*Optimal Solutions for the Future*

# **BM** series

**Double Column
Machining Center**

**BM series**

BM 1530M
BM 2035M
BM 2740M

**ver.** EN 160502 SU

# **BM** series

**The BM Sereis is a large double-column type machining center designed to process molds. Equipped with a low-vibration built-in spindle, the machining center is suitable for a variety of works from roughing to finishing. The new improved design delivers greater efficiency, thereby raising customers' productivity and creating maximum added value.**

## Contents

**Sample work**

Press mold

Injection mold

Refrigerator mold

Automotive mold

### Equipped with a high-speed, high-rigidity spindle as a standard feature

- 12000 r/min high-speed spindle
- Long-nose type ideal for deep pocket mold cutting
- Equipped with a dual contact spindle as a standard feature for high rigidity and minimum vibration

### Standard feed axes equipment for higher level of precision

- All axes provided with a linear scale as a standard feature
- Ball screw bearings and nut cooling system

### Adoption of structure and control solution for high-quality mold cutting

- Covers provided to minimize the impact of ambient temperature
- Thermal displacement compensation for spindle and structure included as a standard feature
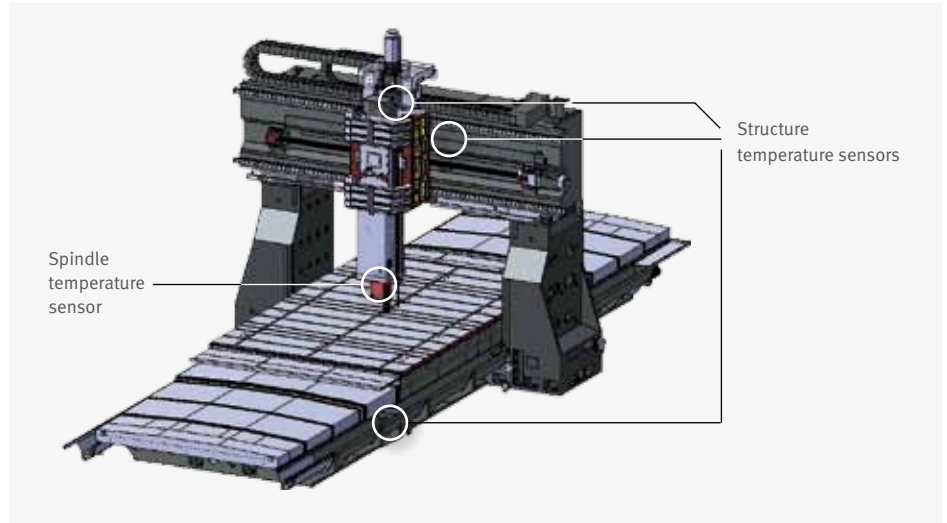
## Basic Structure

Double-column
structure for stable
precision level

### Thermal Displacement Compensation for Spindle and Structure Included as a Standard Feature

Multiple thermal sensors are attached to minimize and compensate thermal displacement of the spindle and the structure.



Structure
temperature sensors

Spindle
temperature
sensor

Important parts of the structure are covered to minimize the impact of ambient temperature



Minimizes influence of
ambient temperature
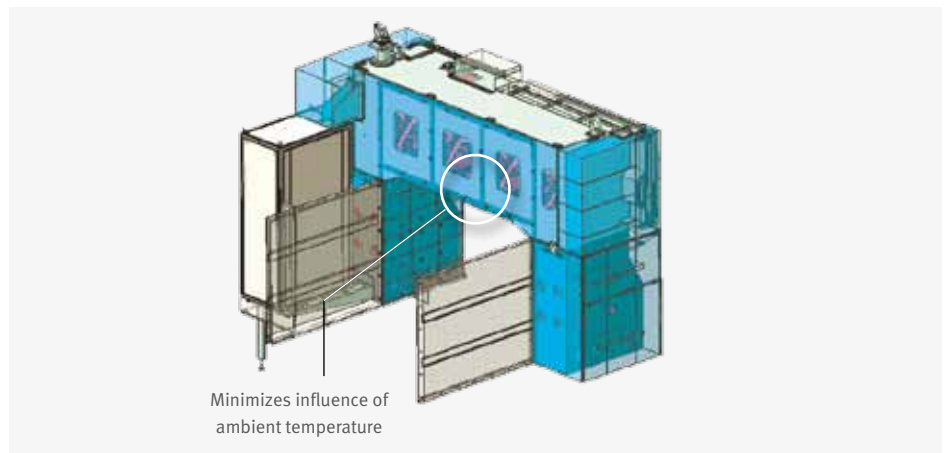
## Foundation

Anchoring is
recommended to
ensure machining
accuracy over a long
time.

### Machine Foundation*

Since machining accuracy is highly dependent on the machine's foundation, anchoring is recommended to maintain accuracy over a long period of time. The anchor bolts and other related parts for foundation work are supplied as standard items.
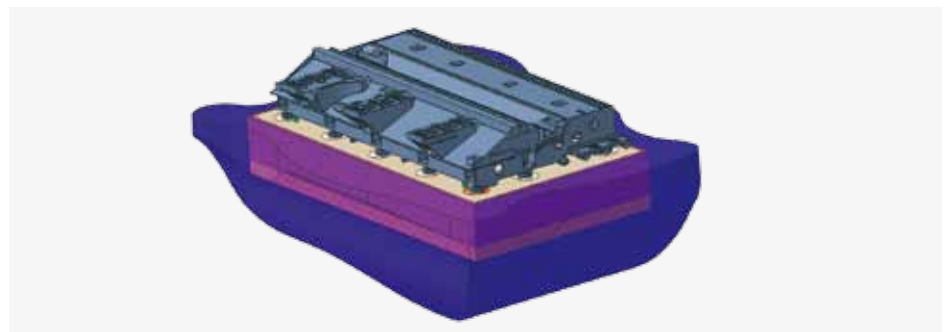


* Please consult with Doosan sales technicians regarding ground and operating conditions.

