PUMA TT 1500
Multi-Axis Turning Center

Doosan Machine Tools
Optimal Solutions for the Future
PUMA TT 1500

Systemized completion of twin turrets and twin spindles, PUMA TT1500 series are another solution to get high productivity, and handle small-sized & complex parts for mass production at small lot.
Multi-axis Turning Center Combines Y-axis Function, Two Spindles and Upper & Lower Turret in a Compact Machine
Main Spindle

Left & Right spindle have the same capacity
• 6 inch Chuck
• Bar working dia. 51mm (2.0inch)

Max. spindle speed
6000 r/min

Motor (30 min)
15 kW (20.1 Hp)

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

- Spindle motor power : 15kW (20.1Hp)(Built-in)
- Max. Spindle speed : 6000 r/min
Rapid Traverse

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)

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.

- **X1,2-axis**: 20 m/min (787.4 ipm)
- **Z1,2-axis**: 40 m/min (1574.8 ipm)
- **A-axis**: 40 m/min (1574.8 ipm)

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)

Rotary tool spindle power-torque diagram

- Max. speed: 5000 r/min (5.5 kW (7.4Hp))

Accurate & Reliable Box Guide Ways (X1, X2, Y-axis)
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) (3.9 inch (±2.0 inch))
Y-axis rapid
7.5 m/min (295.3 ipm)

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.
Working Range

A : Max. turning dia.  230 mm (9.1 inch)
B : Max. turning length  120 mm (4.7 inch)
C : Max. bar working dia.  51 mm (2.0 inch)

Travel
X1-axis (Upper turret)  165 mm (6.5 inch)
Z1-axis (Upper turret)  470 mm (18.5 inch)
X2-axis (Lower turret)  190 mm (7.5 inch)
Z2-axis (Lower turret)  490 mm (19.3 inch)
A-axis  540 mm (21.3 inch)

Systemized Compact Structure

<table>
<thead>
<tr>
<th>Model</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUMA TT1500</td>
<td>3500 (137.8)</td>
<td>2070 (81.5)</td>
<td>2080 (81.9)</td>
</tr>
</tbody>
</table>

Machine Construction

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

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.

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)

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

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**
Pressure control for spindle (Left & Right)

**Door interlock**

**Resin**
Polycarbonate(exterior)
Tempered glass(interior)

**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**
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.
CNC

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

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.

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.
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).

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.

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

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

Tool load monitoring system

Tool management function

Easy operation system

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

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.

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.

Max. work diameter: \(51 \text{ mm} \) (\(2.0 \text{ inch}\))
Max. work length: \(100 \text{ mm} \) (\(3.9 \text{ inch}\))
Max. work weight: \(3 \text{ kg} \) (\(6.6 \text{ lb}\))

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)

PUMA TT 1500S / MS / SY

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

PUMA TT 1500S / MS / SY

Single OD Tool holder

Double OD Tool holder

ID Tool holder

unit: mm (inch)
Working Range

Angular milling head

Straight milling head

Y-axis travels

<table>
<thead>
<tr>
<th>Straight milling head</th>
<th>Angular milling head</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spindle center</td>
<td>Spindle center</td>
</tr>
<tr>
<td>251.69 (9.5)</td>
<td>256.60 (10.1)</td>
</tr>
<tr>
<td>48.0</td>
<td>48.0</td>
</tr>
<tr>
<td>28.43 (1.1)</td>
<td>22.42 (0.9)</td>
</tr>
<tr>
<td>436.5</td>
<td>503.8</td>
</tr>
<tr>
<td>190.0</td>
<td>190.0</td>
</tr>
</tbody>
</table>
Tool Interference Diagram

PUMA TT 1500S / MS / SY

unit: mm (inch)

