



# *Super* NTJ



E V O L U T I O N

**NAKAMURA-TOME**  
PRECISION INDUSTRY CO.,LTD.

# *Super* NTJ One hit machining

Finished parts, complete in one set up



Perform angular hole and surface machining as well as free-form

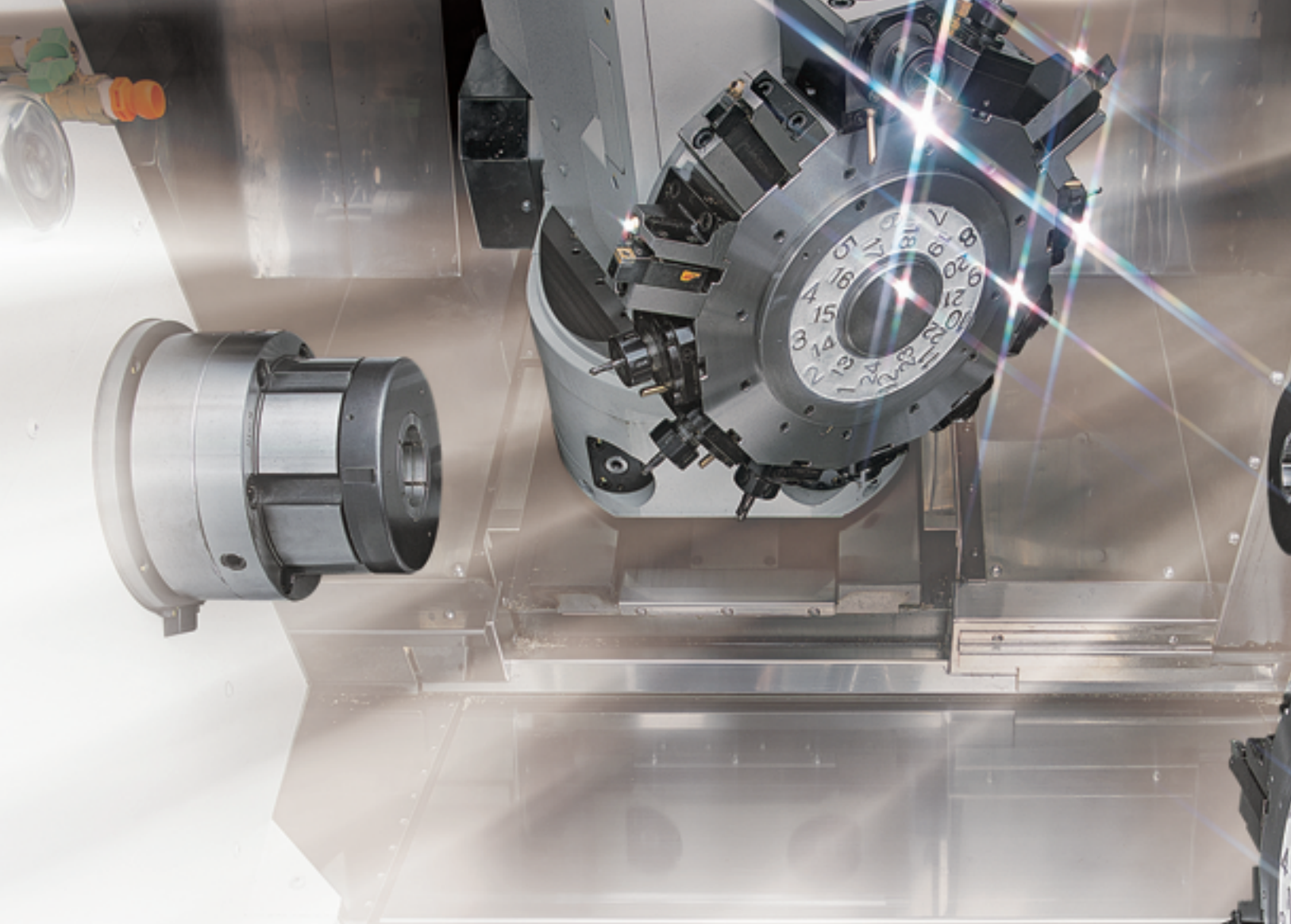
# High Productivity Multi-Tasking Machine

From diversified small-lot production to mass production



182 deg.  
Swiveling range

surface contour-milling easily, using standard driven-tool holders.



# Evolution of “Monozukuri”

Upper turret with B and Y axis swivels  $\pm 91$  degrees

Milling of complex contours at any angle can be easily performed.



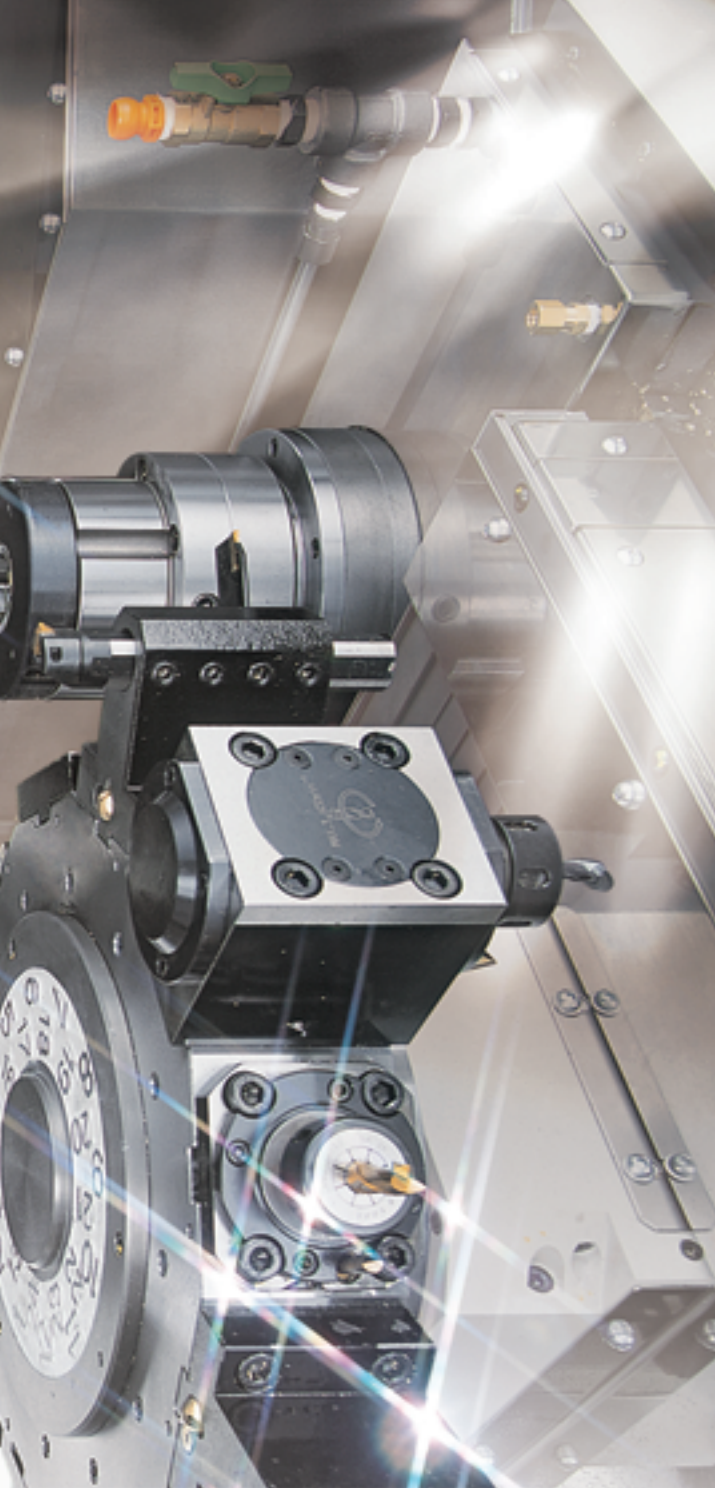
Upper left side lower right side cutting