## Spindle

A high-speed, high-rigidity built-in spindle is provided as a standard feature to enhance the productivity of machining large works as well as smaller parts.

### Built-in Spindle Optimized for Cutting Molds

- Vibration and noise minimized with built-in spindle
- Long-nose spindle protrudes by 293 mm (11.5 inch), making it ideal for cutting deep pocket molds
- Dual contact spindle included as a standard feature for high rigidity and vibration

**Advantaged with Deep pocket cutting**

**Long nose**

**293mm**

**(11.5 inch)**

General → BM series

**Max. spindle speed**

**12000r/min**

**Spindle motor**

**30 / 25kW**

**(40.2 / 33.5 Hp)**

| Type | Speed | Spindle | Specifications |
|---|---|---|---|
| Built-in ISO #50 | 12000 r/min | Power (30 min/cont.) | 30 / 25 kW (40.2 / 33.5 Hp) |
| | | Max. torque | 420 N·m (310.0 ft-lbs) |

### Dual Contact Spindle

Tool rigidity is enhanced by the firm clamping of the spindle. Tool lifecycle and cut-surface roughness have been improved as a result of the reduced vibration realized by the dual contact spindle.

Taper contact

Flange contact

BBT50-CK6-300
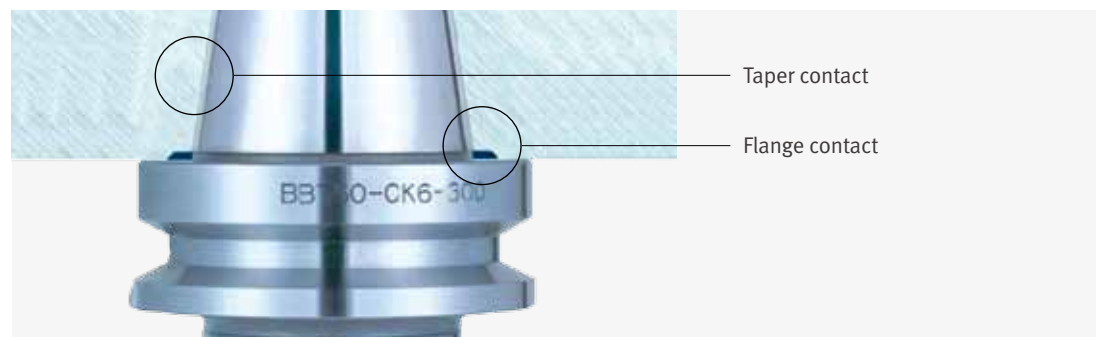
## Feed Axes

Equipped with roller LM Guideways for increased rigidity and a cooling system as a standard feature to minimize thermal displacement.

### Stable and Fast Feed Shaft Structure

Roller-type LM Guideways deliver high rigidity to guarantee the outstanding accuracy of the linear feed system.
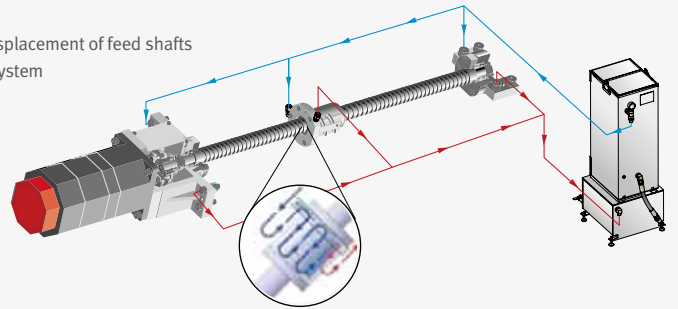
**High-rigidity feed system structure**

Roller guides

Rigid coupling

**Ball screw nut cooling**

Greatly reduced thermal displacement of feed shafts
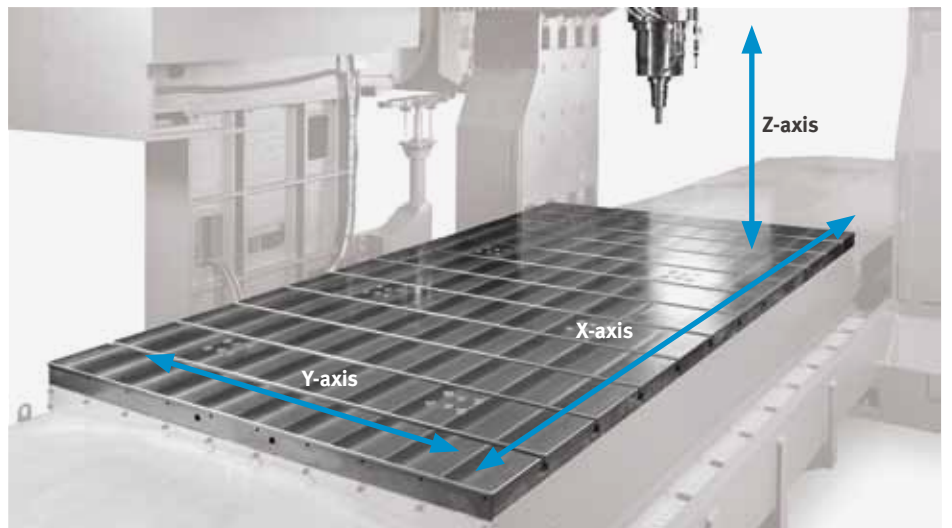Stable rigidity of the feed system

**Linear scale – standard for all axes**

All axes are equipped with the linear scale as a standard feature to maintain the highest degree of accuracy over many hours of operation.

