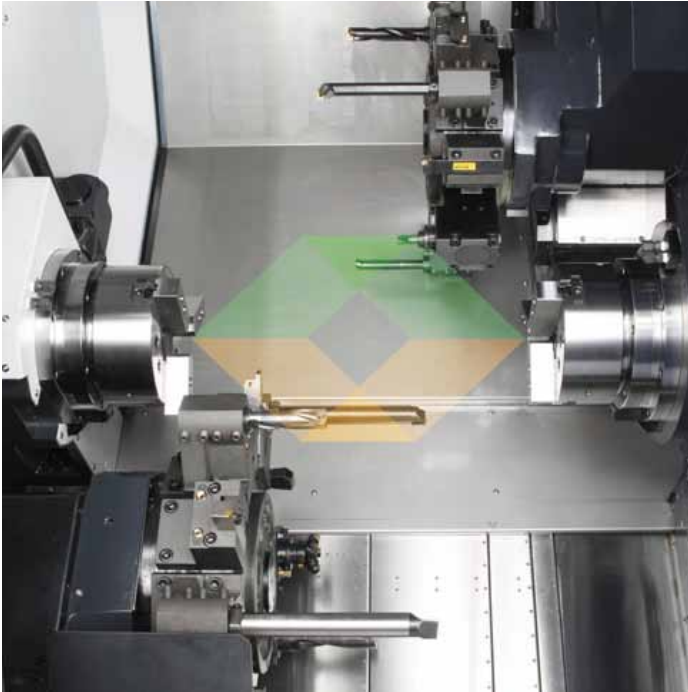
B : Max. turning length

350 mm (13.8 inch)

C : Max. bar working dia.

81 mm (3.2 inch)

Machine Construction



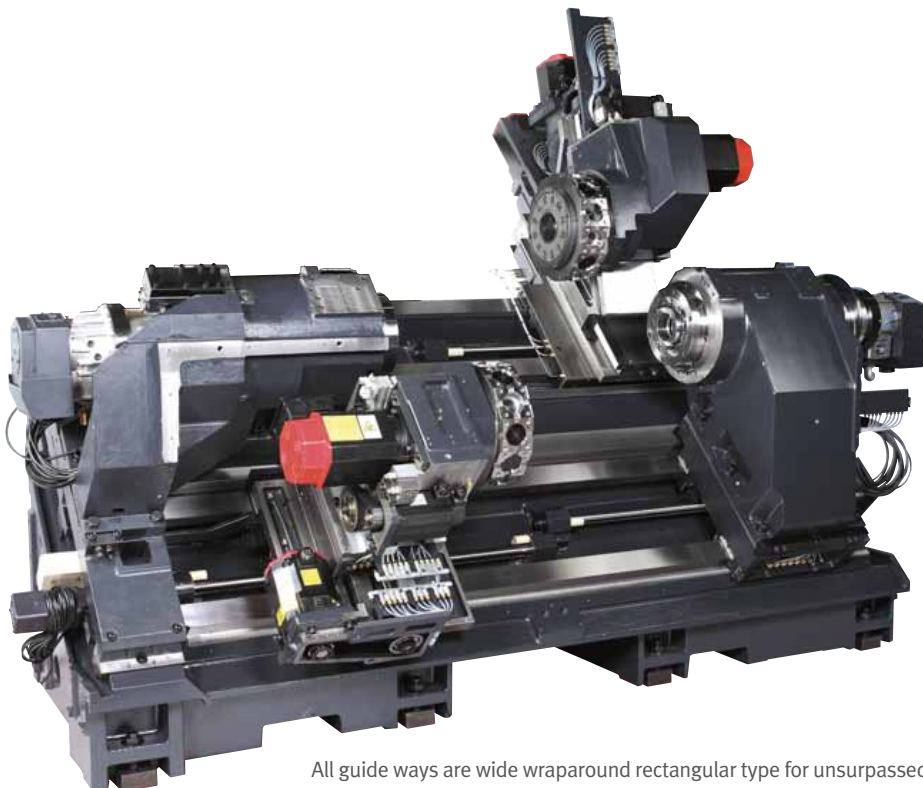
Continuous process accuracy,
Shorten setting time,
Optimal distribution of cycle and
Automated works



Achievement of
PUMA TT machines

Perfect integration of multi-process and high productivity are achieved by Left & right spindle of the same power and capacity, with upper & lower turrets on the grounded box type bed.

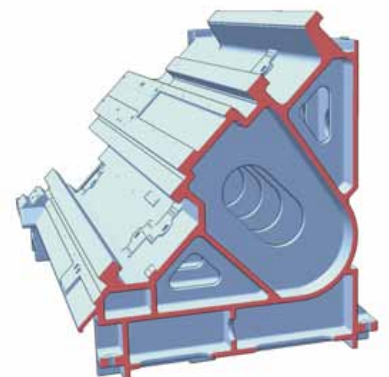
Robust Design



All guide ways are wide wraparound rectangular type for unsurpassed long term rigidity and accuracy



FEM (Finite Element Method) Analysis



The heavily ribbed torque tube design prevents twisting and deformation.

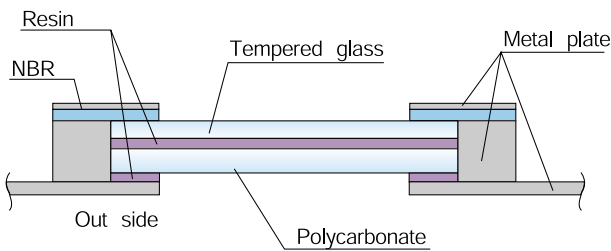
Ergonomic Design

Safety & Operability

● Safety window on front door



Viewing window is designed and was tested under heavy condition to protect operator against possible dangers during real cutting thanks to its shock absorbing laminated glass and double panel construction. The window without grating also provides a clear view of the machine inside.

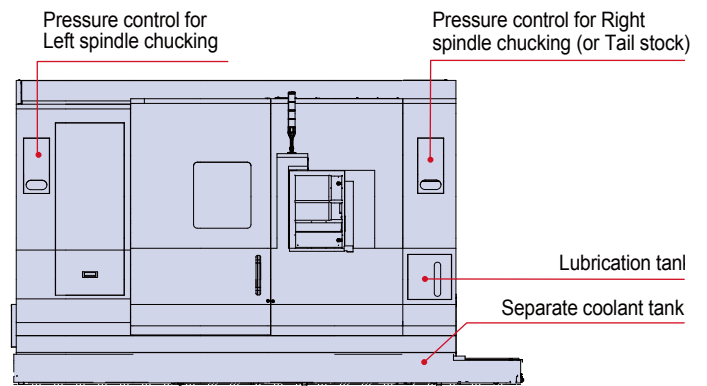


● Swivel type operator panel

Operator oriented design with 90° swivel



● High maintainability



Eco-Friendly Design



Oil Skimmer (opt.)

