TOSHIBA MACHINE

BTH-I3O.R24

Table-Type Horizontal Boring and Milling Machine

Experience with over 8 000 machines with continual technical improvements, the "BTH-130.R24, H³" has been developed to provide horizontal boring operational ability with machining center productivity and flexibility.

BTH-I3O.R24
H³

High-Rigidity

High-Accuracy

High-Speed

Designed by us to provide you with:

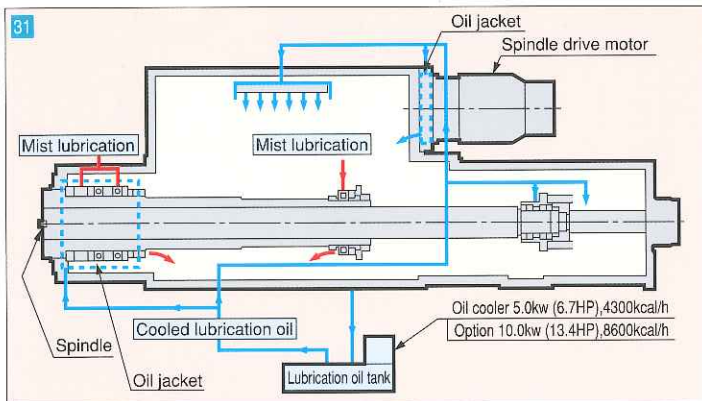|	
Floor space saving	Efficient 7m by 7m (23ft by 23ft) "Square floor space"
Easy chip disposal	High-level side discharge hinge-type chip conveyor
Protective covers	Operator protection from chip and coolant with easy access
Workability	Ease of operation with manual pendant box and environmental platform
Operation capability	Enhanced functions and options from TOSNUC 999

BTH-I3O.R24

BTH-I3O.R24
H³
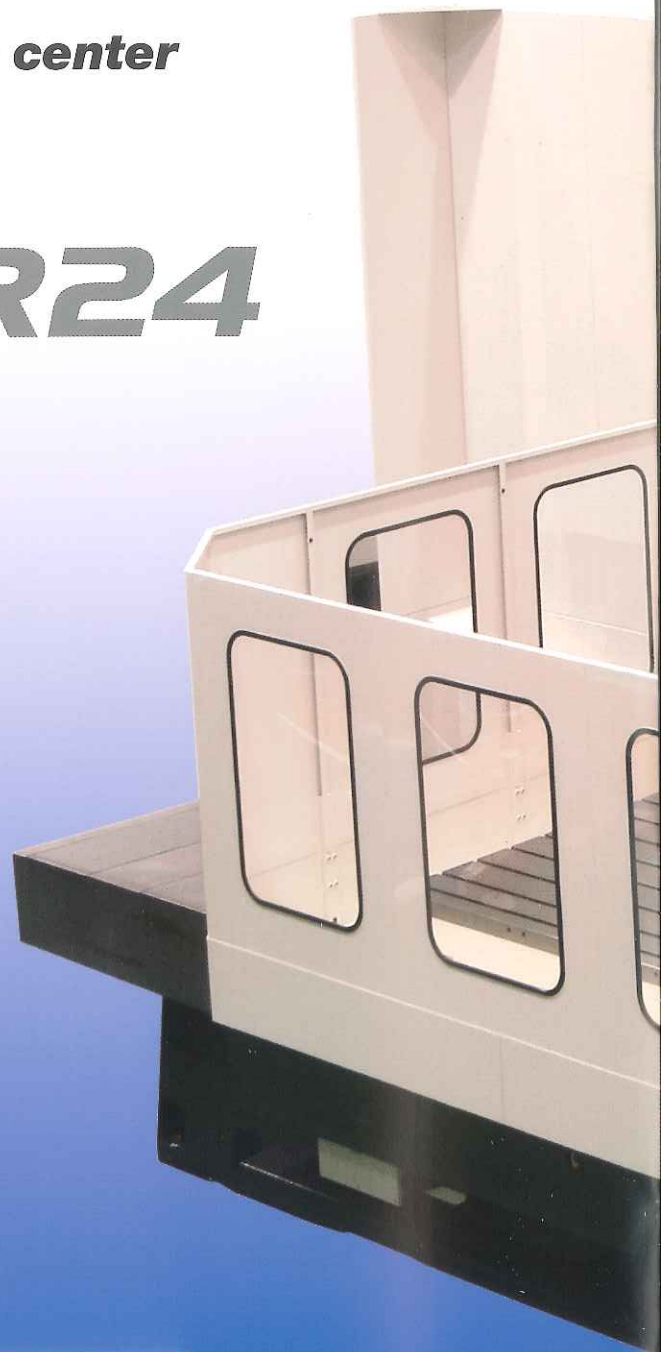
3-step (low, middle and high) spindle drive system provides wide speed range, high rigidity and high torque. Therefore, lots of demands in machining such as in facing, boring, drilling and tapping will be effectively performed with high accuracy and high productivity.

Oil jacket
Spindle drive motor
Mist lubrication
Mist lubrication
Cooled lubrication oil
Spindle
Oil jacket
Lubrication oil tank
Oil cooler 5.0kw (6.7HP),4300kcal/h
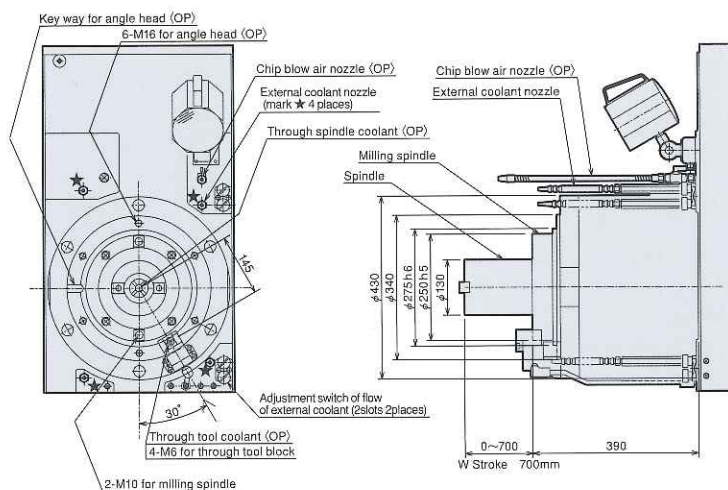Option 10.0kw (13.4HP),8600kcal/h

Minimal thermal displacement of spindle head

Use of an oil jacket and constant lubrication air mist volume for stabilized high accuracy cutting operations.
· Spindle bearings constant mist lubrication

Spindle detailed drawings Spindle head (2500min⁻¹)

