

# Shibaura Machine

BP-130.R22  
BP-150.R22



# BP-130.R22 BP-150.R22

Planer Type Horizontal Boring and  
Milling Machine With Rotary Table

## Shibaura Machine

View the Future with You



### ISO 9001



GOTEMBA plant

#### SHIBAURA MACHINE CO., LTD.

**TOKYO MAIN BRANCH**  
2-2, Uchisaiwaicho 2-Chome, Chiyoda-ku, Tokyo 100-8503, Japan  
TEL:+81-3-3509-0271 FAX:+81-3-3509-0335

**SHIBAURA MACHINE CO., AMERICA**  
Chicago Head Office  
755 Greenleaf Avenue, Elk Grove Village, IL 60007, U.S.A.  
TEL:847-709-7199 FAX:847-593-9741

**Canada Branch**  
6 Shields Court, Suite 101, Markham, Ontario L3R 4S1, CANADA  
TEL:905-479-9111 FAX:905-479-8339

**SHIBAURA MACHINE UK LTD.**  
66 Burners Lane, Kiln Farm, Milton Keynes MK11 3HD  
UNITED KINGDOM  
TEL:+44-(0)1908-562327 FAX:+44-(0)1908-562348

**SHIBAURA MACHINE SINGAPORE PTE. LTD.**  
Head Office  
123 Pioneer Road, Singapore 639596, SINGAPORE  
TEL:68611455 FAX:68612023

**TOSHIBA MACHINE [THAILAND] CO., LTD.**  
127/28 Panjathanee Tower, 23rd Floor, Nonthree Road, Khwaeng Chong  
Nonthree, Khet Yannawa, Bangkok 10120, THAILAND  
TEL:02-681-0158 FAX:02-681-0162

**TOSHIBA MACHINE [VIETNAM] CO., LTD.**  
2nd, VIT Tower, No.519, Kim Ma Street,  
Ba Dinh District, Hanoi, VIETNAM  
TEL:024-2220-8700,8701 FAX:024-2220-8702

**TOSHIBA MACHINE (CHENNAI) PRIVATE LIMITED**  
No. 65 (P.O. Box No. 5), Chennai-Bangalore Highway, Chembarambakkam,  
Poonamallee Taluk, Thiruvallur, Chennai-600123, Tamil Nadu, INDIA  
TEL:044-2681-2000 FAX:044-2681-0303

**SHIBAURA MACHINE TAIWAN CO., LTD.**  
No.62, Lane 188, Jui-Kuang Road, Nei-Hu District, Taipei, TAIWAN  
TEL:02-2659-6558 FAX:02-2659-6381

**SHANGHAI TOSHIBA MACHINE CO., LTD.**  
Head Office  
4788, Jin Du Road, Xinzhuang Industry Zone, Shanghai, 201108  
PEOPLE'S REPUBLIC OF CHINA  
TEL:021-5442-0606 FAX:021-5866-2450

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

# Designed and built with functions for better cutting performance



## Accuracy movements and reliable movements

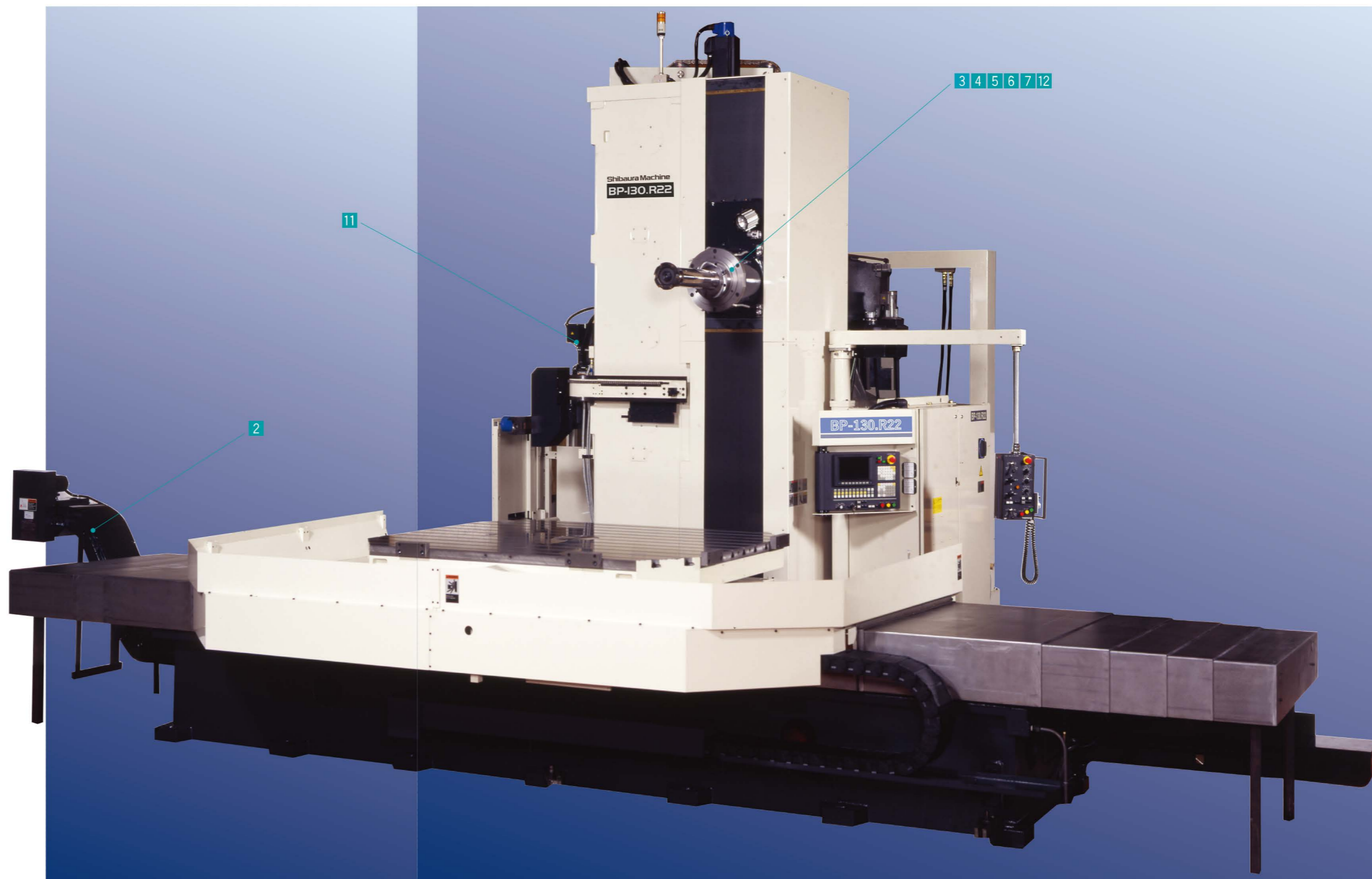
A closed-loop control system for the X,Y,Z and B axes with standard 1 μm linear scales and rotary scale provides the following guaranteed accuracies.

