



Doosan Infracore
Machine Tools

PUMA TT 1500 / 1800

Multi-Axis Turning Center



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

Systemized completion of twin turrets and twin spindles, PUMA TT1500/1800 series are another solution to get high productivity, and handle small-sized & complex parts for mass production at small lot.

PUMA TT 1500 / 1800





Main Spindle

Left & Right spindle have the same capacity

TT1500MS/SY

- 6 inch Chuck
- Bar working dia.51mm

TT1800MS/SY

- 8 inch Chuck
- Bar working dia.67mm



PUMA TT1500 series

Max. spindle speed **Motor(30 min)**
6000 r/min **15 kW**

PUMA TT1800 series

Max. spindle speed **Motor(30 min)**
5000 r/min **22 kW**

Hydraulic C-axis Brake

Forced Oil Lubrication on C-axis Brake to improve C-axis contouring control without stick Slip

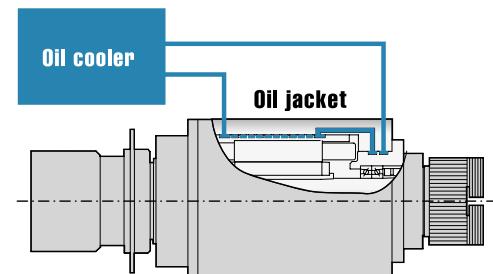
C1, C2-axis index

360°(in 0.001° increment)



Oil Cooling Unit for Spindles

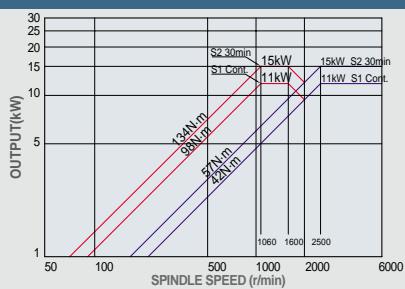
Both left and right spindles are integral motor type. Each motor is surrounded by an oil jacket cooling system to minimize thermal displacement and ensure consistency through a wide range of cutting conditions.



Left & Right Spindle power-torque diagram

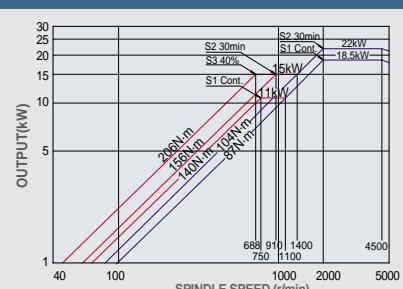
PUMA TT 1500MS/SY

Spindle motor power : 15kW(Built-in)
 Max. Spindle speed : 6000 r/min



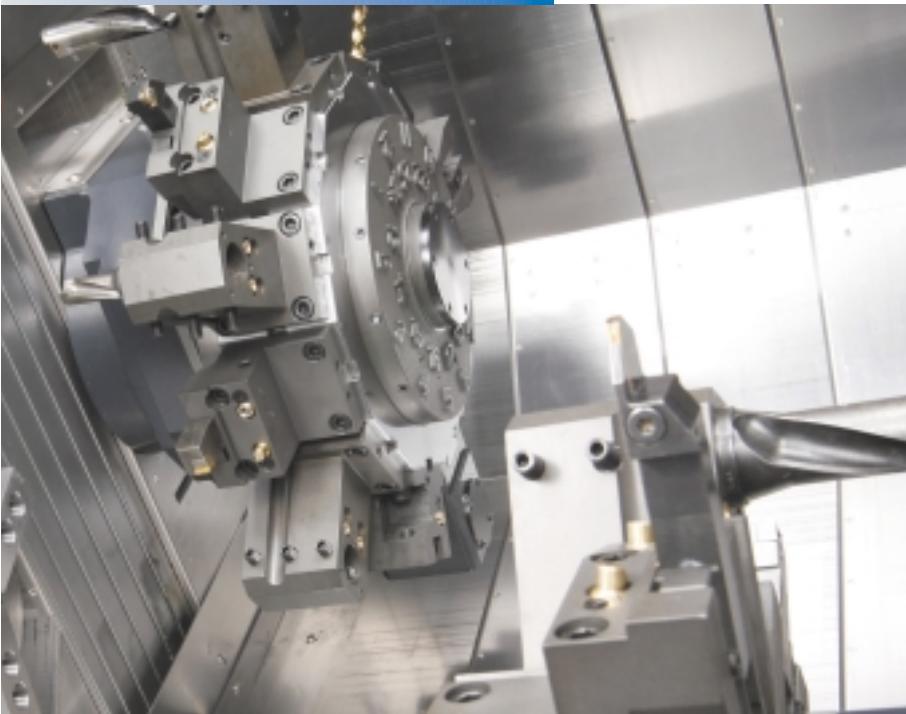
PUMA TT 1800MS/SY

Spindle motor power : 22kW(Built-in)
 Max. Spindle speed : 5000 r/min



Turret

Harmonization of upper & lower turret



Total of 24 tool stations upper and lower turret(BMT55P) 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.

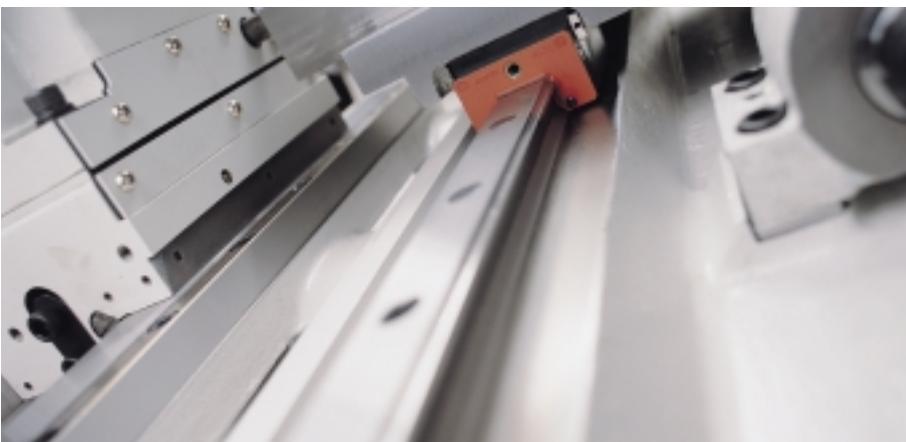
**Index time
(1-station swivel)**

0.15 s

**No. of tool station
(Upper+Lower turret)**

24 stations(12+12)

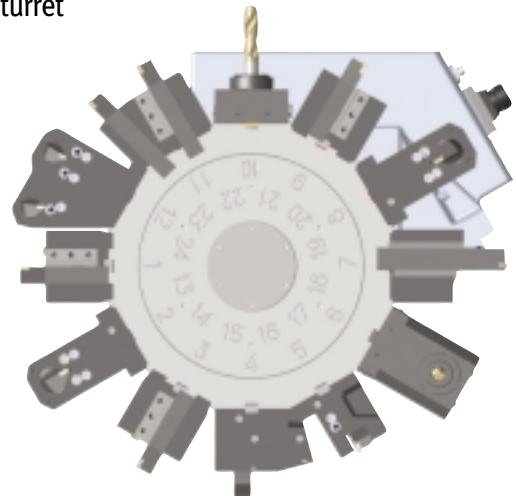
Rapid Traverse



Especially high precision linear guides (Z1, Z2 and B-axis) with equivalent rigidity to box way guide system are used to ensure smooth slide movement.

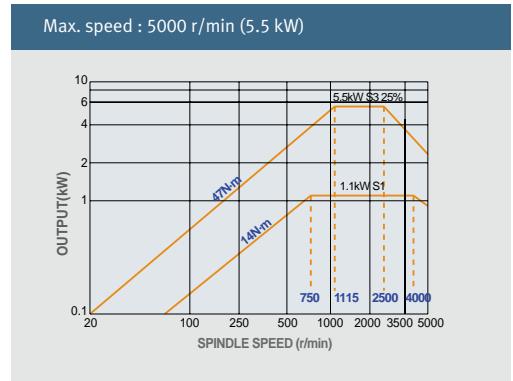
Z1,2-axis 40 m/min

B-axis 40 m/min



Both 12 station turrets providing upto 48 tool positions by using Double tool holders and 15° tool indexing

**Rotary tool spindle
power-torque diagram**



Each axis is powered by a maintenance free digital AC servo motor. These high torque drive motors are connected to the ball screws without intermediate gears for quiet and responsive slide movement with virtually no backlash.

