

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

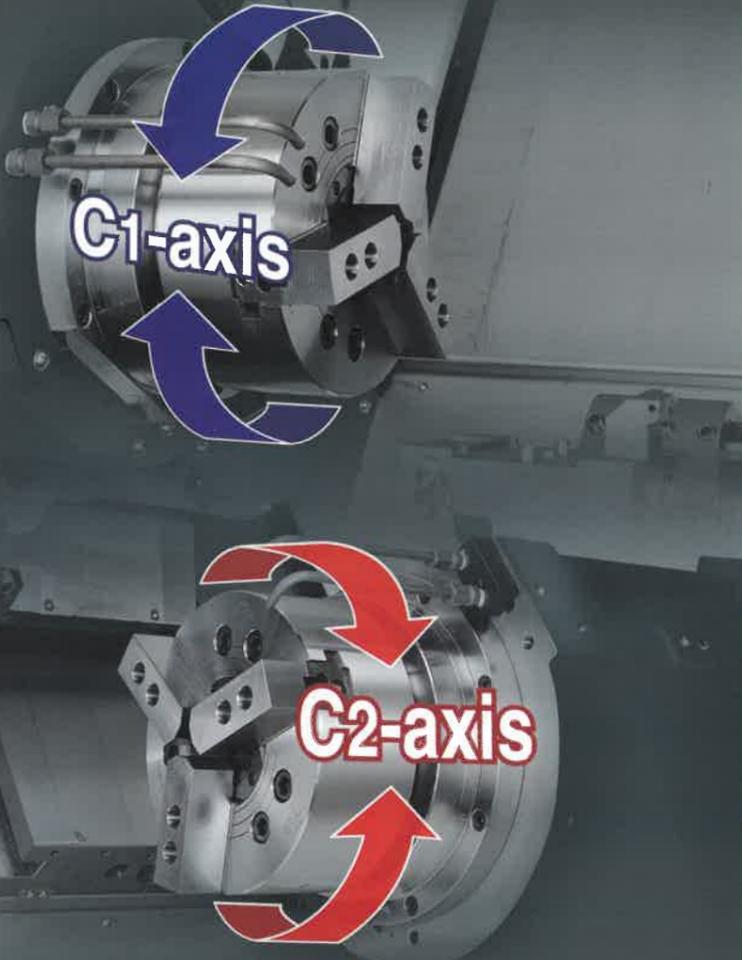


Main Spindle

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



Left and right same size spindle motor assemblies are designed for high precision whether performing low speed high power cutting or fine finishing at high speeds.

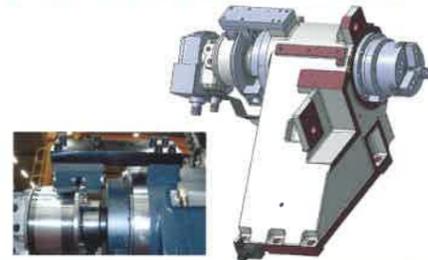
PUMA TT1500 series
Max. spindle speed Motor(30 min)
6000 r/min **15 kW**

PUMA TT1800 series
Max. spindle speed Motor(30 min)
5000 r/min **22 kW**

Hydraulic C-axis Brake

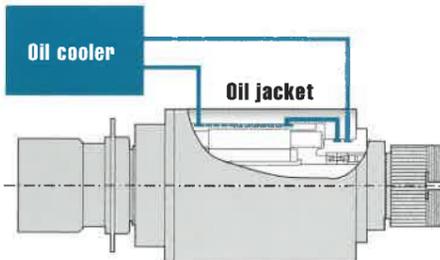
Forced Oil Lubrication on C-axis Brake to improve C-axis contouring control without stick Slip

C1, C2-axis index
360° (in 0.001° increment)

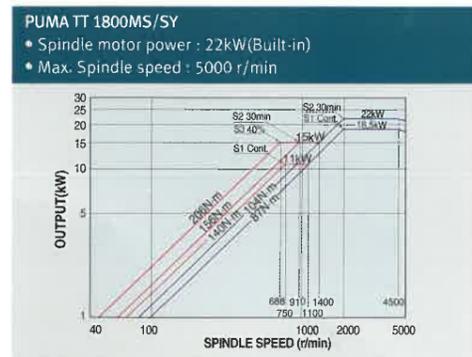
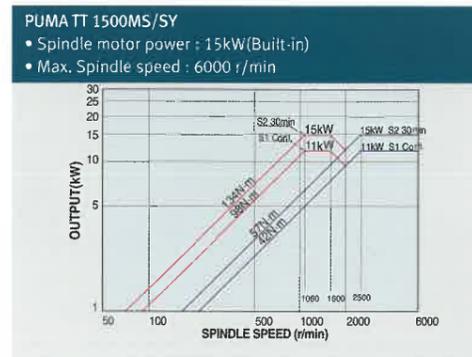


Oil Cooling Unit for Spindles

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.

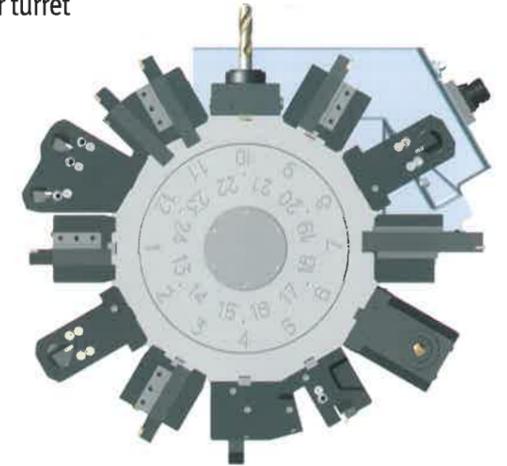
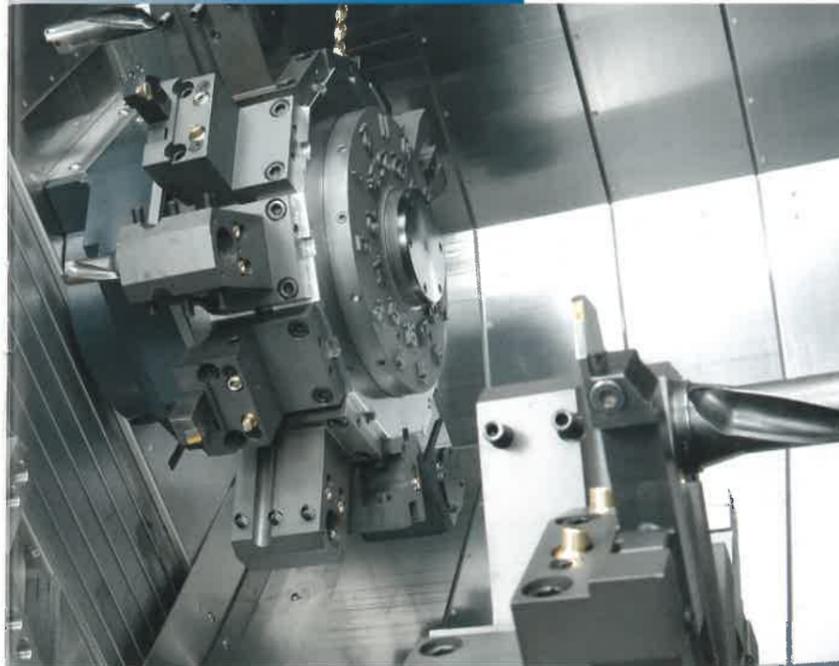