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

Collection of Waste Lubrication Oil

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

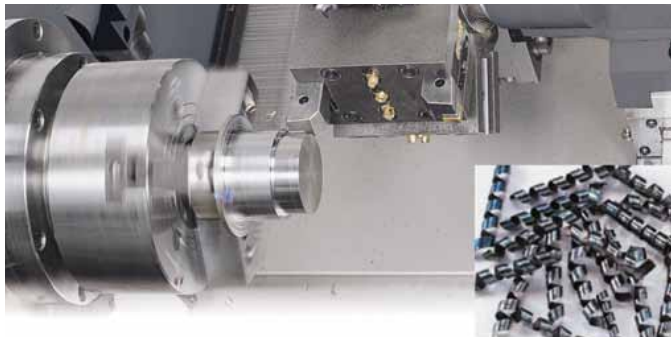
No Coolant Leakage

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

Machine Capacity

Heavy-Duty Cutting, OD (Left spindle & upper turret)

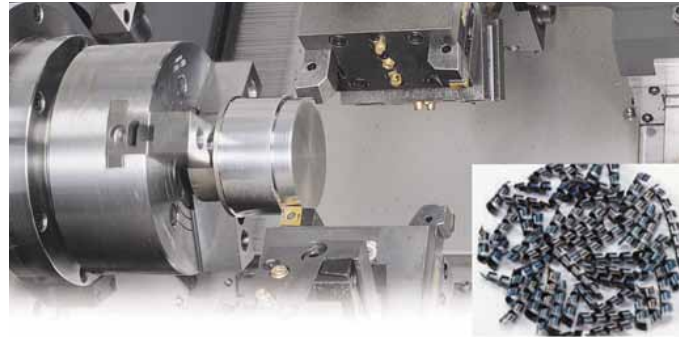
Making full use of the high output motor, heavy-duty O.D. cutting is powerful and precise even with large workpieces.



Material	Carbon steel, SM45C	Chip removal rate	Cutting depth
Cutting speed (m/min (ipm))	120 (4724.4)	348 Cm ³ /min (21.2 inch ³ /min)	10 mm (0.4 inch)
Feedrate (mm/rev (ipr))	0.36 (0.0)		
Spindle speed (r/min)	320		

Balanced Cutting, OD (Left spindle & upper - lower turret)

The synchronous control of Upper and Lower turrets makes O.D. cutting with high precision balanced cutting.



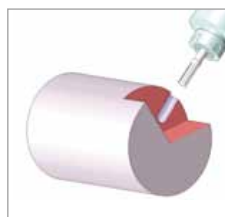
Material	Carbon steel, SM45C	Chip removal rate	Cutting depth
Cutting speed (m/min (ipm))	120 (4724.4)	367 Cm ³ /min (22.4 inch ³ /min)	5 mm × 2 (0.2 inch)
Feedrate (mm/rev (ipr))	0.4		
Spindle speed (r/min)	320		

Drilling



Tool	∅ 20 HSS drill
Material	Carbon steel SM45C
Rotary tool spindle speed (r/min)	1000
Feedrate (mm/rev (ipr))	0.3 (0.0)
Chip removal rate (cm ³ /min (inch ³ /min))	60 (3.7)
Drilling depth (mm (inch))	10 (0.4)

Tapping

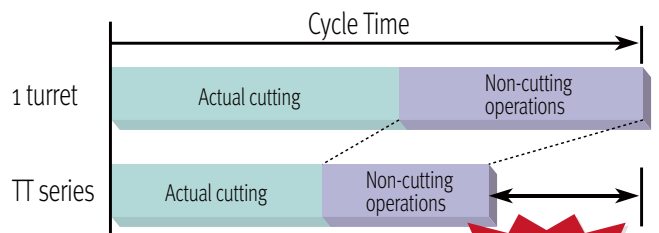


Tool	M16 × 2.0
Material	SM45C (JIS S45C)
Rotary tool spindle speed (r/min)	600
Feedrate (mm/min (ipm))	1200 (47.2)

Machining examples



High productivity

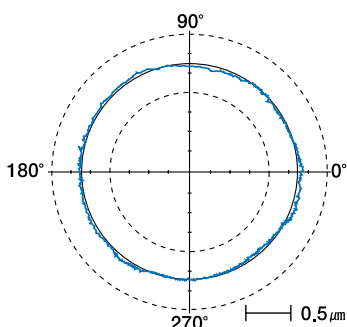


Productivity X 1.7

Reliable Long-Run Machining Accuracy

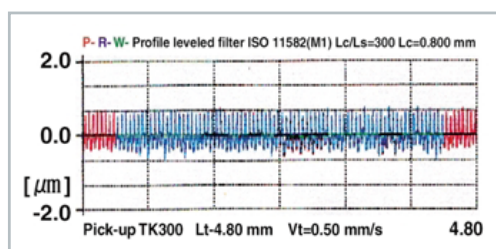
Roundness

0.40 μm



Roughness

0.23 μmRa



■ The machining accuracy indicated is just for reference. Depending on cutting and environmental conditions during measurement, the results can be different.