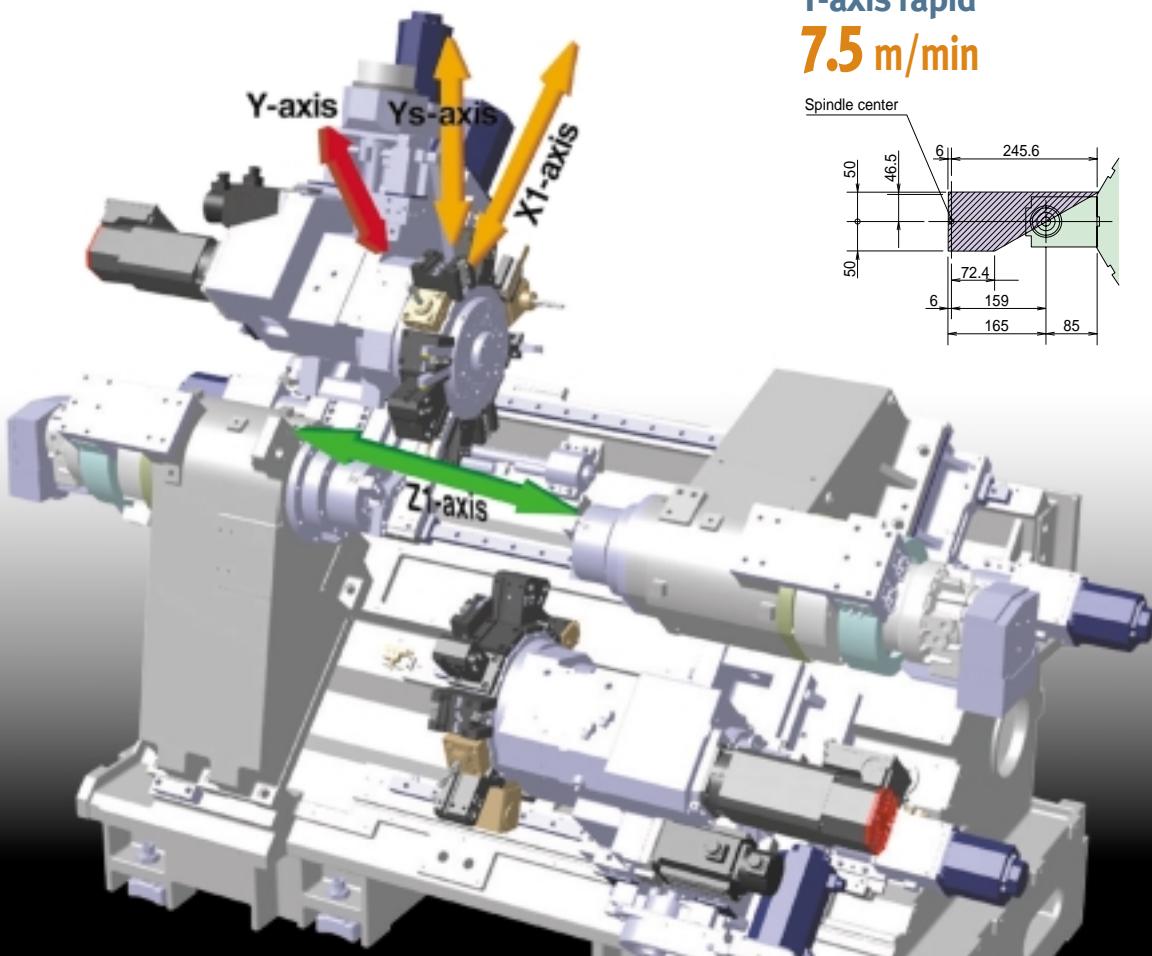


Accurate & Reliable Box Guide Ways (X1, X2, Y-axis)

X1,2-axis 20 m/min

Y-axis Function

The addition of a Y-axis to the upper turret allows parts requiring complex machining to be completed in just one set-up. Synchronous interpolation of X1-axis and Ys-axis in a double way structure creates the Y-axis function.



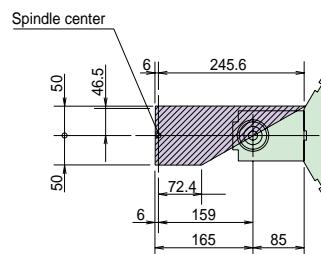
Y-axis Travels

Y-axis travel

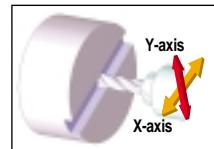
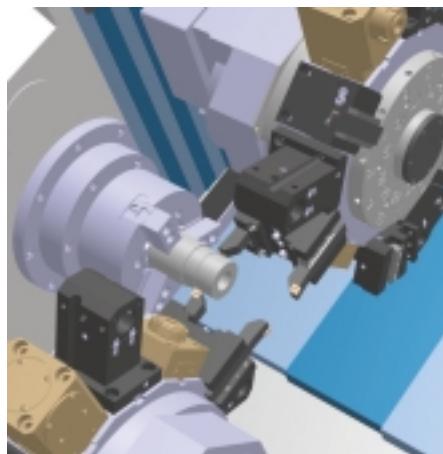
100 mm (± 50 mm)

Y-axis rapid

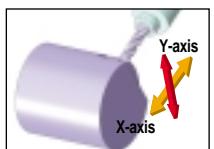
7.5 m/min



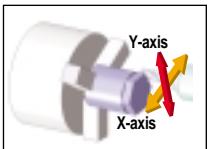
Multi-Axis Flexibility



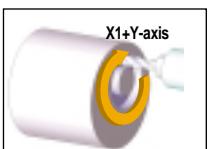
On-center face groove



Off-center side groove



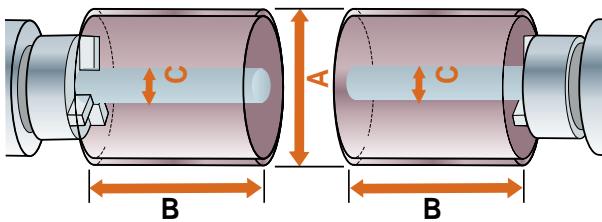
Poly-side machine



X1+Y-axis
Y&X-axis circular
interpolation

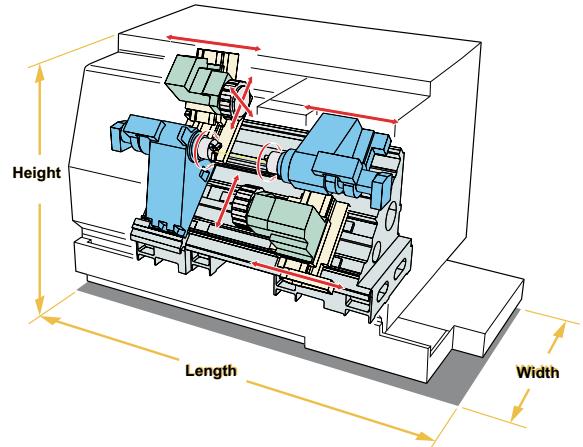
Double productivity and shorten cycle time are achieved by machining strategy and structural stability through various operations, balance cutting of upper & lower system, independent operation of left & right system

Working Range



A : Max. turning dia. **230 mm**
B : Max. turning length **120(230) mm**
C : Max. bar working dia. **51(67) mm**

Systemized compact structure



Travel

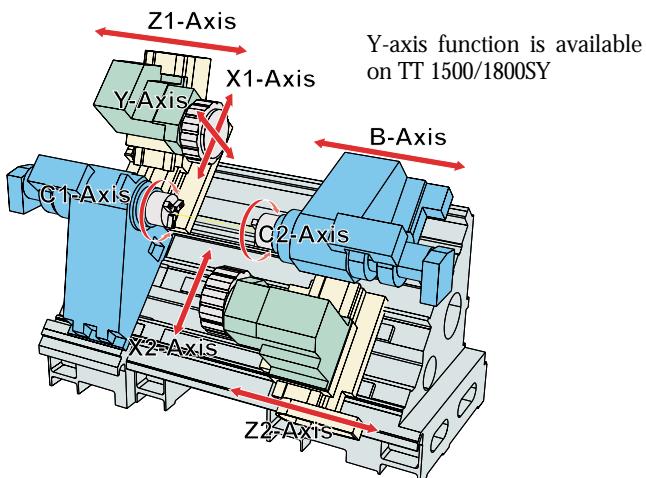
X1axis (Upper turret)	Z1axis (Upper turret)
165 mm	470(700) mm
X2-axis (Lower turret)	Z2-axis (Lower turret)
190 mm	490(720) mm
B-axis	
540 (770) mm	

() : TT1800 series

Model	Length	Width	Height
TT1500SY	3500	2070	2080
TT1800SY	3905	2070	2080

Machine Construction

8-axis controlled machine establishes multi-axis functional performance with simultaneous control of Left & Right carriage.