• Left & Right Spindle power-torque diagram



Turret

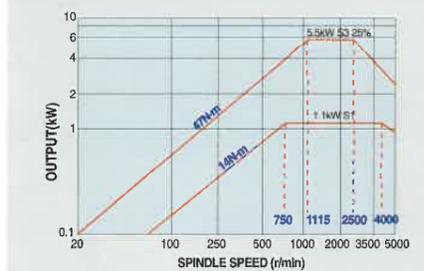
Harmonization of upper & lower turret



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

• Rotary tool spindle power-torque diagram

• Max. speed : 5000 r/min (5.5 kW)



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 A-axis) with equivalent rigidity to box way guide system are used to ensure smooth slide movement.

Z1,2-axis 40 m/min **A-axis 40 m/min**

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.

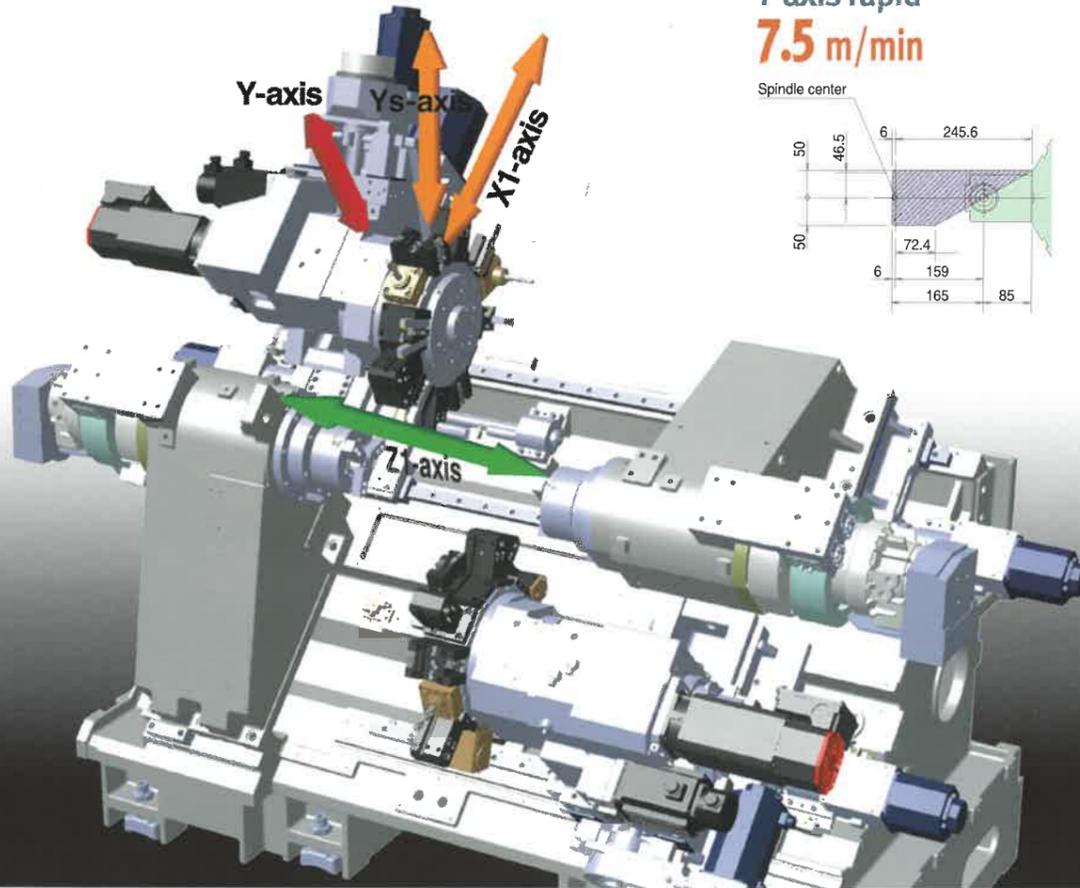


Accurate & Reliable Box Guide Ways (X1, X2, Y-axis)

X1,2-axis 20 m/min

Y-axis Function

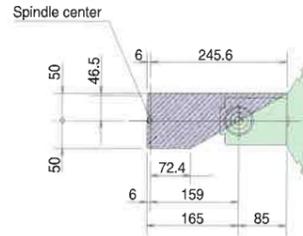
The addition of a Y-axis to the upper turret allows parts requiring complex machining to be completed in just one set-up. Synchronous interpolation of X1-axis and Ys-axis in a double way structure creates the Y-axis function.



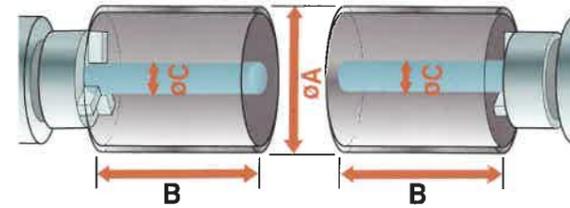
Y-axis Travels

Y-axis travel
100 mm (±50mm)

Y-axis rapid
7.5 m/min



Working Range

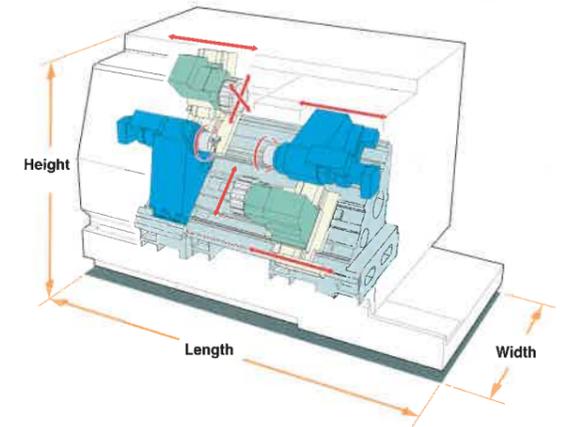


- A : Max. turning dia. **230 mm**
- B : Max. turning length **120(230) mm**
- C : Max. bar working dia. **51(67) mm**