Additional 200mm (7.9 inch) Y-axis for table self-cutting & extended cutting area.

Z-axis

X-axis

Y-axis

| Description | Unit | BM 1530M | BM 2035M | BM2740M |
|---|---|---|---|---|
| Stroke (X / Y / Z) | mm (inch) | 3000 / 1550 / 800 (118.1 / 61.0 / 31.5) | 3500 / 2050 / 800 (137.8 / 80.7 / 31.5) | 4000 / 2700 / 800 (157.5 / 106.3 / 31.5) |
| Rapid traverse (X / Y / Z) | m/min (ipm) | 16 / 16 / 16 (629.9 / 629.9 / 629.9) | 16 / 16 / 16 (629.9 / 629.9 / 629.9) | 12 / 16 / 16 (472.4 / 629.9 / 629.9) |

## Magazine and Table

### Tool Magazine

Enhanced productivity realized with the CAM-type tool changer (standard) for quicker tool changing

| Description | Unit | BM Series |
|---|---|---|
| Tool storage capacity | ea | 40 {60} |
| Tool-to-Tool | sec | 3.0 |
| Max. tool diameter | mm (inch) | 125 / 220 (4.9 / 8.7) |
| Max. tool length | mm (inch) | 400 (15.7) |
| Max. tool weight | kgf (lbs) | 18 (8.8) |

The table is fitted with 2 or 3 lanes of roller-type LM Guideways for highest machining stability.

| Description | Unit | BM1530M | BM 2035M | BM 2740M |
|---|---|---|---|---|
| Size (X x Y) | mm (inch) | 3000 x 1350 (118.1 x 53.1) | 3500 x 1850 (137.8 x 72.8) | 4000 x 2500 (157.5 x 98.4) |
| Load capacity | kgf (lbs) | 8000 (17637.0) | 10000 (22046.2) | 15000 (33069.3) |

## Cutting Performance

### Machining Performance

Enhanced productivity realized with the CAM-type tool changer (standard) for quicker tool changing.

| Cutting Process | Tool mm (inch) | Spindle Speed r/min | Feedrate mm/min (ipm) | Cutting Width mm (inch) | Cutting Depth mm (inch) | Cutting capability $cm^3$/min (inch) |
|---|---|---|---|---|---|---|
| FACEMILL (SM45C) | D125 (D4.9) | 500 | 2900 (114.2) | 100 (3.9) | 3.0 (0.1) | 820 (50.0) |
| | | 500 | 1800 (70.9) | 100 (3.9) | 4.0 (0.2) | 720 (43.9) |
| | | 500 | 1300 (51.2) | 100 (3.9) | 5.0 (0.2) | 650 (39.7) |
| | | 500 | 1100 (43.3) | 100 (3.9) | 6.0 (0.2) | 660 (40.3) |
| | | 400 | 720 (28.3) | 100 (3.9) | 7.0 (0.3) | 504 (30.8) |

| Cutting Process | Tool mm (inch) | Cutting Width mm (inch) | Cutting Depth mm (inch) | Cutting capability $cm^3$/min (inch) |
|---|---|---|---|---|
| U-DRILL | D80 (D3.1) | 500 (2.9) | 100 (3.9) | 40 (2.4) |
| | | 600 (23.6) | 100 (3.9) | 40 (2.4) |
| TAP | M42 x 4.5 | 113 (4.4) | 508 (20.0) | 50 (3.1) |

* The results, indicated in this catalogue are provides as example. They may not be obtained due to differences in cutting conditions and environmental conditions during measurement.

## Standard / Optional Specifications

Various options are available to satisfy the customers' requirements.

● Standard   ○ Optional

| NO. | Description | Features | BM Series |
|---|---|---|---|
| 1 | Spindle | 12000 r/min, 30 / 25 kW (30min / Cont.) | ● |
| 2 | | FLOOD COOLANT PUMP_0.9 kW_0.45 MPA | ● |
| 3 | | FLOOD COOLANT PUMP_3.7 kW_2.0 MPA | ○ |
| 4 | | THROUGH SPINDLE COOLANT_None | ● |
| 5 | | THROUGH SPINDLE COOLANT_1.5 kW_2.0 MPA | ○ |
| 6 | | THROUGH SPINDLE COOLANT_3.7 kW_2.0 MPA | ○ |
| 7 | Travels | LINEAR SCALE (X, Y, Z-AXIS) | ● |
| 8 | | RAISING BLOCK 200 mm | ○ |
| 9 | | RAISING BLOCK 300 mm | ○ |
| 10 | Magazine | MAGAZINE CAPACITY: 40 TOOLS | ● |
| 11 | | MAGAZINE CAPACITY: 60 TOOLS | ○ |
| 12 | Control System | FANUC 31I-B | ● |
| 13 | | DSQ1 (AICC II_200 BLOCKS) | ● |
| 14 | | DSQ2 (DSQ1 & DATA SERVER 1GB) | ○ |
| 15 | | DSQ3 (DSQ2 & 600 BLOCKS) | ○ |
| 16 | | DSQ4 (DSQ3 & 1000 BLOCKS) | ○ |
| 17 | | EXTRA M CODE | ○ |
| 18 | | FLASH MEMORY CARD | ○ |
| 19 | Others | SEMI SPLASH GUARD | ● |
| 20 | | FULL SPLASH GUARD | ○ |
| 21 | | OIL SKIMMER | ○ |
| 22 | | COOLANT GUN | ● |
| 23 | | CHIP CONVEYOR | ○ |
| 24 | | AIR BLOWER | ● |
| 25 | | AIR GUN | ○ |
| 26 | | AIR CONDITIONER | ○ |
| 27 | | ELECTRIC CABINET LIGHT | ○ |
| 28 | | WORK & TOOL COUNTER | ○ |
| 29 | | 1 MPG | ● |
| 30 | | 3 MPG | ○ |
| 31 | | LCD Display MPG | ○ |
| 32 | | TRANSFORMER | ○ |
| 33 | | 3-STAGE SIGNAL TOWER | ● |
| 34 | | WORK LIGHT | ● |

## Optional Devices

Various solutions are available for better machining performance and higher-quality molds.