UPPER TURRET

LOWER TURRET
External Dimensions

Top View

Front View

Side View

unit: mm (inch)
## Machine Specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit</th>
<th>PUMA TT1500S / MS</th>
<th>PUMA TT1500SY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capacity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swing over saddle</td>
<td>mm (inch)</td>
<td>230 (9.1)</td>
<td></td>
</tr>
<tr>
<td>Recom. Turning diameter</td>
<td>mm (inch)</td>
<td>175 (6.9)</td>
<td></td>
</tr>
<tr>
<td>Max. Turning diameter</td>
<td>mm (inch)</td>
<td>Upper Turret : 230 (9.1) / Lower Turret : 230 (9.1)</td>
<td></td>
</tr>
<tr>
<td>Max. Turning length (on each spindle)</td>
<td>mm (inch)</td>
<td>120 (4.7)</td>
<td></td>
</tr>
<tr>
<td>Bar working diameter</td>
<td>mm (inch)</td>
<td>51 (2.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Travels</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel distance X1 / 2-axis</td>
<td>mm (inch)</td>
<td>X1: 165 (6.5) / X2: 190 (7.5)</td>
<td></td>
</tr>
<tr>
<td>Z1 / 2-axis</td>
<td>mm (inch)</td>
<td>Z1: 470 (18.5), Z2: 490 (19.3)</td>
<td></td>
</tr>
<tr>
<td>A-axis</td>
<td>mm (inch)</td>
<td>540 (21.3)</td>
<td></td>
</tr>
<tr>
<td>Y-axis</td>
<td>mm (inch)</td>
<td>-</td>
<td>100 (3.9) x50 (2.0)</td>
</tr>
<tr>
<td><strong>Feedrates</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spindle speed</td>
<td>r/min</td>
<td>6000</td>
<td></td>
</tr>
<tr>
<td>Spindle nose</td>
<td>ASA</td>
<td>A285</td>
<td></td>
</tr>
<tr>
<td>Spindle bearing diameter (Front)</td>
<td>mm (inch)</td>
<td>90 (3.5)</td>
<td></td>
</tr>
<tr>
<td>Spindle through hole</td>
<td>mm (inch)</td>
<td>62 (2.4)</td>
<td></td>
</tr>
<tr>
<td>Cs Spindle Index angle</td>
<td>deg</td>
<td>360 (in 0.001 deg, increment)</td>
<td>600</td>
</tr>
<tr>
<td>Cs Spindle Index Speed</td>
<td>r/min</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td><strong>Left Spindle</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of tool stations (Upper+Lower)</td>
<td>st</td>
<td>12+12 (24+24)</td>
<td></td>
</tr>
<tr>
<td>OD tool height</td>
<td>mm (inch)</td>
<td>20 (0.8)</td>
<td></td>
</tr>
<tr>
<td>Boring bar diameter</td>
<td>mm (inch)</td>
<td>32 (1.3)</td>
<td></td>
</tr>
<tr>
<td>Indexing time</td>
<td>s</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Rotary tool spindle speed</td>
<td>r/min</td>
<td>5000</td>
<td></td>
</tr>
<tr>
<td><strong>Right Spindle</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Turret (Upper+Lower)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left &amp; Right spindle motor (Int/Cont)</td>
<td>kW (hp)</td>
<td>15 (20.1) / 11 (14.8)</td>
<td></td>
</tr>
<tr>
<td>Rotary tool spindle motor (10min/Cont)</td>
<td>kW (hp)</td>
<td>5.5 (7.4) / 1.1 (1.5)</td>
<td></td>
</tr>
<tr>
<td><strong>Motor</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Servo motor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X1-axis</td>
<td>kW (hp)</td>
<td>3.0 (4.0)</td>
<td></td>
</tr>
<tr>
<td>X2-axis</td>
<td>kW (hp)</td>
<td>1.6 (2.1)</td>
<td></td>
</tr>
<tr>
<td>Z1-axis</td>
<td>kW (hp)</td>
<td>2.7 (3.6)</td>
<td></td>
</tr>
<tr>
<td>Z2-axis</td>
<td>kW (hp)</td>
<td>2.7 (3.6)</td>
<td></td>
</tr>
<tr>
<td>A-axis</td>
<td>kW (hp)</td>
<td>1.6 (2.1)</td>
<td></td>
</tr>
<tr>
<td>Y-axis</td>
<td>kW (hp)</td>
<td>-</td>
<td>1.6 (2.1)</td>
</tr>
<tr>
<td><strong>Power source</strong></td>
<td></td>
<td>Electric power supply (rated capacity)</td>
<td>kVA</td>
</tr>
<tr>
<td><strong>Machine Dimensions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>mm (inch)</td>
<td>2080 (81.9)</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>mm (inch)</td>
<td>3500 (137.8)</td>
<td></td>
</tr>
<tr>
<td>Width</td>
<td>mm (inch)</td>
<td>2070 (81.5)</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>kg (lb)</td>
<td>8500 (18739.0)</td>
<td></td>
</tr>
</tbody>
</table>

### 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 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)

* : It should be reviewed in detail before contract.