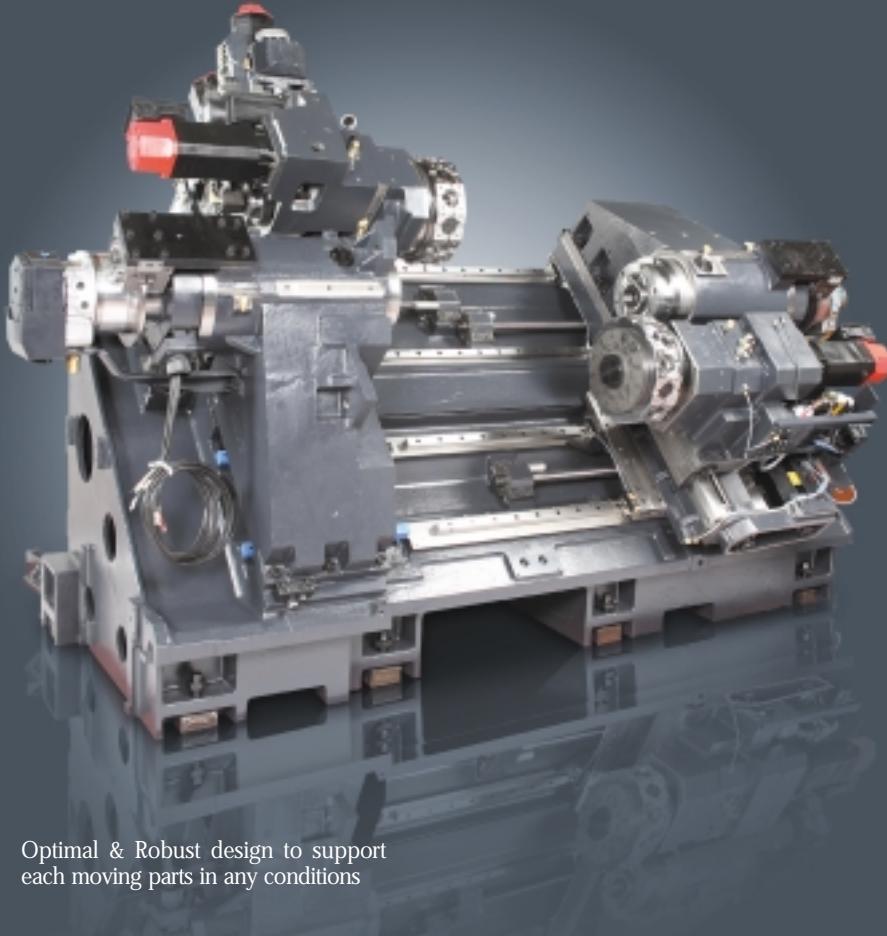
Accuracy and time saving by virtue of single set-up completion
Unmanned operation by automation support. Simple to complex processing by multitasking capability



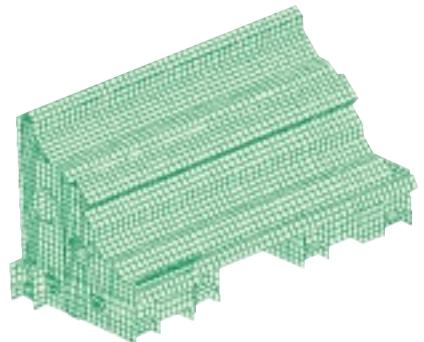
Integration of multi-function capability and high performance of same size spindles, combined with twin upper and lower turrets yields high productivity.

Robust Design

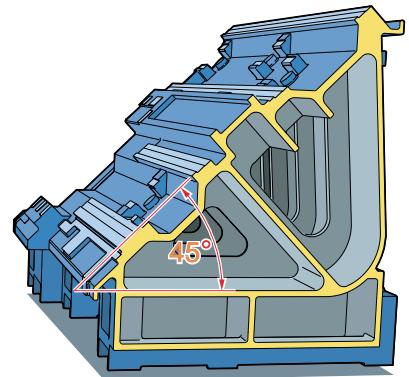
Stable base for supporting high-speed, high-precision machining.



Optimal & Robust design to support each moving parts in any conditions



FEM (Finite Element Method)



Torque tube of triangular frame

Torque tube type frame can resist eccentric loadings with its minimum weight. A 45° inclined wall is inserted into triangular frame under the centre of the frame, to endure high stress due to X direction forces. Especially, triangular frame considered as an easy way.

High Precision

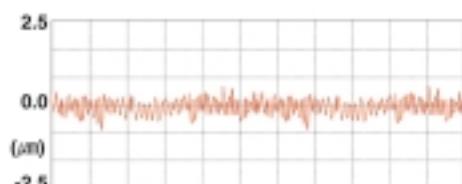
Roundness

0.45 μm



Roughness

0.16 μm (Ra)



Machining capacity · Accuracy

Material : Brass
Cutting Feed : 0.05mm/rev
Workpiece dia. : 59mm
Cutting Speed : 350m/min
Tool : Diamond (Nose R0.1)

This is actual cutting result. It might be not available under certain circumstances

Ergonomic Design

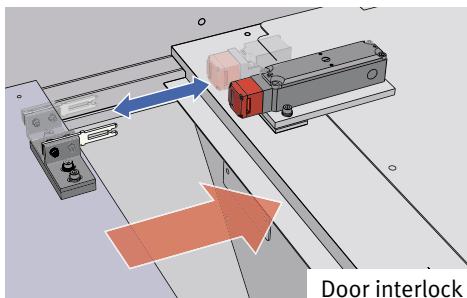
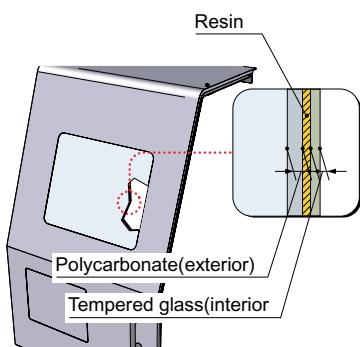
Carefully tailored ergonomic operating environment.

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.

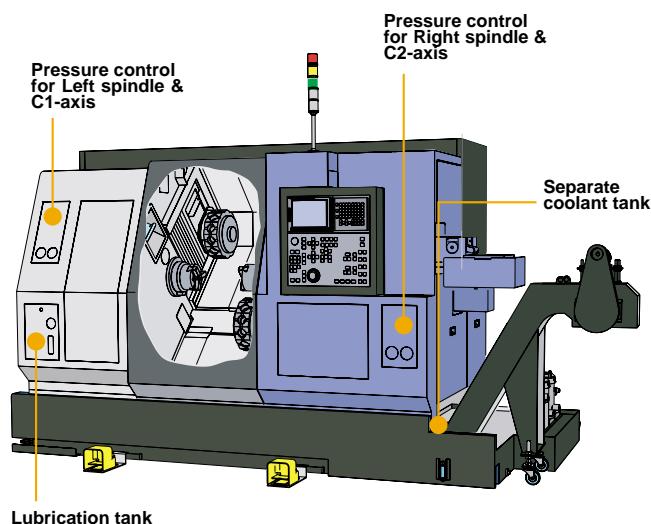


Swivel type operator panel

Operator oriented design with 90° swivel



High maintainability



Eco-friendly Design

Perfect integration to care environment of human and earth

Collection of Waste Lubrication Oil

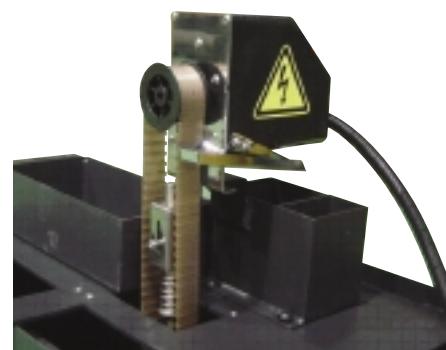
Less waste lubrication oil extends the life time of the coolant water and cut down the grime and offensive smell of the machine inside.

