BMC-800,1000

PMG 800/6

mm(in)

5775(227.4) 3426(134.9) 660(26)

5275(225.4)

2591(102)

5591(220.1)

3000(118.1)

10223(402.5)

PMG 800/8

7110(279.9) 3426(134.9) 660(26)

5275(225.4)

2591(102)

5591(220.1)

3000(118.1)

11560(455.1)

PMG 800/10

8440(332.3) 3426(134.9) 660(26)

5275(225.4)

2591(102)

5591(220.1)

3000(118.1)

12890(507.5)

Shibaura Machine

BMC-800,1000

Horizontal Machining Center

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

A new horizontal machining center for guaranteed stable powerful cutting and precision type machining.
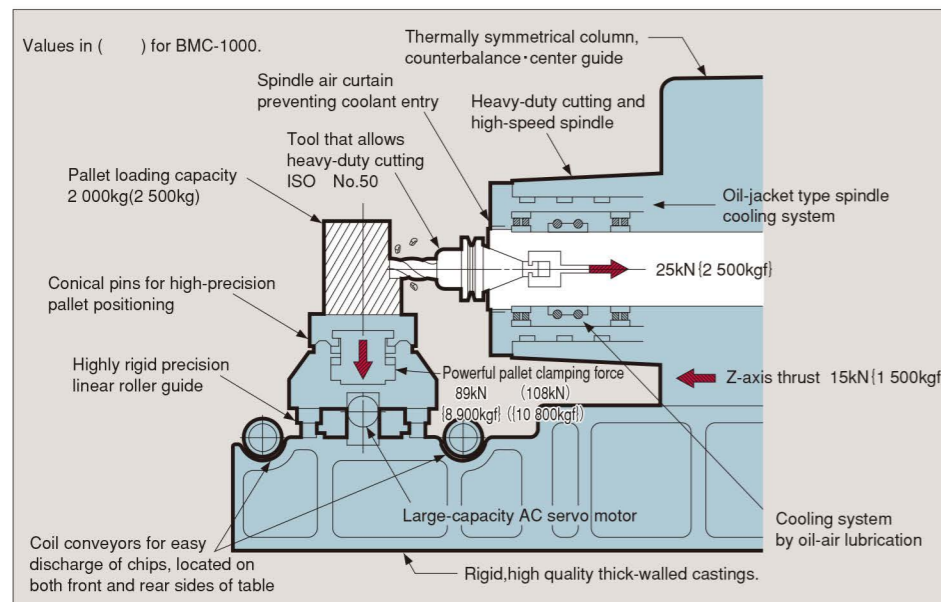
B MC-800,1000

■ **All axes (X, Y and Z) employ linear roller guides for added rigidity and compliance of the feed system to assure stable high speed and high accuracy precision-type positioning and contouring operations over the life of the machine.**

　Circular interpolation cutting accuracy (tolerance)
　　High accuracy specifications　　7μm (0.27μin)
　　Standard specifications　　9μm (0.35μin)

■ **With a rapid traverse rate of 18 m/min (59.1 ft/min) and a maximum feedrate of 10 m/min (32.8 ft/min) for high-speed axis feed, actual idle time is minimized for greatly improved productivity.**

■ **Equipped with thorough thermal displacement features such as an oil-cooled spindle drive motor, ball screw cooling unit and linear scale feedback system (X, Y and Z) to assure stabilized high machining precision over the life of the machine. (Option)**

Values in ( ) for BMC-1000.

Thermally symmetrical column, counterbalance・center guide

Spindle air curtain preventing coolant entry

Heavy-duty cutting and high-speed spindle

Tool that allows heavy-duty cutting ISO No.50

Pallet loading capacity 2 000kg(2 500kg)

Oil-jacket type spindle cooling system

Conical pins for high-precision pallet positioning

25kN (2 500kgf)

Highly rigid precision linear roller guide

Powerful pallet clamping force 89kN (108kN) 8,900kgf (10 800kgf)

Z-axis thrust 15kN (1 500kgf)

Large-capacity AC servo motor

Cooling system by oil-air lubrication

Coil conveyors for easy discharge of chips, located on both front and rear sides of table

Rigid,high quality thick-walled castings.

