High-Precision, 5-Axis Control Vertical Machining Center

NMV5000 DCG
The NMV Series 5-axis control vertical machining center, equipped with DMG MORI’s original technologies: DDM (Direct Drive Motor), which achieves zero backlash and is produced in-house for maximum reliability, DCG (Driven at the Center of Gravity), which controls vibration and improves acceleration, and ORC (Octagonal Ram Construction), which offers high-speed, high-precision feed. It can complete all the machining in one clamping, except for the part being gripped, and achieves high-efficiency, high-quality machining of complex-shaped workpieces. This state-of-the-art 5-axis control machine is equipped with all our cutting-edge technologies, to respond to the need for the increasingly complex workpieces.

Three cutting-edge technologies for outstanding performance

- Working surface: $\phi 500$ mm ($\phi 19.7$ in.)
- Max. workpiece swing diameter: $\phi 700$ mm ($\phi 27.5$ in.)
- Max. workpiece height: 450 mm (17.7 in.)
The photo shows the machine outfitted with options.

Actual nameplate layout may differ from the photo.

The machine shown in the photo is equipped with a separate manual pulse handle as an option.

Figures in inches were converted from metric measurements.

CONTENTS

Outstanding operability 4
Top Box-in-Box Construction 5
DDM (Direct Drive Motor) 6
DCG (Driven at the Center of Gravity) 8
ORC (Octagonal Ram Construction) 10
Workpiece samples 12
Machining example 13
Machining ability 13
Automatic operation support 14
Productivity 16
High precision 17

Basic structure 20
Improved workability, Maintenance 23
Transfer systems 25
Peripheral equipment 26
Chip disposal 27
Eco-friendly design 27
MAPPS 3V 28
General view 32
Tool capacity diagram 32
Table dimensions 33
Pallet dimensions 33

Tooling system diagrams 34
Spindle speed-torque/output-rotation speed diagram 35
Table speed-torque/output-rotation speed diagram 35
Standard & optional features 36
Numerical control unit specifications 38
Machine specifications 40

DOM : Direct Drive Motor
DCG : Driven at the Center of Gravity
ORC : Octagonal Ram Construction
MAPPS: Mori Advanced Programming Production System
Outstanding operability

We have reviewed the NMV Series to achieve far better access and operability than earlier 5-axis machines. The excellent access to the spindle and table allows setup such as fixture adjustment and tool change to proceed smoothly, reducing machine down time. Maintenance inside the machine is also easier.

With the tilting table on a conventional machine, which is supported at both sides, the workpiece is at the back when the table is tilted forwards. This makes it hard to access the workpiece and hard to check the machining status. With the NMV Series, access to the workpiece is excellent even when the table is turned, giving easier setup and better visibility.
Top Box-in-Box Construction

The machine uses the top Box-in-Box Construction that guides and drives the center of gravity of the moving parts with excellent balance. It also improves servo motor’s responsiveness, making unprecedented speed and acceleration possible.

Also, since the guide parts are fully protected by a cover, they are not affected by temperature changes caused by chips or coolant. What’s more, unlike other 5-axis control machines, there is no overhang. This achieves stable feed even at high speeds, and excellent thermal stability thanks to its heat-symmetrical design.

Stable accuracy due to the heat-symmetrical structure
Support structure with no overhang

Conventional machine

NMV SERIES

Guide positions
The world’s fastest rotary axis drive system, with zero backlash

Transmitting the drive power directly to the rotary axes without using gears eliminates backlash. Compared with conventional worm gear systems, this dramatically improves transmission efficiency and offers high-speed feed. And DMG MORI makes them in-house, so if they ever do break down, we can fix them quickly, significantly reducing recovery time.

Table-in-Table Construction

The Table-in-Table Construction, in which the C-axis table is placed within the B-axis table, has been adopted. Its highly rigid structure allows stable machining accuracy.

Table rigidity

We used dynamic analysis to design a table with even higher rigidity.

Displacement

**NMV5000 DCG**

2.0 \( \mu \text{m} \)  
\(( F = 1,200 \text{ N})\)
B-axis

<table>
<thead>
<tr>
<th>Min. indexing increment</th>
<th>0.001°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indexing range</td>
<td>+160° — −180°</td>
</tr>
</tbody>
</table>
| Indexing time (90°)    | 0.72 sec. (35 min⁻¹)  
                      | 0.60 sec. (50 min⁻¹) |

**NMV5000 DCG**

C-axis

<table>
<thead>
<tr>
<th>Min. indexing increment</th>
<th>0.001°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indexing range</td>
<td>360°</td>
</tr>
<tr>
<td>Standard specifications</td>
<td>0.61 sec. (120 min⁻¹)</td>
</tr>
</tbody>
</table>
| Turning specifications  | 0.58 sec. (500 min⁻¹)  
                      | 0.69 sec. (1,200 min⁻¹) |

**NMV5000 DCG**

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*Indexing time: clamping, unclamping time are not included.
With the turning specifications, space is needed for the electrical cabinet for turning and the separate cooler for turning, which will be included. When the C-axis rotates, unbalanced weight of the workpiece (including fixtures) on the table causes vibration, so it may not be possible to rotate at the required speed. In that case, it is necessary to adjust the balance of the workpiece by adding weights to the fixtures.*

Compared with conventional machine

**Conventional machine:** 1.45 sec.  
**NMV5000 DCG:** 0.61 sec.

**Approx. 58% faster**

**Indexing accuracy**

**Conventional machine:** B-axis 60 sec. C-axis 20 sec.  
**NMV5000 DCG:** B-axis 11 sec. C-axis 4 sec.

**C-axis max. rotational speed**

**Conventional machine:** 12.5 min⁻¹  
**NMV5000 DCG:** 120 min⁻¹

**9.6 times more**

**Repeatability**

**Conventional machine:** B-axis 7 sec. C-axis 2 sec.  
**NMV5000 DCG:** B-axis 11 sec. C-axis 4 sec.

**Direct scale feedback is standard for the B and C axes**

*The cutting test results indicated in this catalog are provided as examples. The results indicated in this catalog may not be obtained due to differences in cutting conditions and environmental conditions during measurement.*
Driven at the Center of Gravity

Minimizing vibration, the greatest enemy of machining, and maximizing acceleration

Our DCG technology controls vibration, which is one of the main enemies of high speed and high precision, by driving structural parts at their center of gravity.

Restricting vibration

For positioning, machines with DCG virtually eliminate vibration, while machines without DCG continue to vibrate for a long time. It controls the rotational vibration which appears at every acceleration start point, and which is proportional to the distance between the drive point and the center of gravity. This prevents deterioration of the quality of the machined surface.

Outstanding acceleration performance

Machining by advanced DCG technology generates little vibration at the beginning of acceleration, and it is possible to accelerate with maximum force from the very start.

Improves surface quality

Curved machined surfaces are actually made up of many very short straight lines, which means the moving component has to change direction ever so slightly at every angle. In order to do this without dropping speed requires very fast acceleration.

Improved roundness

DCG also minimizes the vibration that comes from changes in the direction of travel. This significantly improves roundness in circle cutting.
Octagonal Ram Construction

A revolutionary structure which controls thermal displacement and offers outstanding straightness

The 4 guideways are located diagonally from each other, so they distort symmetrically in response to the heat generated by high-speed travel. This means that the center stays in the same position, offering high-speed, high-precision feed.

One of the advantages of conventional square guides is their superior damping characteristics. The lubricating oil in the oil pockets which were made by scraping is forced in and out through the gaps because of the contact pressure caused by vibration, and converted into heat. However, when the moving part travels at high speed, the lubricating oil in the oil pockets acts as a wedge, creating sliding resistance. Since the moving part is travelling against this, heat is generated in proportion to the speed. As a result, only the flat surface heats up, and the slideways warp.

DMG MORI’s ORC has solved this problem of thermal displacement. The slideways, which are located diagonally from each other, offset each other’s thermal displacement, because their distortion in response to heat is symmetrical. For this reason, the center of the moving part can be maintained in the same position, achieving high-precision machining during high-speed travel.

Square guides’ excellent damping characteristics

- Lubricating oil outflow
- Vibration

Heat generated by friction

The lubricating oil in the oil pockets which were made by scraping is forced in and out through the gaps because of the contact pressure caused by vibration, generating heat.