Travel

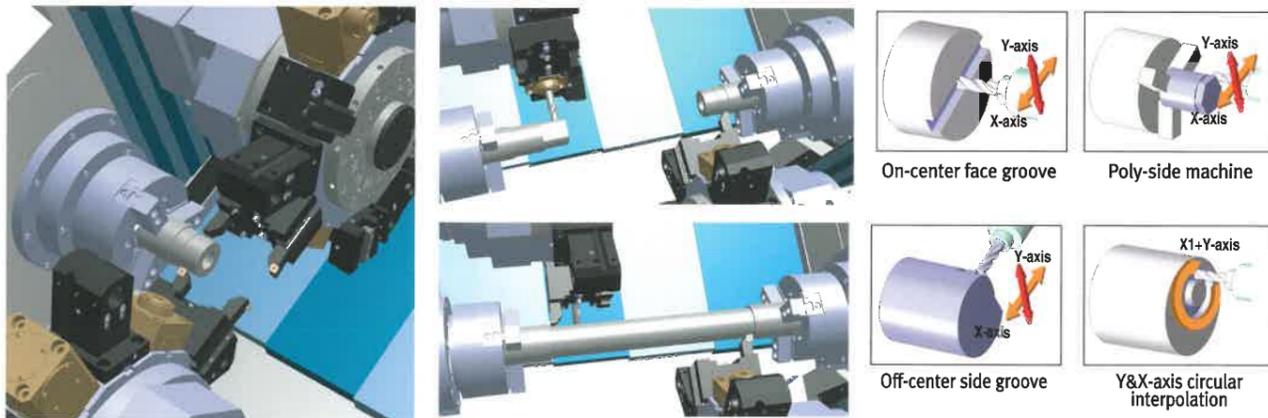
- X1axis (Upper turret) **165 mm**
 - X2-axis (Lower turret) **190 mm**
 - A-axis **540 (770) mm**
 - Z1axis (Upper turret) **470(700) mm**
 - Z2-axis (Lower turret) **490(720) mm**
- () : TT1800 series

Systemized compact structure



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

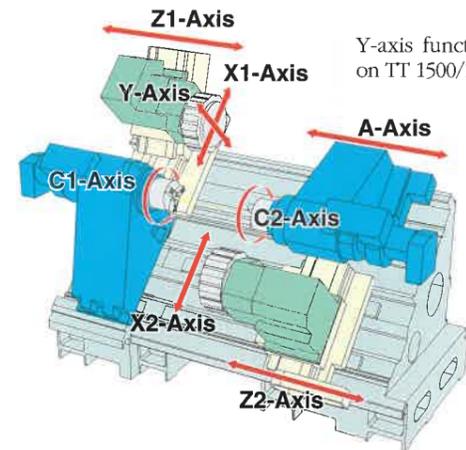
Multi-Axis Flexibility



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

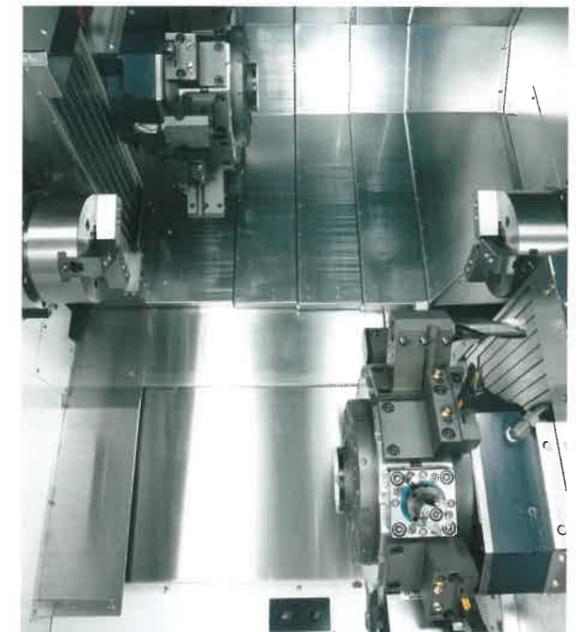
Machine Construction

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



Y-axis function is available on TT 1500/1800SY

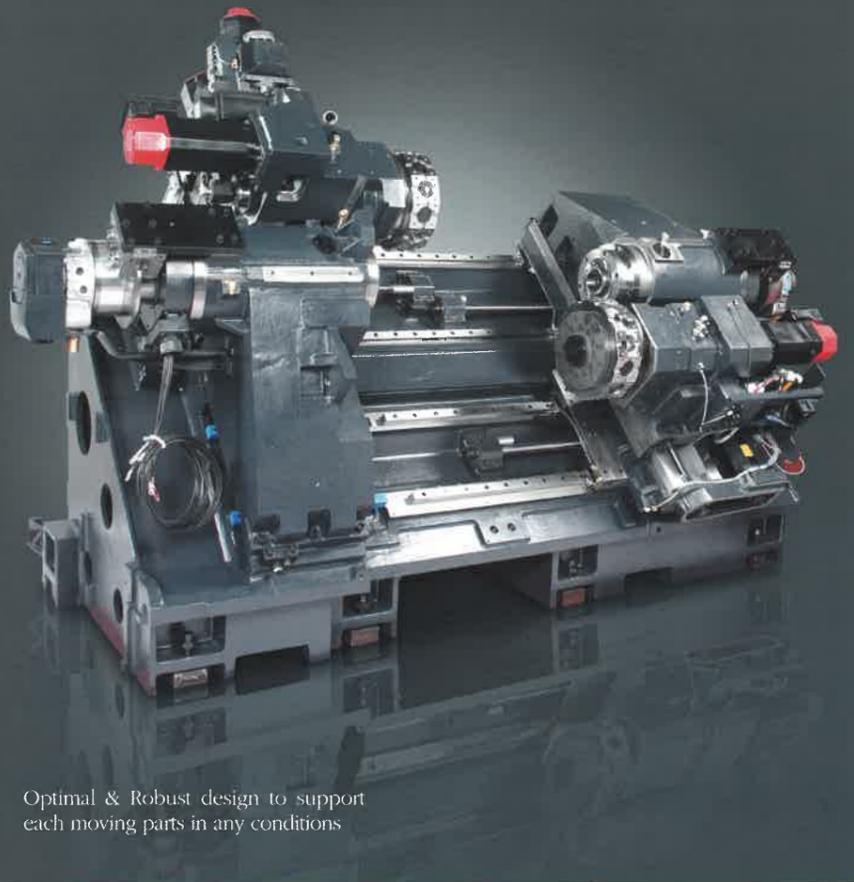
Accuracy and time saving by virtue of single set-up completion
Unmanned operation by automation support. Simple to complex processing by multitasking capability



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

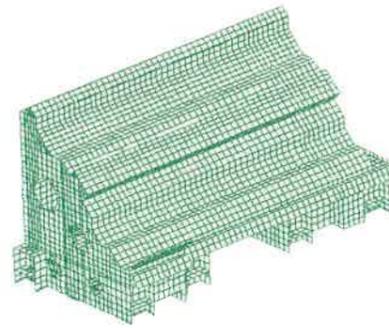
Robust Design

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

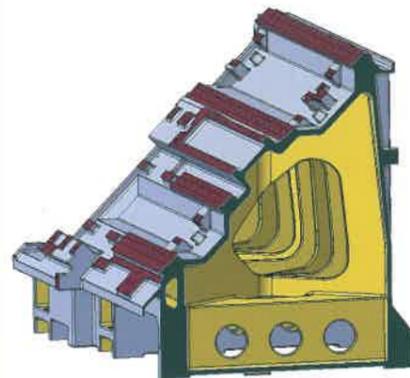


Optimal & Robust design to support each moving parts in any conditions

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.