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.

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.



Easy Operating System



Standard Features

High compact CNC is realized through LCD display with integrated CNC and a flash memory card interface is standard features. Provides many support functions for set-ups, such as tool measurement, workpiece measurement at the original point, and workpiece measurement inside the machine.

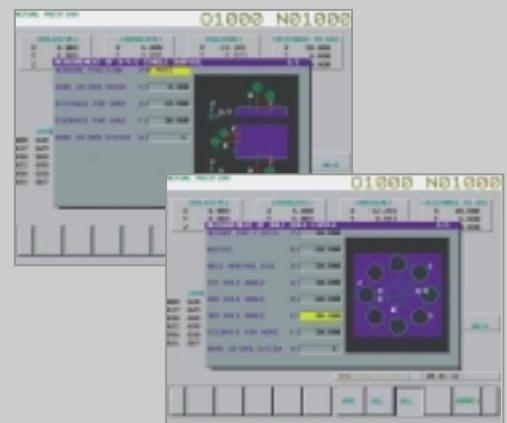
Uses one display screen to perform all operations including programming, checking by animation, and real machining.
User-Friendly Operation : Soft key Selection of Comprehensive Cycle Library



Easy operating system has designed operation the many different machine in our products. We has supplied ease operation and high reliability with user-friendly interface to customer production lines.

Guide for machining preparation

In preparation for machining, simple instructions on a selected screen allow to measure the setting error of workpiece and tool offset value for automated adjustment.



Tool Monitoring System

Tool Monitoring System protects the machine and tools from damage caused by tool wear or breakage.

This system monitors the tool status during machining operations by detecting the load of each axis and spindle.

Tool load monitoring system



Main window of Doosan tool monitoring system.
This screen shows a tool and its number, load meter of each axis and spindle limit load.

Tool management function



This functions consisted of tool pre-check function, substitutive tool selection with tool life management and different tool & tool number command function.

Easy operation system

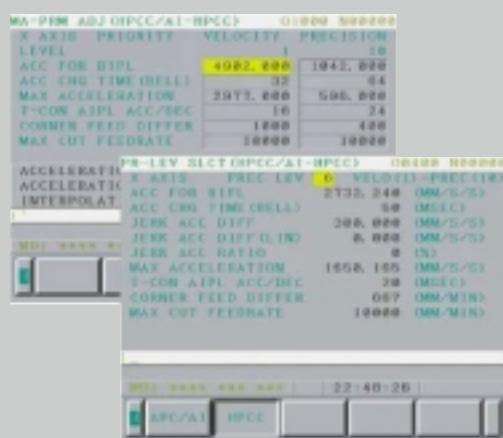
One single screen provides handy operation guidance for programming through machine operation.



For machining center, turning center and compound machine with milling and turning.
Solid modeling provides high speed animation. (TFT-LCD Color Only)
Icon menu soft-keys provide convenient programming for sophisticated milling and turning.
Measurement cycles provide automatic offset measurement of workpiece
(Available for machining center and for compound machine).

Machining condition selecting function

One single screen provides convenient operation & parameter setting for high speed and high precision machining instructions.

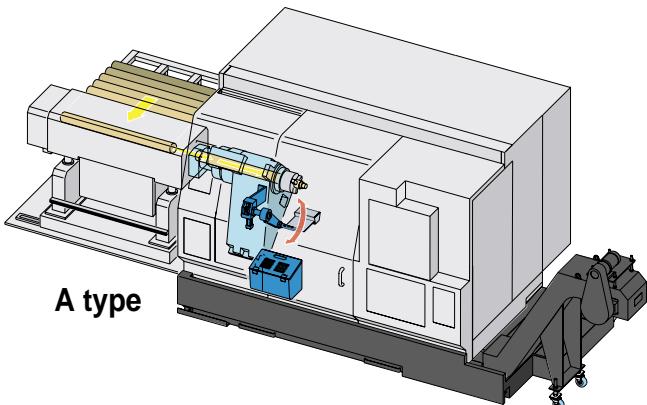


Registration of parameter sets for high speed machining and/or for high precision machining with machine configurations.
Instruction of precision level for desired machining selects appropriate parameters automatically.
Precision level can be instructed through NC program.

Optional Equipments

Parts Catcher & Box

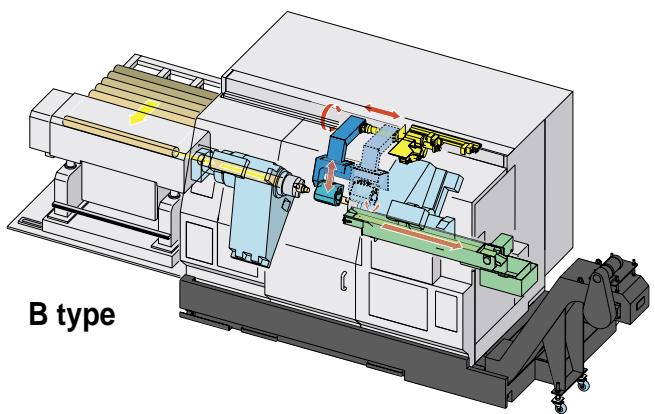
Parts catcher with parts box is available for unattended operation with a bar feeder. This system can handle the finished parts and also bar remnant from left spindle. A separate part conveyor is also available for more advanced applications.



A type

Parts Unloader & Conveyor

Parts unloader system built inside the machine can receive the finished parts from Right spindle. Automated operation is optimized when the system is coupled with a bar feeder system.



B type

- Max. work diameter : **Ø51 (Ø67) mm**
- Max. work length : **100 (150) mm**
- Max. work weight : **3 kg**

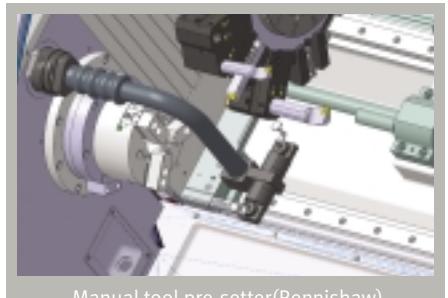
() : TT1800 series



Collet chuck



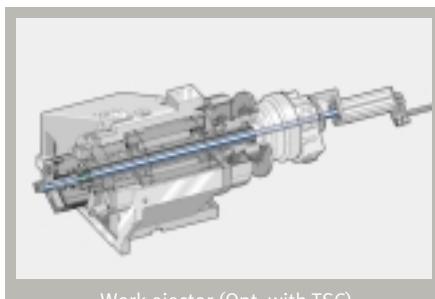
Auto tool pre-setter



Manual tool pre-setter(Rennishaw)