- Only the flat surface (slideway) heats up, and the guideways warp.

Thermal displacement caused by high-speed travel of square guides

- Lubricating oil on the slideway
- Heat generation
- Travel

Vibration is reduced by converting vibrational energy into heat energy. This helps control chattering caused by vibration.

ORC: Octagonal Ram Construction
Workpiece samples

The NMV Series, which is packed with DMG MORI’s original technologies to achieve high-speed, high-precision machining, shows its full potential for all workpieces in the multi-item, multi-lot production industry.

NMV5000 DCG

Automobile industry

- Workpiece: Impeller
  - Material: Aluminum
  - Size: 50 mm (2.0 in.)

- Workpiece: Transmission casing
  - Material: Aluminum
  - Size: 100 mm (3.9 in.)

Aircraft industry

- Workpiece: Coating latch
  - Material: Stainless steel
  - Size: 30 mm (1.2 in.)

- Workpiece: Turbine blade
  - Material: SUS630 (Stainless steel)
  - Size: 40 mm (1.6 in.)

Die & mold industry

- Workpiece: Mold for engines
  - Material: SKD61 (Alloy tool steel)
  - Size: 200 mm (7.9 in.)

- Workpiece: Sample mold for tires
  - Material: A5052 (Aluminum)
  - Size: 100 mm (3.9 in.)

* S052 (ANSI), NS4 (BS), AlMg2.5 (DIN), SA02 (GB)

JIS: Japanese Industrial Standard
Machining example

The NMV Series 5-axis structure offers high-speed, high-precision, high-efficiency machining of complex-shaped workpieces.

Cycle time comparison

<table>
<thead>
<tr>
<th>Conventional machine</th>
<th>NMV5000 DCG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor space required: Approx. 18.6 m² (200.2 ft²)</td>
<td>Floor space required: Approx. 10.9 m² (117.3 ft²)</td>
</tr>
<tr>
<td>Machining method</td>
<td></td>
</tr>
<tr>
<td>Initial setup (3 min.)</td>
<td>B Turning (1.5 min.)</td>
</tr>
<tr>
<td>Machining method</td>
<td></td>
</tr>
<tr>
<td>1. I.D. roughing</td>
<td>6. φ 25 mm (φ 1 in.) × 90° drilling (chamfering)</td>
</tr>
<tr>
<td>2. I.D. finishing</td>
<td>7. φ 6 mm (φ 0.24 in.) drilling</td>
</tr>
<tr>
<td>3. I.D. threading</td>
<td>8. φ 32 mm (φ 1 ¼ in.) end mill roughing</td>
</tr>
<tr>
<td>4. φ 40 mm (φ 1 ½ in.) drilling</td>
<td>9. φ 32 mm (φ 1 ¼ in.) end mill finishing</td>
</tr>
<tr>
<td>5. φ 12 mm (φ ½ in.) drilling</td>
<td>10. φ 18.8 mm (φ 0.74 in.) drilling</td>
</tr>
<tr>
<td>Approx. 46% faster</td>
<td></td>
</tr>
</tbody>
</table>

Machining ability

**Milling**

*Material: JIS: S55C (Carbon steel)*

<table>
<thead>
<tr>
<th>Milling</th>
<th>NMV5000 DCG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face milling</td>
<td></td>
</tr>
<tr>
<td>Material removal rate</td>
<td>336 mL/min (20.5 in³/min)</td>
</tr>
<tr>
<td>Tool diameter</td>
<td>φ 60 mm (φ 2.36 in.)</td>
</tr>
<tr>
<td>Spindle speed</td>
<td>1,000 min⁻¹</td>
</tr>
<tr>
<td>Feedrate</td>
<td>2,100 mm/min (82.7 ipm)</td>
</tr>
<tr>
<td>Width of cut</td>
<td>64 mm (2.5 in.)</td>
</tr>
<tr>
<td>Depth of cut</td>
<td>2.5 mm (0.1 in.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NMV5000 DCG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tool diameter</td>
</tr>
<tr>
<td>Spindle speed</td>
</tr>
<tr>
<td>Feedrate</td>
</tr>
<tr>
<td>Width of cut</td>
</tr>
<tr>
<td>Depth of cut</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drilling</th>
<th>NMV5000 DCG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material removal rate</td>
<td>66 mL/min (4.0 in³/min)</td>
</tr>
<tr>
<td>Tool diameter</td>
<td>φ 35 mm (φ 1.4 in.)</td>
</tr>
<tr>
<td>Spindle speed</td>
<td>227 min⁻¹</td>
</tr>
<tr>
<td>Feedrate</td>
<td>66 mm/min (2.7 ipm)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tapping</th>
<th>NMV5000 DCG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tool</td>
<td>M30×P3.5</td>
</tr>
<tr>
<td>Spindle speed</td>
<td>118 min⁻¹</td>
</tr>
<tr>
<td>Feedrate</td>
<td>354 mm/min (13.9 ipm)</td>
</tr>
</tbody>
</table>

**Turning**

*Material: JIS: S45C (Carbon steel)*

<table>
<thead>
<tr>
<th>Turning</th>
<th>NMV5000 DCG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy-duty cutting (O.D.)</td>
<td></td>
</tr>
<tr>
<td>Material removal rate</td>
<td>344 mL/min (21.0 in³/min)</td>
</tr>
<tr>
<td>Cutting speed</td>
<td>105 m/min (344.5 IpM)</td>
</tr>
<tr>
<td>Feedrate</td>
<td>120 m/min (393.7 IpM)</td>
</tr>
<tr>
<td>Depth of cut</td>
<td>0.5 mm/rev (0.02 ipr)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NMV5000 DCG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting speed</td>
</tr>
<tr>
<td>Feedrate</td>
</tr>
</tbody>
</table>

JIS: Japanese Industrial Standard

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Automatic operation support  

We have prepared many variations which offer the ideal systems for all shapes of material.

The turning specifications (option) can be selected even with the APC or pallet pool system.

### Material IN

<table>
<thead>
<tr>
<th>Shape</th>
<th>System</th>
<th>Transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Square material</td>
<td>5-station side access turn-type APC</td>
<td></td>
</tr>
<tr>
<td>Round material</td>
<td>2-station side access turn-type APC</td>
<td>CPP (Carrier Pallet Pool)</td>
</tr>
<tr>
<td>Unusually shaped workpieces</td>
<td>2-station side access turn-type APC</td>
<td>Workpiece transfer robot</td>
</tr>
</tbody>
</table>

Transfer conveyor: Robot
Finished product OUT

- Transfer
  - 5-station APC

- LPP (Linear Pallet Pool)

Finished product

- Workpiece: Housing
  - Material: Aluminum

- Workpiece: Cam
  - Material: Cast iron

- Workpiece: Knuckle
  - Material: Cast iron

Unloading

- Transfer conveyor
- Workpiece transfer conveyor
- Chuter
Productivity

The NMV Series can do various machining processes on one machine, improving the flow (through-put) from material to finished products. It will dramatically improve your productivity.

Benefits of process integration
- Eliminates waiting time between processes
- Prevents deterioration in accuracy between processes
- Reduces setup time
- Reduces work in process inventory
- Shortens lead time
- Reduces fixture manufacturing costs
- Reduces intermediate transport costs

Comparison of productivity and sales <NMV5000 DCG>

Comparison of productivity (pcs./day)

Conventional machine  NMV5000 DCG
12 pcs.  23 pcs.

Simulation of sales for 1 year ($25 per workpiece)

Compared with conventional machine
$275/ day  $5,775/ month  $69,300/ year
Approx. 1.9 times more

Space-saving, labor-saving

Turning Center + Machining Center
Approx. 18.6 m² (200.2 ft²)

NMV5000 DCG
Approx. 10.9 m² (117.3 ft²)

Floor space required
Approx. 41% reduction

*The machine shown in the photo is equipped with a separate manual pulse handle as an option.*
High precision

Full closed loop control <Scale feedback>

- Superior precision with the Magnescale full closed loop control (Scale feedback)
- Magnetic measuring system with a high resolution of 0.01 µm
- Resistance to oil and condensation due to a magnetic detection principle
- Impact resistance of 980 m/s² (38,582.7 in./s²)
- Vibration resistance of 250 m/s² (9,842.5 in./s²)
- High-accuracy machining achieved by the scale with the thermal expansion coefficient equivalent to the machine castings
- Protection level of IP67 and bearingless non-contact structure for high reliability

Coolant chiller (separate type)

Raised coolant temperature causes thermal displacement in the fixtures and workpiece, affecting the machining accuracy of the workpiece. Use this unit to prevent the coolant from heating up. When using oil-based coolant, the coolant temperature can become extremely high even with the standard coolant pump, so please be sure to select this unit.