Key way for angle head 〈OP〉
6-M16 for angle head 〈OP〉
Chip blow air nozzle 〈OP〉
External coolant nozzle (mark ★ 4 places)
Through spindle coolant 〈OP〉
Chip blow air nozzle 〈OP〉
External coolant nozzle
Milling spindle
Spindle
Adjustment switch of flow of external coolant (2slots 2places)
Through tool coolant 〈OP〉
4-M6 for through tool block
2-M10 for milling spindle
30°
145
ϕ430
ϕ340
ϕ275h6
ϕ250h5
ϕ130
0~700
W Stroke   700mm
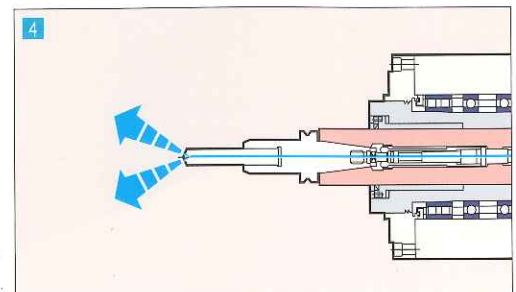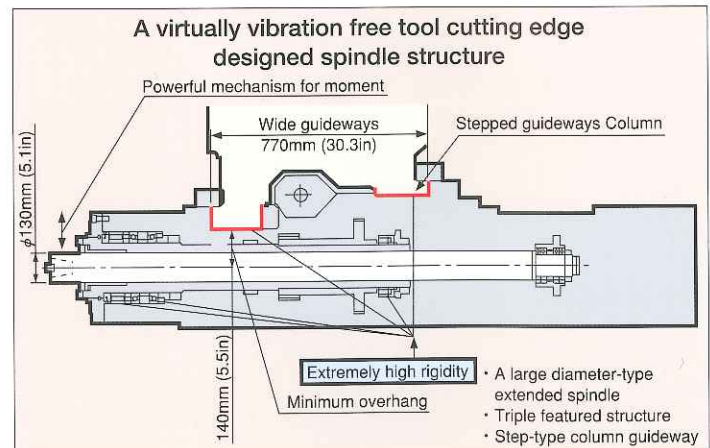390

Hardened and ground spindle

In addition air-oil mist over-sized spindle bearing, the entire unit is nitrided, hardened and precision ground to assure accuracy over the life of the machine.

Step-type column guideways

Extra wide guideways that withstand the cutting force moment for assuring powerful machining with virtually no thermal displacement.

Spindle construction designed for deep hole boring

Spindle designed with extremely rigid, long-span type bearings and an automatic spindle end clamp for increased cutting force and positioning not found on other machining centers.
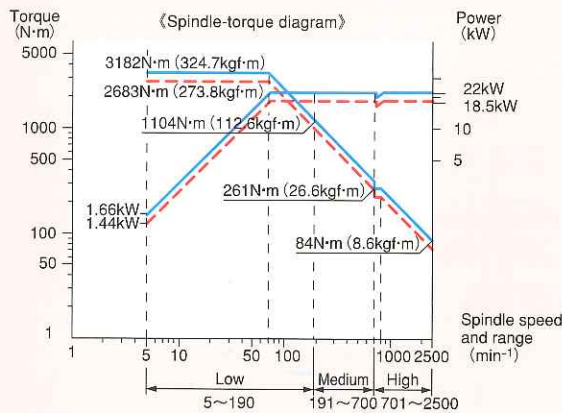
A virtually vibration free tool cutting edge designed spindle structure
Powerful mechanism for moment
Wide guideways 770mm (30.3in)
Stepped guideways Column
ϕ130mm (5.1in)
140mm (5.5in)
Extremely high rigidity
Minimum overhang
· A large diameter-type extended spindle
· Triple featured structure
· Step-type column guideway

■Through-spindle type coolant (option)

3

spindle for optimum high speeds, accuracy and heavy duty machining.

BTH-I3O.R24

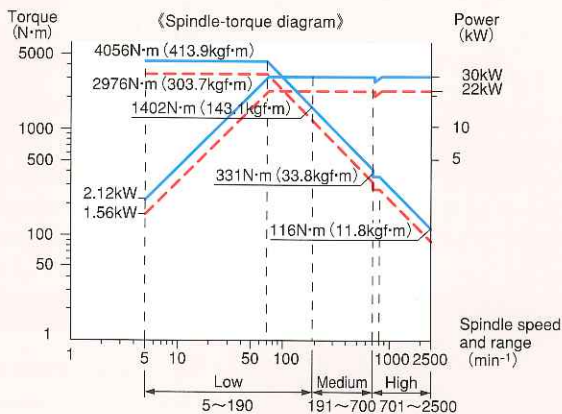## Spindle variations
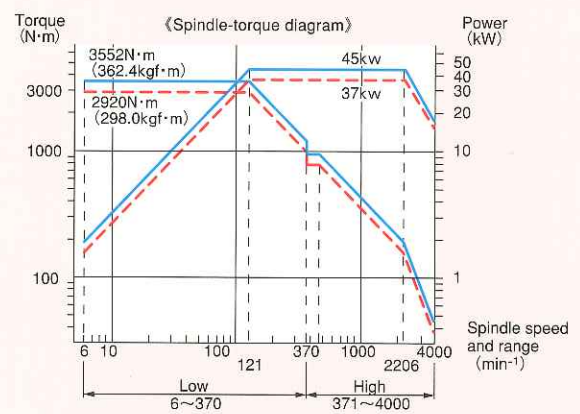
Spindle-torque diagram

Standard (2500min⁻¹, 22/18.5kW)

Torque (N·m) / Power (kW)
《Spindle-torque diagram》
3182N·m (324.7kgf·m)
2683N·m (273.8kgf·m)
1104N·m (112.6kgf·m)
22kW / 18.5kW
261N·m (26.6kgf·m)
1.66kW / 1.44kW
84N·m (8.6kgf·m)
Spindle speed and range (min⁻¹)
Low 5~190 | Medium 191~700 | High 701~2500

Option; High speed type (4000min⁻¹, 30/22kW)

Torque (N·m) / Power (kW)
《Spindle-torque diagram》
2894N·m (295.3kgf·m)
2122N·m (216.6kgf·m)
30kw / 22kw
Spindle speed and range (min⁻¹)
Low 6~370 | High 371~4000
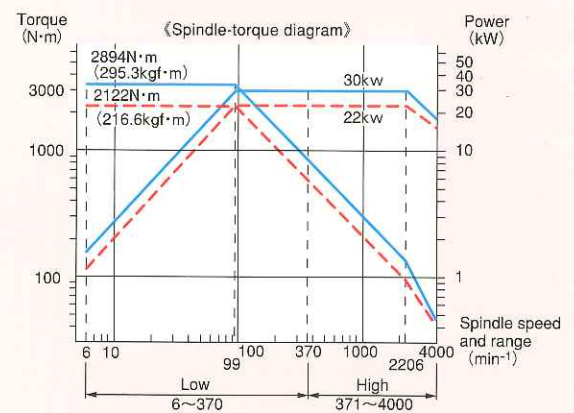
Option; High power output type (2500min⁻¹, 30/22kW)

Torque (N·m) / Power (kW)
《Spindle-torque diagram》
4056N·m (413.9kgf·m)
2976N·m (303.7kgf·m)
1402N·m (143.1kgf·m)
30kW / 22kW
331N·m (33.8kgf·m)
2.12kW / 1.56kW
116N·m (11.8kgf·m)
Spindle speed and range (min⁻¹)
Low 5~190 | Medium 191~700 | High 701~2500

Option; High speed and High power output type (4000min⁻¹, 45/37kW)

Torque (N·m) / Power (kW)
《Spindle-torque diagram》
3552N·m (362.4kgf·m)
2920N·m (298.0kgf·m)
45kw / 37kw
Spindle speed and range (min⁻¹)
Low 6~370 | High 371~4000

Spindle normal direction control ((spring necked turning)) (option)