Upper left side, lower right side milling



Upper right side, lower left side cutting



# High productivity

Top leader of one-hit machining

No work in process  
One-hit machining  
Less set up time



Upper left side, lower right side milling



Simultaneous upper & lower right side cutting

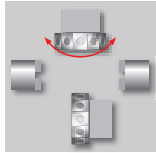


Simultaneous upper & lower right side milling



# Multi-surface angular machining and complex contour

## Meeting the needs of complex machining...



**B**  
B-axis

**Y**  
Y-axis

**M<sub>x2</sub>**  
Double Milling Motor

**C<sub>x2</sub>**  
C-axes

**S<sub>x2</sub>**  
Twin-Spindle

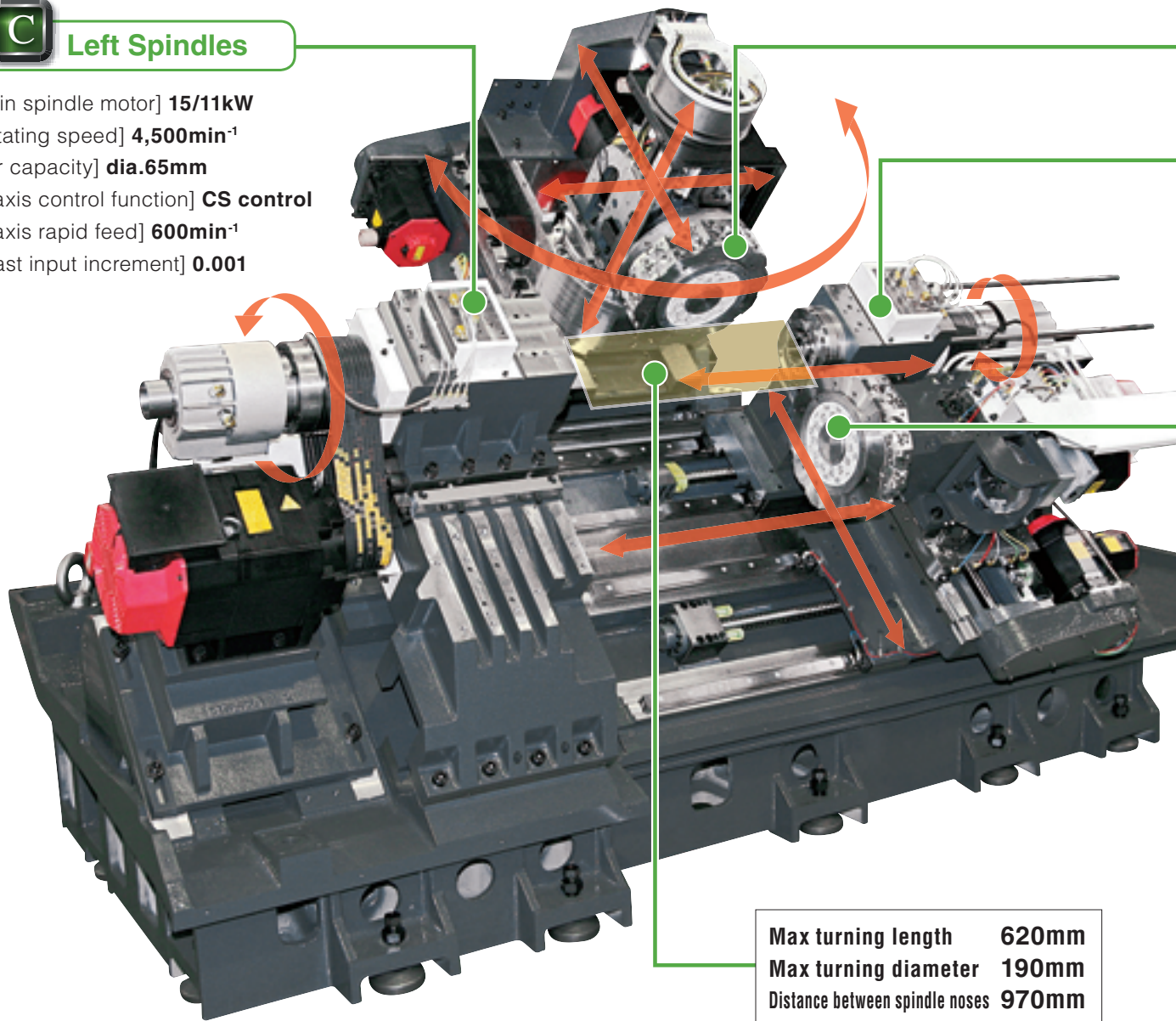
19"  
Color LCD  
Touch Panel

NT  
IPS



### Left Spindles

- [Main spindle motor] **15/11kW**
- [Rotating speed] **4,500min<sup>-1</sup>**
- [Bar capacity] **dia.65mm**
- [C-axis control function] **CS control**
- [C-axis rapid feed] **600min<sup>-1</sup>**
- [Least input increment] **0.001**



Max turning length **620mm**  
 Max turning diameter **190mm**  
 Distance between spindle noses **970mm**

milling are performed automatically.

# A machine featuring the latest in engineering technology.

## **B Y M** Upper Turret

### 12-Station dodecagonal drum turret with 24 indexing positions

- [Number of tool positions] **24**      [Curvic coupling indexing angle] **5 deg.**
- [Number of driven-tool stations] **12**      [Driven-tool motor] **5.5/3.7kW**
- [B axis swiveling range] **±91 deg.**      [Rotating speed] **6,000min<sup>-1</sup>**
- [B axis rotation] **180 deg./sec.**      [Y-axis stroke] **±45mm**

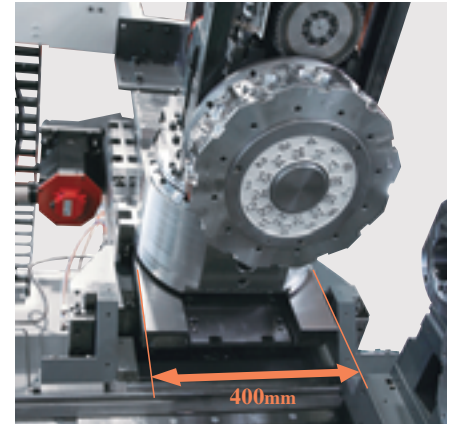
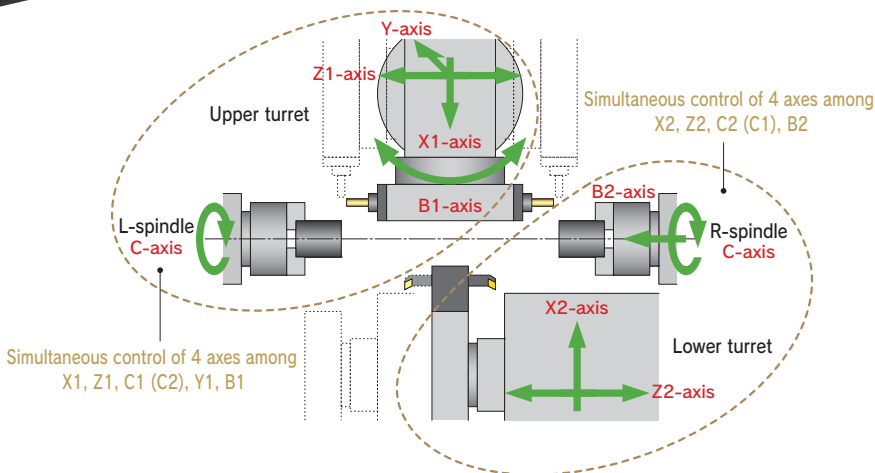
## **C** Right Spindles

- [Main spindle motor] **11/7.5kW**
- [Rotating speed] **5,000min<sup>-1</sup>**
- [Bar capacity] **dia.51mm**
- [C-axis control function] **CS control**
- [C-axis rapid feed] **600min<sup>-1</sup>**
- [Least input increment] **0.001**

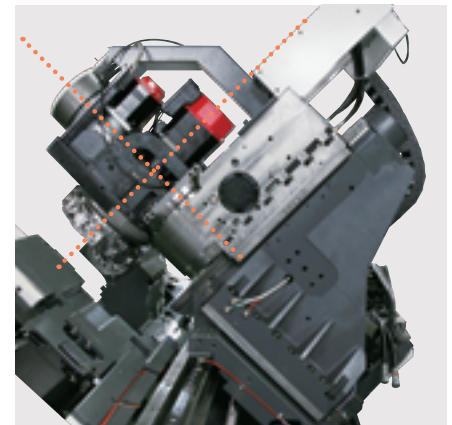
## **M** Lower Turret

### 12-station dodecagonal drum turret with 24 indexing positions

- [Number of tool stations] **24**
- [Number of driven-tool stations] **12**
- [Driven-tool motor] **5.5/3.7kW**
- [Rotating speed] **6,000min<sup>-1</sup>**



The upper X and Y-axes slides, hand-scraped with a proud traditions, are featuring high rigidity and durability. Using high-grade Turcite-B® and slide-scraping ensures low friction, no vibrations and ultra-precision gliding qualities, resulting in superior machining qualities and long tool life. Additionally, all index units, spindle headstocks, and ball screw bearing-housings are also hand scraped by highly skilled specialists before their final assembly.



In addition to servo-driven positioning of the B-axis, a curvic-coupling is also employed.

### Curvic coupling

The curvic-coupling with 120 divisions provide hydraulic clamping of the B-axis at every 5 degrees.

### Servo-motor

The B-axis adopts a high rigidity roller gear cam system that is servo driven at incremental units of 0.001 degrees. A hydraulic disk brake holds the B-axis at any programmed position.



Tool to tool **0.2 sec.**

Productivity superior to that of a Machining Center



Medical industry

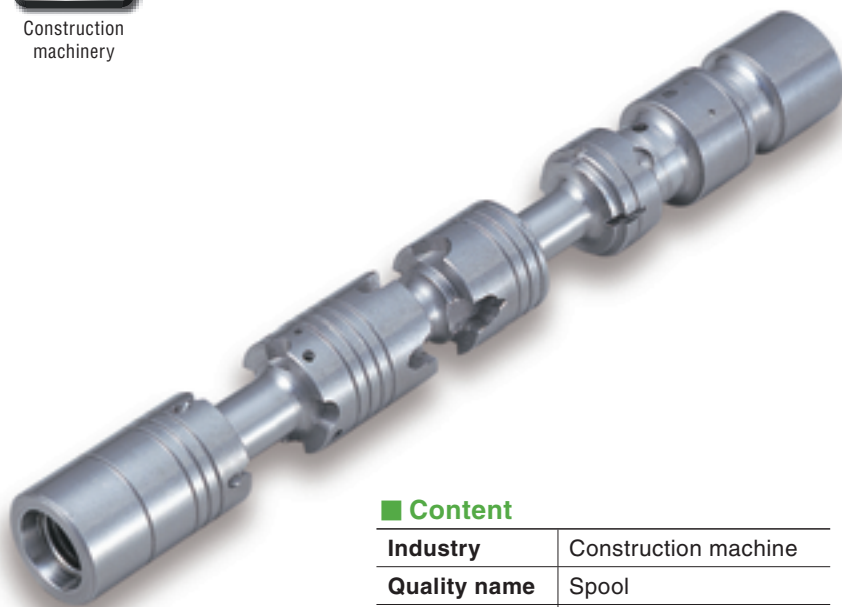


■ **Content**

<b>Industry</b>	Medical instruments
<b>Quality name</b>	Thighbone
<b>Cycle time</b>	30min.
<b>Material</b>	$\beta$ Titanium
<b>Material shape</b>	Bar / dia.15mm×300mm

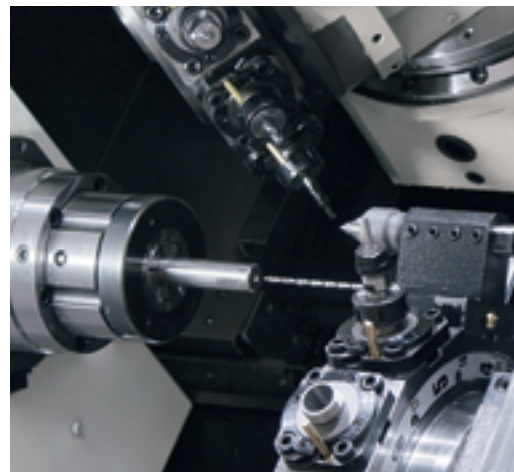


Construction machinery



■ **Content**

<b>Industry</b>	Construction machine
<b>Quality name</b>	Spool
<b>Cycle time</b>	12min. 56sec.
<b>Material</b>	SCM415
<b>Material shape</b>	Shaft / dia. 30mm×250mm



**Dia.6mm deep drilling**

- [Drilling dia.] **6mm**
- [Hole depth] **130mm**
- [Rotating speed] **4200min<sup>-1</sup>**  
Main spindle 2100min<sup>-1</sup>, Milling 2100min<sup>-1</sup>
- [Feed rate] **80m/min**
- [Feed rate] **0.2mm/rev**
- [Machining method] **Non-step**
- [Cycle time] **15sec.**





Idle time is drastically reduced

# High accuracy synchronization function

Spindle synchronization

C-axis synchronization

## Spindle synchronization

0 ⇒ 3000min<sup>-1</sup> : 2.2sec.