When using oil-based coolant, please be sure to consult our sales representative.

SVC function (standard features for F31B5)

The SVC function, in which the program commands for tool tip control are read in advance and compensation is automatically applied to achieve smooth tool feed, is equipped as standard. By combining this function with DDM (Direct Drive Motor), the machine offers greatly improved surface quality and reduced cycle time during 5-axis machining.

Motion of the SVC function

The SVC function includes the following functions:
- AI contour control II
- Nano smoothing II
- Smooth TCP
- Machining mode selection
- G232 tolerance command

SVC: Smooth Velocity Control

Tool center point control* / Cutting point command

- Main features
  - The tool path can be controlled from the tool center point.
  - No reprogramming is needed when the tool length and the tool diameter are changed.
  - NC automatically calculates cutter radius compensation and tool length offsets based on the program commands for tool tip control.

* Standard features for F31B5
High precision

Circularity (Simultaneous 5-axis control) <NAS Standard 979>

The roundness of the NMV Series demonstrates how good its structure is, because conventional machines usually met NAS Standards with precision of 20–30 µm.

<table>
<thead>
<tr>
<th>Machine type</th>
<th>Conventional models</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMV5000 DCG</td>
<td>20–30 µm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material &lt;JIS&gt;</th>
<th>Tool</th>
<th>Spindle speed</th>
<th>Feedrate</th>
<th>Workpiece shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>A7075 * (Aluminum)</td>
<td>Carbide end mill φ 40 mm (φ 1 1/2 in.)</td>
<td>2,000 min⁻¹</td>
<td>1,000 mm/min (39.4 ipm)</td>
<td>φ 216 mm (φ 8.5 in.)×φ 251 mm (φ 9.8 in.)×height 63.5 mm (2.5 in.)</td>
</tr>
</tbody>
</table>

* 7175 (ASTM), AlZnMgCu1.5 (DIN), 7A09 (GB)

Boring accuracy (B-axis 90°)/Squareness

<table>
<thead>
<tr>
<th>Machine type</th>
<th>Other company’s machine</th>
<th>Conventional machine</th>
<th>NMV5000 DCG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circularity &lt;actual results&gt;</td>
<td>1.20 µm</td>
<td>1.05 µm</td>
<td>0.90 µm</td>
</tr>
<tr>
<td>Surface roughness &lt;actual results&gt;</td>
<td>0.37 µm Ra</td>
<td>0.35 µm Ra</td>
<td>0.27 µm Ra</td>
</tr>
<tr>
<td>Squareness &lt;actual results&gt;</td>
<td>3.52 µm</td>
<td>3.26 µm</td>
<td>B-axis rotational accuracy (A-B plane)</td>
</tr>
<tr>
<td>C-axis rotational accuracy (B-C plane)</td>
<td>2.80 µm</td>
<td>1.60 µm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material &lt;JIS&gt;</th>
<th>Tool</th>
<th>Spindle speed</th>
<th>Feedrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>Boring φ 30 mm (φ 1.2 in.)</td>
<td>5,000 min⁻¹</td>
<td>1,000 mm/min (39.4 ipm)</td>
</tr>
<tr>
<td>A5056 * (Aluminum)</td>
<td>Boring φ 30 mm (φ 1.2 in.)</td>
<td>5,000 min⁻¹</td>
<td>1,000 mm/min (39.4 ipm)</td>
</tr>
<tr>
<td>A5052 * (Aluminum)</td>
<td>Boring φ 35 mm (φ 1.4 in.)</td>
<td>10,000 min⁻¹</td>
<td>500 mm/min (19.7 ipm)</td>
</tr>
</tbody>
</table>

* 1 5056 (ANSI), NB6 (BS), AlMg5 (DIN), SA05 (GB)
* 2 5052 (ANSI), NS4 (BS), AlMg2.5 (DIN), SA02 (GB)

JIS: Japanese Industrial Standard

The cutting tests results indicated in this catalog are provided as examples. The results indicated in this catalog may not be obtained due to differences in cutting conditions and environmental conditions during measurement.
Circularity (X-Y plane) <milling>

 Machine type | NMV5000 DCG
---|---
Circularity <actual results> | 1.78 µm

<table>
<thead>
<tr>
<th>Material</th>
<th>Tool</th>
<th>Spindle speed</th>
<th>Feedrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>A5052* (Aluminum)</td>
<td>End mill φ16 mm (φ/8 in.) &lt;4 flutes&gt;</td>
<td>1,000 min⁻¹</td>
<td>500 mm/min (19.7 ipm)</td>
</tr>
</tbody>
</table>

* 5052 (ANSI), NS4 (BS), AlMg2.5 (DIN), 5A02 (GB)

Circularity/Surface roughness <turning> OPC

<table>
<thead>
<tr>
<th>Material</th>
<th>Tool</th>
<th>Spindle speed</th>
<th>Feedrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brass</td>
<td>Diamond tool &lt;nose radius 0.5 mm (0.02 in.)&gt;</td>
<td>600 min⁻¹</td>
<td>0.05 mm/rev (0.002 ipr)</td>
</tr>
<tr>
<td>Brass</td>
<td>Diamond tool &lt;nose radius 0.5 mm (0.02 in.)&gt;</td>
<td>600 min⁻¹</td>
<td>0.05 mm/rev (0.002 ipr)</td>
</tr>
<tr>
<td>Brass</td>
<td>Diamond tool &lt;nose radius 0.5 mm (0.02 in.)&gt;</td>
<td>600 min⁻¹</td>
<td>0.05 mm/rev (0.002 ipr)</td>
</tr>
</tbody>
</table>

When the C-axis rotates, unbalanced weight of the workpiece (including fixtures) on the table causes vibration, so it may not be possible to rotate at the required speed. In that case, it is necessary to adjust the balance of the workpiece by adding weights to the fixtures.

JIS: Japanese Industrial Standard

* The cutting test results indicated in this catalog are provided as examples.

The results indicated in this catalog may not be obtained due to differences in cutting conditions and environmental conditions during measurement.
Basic structure

Working area

<table>
<thead>
<tr>
<th></th>
<th>NMV5000 DCN</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-axis travel</td>
<td>730 mm (28.7 in.)</td>
</tr>
<tr>
<td>Y-axis travel</td>
<td>510 mm (20.1 in.)</td>
</tr>
<tr>
<td>Z-axis travel</td>
<td>510 mm (20.1 in.)</td>
</tr>
<tr>
<td>B-axis travel</td>
<td>+160°—−180°</td>
</tr>
<tr>
<td>C-axis travel</td>
<td>360°</td>
</tr>
</tbody>
</table>

Max. workpiece size

<table>
<thead>
<tr>
<th></th>
<th>NMV5000 DCN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table loading capacity</td>
<td>300 kg (660 lb.)</td>
</tr>
<tr>
<td>Table working surface</td>
<td>φ 500 mm (φ 19.7 in.)</td>
</tr>
<tr>
<td>B-axis max. rotational speed</td>
<td>F311B 35 min⁻¹, 50 min⁻¹  OP</td>
</tr>
<tr>
<td></td>
<td>F311B5 50 min⁻¹</td>
</tr>
<tr>
<td>C-axis Table mode</td>
<td>120 min⁻¹</td>
</tr>
<tr>
<td>Turning mode</td>
<td>500 min⁻¹  OP, 1,200 min⁻¹  OP</td>
</tr>
</tbody>
</table>

- When the C-axis rotates, unbalanced weight of the workpiece (including fixtures) on the table causes vibration, so it may not be possible to rotate at the required speed. In that case, it is necessary to adjust the balance of the workpiece by adding weights to the fixtures.
- For the max. workpiece size for a machine with the APC/pallet pool system, please see page 25.

