Super NTMX

INNOVATION

NAKAMURA-TOME
PRECISION INDUSTRY CO., LTD.
Fusion between a 5-axis machining center and a lathe

World Premiere Twin ATC machine!

To optimize the setup and tool change.
Superior Operation and Flexibility

- Tool setting and magazine setup are all done in the front side of the machine.
- Even when the machine is running, access to the ATC magazine is possible to check tool condition or change inserts or tools as needed.

Easy Tool Management

On the Tool Setting screen, setting the tool number, tool type and tool size is performed easily. Finding one specific tool inside the tool list can be done quickly and precisely, by using the “Tool search function.”
Tool magazines on the left and right hand sides!

- **48 ATC Tools in a compact machine.**
  Using a twin magazines, it became possible to have 48 tools in a compact space.

  - **Tool shank type:** CAPTO C4
  - **Max Tool diameter:** 60mm (without adjacent tool: 80mm)
  - **Max. Tool length/weight:** 180mm/4kg
  - **Tool changing time:** 1.3sec.

- **Low center of gravity design.**
  Thanks to low center of gravity design of the machine bed and both spindles, a stable cutting process is accomplished.

### with Twin Magazines

- **Shortest distance ATC**
  Storing left or right side spindle cutting tools respectively on the left or right side ATC magazine, enables tool change on the nearest magazine. Additionally, tools are easier to manage and mistakes are preventable.

- **Change Tool setup without stopping the machine.**
  Even when the machine is running in auto mode, either tool magazine can be rotated in manual mode, and tools loaded for the next setup. It is possible also to use one magazine for one setup, and keep the second magazine for the next setup. In that case the setup time can be reduced to near “zero”.

- **Auto Sort Function**
  After reading the machining program, this function automatically rearranges the tools to be used in the process between magazines, moving tools from the left or right side magazine, and at the same time rearranging them in accordance with the program. By using this function during a setup change, tools are rearranged easily and quickly, and the shortest distance ATC can be achieved.
Machine Designed in Pursuit of High Accuracy

- **Fully horizontal and vertical structure.**
  X, Y, Z-Axis slides have a fully horizontal and vertical structure. Highly rigid column with very wide frame ensures high accuracy machining.

- **Wide machining range**
  - Max Turning diameter: 200mm
  - Max Turning length: 780mm
  - Y axis machining range: 200mm
Precision Machining —— Stable Accuracy Ensured

**High Precision B-axis**

By reducing the distance from the tool tip to the center of rotation, a high precision B-axis machining is achieved.

**New frontiers with 5-axis simultaneous machining**

The use of 5-axis machining capabilities enables high-speed milling of complicated free-form curved surfaces, which is ideal for complex parts, such as medical parts, aircraft parts and molds.

**Direct axis feed motor**

Backlash free motor rotation is ensured through direct-mount X, Y, and Z-axis motors to the respective ball screws. Linear scales are optionally available for the X, Y and Z-axis.
## Tool Spindle
- **Milling motor**: 7.5/3.7kW
- **Max. Rotation speed**: 12,000 min⁻¹
- **Indexing range**: 190 degrees
- **Indexing speed**: 37.5 min⁻¹
- **Indexing mechanism**: Servo motor + Cam
- **Number of tool stock**: 24×2
- **Tool shank type**: CAPTO C4
- **Max. tool diameter / without adjacent tool**: 60mm / 80mm
- **Max. tool length / Max. tool weight**: 180mm / 4kg
- **ATC Time**: 1.3 sec
- **Y-axis stroke**: ±100mm

## Left / Right Spindle
- **Spindle motor**: 11/7.5kW
- **Max. Rotation speed**: 5,000 min⁻¹
- **Bar capacity dia.**: 51mm
- **C-axis function**: CS milling
- **Rapid index speed**: 600 min⁻¹
- **Least command increment**: 0.001 degree

## Lower Turret
- **Dodecagonal 24-station turret**
- **Number of tools to be mounted**: Max. 24

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### Key Features
- **2-PATH control**: FANUC 31i-A5
- **9 controlled axes**
- **Spindle motor**: 11/7.5kW
- **Tool spindle**: Y-axis travel 200mm, B-axis range 190° (±95°)
- **Tool spindle motor**: 7.5/3.7kW
- **Number of ATC tools**: 48pcs. (24 × 2)
- **ATC tool shank**: CAPTO C4
- **Spindle speed**: 5,000 min⁻¹
Although it is considered a floor space saving machine, the Super NTMX has a wide working range, featuring a stroke of 200 mm for the Y-axis and 780 mm for the Z-axis. The upper or lower unit can be freely programmed to work on either of the two spindles, maximizing process flexibility. Additionally, part supporting such as servo-controlled center support among others, contribute to one-hit machining from bar work, shaft work or forgings.