■ **Major specifications**

		BMC-800	BMC-1000
Axis travel (X·Y·Z)	mm (in)	1 250 × 1 000 × 900 [1 600 × 1 000 × 1 200] [1 600 × 1 250 × 1 200] (49.2 × 39.4 × 35.4 [63 × 39.4 × 47.2] [63 × 49.2 × 47.2])	1 600 × 1 250 × 1 200 [2 000 × 1 250 × 1 200] [2 000 × 1 500 × 1 200] (63 × 49.2 × 47.2 [78.7 × 49.2 × 47.2] [78.7 × 59 × 47.2])
Pallet size	mm (in)	800 × 800 (31.5 × 31.5)	1 000 × 1 000 (39.4 × 39.4)
Pallet loading capacity	kg (lbs)	2 000 (4 400)	2 500 (5 500)
Spindle speeds	min⁻¹	15 ~ 5 000 [40 ~ 10 000]	
Spindle drive motor	kW (HP)	AC22/18.5 [AC30/22] (AC30/25 [AC40/30])	
ATC tool storage capacity		38 [60, 90, 120, 180] tools	
CNC unit		TOSNUC 999	

The dimension in brackets [ ] are option

BMC-800

Shibaura Machine

Photo shows the machine with the splash cover (full enclosure) [option]

BMC-800

Stabilized high accuracy
Culmination of a vast technological array of stabilized precision over the life of the machine

High efficiency and high productivity substantiated by extensive technologies

Stable and accurate positioning

Our special precision machining technologies and linear roller guides used for all axes contribute to improved rigidity and compliance of the feed system, resulting in stable and accurate positioning.

- Positioning accuracy ±1.5μm (±0.059μin) (actual data)
- Repeatability ±0.3μm (±0.012μin) (actual data)
- Circular interpolation accuracy
  5μm/ϕ260 mm (0.2μin/ϕ10.2 in) (actual data)
  (with linear scale feedback)

Minimized spindle thermal displacement

● **Cooling of spindle bearings**
  Highly effective oil-air lubrication is used together with a large-capacity oil jacket cooling unit.

[31] **Z-axis thermal displacement compensation function (option)**
 Stabilized precision can be maintained over long hours of operation.

## T-shaped bed construction designed for heavy-duty machining operations.

Integration of the column and table beds, with rationally arranged ribs and thick-walled construction assures enhanced bed rigidity and stabilized precision over the life of the machine.
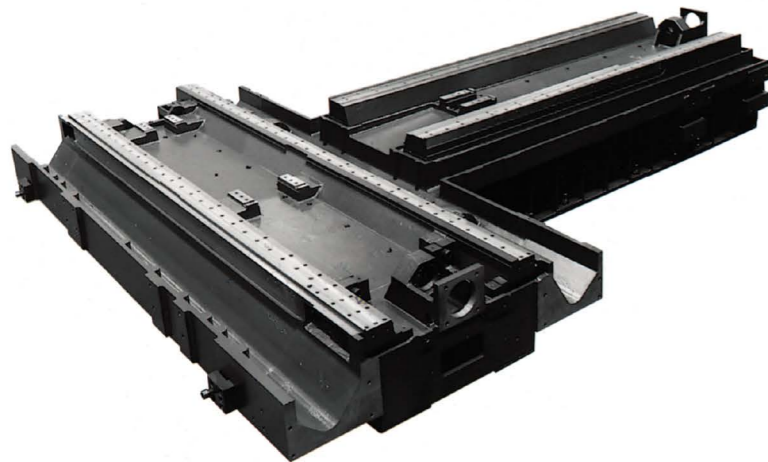
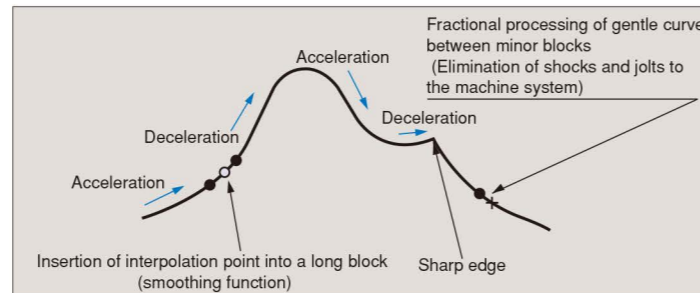## Circular interpolation accuracy (Example of cutting)
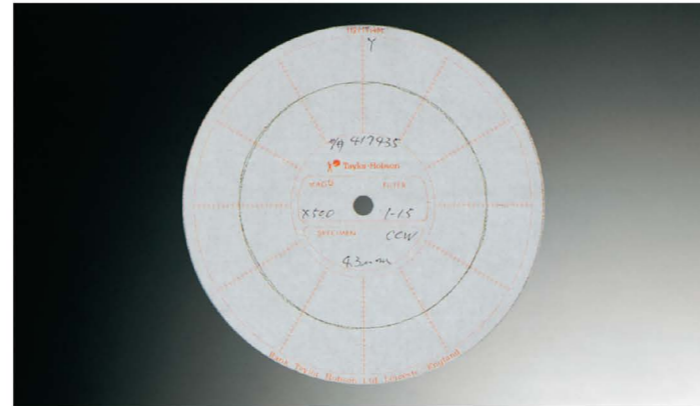
[37] **Ball screw oil cooling** (option)

Interally cooled ball screw (Z-axis)