Spindle

The DDS motor extracts full power across a wide range, from high-speed machining to heavy-duty cutting.

DDS: Direct Drive Spindle

<table>
<thead>
<tr>
<th>Spindle variations</th>
<th>NMV5000 DCN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. spindle speed</td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>12,000 min⁻¹</td>
</tr>
<tr>
<td>High output  OP</td>
<td>20,000 min⁻¹</td>
</tr>
</tbody>
</table>

- When using spindle No. 40 taper at 15,000 min⁻¹ or higher, or spindle No. 50 taper at 10,000 min⁻¹ or higher, please use two-face contact tool.
Spindle lubrication

[Oil-air lubrication]
For bearing lubrication, we have adopted a oil-air lubrication system, which supplies minimum amount of lubricating oil and reduces heat generation caused by resistance to stirring. Air enables effective cooling, and the air purge which increases air pressure for bearings prevents foreign matter from getting inside.

[Spindle cooling]
Stator coil in DDS motor: Oil jackets are placed around the stator coil, allowing forced circulation of coolant and prevents heat from spreading.

Two-face contact
By using two-face contact tool holders, we have improved rigidity, allowing high-precision machining and extending tool life. Please use these tool holders which DMG MORI has prepared for turning specifications.

- If you select turning specifications, the through-spindle coolant system is a center-through type only.
  Please note that to attach turning tools, BT or HSK tool holder (two-face contact), which DMG MORI has prepared according to machine specifications, is required.
- When selecting the two-face contact tool specification, be sure to use a two-face contact tool.
Basic structure

ATC

Uses a highly-reliable double-arm ATC, reducing non-cutting time and offering high-efficiency machining. We have also simplified the tool clamping mechanism, improving reliability and ease of maintenance.

### Chain-type

<table>
<thead>
<tr>
<th>NMV5000 DCG</th>
<th>Tool storage capacity</th>
<th>Total</th>
<th>[240]</th>
<th>[300]</th>
<th>[320]</th>
</tr>
</thead>
<tbody>
<tr>
<td>With adjacent tools</td>
<td>mm (in.)</td>
<td>φ 70×300 mm (φ 2.8×11.8 in.)</td>
<td>—</td>
<td>284</td>
<td>—</td>
</tr>
<tr>
<td>Without adjacent tools</td>
<td>mm (in.)</td>
<td>φ 90×300 mm (φ 3.5×11.8 in.)</td>
<td>135</td>
<td>—</td>
<td>185</td>
</tr>
<tr>
<td>Max. tool diameter</td>
<td>mm (in.)</td>
<td>φ 90 (φ 3.5)</td>
<td>81</td>
<td>—</td>
<td>111</td>
</tr>
<tr>
<td>Max. tool length</td>
<td>mm (in.)</td>
<td>φ 125 (φ 4.9)</td>
<td>15</td>
<td>—</td>
<td>15</td>
</tr>
<tr>
<td>Max. tool mass</td>
<td>kg (lb.)</td>
<td>912 (200 lb.)</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. tool moment</td>
<td>N·m (ft·lbf)</td>
<td>5,019 (1,176)</td>
<td>2,929 (115.3)</td>
<td>6,069 (238.9)</td>
<td></td>
</tr>
<tr>
<td>Tool-to-tool sec.</td>
<td>sec.</td>
<td>1.8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Option**

* A pot transfer type magazine is used. The tool storage capacity includes a tool mounted in the spindle.

### Rack-type

<table>
<thead>
<tr>
<th>NMV5000 DCG</th>
<th>Tool storage capacity</th>
<th>Total</th>
<th>[240]</th>
<th>[300]</th>
<th>[320]</th>
</tr>
</thead>
<tbody>
<tr>
<td>With adjacent tools</td>
<td>mm (in.)</td>
<td>φ 90×300 mm (φ 3.5×11.8 in.)</td>
<td>952 (217)</td>
<td>952 (217)</td>
<td></td>
</tr>
<tr>
<td>Without adjacent tools</td>
<td>mm (in.)</td>
<td>φ 125 (φ 4.9)</td>
<td>11 (18.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. tool mass</td>
<td>kg (lb.)</td>
<td>9 (20)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. tool moment</td>
<td>N·m (ft·lbf)</td>
<td>15 (11)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tool-to-tool sec.</td>
<td>sec.</td>
<td>1.8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Option**

* A pot transfer type magazine is used. The tool storage capacity includes a tool mounted in the spindle.

### Double-anchor support

Prevents expansion and contraction caused by heat. And by connecting the ball screw directly to the servo motor, it ensures sufficient rigidity.

### Rollers guideway

Compared with balls, rollers have far less elastic deformation under load. By placing many rollers inside the slide unit, we have achieved high rigidity. The standard Double Seal on the X- and Y-axis roller guides minimizes the entry of dust particles into the driving parts.

*The Z-axis slideways also come standard with Double Seal.*
Improved workability, Maintenance

Access to the spindle

The excellent access to the spindle allows tool replacement and maintenance to be done easily.

Access to the table

The access to the table is good, offering superior operability and setup.

Swivel-type operation panel

The operation panel which swivels from 0 to 135 degrees improves visibility during operation.
Improved workability, Maintenance

Automatic opening/closing protector

The Y-axis can move further beyond the work envelope. This allows workpieces to be loaded easily using a crane.

<table>
<thead>
<tr>
<th>Automatic opening/closing protector travel</th>
<th>860 mm (33.9 in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door opening width</td>
<td>926 mm (36.5 in.)</td>
</tr>
</tbody>
</table>

In-house production of DDM (Direct Drive Motor)

Because DMG MORI makes them in-house, if they ever do break down we can fix them quickly. MTTR (Mean Time To Repair) is greatly reduced.

Centralized layout of devices

Devices are placed together at the side of the NMV5000 DCG for easier maintenance.

* The machine shown in the photo is equipped with a separate manual pulse handle as an option.
Transfer systems

APC

The NMV Series boasts outstanding operability, allowing smooth setups which do not interfere with operation with the standard specifications, and offers excellent access to the spindle and the table even with the APC specifications.

[Max. workpiece size]

- **APC <NMV5000 DCG>**
  - Change time: 38 sec.
  - Pallet working surface: 400 mm x 400 mm (15.7 in. x 15.7 in.)
  - Pallet loading capacity: 250 kg (550 lb.)

- **CPP/LPP <NMV5000 DCG>**
  - The picture shows the orientation of a workpiece in the setup station.
Peripheral equipment

In-machine measuring system (spindle)

Touch sensor (optical signal transmission type)

Automatic
- Centering
- Measurement

Manual
The workpiece setter function can be added

Workpiece zero point setting and centering are possible

In-machine measuring system (table)

Touch sensor
- Tool length measurement
- Tool breakage detection

Manual
The tool setter function can be added

Allows tool length offset

Touch sensor
- Tool length measurement
- Tool breakage detection

Manual
The tool setter function can be added

Allows tool length offset and tool diameter offset

In-machine measuring system (table) <turning specifications>

Touch sensor
- Tool length measurement
- Tool breakage detection

Manual
Allows tool length offset and tool diameter offset

- The tool setter function is attached.

Through-spindle coolant system

The through-spindle coolant system effectively eliminates chips, cooling the machine point and lengthening the lives of your tools.

Recommended equipment

Coolant chiller (separate type)

The high-pressure coolant system generates a lot of heat because it discharges coolant at high pressure. The Coolant Chiller controls the temperature of the coolant and suppresses temperature increases in the workpiece, tool and table, ensuring stable machining accuracy. This is essential equipment when using high-pressure coolant. A unit with a heater will be customized.

- The illustrations show the 1.5 MPa (217.5 psi) specification. For the 7.0 MPa (1,015 psi) specification, the location of a coolant pump differs. For details, please consult our sales representative.
Peripheral equipment

External chip conveyor

<table>
<thead>
<tr>
<th>Available specifications</th>
<th>Workpiece material and chip size</th>
<th>Steel</th>
<th>Cast iron</th>
<th>Aluminium, non-ferrous metal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Long</td>
<td>Short</td>
<td>Powdery</td>
<td>Long</td>
</tr>
<tr>
<td>Hinge type + Drum filter type</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Scraper type + Drum filter type</td>
<td>×</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Magnet scraper type + Drum filter type</td>
<td>×</td>
<td>○</td>
<td>○</td>
<td>×</td>
</tr>
</tbody>
</table>

Chip size guidelines
- Short: Chips shorter than 50 mm (2.0 in.), blocks of chips shorter than Ø40 mm (Ø1.6 in.).
- Long: Chips larger than those indicated above.

