PUMA TT 1500/1800
Multi-Axis Turning Center
PUMA TT 1500/1800

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.
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
TT1500MS/SY  
- 6 inch Chuck  
- Bar working dia. 51mm (2.0inch)

TT1800MS/SY  
- 8 inch Chuck  
- Bar working dia. 65mm (2.6inch)

**PUMA TT1500 series**
Max. spindle speed  
6000 r/min  
Motor (30 min)  
15 kW (20.1 Hp)

**PUMA TT 1800 series**
Max. spindle speed  
5000 r/min  
Motor (30 min)  
22 kW (29.5 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

**PUMA TT1500MS/SY**
- Spindle motor power: 15kW(20.1Hp)(Built-in)
- Max. Spindle speed: 6000 r/min

**PUMA TT1800MS/SY**
- Spindle motor power: 22kW(29.5Hp)(Built-in)
- Max. Spindle speed: 5000 r/min
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

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.

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

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 Y-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 (230) mm (4.7 (9.1) inch)
C : Max. bar working dia. 51 (65) mm (2.0 (2.6) inch)

Travel
X1-axis (Upper turret) 165 mm (6.5 inch)
X2-axis (Lower turret) 190 mm (7.5 inch)
A-axis 540 (770) mm (21.3 (30.3) inch)
Z1-axis (Upper turret) 470 (700) mm (18.5 (27.6) inch)
Z2-axis (Lower turret) 490 (720) mm (19.3 (28.3) inch)

Systemized Compact Structure

<table>
<thead>
<tr>
<th>Model</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
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</thead>
<tbody>
<tr>
<td>TT1500SY</td>
<td>3500(137.8)</td>
<td>2070(81.5)</td>
<td>2080(81.9)</td>
</tr>
<tr>
<td>TT1800SY</td>
<td>3905(153.7)</td>
<td>2070(81.5)</td>
<td>2080(81.9)</td>
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</tbody>
</table>

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.

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

<table>
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<tr>
<th>Roundness</th>
<th>Roughness</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.45 µm</td>
<td>0.16 µm (Ra)</td>
</tr>
</tbody>
</table>

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)

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.
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

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.

**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.

**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 function consisted of tool pre-check function, substitutive tool selection with tool life management and different tool & tool number command function.
### 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](image1)

#### 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](image2)

- **Max. work diameter:** \( \varnothing 51 \text{ (\varnothing 65)} \) mm
  \( \text{ (\varnothing 2.0 (\varnothing 2.6) inch)} \)
- **Max. work length:** \( 100 \text{ (150)} \) mm
  \( \text{ (\varnothing 3.9 (\varnothing 5.9) inch)} \)
- **Max. work weight:** \( 3 \) kg \( \text{ (6.6 lb)} \)

![Collet chuck](image3)

- **Auto tool pre-setter**
  - ![Auto tool pre-setter](image4)

- **Manual tool pre-setter (Rennishaw)**
  - ![Manual tool pre-setter](image5)

- **Coolant blower**
  - ![Coolant blower](image6)

- **Work ejector (Opt. with TSC)**
  - ![Work ejector](image7)

- **Oil mist collector**
  - ![Oil mist collector](image8)
Tooling System (Upper & Lower turret)

- **Upper Turret BMT 55P**
- **Lower Turret BMT 55P**

**Turning Tool**
- Single OD Tool Holder
- Double OD Tool Holder (Both Side)
- Single ID Tool Holder
- Cut-Off Tool Holder
- OD Tool (Ø20)
- OD Tool (Ø20)

**ID Holder**
- Single ID Tool Holder
- Triple ID Tool Holder
- OD/ID Tool Holder
- OD Tool (Ø20)
- Boring Bar Sleeves (Ø10 x H25, Ø12 x H25, Ø16 x H25, Ø20 x H25)
- Boring Bar Sleeves (Ø25 x H32, Ø30 x H32)
- Boring Bar Sleeves (Ø35 x H32, Ø40 x H32)

**OD/ID Holder**
- OD Tool (Ø20)
- Boring Bar Sleeves (Ø10 x H25, Ø12 x H25, Ø16 x H25, Ø20 x H25)
- Boring Bar Sleeves (Ø25 x H32, Ø30 x H32)
- Boring Bar Sleeves (Ø35 x H32, Ø40 x H32)

**Rotary Tool**
- Straight Milling Head for Side Cutting
- Angular Milling Head for Face Cutting
- Dummy Plug
- Weldon Adapter (ID16)
- Collet (ER25)
- Collet Adapter (Ø3 - Ø16)