Tool	Diamond Tool [nose Ro.8]
Material	AL2024
Outer diameter (mm (inch))	60 (2.4)
Spindle speed (r/min)	1300
Feedrate (mm/rev (ipr))	0.05 (0.0)

Optional Equipments



Collet chuck



Auto tool pre-setter



Oil skimmer



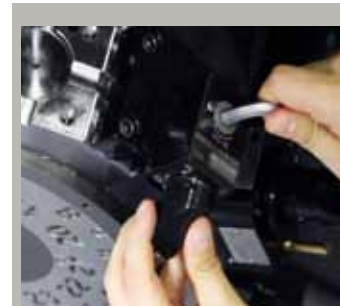
Coolant blower



Work measurement

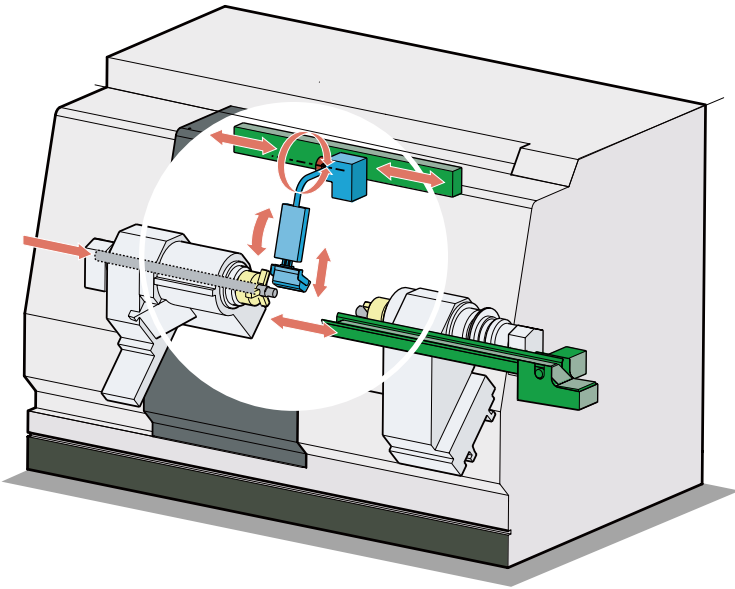


Oil mist collector



Quick change tooling(CAPTO)

Optimal Support System of Automatic Operation (option)



Parts Unloader & Conveyor

Parts unloader system built inside the machine can receive workpieces from both spindles. Automated operation is realized perfectly when the system is coupled with bar feeder system.

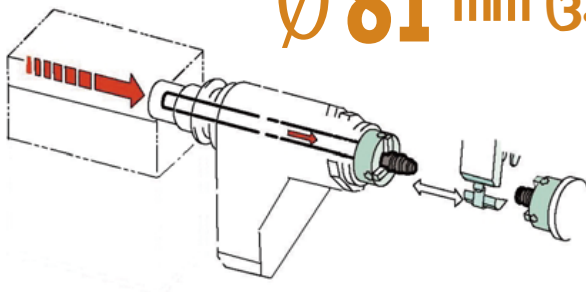
Max. work diameter	Ø81 mm (3.2 inch)
Max. work length	160 mm (6.3 inch)
Max. work weight	4kg (8.8 lb)

Bar Feeder System

Automated bar working is possible by bar feeder system. When parts unloader system is added, its value of use will be in the best.

Max. Bar Working dia

Ø 81 mm (3.2 inch)



Note) Depending on the chuck and cylinder spec. used in the machine, the bar working dia. can be reduced.

User-friendly OP Panel

The operation panel of new design enhances operating convenience by common buttons and layout, and uses qwerty type keyboard for easy and fast operation.

- 10.4 inches Display
- USB & PCMCIA card (standard)
- QWERTY keyboard (standard)
- Buttons can be easily added for additional options
- Operation panel newly designed for greater user convenience



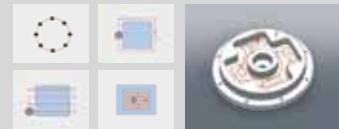
10.4 inches Display

EZ-Guide i

Using the DOOSAN EZ-Guide i, users can create a cutting program for any desired shape, including patterns, by entering figures only.

Example programming

cutting shape



EZ-Guide i screen



Enter the dimensions of the shape.



Automatic creation of cutting program

O7000 (SAMPLE PROGRAM) ;

```
M3 S1500 ;
G0 X50. Y125. ;
G0 Z30. ;
G1040 T0.5 J3. H0.2 K0.5 ;
G1020 H120. V50. U37. W68. ;
G0 Z80. ;
M5 ;
```

A cutting program is automatically created with the entered values.

Easy Operation Package

Doosan's Easy Operation Package (EOP) supports the user with functions relating to tool data, error diagnostics, set up and machine monitoring.

Tool Load Monitoring Function

During cutting operation, abnormal load caused by wear or damage of the tool is detected and an alarm is triggered to prevent further damage.



Tool monitoring screen

Tool Load Monitoring Function

The condition and service procedures of the sensors are provided for easy maintenance and servicing of major units.

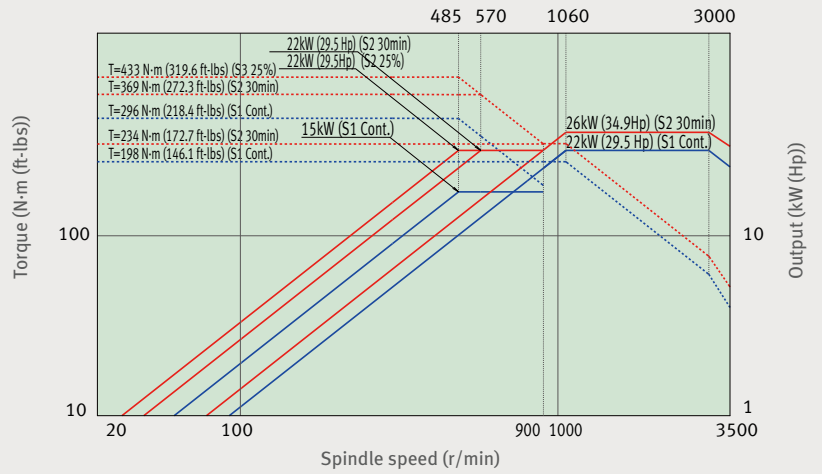


Turret maintenance and service screen

Spindle power-torque diagram

PUMA TT 2500S/MS/SY

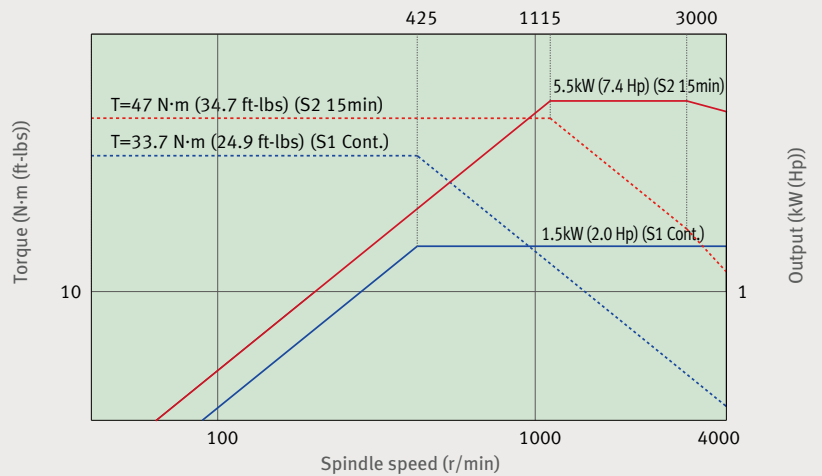
- Spindle motor power : 26 kW (34.9 Hp) (Built-in)
- Max. Spindle speed : 35000 r/min