Bed

Cooling oil flow direction
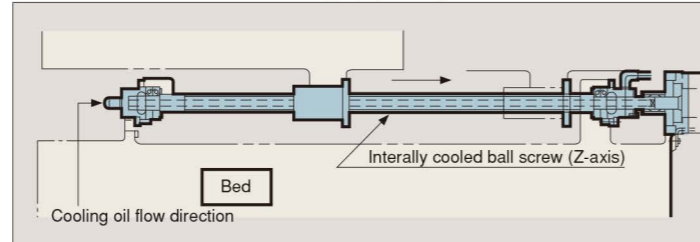
Shape recognition preview control function (CNCSHAPE) (Option; patent pending)

Our specially designed previewing system allows the CNC system to always maintain optimal machining conditions while analyzing various workpiece profiles.
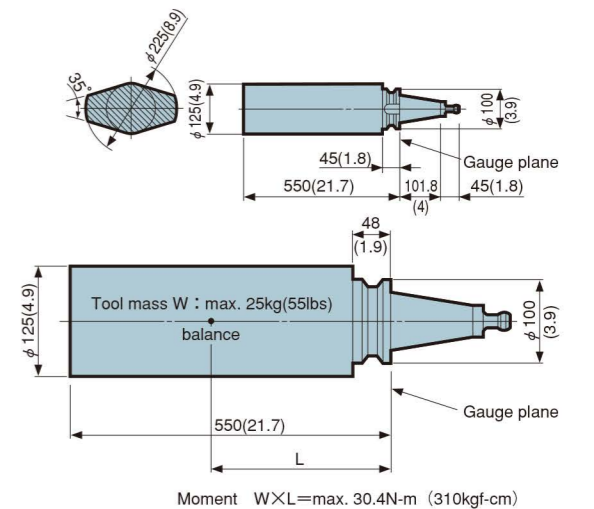Precision contouring of a free-curved surface is possible at high speeds.

Fractional processing of gentle curve between minor blocks (Elimination of shocks and jolts to the machine system)

Acceleration

Deceleration

Deceleration

Acceleration

Insertion of interpolation point into a long block (smoothing function)
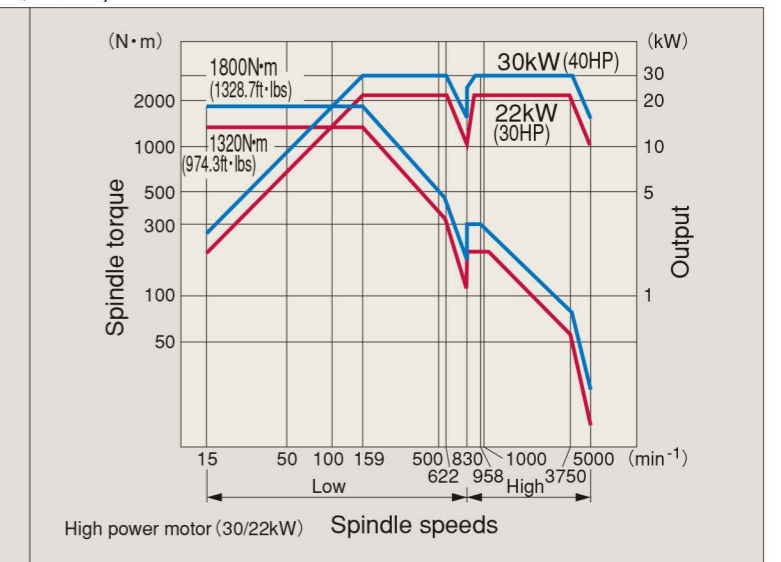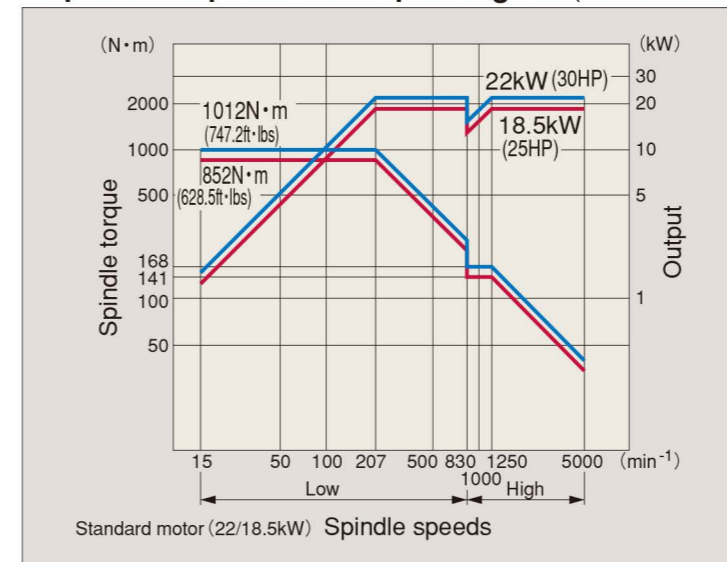
Sharp edge