### Tool measuring device

NC4

TS27R

### Position of tool measuring device
(Wired & fixed types)

Rear-right side of the table →
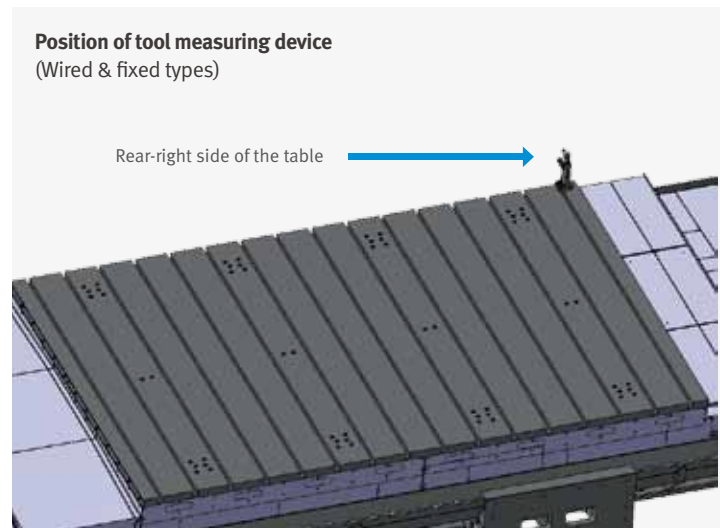
## Convenience

Operator convenience and work efficiency have been improved with the adoption of various convenience controls and ergonomic design.

### Coolant Gun

Coolant gun for removing chips included as a standard feature for the operator's convenience

### Work Light (LED)

Work light under the cross

### MPG

MPG suitable for large works

Portable MPG

Portable 3 MPG

### Full Splash Guard  option

Full splash guard for cleaner and safer work environment

### Inner Footing (LED)

Footings at the front, right/left sides of the table

Position Display MPG (LCD)
option

### Semi-Splash Guard

### 3-Stage Signal Tower

**Warning lamp**
Reports abnormal operational conditions of the machine

**Work completion indicator**
Indicates that the work has been completed

**In-progress lamp**
Indicates that the work is being carried out

### Chip Disposal

Hinged type C/C
BM 1530M BM 2035M

## Optimized Tool Processing Solution

Superior surface finishes and machining accuracy are achieved through using standard processing solutions such as high-speed / high-precision contour control and thermal displacement compensation.

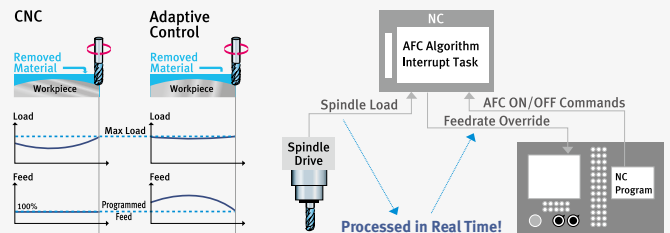### High Speed / High Precision Contour Control

∗ DSQ : Doosan Super Quality

- **DSQ1**
  (AICC2 _ 200 Block + Machining condition selection function)
- **DSQ2** option
  (DSQ1 + Data server [1GB])
- **DSQ3** option
  (DSQ2 + High speed processing _ 600 Block)
- **DSQ4** option
  (DSQ3 + High speed processing_1000 block)

**Specimen tested : VASE**

With DSQ
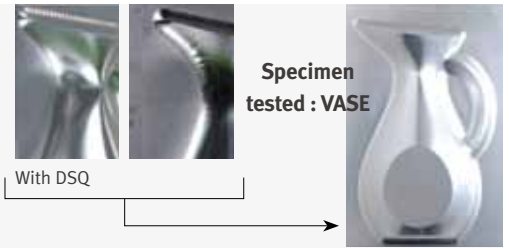
### The Optimal Feed Control option

∗ DAFC : Doosan Adaptive Feedrate Control

**Optimal feed control is ensured by real-time spindle load detection.**

CNC

Adaptive Control

Removed Material
Workpiece

Removed Material
Workpiece

Load
Max Load

Load

Feed

Feed

100%
Programmed Feed

NC

AFC Algorithm Interrupt Task

Spindle Load

AFC ON/OFF Commands
Feedrate Override

Spindle Drive

NC Program

**Processed in Real Time!**

### Tool Load Monitoring System (DTMM*) option

∗ DTMM : Doosan Tool load Monitoring for Machining Centers

**The technology of protecting tool and machine in abnormal load during the cutting process**

Spindle Drive

Spindle load

Servo axis load

Automatic stop when an abnormal load is detected
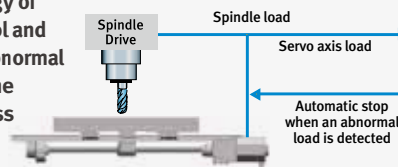
DTMM* software

☑ Detection cycle = Program interpolation cycle

☑ Automatic stop when an abnormal load is detected

☑ Select an alternative tool and command to NC

### Smart thermal displacement multi compensation technology

∗ DSTC : Doosan Smart Thermal Control

**Realizes high-quality, high-precision machining with smoothing thermal displacement compensation of the spindle and structure.**

**Compensation of static displacement of spindle**

Compensates changes in tool position caused by expansion of the spindle shaft at high speed.