**Unit:** mm (inch)

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 1500 MS/SY**

**Single OD Tool holder**

**Double OD Tool holder**

**ID Tool holder**

**Angular milling head**

**Straight milling head**

**Y-axis travels**

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*unit: mm (inch)*
Working Range

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

unit: mm (inch)
Tool Interference Diagram

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

unit: mm (inch)
External Dimensions

Top View

Front View

Side View

unit: mm (inch)

( ) : PUMA TT 1800 Series
## Machine Specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit</th>
<th>PUMA TT1500MS</th>
<th>PUMA TT1500SY</th>
<th>PUMA TT1800MS</th>
<th>PUMA TT1800SY</th>
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<td><strong>Capacity</strong></td>
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<td></td>
<td></td>
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<td>Swing over saddle</td>
<td>mm (inch)</td>
<td>230 (9.1)</td>
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<td>Recom. Turning diameter</td>
<td>mm (inch)</td>
<td>175 (6.9)</td>
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<td>210 (8.3)</td>
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<td>Max. Turning diameter (mm (inch)</td>
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<tr>
<td>Max. Turning length (on each spindle)</td>
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<td>65 (2.6)</td>
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<td><strong>Travels</strong></td>
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<tr>
<td>Travel distance</td>
<td>X1/2-axis</td>
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<td>X1: 165 (6.5) / X2: 190 (7.5)</td>
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<tr>
<td></td>
<td>Z1/2-axis</td>
<td>mm (inch)</td>
<td>Z1: 470 (18.5), Z2: 490 (19.3)</td>
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<tr>
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<td>Y-axis</td>
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<td>- 100 (3.9) ±50 (2.0)</td>
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<td><strong>Feedrates</strong></td>
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<td>Rapid traverse</td>
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<td>- 7.5 (295.3)</td>
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<td>5000</td>
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<tr>
<td>Spindle nose</td>
<td>ASA</td>
<td>A2#5</td>
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<td>A2#6</td>
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<tr>
<td>Spindle bearing diameter (Front)</td>
<td>mm (inch)</td>
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<td>110 (4.3)</td>
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<tr>
<td>Spindle through hole</td>
<td>mm (inch)</td>
<td>62 (2.4)</td>
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<td>76 (3.0)</td>
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<tr>
<td>Cs Spindle Index angle</td>
<td>deg</td>
<td>360 (in 0.001 deg. increment)</td>
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<tr>
<td>Cs Spindle Index Speed</td>
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<td><strong>Right Spindle</strong></td>
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<td>Spindle speed</td>
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<td>5,000</td>
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<tr>
<td>Spindle nose</td>
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<td>A2#5</td>
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<tr>
<td>Spindle bearing diameter (Front)</td>
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<td>90 (3.5)</td>
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<td>Spindle through hole</td>
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<td>76 (3.0)</td>
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<tr>
<td>Cs Spindle Index angle</td>
<td>deg</td>
<td>360 (in 0.001 deg. increment)</td>
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<tr>
<td>Cs Spindle Index Speed</td>
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<tr>
<td><strong>Turret (Upper+Lower)</strong></td>
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<tr>
<td>No. of tool stations (Upper+Lower)</td>
<td>st</td>
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<td>Y-axis</td>
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<td></td>
<td>65.09</td>
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<td><strong>Machine Dimensions</strong></td>
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<td>Length</td>
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<td>3905 (153.7)</td>
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<tr>
<td>Width</td>
<td>mm (inch)</td>
<td>2070 (81.5)</td>
<td></td>
<td>8800 (19400.4)</td>
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</tbody>
</table>

### Standard Feature
- Absolute positioning encoder
- Air blast for chuck jaw cleaning
- Coolant supply equipment
- Foot switch
- Front guard door interlock
- 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)

* : It should be reviewed in detail before contract.
**AXES CONTROL**

- Controlled pitch: 2 pitch
- Controlled axes: X1, X2, Y1, Y2, Z1, Z2, C1, C2, A
- Angular axis control
- Manual control by PMC
- Backlash compensation: 0 ~ ±9999 pulses
- Backlash compensation for each rapid traverse and cutting feed
- Chattering on/off
- CS contouring control
- Synchronous / Composite control
- Emergency stop
- Power-up
- HRT2 control
- Inch / Metric conversion
- Interlock: All axes / each axis
- Lead in command: 0.001 / 0.0001 mm/inch
- Manual lock: All axes / each axis
- Mirror image
- Overtravel
- Position switch
- Servo off
- Simultaneous controlled axes: 4 axes
- Stored pitch error compensation
- Stored stroke check: 1
- Tooling control
- Unexpected disturbance torque detection function