- Roundness for boring : 0.005mm(0.0002in)
- Positioning accuracy
  - Linear axes(X,Y,Z) : ±0.008mm(±0.0003in)/full stroke (with linear scale)
  - Table indexing : ±5sec
- Repeatability
  - Linear axes(X,Y,Z) : ±0.004mm(±0.00016in) (with linear scale)
  - Table indexing : ±3sec

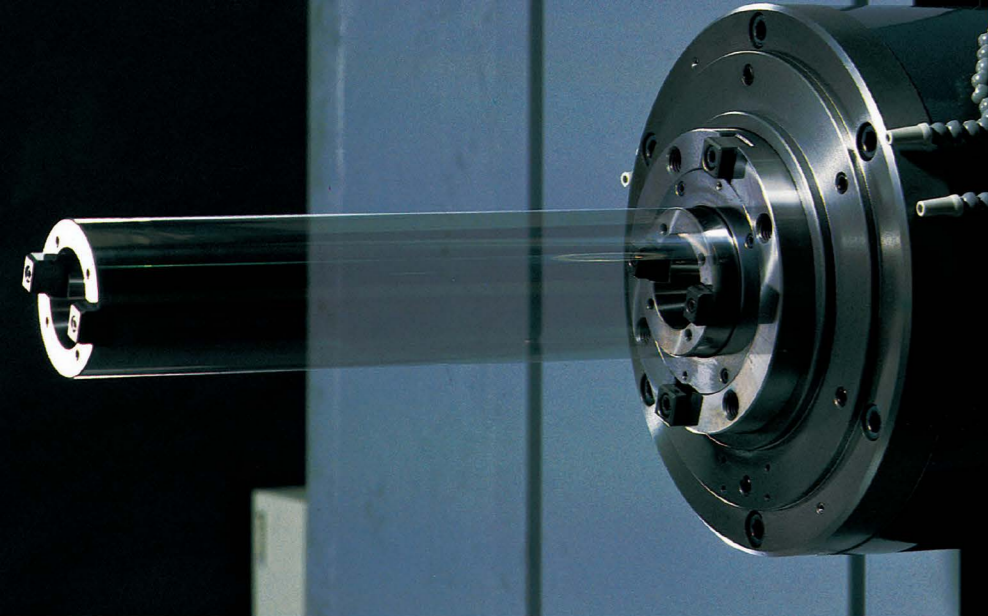
## Main Specifications

		BP-130.R22	BP-150.R22
Axis travel	X-axis mm(in)	4 064(160)	
	Y-axis mm(in)	2 540(100) [3 048(120)]	
	Z-axis mm(in)	1 524(60)	
	W-axis mm(in)	711.2(28) [*400(15.7)]	
Table working surface	mm(in)	1 800×2 200(70.8×86.6)	
Table loading capacity	kg(lbs)	10 000(22 000) [20 000(44 000)]	
Spindle speed	min <sup>-1</sup>	5~2 500 [*40~8 000]	
Spindle drive motor	kW(HP)	AC22/18.5(30/25) [AC30/22, *26.5/22] ([AC40/30, *36/30])	AC37/30 [*26.5/22] (AC50/40 [*36/30])
Tool storage capacity		38 {60, 90, 120} tools	
CNC system		TOSNUC 999	
Mass of machine	kg(lbs)	44 000(96 800) [44 500(97 900)]	

Note: Value in brackets [ ] refer to the options.  
Value in brackets [ \* ] refer to the high speed type spindle.