**Structure thermal displacement compensation**

Compensates irregular deflection or expansion of the structure due to ambient temperature using a multiple temperature sensors.
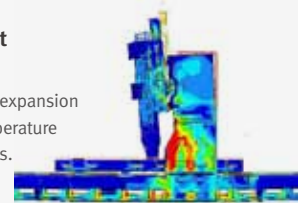
**Compensation of structure thermal displacement**

Thermal error of the spindle caused by heat accumulation is compensated with 5 algorithms including a smoothing function.

Without smoothing

Thermal displacement of spindle

Thermal displacement of the spindle after compensation

Thermal displacement of the spindle before compensation

Spindle rotation
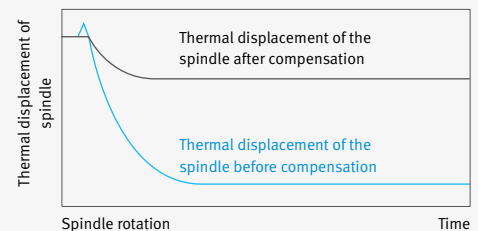
Time

These Doosan software packages have been customized to provide fast and easy setup of tooling, workpiece, and program. These functions minimize the idle time caused by process setup and maximize the machine's productivity.
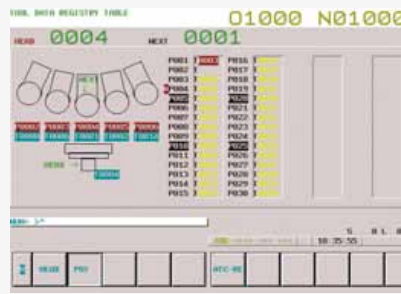


**Tool Data Registry Table**

Displays the information on the tools in the pot in 2D graphics.
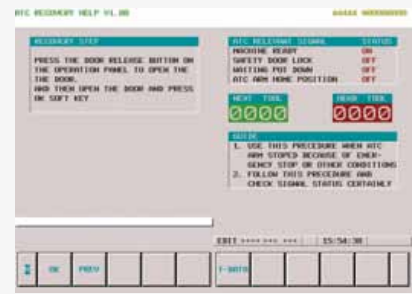


**Sensor Status Monitor**

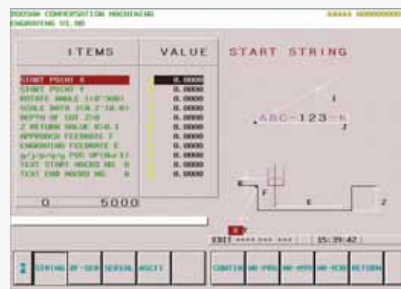Shows solenoid valve and sensor status without the electric diagram.



**Engraving** option

Allows character engraving on the workpiece.



**Pattern Cycle**

Pattern cycle programs can be created using an interactive way of parameter input.
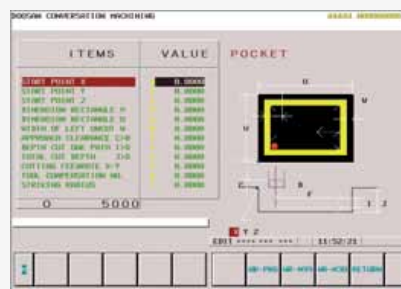


**ATC Recovery Help**

When ATC is stopped (malfunction or emergency), this function guides the operator to recover the machine back to its normal state.



**Tool Load Monitor** option

Detects tool damage and wear by setting limits on the load for spindle and axis to minimize mechanical damages.



**Renishaw Gui** (Tool measure)
(Work measure option )

Enables automatic measurement of tool length, tool diameter, and work coordinates, and detects tool damage using an interactive method.



**Calculator**

Provides all functions of a general calculator plus automatic calculation of cutting size and conditions.
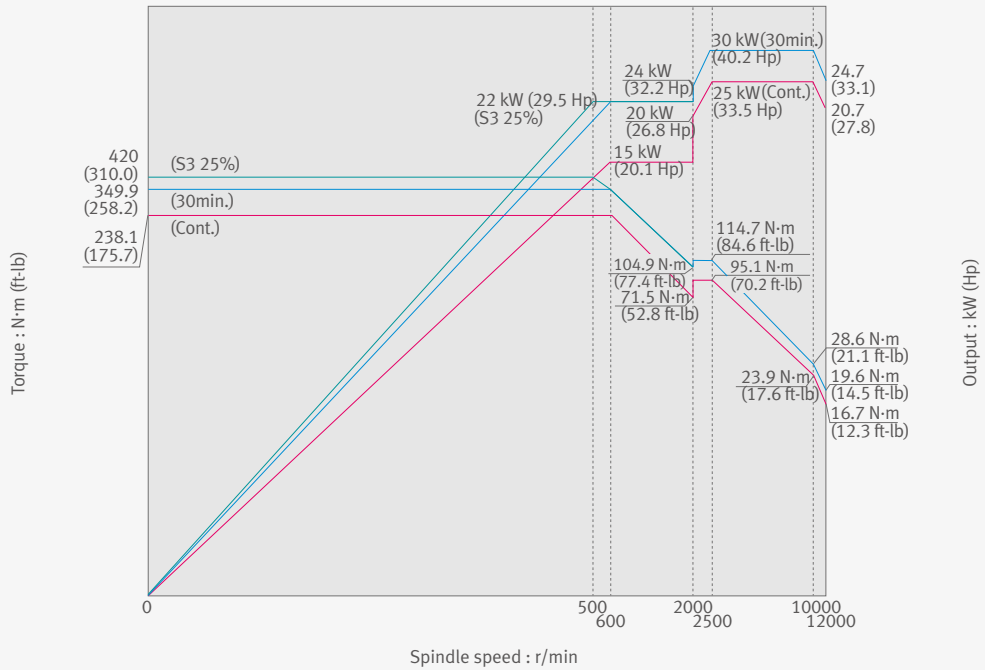
**Power-Torque Diagram / Tool Shank**