Composite machining of any shape such as cutoff and hale type finishing on an arc or along a straight line on any plane is possible with this C axis spindle control. Simple-type programs and tooling available for the machining of complex seal surfaces on the slots of such workpieces as vacuum devices.
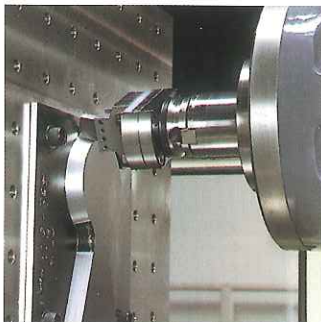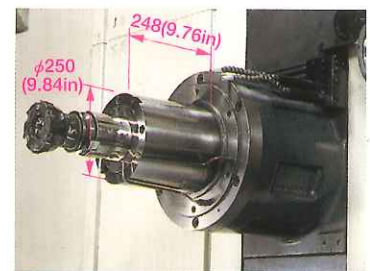

Long nose type spindle head (option)

A long spindle head nose allows easy access to the workpiece, assuring stabilized accuracy even during heavy-duty machining operations.
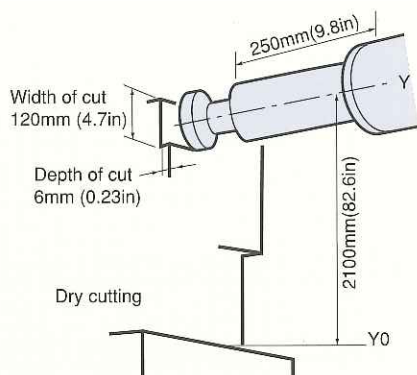(The spindle extension is 700 mm (27.3 in) same as standard.)

Note : Detailed of option specifications to be decided at a separate meeting.

248(9.76in)
φ250 (9.84in)

Example of machining data, material : AISI 1055 (Carbon steel)

FACE MILLING φ160 (6.3 in) No. of flutes 8

250mm(9.8in)

Width of cut 120mm (4.7in)

Depth of cut 6mm (0.23in)

2100mm(82.6in)

Dry cutting

Y0

Workpiece material : AISI 1055 (Carbon steel)
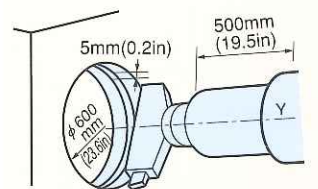W axis extension   **250mm (9.8in)**
Cutting speed   **201m/min (688.8ft/min)**
Spindle speed   **400min⁻¹**
Cutting feedrate   **1200mm/min (46.8in/min)**
Volume of cutting   **864cc/min (52.7cu.in/min)**
Cutting power   **26.8kw (35.9HP)**

BORING

5mm(0.2in)   500mm (19.5in)

φ600 mm (23.6in)

Dry cutting

Workpiece material : AISI 1055 (Carbon steel)
Tool dia.   φ100mm (3.9in)
W axis extension 500mm (19.5in)
Cutting speed 150m/min (492ft/min)
Spindle speed   80min⁻¹
Cutting feedrate 32mm/min (1.25in/min)
Volume of cutting 298cc/min (18.2cu.in/min)

END MILLING

Workpiece material : AISI 1055 (Carbon steel)
Tool dia.   φ80mm (3.1in)
W axis extension 150mm (5.85in)
Cutting speed 151m/min (495ft/min)
Spindle speed   600min⁻¹
Cutting feedrate 600mm/min (23.4in/min)
Volume of cutting 1080cc/min (66cu.in/min)
Cutting power 38kw (50.9HP)
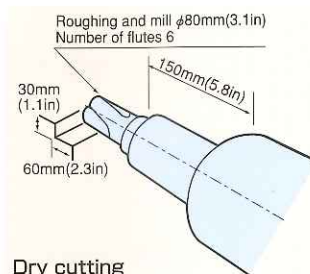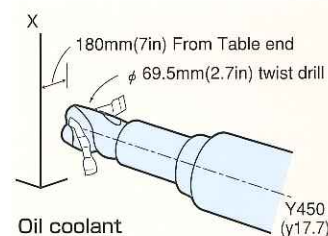
Roughing and mill φ80mm(3.1in)
Number of flutes 6

30mm (1.1in)   150mm(5.8in)

60mm(2.3in)

Dry cutting

DRILLING (Pick cycle)

X

180mm(7in) From Table end
φ 69.5mm(2.7in) twist drill

Oil coolant

Y450 (y17.7)

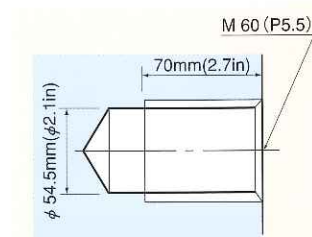**Workpiece material : AISI 1055 (Carbon steel)**
Tool dia.   φ69.5mm (2.7in)
Cutting speed 22m/min (72ft/min)
Spindle speed   101min⁻¹
Cutting feedrate 91mm/min (3.6in/min)
                 0.9mm/rev (0.04in/rev)
Cutting power 13.6kw (18.2HP)

TAPPING

M 60 (P5.5)

70mm(2.7in)

φ 54.5mm(φ2.1in)

Tapping oil(paste)

Workpiece material : AISI 1055 (Carbon steel)
Tool dia.   M60P5.5
Cutting speed 10m/min (32.8ft/min)
Spindle speed   54min⁻¹
Cutting feedrate 297mm/min (11.6in/min)
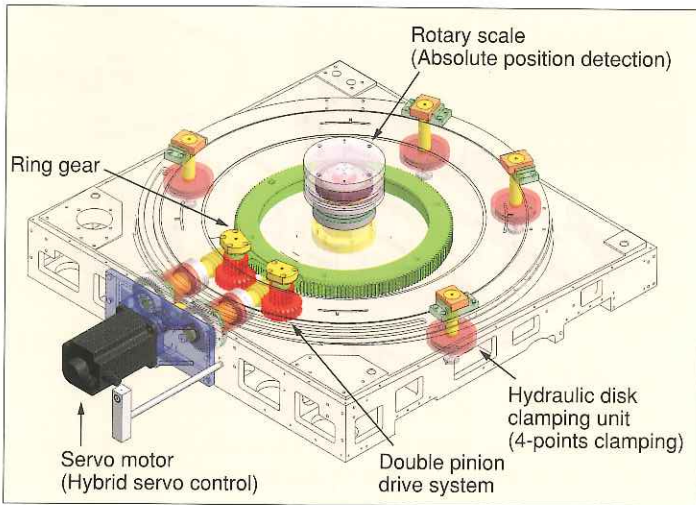Cutting power   3.3kw (4.4HP)

※ Cutting data may vary according to such factors as the machine model, work piece fixture, machining position, cutter and tool holders used.
※ These data are results of high power output type spindle head(S4000,45/37kw)

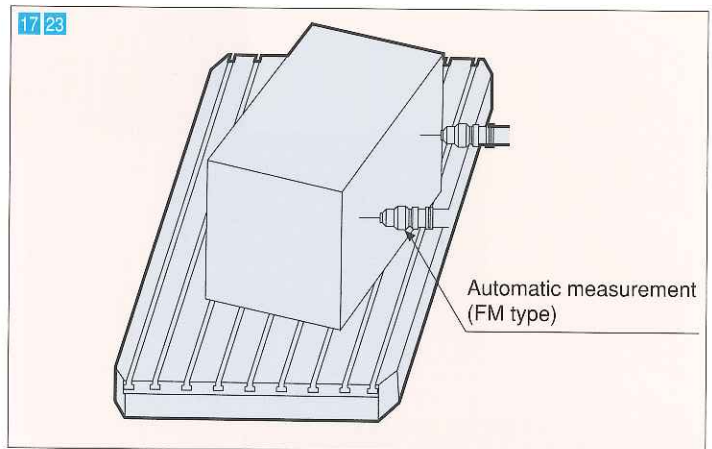## High speed precision machining is achieved through the use of a new B-axis drive mechanism (pat. pending).