### Various Applications

#### Flexible!

- **R-side milling with tool spindle / L-side turning with lower turret**
  - Minimum tool interference through compact turret and compact tool spindle

- **Simultaneous turning with upper and lower tools**
  - Balance cutting with two tools simultaneously

- **Milling operation with center support**
  - Rotating center is available on the lower turret. Useful when accuracy is critical, or during machining long shafts.

- **R-side turning with tool spindle / L-side turning with lower turret**
  - Simultaneous turning with upper and lower tools

- **Part transfer process**
  - High-accuracy transfer is achieved by accurate positioning through phase synchronization, and by direct chucking

- **Steady rest (Example on Super NTX)**
  - Steady rest is available on lower turret.
Combined Turning and Milling Capabilities

### Turning [Spindle]

- **S x 2 Twin-Spindles**
- **11/7.5kW 5000min⁻¹**

### Milling [Tool spindle]

- **7.5 / 3.7kW 12000min⁻¹**

### Super NTMX Cuts CO₂ Emissions

<table>
<thead>
<tr>
<th>Model</th>
<th>Cycle time / pc.</th>
<th>Power consumption</th>
<th>Emission of CO₂ *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional machine</td>
<td>75 min</td>
<td>13.7 kWh</td>
<td>5.5 kg</td>
</tr>
<tr>
<td>Super NTMX</td>
<td>43 min</td>
<td>9.7 kWh</td>
<td>3.9 kg</td>
</tr>
</tbody>
</table>

* For reference only

Through efficient energy consumption, cut harmful CO₂ emissions by 29%
## Applications from Various Industries

<table>
<thead>
<tr>
<th>Industry</th>
<th>Part name</th>
<th>Cycle time</th>
<th>Material</th>
<th>Raw material</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aeronautics</td>
<td>Wheel</td>
<td>8 min.</td>
<td>Aluminum</td>
<td>Cylindrical slug</td>
<td>High speed multi-tasking machining. Engraving with tool spindle.</td>
</tr>
<tr>
<td>Aeronautics</td>
<td>Blade</td>
<td>50 min.</td>
<td>S45C</td>
<td>Bar stock</td>
<td>Turn-milling with simultaneous 4-axis machining. Profiling machining with CAD/CAM system. One hit machining from bar stock.</td>
</tr>
<tr>
<td>Aeronautics</td>
<td>Joint</td>
<td>14 min.</td>
<td>Stainless SUS303</td>
<td>Cylindrical slug</td>
<td>High speed milling. Small drill (Diameter 0.5 mm) Center support on lower turret</td>
</tr>
<tr>
<td>Aeronautics</td>
<td>Joint</td>
<td>17 minutes</td>
<td>SKD11</td>
<td>Cylindrical slug</td>
<td>High-speed multitasking of Y-axis use machining</td>
</tr>
<tr>
<td>Medical</td>
<td>Thighbone support</td>
<td>30 minutes</td>
<td>Titanium</td>
<td>Bar stock</td>
<td>Deep-hole drilling, at a freely programmable angle Center support with the lower turret</td>
</tr>
<tr>
<td>Medical</td>
<td>Pump part</td>
<td>12 minutes</td>
<td>Titanium</td>
<td>Bar stock</td>
<td>High-speed multitasking of Y-axis use machining</td>
</tr>
<tr>
<td>Medical</td>
<td>Hip cup</td>
<td>43 minutes</td>
<td>Titanium</td>
<td>Bar stock</td>
<td>Milling a spherical surface with the tool spindle at 12,000 min⁻¹</td>
</tr>
<tr>
<td>Medical</td>
<td>Bone screw</td>
<td>5 minutes</td>
<td>Titanium</td>
<td>Bar stock</td>
<td>Diameter 1.5 mm through-hole drilling. Special thread machining</td>
</tr>
</tbody>
</table>
Air Cutting Mode

Air cutting mode is for executing machining programs without actual machining. When programs are executed in active air cutting mode, bar-feed forward and chuck open/close commands are ignored. In addition, part-unloading confirmation is disabled.