Rotary tool spindle

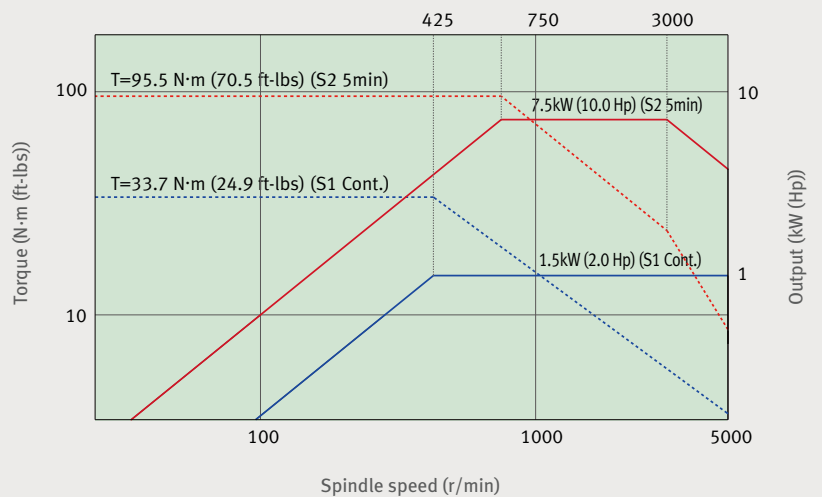
PUMA TT 2500 MS/SY

- Spindle motor power : 5.5/1.5 kW (7.4/2.0 Hp) (15min/Cont.)



PUMA TT 2500 MS/SY (option)

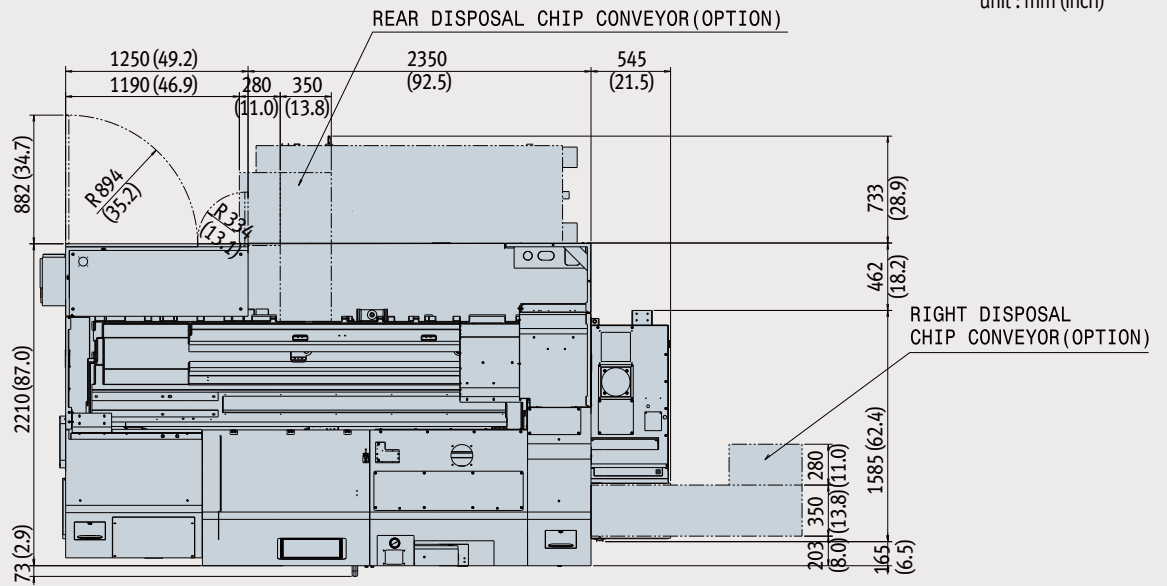
- Spindle motor power : 7.5/1.5 kW (10.1/2.0 Hp) (5min/Cont.)



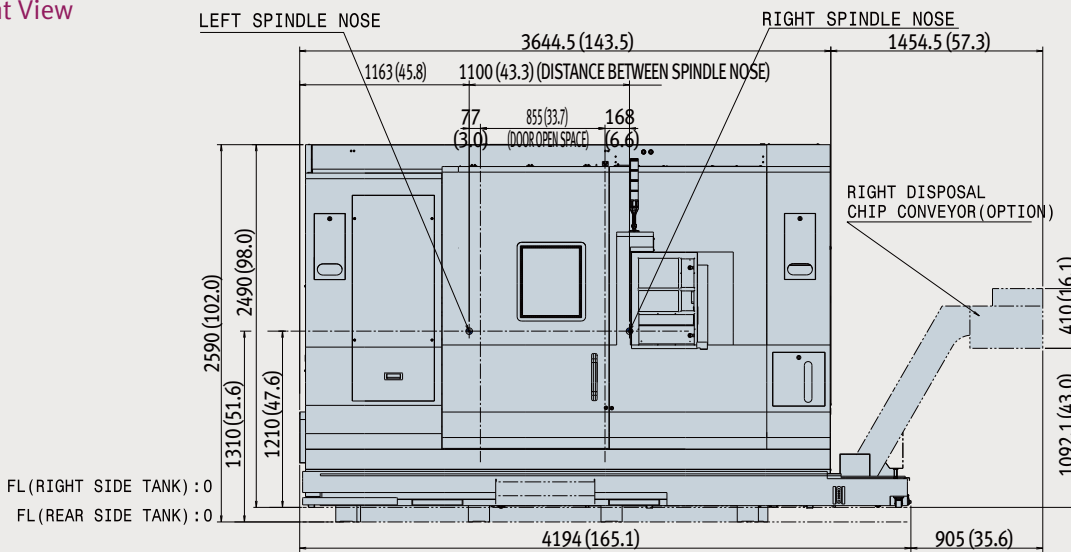
External Dimensions

unit : mm (inch)