B-axis positioning time : 15sec (0°～90°)
The revolutionary type of clamp is standard with a highly rigid double pinion-type drive system and rotary scale for stabilized precision table indexing.

Rotary scale
(Absolute position detection)

Ring gear

Servo motor
(Hybrid servo control)

Double pinion
drive system

Hydraulic disk
clamping unit
(4-points clamping)

Efficient NC rotary milling (option)

Cylindrical and end surfaces can be machined continuously by the B-axis continuous indexing function, eliminating the need for an optional independent-type NC rotary table. Cylindrical surface machining is easily programmed in the manual programing by the cylindrical interpolation function.

Machining Example : Winding Drum

G67B _ _
G03Y _ _ B _ _ R _ _

Set-up compensation function (option) eliminates manual workpiece centering!

After placing workpiece on a suitable location on the table surface, workpiece paralleling is simply completed by the automatic measuring and recording of workpiece position dimensions which is then used to precision index the table. Table will then be precision indexed to bring it in parallel with the X axis.

Automatic measurement
(FM type)

6

TOSNUC 999 (Triple nine) permits quick switching between manual, MDI and Automatic operation modes.

Automatic mode

MDI mode

Full tea
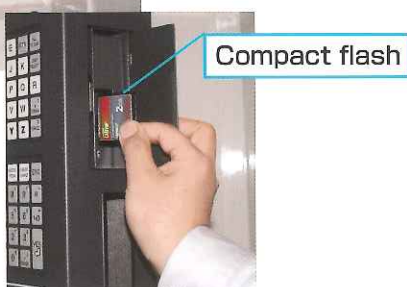
● **Customizing keys**

1. Memorize a series of input operations beforehand in one of the special keys (⊡ ⊡ ⊡ ⊡ ⊠ ⊞) and press these keys to execute operations continuously.

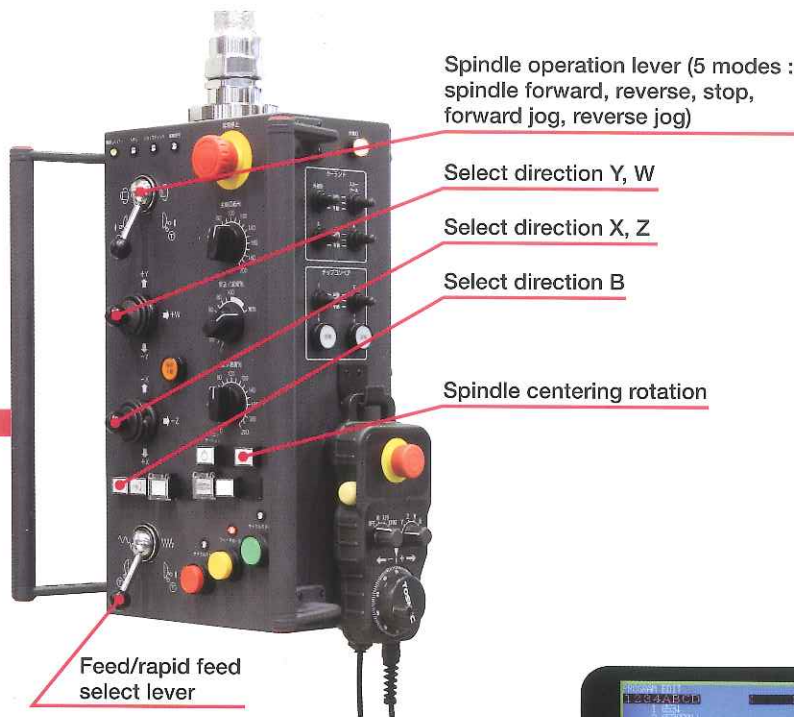2. Memorize a combination of NC standard displays such as main, sub and window displays in one of the special keys (♠ ♥ ♦ ♣). By pressing these keys it displays the combination memorized.

USB flash drive

● **Supporting both USB flash drive unit and compact flash (CF)**

TOSNUC 999 is standard equipped with USB port and CF card slot in response to capacity enlargement of NC programs.

Compact flash

Manual mode

Spindle operation lever (5 modes : spindle forward, reverse, stop, forward jog, reverse jog)

Select direction Y, W

Select direction X, Z

Select direction B

Spindle centering rotation

...ching

Feed/rapid feed select lever

Multi-window triple display

NC drawing function

Manual measurement

Full screen program editing function helps create an NC program easily.

● Multi-window triple display

The display of TOSNUC 999 can be divided into three separate screens where simultaneous display of two different programs and offset data necessary for machining is possible. Also, data entry and editing can be done separately on each screen.

● Multi-editing function

A new program can be easily created by referring to and utilizing a previously made program on the multi-window display.

Visual program check function (option)

During programmed operation (i.e., background operation), an NC tape image of another program can be checked graphically. After program check, relevant tool path is drawn.

Triple teaching function for simultaneous machining and NC programming (option)

TOSNUC 999 stores in its memory all data created by the operator as NC programs. Programming is very easy by combining these programs, using various teaching functions.

● Manual teaching function

All machining data such as tool path, spindle speed and feedrate as obtained in the manual mode are stored automatically as an NC program.

● MDI teaching function

When machining processes are executed one by one consecutively in the MDI mode, all such data are stored automatically as an NC program.

● Auto teaching function

In the AUTO or DNC mode, any data which has been modified can be fed back to the memory automatically.

Various functions shown above significantly improve operability

● Manual alignment (centering) function

The touch sensor or master tool comes into contact with the measured surface of a workpiece according to the interactive screen, inner and outer diameters and angle of inclination of the specific workpiece that automatically calculates set-up.