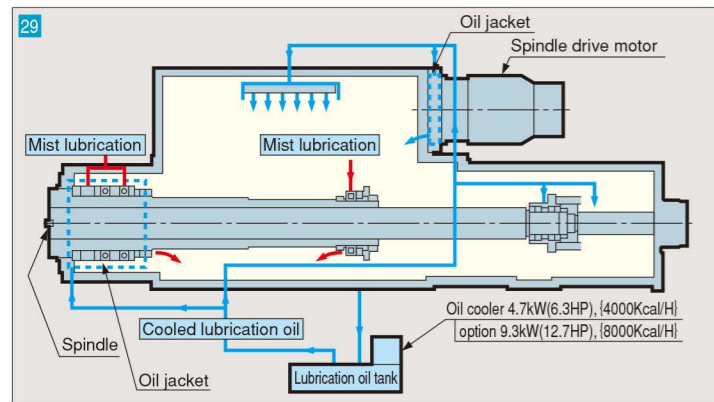
Numerals within ■ represents option number.



# A newly developed spindle for optimum high speeds, assurance of high accuracy and heavy duty machining.



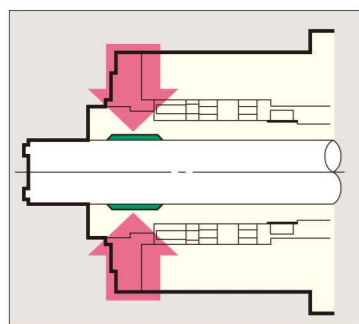
A variety of spindles



## Minimal thermal displacement of spindle head

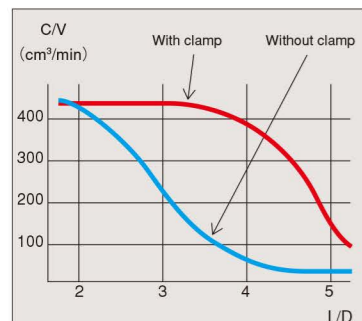
Use of an oil jacket and constant lubrication air mist volume for stabilized high accuracy cutting operations.

- Spindle bearings constant mist lubrication



## Automatic spindle clamp (pat. pending)

This new clamping mechanism greatly increases the cutting force. Additionally, the spindle can be NC positioned at any location over its entire extension. (Only available for BP-130.R22. Spindle clamp is not available for BP-150.R22.)



## Hardened and ground spindle

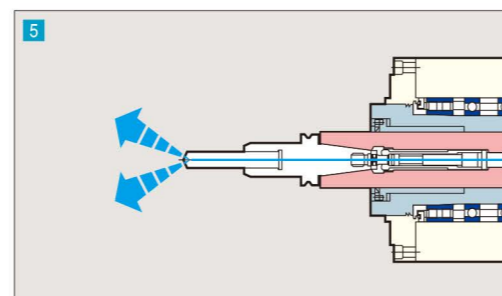
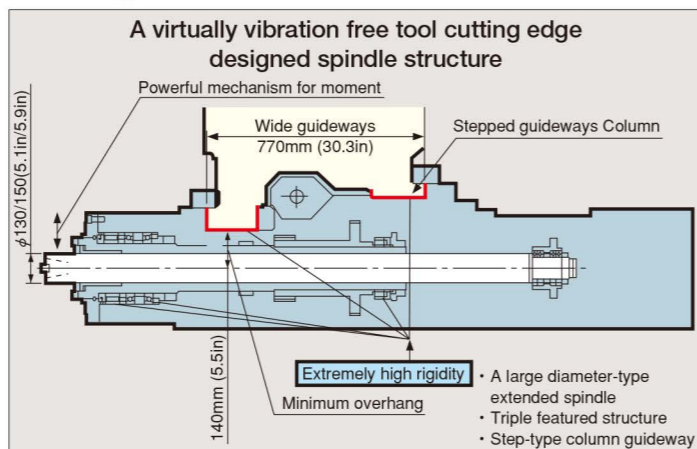
In addition air-oil mist over-sized spindle bearing, the entire unit is nitrided, hardened and precision ground to assure accuracy over the life of the machine.