Coolant blower



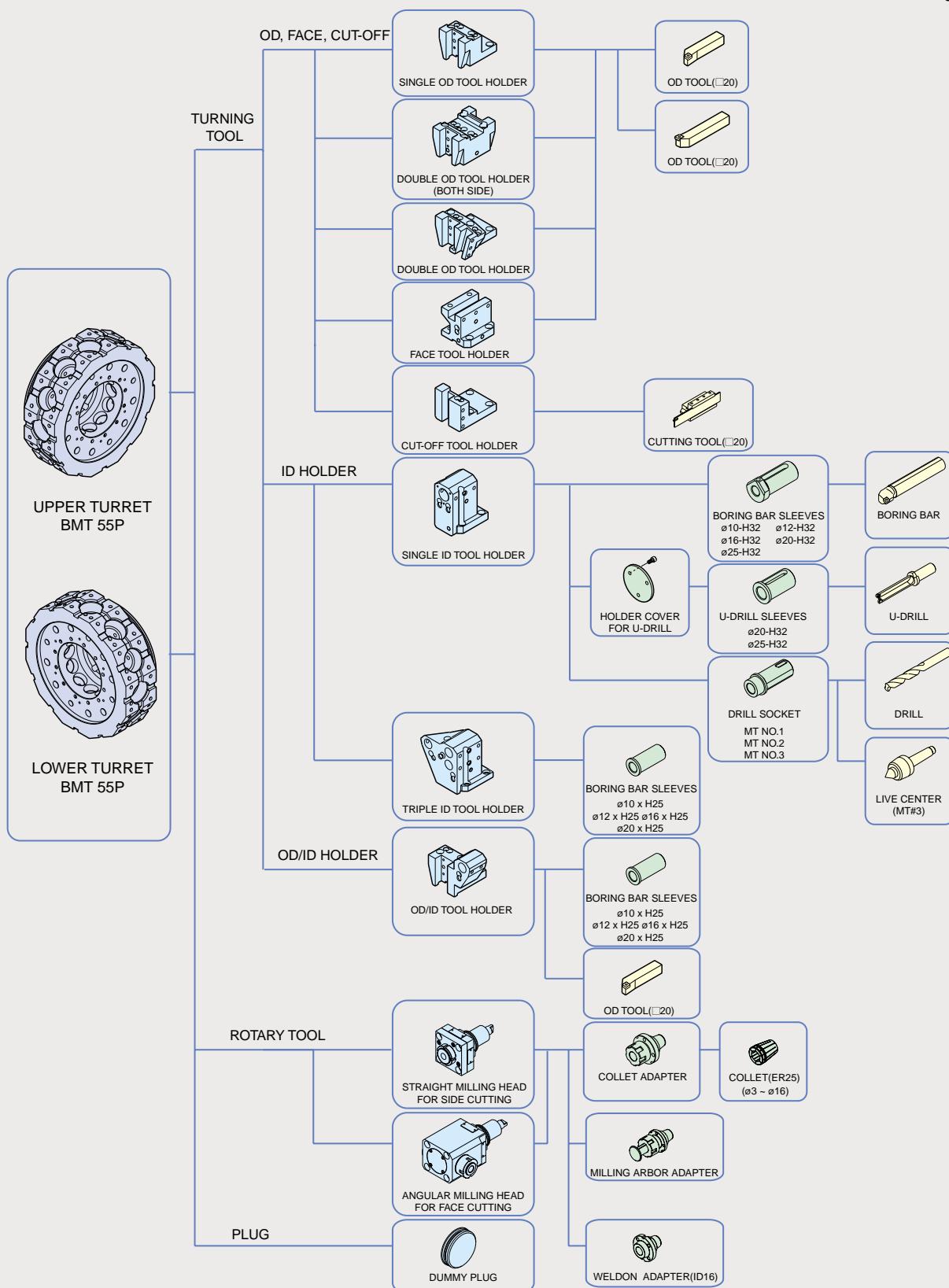
Work ejector (Opt. with TSC)



Oil mist collector

Tooling System (Upper & Lower turret)

unit : mm



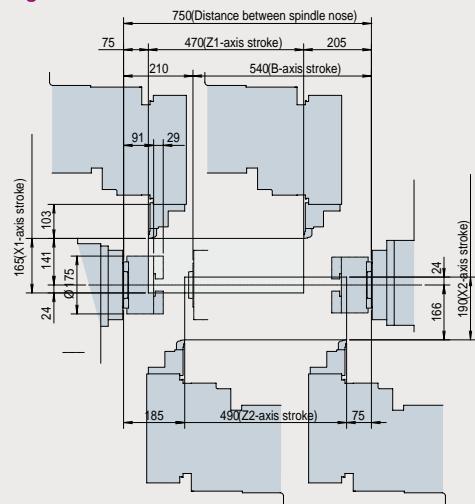
Note) Above tooling system is our recommendation. Depending on export condition, the standard tooling packed with the machine can be different.