Index Speed override

Turret speed can be adjusted with the feed override rotary switch from 0 to 100% during indexing in automatic or manual mode. This can be used during fully automatic operation to reduce turret speed, or even bring it to a halt when necessary.

Continuous-machining essentials

Jump Programming (G411)

For machines equipped with a gantry loader or a bar feeder, restarting operation after an interruption, is significantly improved. Even if the operator has to stop and to reset the machine in the middle of automatic cycle, there is no need to remove all the parts from the chucks or gantry hands in order to restart operation. The part “Status” displayed on the NT Nurse screen is used to restart the program, which depending on part machining condition (raw, half-finished or finished part) jumps to the appropriate program block and re-starts from there. Thanks to this feature, programming of machines with a gantry loader has become drastically simplified, eliminating the need to divide each machining program into several sub-programs.

Axis Torque Limit Function (G359)

This feature is to prevent overload servo alarms that may occur during part transfer or part cut-off. Such alarms are caused by load build up when the right chuck is closed, which is due to overshooting of the jaw in case of three-jaw chucks or pushing/pulling in case of collets/chucks. The thrust of the B-Axis servo motor thrust is kept in a range of 20% to 100%, preventing servo alarms and breakage of cut-off inserts. If a stopper is used on the right chuck, soft work pusher (G131) is used instead.

Offset Conversion

With the B-axis positioned at an arbitrary angle, the tool offset is converted with one single G-code.

Three-dimensional coordinate conversion

Three-dimensional coordinate conversion simplifies machining on an inclined plane, by rotating the machine coordinate system with one single G-code.

Cut-in Check

During automatic operation, the machine can be temporarily stopped to check the condition of a part or tool, or to remove cutting chips. After the door is closed, machining can be restarted automatically from the point where it was stopped.

Program Resume

If automatic operation were to be interrupted in the middle of a program, machining can be resumed easily. Regardless if “Automatic mode” were disabled during an interruption, the program-stop position data is recorded in the CNC unit. To restart from the top of the process during which operation was stopped, the operator has to push “RESET & REWIND” then push “CYCLE START;” without the need to position the cursor in the middle of the program, reducing the risk of unwanted collisions.

Manual Handle Retrace (op.)

To make program first-time-checking easier and collision-free, “manual handle retrace” enables the operator to have more control over the machine during program execution. In “manual handle retrace” mode, machine slides move only when the manual pulse generator (hand wheel) is turned. In this mode, program execution, slide movement, moving speed as well as stop and reverse, are controlled by rotating the handwheel. “Manual handle retrace” can be executed in memory mode for each path separately, or in multiple-memory mode with all slides moving simultaneously, ensuring easier collision checks.

Full operator support for more ease of use and reliability

NT NURSE LUCK-BEI II AIRBAG NT Work Navigator 3D Interference Check Manual Handle Retrace

FANUC 31i-A5

Generous User-friendly Features / Main Specifications

- Program storage capacity : 2560m
- Registerable programs : 2000
- Number of tool offset pairs : 99
- 10.4" LCD (color)
- Drawing size direct input
- Simple fixed cycle (G90, G92, G94)
- Multiple repetitive cycle (G70 - G76)
- Multiple repetitive cycle II
- Canned cycle for drilling (G80 - G89)
- Synchronous mixture control
- Custom macro
- Additional custom macro common variables
- DNC operation using memory card (Memory card is not included)
- Rigid tapping/ Main spindle Milling
- Spindle synchronization control
- NT Work Navigator
- NT Nurse
- Overload Detection

DNC operation using memory card. The FANUC card (sold separately) can be completely inserted inside the provided slot, making operation with a closed card slot possible.

Software to Support Five-axis Control (option)

- Tool Center Point Control
  Tool center point control facilitates programming, when the tool axis direction changes during machining. The path and feed rate of the tool tip are automatically controlled to move at the path and feed rate specified in the program, eliminating the need for short line segments that are following the tool-axis center rotation.

- AI High Precision Contour Control II
  The use of powerful look-ahead performance enables high-speed high-precision milling of free-form curved surfaces that are specified in consecutive tiny blocks.

- Jerk Control
  Even if the part has a smooth shape with no abrupt corners, jerk control recognizes vibrations at corners before they occur and automatically controls the feed rates accordingly. Enhanced smooth motion reduces mechanical shock and improves surface finish.
A programming guidance system with the ability to generate NC programs (ISO/EIA G-code programs) easily. Processes created in conversational mode can be cut, copied or moved ensuring flexibility. Additionally, several cycles such as part-transfer cycle, requiring waiting M-codes, are readily made with the "NC program editing support function". The "NC program simulation function" can be used to check created programs by tool-path simulation or solid-model animation.