## Step-type column guideways

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

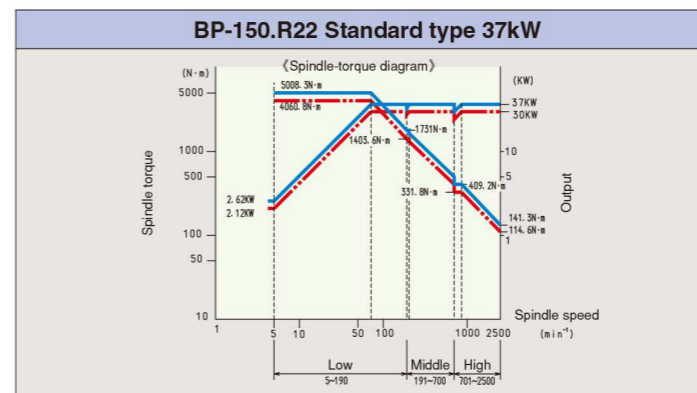
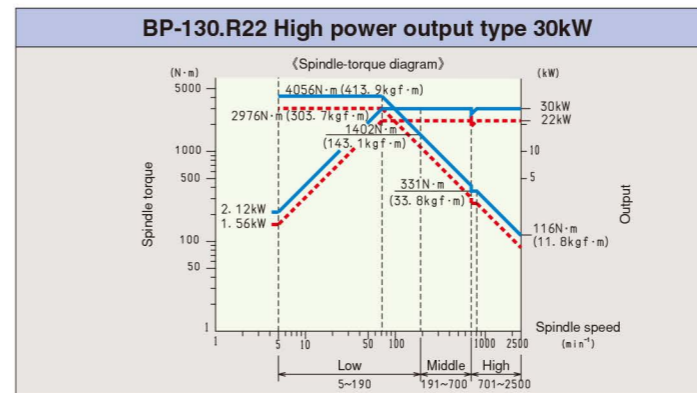
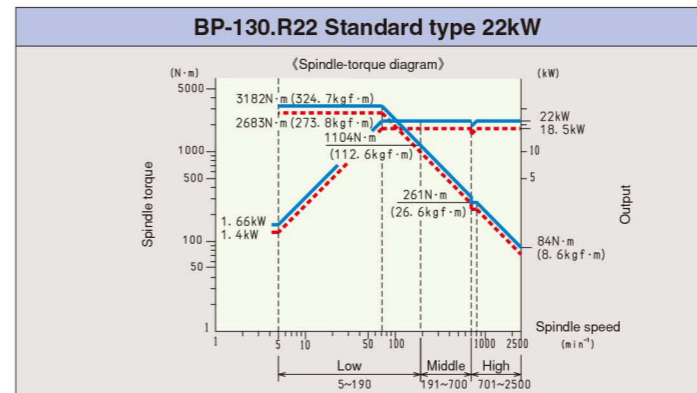
## Spindle construction designed for deep hole boring

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.



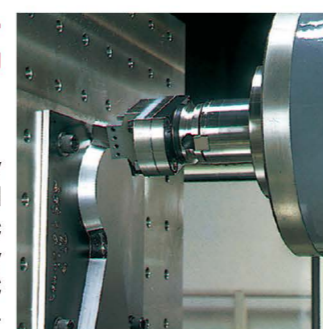
Through-spindle type coolant (option)

## Spindle-torque diagram

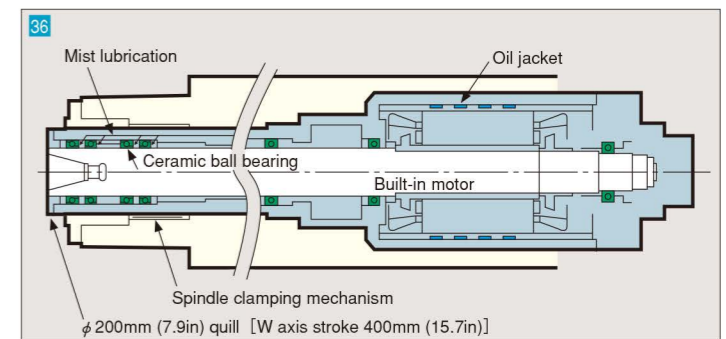


## Spindle normal direction control ((spring necked turning)) (option)

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.

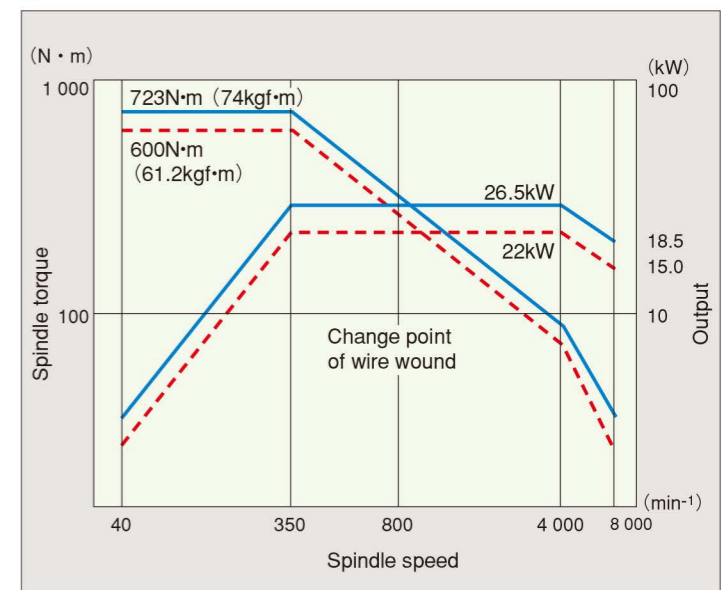


## High speed spindle (option)



40 ~ 8 000 min<sup>-1</sup>  
(use of a special type built-in motor)