No segment-fracture :

0 → 3000min<sup>-1</sup>, CCW → 0 → 3000min<sup>-1</sup>, CW → 0

## C-axis synchronization

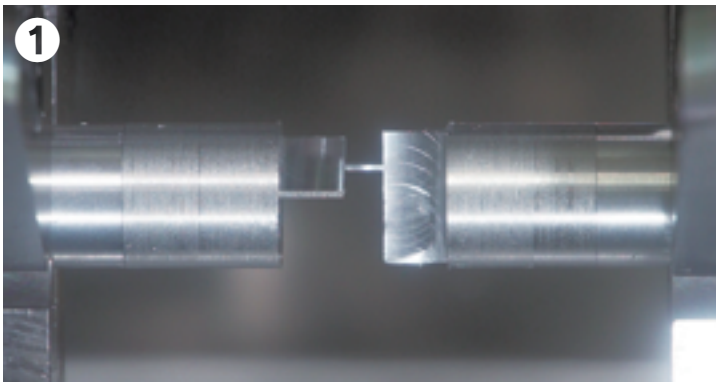
C-axis indexing speed : 600min<sup>-1</sup>

180° indexing : 0.6sec.

360° indexing : 1.2sec.

Left and right C-axis synchronization for parts clamped by the left and right side chucks simultaneously

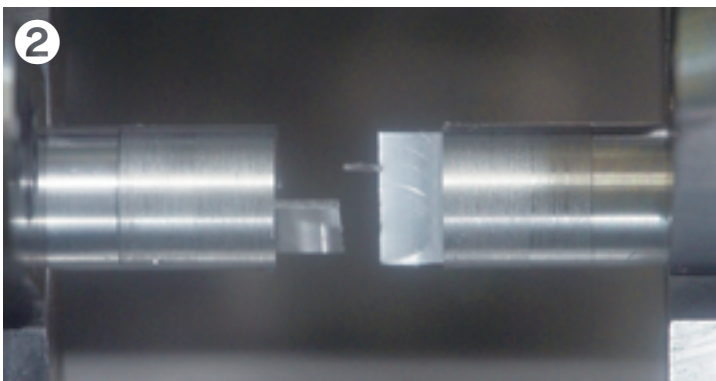
With C-axis synchronization



Picture 1 shows 1mm-thick rectangular segment in the middle.

Picture 2 shows segment-fracture due to no C-axis synchronization

Without C-axis synchronization



### Comparison of C-axis indexing time

With  
C-axis synchronization

G00H180.

⇒ 0.6sec.

Without  
C-axis synchronization

G98G01H180.F4000

⇒ 2.9sec.

In case of no C-axis synchronization

1) Open the chuck on one side or the other

2) Close the chuck, and then rotate the spindle slowly

# Combining Turning and Milling Capabilities

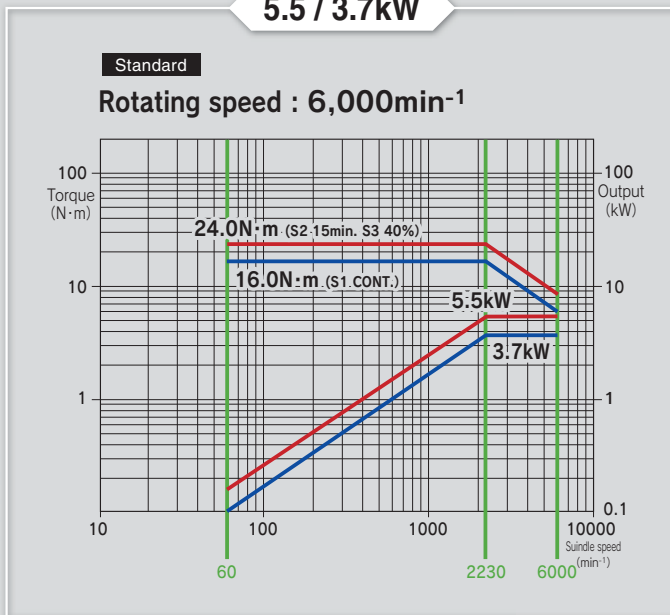


Super NTJ

24 driven tools available for extensive machining processes

## Driven-tool motor

5.5 / 3.7kW



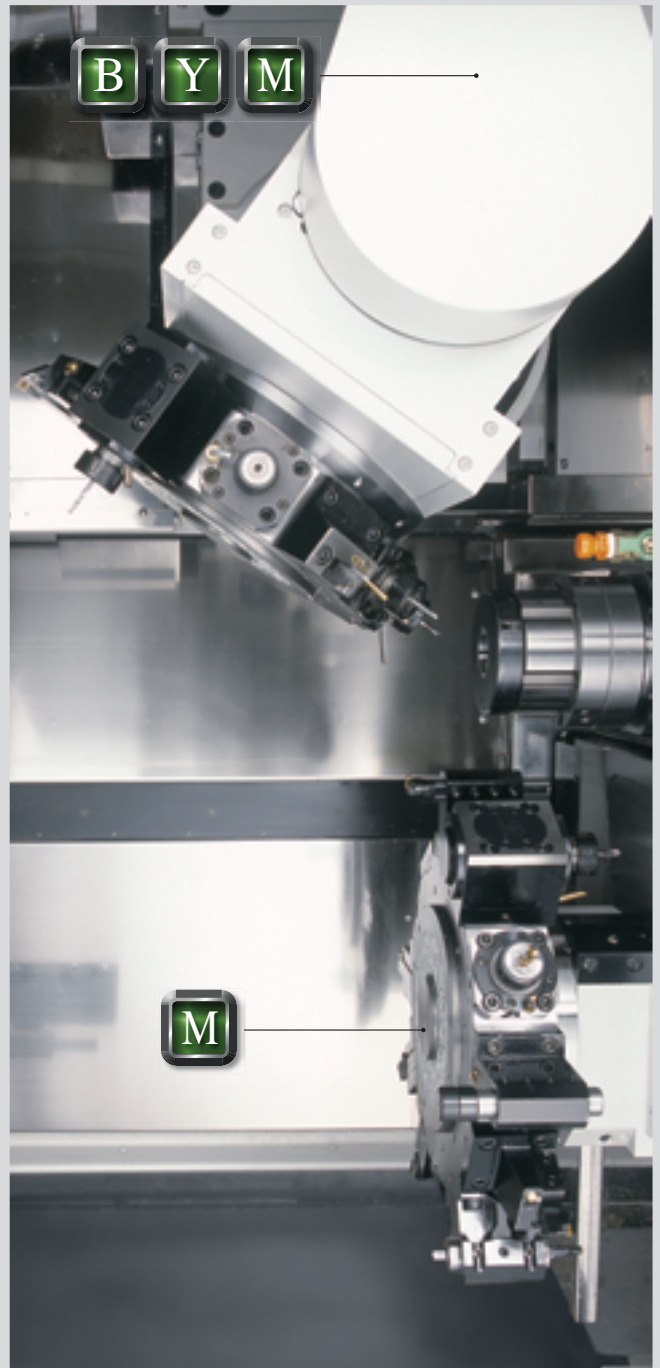
### High rigidity milling

Equipped with Max. 24 driven-tools

High-speed C-axis rapid feed 600min<sup>-1</sup>

Innovative milling drive

By integrating the non-lift servo-index and milling drive (patent pending), rigidity was increased, and machining efficiency became 20% higher.



# From diversified small-lot production to mass production



## Super NTJ

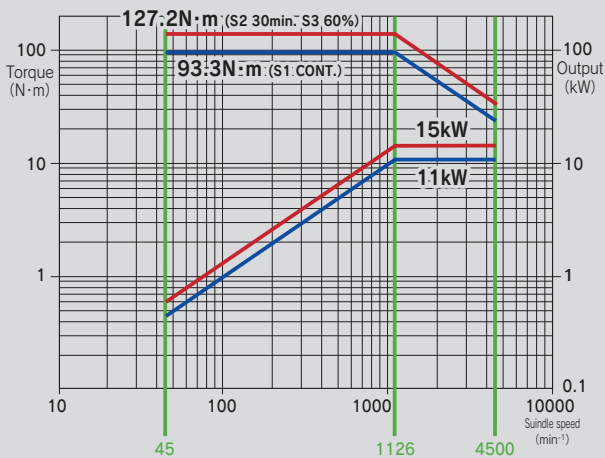
By introducing faster motor acceleration / deceleration, machining efficiency was improved.