Working Range

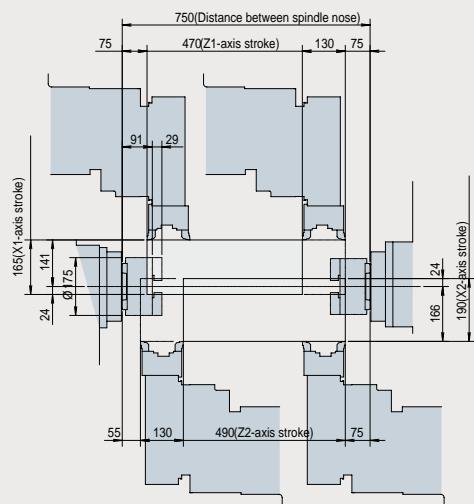
unit : mm

PUMA TT 1500 MS/SY

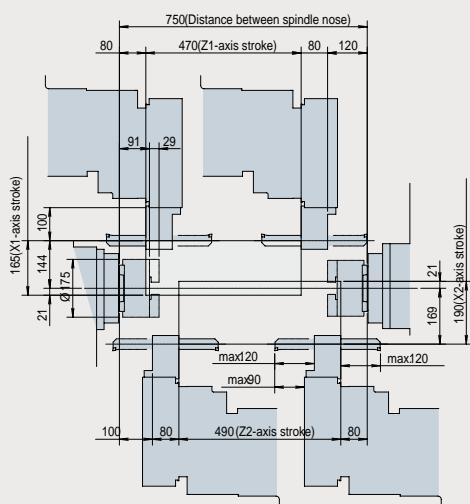
Single OD Tool holder



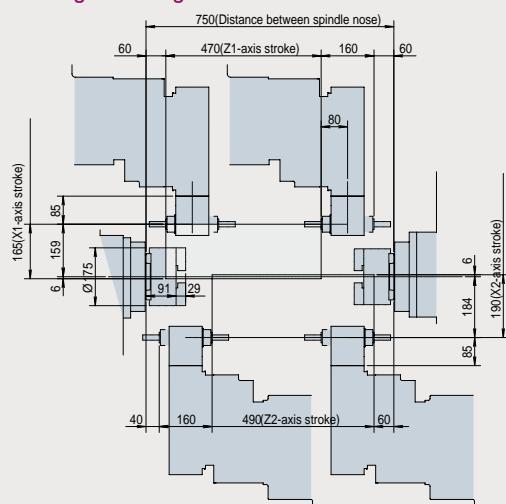
Double OD Tool holder



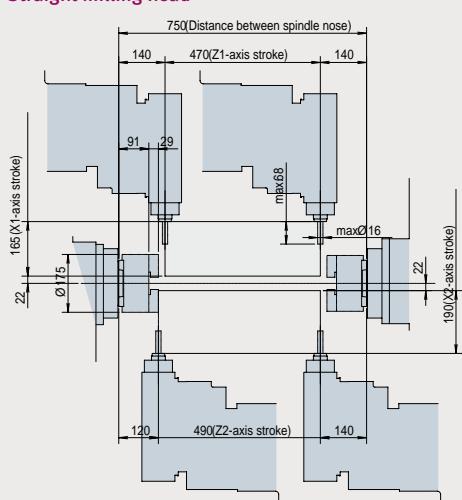
ID Tool holder



Angular milling head

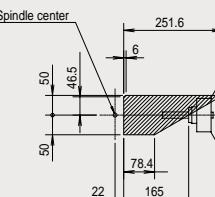


Straight milling head

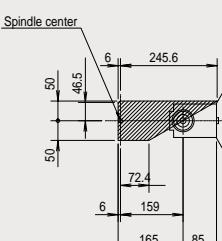


Y-axis travels

Straight milling head



Angular milling head

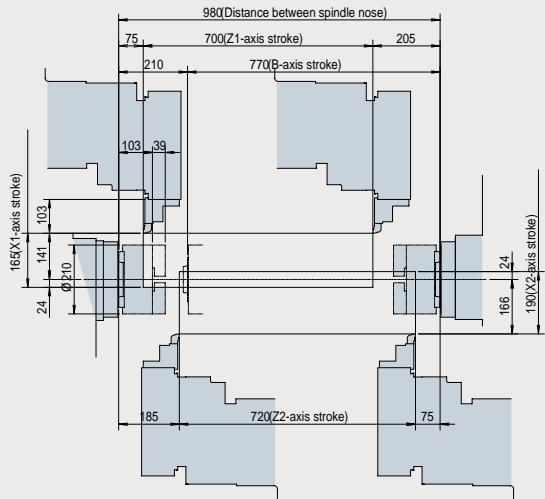


Working Range

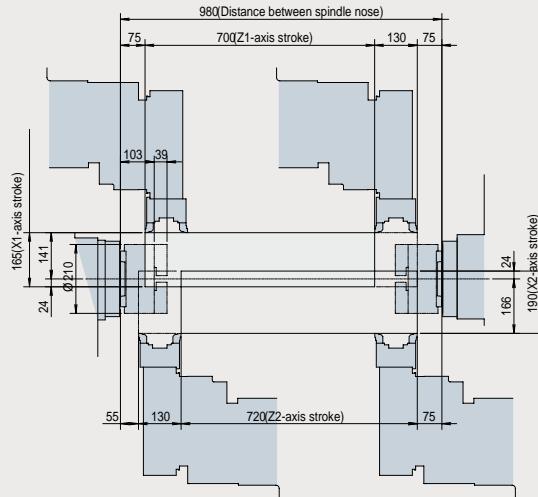
unit : mm

PUMA TT 1800 MS/SY

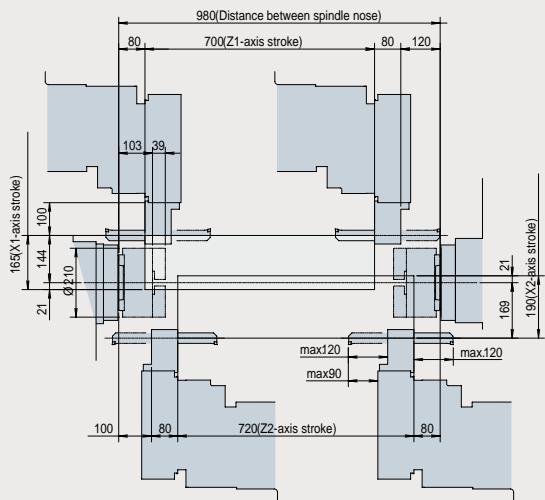
Single OD Tool holder



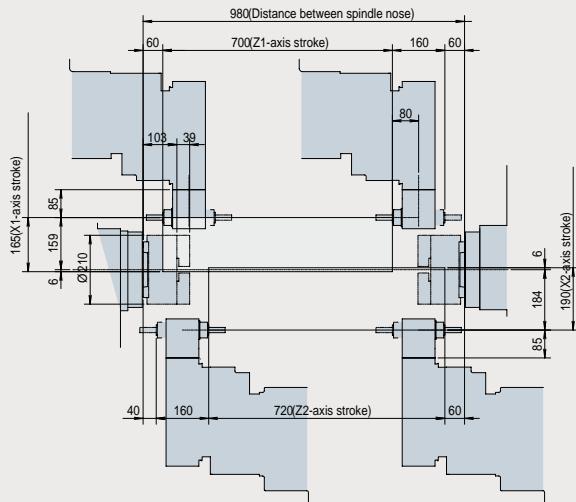
Double OD Tool holder



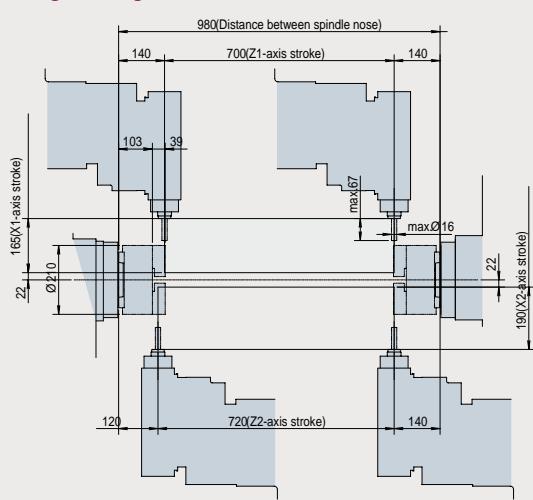
ID Tool holder



Angular milling head

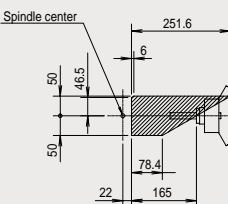


Straight milling head

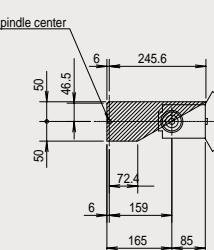


Y-axis travels

Straight milling head



Angular milling head

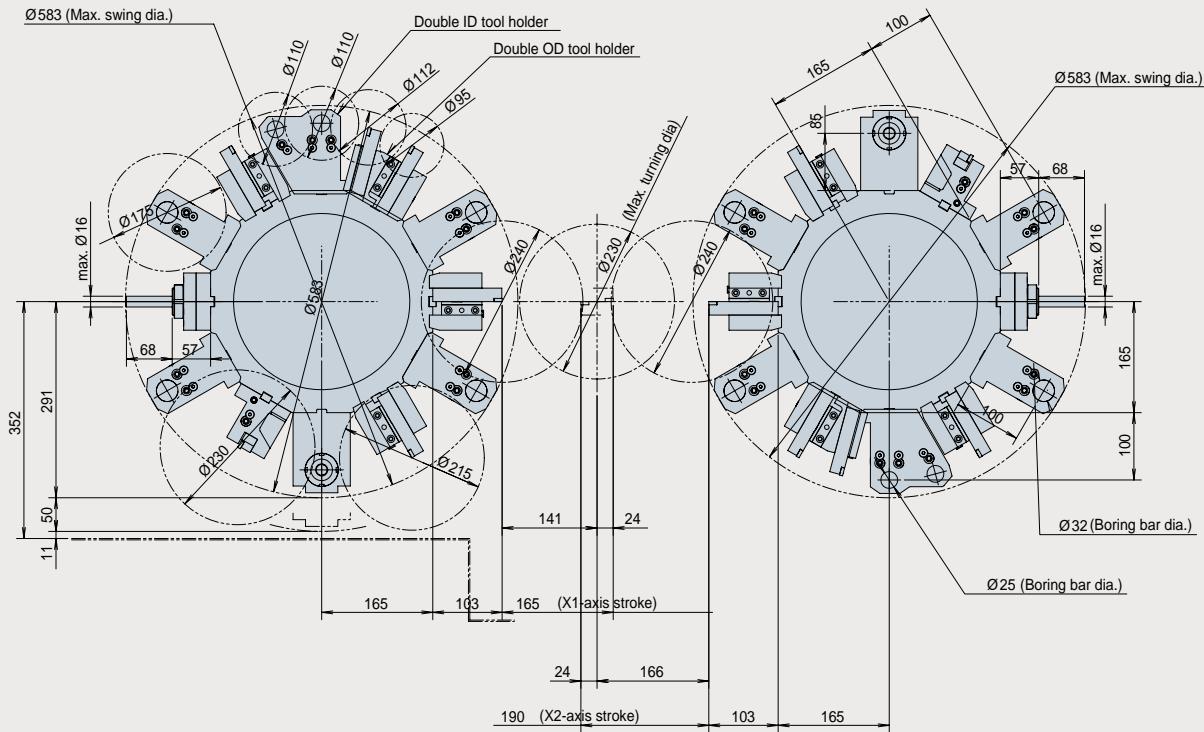


Tool Interference Diagram

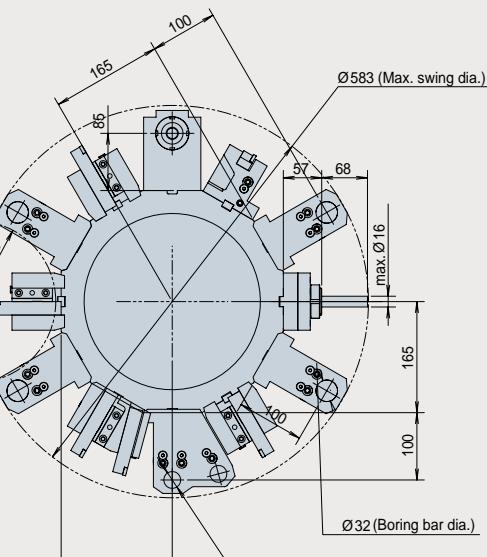
unit : mm

PUMA TT 1500 MS/SY
PUMA TT 1800 MS/SY

UPPER TURRET



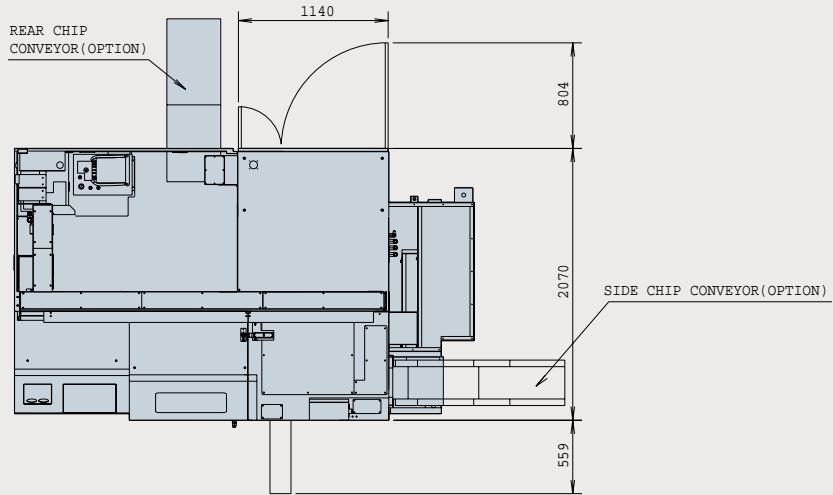
LOWER TURRET



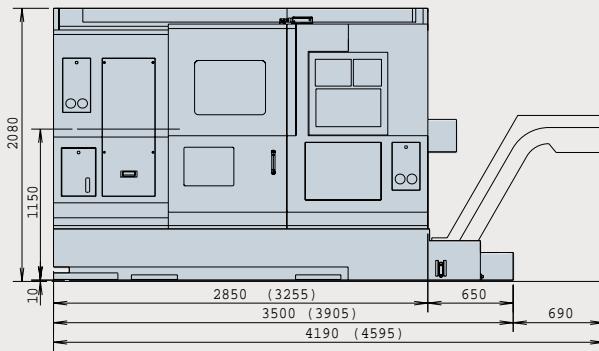
External Dimensions

unit : mm

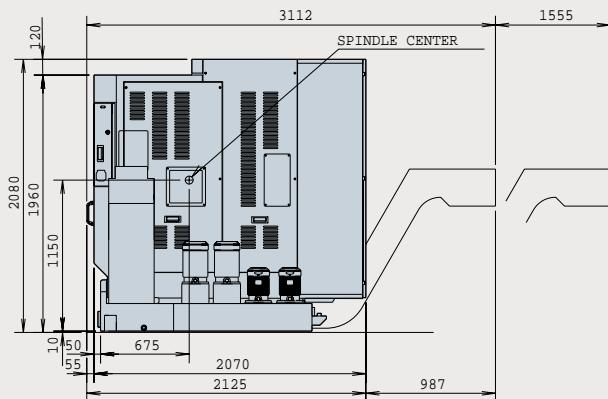
Top View



Front View



Side View



() : TT1800 series

Machine Specifications

	Description	Unit	PUMA TT1500MS	PUMA TT1500SY	PUMA TT1800MS	PUMA TT1800SY
Capacity	Max. distance between spindle noses	mm	750		980	
	Swing over saddle	mm		230		
	Recom. Turning diameter	mm	175		210	
	Max. Turning diameter	mm		Upper Turret : 230 / Lower Turret : 230		
	Max. Turning length (on each spindle)	mm	120		230	
Left Spindle	Bar working diameter	mm	51		65	
	Spindle speed	r/min	6000		5000	
	Spindle nose	ASA	A2#5		A2#6	
	Spindle bearing diameter (Front)	mm	90		110	
	Spindle through hole	mm	ø 62		ø 76	
Right Spindle	Cs Spindle Index angle	deg		360(in 0.001 deg. increment)		
	Cs Spindle Index Speed	r/min		600		
	Spindle speed	r/min	6000		5000	
	Spindle nose	ASA	A2#5		A2#6	
	Spindle bearing diameter (Front)	mm	90		110	
Carriage	Spindle through hole	mm	ø 62		ø 76	
	Cs Spindle Index angle	deg		360(in 0.001 deg. increment)		
	Cs Spindle Index Speed	r/min		600		
	Travel distance	X1/2-axis	mm		X1: 165 / X2: 190	