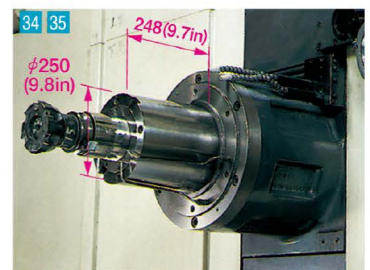
## High speed, high torque spindle



Capable of a variety of machining ranging from the rough cutting of steel alloys to precision machining of aluminum

## With Long-Nosed Spindle Head (BP-150.R22:Standard / BP-130.R22:Option)

In this type, the hardened milling spindle is extended by 200mm(7.8in). This gives improved workpiece accessibility, enlarges the heavy cutting area, and ensures stable cutting precision. \*The spindle extends up to 711.2mm(28in) from the extended milling spindle. (Contact Shibaura Machine for specifications)



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



Automatic mode

Manual mode

MDI mode

Full teaching



## ● 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.

## ● Supporting both USB flash drive and compact flash (CF)

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



USB flash drive

Compact flash

## 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.



Multi-window triple display



NC drawing function



Manual measurement

## 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.

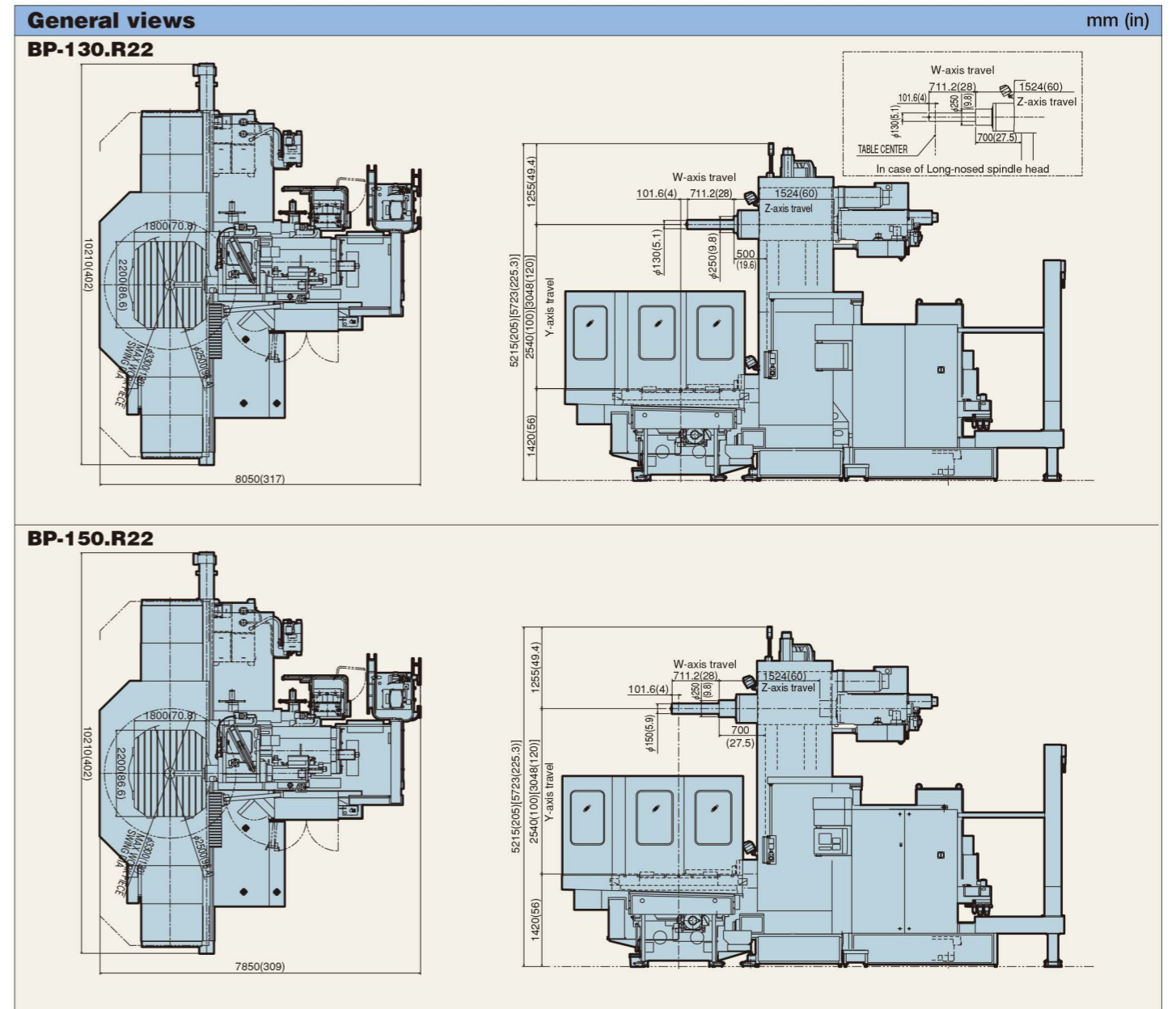
# Machine Specifications

Machine specifications			BP-130.R22	BP-150.R22	
Travel	X-axis travel (Cross movement of table)	mm (in)	4 064 (160)		
	Y-axis travel (Vertical movement of spindle head)	mm (in)	2 540 (100) [3 048 (120)]		
	Z-axis travel (Longitudinal movement of column)	mm (in)	1 524 (60)		
	W-axis travel (Spindle extension)	mm (in)	711.2 (28)		
	Distance from table surface to spindle center	mm (in)	0~2 540 (0~100) [0~3 048 (120)]		
	Distance from table center to milling spindle gage plane	mm (in)	812.8~2 336.8 (32~92)	609.6~2 133.6 (24~84)	
Table	Table working surface	mm (in)	1 800×2 200 (70.8×86.6)		
	Table loading capacity	kg (lbs)	10 000 (22 000) [20 000 (44 000)]		
	Table surface configuration	mm (in)	11 T-slots, size 22, pitch 160 (11 T-slots, size 0.8661, pitch 6.3)		
	Minimum table indexing angle		0.0001°		
Spindle	Spindle diameter	mm (in)	130 (5.1)	150 (5.9)	
	Spindle speed range	min <sup>-1</sup>	5~2 500 [40~8 000 High speed spindle]		