Cutting ability (BMC-800) Workpiece material: Carbon steel (Carbon 0.55%)

	Cutting speeds: m/min (fpm)	Spindle speeds: min⁻¹	Feedrate: mm/min (ipm)	Depth of cut: mm (in)	Material removal: cm³/min (in³/min)
Face milling Face mill:ϕ160 (ϕ6.3"), 8 teeth	145 (475.7)	290	720 (28.3)	8 (0.3)	720 (43.9)
High speed face milling Face mill: ϕ160 (ϕ6.3")	300 (984.2)	600	1 800 (70.9)	0.05 (0.002)	—
Helical milling End mill: ϕ80 (ϕ3.1")	120 (393.7)	480	300 (11.8)	30 (1.2)	450 (27.5)
End milling End mill: ϕ20 (ϕ0.8"), 4 teeth	150 (492.1)	2 400	480 (18.9)	0.1 (0.004)	—
Boring: ϕ130 (ϕ5.1")	140 (459.3)	345	90 (3.5)	15 (0.6)	480 (29.1)
Drilling Twist drill: ϕ69.5 (ϕ2.73"), HSS	22 (72.2)	100	40 (1.6)	—	—
Tapping Tap: M60 × 5.5	8 (26.2)	42	231 (9.1)	—	—

Tool limitations

mm (in)

Tool mass W : max. 25kg(55lbs)
balance

Gauge plane

Moment W×L=max. 30.4N-m（310kgf-cm）

Spindle torque/motor output diagram (for BMC-800, 1000)

Standard motor（22/18.5kW） Spindle speeds

High power motor（30/22kW） Spindle speeds

Workpiece size limitations (at APC)

Standard stroke X1250 (49.2)
Y1000 (39.4)
Z 900 (35.4)
Max. workpiece height 1150 (45.3)

Spindle

Pallet indexed position after automatic pallet change is B=0°.

BMC-800

Standard stroke X1600 (63)
Y1250 (49.2)
Z1200 (47.2)
Max. workpiece height 1400 (55.1)

Spindle

Pallet indexed position after automatic pallet change is B=0°.
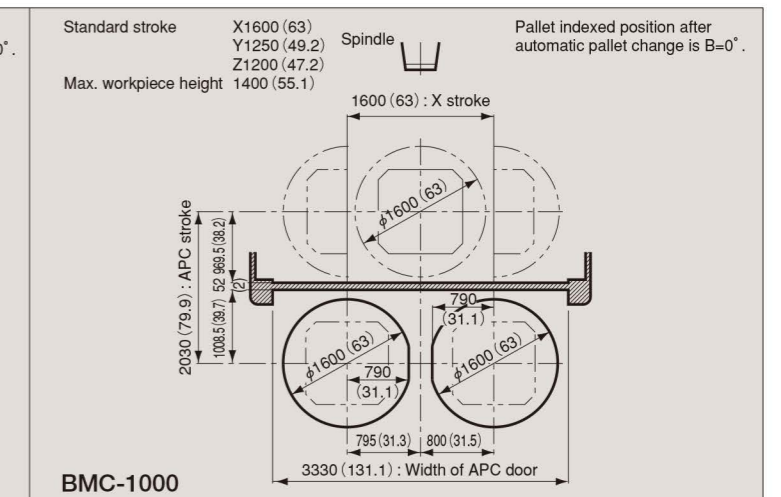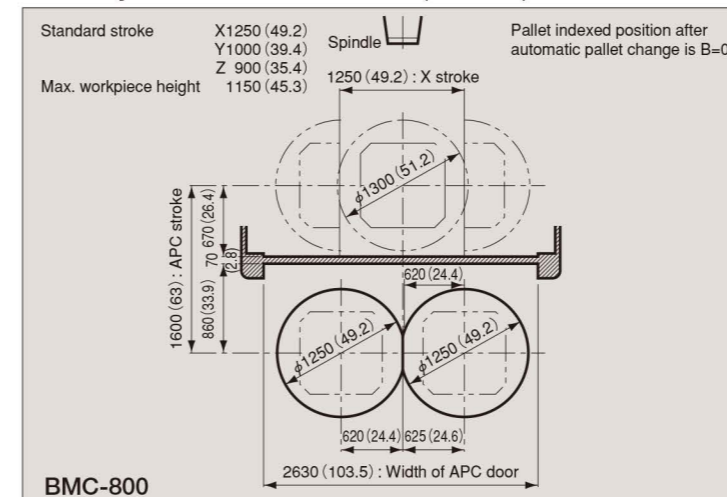
BMC-1000