Process Editing
A function that automatically recognizes and extracts the name and order of all machining processes, then displays them in table layout. Machining processes can be moved, copied or swapped easily. In addition, waiting M-codes can be added with the click of a button.

Fixed Forms
Generous fixed forms with over 600 patterns (10 times more than before) are standard. Fixed forms are easily selected from a menu. Additional custom made programs can be registered.

Machining Cycle (conversational) Function
In addition to Nakamura-Tome’s original NT Work Navigator, which is essential for multitasking, “soft quill pusher” and other NT-Nurse functions can be programmed easily.
For Increased Productivity!

“NT Nurse” which is standard on all machines, has a new function called “Screen registration”. NT Nurse Functions that are frequently used can be registered, and later called up with one-key stroke. More than 34 NT Nurse functions are available to support improving your productivity.

**NT Nurse call button**

Up to two NT Nurse frequently used functions can be registered, and later called with in one-key stroke.

These are only a few of the available 34 NT Nurse user support functions.
"Program and setup is difficult..." "If the machine stops during the process...." "Costly jigs and fixtures for Complex parts...." You may have similar production concerns. Having the NT Nurse system, NT Work Navigator and Overload detection, reduces manufacturing headaches and provides precious production support.

### NT Nurse System

**All-in-one Software Package**

NT Nurse is software that provides the operator with user-friendly support for operation, programming and production on the machine. Among vital features are phase recognition (a must for multitasking), direct chucking to prevent positioning error during transfer, and perfect synchronization of the left and right hand spindles. Among other features, are the load monitor for detecting tool wear and tool breakage, tool life management, operation condition monitoring, in addition to many other features to simplify programming, set up, operation and production, all offered in one single package.

### Airbag (Overload detection)

Nakamura-Tome machines will not break for the slightest collision, as other machines do.

#### No need to panic

When unavoidable human error results in machine collision, there is no reason to panic. All Nakamura-Tome machines are equipped with a safety feature called “airbag” (overload detection), which will greatly reduce the impact force and prevent heavy damage to the machine.

### 3D Interference Check (op.)

Interference check can be made in automatic or manual operation. Registered machine data, chucks, tools, holders, and parts are used to monitor the machine during automatic, manual or jog movement, and recognize in advance collisions before they happen. Even turret indexing is monitored to avoid collisions, drastically reducing machine collision risks, especially during set up.

#### Preventive safety technology -- Machine collisions are avoidable!

If interference is detected, the machine stops with the affected area highlighted in red on the CNC display.

### NT Work Navigator

**Advanced NT Work Navigator !**

Navigation function is expanded to also include the X and Y-axis. Coordinate Recognition can make the part’s outer surface in the X or Y-Axis direction.

**No fixtures required**

Machining parts with non-round shapes, such as forgings or castings requires that the raw part coordinates be recognized by the CNC control. In order to achieve this without requiring extra cost or additional options, the NT Navigator is used. It works just by touching the part with a simple inexpensive probe (mostly round bar mounted on a tool holder) and using the torque control feature of the servo-motor, which is to record required coordinates in the CNC. The NT Navigator is a cost cutting feature in multitasking machines, eliminating the need for positioning fixtures and special clamping devices.

#### New Navigator for X-axis and Y-axis

XYZBC

### 3D interferance check can be performed on a PC* that is connected to the machine.

To do this, 3D interference check (op.) is required on the machine side.

* The PC is to be arranged at the customer’s side.
Machine Dimension

Chip conveyor right side outlet with chip bucket

Axis travel range

(Unit mm)
Safety quality specification

Safety devices such as various interlock, various safety fences, auto loading device, work stocker, automatic fire extinguisher etc. are available as options which can be included in your purchase package. Please contact our local distributor and dealer for your specific requirements.

Precautions about the use of cutting coolant

Synthetic Coolants are Damaging to Machine Components

Concerning the use of cutting fluids, cautions have to be taken on the type of coolant being used. Among coolants available in the market, some types are damaging to machine components and should be avoided. Typical damages are turcite wear, peeling of paint, cracking and damage to plastics and polymers, expansion of rubber parts, corrosion and rust build up on aluminum and copper.

To prevent such damages, coolants that are synthetic, or containing chlorine have to be avoided. Machine warranty terms do not apply to any claims or damage arising from the use of improper coolant.