	Milling spindle nose diameter	mm (in)	250 (9.8)		
	Type of spindle taper hole		ISO 50		
Feedrate	Rapid traverse rate	X, Y, Z	mm/min (ipm)		
		W	mm/min (ipm)		
		B	deg/min		
	Feedrate	X, Y, Z	mm/min (ipm)		
Automatic tool changer	Type of tool shank		MAS BT50 [CAT-50V]		
	Type of retention knob		MAS P50T-1 (45°)		
	Tool storage capacity		38 [60, 90, 120] tools		
	Maximum tool diameter	When pots are full	mm (in)	125 (4.9)	
		When adjacent pots are occupied	mm (in)	240 (9.4) T type bar $\phi$ 400 (15.7)	
	Maximum tool length	mm (in)	400 (15.7)		
	Maximum tool mass	kg (lbs)	25 (55)		
Method of tool selection		Pot address random short-cut			
Spindle drive motor	(30min/continuous)	kW (HP)	AC22/18.5 (AC30/25)	AC37/30 (AC50/40)	
Power sources	Electrical power supply		AC200/220V±10%, 50/60Hz±2%		
		kVA	70	80	
	Compressed air supply	MPa (kg/cm <sup>2</sup> )	0.5~0.8 {5~8} (72.5~116psi)		
Machine size		NI/min	750		
	Machine height	mm (in)	5 215 (206) [5 723 (225.3)]		
	Floor space(machine size)	mm (in)	7 620×10 210 (300×402)		
	Mass of machine with numerical control	kg (lbs)	44 000 (96 800) [44 500 (97 900)]		
Accuracy	Positioning accuracy	X, Y, Z	±0.016 (±0.0006) per full length (without linear scale) ±0.008 (±0.0003) per full length (with linear scale)		
		W	±0.012 (±0.0005) per full length (without linear scale)		
		X, Y, Z	±0.007 (±0.00027) (without linear scale) ±0.004 (±0.00016) (with linear scale)		
	Repeatability	W	±0.008 (±0.00031) (without linear scale)		
		Table indexing accuracy		±5"	
	Table indexing repeatability		±3"		
Painting color	Standard exterior paint color		R4-383 (ivory white) and N2.5 (dark gray) (For the NC system, servo motors and cooler, each maker's standard colors shall apply.)		

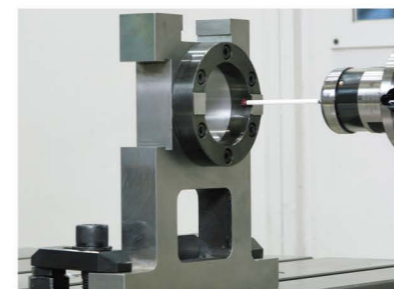
Note: Value in brackets [ ] refer to the options.  
Note: When measuring accuracy, there shall be no load on table.

The values in the specifications table above indicate the maximum capacity. If a continuous long-hour operation is required at the maximum capacity, please consult with us beforehand.