- The options table shows the general options when using coolant. Changes may be necessary if you are not using coolant, or depending on the amount of coolant, compatibility with machines, or the specifications required.
- Please select a chip conveyor to suit the shape of your chips. When using special or difficult-to-cut material (chip hardness HRC45 or higher), please consult with our sales representative.
- Chip conveyors are available in various types for handling chips of different shape and material. For details, please consult with our sales representative.

Chip disposal

[Table]
By rotating the table, chips fall straight down into the center conveyor.

[Shower coolant]
As well as preventing chips from scattering during machining, this makes them fall smoothly into the flush coolant system.

Eco-friendly design

Reduced consumption of lubricating oil

[Oil-free type roller guides]
Uses oil-free type roller guides to reduce the amount of lubricating oil.

<table>
<thead>
<tr>
<th>Consumption of lubricating oil</th>
<th>Conventional machine</th>
<th>NMV5000 DCG</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11.87 mL/h</td>
<td>6.08 mL/h</td>
</tr>
</tbody>
</table>

Consumption of lubricating oil per hour

- Compared with conventional machine: Approx. 1/2

Reduced consumption of electricity

[Automatic machine light function]
If the operating panel is not touched for a certain amount of time, the interior light turns off. This saves energy and lengthens the life of the machine lights.

[Automatic sleep function]
If the keyboard is not touched for a certain amount of time and NC operation is not being performed, power is cut off to the servo motor, the spindle, the coolant pump and the chip conveyor, thereby saving energy.
High-performance operation system that pursues ease of use, and combines the best hardware in the industry with the advanced application/network systems.

- Outstanding operability thanks to upgraded hardware
- Cutting-edge functions for easier setup and maintenance
- Various types of monitoring, including internal monitoring, are possible on the screen (option)
- In the event of trouble, DMG MORI’s remote maintenance service solves it smoothly MORI-NET Global Edition Advance

### Outstanding operability

**Vertical soft-keys**
Vertical soft-keys are arranged on the left and right sides of the screen. The vertical soft-keys can be used as option buttons or shortcut keys to which you can assign your desired screens and functions, allowing you to quickly display the screen you want.

**Keyboard**
A PC-type keyboard is used as standard, making key input easy. A keyboard with a conventional key layout is also available as an option.

### Functions for multi-axis machining

#### 3D interference checking function
Checks for interference in 3D for spindles, tables, tools, workpieces and fixtures. If interference is detected, the machine will stop operation regardless of whether it is in the automatic or manual mode, providing the highest level of protection against interference.

- Interference detected
- Machine stops automatically
- Collisions can be avoided not only during program operation but also during setup.

- The 3D interference checking function will check for interference accurately as long as the 3D model exactly matches the actual configuration of the spindles, tables, tools, workpieces and fixtures.
- Customized design is required for special shape. For details, please refer to the description of "3D interference checking function" in the NC control unit specifications.
- A cutting simulation that shows how material is removed as machining proceeds cannot be carried out during a 3D interference check.

### Improved ease of setup

**Alarm help function**
When an alarm occurs, MAPPS identifies the cause of the trouble and provides solutions.

### Improved ease of maintenance

**File display and Memo function**
Data necessary for setups such as operating instructions, drawing data and text data can be viewed on MAPPS. Text data is editable.

**Viewable file types**
- PDF
- TXT (Editable)
- Any file that can be displayed with Internet Explorer is available

### Improved work efficiency

**Fixed-point in-machine camera**
Images taken by cameras installed inside/outside the machine can be viewed on the programming screen. This function is useful for maintenance.

**Examples of camera locations**
- Inside machine (to check machining)
- Tool magazine (to check cutting tools)
- Chip bucket (to check chip accumulation)
**Conversational automatic programming**

This function allows users to create programs simply by following the guidance on the screen. Much of the programming process has been simplified due to the minimal key entry required for even the most complex shapes.

### Islands, open pockets

- **OP**

### MORI-POST advanced mode

- **OP**

### DXF import function

- **OP**

---

**Application System**

**MORI Automatic Programming System for Machining Center**

**MORI-APM**

MORI-APM are application systems which let you create machining programs easily on your PC.

1. **Simple programming**

   ![Machining menu]

   **(Conversational automatic programming)**

   Easy operation by simply inputting product shapes according to the screen guidance.

2. **Reduce programming time**

   ![List display function]

   **(Supporting complicated programming)**

   Simply enter the machining shape using conversational automatic programming and the machine automatically selects the necessary tools and cutting conditions.

3. **Save costs**

   ![Contour input]

   **(Compatibility with the MAPPS conversational function)**

   Prepared conversational programs can be converted into NC programs with MAPPS. Cutting conditions can also be changed on MAPPS.

---

- The photo shown may differ from actual machine.
- Information about the screen is current as of January 2018.
This network system application achieves fast information sharing and increased production efficiency.

### Remote Maintenance/Machine Operation Monitoring Service

**MORI-NET Global Edition Advance**

- **Features**
  - Remote maintenance service by DMG MORI Service Center
  - Internet-based, high speed (max. 1 Gbps), large capacity network
  - No server installation is required — reduction in initial cost
  - Download various data from the server located at DMG MORI

- **Remote alarm support**

  When an alarm goes off, an alarm notification will be sent to the DMG MORI Service Center simply by pressing the "Send e-mail" button on MAPPS. DMG MORI service personnel will remotely diagnose the cause of the problem, and quickly provide solutions for machine recovery.

  - This service may not be available in some areas. Please contact our sales representative for details.

### Machine Operation Monitoring System

**DMG MORI MESSENGER**

- **Features**
  - Intra-corporate network system
  - Up to 30 machines can be connected with one server
  - The operating status of your machines can be centrally managed in real time

### Application for Data Transmission

**MORI-SERVER** ([Standard features])

This enables high-speed transfer of programming data between your office computer and machine, reducing the lead time of pre-machining processes.

### MAPPS Screen Remote Control and Browsing Application

**MORI-MONITOR**

This is an application which allows you to remotely operate and view the MAPPS screens from your office computer.
Advanced Communication Technology (ACT) connects machine tool and peripheral devices

DMG MORI’s new proposal, ACT, is designed to strengthen connections between machine tools and peripheral equipment by standardizing communication and software of the entire system. With ACT, standardization of interfaces of peripherals, simplified wiring, and labor saving can be achieved.

Industrial Network for Peripheral Equipment Control

MAPPS EtherNet/IP I/F

This industrial network using the standard Ethernet (TCP/IP) offers high speed and reliable connection. Simple Plug and Play connections, which are made available just by connecting to the hub through MAPPS, enable you to build a system easily. The use of standard cables also helps to reduce costs.

■ Features
- Connections between a machine and peripheral equipment become easy because standard LAN cables are used
- Thanks to increased versatility, your peripheral equipment can be used even when the machine tools are replaced by new ones
- Reliability is significantly increased by reducing the number of I/O cables

- Easy system construction
- Connection with existing devices
- Inexpensive devices

Communication Interface for Monitoring Machine Operation

MAPPS MTConnect I/F

MTConnect, which was introduced by the Association for Manufacturing Technology (AMT) in 2008, is a new XML (Extensible Markup Language) based communication protocol that offers an open interface. This interface allows you to build a system to monitor the operating status of your machines.

■ Features
- Open communication interface allows you to access to your company’s system
- This makes it possible for you to build a system to monitor the operating status of your machines via the Internet

■ System examples

- Adapter 1
- Adapter 2
- Adapter 3

- Agent 1
- Agent 2

- Application Server
- Router
- Outside the office
- Office

■ Application examples

Your machines are displayed all at once, allowing you to quickly call up the machine you wish to check.

Operating status can be checked in real time.

You can check the operating history on the Gantt chart screen.