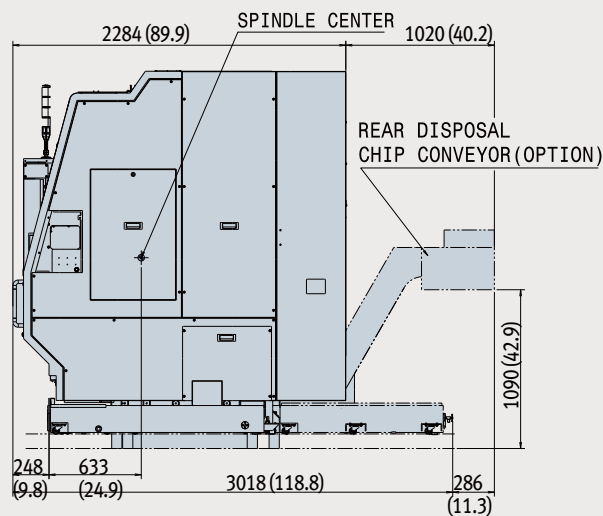
Top View



Front View



Side View



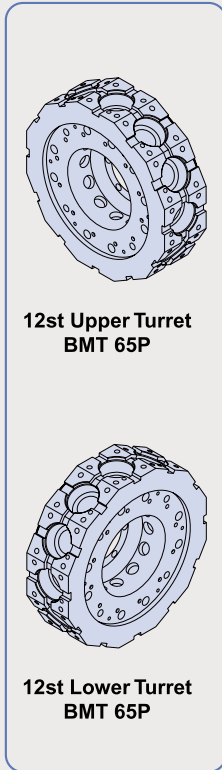
* Some peripheral equipment can be placed in other places

Tooling System (Upper & Lower turret)

unit : mm (inch)

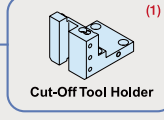
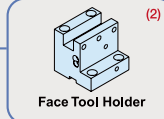
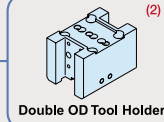
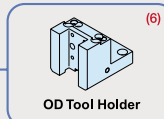
Standard

■ : MS/SY series

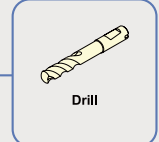
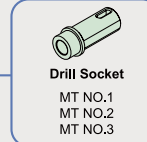
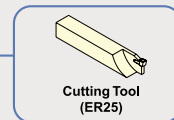
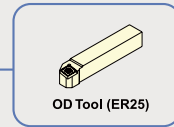
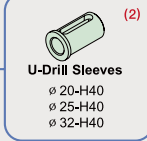
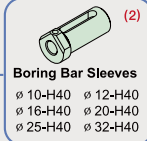
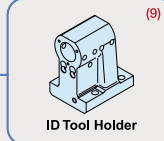


TURNING TOOL

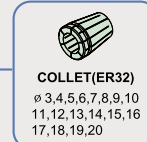
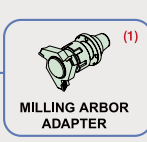
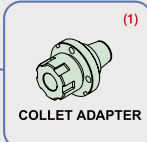
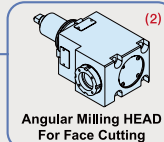
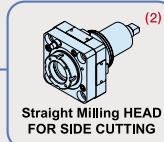
OD, FACE, CUT-OFF