# General views



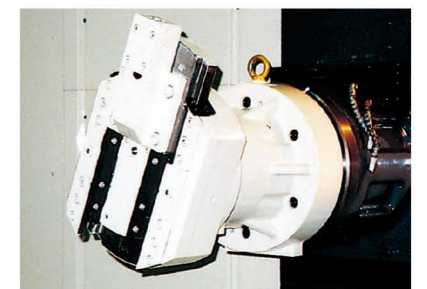
## Main optional



20 Automatic measuring function



13 Angle head



15 18 19 Rotating facing head CS

# Accessories (Machine)



## Standard Accessories

1	Numerical control system TOSNUC 999	1 set
2	Machine operation box (pendant type)	1 set
3	Automatic tool changer 38tools	1 set
4	Automatic tool clamping unit	1 set
5	Spindle orientation stop function	1 set
6	Spindle speed drop monitoring function	1 set
7	Constant volume mist unit for spindle bearing lubrication	1 set
8	Spindle head cooling unit	1 set
9	Spindle centering unit	1 set
10	Hand wheel feed unit (portable) for X, Y, Z, W and B axes	1 pc.
11	Scale feedback (X, Y, Z and B axes)	1 set
12	Automatic table random angle indexing unit (every 0.0001°)	1 set
13	Automatic table clamping unit (hydraulic)	1 set
14	Table oil pan	1 set
15	Table bed slide way cover	1 set
16	Column bed slide way cover	1 set
17	Column front cover	1 set
18	Hydraulic unit for spindle head hydraulic pressure and lubrication (including cooling unit)	1 set
19	Grounded service outlet (AC100V, 5A)	1 set
20	Assembly and reassemble tools for maintenance	1 set
21	Installation parts	1 set
22	Auto power OFF unit	1 set
23	Work light (spot light)	1 set
24	Operator call lamp (1 color: yellow)	1 set
25	Operator's Step	1 set
26	ATC oil pan	1 set

## Optional Accessories

1	Chip conveyor (Hinge plate type) Mainly used for cast iron and steel milling tips Processing capacity	3 L/min.(0.8 gal/min)
2	Flood coolant set Chip conveyor (Lift up type) Mainly used for cast iron and steel milling tips Processing capacity Flood coolant unit Pump capacity  Tank capacity	3 L/min.(0.8 gal/min) 50 L/min., head 5 m (13 gal/min., head 16ft) 270 L(70 gal)
3	Through-tool type coolant set Flood coolant set Through-tool type coolant unit Pump capacity	1.2Mpa [12kgf/cm <sup>2</sup> ] (170psi)
4	Coolant / Air blow set (it's necessary to attach Air compressor which has enough capacity for machine total air consumption) Flood coolant set Through-tool type coolant set Coolant / Air blow unit	
5	Through-spindle type coolant set Flood coolant set Through-spindle type coolant unit(with large sized coolant tank) Pump capacity	1.2Mpa [12kgf/cm <sup>2</sup> ] (170psi)
Note: In this case, spindle head unit is changed. Note: Coolant set cannot be selected at the same time. Please select either one.		
6	Chip blow air unit (it's necessary to attach Air compressor which has enough capacity for machine total air consumption)	
7	Intermittent coolant unit	
8	Chip bucket (C)	Capacity: 0.18m <sup>3</sup> (6.3ft <sup>3</sup> )

9	Type of retention knob	MAS P50T-2(30°)
10	Attached retention knob	MAS P50T-1(45°) MAS P50T-2(30°)
11	Automatic tool changer Tool storage capacity (When installing a 60 or 90 or 120-tools magazine, the required floor space exceeds the standard one.)	60, 90, 120 tools
12	Spindle lock device	
13	Angle head (spindle taper hole: JIS 7/24 taper No.50)	
14	Rotating facing head C (rack and pinion feed) Outer diameter Tool slide travel	600mm(23.6in) 150mm(5.9in)
15	Rotating facing head CS (ball screw feed) Outer diameter Tool slide travel	400mm(15.7in) 80mm(3.1in)
16	Tool holder for rotating facing head C	
17	Telescopic tool holder for rotating facing head C	
18	Tool holder for rotating facing head CS	
19	Telescopic tool holder for rotating facing head CS	
20	Automatic measuring function and dedicated touch probe (FM type) (Program storage capacity reduces approximately 50m(164ft).)	
21	Calibration block (for automatic measuring function)	
22	Automatic tool length measurement (Program storage capacity reduces approximately 30m(98ft).)	
23	Reference tool for automatic tool length measurement	
24	Test bar φ 60×L310(φ 2.36×L12.2in)	
25	Table edge locators	
26	B-axis setup compensation function (Shift of workpiece setup position in B-axis direction is automatically measured and compensated.)	

Note: Optional automatic measuring function is required.

27	Continuous table indexing device	0.0001°(NC rotary milling operation)
28	Z axis thermal displacement compensation	
29	High accuracy method Cooling capacity: 9.3kW 8000kcal/h or equivalent Hydraulic unit with precise temperature regulation type oil cooler Z axis thermal displacement compensation	
30	Chip cover A (simple and detachable)	
31	External M code	
32	High power output type spindle motor	AC30kW(30min)/22kW(cont.)
33	Through spindle type spindle head	
34	Long-nosed spindle head (milling spindle is extended by 200mm(7.8in)) The spindle extended up to 711.2mm(28in) from the extended milling spindle.	
35	Long-nosed through spindle head (milling spindle is extended by 200mm(7.8in)) The spindle extended up to 711.2mm(28in) from the extended milling spindle.	