8

Machine Specifications

Machine Specification			BTH-130.R24	BTH-130.R24 (APC)
Travel	X-axis travel (Cross movement of table)	mm (in)	3 000 [3 500] (118.0 [138.0])	
	Y-axis travel (Vertical movement of spindle head)	mm (in)	2 300 [2 540] (90.5 [100])	2 000 (80.0)
	Z-axis travel (Longitudinal movement of column)	mm (in)	1 500 [2 400] (60 [94.5])	
	W-axis travel (Spindle extension)	mm (in)	700 (27.5)	
	Distance from table surface to spindle centerline	mm (in)	0 to 2 300 [0 to 2 540] (0 to 90.5) ([0 to 100])	0 to 2 000 (0 to 78.7)
	Distance from table centerline to spindle gage plane	mm (in)	900 to 2 400 (35.4 to 94.4) [900 to 3 300] ([35.4 to 129.9])	
Table	Table working surface	mm (in)	2 000×2 400 (78.7×94.4)	
	Table loading capacity	kg (lbs)	20 000 (44 000)	15 000 [33 000]
	Table surface configuration (Pitch of T-slots: 160 mm)	mm (in)	13T-slots, size 22, pitch 160 (size 0.86, iptch 6.2)	
	Minimum table indexing angle		0.0001°	
Spindle	Rotating spindle diameter	mm (in)	130 (5.1)	
	Spindle speed	min^{-1}	5~2 500 [6~4 000]	
	Milling spindle nose diameter	mm (in)	250 (9.8)	
	Type of spindle taper hole		7/24 taper No.50	
Feedrate	Rapid traverse rate — X, Y, Z	mm/min (ipm)	14 000 (551.1)	
	Rapid traverse rate — W	mm/min (ipm)	5 000 (196.8)	
	Rapid traverse rate — B	deg/min	500	
	Feedrate — X, Y, Z	mm/min (ipm)	1 to 7 000 (0.039 to 275.5)	
Automatic tool changer (ATC)	Type of tool shank		MAS BT50 (CAT 50V)	
	Type of retention knob		MAS P50T-1 (45 degree)	
	Tool storage capacity		38 [60, 90, 120] tools	
	Maximum tool diameter — When pots are full	mm (in)	125 (4.92)	
	Maximum tool diameter — When adjacent pots are empty	mm (in)	240 (9.44)	
	Maximum tool length	mm (in)	400 (15.74)	
	Maximum tool mass	kg (lbs)	25 (55)	
	Method of tool selection		Pot address random short-cut	
Spindle drive motor	(30-min. rating/cont. rating)	kW (HP)	[AC22/18.5, AC30/22] <AC/30/22, AC45/37> ([AC30/25, AC40/30] <AC/40/30, AC60/50>)	
Power source	Electric power supply		AC200/220V±10%, 50/60Hz±2%	
	Power capacity	kVA	90 [High Power]	
	Compressed air supply — Pressure	MPa {kgf/cm²} (psi)	0.5 to 0.8 {5 to 8} (82.5 to 116)	
	Compressed air supply — Flowrate	Nℓ/min	900	
Machine size	Machine height	mm (in)	5 060 (199.2)	
	Floor space	mm (in)	6 950×7 250 (273.6×289.3)	
	Mass of machine (including CNC system)	kg (lbs)	45 000 (99 000)	
Accuracy	Positioning accuracy — X, Y, Z	mm (in)	±0.016/full length (±0.00064/full length)	
	Positioning accuracy — W	mm (in)	±0.012/full length (±0.00047/full length)	
	Repeatability — X, Y, Z	mm (in)	±0.007 (±0.00027)	
	Repeatability — W	mm (in)	±0.008 (±0.00031)	
	Table indexing accuracy (arbitrary angle)		±3"	
	Table indexing repeatability (arbitrary angle)		±1.5"	
Machine colour			R4-383 (Munsell 5Y8.4/0.5) and N2.5 (For CNC system, servo motors and cooler, each maker's standard color shall apply.)	

Note : Values in brackets [ ] refer to the options.
The values in the specifications tablle above indicate the maximum capacity. If a continuous long-hour operation is requred at the maxmum capacity, please consult with us beforehand.

Accessories (Machine)

STANDARD ACCESSORIES

1. Numerical control system TOSNUC 999 — 1 set
2. Machine operation box (Pendant type) — 1 set
3. Spindle orientation stop function — 1 set
4. Spindle speed drop monitoring function — 1 set
5. Constant volume mist unit for spindle bearing lubrication — 1 set
6. Spindle head cooling unit (main bearing, motor flange oil jacket) — 1 set
7. Hand wheel feed unit (portable) fox X, Y, Z, W and B axes — 1 set
8. Automatic table random angle indexing unit, every 0.0001 degree — 1 set
   (with B-axis rotary scales feedback)
9. Automatic table clamping unit (hydraulic) — 1 set
10. Table oil pan — 1 set
11. High rigid type X-axis feed system
    Ball-screw diameter: 80 mm (Ball-screw diameter: 3.14 in)
12. High rigid type Z-axis feed system
    Ball-screw diameter: 80 mm (Ball-screw diameter: 3.14 in)
13. High type Chip cover (with operator door) at table side — 1 set
14. Table-bed slideway cover on X-axis (both right and left side) — 1 set
15. Column-bed slideway cover on Z axis (both front and back side) — 1 set
16. Column-front slideway cover: Y axis (column vertical) — 1 set
17. ATC rail cover — 1 set
18. Chip disposal chute for Z-axis (both sides of column-bed) — 1 set
19. Spindle head cooling unit and hydraulic unit — 1 set
    Inverter controlled oil cooler
    Cooling capacity: 2.8/3.2kW [3.7/4.3 HP] (50/60 Hz): 2400/2750 kcal/h
20. Assembly and reassemble tools for maintenance — 1 set
21. Installation parts — 1 set
22. Operator call lamp: one color (Yellow) — 1 set
23. Automatic power OFF device — 1 set

MECHANICAL ACCESSORIES

1. Flood coolant set
   - X-axis chip conveyor combined with Lift-up type chip conveyor
     (incorporating coolant tank)
     Mainly used for cast and steel milling chips.
     Processing capability — 3 liters/min
   - Flood coolant unit
     Pump capacity — 50 liters/min., head 5 m
     (13.2 gal/min., head 16.4 ft)
     Tank capacity — 400 liters (105 gal)
2. Through-tool type coolant set
   - Flood coolant set
   - Through-tool coolant set
     Pump capacity — 1.2 MPa, 20 liters/min.
     (170 psi, 5.25 gal/min)
3. Coolant/Air blow set
   It is necessary to attach air-compressor of 1 200/1 300 normal liters/min
   (50/60 Hz) (Recommend type: IDF11E (11kW) made by SMC)
   - Flood coolant set
   - Through-tool coolant set
   - Coolant/air blow unit
4. Through spindle type coolant set
   It is necessary to attach air-compressor of 1200/1300 normal liters/min
   (50/60 Hz) (Recommend type: IDF11E (11kW) made by SMC)
   - Flood coolant set
   - Through-spindle type coolant unit (including sub-tank)
     1.2 MPa, 20 liters/min or 2.0 MPa, 20 liters/min
     (170 psi, 5.25 gal/min or 290 psi, 5.25 gal/min)
   - Through-spindle type air blow unit

***Coolant set cannot be selected at the same time. Please select either one from Item No. 1 to 4.

***Caution: To avoid serious case of fire, we recommend the followings.
- Must provide fire distinguisher near machine in case of using inflammable type coolant material(s), which may cause fire. And also must observe machine during using coolant by machine operator(s).
- Regarding the ignition point of coolant material, there are two kinds of Open-type and Closed-type features.

If your facility has a Closed-type splash cover, you must obtain details of coolant material(s) and make cross check to avoid unfavourable situation of fire. Before to use machine, must provide Prevention of fire or equivalent facility, just in case.
- Must use anti-inflammable coolant material for un-manned operation.