ID HOLDER



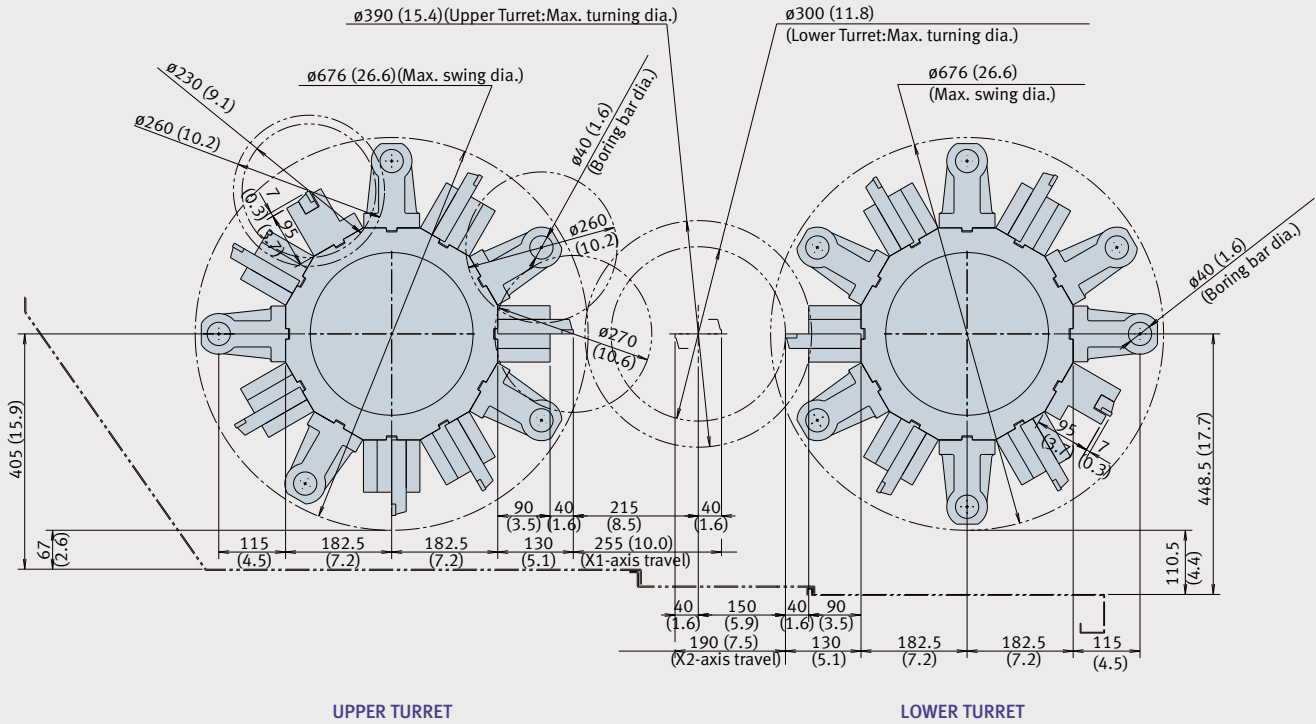
ROTARY TOOL



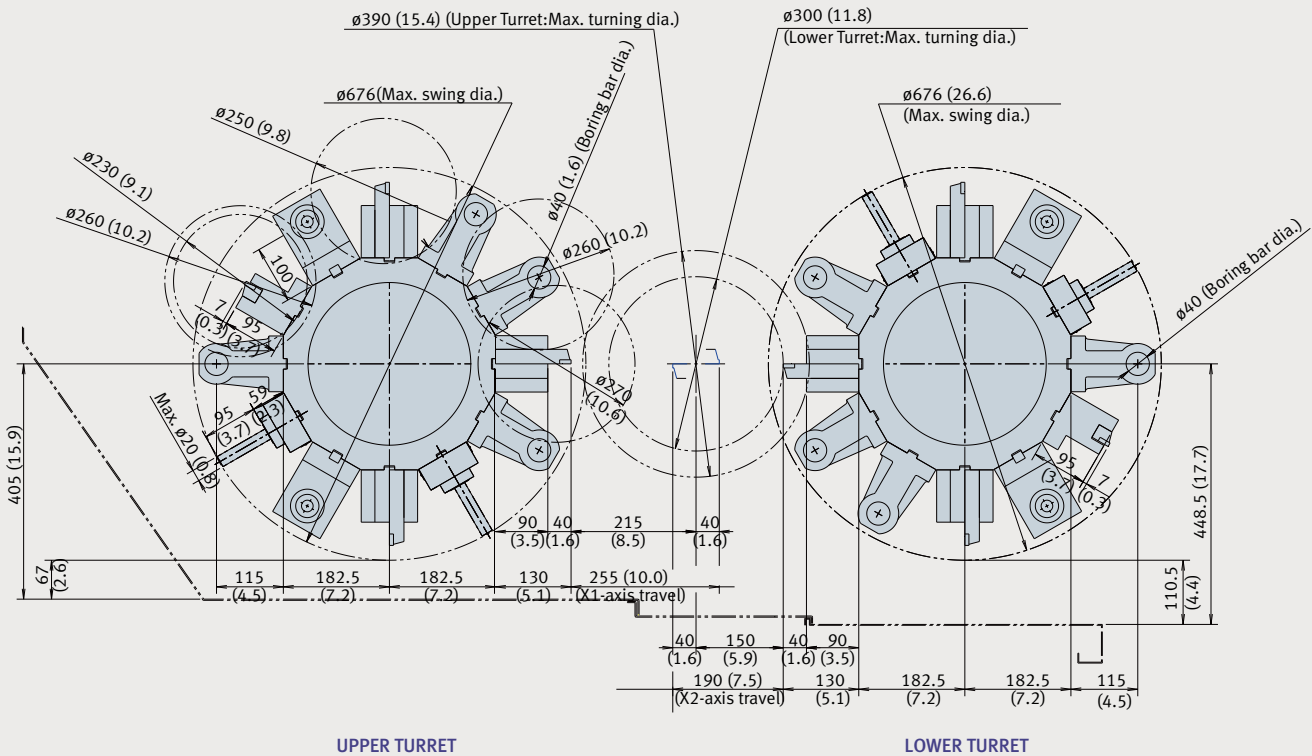
Tool Interference Diagram

unit : mm (inch)

PUMA TT 2500 S



PUMA TT 2500 MS/SY

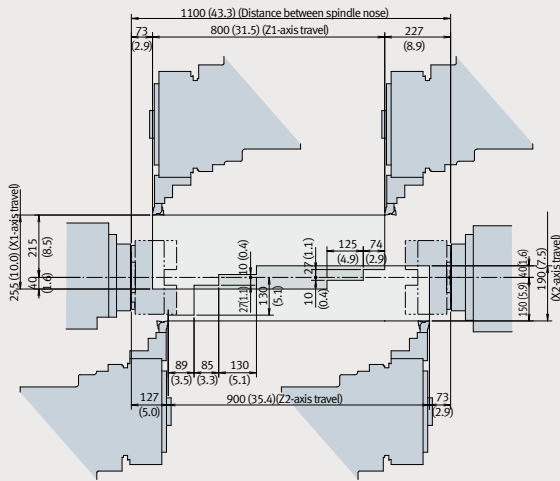


Working Range

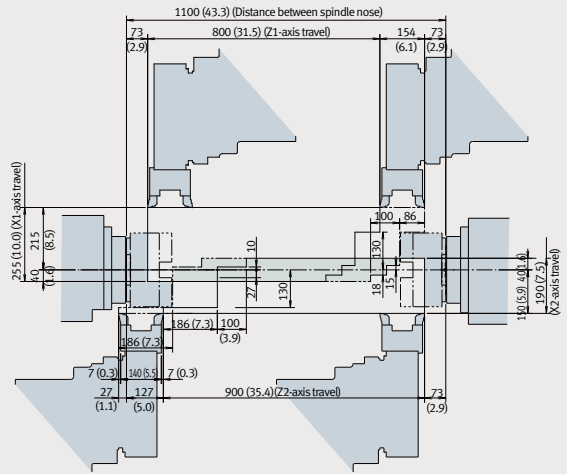
PUMA TT 2500 S/MS/SY

unit : mm (inch)