- A server and application must be prepared by the customer.
- For introduction of MTConnect, separate consultation is required.
**General view**

**Tool storage capacity (Chain-type)**

<table>
<thead>
<tr>
<th></th>
<th>31 tools</th>
<th>61 tools (option)</th>
<th>91 tools (option)</th>
<th>121 tools (option)</th>
<th>181 tools (option)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Width) mm (in.)</td>
<td>2,773 (109.2)</td>
<td>3,043 (120.1)</td>
<td>3,263 (128.5)</td>
<td>3,626 (142.7)</td>
<td>3,923 (154.4)</td>
</tr>
<tr>
<td>B (Depth) mm (in.)</td>
<td>2,686 (105.7)</td>
<td>3,043 (120.1)</td>
<td>3,263 (128.5)</td>
<td>3,626 (142.7)</td>
<td>3,923 (154.4)</td>
</tr>
</tbody>
</table>

**Tool storage capacity (Rack-type)**

<table>
<thead>
<tr>
<th></th>
<th>240 tools (option)</th>
<th>300 tools (option)</th>
<th>320 tools (option)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Width) mm (in.)</td>
<td>3,043 (120.1)</td>
<td>4,239 (166.9)</td>
<td>4,354 (171.4)</td>
</tr>
<tr>
<td>B (Depth) mm (in.)</td>
<td>5,589 (220.0)</td>
<td>3,553 (139.9)</td>
<td>6,639 (261.4)</td>
</tr>
</tbody>
</table>

**Chip conveyor**

<table>
<thead>
<tr>
<th></th>
<th>Hinge type + Drum filter type (option)</th>
<th>Scraper type + Drum filter type (option)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C (Depth) mm (in.)</td>
<td>4,453 (175.3)</td>
<td>4,354 (171.4)</td>
</tr>
<tr>
<td>D (Discharge height) mm (in.)</td>
<td>1,017 (40.0)</td>
<td>820 (32.3)</td>
</tr>
</tbody>
</table>

**Tool capacity diagram**

- Shank size: BT40
  - Standards: MAS, CAT, DIN, HSK-A63
  - Max. tool length mm (in.): 300 (11.8)
  - Max. tool diameter <with adjacent tools> mm (in.): 90 (3.5)/70 (2.8)
  - Max. tool diameter <without adjacent tools> mm (in.): 125 (4.9)
  - Tool capacity (Min.) mm (in.): 63 (2.4) 44 (1.7) 50 (1.9) 53 (2.0)
  - Max. tool mass kg (lb.): 8 (17.6)
  - Max. tool mass moment <from spindle gage line> Nm (ft-lb): 11 (8.1)

- When the machine is equipped with a 300-tool rack magazine, any tools cannot be stored next to turning tools.
- If a tool greater than O.D. 70 mm (2.8 in.) is stored in the column 10, tools cannot be stored in the adjacent tools.
- No.300 pot is a waiting pot. Do not store a tool.
The concentricity of the table center hole and the C-axis rotation center is not guaranteed. If the concentricity is required, consult with our sales representative.

Do not remove the plug of the rotation axis from the table center hole when using the machine. If the plug is removed, chips and coolant could enter the table, damaging the machine.

The concentricity of the pallet center hole and the C-axis rotation center is not guaranteed. If the concentricity is required, consult with our sales representative.
### Tooling system diagrams (tools for turning specifications)

#### Turning tool holder (incl. tool shank)

<table>
<thead>
<tr>
<th>Type</th>
<th>BT40 Specifications</th>
<th>HSK-A63 Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>O.D. cutting tool holder (left-hand specifications)</td>
<td>BT40: T00260 &lt;T00363&gt;</td>
<td>HSK-A63: T00262 &lt;T00368&gt; (suitable for HSK)</td>
</tr>
<tr>
<td>O.D. cutting tool holder (right-hand specifications)</td>
<td>BT40: T00261 &lt;T00364&gt;</td>
<td>HSK-A63: T00263 &lt;T00369&gt; (suitable for HSK)</td>
</tr>
<tr>
<td>CAPTO C4 conversion adapter</td>
<td>BT40: T11034 &lt;T11035&gt;</td>
<td>HSK-A63: T11044 &lt;T11045&gt; (suitable for HSK)</td>
</tr>
<tr>
<td>CAPTO C5 conversion adapter</td>
<td>BT40: T11054 &lt;T11055&gt;</td>
<td>HSK-A63: T11056 &lt;T11057&gt; (suitable for HSK)</td>
</tr>
</tbody>
</table>

#### O.D. cutting tool holder

- **BT40 specifications**
  - T0A025 <T00365>
  - HSK-A63: T00266 <T00370> (suitable for HSK)
- **HSK-A63 specifications**
  - BT40: T00260 <T00363>
  - HSK-A63: T00262 <T00368> (suitable for HSK)

#### I.D. cutting tool holder

- **BT40 specifications**
  - T0A026 <T00361>
  - HSK-A63: T11022 <T00366> (suitable for HSK)
- **HSK-A63 specifications**
  - BT40: T00260 <T00363>
  - HSK-A63: T11021 <T00367> (suitable for HSK)

#### Cut-off tool holder (for blade tools)

- **BT40 specifications**
  - T0A027 <T0A027>
  - HSK-A63: T00264 <T00264> (suitable for HSK)
- **HSK-A63 specifications**
  - BT40: T11020 <T11021> <T11022>
  - HSK-A63: T11021 <T11022> (suitable for HSK)

#### Blank holder

- **BT40 specifications**
  - T13031 <T13032>
  - HSK-A63: T13143 <T13144> (suitable for HSK)
- **HSK-A63 specifications**
  - BT40: T11054 <T11055> 
  - HSK-A63: T11056 <T11057> (suitable for HSK)

#### Face and O.D. cutting

- **Qualified tool**
  - BT40 specifications: 25 mm × 25 mm <1 in. × 1 in.>
  - HSK-A63 specifications: 25 mm × 25 mm <1 in. × 1 in.>

#### Boring bar sleeves

- **φ 25 mm**: F0B373 <φ 1 in.; T20221>
- **φ 20 mm**: F0B374 <φ 3/4 in.; T20222>
- **φ 16 mm**: F0B375 <φ 5/8 in.; T20223>
- **φ 12 mm**: F0B376 <φ 1/2 in.; T20224>
- **φ 10 mm**: F0B377 <φ 3/8 in.; T20225>
- **φ 8 mm**: F0B378

---

*If you select the turning specification, the through-spindle coolant system is a center-through type only. Please note that to attach turning tools, either a BT or HSK tool holder (two-face contact), which we have prepared according to machine specifications, is required.*

---

**Additional Information**

- **CAPTO C4 conversion adapter**
  - BT40: T11034 <T11035> <T11036>
  - HSK-A63: T11044 <T11045> (suitable for HSK)
- **CAPTO C5 conversion adapter**
  - BT40: T11054 <T11055> <T11056>
  - HSK-A63: T11056 <T11057> (suitable for HSK)

---

**Notes**

- [BT40 specifications](#)
- [HSK-A63 specifications](#)

---

**Dimensions (in mm and inch)**

- **124 mm**
- **124 mm**
- **159 mm**
- **47 mm**
- **50 mm**
- **70 mm**
- **90 mm**
- **138 mm**
- **103 mm**
- **100 mm**
- **52 mm**
- **32 mm**
- **32 mm**
- **φ 8 mm**: F0B377 <φ 3/8 in.; T20225>
- **φ 10 mm**: F0B377 <φ 3/8 in.; T20225>
- **φ 12 mm**: F0B376 <φ 1/2 in.; T20224>
- **φ 16 mm**: F0B375 <φ 5/8 in.; T20223>
- **φ 20 mm**: F0B374 <φ 3/4 in.; T20222>
- **φ 25 mm**: F0B373 <φ 1 in.; T20221>
Spindle speed-torque/output-rotation speed diagram

[Standard]
Max. spindle speed: 12,000 min⁻¹
Spindle drive motor: 18.5/15 kW (24.7/20 HP) <15 min/30 min/cont>
Max. spindle torque: 105 N·m (77.4 ft·lbf) <15 min>

[Torque (N·m) vs. Output (kW)]

[High speed/Option]
Max. spindle speed: 20,000 min⁻¹
Spindle drive motor: 22/18.5 kW (30/24.7 HP) <15 min/cont>
Max. spindle torque: 167 N·m (123.2 ft·lbf) <25%ED>

[High speed/Option]
Max. spindle speed: 20,000 min⁻¹
Spindle drive motor: 22/18.5 kW (30/24.7 HP) <15 min/cont>
Max. spindle torque: 280 N·m (206.5 ft·lbf) <25%ED>

Table speed-torque/output-rotation speed diagram

[Turning mode/Option]
Max. table rotation speed: 500 mm/1
Table rotation motor: 15.1 kW (20.1 HP) <cont>
Max. table torque: 280 N·m (206.5 ft·lbf) <cont>

[Turning mode/Option]
Max. table rotation speed: 1,200 min⁻¹
Table rotation motor: 28.2 kW (37.6 HP) <cont>
Max. table torque: 280 N·m (206.5 ft·lbf) <cont>
Specifications, accessories, safety device and function are available upon request.