FEM (Finite Element Method)

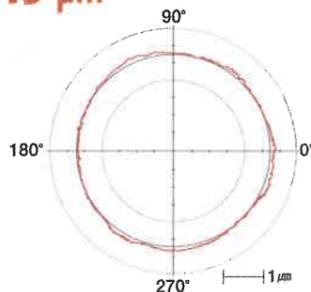


Torque tube of triangular frame

High Precision

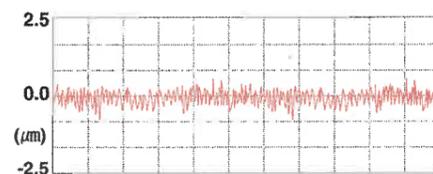
Roundness

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

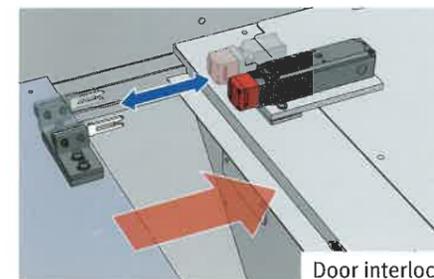
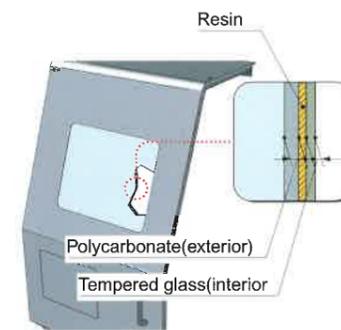
Carefully tailored ergonomic operating environment.

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.



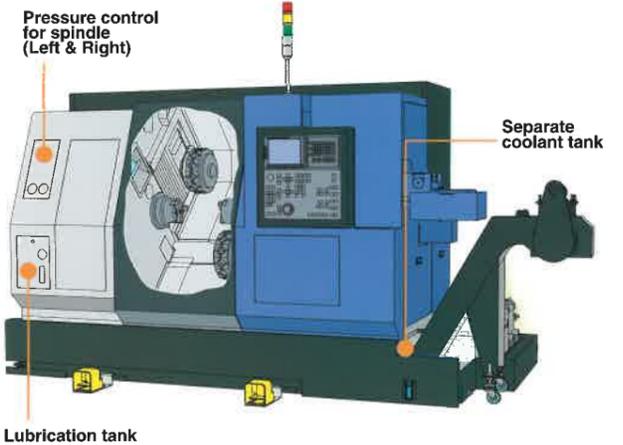
Door interlock

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

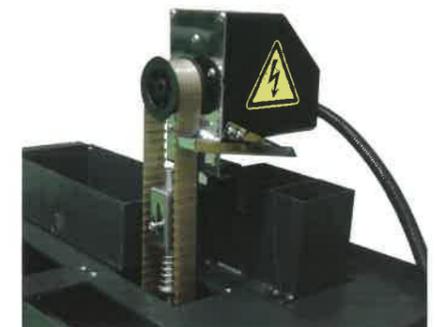
Less waste lubrication oil extends the life time of the coolant water and cut down the grime and offensive smell of the machine inside.

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

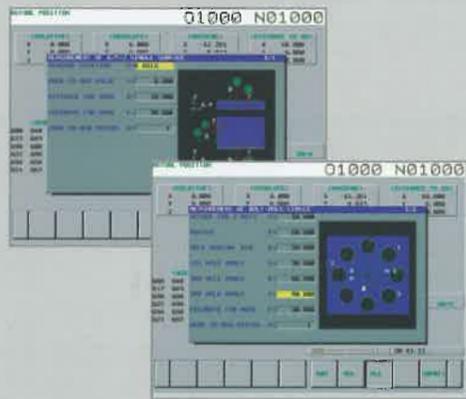
- High compact CNC is realized through LCD display with integrated CNC and a flash memory card interface is standard features.
- Provides many support functions for set-ups, such as tool measurement, workpiece measurement at the original point, and workpiece measurement inside the machine.
- Uses one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

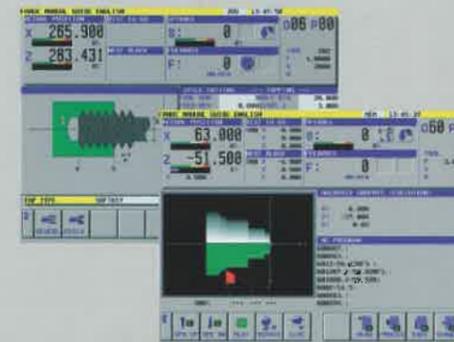
Tool management function



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.

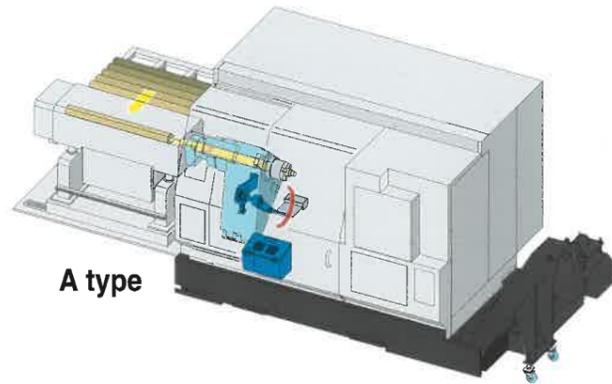


- Registration of parameter sets for high speed machining and/or for high precision machining with machine configurations.
- Instruction of precision level for desired machining selects appropriate parameters automatically.
- Precision level can be instructed through NC program.

Optional Equipments

Parts Catcher & Box

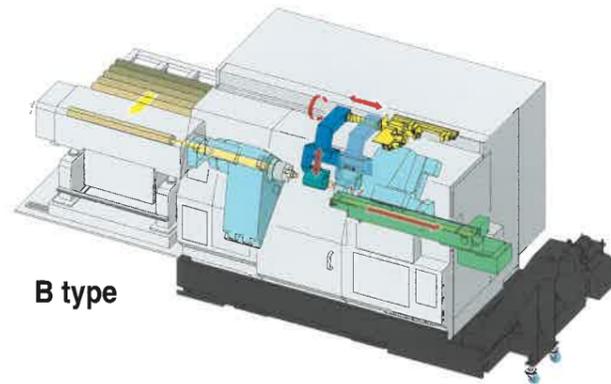
Parts catcher with parts box is available for unattended operation with a bar feeder. This system can handle the finished parts and also bar remnant from left spindle. A separate part conveyor is also available for more advanced applications.