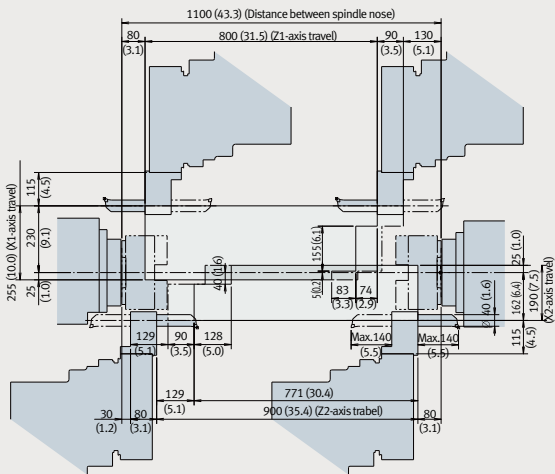
Single OD Tool holder



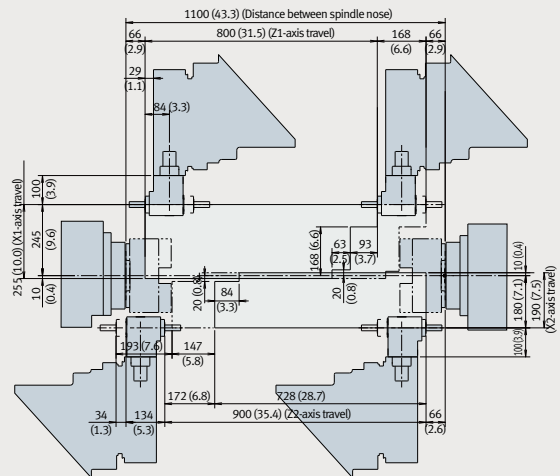
Double OD Tool holder



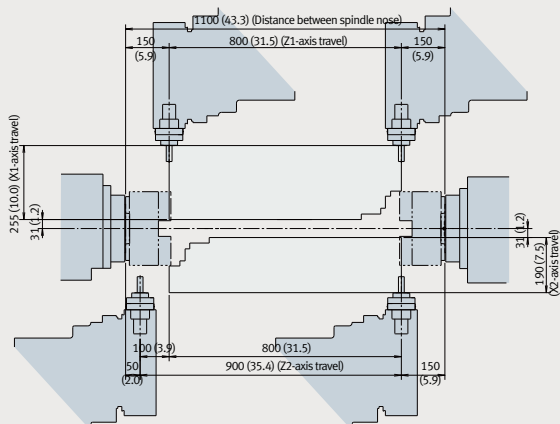
Single ID Tool holder



Angular milling head



Straight milling head



Machine Specifications

Item	Unit	Specification			
		PUMA TT2500S	PUMA TT2500MS	PUMA TT2500SY	
Capacity	Swing over bed	mm (inch)	800 (31.5)		
	Swing over saddle	mm (inch)	620 (24.4)		
	Max. turning diameter	On upper turret	mm (inch)	390 (15.4)	
		On lower turret	mm (inch)	300 (11.8)	
	Recommended turning diameter	mm (inch)	255 (10.0)		
	Max. turning length	mm (inch)	350 (13.8)		
	Bar working diameter	mm (inch)	76 (3.0)		
Spindle (Left/Right)	Spindle speed	r/min	3500		
	Spindle nose	ASA	A2-8		
	Spindle bearing diameter (front)	mm (inch)	130		
	Spindle through hole diameter	mm (inch)	86		
	C1-axis minimum indexing increment	deg	-	0.001	
	Travels	X1-axis	mm (inch)	255 (10.0)	
Z1-axis		mm (inch)	800 (31.5)		
A-axis		mm (inch)	810 (31.9)		
X2-axis		mm (inch)	190 (7.5)		
Z2-axis		mm (inch)	900 (35.4)		
C1, C2-axis		deg	-	360	
Y-axis		mm (inch)	-	-	120 (±60) (4.7 (±2.4))
Rapid traverse rate	X1, 2-axis	m/min (ipm)	20 (787.4)		
	Z1, 2-axis	m/min (ipm)	24 (944.9)		
	A-axis	m/min (ipm)	24 (944.9)		
	C1, C2-axis	r/min	-	200	
	Y-axis	m/min (ipm)	-	75 (2952.8)	
Turret (Upper/Lower)	Number of tool stations	ea	12		
	OD tool size	mm (inch)	25 x 25 (1.0 x 1.0)		
	Max. boring bar size	mm (inch)	Ø40 (Ø1.6)		
	Turret indexing time	1 station swivel	sec	0.2	
	Max. rotary tool speed	r/min	-	4000	
	Motor	Spindle motor power (Left/Right)	kW (Hp)	26 / 22 (34.9 / 29.5) (30min/Cont.)	
Servo motor power		X1-axis	kW (Hp)	4 (5.4)	
		X2-axis	kW (Hp)	3 (4.0)	
		Z1, 2-axis	kW (Hp)	4 (5.4)	
		A-axis	kW (Hp)	4 (5.4)	
		Y-axis	kW (Hp)	-	3 (4.0)
Coolant pump motor power		kW (Hp)	0.4 (0.5)		
Power source	Required power capacity	kVA	95.77		
Machine Dimensions	Machine size	Floor space	4050 x 2210 (159.4 x 87.0)		
		Height	2480 (97.6)		
	Machine weight (Net) ⁽¹⁾	kg (lb)	12700 (27998.3)		

Standard Feature

- | | | | |
|--|--|--|--|
| <ul style="list-style-type: none"> • Absolute positioning coder • Air blower • Automatic coolant system | <ul style="list-style-type: none"> • Coolant supply equipment • Front guard door interlock • Hydraulic unit | <ul style="list-style-type: none"> • Machine level inspection plate • Soft jaws (total) • Spindle head cooling system | <ul style="list-style-type: none"> • Standard hydraulic chuck • Tools and tool box • Work light |
|--|--|--|--|

Optional Feature

- | | | | |
|--|---|---|--|
| <ul style="list-style-type: none"> • Air conditioner for electric cabinet • Air gun • Automatic door • Automatic door with safety device • Automatic power off • Bar feeder interface • Chip Conveyor & Chip Bucket • Chuck coolant • Collet chucks | <ul style="list-style-type: none"> • Dual chucking pressure • Electric cabinet light • Extra M-Code (4ea) • High pressure coolant • Linear Scale(X1/X2) • Minimum Quantity Lubrication (MQL)system • Oil mist collector • Oil skimmer | <ul style="list-style-type: none"> • Parts unloader and conveyor • Portable MPG • Proximity switches for chuck clamp confirmation • Robot interface (PMCI / O, PROFIBUS) • Signal Tower • Special chuck • Tail center for turret | <ul style="list-style-type: none"> • Through Spindle Coolant(T.S.C) For Spindle (Left / Right) • Tool Load Monitoring • Tool pre-setter • Work & tool counter • Work ejector for right spindle • Coolant level switch : Sensing level - Low • Quick change tooling(CAPTO)** |
|--|---|---|--|

** Special Quotation.

NC Unit Specifications (FANUC 31i)