### L Spindle motors

15 / 11kW

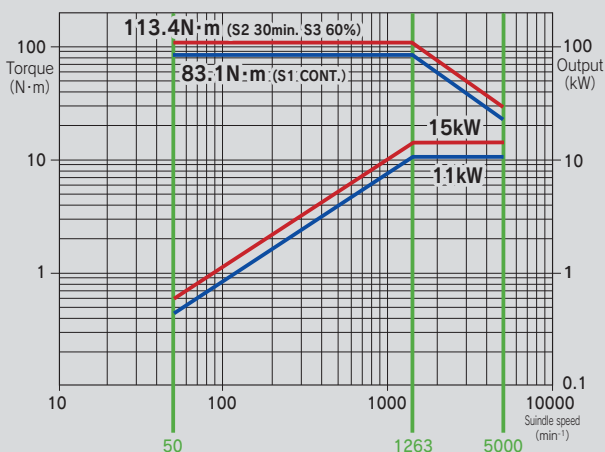
Standard

Rotating speed : 4,500min<sup>-1</sup> dia.65mm



Option

Rotating speed : 5,000min<sup>-1</sup> dia.51mm

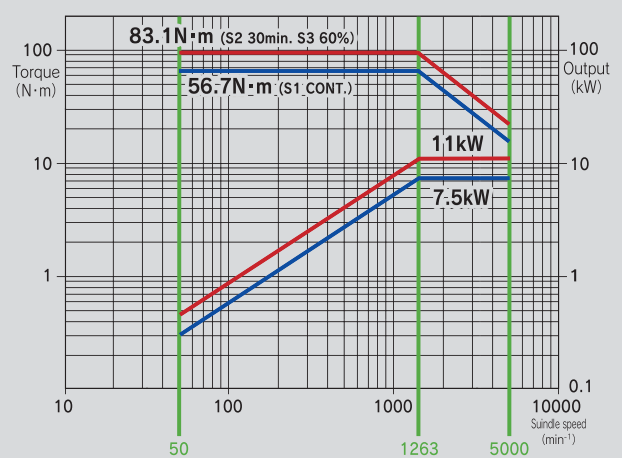


### R Spindle motors

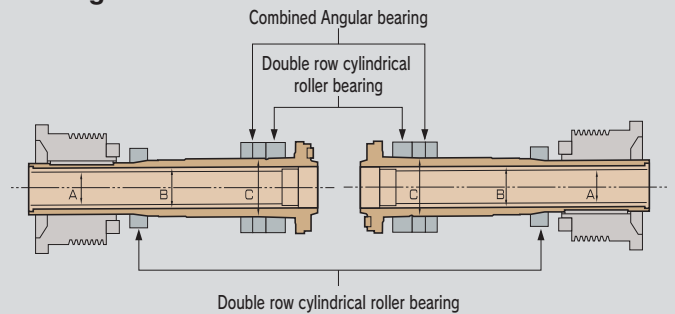
11 / 7.5kW

Standard

Rotating speed : 5,000min<sup>-1</sup> dia.51mm



### Bearing structure



Main spindle bearing	Dia.65 L spindle	Dia.51 R spindle
A I.D. of draw tube	Dia. 66 mm	Dia. 52 mm
B Spindle bore	Dia. 80 mm	Dia. 63 mm
C I.D. of front bearing	Dia. 110 mm	Dia. 90 mm

## Largest Display : 19" Touch Panel

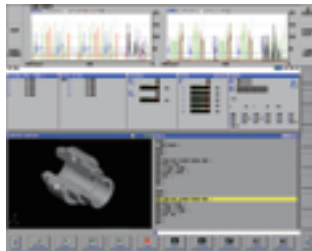
- NT NURSE
  - LUCK-BEI II
  - AIRBAG
  - NT Work Navigator
  - NT Collision Guard
  - Manual Handle Retrace
- (option)

### 19" Color LCD Monitor

With the user in mind, a large high-resolution (19" SXGA 1280x1024) color LCD is introduced. Nakamura-Tome's original screens are featured on a large CNC display unit. Switch between machine status screen and load graph screen by pressing a single button, or return to the previous NT screen by simply pressing the NT screen button.



● STATUS DISPLAY



● LOAD GRAPH

### Open CNC

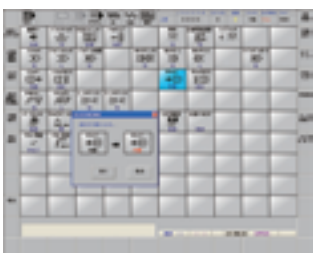
Several original screens developed by Nakamura-Tome, such as Tool Setting Screen and Work-piece Status Screen, are featured on this machine to ensure ease of set up and ease of operation with loading / unloading devices.



● CNC SCREEN



● PROGRAM CHECK



● NT SETTING



● TOOL SETTING



Program storage length	2560mm	5120mm	10240mm	20480mm
Program registered number	2000	1000 or 4000		
Tool offset pairs	99+ 99			

  Standard   Option

## Full operator support for more ease of use and reliability

### Illuminated Switches

LED light switches are introduced on the operation panel. When machine power is on, a backlight makes it possible to see the switch even in a dark condition. When pressed, the switch is fully illuminated. When the spindle, tool spindle or feed override rotary switches are set to 100%, the lit LED switches enable the operator to see the override condition from a distance.



Spindle override switch

Feed-rate override switch

### NT-Original screen

#### Setting and operation integrated in one screen

Switches on the control panel, NT-setting screen commands and other buttons were all put together in one screen. All setting operations can be done from within one screen, which is displayed by pushing one button, ensuring easy operation.



NT SETTING

#### All required information displayed on one screen

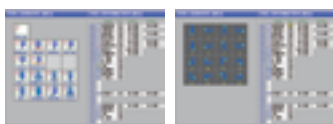
Set up can be easily performed without changing screens. Graphic displays of working-area units, such as chucks, parts, tool spindle, ...etc, are great visual aids to ensure ease of understanding.



TOOL SETTING

#### Coolant setting screen

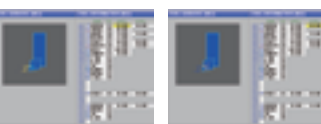
Coolant setting screen pops up by pushing one button on the control panel. Easy to see! Easy to use!



TOOL INFORMATION

#### Coordinate and tool setting integrated in one Screen

Geometry & wear offsets, work coordinates and Manual Guide i tool information were all put together in one screen. Easy to see! Easy to use!



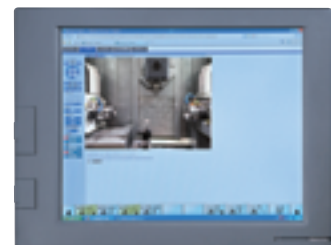
### Pop up display

By pressing the AUX key, registered screens subsequently pop up, showing machine conditions on several screens. Thanks to the NTIPS large screen, it became possible to look at the NC program while watching 3D interference check, or to look at the CNC coordinates while watching the machining area through a video camera, ... etc. Easy to see! Easy to understand! Easy to use!



### Monitoring System (op.)

It is possible to mount an external CCD camera inside the machine. Using the screen controller, the video camera can be panned, tilted or zoomed. Additionally, it is possible to pre-register up to 6 camera positions, which can be quickly recalled later by simply pressing the "AUX" key. Full screen display is also available by pressing the provided "□" button, similar to several Windows applications.



**Featuring new functions!**

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.

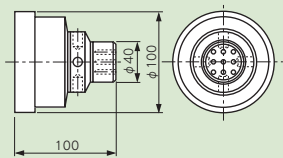
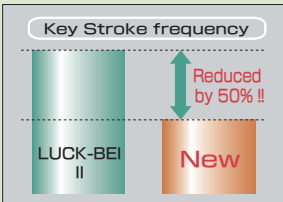


## Automatic Cutting-Condition Setting Function

By setting the material type and required surface roughness, cutting conditions are automatically generated. These can be also changed depending on customer's experience.



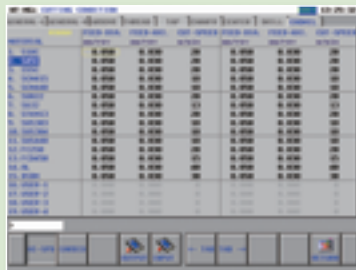
By selecting the material, cutting conditions are automatically input.



By introducing the "automatic cutting condition setting function", the number of key strokes required to make a program were reduced by 50% reduced, compared with the previous NT-Manual guide version.



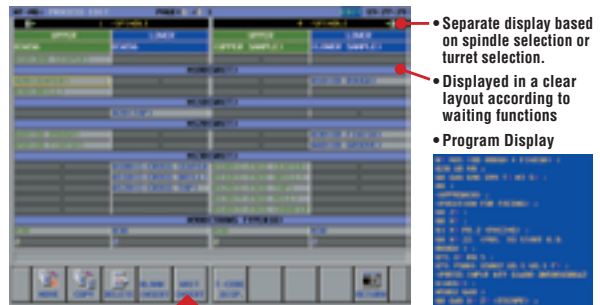
By setting the surface roughness, machining conditions are automatically input



Cutting conditions. End mill

## 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.



- Separate display based on spindle selection or turret selection.
- Displayed in a clear layout according to waiting functions
- Program Display

Waiting function is easily input with the push 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.