## Spindle Power – Torque Diagram

Max. spindle speed : 12000 r/min
Spindle motor : 30 / 25 kw (30 min/Cont.)
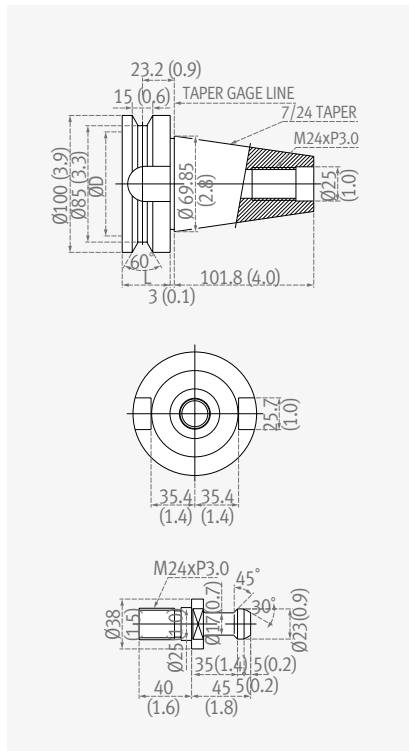(40.2 / 33.5 Hp)



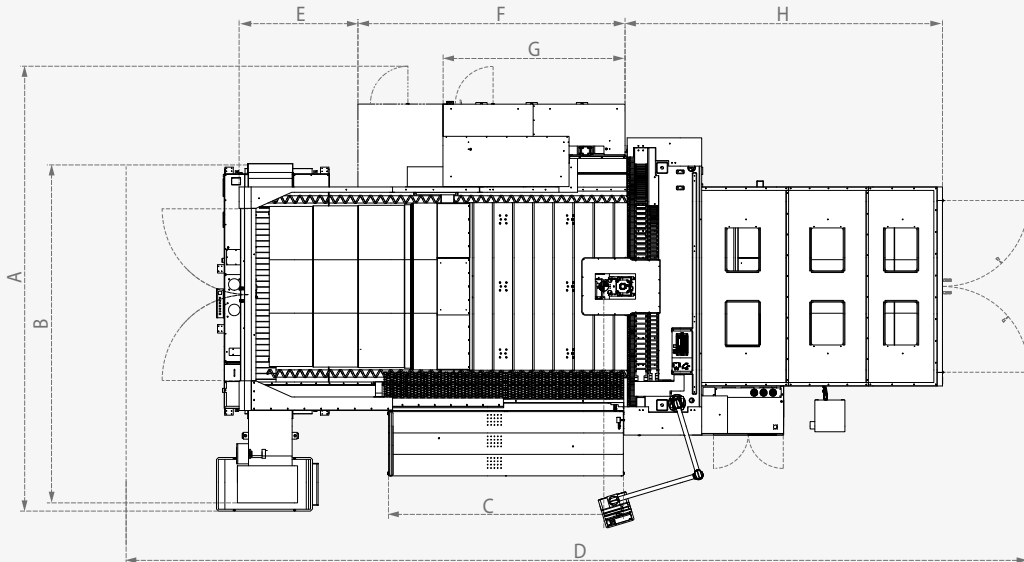## Tool Shank

Unit: mm (inch)

BT 50



CAT 50



DIN 50
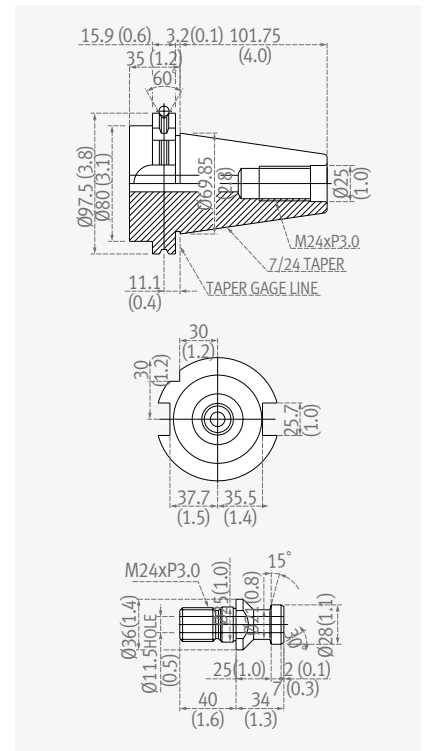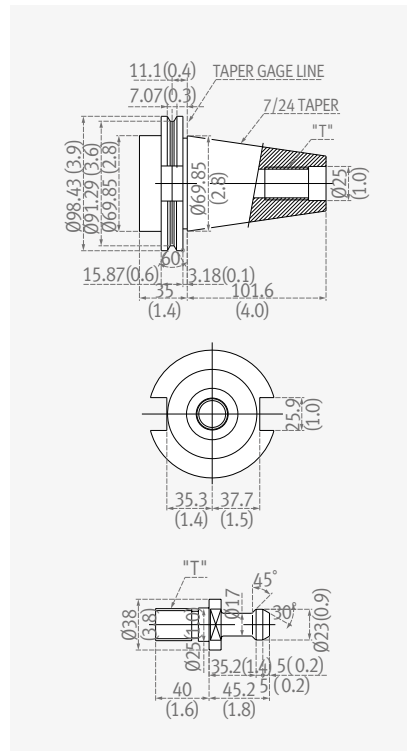
## External Dimensions / Table