A type

Parts Unloader & Conveyor

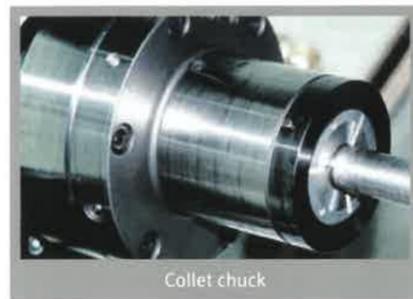
Parts unloader system built inside the machine can receive the finished parts from Right spindle. Automated operation is optimized when the system is coupled with a bar feeder system.



B type

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

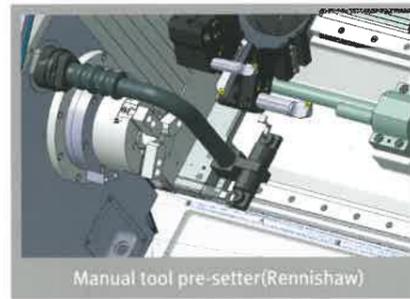
() : TT1800 series



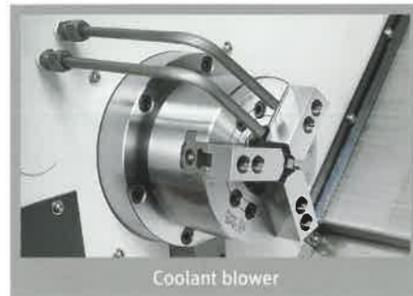
Collet chuck



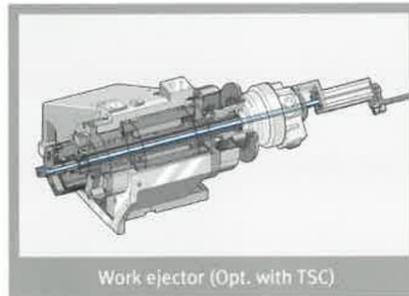
Auto tool pre-setter



Manual tool pre-setter(Rennishaw)



Coolant blower



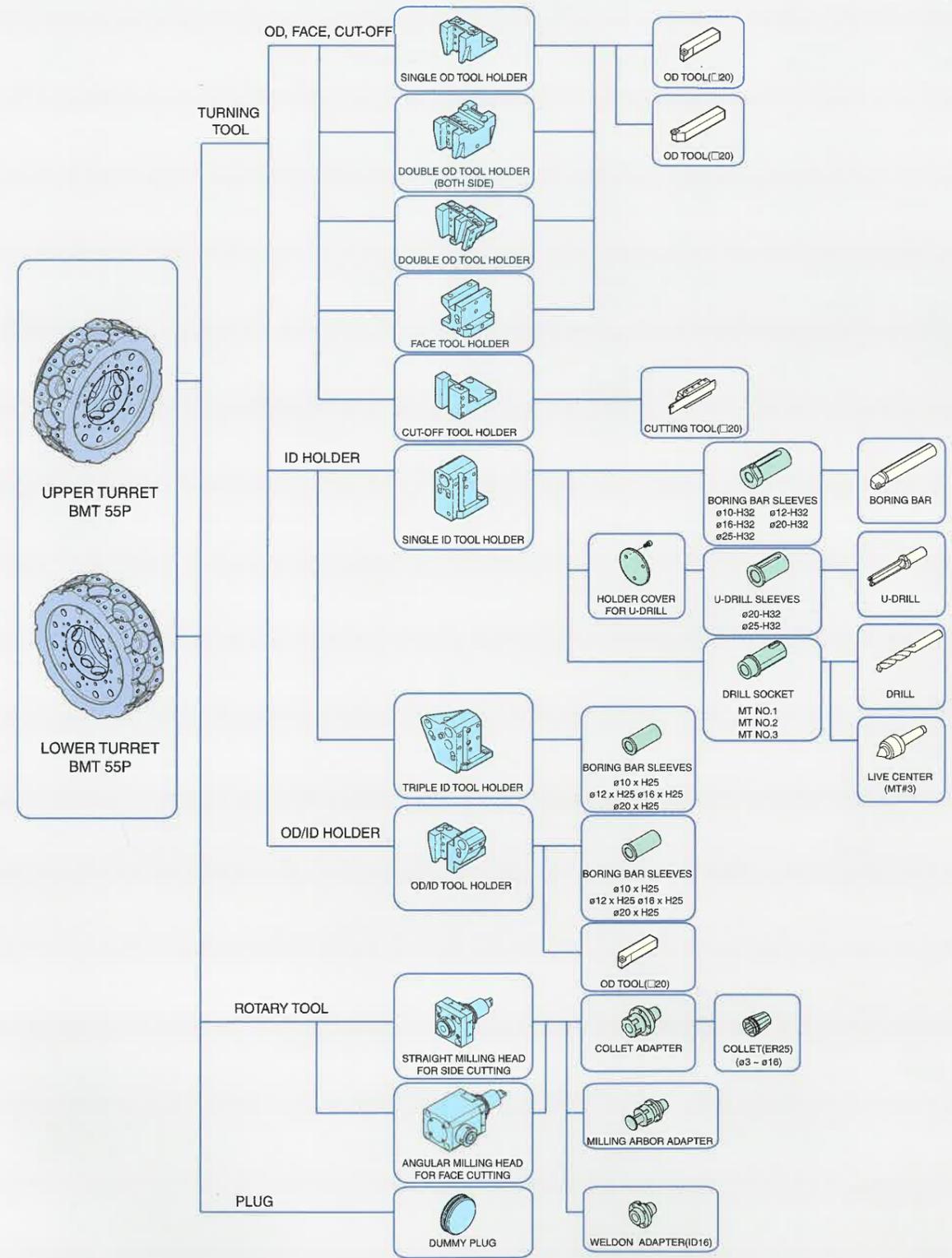
Work ejector (Opt. with TSC)



Oil mist collector

Tooling System (Upper & Lower turret)

unit : mm



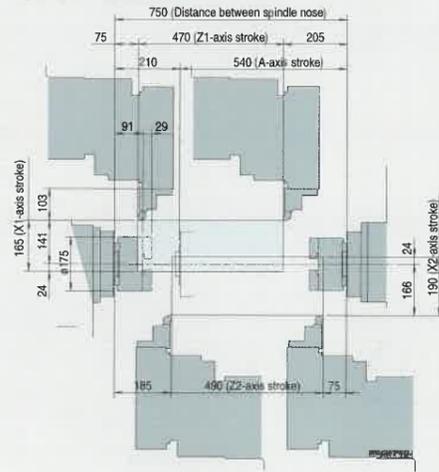
Note) Above tooling system is our recommendation. Depending on export condition, the standard tooling packed with the machine can be different.