Work navigator programming screen



Soft work pusher programming screen

# Advanced NT Nurse

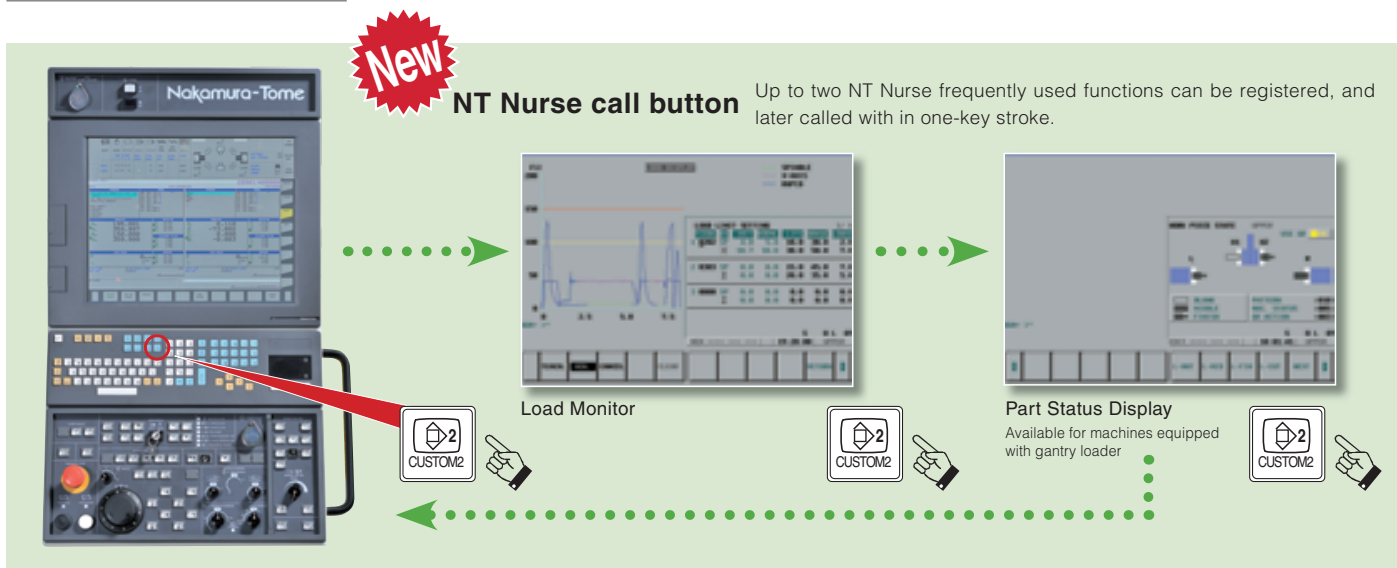
–Generous User-friendly Support System–



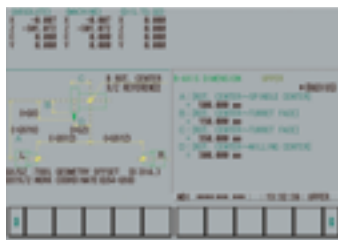
Full operator support for more ease of use and reliability

**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.



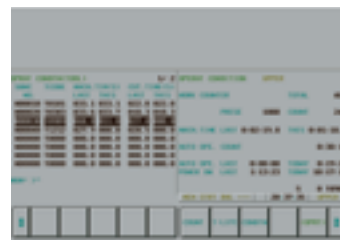
These are only a few of the available 19 NT Nurse user support functions.



● B-axis machine large display



● Menu screen



● Condition display



● Alarm detail display



● Spare tool call-up



● Tool counter



● Power saving function



● Offset history



● Data Input / Output to Memory

- Tool Counter
- Tool Life Management
- Cutting conditions
- Quick offset / wear offset
- Setting switch
- Operation Condition Display
- Load Monitor
- Menu Display
- Gantry screen (op.)
- Work stoker screen (op.)
- Soft work pusher screen
- In-process measurement Han-bei (op.)
- Chucking condition confirmation by pneumatic device (op.)
- B-axis machine large display
- Work-Piece Status screen
- Periodical maintenance screen
- Data Input / Output Function
- Power-Saving Setting screen
- Offset History screen

In case of 19-inch screen, Auto Monitor-off function is not available.  
Power saving function for PC can be used.

← Program data, tool offsets, coordinate offsets, NT-Nurse data and all other part related-data, can be easily transferred to one single folder on the memory card with one single stroke, making machining data for one single part easy to manage and to recall. A memory card is required for data input/output.

## Dual safety

NT Collision Guard



Airbag

# Double safety features

## NT Collision Guard

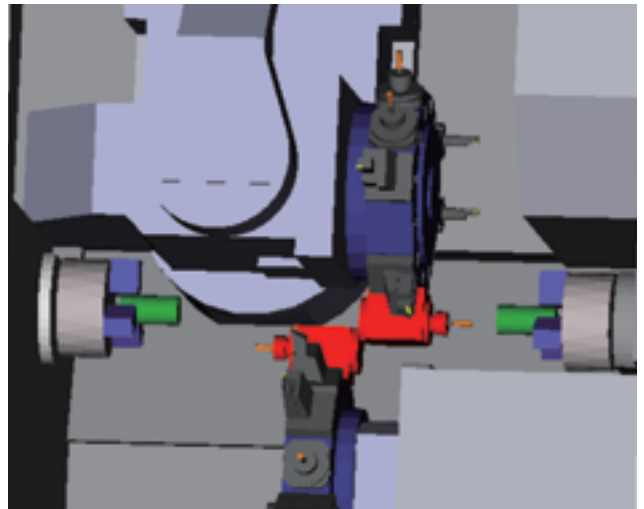
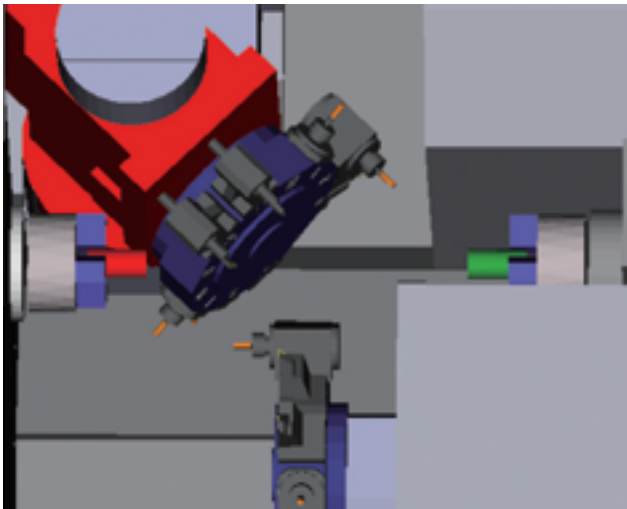
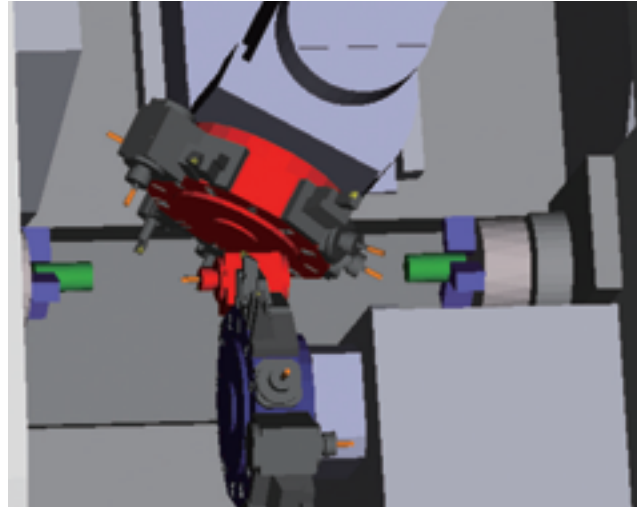
ACTIVE SAFETY

New

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

NT Collision Guard to avoid machine collision before machining and Air bag function (Abnormal load detection) to minimize damage even in case of collision during actual machining.

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



# Jig less! Set-up less! Skill less!

This essential function for multitasking machines is standard.

## Safety Technology.

"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 Work Navigator

ACTIVESAFETY

X Y Z B C

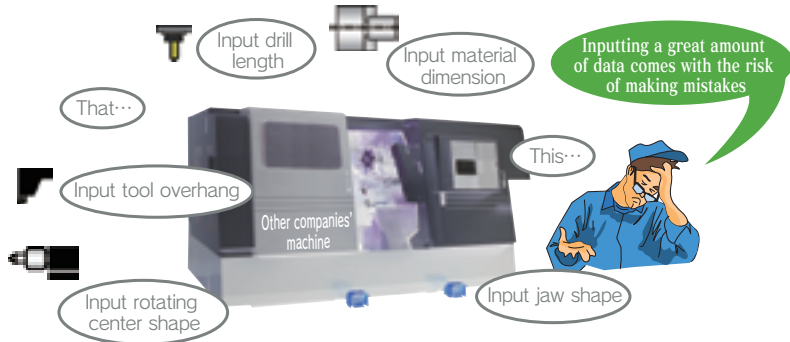
- Advanced NT Work Navigator !
- No fixtures required



# for maximum machine protection

Full operator support for more ease of use and reliability

## Airbag (Overload detection) PASSIVE SAFETY

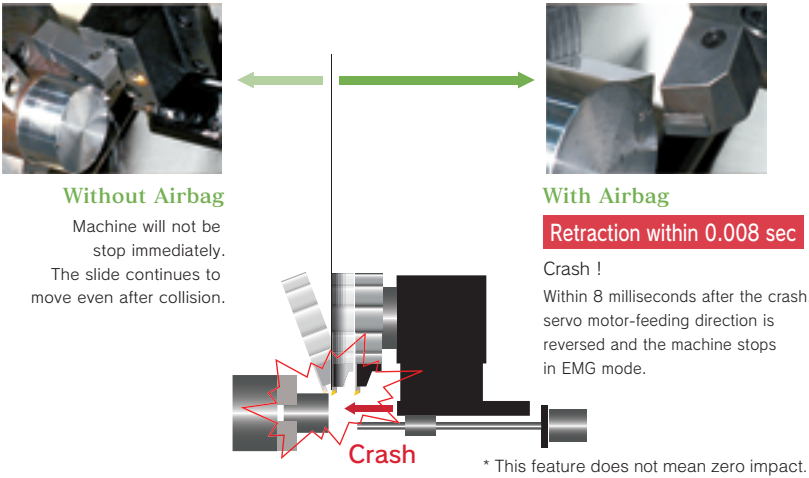


**Even with barrier function, machine collisions may occur**

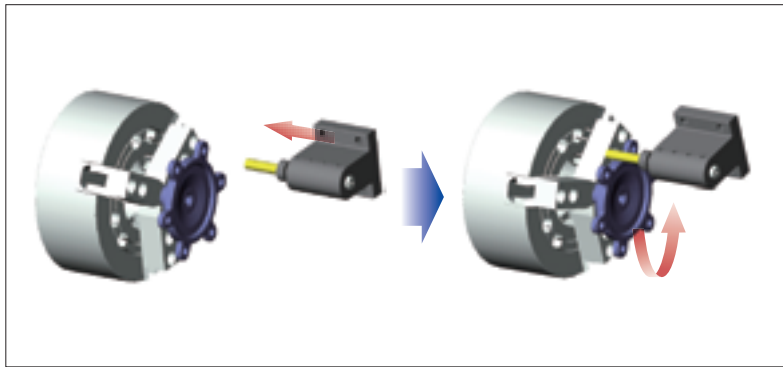
Soft barrier function is not perfect. If wrong data is input, a collision will occur.