5. Chip blow air unit
   It is necessary to attach air-compressor of 1 200/1 300 normal liters/min
   (50/60 Hz) (Recommend type: IDF11E (11kW) made by SMC)
6. Intermittent coolant unit
7. Type of retention knob — MAS P50T-2 (30 degree)
8. Attached retention knob — MAS P50T-1 (45 degree)
9. Automatic tool changer (ATC) — Tool storage capacity 60, 90, 120 tools
   In case of ATC-60, 90 and 120, required floor space will be larger than standard
10. Maximum tool length up to 600 mm [23.6 in]
11. Z-axis Coil type chip conveyors for both sides of column-bed
    (AC 0.4 kW x 2) [AC 0.53 HP x 2]
12. Chip cover-A (Simple and detachable)
13. Chip cover A included opening the door by manually
14. Chip bucket C (Capacity: 0.18m³ [6.3 ft³])
15. Box type cover, totally closed, for Standard type machine
16. Automatic pallet changer (APC) two (2) pallets
    Pallet loading capacity: — 15 000 kg (33 000 lbs)
    Note that some of machine specifications will be changed when APC selected.
17. Automatic measuring function and dedicated touch probe (Renishaw made)
    (FM wave type and part program storage capacity reduces approximately 50 m [164 ft])
18. Calibration block (for Automatic measuring function)
19. Automatic tool length measurement
    (Part program storage capacity reduces approximately 30 m [98.4 ft])
20. Reference tool for Automatic tool measurement function
21. Test bar: — diameter 60 x 310 mm length (diameter 2.36 x 12.2 in length)
22. Table reference piece
23. B-axis set-up compensation function
    Shift workpiece setup position in B-axis direction is automatically measured and compensated.
    Automatic measuring function option is required.
24. Continuous table indexing device: 0.0001-degree NC rotary milling operation
25. Automatic table indexing unit, every 90 degree — Locator pin at every 90 degree
26. High power output type spindle head (2500min⁻¹)
    AC30/22kw[40/30HP](30min/cont.)
    Spindle speed range 5 to 2500 min⁻¹
27. High speed type spindle head (4000min⁻¹)
    AC30/22kw[40/30HP](30min/cont.)
    Spindle speed range 6 to 4000 min⁻¹
28. High speed and High power output type spindle head (4000min⁻¹)
    AC45/37kw[60/50HP](10min. /cont.)
    Spindle speed range 6 to 4000 min⁻¹
    Note : Adding the piping, floor space will be changed.
29. Spindle lock device (at random angle)
30. Linear scale feedback for X, Y and Z-axes
    Positioning accuracy — linear scale (X, Y, Z): ±0.008mm (0.00032in)/full length
    Repeatability — linear scale (X, Y, Z): ±0.004mm (0.00016in)
31. Z axis thermal displacement compensation
32. External M-code: 8 types
33. Operator call lamp: three (3) colours
34. Residual current operated protective device
35. Customer's specified painting colour
    Submit a colour samples to us
    For internal paiting colour, however, our standard colour shall govern.
36. Angle head (spindle taper hole : JIS 7/24taper No50)
37. Rotating facing head CS (accuracy improved type)
    Outer diameter 430mm(17in)
    Tool slide travel 80mm(3.1in)
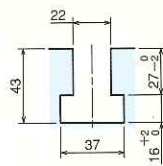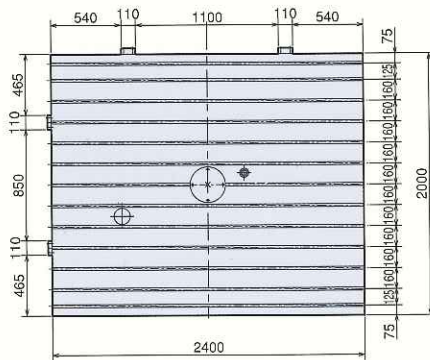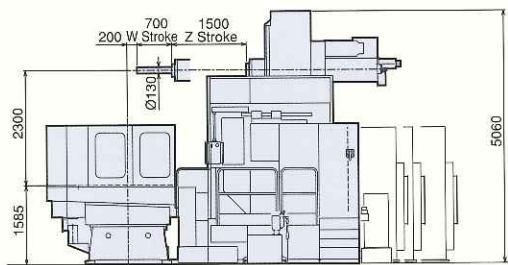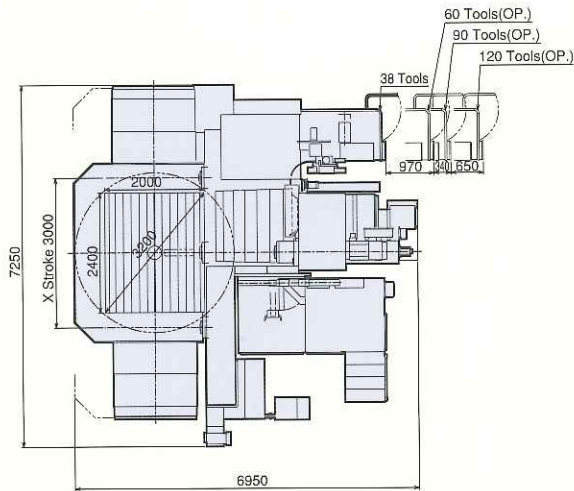38. Tool holder for rotating facing head CS

Note) Air source to be supplied by the customer
    When conventional type air compressor is used, must prepare Air dryer.
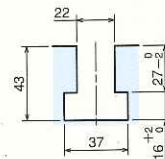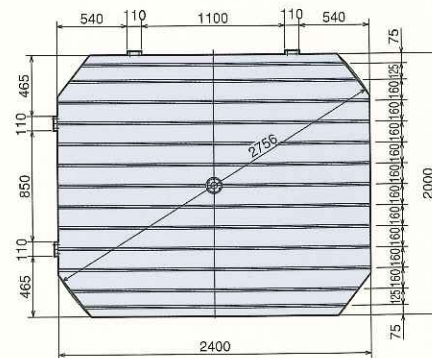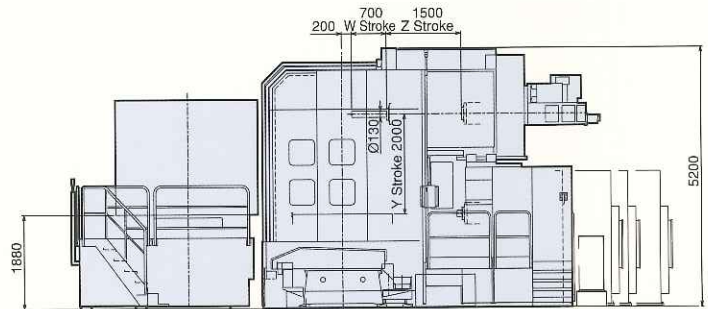
General views

BTH-130.R24
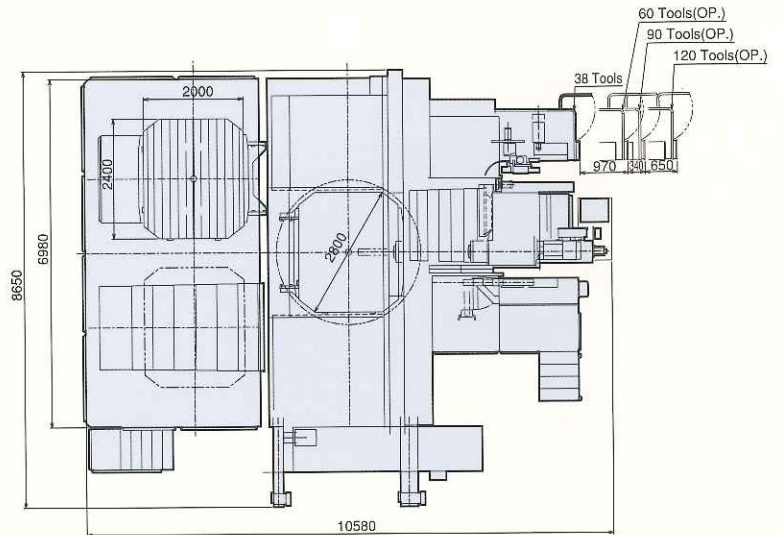
BTH-130.R24（APC）

mm

60 Tools(OP.)
90 Tools(OP.)
120 Tools(OP.)
38 Tools

970 340 650

2000
2400
X Stroke 3000
7250
6950

700 1500
200 W Stroke Z Stroke
Ø130
2300
5060
1585

540 110 1100 110 540
75
465
110
850
2400
110
465
75
2000

22
43
27 0 -2
37
16 +2 0

Details of T-slot

60 Tools(OP.)
90 Tools(OP.)
120 Tools(OP.)
38 Tools

970 340 650

2000
2400
6980
8650
2600
10580

700 1500
200 W Stroke Z Stroke
Ø130
Y Stroke 2000
1880
5200

540 110 1100 110 540
75
465
110
850
2400
110
465
75
2000
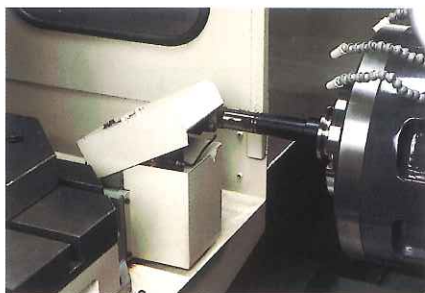2756