Spindle

- 12,000 min⁻¹: 18.5/15 kW (24.7/20 HP) <30 min/cont.
- 12,000 min⁻¹: 22/18.5 kW (30/24.7 HP) <15 min/cont. <high output>
- 20,000 min⁻¹: 22/11 kW (30/15 HP) <15 min/cont. <high speed>
- 20,000 min⁻¹: 22/18.5 kW (30/24.7 HP) <15 min/cont. <high speed-high output>
- Oil chiller
- BT40 (two-face contact) *1
- HSK-A63 (two-face contact)
- CAT40 (two-face contact)

*1 When selecting the two-face contact tool specification, be sure to use a two-face contact tool.
* When using spindle No. 40 taper at 15,000 min⁻¹ or higher, please use two-face contact tool.

Table

<table>
<thead>
<tr>
<th>Spindle</th>
<th>B-axis max. rotational speed</th>
<th>35 min⁻¹</th>
<th>50 min⁻¹</th>
<th>120 min⁻¹</th>
<th>500 min⁻¹</th>
<th>1,200 min⁻¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spindle</td>
<td>F31B</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Spindle</td>
<td>F31B5</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Table C-axis rotational speed

<table>
<thead>
<tr>
<th>Table</th>
<th>T-slot</th>
<th>Tap</th>
</tr>
</thead>
</table>

Sub table

Table chuck

Interface for fixture clamping

Pneumatic/Hydraulic fixture interface *2 6 ports

Pallet/APC

2-station side access turn-type APC*4

- T-slot pallet
- Tapped pallet

5-station side access turn-type APC*4

- T-slot pallet
- Tapped pallet

16-station side access turn-type APC*4

- T-slot pallet
- Tapped pallet

Built in arbor clamping device (table)

BT-50

One additional pallet

- T-slot
- Tap

Coolant

- Chip flushing coolant
- Air blow
- Tool tip
- Shower coolant
- Oil skimmer
- Through-spindle coolant system (separate type) interface
- Through-spindle coolant system (separate type) interface
- Through-spindle coolant system (separate type) interface
- Through-spindle coolant system (separate type) interface
- Through-spindle coolant system (separate type) interface
- Oil mist
- Can switch to the air blow system (tool tip)
- Coolant system (machining side)
- Coolant float switch
- Coolant chiller (separate type) interface
- Coolant chiller (separate type)
- Optional when using water-soluble coolant
- Coolant chiller (separate type)
- Optional when using water-soluble coolant
- Coolant chiller (standard coolant + for through-spindle coolant system)
- Semi dry unit
- Need to select Through-spindle coolant (center through) specifications

Magazine

<table>
<thead>
<tr>
<th>Magazine</th>
<th>Chain-type</th>
<th>Tool storage capacity</th>
<th>Rack-type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>31 tools</td>
<td>61 tools</td>
<td>91 tools</td>
</tr>
<tr>
<td></td>
<td>121 tools</td>
<td>181 tools</td>
<td>320 tools</td>
</tr>
</tbody>
</table>

Flammable coolant such as oil-based coolant has a high risk of ignition, and will cause fire or machine breakage if ignited. If you have to use a flammable coolant for any reason, please be sure to consult our sales representative.

If using oil-based coolant, please consult our sales representative.

* Oil-based coolant cannot be used for the mist collector AFS-1600.
* When using oil-based coolant, select HVS-220.
### Chip disposal

<table>
<thead>
<tr>
<th>Chip conveyor</th>
<th>Rear discharge, Hinge type + Drum filter type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chip conveyor interface (rear discharge) (There are limitations to the chip conveyor manufacturers which are compatible with the chip conveyor interface)</td>
<td>Hinge type + Drum filter type</td>
</tr>
</tbody>
</table>

### Measurement

<table>
<thead>
<tr>
<th>In-machine measuring system (spindle)</th>
<th>Touch sensor (optical signal transmission type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-machine measuring system (spindle)</td>
<td>Touch sensor (optical signal transmission type)</td>
</tr>
<tr>
<td>In-machine measuring system (table)</td>
<td>Touch sensor (R)</td>
</tr>
<tr>
<td>In-machine measuring system (table)</td>
<td>Touch sensor (M)</td>
</tr>
<tr>
<td>In-machine measuring system (table)</td>
<td>Touch sensor (R)</td>
</tr>
<tr>
<td>In-machine measuring system (table)</td>
<td>Touch sensor (M)</td>
</tr>
</tbody>
</table>

- (M): Made by Metrol
- (R): Made by Renishaw

### Improved accuracy

<table>
<thead>
<tr>
<th>Full closed loop control (Scale feedback)</th>
<th>X-axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y-axis</td>
<td></td>
</tr>
<tr>
<td>Z-axis</td>
<td></td>
</tr>
<tr>
<td>B-axis</td>
<td></td>
</tr>
<tr>
<td>C-axis</td>
<td></td>
</tr>
</tbody>
</table>

### Automation

<table>
<thead>
<tr>
<th>Automatic power off device</th>
</tr>
</thead>
<tbody>
<tr>
<td>EtherNet/IP interface</td>
</tr>
<tr>
<td>Automatic door</td>
</tr>
</tbody>
</table>

### Other

- Full cover
- Door interlock system (incl. mechanical lock)
- Front door/Setup station door (for APC specifications)
- Door interlock system: Electrical cabinet door/Magazine door
- Low air pressure detecting switch
- Built-in worklight
- Leveling block
- Hand tools
- Signal light: 3 layers
- Automatic opening/closing protector
- Danger sensing device interface (recommended when oil-based coolant is used or during unmanned operation)
- Earth leakage breaker
- Power failure dropping prevention unit
- Weekly timer
- Total counter
- Workpiece counter
- External M-code
- Manual pulse generator (separate type)
- Refrigerating type air dryer
- Dry anchor
- 2-axis servo motor detaching shipment
- High Saddle Specification 150 mm (5.9 in.)
- Electrical cabinet lighting

### Through-spindle coolant system (high-pressure coolant system is attached)

<table>
<thead>
<tr>
<th>Discharge pressure (MPa)</th>
<th>Side through</th>
<th>Center through (special retention knobs are required)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 (217.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5 (507.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.0 (1,015)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Controlled axes

<table>
<thead>
<tr>
<th>Controlled axes</th>
</tr>
</thead>
<tbody>
<tr>
<td>X, Y, Z, B, C</td>
</tr>
<tr>
<td>Simultaneously controllable axes:</td>
</tr>
<tr>
<td>F31iB: 4-axis, F31iB5: 5-axis</td>
</tr>
<tr>
<td>Least input increment:</td>
</tr>
<tr>
<td>0.001 mm (0.0001 in.)</td>
</tr>
<tr>
<td>Least command increment:</td>
</tr>
<tr>
<td>0.001 mm (0.0001 in.)</td>
</tr>
<tr>
<td>Max. command value:</td>
</tr>
<tr>
<td>+399.999.999 mm (+399.999.999 in.)</td>
</tr>
<tr>
<td>Inch/Metric conversion</td>
</tr>
<tr>
<td>G20/G21</td>
</tr>
</tbody>
</table>

## Interpolation functions

### Positioning

- G00

### Single direction positioning

- G01

### Exact stop mode

- G02

### Tapping mode

- G03

### Cutting mode

- G04

### Helical interpolation

- Full 2nd axis and 1 other axis

### Reference position return

- G20

### Reference position return check

- G21

### Return from reference position

- G22

### 2nd reference position return

- G30 (It is used on ATC)

### Cutting point interpolation for cylindrical interpolation (includes cylindrical interpolation)

- G28, G31

### Involute interpolation

- G2, G3, G29

### Spiral/conical interpolation

- G2, G3, G4

### Smooth interpolation

- G2, G3, G4

### 3rd, 4th reference position return

- G27

### Tool spindle Cs control (Cs contour control) /Normal direction control)

- G28, G29

###咨询 is required if orbit machining or hole machining needs to be performed:

### NURBS interpolation

- G12.1, G13.1

### Thread cutting/synchronous cutting

- Feed per revolution

- Standard features for turning specifications

### Cylindrical interpolation

- G7.1

### Hypothetical axis interpolation

- G7.2

### Expontential interpolation

- G7.3

### Retract during thread cutting cycle

- G34

### Circular thread-cutting

- G35, G36

### Polygon cutting

- G50.2, G51.2

* Thread cutting/synchronous cutting and feed per revolution are required.