Working Range

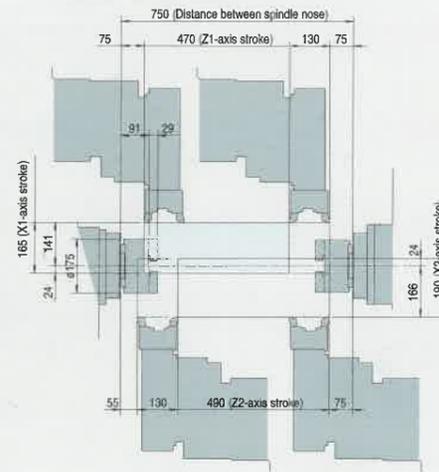
unit : mm

PUMA TT 1500 MS/SY

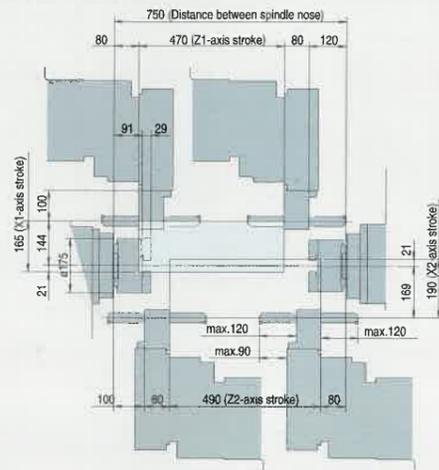
Single OD Tool holder



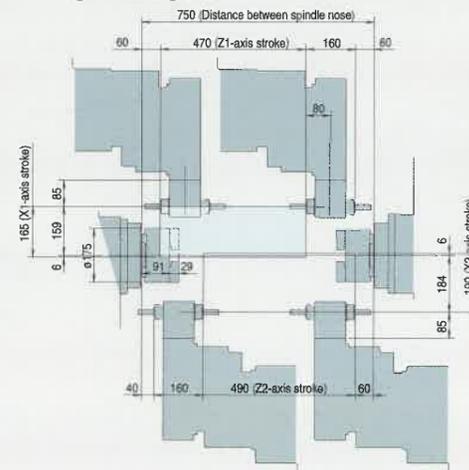
Double OD Tool holder



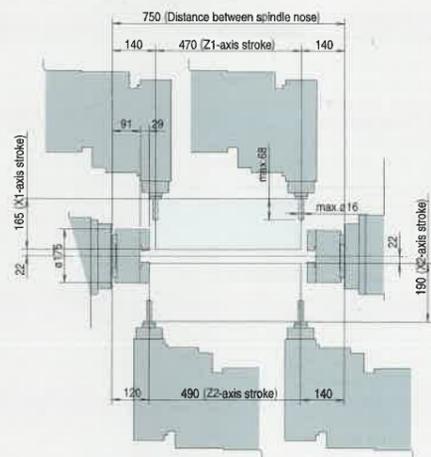
ID Tool holder



Angular milling head

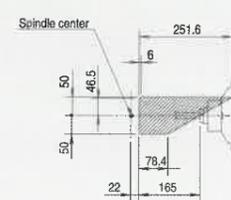


Straight milling head

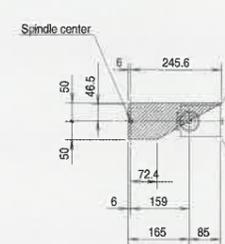


Y-axis travels

Straight milling head



Angular milling head

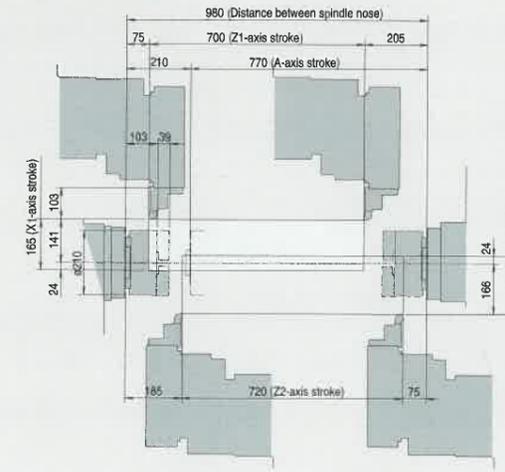


Working Range

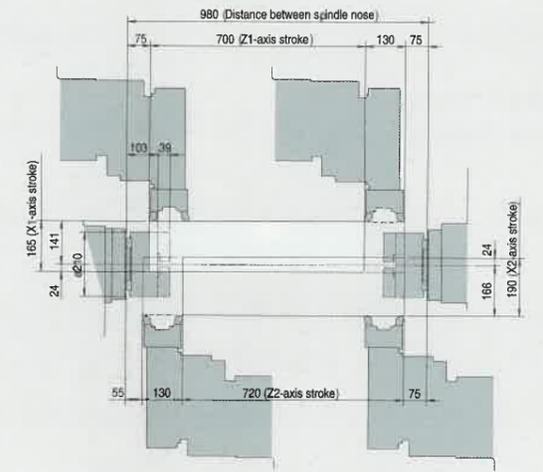
unit : mm

PUMA TT 1800 MS/SY