22
43
27 0 -2
37
16 +2 0

Details of T-slot

11

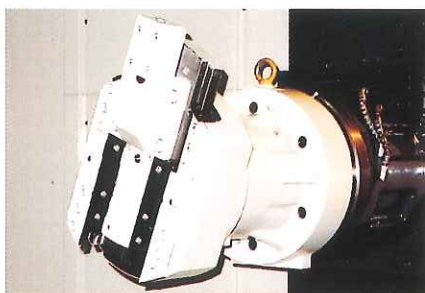# Available options

17 Automatic measuring function

19 Automatic tool length measuring function

13 Chip cover A included opening the door by manually
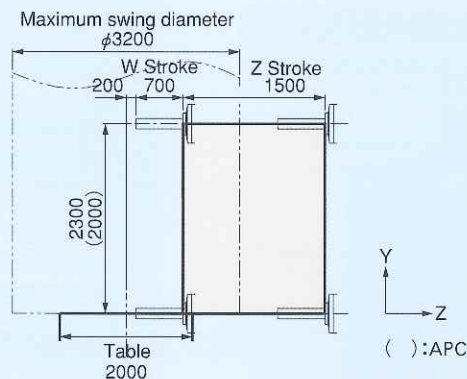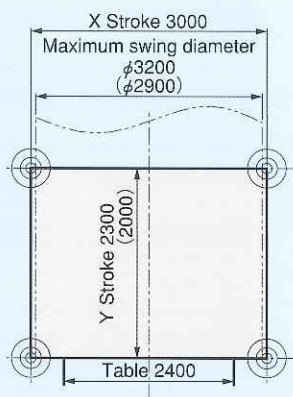

36 Angle head

37 38 Rotating facing head CS

15 Box type cover, totally closed, for Standard type machine
16 Automatic pallet changer (APC) two (2) pallets

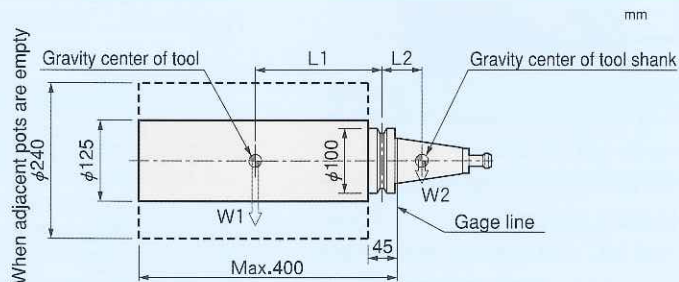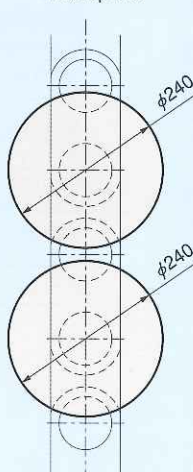## Maximum work area and Axis travel

mm

X Stroke 3000
Maximum swing diameter
φ3200
(φ2900)

Y Stroke 2300
(2000)

Table 2400

Y
X
( ):APC

Maximum swing diameter
φ3200

W Stroke
200 700
Z Stroke
1500

2300
(2000)

Table
2000

Y
Z
( ):APC

Maximum tool diameter

When pots are full
max. φ125

φ125
φ125
φ125
φ125
φ125

When adjacent pots are empty
max. φ240

φ240
φ240

mm

When adjacent pots are empty
φ240

Gravity center of tool

L1 L2

Gravity center of tool shank

φ125

φ100

W1

W2

Gage line

45

Max.400

Tool mass : Max 25kg (W1+W2)
Tool moment : Max 24.5N・m (250kg・cm)
(W1×L1−W2×L2)
＊When using a general BT50 taper shank.
W2＝approximately3.8kg
L2＝approximately38.2mm
(These values may vary, however, with the type of an applicable retention knob and
The manufacturer of shank)

12

CNC System TOSNUC 999

User media (option set B)

Very useful device for managing long programs.

Pendant operation box

Manual operations relating to machine movements are separated from the NC operation unit and centrally arranged on the pendant operation box. Thus, combined NC and manual machining operations can be performed smoothly.

CNC System Specifications TOSNUC 999

Standard Specifications

● Controlled Axes

Controlled axes	5 axes : X,Y,Z,W,B

Simultaneously controlled axes
3 axes (X, Y, Z) for positioning (G00) and linear interpolation (G01)
2 axes (any two axes excluding W- and B-axes) for circular interpolation (G02, G03)

● Programmable Methods

Programming resolution Linear axis : 0.001 mm
Rotating axis : 0.0001°
Maximum programmable dimension Linear axis : ±99999.999mm
Rotating axis : ±9999.9999°
Data code   Automatic recognition of ISO/EIA code
JIS B6311
ISO 6983/1
EIA RS-358-B
EIA RS-244-B
Data format Variable block with a decimal point
word address format

Absolute/incremental programming	G90/G91
Decimal point input Calculator type/Programming resolution type	

● Interpolation

Positioning	G00
Linear interpolation	G01
Circular interpolation	G02/G03: CW/CCW

● Feed

Feedrate	F5-digit programming in mm/min
Dwell	G04 (0 ~ 999.99 sec)

Handwheel feed (portable)
Linear axis : 0.001/0.01/0.1 mm (per division)
Rotary axis : 0.0001/0.001/0.01° (per division)

Continuous jog feed

Rapid traverse rate override 0 ~ 100 % in 10 % increments	
Feedrate override 0 ~ 200 % in 10 % increments	
Override cancel	M48/M49

Automatic acceleration/deceleration
Linear acceleration or deceleration is effected on rapid traverse rate and jog feedrate.

Automatic acceleration/deceleration for feed G08/G09 G50/G51	

● Part Program Storage and Edit

Program storage 150 m equivalent punched tape
(To be reduced as per the attached functions.)
No. of registrable programs
128 (To be reduced as per the attached functions.)
Program edit   Various editing operations are
possible for stored programs.
Background edit
Program deletion, insertion and modification are possible in the background edit mode.
Program name $ (or O)8-digit programming (alphanumeric characters)
Program comment No. of displayed characters   max. 32
(max. 197 for input)

Control in/out	
Sequence number	N5-digit programming
Sequence number search	Bidirectional search is possible.
Program nesting list	
Fixture offset list	
T-code list	

Calendar timer
Program creation date management, time display

● Operation and Display

Operation panel
Display section: 10.4 inch color TFT liquid crystal display
Operation section: Keyboard with membrane switches
Customizing keys
A series of key input operations (key pattern) can be registered. (6 types)
A combination of screens can be registered. (4 types)
Tool file
Tool information such as tool offset and tool name can be batch-displayed and edited.
Automatic operation   Memory operation and DNC operation
MDI operation   Entry of multiple blocks and restart
of an already executed block are possible.
Manual numerical input command
S.F manual setting   Setting of S and F codes in manual mode.
S.F auto setting
Automatic setting of S and F codes in manual mode.
Spindle drive motor load factor display
Load imposed on spindle drive motor is displayed.
Run hour display The NC working time is displayed.
Program record   A record of programs already executed is displayed.
(Date of program execution, actual time, etc.)
User's name registration
A user's name is displayed at system startup.
Customized display color tone

● I/O functions and Devices

RS232C interface port A
Operation via external device, loading and dumping of programs and data are possible.