		Z1/2-axis	mm	Z1: 470, Z2: 490		Z1: 700, Z2: 720
Turret (Upper+Lower)	B-axis	mm	540		770	
	Y-axis	mm	-	100<± 50>	-	100<± 50>
	Rapid traverse	X1/2-axis	m/min	20		
		Z1/2-axis	m/min	40		
		B-axis	m/min	40		
Motor	Y-axis	m/min	-	7.5	-	7.5
	Max. cutting feedrate	X1/2-axis	mm/rev	500		
		Z1/2-axis	mm/rev	500		
		B-axis	mm/rev	500		
		Y-axis	mm/rev	-	500	-
Other	No. of tool stations (Upper+Lower)	st		12 + 12(24 + 24)		
	OD tool height	mm		20		
	Boring bar diameter	mm		ø 32		
	Indexing time	s		0.15		
	Rotary tool spindle speed	r/min		5000		
	Left & Right spindle motor (Int./Cont)	kW	15/11		22/18.5	
	Rotary tool spindle motor (10min./Cont)	kW		5.5/1.1		
	Servo motor	X1-axis	kW	3.0		
		X2-axis	kW	1.6		
		Z1-axis	kW	2.7		
	Z2-axis	kW	2.7			
	B-axis	kW	1.6			
	Y-axis	kW	-	1.6	-	1.6
	Coolant pump	kW		0.9 × 2		
	Electric power supply (Rated capacity)	kVA	64.03	65.09	74.15	75.21
	Machine height	mm		2080		
	Machine dimensions	length	mm	3500		3905
		width	mm		2070	
	Machine weight	kg	8200	8500	8800	9000

Standard Feature

Absolute positioning encoder	Hand tool kit (including small tool for operations)	Safety precaution name plates
Air blast for chuck jaw cleaning	Hyd. chuck & actuating cylinder	Soft jaws (total)
Coolant supply equipment	Hydraulic power unit	Spindle oil cooling unit
Foot switch	Leveling jack screw & plates	Standard tool kit
Front guard door inter lock	Lubrication equipment	(tool holder & boring sleeve)
Full enclosure chip and coolant shield	Manuals	Work light

Optional Feature

Air gun	Chip bucket	Proximity switches for chuck clamp detection
Automatic door	Collet chucks*	Pressure switch for chucking pressure check
Automatic door with safety device	Coolant blower	Parts unloader and conveyor
Automatic power off	Dual chucking pressure	Signal tower (yellow, red, green)
Automatic measuring system* (in process touch probe)	Hardened & ground jaws	Special chucks
Bar feeder interface	High pressure coolant pump	Tool monitoring system
Chip conveyor	Minimum Quantity Lubrication (MQL)system	Tool pre-setter (hydraulic type)
	Oil skimmer	Tool pre-setter (manual type)

• Design and specifications are subject to change without prior notice.

Note) * : It should be reviewed in detail before contract.

• Doosan is not responsible for difference between the information in the catalogue and the actual machine.