**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.



\* This feature does not mean zero impact.



- Air Cutting Mode
- Index Speed override  
Machine set-up essentials
- Jump Programming (G411)  
Continuous-machining essentials
- Axis Torque Limit Function (G359)
- Cut-in Check
- Program Resume Function
- Manual Handle Retrace (op.)

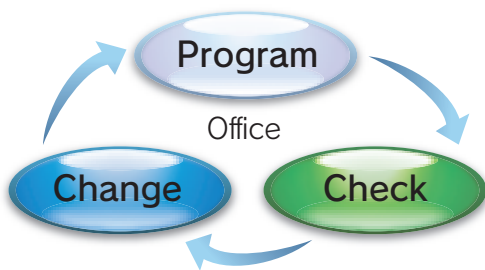
# NT Multitasking Office



By integrating 3D CAD models of the machine, chucks, tools and part, with the dynamics of the real machine (parameter settings) as well as guided programming, Multi-Tasking Office enables virtual planning and verification of the production process.

Efficient Programming for Higher productivity

Shorter set-up times

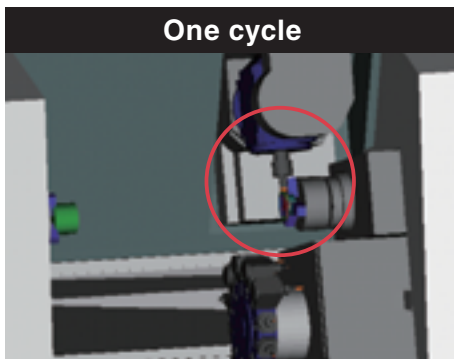


## Drastically reducing set-up time leads to higher productivity

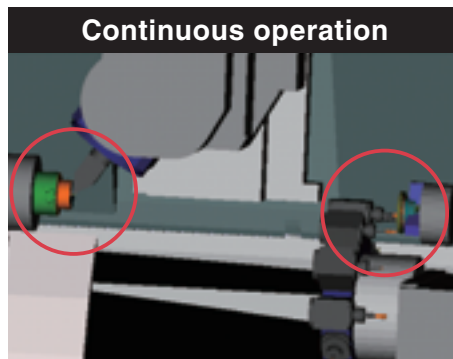
Virtual simulation of the machining processes using 3D solid models of the machine, chucks, tool holders and tools, coupled with all the features of NT-Manual guide I, contribute to not only high efficiency programming and reduced cycle times, but also prevent collisions and reduce set up time.

### Features

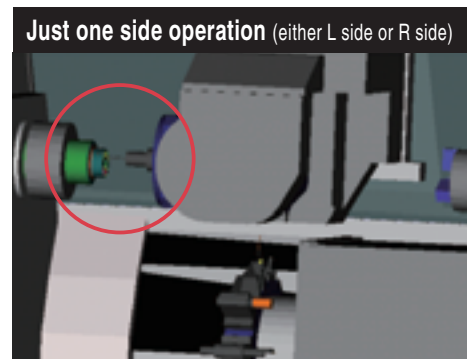
- 1 Simulation is possible either from Manual guide program (including 4-digit G-codes), or from ISO NC program.
- 2 Simulation of Canned cycles such as G71, G83, ...etc.
- 3 Simulation of programs using Jump programming function (G411) is available as well.



One cycle

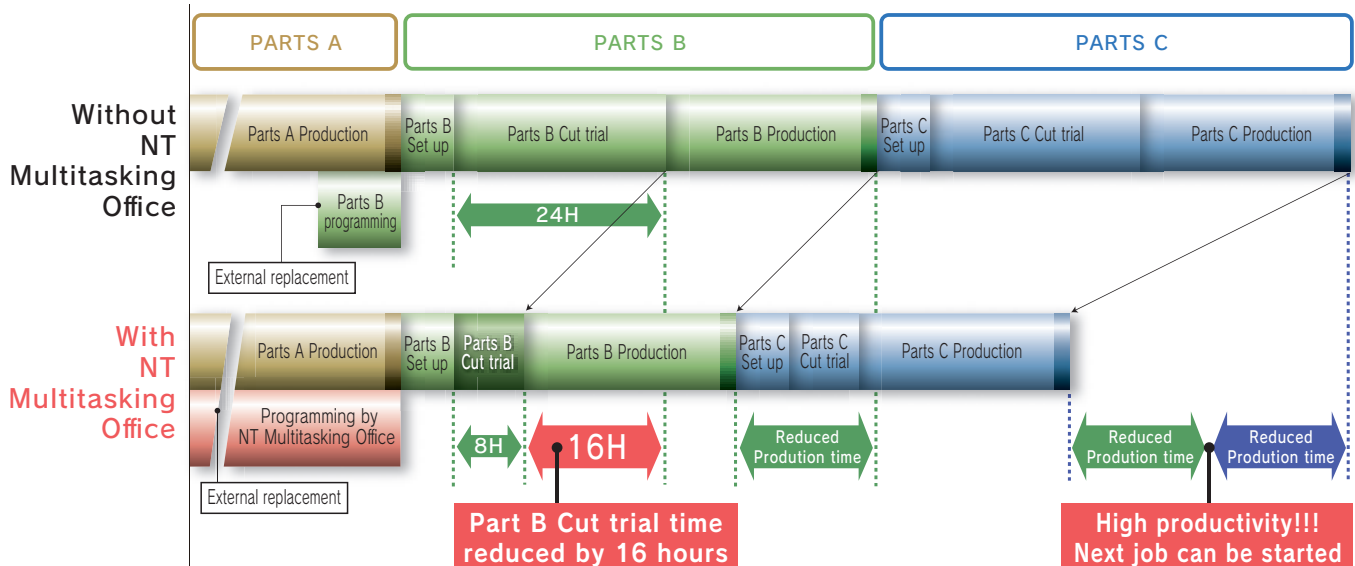


Continuous operation



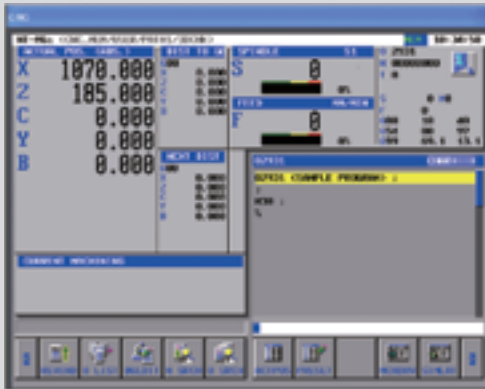
Just one side operation (either L side or R side)

## Effect of NT Multitasking Office

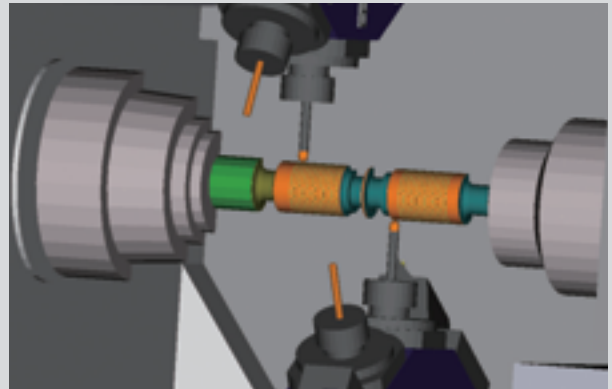


# Programming and test cut can be done in the office.

## ● NT Multitasking Office ●

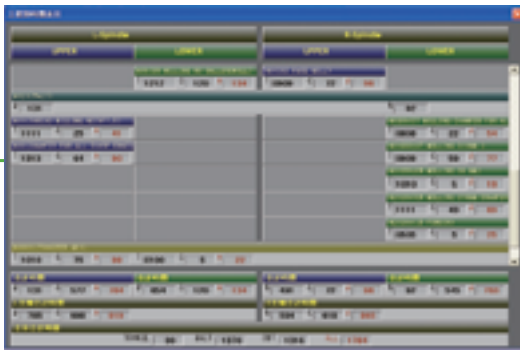


Programming software

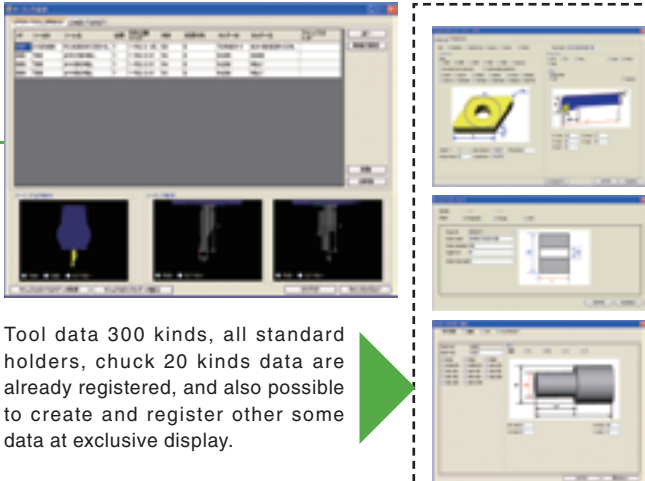


Simulation software

### Process split display function

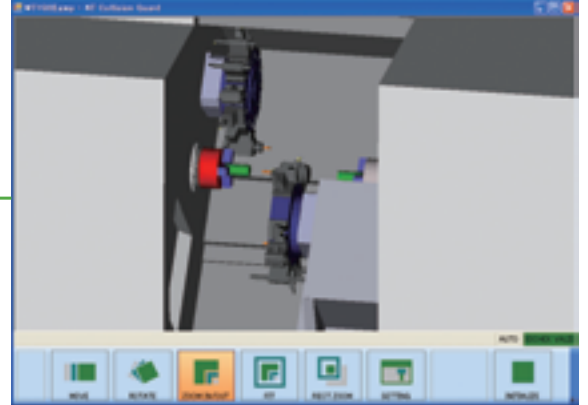


### Tool setting display



Tool data 300 kinds, all standard holders, chuck 20 kinds data are already registered, and also possible to create and register other some data at exclusive display.