Machine specifications

Machine specifications			BMC-800	BMC-1000
Travel	X-axis travel (Pallet cross)	mm (in)	1 250 [1 600] (49.2 [63])	1 600 [2 000] (63 [78.7])
	Y-axis travel (Spindle head vertical)	mm (in)	1 000 [1 250] (39.4 [49.2])	1 250 [1 500] (49.2 [59])
	Z-axis travel (Column longitudinal)	mm (in)	900 [1 200] (35.4 [47.2])	1 200 (47.2)
	Distance from spindle center to table top	mm (in)	75~1 075 [1 325] (3~42.3 [52.2])	75~1 325 [1 575] (3~52.2 [62])
	Distance from spindle nose to table center	mm (in)	200~1 100 [200~1 400] (7.9~43.3 [7.9~55.1])	200~1 400 (7.9~55.1)
Pallet	Pallet size	mm (in)	800×800 (31.5×31.5)	1 000×1 000 (39.4×39.4)
	Pallet loading capacity	kg (lbs)	2 000 (4 400)	2 500 (5 500)
	Pallet table surface		24-M16 Tap [5-22 mm (0.9 in) T-slot]	36-M20 Tap [6-22 mm (0.9 in) T-slot]
	Pallet table indexing		1° [0.001° cont.]	1° [0.0001° cont.]
Spindle	Spindle speeds	min⁻¹	15~5 000 [40~10 000]	
	Spindle speed range		2 steps	
	Type of spindle taper hole		ISO No.50 taper	
	Spindle bearing inner diameter	mm (in)	100 (3.9) [90(3.5)]	
Feedrate	Rapid traverse	mm/min (ipm)	18 000 (708.7)	
	Feedrate	mm/min (ipm)	1~10 000 (0.04~393.7)	
	Jogging feed	mm/min (ipm)	0~2 000 (0~78.7)	
Automatic Tool Changer	Tool shank		MAS BT50	
	Retention knob		MAS P50T-1 (45°)	
	Tool storage capacity		38 [60, 90, 120, 180] tools	
	Maximum tool diameter — When pots are full	mm (in)	125 (4.9)	
	Maximum tool diameter — When adjacent pots are occupied	mm (in)	250 (9.8) { in case of T type boring bar: 400 (15.7), set on 90° shift }	
	Max. tool length	mm (in)	550 (21.7)	
	Max. tool mass	kg (lbs)	25 (55)	
	Max. tool moment	N·m	30.4 [310 kgf·cm] (22.5 ft·lbs)	
	Tool selection method		Pot-address random short cut	
Automatic Pallet Changer	No. of pallets		2	
	Changing method		Parallel shuttle	
Motors	Spindle drive motor (30 min./cont.)	kW (HP)	AC 22/18.5 [AC 30/22] (AC 30/25 [AC 40/30])	
	Feed motor — X-axis	kW (HP)	AC 5.5 (AC 5.4) (AC 7.4)	
	Feed motor — Y-axis (with brake)	kW (HP)	AC 4.0 (AC 4.7) (AC 5.4)	
	Feed motor — Z-axis	kW (HP)	AC 5.5 (AC 5.4) (AC 7.4)	
Power Sources	Electrical power supply		AC 200/220V ±10%, 50/60Hz ±1Hz	
	Power capacity	kVA	appr. 58	appr. 60
	Compressed air to be supplied		0.5~0.8MPa (71~114 psi), 550N ℓ/min (132.1 Ngal/min)	
Tank Capacity	for hydraulic unit	ℓ (gal)	60 (15.8)	
	for lubrication cooling unit	ℓ (gal)	35 (9.24)	
	for concentrated lubrication unit	ℓ (gal)	6 (1.6)	
	for oil air unit	ℓ (gal)	2.7 (0.7)	
Machine Size	Machine height	mm (in)	3 415 (134.4)	3 825 (150.6)
	Floor space (Including maintenance area)*	mm (in)	4 910×6 880 (193.3×270.9)	5 535×7 870 (217.9×309.8)
	Mass of machine	kg (lbs)	22 000 (48 500)	27 500 (60 600)
Accuracy	Positioning accuracy (X, Y, Z) — Encoder	mm (in)	±0.003 (±0.00012)/Full stroke	±0.005 (±0.00020)/Full stroke
	Positioning accuracy (X, Y, Z) — Linear scale	mm (in)	±0.002 (±0.00008)/Full stroke	±0.003 (±0.00012)/Full stroke
	Repeatability — Encoder	mm (in)	±0.0020 (±0.00008)	
	Repeatability — Linear scale	mm (in)	±0.0015 (±0.00006)	
Painting Color	Standard point color (Urethane painting)		R4-383 [Munsell 5Y8.4/0.5 (Ivory white) N2.5 (dark gray)] R40-837 (Blue)	

*: 60-tools ATC, Coolant set BE

Values in brackets [ ] are optional.

The values in the specifications indicate the maximum capacity. If a continuous operation is required at the maximum capacity, please contact us for consultation.