## External Dimensions

Unit: mm (inch)

Top View

Front View
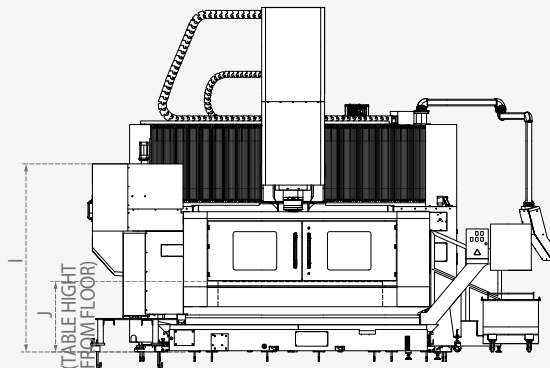
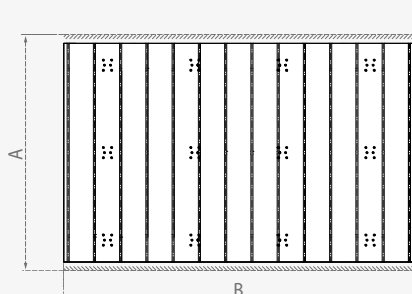| Model | A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|---|
| BM 1530M | 5543 (218.2) | 4282 (168.6) | 2768 (109.0) | 10944 (430.9) | 677 (26.7) | 3985 (156.9) | 2715 (106.9) | 3826 (150.6) | 2520 (99.2) | 923 (36.3) |
| BM 2035M | 5943 (234.0) | 4682 (184.3) | 3000 (118.1) | 11963 (471.0) | 1036 (40.8) | 3985 (156.9) | 2715 (106.9) | 4246 (167.2) | 2520 (99.2) | 923 (36.3) |
| BM 2740M | 6636 (261.3) | 5042 (198.5) | 3500 (137.8) | 13459 (529.9) | 1772 (69.8) | 3983 (156.8) | 2712 (106.8) | 4733 (186.3) | 2550 (100.4) | 953 (37.5) |

## Table

Unit: mm (inch)
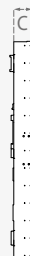
| Model | A | B | C |
|---|---|---|---|
| BM 1530M | 1350 (53.1) | 3000 (118.1) | 210 (8.3) |
| BM 2035M | 1850 (72.8) | 3500 (137.8) | 210 (8.3) |
| BM 2740M | 2500 (98.4) | 4000 (157.5) | 210 (8.3) |

## Machine Specifications

**BM Series**

| Description | | Unit | BM 1530M | BM 2035M | BM2740M |
|---|---|---|---|---|---|
| Travel | X-axis | mm (inch) | 3000 (118.1) | 3500 (137.8) | 4000 (157.5) |
| | Y-axis | mm (inch) | 1550 (61.0) | 2050 (80.7) | 2700 (106.3) |
| | Z-axis | mm (inch) | 800 (31.5) | 800 (31.5) | 800 (31.5) |
| Table | Spindle to table surface | mm (inch) | 200~1000 (7.9~39.4) | | 150~950 (5.9~37.4) |
| | Distance between columns | mm (inch) | 1700 (66.9) | 2200 (86.6) | 2700 (106.3) |
| | Table size | mm (inch) | 3000 x 1350 (118.1 x 53.1) | 3500 x 1850 (137.8 x 72.8) | 4000 x 2500 (157.5 x 98.4) |
| | Loading capacity | kg (lb) | 8000 (17636.7) | 10000 (22045.9) | 15000 (33068.9) |
| | Table surface | - | T-SLOT (10-300 x 24H8) | T-SLOT (11-300 x 24H8) | |
| Spindle | Speed | r/min | 12000 | | |
| | Taper | - | ISO #50, 7/24 | | |
| | Max. torque | N·m (ft-lb) | 420 (310.0) | | |
| | Spindle power | kW (Hp) | 30 / 25 (40.3 / 33.6) [30min / Cont.] | | |
| Feed rate | Rapid feedrate (X, Y, Z) | m/min (ipm) | 16 / 16 / 16 (629.9 / 629.9 / 629.9) | | 12 / 16 / 16 (472.4 / 629.9 / 629.9) |
| | Cutting feedrate | mm/min (ipm) | 8000 (315.0) | | |
| ATC | Tool shank type | - | BT / CAT / DIN 50 | | |
| | Tool storage capacity | ea | 40 {60}* | | |
| | Max. tool diameter [w/o adjacent tool] | mm (inch) | 125 [220] (4.9 [8.7]) | | |
| | Max. tool length | mm (inch) | 400 (15.7) | | |
| | Max. tool weight | kg (lb) | 18 (39.7) | | |
| | Tool selection type | - | MEMORY RANDOM | | |
| | Tool change time (T-T-T) | s | 3.0 | | |
| Machine Size | Height | mm (inch) | 4770 (187.8) | 4770 (187.8) | 4675 (184.1) |
| | Dimension (L x W) | mm (inch) | 8690 x 4450 (342.1 x 175.2) | 9540 x 4960 (375.6 x 195.3) | 10825 x 5535 (426.2 x 217.9) |
| | Weight | kg (lb) | 29000 (63933.1) | 35500 (78262.9) | 48000 (105820.3) |