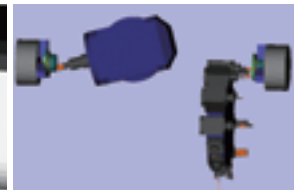
### Interference check



### Mechanical structural simulation



### Workpiece simulation



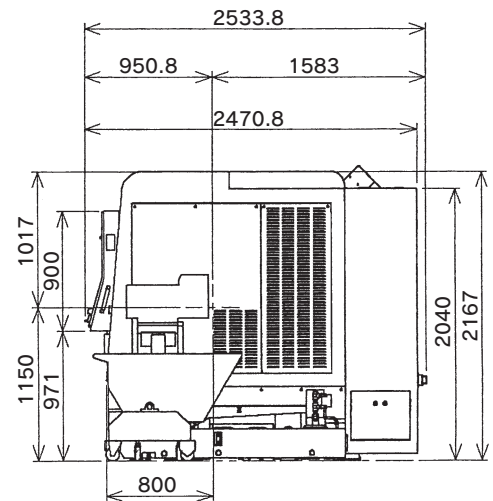
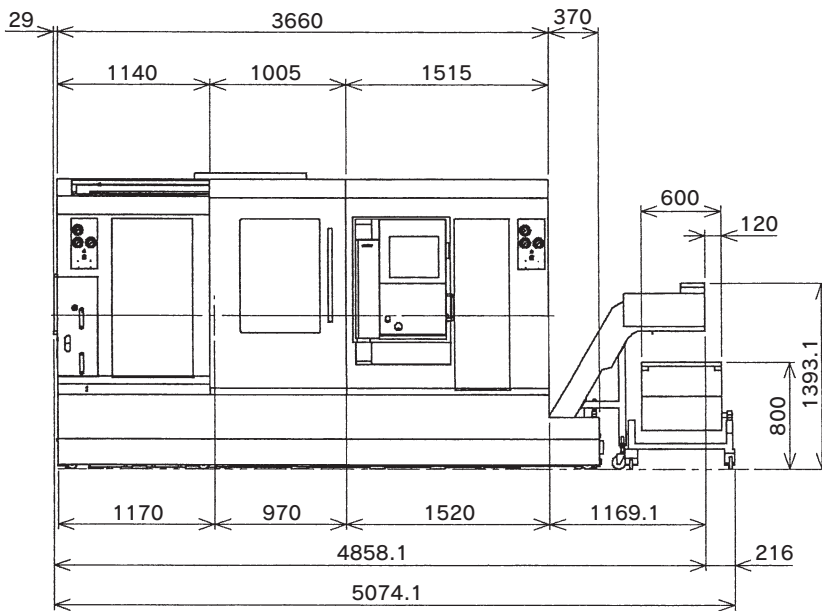
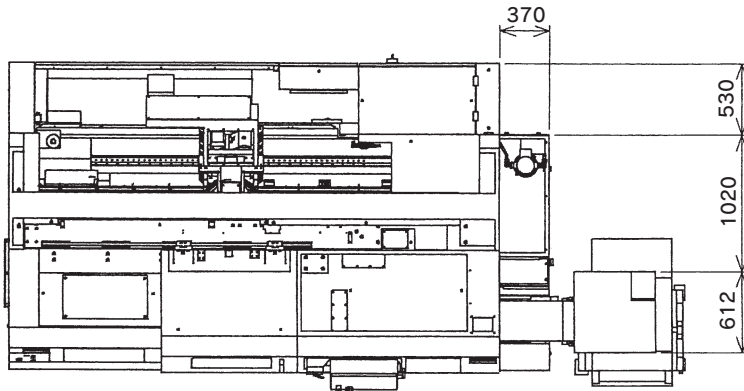
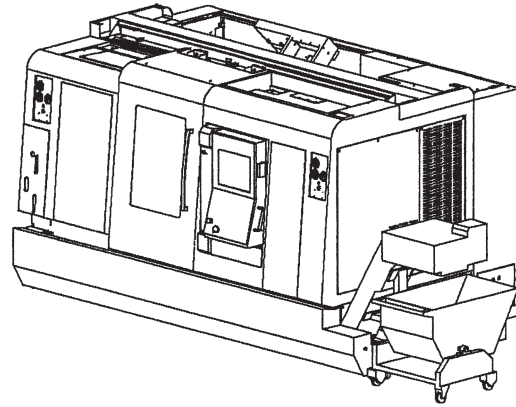
### Workpiece cutting simulation



\* Other PC is required when working this function.

Machine Dimension

■ Chip conveyor right side outlet

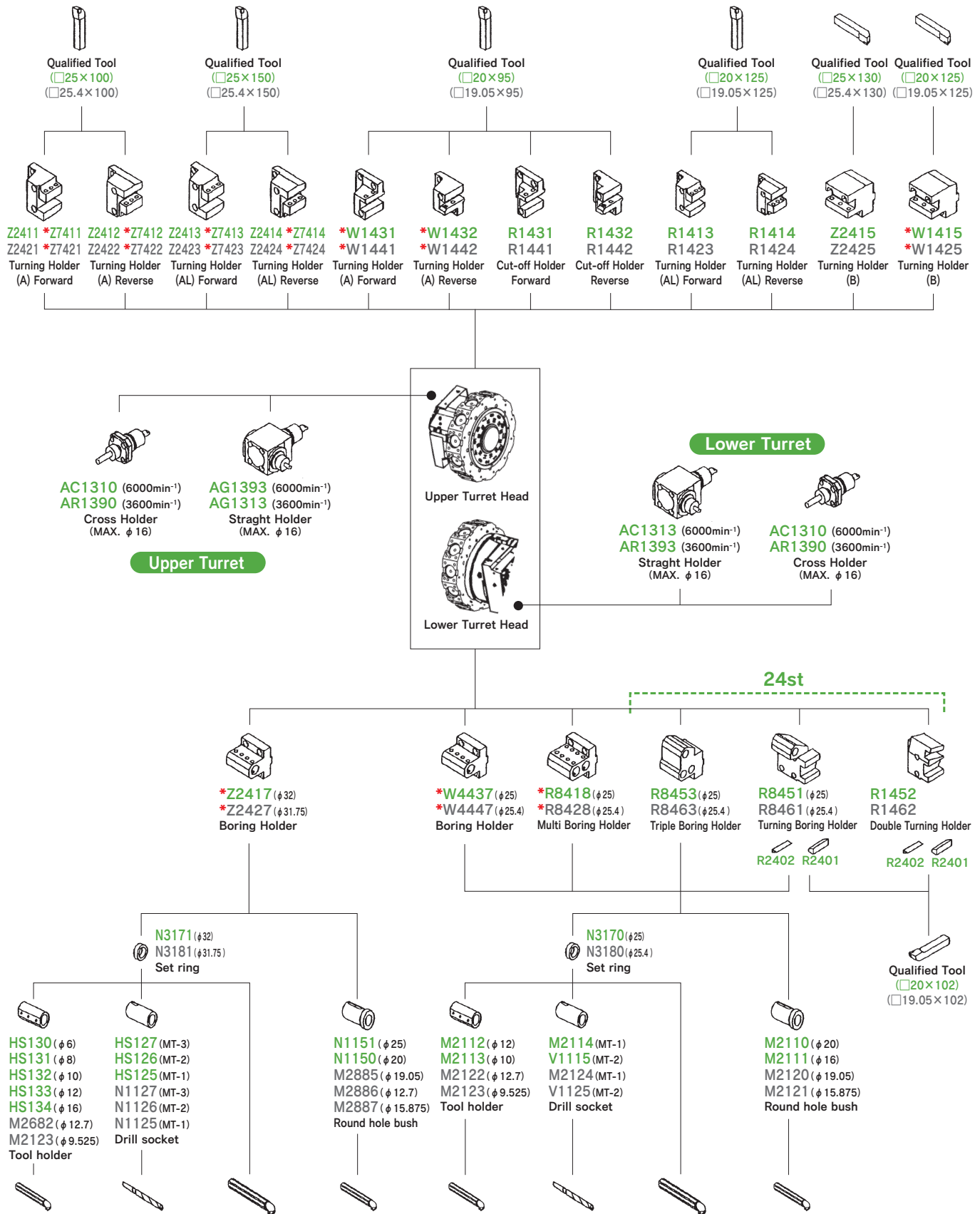


(Unit mm)

Tooling system diagram

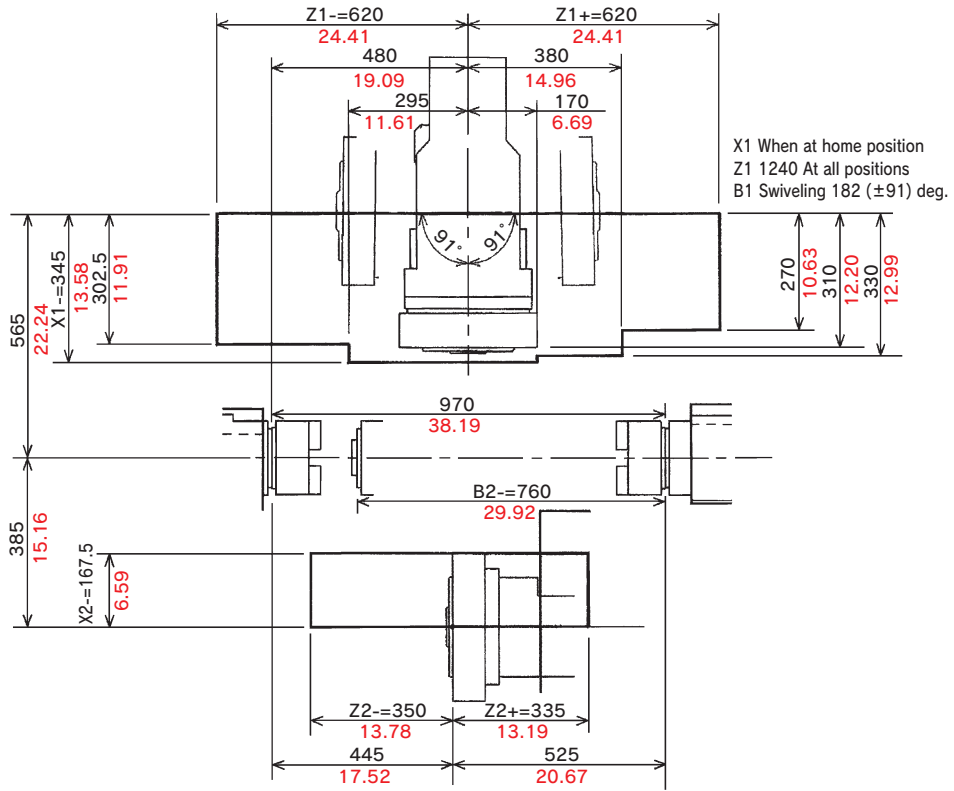
mm  
inch

For \* marked tool holders, coolant comes out from both sides of holder when machining on either L or R hand side. For other tool holders, by connecting a pipe from the turret face to the holder, coolant can come out from both sides.