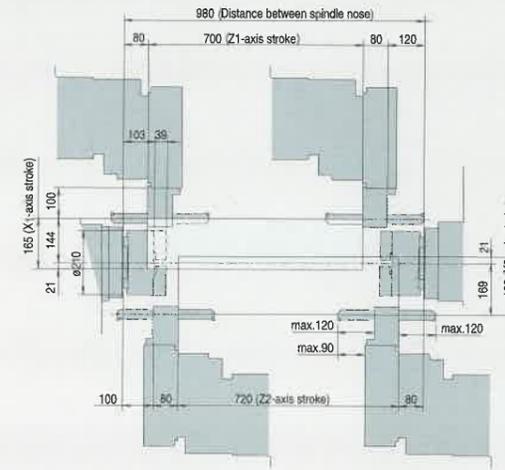
Single OD Tool holder



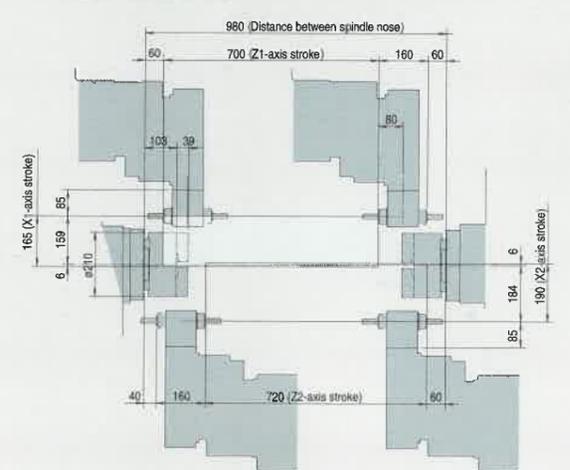
Double OD Tool holder



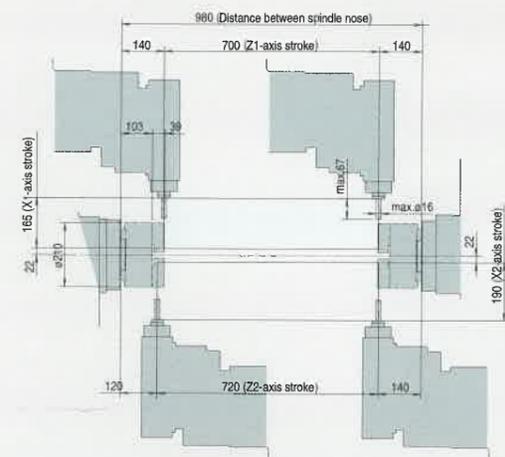
ID Tool holder



Angular milling head

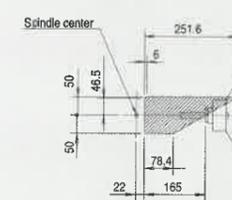


Straight milling head

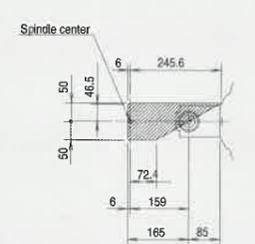


Y-axis travels

Straight milling head



Angular milling head



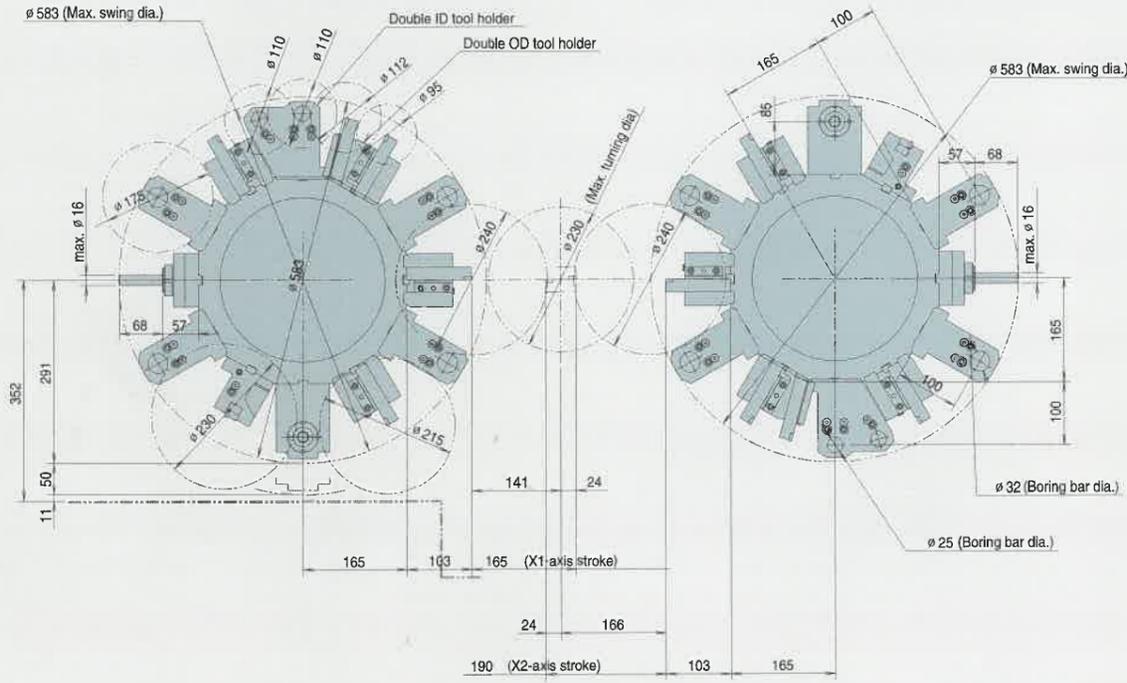
Tool Interference Diagram

unit : mm

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

UPPER TURRET (24 outills)

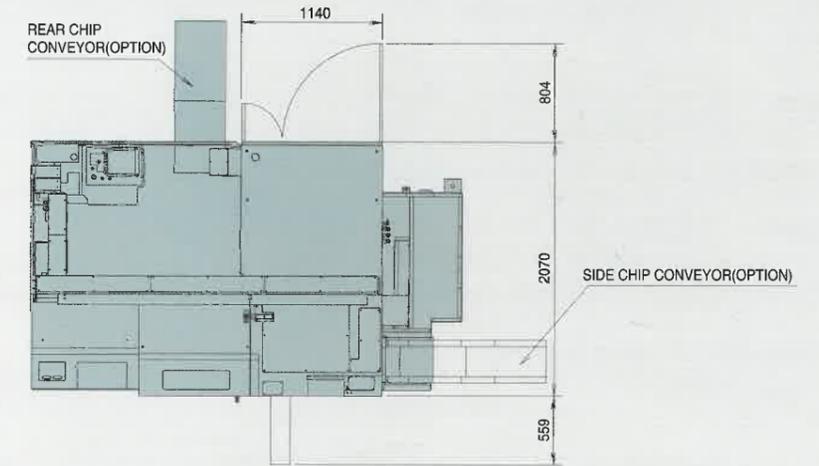
LOWER TURRET (24 outills)