**\* {　} : Option**

## NC Unit Specifications

**FANUC 31i**

| | Item | | Spec. | FANUC 31i |
|---|---|---|---|---|
| Axes Control | Additional controlled axes | | 5 axes in total | ○ |
| | Least command increment | | 0.001 mm / 0.0001" | ● |
| | Least input increment | | 0.001 mm / 0.0001" | ● |
| | Interpolation type pitch error compensation | | | ○ |
| Interpolation & Feed Function | 2nd reference point return | | G30 | ● |
| | 3rd / 4th reference return | | | ○ |
| | Inverse time feed | | | ○ |
| | Cylinderical interpolation | | G07.1 | ○ |
| | Helical interpolation B | | Only Fanuc 30i | - |
| | Smooth interpolation | | | ○ |
| | NURBS interpolation | | | ○ |
| | Involute interpolation | | | ○ |
| | Helical involute interpolation | | | ○ |
| | Bell-type acceleration / deceleration before look ahead interpolation | | | ○ |
| | Smooth backlash compensation | | | ● |
| | Automatic corner override | | G62 | ○ |
| | Manual handle feed rate | | x1, x10, x100 (per pulse) | ● |
| | Handle interruption | | | ● |
| | Manual handle retrace | | | ○ |
| | Nano smoothing | | AI contour control II is required. | ○ |
| | AICC II | | 200 BLOCK | ● |
| | AICC II | | 400 BLOCK | ○ |
| | High-speed processing | | 600 BLOCK | X |
| | DSQ I | | AICC II (200block) + Machining condition selection function | ● |
| | DSQ II | | AICC II (200block) + Machining condition selection function + Data server(1GB) | ○ |
| | DSQ III | | AICC II with high speed processing (600block) + Machining condition selection function + Data server (1GB) | ○ |
| | DSQ IV | | AICC II with high speed processing (1000block) + Machining condition selection function + Data server (1GB) | ○ |
| Spindle & M-code Function | M- code function | | | ● |
| | Retraction for rigid tapping | | | ● |
| | Rigid tapping | | G84, G74 | ● |
| Tool Function | Number of tool offsets | | 64 ea | ● |
| | Number of tool offsets | | 99 / 200 / 400 / 499 / 999 / 2000 ea | ○ |
| | Tool nose radius compensation | | G40, G41, G42 | ● |
| | Tool length compensation | | G43, G44, G49 | ● |
| | Tool life management | | | ● |
| | Addition of tool pairs for tool life management | | | ○ |
| | Tool offset | | G45 - G48 | ○ |
| Programming & Editing Function | Custom macro | | | ● |
| | Macro executor | | | ● |
| | Part program storage | | 256KB(640m) | ● |
| | Part program storage | | 512KB (1,280m) / 1MB (2,560m) / 2MB (5,120m) / 4MB (1,0240m), 8MB (2,0480m) | ○ |
| | Inch/metric conversion | | G20 / G21 | ● |
| | Number of Registered programs | | 500 ea | ● |
| | Number of Registered programs | | 1000 / 4000 ea | ○ |
| | Optional block skip | | 9 BLOCK | ○ |
| | Playback function | | | ○ |
| | Addition of workpiece coordinate system | | G54.1 P1 - 48 (48 pairs) | 48 pairs |
| | Addition of workpiece coordinate system | | G54.1 P1 - 300 (300 pairs) | ○ |
| OTHERS FUNCTIONS (Operation, setting & Display, etc) | Embeded Ethernet | | | ● |
| | USB memory interface | | Only Data Read & Write | ● |
| | High speed skip function | | | ○ |
| | Polar coordinate command | | G15 / G16 | ○ |
| | Polar coordinate interpolation | | G12.1 / G13.1 | ○ |
| | Programmable mirror image | | G50.1 / G51.1 | ○ |
| | Scaling | | G50, G51 | ○ |
| | Single direction positioning | | G60 | ○ |
| | Pattern data input | | | ○ |
| | Jerk control | | AI contour control II is required. | ○ |
| | Fast Data server with1GB PCMCIA card | | | ○ |
| | Fast Ethernet | | | ○ |
| | 3-dimensional coordinate conversion | | | ○ |
| | 3-dimensional tool compensation | | | ○ |
| | Figure copying | | G72.1, G72.2 | ○ |
| | Machining time stamp function | | | ○ |
| | EZ Guide I with 10.4" Color TFT | | Doosan infracore Conversational Programming Solution -.When the EZ Guide i is used, the Dynamic graphic display cannot application | ○ |
| | Dynamic graphic display (with 10.4" Color TFT LCD) | | Machining profile drawing. -.When the EZ Guide i is used, the Dynamic graphic display cannot application | ○ |

# BM series

| Description | | Unit | BM 1530M | BM 2035M | BM 2740M |
|---|---|---|---|---|---|
| Axes Travel Distance | X-axis | mm (inch) | 3000 (118.1) | 3500 (137.8) | 4000 (157.5) |
| | Y-axis | mm (inch) | 1550 (61.0) | 2050 (80.7) | 2700 (106.3) |
| | Z-axis | mm (inch) | 800 (31.5) | | |
| Table Size (X x Y) | | mm (inch) | 3000 x 1350 (118.1 x 53.1) | 3500 x 1850 (137.8 x 72.8) | 4000 x 2500 (157.5 x 98.4) |
| Distance between columns | | mm (inch) | 1700 (66.9) | 2200 (86.6) | 2700 (106.3) |
| Table Loading Capacity | | kg (lb) | 8000 (17636.7) | 10000 (22045.9) | 15000 (33068.9) |
| Max. Spindle Speed | | r/min | 12000 | | |
| No. of Tool Storage | | ea | 40 {60}* | | |

\* { } : Option

## Doosan Machine Tools

http://www.doosanmachinetools.com
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## Optimal Solutions for the Future