Note: The specifications and information above-mentioned may be changed without prior notice.

For more details, please contact Doosan
NC Unit Specifications
Fanuc 31i

**AXES CONTROL**
- Controlled pair
- Controlled axes X1, X2, Y1, Y2, Z1, Z2, C1, C2
- Angular axis control
- Manual control by PMC
- Backlash compensation
- Backlash compensation for each rapid traverse and cutting feed
- Chattering on / off
- Cs containing control
- Synchronous / Composite control
- Emergency stop
- Power-up
- HRx2 control
- Index / Metric conversion
- Interlock
- Max. all axes / each axis
- Mirror image
- Overtravel
- Position detection
- Servo off
- Autonomous controlled axes 4 axes
- Stored pitch error compensation
- Stored stroke check
- Torque control
- Unexpected disturbance torque detection function

**PROGRAM INPUT**
- Addition of custom macro common variables
- Automatic coordinate system setting
- Canned cycle for drilling / turning
- Circular interpolation by K programming
- Control in / out
- Coordinate system setting
- Coordinate system shift
- Custom macro
- Decimation point programming
- Pocket calculator type decimal point programming
- 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 I
- Multiple repetitive canned cycle II
- Optional block skip
- Parity check
- Plane selection G17, G18, G19
- Program file name 32 characters
- Program stay / end (M00, M01 / M02, M30)
- Programmable data input G10
- Sequence number NB digit
- SUB program call 10 folds repeated
- Tape code: ISO / EIA auto recognition
- 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 &
- T - code function T2 +2 digits
- Tool geometry / wear compensation
- Tool nose radius compensation
- Tool offset G63, G44, G64
- 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 editor & operation
- Number of registered programs 1000 ea
- Part program editing
- Part program storage size: Upper=640m / Lower=640m (512 kB)
- Program protect

**SETTING AND DISPLAY**
- Actual cutting feedrate display
- Alarm display
- Alarm history display
- Current position display
- Display of maintenance screen
- Display of spindle speed and T code at all screens
- Help function
- Optional name path display (Only for 2path)
- Multi-language display
- Operating monitor screen
- Operation history display
- Parameter setting and display
- Program comment display
- Run hours / part count display
- Self-diagnosis function
- Servo selling screen

**DATA INPUT / OUTPUT**
- Automatic data backup
- External key input
- External data input
- External work number search 15 points
- Memory card input / output
- Reader / puncher interface CFI, interface
- RS232 interface
- Screen hard copy

**OTHERS**
- Cycle start and lamp
- Display unit 35.4” Color TFT LCD
- Feed hold and lamp
- NC and servo ready
- PMC, system 31A-PMC
- Reset / rewind

**OPTIONAL SPECIFICATIONS**

**AXIS CONTROL**
- Chuck and tail stock barrier
- Stroke limit check before move

**OPERATION**
- DNC operation (Reader/puncher interface is required)
- Manual handle 2 units
- Manual handle interruption
- Reference position shift

**INTERPOLATION FUNCTIONS**
- Circular interpolation
- Multi axis skip
- Polygon machining with two spindles
- Variable lead handling

**FEED FUNCTION**
- At Contour Control II 200 blocks
- Maximum deceleration
- Feed stop

**PROGRAM INPUT**
- Addition of workpiece coordinate system pair 99 pairs
- Automatic corner override
- Intermillen Type custom macro
- Optional block skip (Soft operator’s panel) 9 pieces
- Pattern data input
- Work coordinate system preset

**TOOL FUNCTION / TOOL COMPENSATION**
- Tools offset pairs 1,000 / 4,000 ea
- Automatic corner override
- Coordinate system shift

**EDITING OPERATION**
- Number of registered programs 2,000 / 4,000 ea
- Part program storage length 2560 / 5120 m

**SETTING AND DISPLAY**
- Display operation of display cassette

**DATA INPUT / OUTPUT**
- Data server
- Fast Ethernet function
- Remote buffer

**ROBOT INTERFACE**
- Robot interface with PMC & motors
- Robot interface with PROFIBUS-DP