● Standard ○ Optional X Not applicable

NO.	Division	Item	Spec.	Fanuc 31i		
				S	MS	SY
1	Control axes	Control paths		2 Path	2 Path	2 Path
2		Controlled axes		5 (X1, Z1, X2, Z2, A)	7 (X1, Z1, C1, X2, Z2, C2, A)	8 (X1, Z1, C1, Y, X2, Z2, C2, A)
3		Simultaneously controlled axes		4 axes	4 axes	4 axes
4		Axis control by PMC		●	●	●
5		Cs contouring control		X	●	●
6		Synchronous/Composite control		●	●	●
7		Torque control		●	●	●
8		Increment system	ISA, IS-B	●	●	●
9		HRV2 control		●	●	●
10		Inch / metric conversion		●	●	●
11		Stored limit check before move		○	○	○
12		Chamfering on / off		●	●	●
13		Interference check for rotary area		●	●	●
14		Unexpected disturbance torque detection function		●	●	●
15		Position switch		●	●	●
16	Operation	Tool retract and recover		○	○	○
17		Dry run		●	●	●
18		Single block		●	●	●
19		Handle interruption		○	○	○
20		Incremental feed	x1, x10, x100	●	●	●
21		Manual handle retrace		○	○	○
22		Active block cancel		○	○	○
23	Interpolation	Nano interpolation		●	●	●
24		Linear interpolation		●	●	●
25		Circular interpolation		●	●	●
26		Polar coordinate interpolation		●	●	●
27		Cylindrical interpolation		●	●	●
28		Helical interpolation		X	●	●
29		Thread cutting, synchronous cutting		●	●	●
30		Multi threading		●	●	●
31		Thread cutting retract		●	●	●
32		Continuous threading		●	●	●
33		Variable lead thread cutting		○	○	○
34		Circular thread cutting		○	○	○
35		Polygon machining with two spindles		●	●	●
36	High-speed skip	Input signal is 8 points.	○	○	○	
37	3rd/4th reference position return		○	○	○	
38	Balanced cutting	Only for more than 2 path control	●	●	●	
39	Feeding	Bell-shaped acceleration/ deceleration after cutting feed interpolation		●	●	●
40		Override cancel		●	●	●
41		AI contour control I		●	●	●
42		AI contour control II		○	○	○
43	Rapid traverse block overlap		●	●	●	
44	Program ming	Optional block skip	9 pieces	●	●	●
45		Absolute / incremental programming	Combined use in the same block	●	●	●
46		Diameter / Radius programming		●	●	●
47		Automatic coordinate system setting		●	●	●
48		Workpiece coordinate system	G52 - G59	●	●	●
49		Workpiece coordinate system preset		○	○	○
50		Addition of workpiece coordinate system	48 pairs	○	○	○
51		Addition of workpiece coordinate system	300 pairs	○	○	○
52		Direct drawing dimension programming		●	●	●
53		Chamfering / Corner R		○	○	○
54		Custom macro		●	●	●
55	Addition of custom macro common variables	#100 - #199, #500 - #999	●	●	●	

NO.	Division	Item	Spec.	Fanuc 31i		
				S	MS	SY
56	Program ming	Custom macro common variables between each path	Only for more than 2 path control. Included in Custom macro.	●	●	●
57		Interruption type custom macro		○	○	○
58		Canned cycle		●	●	●
59		Multiple repetitive cycles	G70-G76	●	●	●
60		Multiple repetitive cycles II	Pocket profile	●	●	●
61		Canned cycle for drilling		●	●	●
62		Automatic corner override		○	○	○
63		Custom software (Total amount of each path)	12MByte	●	●	●
64		Coordinate system shift		●	●	●
65		Direct input of coordinate system shift		●	●	●
66	Real time custom macro		○	○	○	
67	Pattern data input		○	○	○	
68	Interactive programming	EZ-Guide i (Conversational Programming Solution)		●	●	●
69		Easy Operation Package		●	●	●
70	Auxiliary/ spindle function	High-speed M / S / T / B interface		●	●	●
71		Waiting M codes of high-speed type	Only for more than 2 path control	●	●	●
72		Constant surface speed control		●	●	●
73		Spindle override	0 - 150%	●	●	●
74		Spindle orientation		●	●	●
75		Spindle synchronous control		●	●	●
76		Rigid tap		●	●	●
77	Arbitrary speed threading		○	○	○	
78	Tool function / tool compensation	Tool offset pairs	99-pairs	●	●	●
79			128 / 200 / 400 / 499 / 999 pair	○	○	○
80		Common offset memory between each path	Only for more than 2 path control	●	●	●
81	Tool function / tool compensation	Tool offset		●	●	●
82		Tool radius/Tool nose radius compensation		●	●	●
83		Tool geometry / wear compensation		●	●	●
84		Automatic tool offset		●	●	●
85		Direct input of offset value measured B		●	●	●
86	Accuracy compensation function	Tool life management		●	●	●
87		Backlash compensation for each rapid traverse and cutting feed		●	●	●
88		Stored pitch error compensation		●	●	●
89	Editing operation	Part program storage size & Number of registerable programs	640M (256KB)_500 programs	○	○	○
90			1280M (512KB)_1000 programs	●	●	●
91			1MB / 2MB / 4MB / 8MB 1000 / 2000 / 4000 programs	○	○	○
92		Program protect		●	●	●
93	Password function		●	●	●	
94	Playback		○	○	○	
95	Memory card program edit & operation	Max 63 programs	●	●	●	
96	Data input / output	Fast data server		○	○	○
97		External data input		●	●	●
98		Memory card input / output		●	●	●
99		USB memory input / output		●	●	●
100	Automatic data backup		●	●	●	
101	Interface function	Embedded Ethernet		●	●	●
102		Fast Ethernet		○	○	○
103	Others	Display unit	10.4" color LCD	●	●	●
104	Robot interface	Robot interface with PMC I/O module		○	○	○
105		Robot interface with PROFIBUS-DP		○	○	○

Major Specifications

PUMA TT2500 series



Description	Unit	PUMATT2500S / MS / SY
Max. turning diameter	mm (inch)	Upper turret: 390 (15.4) / Lower turret: 300 (11.8)
Max. turning length	mm (inch)	350 (13.8)
Bar working diameter	mm (inch)	76 (3.0)
Chuck size	inch	10
Spindle speed	r/min	3500
Spindle motor power (Left / Right)	kW (Hp)	26/22 (34.9/29.5) (30min/Cont.)

*{}: Option

Doosan Machine Tools

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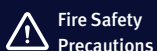
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**Fire Safety
Precautions**

There is a high risk of fire when using non-water-soluble cutting fluids, processing flammable materials, neglecting use coolants and modifying the machine without the consent of the manufacturer. Please check the SAFETY GUIDANCE carefully before using the machine.

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