**OPERATION**

- Automatic operation (memory)
- DNC operation with Memory card
- Buffer register
- Dry run
- Feed incremental feed: X1, X10, X100
- JOG feed
- Manual handle feed: 1 unit
- Manual interpolation and return
- Manual pulse generator: 1 ea
- Manual reference position return
- MDL operation
- Program number search
- Reference position setting without dog
- Sequence number search
- Single block
- Writing operation

**INTERPOLATION FUNCTIONS**

- 1st. Reference position return: Manual, G28
- 2nd. Reference position return: G29
- 3rd/4th reference position return
- Balance cut-out
- Linear interpolation
- Circular interpolation
- Cylindrical interpolation
- Linear per sec: G04
- Helical interpolation
- Linear interpolation
- Multiple threading
- Nano interpolation
- Polar coordinate interpolation
- Positioning: G00
- Reference position return check: G27
- Reference position return check: G76
- Thread cutting / Synchronous cutting
- Thread cutting retract
- Tool retract and recover
- Reference position setting without dog
- Sequence number search
- Single block
- Writing operation

**FEED FUNCTION**

- [Control screen]
- (Look-ahead block, max. 30 digits, 1 Q1)
- Automatic acceleration / deceleration
- Cutting feedrate clamp
- Feed per minute
- Feed per revolution
- Feed override: 100% unit
- Jog feed override: 100% unit
- Manual per revolution feed
- Overide cancel
- Rapid traverse override: P6, 25, 100% 
- Tangential speed constant control

**AUXILIARY / SPINDLE SPEED FUNCTION**

- Actual spindle speed output
- Auxiliary function lock
- Constant speed control
- High speed M/S/T Interface
- M-code function: M7 digits
- Multi spindle control
- Input: stepping
- S-code function: S4 / S5 digits
- Spindle external signal: S4 / S5 digits
- Spindle speed override: 0 ~ 139%
- Spindle synchronous control
- Spindle orientation
- Spindle output switching
- Spindle setting screen
- Status display
- Servo waveform display

**DATA INPUT / OUTPUT**

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

**OTHERS**

- Cycle start and lamp
- Display unit: 15.4" Color TFT LCD
- Feed hold and lamp
- NC and servo ready
- PMC system: 31A-PMC
- Reset / rewind

**OPERATION GUIDANCE FUNCTION**

- EZ GuideI (Conversational Programming Solution)

**INTERFACE FUNCTION**

- Ethernet function
- Embedded ethernet

**OPTIONAL SPECIFICATIONS**

- Robot interface with PMC I/O module
- Fast Ethernet function
- Data server: Only for 1 path
- Directory display of floppy cassette
- Play back
- Number of registered programs: 2000 / 4000 ea
- Multiple repetitive canned cycle
- Tool load monitoring system
- Work coordinate system preset
- Pattern data input
- Interruption type custom macro
- Automatic corner override
- 48 pairs
- Variable lead threading

**TOOL FUNCTION / TOOL COMPENSATION**

- Automatic tool offset
- Direct input of tool offset value measured
- Direct input of tool offset value measured
- T-cut code
- Tool geometry / wear compensation
- Spot file management
- Tool nose radius compensation
- Tool offset
- Tool offset pairs: 64 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=640 / Lower=640 (512 kB)
- Program protect

**SETTING AND DISPLAY**

- 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
- Home position display
- Multi-language display
- Operating monitor screen
- Operation history display
- Parameter setting and display
- Program comment display: 32 characters
- Run/hr/hrs / part count display
- Self-diagnosis function
- Servo setting screen

**TOOL FUNCTION / TOOL COMPENSATION**

- Tool offset pairs: 64 pairs
- Tool offset pairs: 64 pairs
- Spindle setting screen
- Status display
- Servo waveform display

**DATA INPUT / OUTPUT**

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

**ROBOT INTERFACE**

- Robot interface with PMC I/O module
- Remote buffer

**EDITING OPERATION**

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

**SETTING AND DISPLAY**

- Display of display message

**TOOL FUNCTION / TOOL COMPENSATION**

- Tool offset pairs: 64 pairs
- Tool offset pairs: 64 pairs
- Spindle setting screen
- Status display
- Servo waveform display

**DATA INPUT / OUTPUT**

- Data server
- Fast Ethernet function
- Remote buffer

**ROBOT INTERFACE**

- Robot interface with PMC I/O module
- Remote buffer