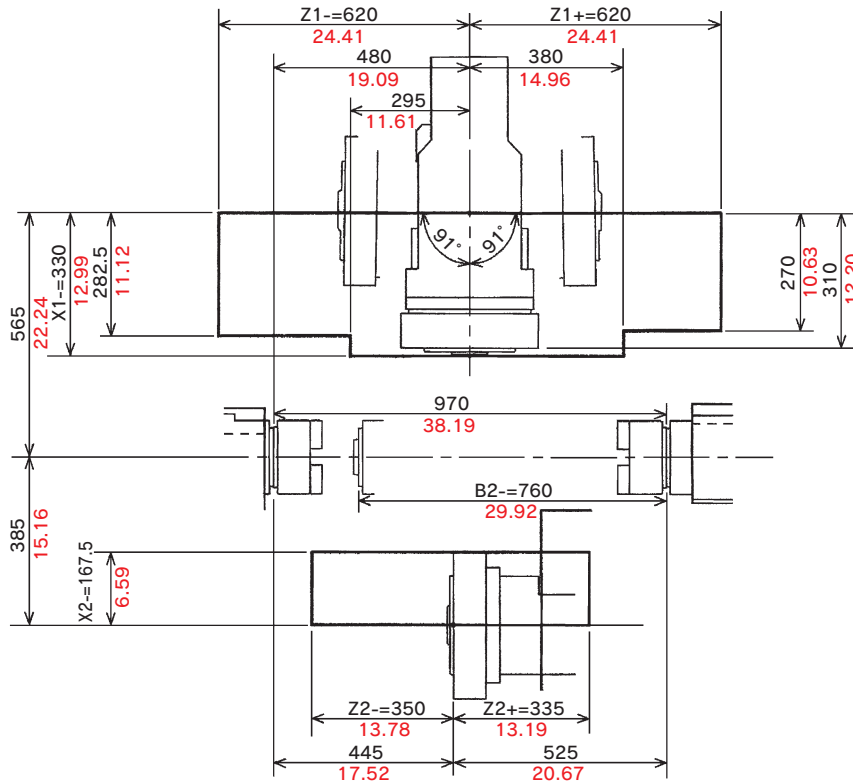
Slide Travel Range

■  $\phi 51$



Unit  $\frac{mm}{inch}$

■  $\phi 65$



Unit  $\frac{mm}{inch}$

## Machine Specification

### Capacity

Max. turning diameter	190mm
Standard turning diameter	170mm
Distance between spindle noses	max.970mm / min.210mm
Max. turning length	620mm
Bar capacity	65mm (op. 51mm) / 51mm
Chuck size	165mm (6")

### Axis travel / speed

Slide travel X1 / X2	345mm / 167.5mm
Slide travel Z1 / Z2	1240mm / 685mm
Slide travel Y-axis	± 45mm
Slide travel B2-axis	760mm
Rapid feed X1 / X2	16m/min
Rapid feed Z1 / Z2	40m/min
Rapid feed B2 axis	40m/min
Rapid feed Y-axis	6m/min

### B1 axis

installed position	Upper turret
Swiveling over slide	+91deg. -91deg.
Swivel speed	180 deg/ sec.
Least index angle increment of curvic coupling	5 deg.

### Left spindle

Spindle speed	4500min <sup>-1</sup>	5000min <sup>-1</sup> (op. 51mm)
Spindle speed range	Stepless	
Spindle nose	A2-6	A2-5
Hole through spindle	80mm	63mm (op.)
I.D. of front bearing	110mm	90mm (op.)
Hole through draw tube	66mm	52mm (op.)

### Right spindle

Spindle speed	5000min <sup>-1</sup>
Spindle speed range	Stepless
Spindle nose	A2-5
Hole through spindle	63mm
I.D. of front bearing	90mm
Hole through draw tube	52mm

### C-axis L/R

Least input increment	0.001°
Least command increment	0.001°
Rapid index speed	600min <sup>-1</sup>
C-axis cutting feed rate	1 - 4800° /min
C-axis clamp	Disk clamp
C-axis connecting time	1.5sec.

### Upper & Lower turrets

Number of turrets	2
Turret type	Dodecagonal drum turret
Number of tool stations	24 stations
Number of indexing positions	24
Tool size (square shank)	25mm
Tool size (round shank)	dia.32mm

### Driven-tools

Drive system	Individual rotation
Spindle speed	6000min <sup>-1</sup>
Spindle speed range	Stepless
Number of driven-tool stations	12
Holder type and tool size	Straight holder dia.1mm - dia.16mm Cross holder dia.1mm - dia.16mm

### Drive motor

L spindle motor	Power	15/11kW
	Torque	127.2/93.3N·m   113.4/83.1N·m
R spindle motor		11/7.5kW 83.1/56.7N·m
Rotating tool spindle		5.5/3.7kW 24/16N·m × 2

### General

Machine height	2170mm
Floor space	3660mm × 2320mm
Machine weight (including tooling)	12,500kg

### Main Power supply

Power supply	61.7kVA
Air supply	200NL/min

### 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 turbine 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.

## Control Specification

### Items

Control type	FANUC 31i-B 2 PATH
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### Controlled axes

Controlled axes	9axes
Simultaneously controlled axes	4 axes upper (X1, Z1, C1 (C2), Y1, B1) + 4 axes lower (X2, Z2, C2 (C1), B2)

### Input command

Least input increment	0.001mm/0.0001inch (diameter for X-axis), 0.001°
Least command increment	X: 0.0005mm, Z: 0.001mm, Y: 0.001mm, C: 0.001°, B1: 0.001°, B2: 0.001mm
Max. programmable dimension	± 999999.999mm/ ± 39370.0787inch, ± 999999.999°
Absolute / incremental programming	X, Z, C, Y, B1, B2 (only absolute for B1, B2) / U, W, V, H
Decimal input	Standard
Inch / Metric conversion	G20 / G21
Programmable data input	G10

### Feed function

Cutting feed	feed / min X: 1 - 4800mm/min, 0.01 - 188inch/min
	Z: 1 - 4800mm/min, 0.01 - 188inch/min
	Y: 1 - 4800mm/min, 0.01 - 188inch/min
	C: 1 - 4800degree/min
	B2: 1 - 4800mm/min, 0.01 - 188inch/min
	feed / rev: 0.0001 - 4800mm/min 0.000001 - 188inch/min

Dwell	G04
Feed per minute / Feed per revolution	G98/G99
Thread cutting	G32
Thread cutting retract	Standard
Continuous thread cutting	G34
Handle feed	Manual pulse generator 0.001/ 0.01/ 0.1mm,° (per pulse)
Automatic acceleration / deceleration	Standard
Linear accel. / decel. After cutting feed interpolation	Standard
Rapid feed override	F0 / 25 / 100% (from NT setting screen, changeable 0 ~ 100% at 10% steps)
Cutting feedrate override	0 - 150% at 10% steps

### Program memory

Part program storage length	Total 2560m
Part program editing	delete, insert, change
Program number search	Standard
Sequence number search	Standard
Address search	Standard
Number of registerable programs	2000programs
Program storage memory	Backed up by battery
Multiple program simultaneous editing	Standard (Background program editing cannot be used when PCC or Gantry loader is in automatic operation)
DNC operation through memory card	Standard (Only one turret can access memory card at a time) (not including memory card)
Extended part program editing	Standard

### Operation and display

Operation panel : Display	19inch color SXGA liquid tough panel
Operation panel : keyboard	QWERTY keyboard

### Programming assist function

Circular interpolation R programming	Standard
Direct drawing dimension programming or Chamfering / Corner R	Standard (by setting parameter)
Canned cycle	G90, G92, G94
Multiple repetitive canned cycle	G70 - G76
Multiple repetitive canned cycle II	Standard
Canned cycle for drilling	G80 - G89
Synchronized mixture control	Standard
Sub program	Standard
Balance cut	G68, G69
Custom macro	Standard (#100 - #149, #500 - #549)
Addition to custom macro common variables	Standard (After addition, #100 - #199, #500 - #999)
FS15 tape format	Standard
Luck-bei II NT Manual Guide i	Standard
Abnormal load detection function	Standard
NT Work Navigator	Standard (not including contact bar)
NT Nurse	Standard
NT Collision Guard	Standard

### Machining support functions

Rigid tapping	Standard
Spindle synchronization control	Standard
C-axes synchronization control	Standard
Spindle orientation	Standard (360 deg. Possible to command optional degree, control unit : 0.088)

### NT-IPS

O/S	Windows XP Embedded (There are some restrictions depending on application to be installed)
Pointing device	Touch pad



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