NC Unit Specifications(Fanuc 18i-TB)

AXES CONTROL	
- Controlled path	2 path
- Simultaneous controlled axes	4axes
- Angular axis control	
- Axis control by PMC	
- Arbitrary angular axis control	
- Backlash compensation	0 ~ ± 9999 pulses
- Backlash compensation for each rapid traverse and cutting feed	
- Chamfering on/off	
- Controlled axes expansion (total)	Max.8 [4+4] axes
- Cs contouring control	
- Emergency stop	
- Fine Acc & Dec control	
- Follow-up	
- High speed HRV control	
- HRV control	
- Inch / Metric conversion	
- Interference check for rotary area	
- Interlock	All axis / each axis
- Least input command	0.001 / 0.0001mm / inch
- Machine lock	All axis / each axis
- Mirror image	
- Overtavel	
- Position switch	
- Serve off	
- Simultaneous controlled axes expansion (total)	Max.4axes
- Stored pitch error compensation	
- Stored stroke check 1	
- Unexpected disturbance torque detection function	
OPERATION	
- Automatic operation (memory)	
- Buffer register	
- Dry run	
- Handle incremental feed	X1, X10, X100
- JOG feed	1 unit
- Manual handle feed	
- Manual intervention and return	
- Manual pulse generator	1 ea
- Manual reference position return	
- MDI operation	
- Program number search	
- Program restart	
- Sequence number search	
- Single block	
INTERPOLATION FUNCTIONS	
- 1st. reference position return	Manual, G28
- 2nd. reference position return	G30
- Balance setting (Only for 2 path)	
- Circular interpolation	G02
- Continuous threading	
- Cylindrical interpolation	
- Dwell (per sec)	G04
- Helical interpolation (Only with Y)	
- Linear interpolation	G01
- Multiple threading	
- Polar coordinate interpolation	
- Polygon turning	
- Positioning	G00
- Reference position return check	G27
- Skip	G31
- Superimposed control	
- Synchro / composite control	
- Thread cutting / Synchronous cutting	
- Thread cutting retract	
- Torque limit skip	
FEED FUNCTION	
- Automatic acceleration / deceleration	
- Cutting feedrate clamp	
- Feed per minute	
- Feed per revolution	
- Feedrate override (10% unit)	0 - 200 %
- Jog feed override (10% unit)	0 - 2000 mm/min
- Manual per revolution feed	
- Override cancel	
- Rapid traverse override	F0, 25, 100 %
- Rapid traverse rate	
- Tangential speed constant control	
AUXILIARY / SPINDLE SPEED FUNCTION	
- 1st spindle orientation	
- Actual spindle speed output	
- Auxiliary function lock	
- Constant surface speed control	
- M - code function	M3 digits
- Multi spindle control	
- Rigid tapping	
- S - code function	S4 / S5digits
- Spindle serial output	S4 / S5 digits
- Spindle speed override	0 - 150 %
- Spindle synchronous control	
PROGRAM INPUT	
- Absolute/incremental programming	
- Addition of custom macro common variables	#100~#199, #500~#999
- Automatic coordinate system setting	
- Canned cycle for drilling	
- Canned cycle for turning	
- Circular interpolation by R programming	
- Control in/out	
- Coordinate system setting	G50
- Coordinate system shift	
- Custom macro B	
- Decimal point programming	
- pocket calculator type decimal point programming	
- Diameter/radius programming (X axis)	
- Direct drawing dimension programming	
- Direct input of coordinate system shift	
- G code system A	
- G code system B/C	
- Input unit 10 time multiply	
- Label skip	
- Macro executor	
- Manual absolute on and off	
- Maximum program dimension	± 8 digit
- Multiple repetitive canned cycle	C70 - C76
- Multiple repetitive canned cycle	
- Optional block skip	1 piece
- Optional block skip (with out hardware)	9 piece
- Parity check	
- Plane selection	G17,G18,G19
- Program number	O4 digit
- Program stop / end (M00, M01 / M02, M30)	

- Programmable data input (G10)	
- Sequence number	N5 digit
- SUB program call	4 folds nested
- Tape code : ISO / EIA auto recognition	EIA RS422/ISO840
- Tape format for FANUC Series15	
- Work coordinate system	G52 - G59
TOOL FUNCTION / TOOL COMPENSATION	
- Automatic tool offset	
- Direct input of offset value measured	
- Direct input of offset value measured B	
- T - code function	T2 + 2 digits
- Tool geometry / wear compensation	
- Tool life management	
- Tool nose radius compensation	
- Tool offset	G43, G44, G49
- Tool offset pairs (TT2000/2500 series)	64 pairs
- Tool offset pairs (TT1500/1800 series)	64 pairs
- Tool offset value counter input	
- Y-axis offset (TT SY type machine)	
EDITING OPERATION	
- Back ground editing	
- Extended part program editing	
- Number of registered programs	125 ea
- Part program editing	
- Part program storage length *1	640 m
- Program protect	
SETTING AND DISPLAY	
- Actual cutting feedrate display	
- Alarm display	
- Alarm history display	
- Current position display	
- Directory display and punch for each	
- Display of spindle speed and T code at all screens	
- External message display	
- Help function	
- Lock function	
- Multi-language display	english
- Operation history display	
- Parameter setting and display	
- Program name display	31 characters
- Run hours / parts count display	
- Self-diagnosis function	
- Servo setting screen	
- Spindle setting screen	
- Status display	
- Tool path graphic display	
DATA INPUT/OUTPUT	
- External key input	
- External program input	
- External work number search	15 points
- Memory card input/output	
- Reader/puncher interface	CH1.interface
- RS232C interface	
OTHERS	
- Cycle start and lamp	10.4 Color LCD
- Display unit	
- Feed hold and lamp	for 10.4 LCD
- MDI unit	
- NC and servo ready	PMC-SB7
- Reset / rewind	
- Reset / rewind	
INTERFACE FUNCTION	
- Ethernet function	Embedded ethernet
OPERATION GUIDANCE FUNCTION	
- EZ Guide (Conversational Programming Solution)	
OPTIONAL SPECIFICATIONS	
AXIS CONTROL	
- Chuck and tail stock barrier	
- Stored stroke 2 and 3	
- Stroke limit check before move	
OPERATION	
- DNC operation(Reader/puncher interface is required)	2 units
- Manual handle feed	
- Manual handle interruption	
- Reference position shift	
- Tool retract and recover	
INTERPOLATION FUNCTIONS	
- 3rd / 4th reference point return	
- Circular threading	
- Multi step skip	
- Variable lead threading	
FEED FUNCTION	
- Advanced preview control	
- External deceleration	
- Feed forward function	
- Feed stop	
PROGRAM INPUT	
- Automatic corner override	
- Coordinate system rotation	
- Interruption type custom macro	
- Optional block skip (with hardware)	9 piece
- Pattern data input	
- Work coordinate system preset	
TOOL FUNCTION / TOOL COMPENSATION	
- Addition of tool pairs for tool life management	128 pairs
- Tool monitoring system	
- Tool offset pairs (TT2000/2500 series)	99 / 400 / 999 pairs
- Tool offset pairs (TT1500/1800 series)	99 / 400 / 999 pairs
EDITING OPERATION	
- Number of registered programs	200 / 400 / 1000 ea
- Part program storage length *1	1280 / 2560 / 5120 m
- Play back	
SETTING AND DISPLAY	
- Directory display of floppy cassette	
DATA INPUT/OUTPUT	
- Data serverOnly for 1 path	
- DNC1 control	
- Remote bufferOnly for 1 path	
CONVERSATIONAL PROGRAMMING FUNCTION	
- Symbol CAP iT	
*1) - Sub cycle function - Automatic process determination	
- Animated simulation function - C-axis FAPT function	
- Y-axis FAPT function - Back machining function	
- Conversational screen display language change over	
ROBOT INTERFACE	
- Robot interface with PMC I/O module(Hardware between PMC I/O modules)	
- Robot interface with PROFIBUS-DP	

*1 : The standard part program storage length is available 80m, if end-user chooses "Tool monitoring system" as optional specifications.

*1) Function included in another option

PUMA TT 1500 / 1800



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