General views

BMC-800(Standard stroke: X=1250(49.2), 60-tools ATC)

mm(in)

CHIP CONVEYOR / COOLANT SET BE/CE / TOOL MAGAZINE (60) / HYD UNIT / OIL COOLER

4110(161.8) [coolant set BE, CE] / X:1250 (49.2) / 200 (7.9) / Z:900 (35.4)

2430(95.7) / 6880(270.9)

36 BMC-800(Extended stroke: X=1600(63), 60-tools ATC)

CHIP CONVEYOR / COOLANT SET BE/CE / TOOL MAGAZINE (60) / HYD UNIT / OIL COOLER

4735(186.4) [coolant set BE, CE] / X:1600 (63) / 200 (7.9) / Z:900 (35.4)

2430(95.7) / 7430(292.5)

The dimension in brackets [ ] are extended stroke:Y=1250(49.2)

*Operator call lamp 3 colors(Option)

BMC-1000(Standard stroke: X=1600(63), 60-tools ATC)

mm(in)

CHIP CONVEYOR / COOLANT SET BE/CE / TOOL MAGAZINE (60) / HYD UNIT / OIL COOLER

4735(186.4) [coolant set BE, CE] / X:1600 (63) / 200 (7.9) / Z:1200 (47.2)

2880(11.4) / 7870(309.8)

36 BMC-1000(Extended stroke: X=2000(78.7), 60-tools ATC)

CHIP CONVEYOR / COOLANT SET BE/CE / TOOL MAGAZINE (60) / HYD UNIT

5435(214) [coolant set BE, CE] / X:2000 (78.7) / 200 (7.9) / Z:1200 (47.2)

3000(118.1) / 7990(314.6)

Accessories

Standard Accessories

1. Special assembly and operation tools — 1 set
2. Installation parts — 1 set
3. Hydraulic unit — 1 set
4. Spindle head lubricant oil cooling (Proportionate to machine temperature) — 1 set
5. Spindle oil air lubrication system — 1 set
6. Operator call lamp (Yellow) — 1 set
7. Working light — 1 set
8. Automatic NC power OFF — 1 set

Optional Accessories

1. Splash cover (full enclosure)
2. Coolant set BE
   - Taking-up hinged plate conveyor
3. Coolant set CE
   - Taking-up hinged plate conveyor
   - Shower coolant pump
4. Coolant set DE
   - Conveyor with filter
     Taking-up scraper conveyor
     Filter reverse washing-type pump
5. Coolant set EE
   - Conveyor with filter
     Taking-up scraper conveyor
     Filter reverse flow washing pump
   - Shower coolant pump
   Note: Splash cover (full enclosure) and one of the above coolant sets (BE, CE, DE, EE) should be selected as optional.
6. Chip bucket C [Bucket capacity: Approx 0.18 m³ (47.6 gal)]
7. Automatic tool changer (ATC) 60, 90, 120, 180 tools
8. High power output spindle head
   AC 30 kW/22 kW (AC 40/30 HP) [30 min/cont.]
9. High-speed spindle head 40~10000 min⁻¹
   AC 22 kW/18.5 kW (AC 30/25 HP) only
10. Built-in type NC rotary table (B-axis)
    BMC-800: 0.001°, BMC-1000: 0.0001°, 4 axes simultaneously controllable
11. Type of retention knob MAS P50T-2 (30°)
12. Coolant unit for through the tool-type AC 0.75 kW (AC 1 HP)
13. Coolant unit for DIN (B-type) through-spindle (Coolant/air blow unit is not included)
14. High-pressure coolant (DIN) 1.9 MPa, 6.9 MPa
15. Coolant/air blow unit (including coolant through the tool)
16. Chip blow air unit
17. Intermittent coolant unit
    Note: 16 and 17 cannot be installed at the same time. Select one.
18. Automatic measuring device (including touch probe and 2 stylus) (52 m (170 ft) program-memory is used)
19. Calibration block for automatic measuring system
20. Automatic tool length measurement (including tool breakage detecting function) (31 m (102 ft) program memory is used)
21. Reference tool for automatic tool length measurement
22. Test bar φ60×L310 (φ2.4″×L12.2″)
23. Residual current operated protective device
24. Automatic main power OFF
25. Preheat timer
    Note: 24 and 25 cannot be connected at the same time. Only one of such items may be connected.
26. Work counter
27. Linear scale feed back (X, Y and Z axes)
28. Rotary scale feedback (B axis)
29. T-slot pallet table BMC-800: 5T-slots, BMC-1000: 6T-slots
30. Customer painting color
31. Z-axis thermal displacement compensation function
32. External M-code output (8 kinds)
33. Operator call lamp (Red, Yellow, Green)
34. Multi-pallet magazine system
    BMC-800: PMG800/6, 8, 10
    BMC-1000: PMG1000/6, 8, 10
    (25 m (82 ft) program memory is used)
35. Extension stroke
36. Coolant temp. control unit
37. High precision specifications
38. Safety specification conformity with CE mark.
39. Safety specification conformity with CSA (CANADA).
Note 1: Air source to be supplied by customer
   - Screw type air compressor
     Capacity: more than 720 N ℓ /min, 7.5 kW (10 HP)
Note 2: Use a fire-resistant water-soluble coolant.