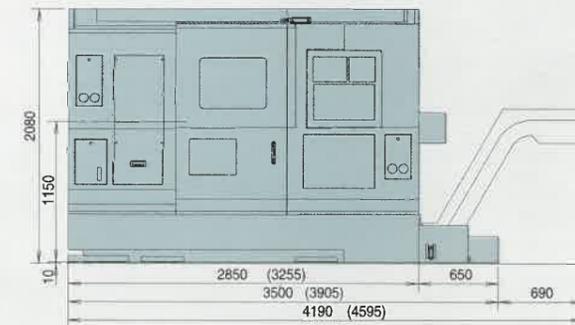
External Dimensions

unit : mm

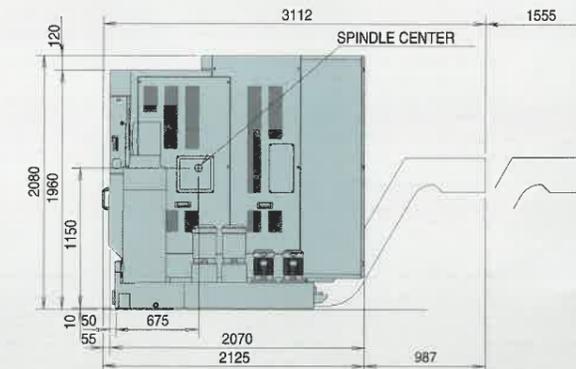
Top View



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	230	980	
	Swing over saddle	mm				
	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	ø62		ø76	
	Cs Spindle Index angle	deg	360 (in 0.001 deg. increment)			
Right Spindle	Cs Spindle Index Speed	r/min	600		600	
	Spindle speed	r/min	6000		5000	
	Spindle nose	ASA	A2#5		A2#6	
	Spindle bearing diameter (Front)	mm	90		110	
	Spindle through hole	mm	ø62		ø76	
	Cs Spindle Index angle	deg	360 (in 0.001 deg. increment)			
Carriage	Travel distance	X1/2-axis	mm	X1: 165 / X2: 190		
		Z1/2-axis	mm	Z1 : 470, Z2 : 490		
		A-axis	mm	540		770
		Y-axis	mm	-	100 <±50>	100 <±50>
		Rapid traverse	X1/2-axis	m/min	20	
	Max. cutting feedrate	Z1/2-axis	m/min	40		
		A-axis	m/min	40		
		Y-axis	m/min	-	7.5	7.5
		X1/2-axis	mm/rev	500		500
		Z1/2-axis	mm/rev	500		500
Turret (Upper+Lower)	No. of tool stations (Upper+Lower)	st	12 + 12 (24 + 24)			
	OD tool height	mm	20			
	Boring bar diameter	mm	ø32			
	Indexing time	s	0.15			
	Rotary tool spindle speed	r/min	5000			
	Left & Right spindle motor (Int./Cont)	kW	15 / 11		22 / 18.5	
Motor	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		
		A-axis	kW	2.7		
Y-axis	kW	1.6		1.6		
Other	Coolant pump	kW	0.9 x 2			
	Electric power supply (Rated capacity)	kVA	64.03	65.09	74.15	
	Machine height	mm	2080			
	Machine dimensions	length	mm	3500	3905	
	width	mm	2070			
Machine weight	kg	8200	8500	8600	8800	

Standard Feature

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

Optional Feature

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

• Design and specifications are subject to change without prior notice.
 • Doosan is not responsible for difference between the information in the catalogue and the actual machine.

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

NC Unit Specifications (Fanuc 31i-A)

AXES CONTROL

- Controlled path 2 path
- Controlled axes X1, Z1, C1, Y, X2, Z2, C2, A
- Simultaneous controlled axes 4 axes
- Angular axis control -
- Axis control by PMC
- Backlash compensation 0 ~ ±9999 pulses
- Backlash compensation for each rapid traverse and cutting feed
- Chamfering on / off
- Cs contouring control
- Synchronous / Composite control
- Emergency stop
- Follow-up
- HRV2 control
- Inch / Metric conversion
- Interlock All axes / each axis
- Least input command 0.001 / 0.0001 mm/inch
- Machine lock All axes / each axis
- Mirror image
- Overtravel
- Position switch
- Servo off
- Stored pitch error compensation
- Stored stroke check 1
- Torque control
- Interference check for rotary area
- Unexpected disturbance torque detection function

OPERATION

- Automatic operation (memory)
- MDI operation
- DNC Operation with Memory card
- Buffer register
- Dry run
- Handle incremental feed X1, X10, X100
- Program restart
- Wrong operation prevention
- JOG feed
- Manual handle feed 1 unit
- Manual intervention and return
- Manual pulse generator 1 ea
- Manual reference position return
- Program number search
- Reference position setting without dog
- Sequence number search
- Single block

INTERPOLATION FUNCTIONS

- Nano interpolation
- Positioning G00
- 1st. Reference position return Manual, G28
- 2nd. reference position return G30
- 3rd/4th reference position return
- Balance cutting
- Circular interpolation G02
- Continuous threading
- Cylindrical interpolation
- Dwell (per sec) G04
- Helical interpolation
- Linear interpolation G01
- Multiple threading
- Polar coordinate interpolation
- Reference position return check G27
- Skip G31
- 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 %
- Tangential speed constant control
- AI Contour control I (Look-ahead block no. is Max 30) G5.1 Q1

AUXILIARY / SPINDLE SPEED FUNCTION

- Spindle orientation
- Auxiliary function lock
- Constant surface speed control
- High speed M/S/T interface
- M - code function M3 digits
- Multi spindle control
- Rigid tapping
- S - code function S4 / S5 digits
- Spindle serial output S4 / S5 digits
- Spindle speed override 0 - 150 %
- Spindle synchronous control
- Spindle Output switching
- Actual spindle speed output
- Waiting function

PROGRAM INPUT

- Addition of custom macro common variables #100~#199, #500~#999
- Automatic coordinate system setting
- Canned cycle for drilling / Turning
- Canned cycle
- Circular interpolation by R programming
- Control in / out
- Coordinate system setting G50
- Coordinate system shift
- Custom macro
- 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 ± 9 digit
- Multiple repetitive canned cycle G70 - G76
- Multiple repetitive canned cycle II
- Optional block skip 9 pieces
- Parity check
- Plane selection G17, G18, G19
- Program file name 32 characters
- Program stop / end (M00, M01 / M02, M30)
- Programmable data input G10
- Sequence number N8 digit
- SUB program call 10 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 99 (Upper=50 / Lower=49) pairs
- Tool offset value counter input
- Y-axis offset

EDITING OPERATION

- Back ground editing
- Extended part program editing
- Memory card edit & operation
- Number of registered programs 1000 ea
- Part program editing
- Part program storage size Upper=640m / Lower=640m(512 kB)

SETTING AND DISPLAY

- Program protect
- Actual cutting feedrate display
- Alarm display
- Alarm history display
- Current position display
- Periodic maintenance screen
- Display of spindle speed and T code at all screens

- Help function
- Optional path name display (Only for 2path)
- Multi-language display
- Operation history display
- Parameter setting and display
- Program comment display 31 characters
- Run hours / part count display
- Self-diagnosis function
- Servo setting screen
- Spindle setting screen
- Status display
- Operating monitor screen
- Servo waveform display

DATA INPUT / OUTPUT

- External key input
- External data input
- External work number search 15 points
- Memory card input/output
- Reader / puncher interface CH1.interface
- RS232C interface
- Automatic data backup
- Screen hard copy

OTHERS

- Cycle start and lamp
- Display unit 10.4" Color TFT LCD
- Feed hold and lamp
- NC and servo ready
- PMC system 31iA-PMC
- Reset / rewind

OPERATION GUIDANCE FUNCTION

- EZ Guide 1 (Conversational Programming Solution)

INTERFACE FUNCTION

- Ethernet function Embedded ethernet

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)
- Manual handle feed 2 units
- Manual handle interruption
- Reference position shift
- Tool retract and recover

INTERPOLATION FUNCTIONS

- 3rd / 4th reference point return
- Circular threading
- Multi step skip
- Polygon machining with two spindle
- Variable lead threading

FEED FUNCTION

- AI Contour Control II 200 blocks
- External deceleration
- Feed stop

PROGRAM INPUT

- Addition of workpiece coordinate system pair 48 pairs
- Automatic corner override
- Interruption type custom macro
- Pattern data input
- Work coordinate system preset
- Optional block skip (Soft operator's panel) 9 pieces

TOOL FUNCTION / TOOL COMPENSATION

- Tool Load Monitoring system
- Tool offset pairs 200 / 400 / 999 pairs

EDITING OPERATION

- Number of registered programs 2000 / 4000 ea
- Part program storage length 2560 / 5120 m
- Play back

SETTING AND DISPLAY

- Directory display of floppy cassette

DATA INPUT / OUTPUT

- Data server Only for 1 path
- Fast Ethernet function
- Remote buffer Only for 1 path

ROBOT INTERFACE

- Robot interface with PMC I/O module (Hardware between PMC I/O modules)
- Robot interface with PROFIBUS-DP