● S, T and M Functions

Spindle speed function S5-digit programming	
Spindle speed override 50 ~ 200 % (in 10 % increments)	
Tool function	T4-digit programming
Miscellaneous function M4-digit programming	

● Tool Offset

Tool length offset	G43/G44/(G49)
Tool offset	G45/G46/G47/G48
Cutter compensation C G40/G41/G42, point of intersection calculation	
No. of tool offsets 60 sets (tool length offset, cutter compensation)	

● Coordinate System

Coordinate system setting	G92
Machine coordinate system positioning command G73	
Plane selection	G17/G18/G19
Fixture offset	G53/G57, 9 sets
(This function cannot be used together with fixture offset 2.)	
Fixture offset 2	G53/G54/G55/G56, 3 sets

● Operation Support Function

Single block A program can be executed block by block.	
Optional stop	
Optional block skip	
A block containing a "/" code at the head is ignored.	
Dry run	
Machine lock	
Auxiliary function lock	
Z-axis feed cancel	
Manual absolute ON/OFF	
All clear	

Reset

Feed hold

Cycle stop

Program restart

Program restart, block restart

Sequence number collation and stop

Manual interruption

Handwheel feed interruption

●Programming Support Function

Circular interpolation by radius R designation

Radius of a circle can be specified directly, using R code.

Circle cutting   Inner circle cutting: G12/G13, G22/G23

Outer circle cutting: G222/G223

Canned cycle

G77 ～ G89, G98, G99, G100, G186

Subprogram call   G72 (Nesting of up to five levels is possible.)

Macro programming   Single call: G72

Modal call 1: G74/G76

Modal call 2: G75/G76

Automatic corner override

Inside corner automatic override
and inside corner cutting speed change.

Pattern cycle   G109 ～ G119 (Drilling pattern)

G121 ～ G132 (Milling pattern)

Programming format check function   Program format check

Tapping range selection   G63

Single block suppression   G990/G991

Feed hold suppression   G992/G993

Override suppression   G994/G995

Handwheel feed interruption suppression   G996/G997

●Mechanical Error Compensation

Backlash compensation

Pitch error compensation

Pitch error gradient compensation

Origin correction

X-axis shift from table center is corrected.

Unidirectional positioning   G60

Straightness compensation

Non-linear type compensation control

●Automatic Support Function

Tool life management

· Counting of tool working time

· Tool wear coefficient function Tool life and workingtime are
counted by multiplying a specified coefficient.

· Spare tool selection

●Machine Control Support Function

Integrated PLC   TC200

Axis feed interlock

●Safety and Maintenance

Emergency stop

Stored stroke limit

Axis interference area setting and axis interference check
G24/G25, G26/G27

Self-diagnosis function

Door interlock

●Servo System

Servo motor   AC servo motors

Position detectors

Absolute encoders (All axes: Absolute position detection)

Rotary scale (B-axis)

Special Specifications (Options)

Options - Set B

(1)Helical interpolation   G02/G03 (arc + linear)

(2)Synchronous tapping   M843, M844, M845

(3)Part program storage

300 m equivalent punched tape (No. of registrable programs: 256)

(4)User media

(USB port and compact flash slot)

For loading and dumping of NC programs and tool offset data.

(5)No. of fixture offsets

99 sets (including the standard sets)

(6)Random angle chamfering & corner R

(7)Manual alignment function

Including manual tool length/diameter measurement
and coordinate conversion (G10/G11).

(8)Teaching function

Automatic program creation by MDI and manual operations.

(9)W-axis offset function

W-axis extended position is compensated
with Z-axis fixture offset.

Other Options

● Controlled Axes

(1)One additional controlled axis

●Programming Methods

(2)Inch/metric selection   G70/G71

●Interpolation

(3)Parabolic interpolation   G06

Note : It is not compatible with NURBS interpolation.

(4)Hypothetical axis interpolation (i.e., interpolation with sine curve)   G07

(5)Cylindrical interpolation   G67

(6)Involute interpolation   G105

(7)Spindle normal direction control

(Spring necked turning)   G140/G141/G142

(8)Archimedes interpolation (Spiral interpolation)

G102/G103

●Feed

(9)Synchronous thread-cutting

(10)Per-revolution feed   G95

(11)Per-revolution dwell   G05

●Part Program Storage and Edit

(12) Part program storage

600 m equivalent punched tape (No. of registrable programs: 512)

1,200 m equivalent punched tape (No. of registrable programs: 1024)

3,000 m equivalent punched tape (No. of registrable programs: 1024)

5,400 m equivalent punched tape (No. of registrable programs: 1024)

7,800 m equivalent punched tape (No. of registrable programs: 1536)

10,200 m equivalent punched tape (No. of registrable programs: 1536)

*(13)Mass memory (CF)   2GB

●I/O Functions and Devices

(14)Remote buffer operation   (including port C connection)

*(15)High-speed LAN linkage

File transfer by connecting CNC and LAN.

●Tool Offset

(16)No. of tool offsets

No. of tool length offsets: 499 sets (including the standard sets)

No. of cutter compensations: 499 sets (including the standard sets)

(17)Three-dimensional tool compensation G30/G31

●Operation Support Function

(18)Foreground plotting function

A tool locus of active program is plotted.

(19)Additional number of optional block skips   Max. 9

●Programming Support Function

(20)Programmable mirror image   G62/G66

(21)Programmable data input

Updating of offsets by G58/G59.

(22)Scaling   G64/G65

(23)Plane conversion   G35～G39

(24)Three-dimensional coordinate conversion   G14

(25)Figure copy function   G721/G722

(26)Circle cutting compensation

(27)Machining time estimate & NC plotting function

Machining time estimate and tool path plotting
for non-active program on the background.

(28)Pattern cycle division into NC statements

(29) W axis travel distance Conversion function

●Automatic Support Function

(30)Faulty cut detection & feedrate regulation function

Tool breakage and wear detection

Feedrate regulation

Note)Counting of tool working time and
spare tool selection are included
in the standard specifications.

(31)Program check & used tool list creation

Check of a program to be executed next
and creation of a slated tool list.

(32)Cutting start detection Used for spot facing, etc.

(33)NEXUS Schedule operation function

●Safety and Maintenance

(34)Memory lock

●High-Accuracy Machining & Servo System

(35)Shape recognition preview positioning control

(36)NURBS interpolation

Note : Shape recognition preview control function is required.

●Cable

(37)RS232C cable   10 m-long

Note) Marked with *, selectable between two
options.

TOSHIBA MACHINE CO., LTD.

✱ We reserve the right to change any of specifications in this catalog without notice in order to effect improvements.

URL : http://www.toshiba-machine.co.jp