2 3 4 5 Coolant set

| Coolant set	BE	CE	DE	EE
Coil conveyor	○	○	○	○
Flood coolant	○	○	○	○
Coolant tank capacity	680 ℓ	680 ℓ	680 ℓ	680 ℓ
Take-up hinge plate conveyor (chute height: 1200 mm (47.2 in) above floor)	○	○	—	—
Shower coolant	—	○	—	○
Conveyor with filter (filter reverse-washing type) Take-up scraper conveyor (chute height: 1200 mm (47.2 in) above floor)	—	—	○	○

18 Automatic measuring device
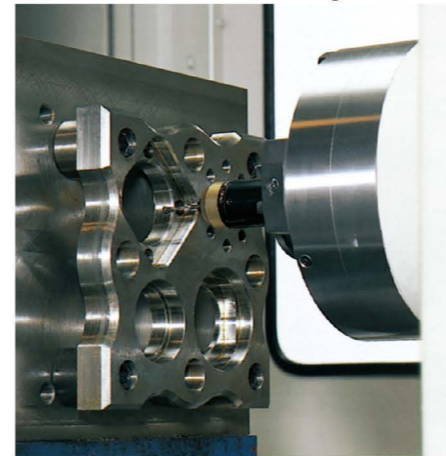
19 Calibration block for automatic measuring system (for BMC-800)

mm (in)

160(6.3)
82(3.2)
80 (3.1)
285(11.2)
45 (1.8)
310(12.2)
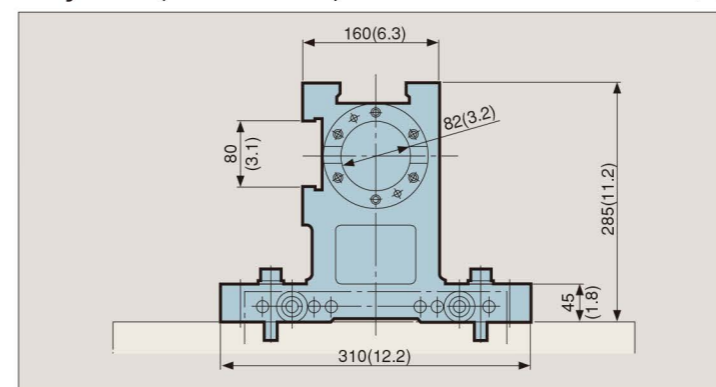
35 Extension stroke

mm (in)

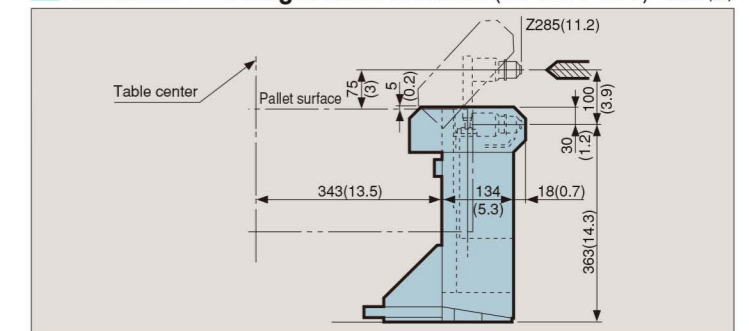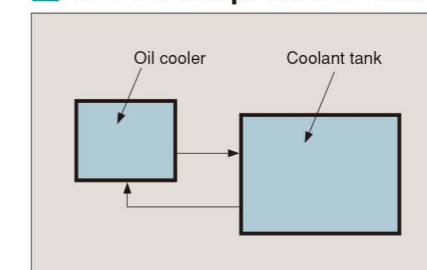| Model	X axis stroke	Y axis stroke	Z axis stroke
BMC-800	1 250 (49.2) std.	1 000 (39.4) std.	900 (35.4) std.
	1 600 (63)	1 000 (39.4)	1 200 (47.2)
	1 600 (63)	1 250 (49.2)	1 200 (47.2)
BMC-1000	1 600 (63) std.	1 250 (49.2) std.	1 200 (47.2) std.
	2 000 (78.7)	1 250 (49.2)	1 200 (47.2)
	2 000 (78.7)	1 500 (59)	1 200 (47.2)

13 Coolant unit for DIN (B-type) through-spindle
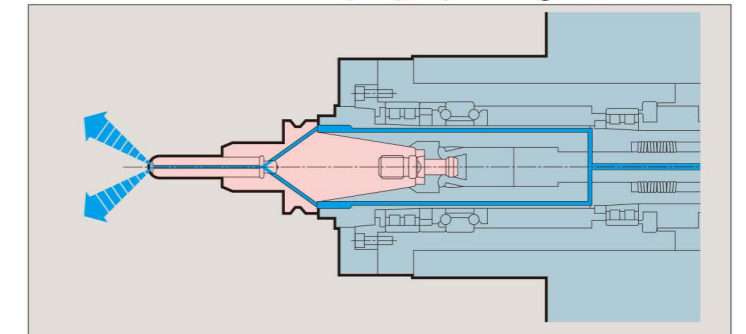
Through-spindle type coolant delivery system for cooling under high pressure and at high spindle speeds.