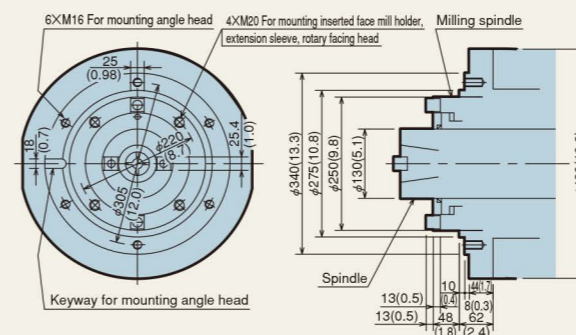
※Item 32-34 are standard for BP-150.R22

36	High speed spindle (40-8000RPM), spindle diameter 110mm(4.3in) Spindle power 26.5kW/22kW(35/30HP)	
37	Operator call lamp (3-colored: red, yellow and green)	
38	Residual current operated protective device	
39	Customer's specified paint color	
40	Column front cover (telescopic cover)	
41	Table loading capacity	20000kg(44000 lbs)
42	Rotary Table locate pin (B-pos. at 0,90,180,270°)	
43	Swing type pendant operation box	
44	Hydraulic unit pursuant to the Fire Prevention Law	

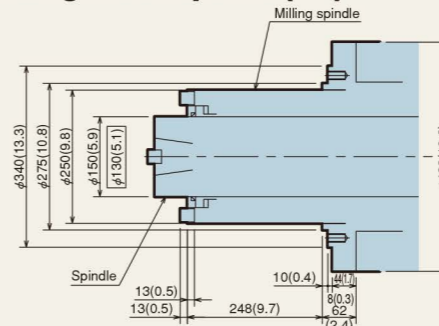
Notes: The air compressor should be provided by the customer.  
Notes: Use a fire-resistant water- soluble coolant

## Spindle nose drawing

### BP-130R22 Standard Spindle



### BP-150.R22 Standard spindle / BP-130.R22 Long-nosed spindle (OP)



## Restrictions on tool shape

### BP-130.R22, BP-150.R22

1. Cylindrical tool (Unit:mm)

Maximum tool mass : 25kg or less (W1+W2)  
Unbalance : 250kg·cm or less  
\*When using a general BT50 taper shank  
W2=3.8kg  
L2=38.2mm  
(These values may vary, however, with the type of an applicable retention knob and the manufacture of shank)

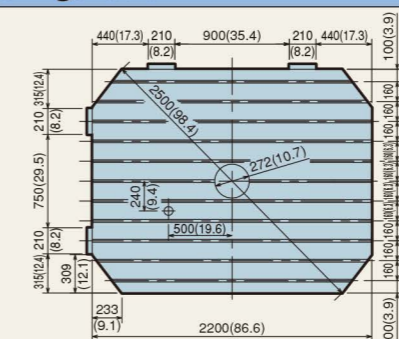
2. Single-point tool (Unit:mm)

Restrictions imposed on the shape of a single-point tool with machining diameter of up to 240mm are the same as in the cylindrical tool  
Restrictions imposed on the shape of a single-point tool with machining diameter of over 240mm are shown below.

Note : Tools must be stored in the balanced condition in the tool magazine. Otherwise, the magazine may not carousel.

## Table surface configuration

### BP-130.R22 BP-150.R22

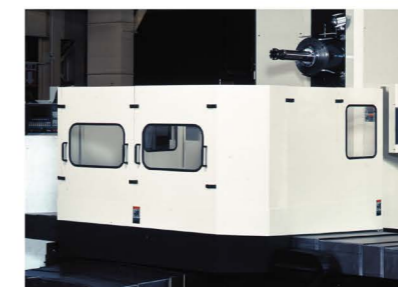


unit:mm(in)

## Main optional



22 Automatic tool length measuring function



30 Chip cover A



42 Rotary table locating pin at 90° locations



## 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 : ±99999.999 mm  
 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.)

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

Help function Descriptions on alarm and operation are given.  
 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 working time are counted by multiplying a specified coefficient.

#### ●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 G173  
 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  
 (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 G94/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 2 GB

#### ●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.

#### ●Safety and Maintenance

(33) Memory lock

#### ●High-Accuracy Machining & Servo System

(34) Shape recognition preview positioning control  
 (35) NURBS interpolation

#### ●Cable

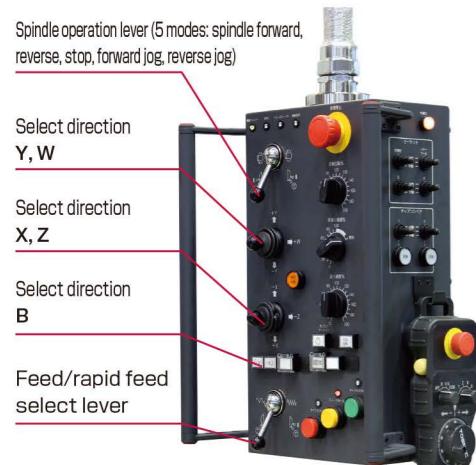
(36) RS232C cable 10 m-long

Note) Marked with \*, selectable between two options.

### 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.