- When a through-spindle type coolant is used, coolant delivery under high pressure of up to 6.9 MPa {70 kgf/cm²} is possible. Chips can be cleared easily. Feedrate can be greatly increased, surface roughness of a machined hole will improve and step feed is unnecessary (mainly in steels). As a result, the efficiency can be increased 2 to 4 times, compared to externally applied coolant.
- Increase in feedrate can reduce the life of the tool tip. The cooling effect on the tool tip, extends the tool life.
- The through-spindle type coolant of DIN standard B type has separate coolant and collet air circuits to prevent the formation of coolant mist, thus eliminating any adverse effect on the machine surroundings. As the coolant is delivered to the spindle nose, it can not stick to the spindle taper.

20 Automatic tool length measurement (for BMC-800)

mm (in)

Table center
Pallet surface
Z285(11.2)
100 (3.9)
30 (1.2)
343(13.5)
134 (5.3)
18(0.7)
363(14.3)

36 Coolant temp. control unit

Oil cooler
Coolant tank

CNC system TOSNUC 999

User media (option set B)

Very useful device for managing long programs.

Outstanding operability contributes to high machine performance.

The TOSNUC 999 (Triple nine), equipped with many new and improved functions and devices is the most advanced, operator friendly CNC system, contributing to significantly improved operability.

● Customized keys
1. Operation procedure registration
By registering a series of operations in either of six exclusive keys ⚀ ⚁ ⚂ ⚃ ⚄ ⚅, it can be executed by just a press of the key.
2. Screen display registration
By just a press of the key, a preset combination of such NC standard displays as the main, sub and window, as registered in either of four dedicated keys ♠ ♥ ♦ ♣, can be called on the screen.

Standard Specifications

●Controlled Axes
Controlled axes	3 axes：X,Y,Z
Simultaneously controllable axes	
♦3 axes for positioning (G00) and	linear interpolation (G01)
♦2 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.)
Customized display color tone	
Display gray scale of window frame, background and characters can be changed.	

●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
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.	

Other Options
● Controlled Axes
(1)One additional controlled axis	

●Programming Methods
(2)Inch/metric selection	G70/G71

●Interpolation
(3)Hypothetical axis interpolation (i.e., interpolation with sine curve)	G07
(4)Cylindrical interpolation	G67
(5)Involute interpolation	G105
(6)Archimedes interpolation (Spiral interpolation)	
	G102/G103

●Feed
(7)Synchronous thread-cutting	
(8)Per-revolution feed	G94/G95
(9)Per-revolution dwell	G05

●Part Program Storage and Edit
(10)Part program storage	
600 m equivalent punched tape (No. of registrable programs: 512)	
1200 m equivalent punched tape (No. of registrable programs: 1024)	
3000 m equivalent punched tape (No. of registrable programs: 1024)	
5400 m equivalent punched tape (No. of registrable programs: 1024)	
7800 m equivalent punched tape (No. of registrable programs: 1536)	
10200 m equivalent punched tape (No. of registrable programs: 1536)	
*(11)Mass memory	2GB

●I/O Functions and Devices
(12)Remote buffer operation (including port C connection)	
*(13)High-speed LAN linkage	
File transfer by connecting CNC and LAN.	

●Tool Offset
(14)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)	
(15)Three-dimensional tool compensation	G30/G31

●Operation Support Function
(16)Foreground plotting function	
A tool locus of active program is plotted.	
(17)Additional number of optional block skips	Max. 9

●Programming Support Function
(18)Programmable mirror image	G62/G66
(19)Programmable data input	
Updating of offsets by G58/G59.	
(20)Scaling	G64/G65
(21)Plane conversion	G35～G39
(22)Three-dimensional coordinate conversion	G14
(23)Figure copy function	G721/G722
(24)Circle cutting compensation	
(25)Machining time estimate & NC plotting function	
Machining time estimate and tool path plotting for non-active program on the background.	
(26)Pattern cycle division into NC statements	

●Automatic Support Function
(27)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.	
(28)Program check & used tool list creation	
Check of a program to be executed next and creation of a slated tool list.	
(29)Cutting start detection Used for spot facing, etc.	

●Safety and Maintenance
(30)Memory lock	

●High-Accuracy Machining & Servo System
(31)Shape recognition preview positioning control	
(32)NURBS interpolation	

●Cable
(33)RS232C cable	10 m-long

Note) Marked with *, selectable between two options.