## Feed functions

### Rapid traverse rate

- X, Y-axis: Max. 50,000 mm/min (1,968.5 ipm)

### Cutting feedrate

- For all contour control:

  - X, Y-axis: 1—50,000 mm/min (0.01—1,968.5 ipm)

### Linear interpolation

- G31iB

### Rapid traverse rate override

- F0/1/10/25/100%

### Feed per minute

- Constant tangential velocity control

### Cutting feedrate clamp

- Automatic acceleration/deceleration

### Linear type (rapid traverse) /Linear type (cutting feed)

- Rapid traverse bell-shaped acceleration/deceleration

### Feedrate override

- 0—200% (10% increments)

### Feedrate override cancel

- Linear acceleration/deceleration after cutting feed interpolation

### Al contour control I (Number of look-ahead blocks: Max. 200)

- Al contour control II (Number of look-ahead blocks: Max. 30)

### One-digit F code feed

- F1—F9

### Inverse time feed

- Small-hole peck drilling cycle

(i.e., the arbor with the overload torque detection function must be attached)

### Program input

- Optional block skip

### Max. command value

- ±9 digits (R, I, J, K is ±12 digits)

### Program number/name

- Program number: 4 digit

### Decimal point input

- You can change the electrical calculator type

### Decimal point programming by changing a parameter

- Diameter/radius programming

- G01/G02/G03

### Plane selection

- G01, G02, G03

### Rotary axis designation

- G04

### Rotary axis roll-over

- G05

### Coordinate system setting

- G09

### Automatic coordinate system setting

- G10

### Workpiece coordinate system

- G52—G59

### Programmable data input

- G11

### Sub-program call

- Up to 10 nestings

### Custom macro

- Custom macro

### Drilling cycle

- G80—G89

### F15 format

- G90/G91

### Custom macro: common variables (60 in total)

- #100—#199, #500—#999

### Additional workpiece coordinate systems

- 48 sets

### Additional workpiece coordinate systems

- Standard key type (2—9)

### Optional chamfering/corner R

- Soft key type (2—9)

### Interpolation type custom macro

- Automatic corner override

### Scaling

- Coordinate system rotation

### Programmable mirror image

- G72.1/G72.2

### 3-D coordinate conversion

- G72.1

### Polar coordinate command

- Efficient Production Package (High-speed canned cycle) <MAPPS>

### Islands, open pockets <MAPPS>

- MORI-POST advanced mode <MAPPS>

### DXF Import function <MAPPS>

- Text Engraving Function <MAPPS>

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The information in this catalog is valid as of April 2019.
### Miscellaneous functions/Spindle speed functions

- Miscellaneous function (M function) 4 digits M code
- Auxiliary function lock
- Spindle speed functions (S function) 5 digits S code
- Spindle speed override: 50 ~ 150% (10% increments)
- Spindle orientation
- Rigid tap
- Tool length compensation ±9,999 pulses
- Number of tool offsets 64 sets (length, radius, wear and geometry)
- Program comment display: Program name: 48 characters
- Tool management system
  - Tool length compensation G40, G44, G49
  - Tool offsets 999 sets in total
  - Tool offset functions 999 sets in total
  - Tool offset system tool ID (MAPPS software only)
  - Tool position offset G45 – G48
  - Tool life management
  - Total tool pairs for tool life management 1,024 pairs

### Mechanical accuracy compensation

- Backlash compensation ±9,999 pulses
- Rapid traverse/cutting feed backlash compensation
- Stored pitch error compensation
- Interpolation type pitch error compensation

### Editing

- Program protect
- Expanded program edit: A limitation in the copy buffer <10 KB>
- Background editing
- Undo/Redo function <MAPPS>
- Line number display <MAPPS>
- Playback
- Machining time stamp

### Operation and display

- Status display
- Clock function
- Actual position display
- Program comment display: Program name: 48 characters
- Parameter setting display
- Alarm display
- Alarm history display
- Operator message history display
- Operation history display
- Running time display, No. of parts display
- Actual feedrate display
- Operating monitor screen: Load meter display etc
- Help function
- Self-diagnosis: Includes alarm display, I/O signal diagnosis and ladder diagram
- Operation panel: Display section: 19-inch TFT color LCD
- Multi-counter display <MAPPS>

### I/O Functions

- USB memory
- RS-232C
- Operating panel
- Inside electrical cabinet
- 6 GB Program Storage Area, Updatable (for MAPPS-DNC operation, for data backup) <MAPPS>
- Ethernet: 10/100/1000BASE-T
- Access to user memory area by Ethernet function with MORI-SERVER Software
- DNC operation using external memory (front USB port)
- Memory card for MAPPS

### Number of registerable programs <in total>

<table>
<thead>
<tr>
<th>Port program storage length &lt;in total&gt;</th>
<th>Number of registerable programs &lt;in total&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without expansion</td>
<td>Expansion 1</td>
</tr>
<tr>
<td>320 m (1,050 ft)</td>
<td>63</td>
</tr>
<tr>
<td>320 m (1,050 ft)</td>
<td>-</td>
</tr>
<tr>
<td>440 m (1,450 ft)</td>
<td>-</td>
</tr>
<tr>
<td>1,280 m (4,200 ft)</td>
<td>-</td>
</tr>
<tr>
<td>2,560 m (8,400 ft)</td>
<td>-</td>
</tr>
<tr>
<td>5,120 m (16,800 ft)</td>
<td>-</td>
</tr>
<tr>
<td>10,240 m (33,600 ft)</td>
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<tr>
<td>20,480 m (67,200 ft)</td>
<td>-</td>
</tr>
</tbody>
</table>

### High-speed, high-precision, 5-axis machining functions

- Interpolation functions: Nano smoothing
- Feed functions: AI contour control

### Tool functions/Tool offset functions

- Tool functions (T function): 4 digits T code
- Tool offset data memory C: D/H code, geometry and wear offset data
- Tool diameter compensation G40 – G42
- Tool length measurement
- Tool management system: Includes common variable 600 for custom macro
- Tool management system: Tool IC (MAPPS software only): Includes common variable 600 for custom macro. Need "order design spec. sheet" for hardware and software change of tool IC.
- Tool position offset G45 – G48
- Tool life management
- Total tool pairs for tool life management 1,024 pairs

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<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>2,560 m (8,400 ft)</td>
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</tr>
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</tr>
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</table>

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- Stored pitch error compensation
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- Operation panel: Display section: 19-inch TFT color LCD
- Multi-counter display <MAPPS>
**Machine specifications**

<table>
<thead>
<tr>
<th>Item</th>
<th>NVM5000 DCG</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Travel</strong></td>
<td></td>
</tr>
<tr>
<td>A-axis travel</td>
<td>mm (in.)</td>
</tr>
<tr>
<td>B-axis travel</td>
<td>mm (in.)</td>
</tr>
<tr>
<td>C-axis travel</td>
<td>mm (in.)</td>
</tr>
<tr>
<td>Distance from table surface to spindle gauge plane</td>
<td>mm (in.)</td>
</tr>
<tr>
<td>C-axis travel</td>
<td>mm (in.)</td>
</tr>
<tr>
<td><strong>Table</strong></td>
<td></td>
</tr>
<tr>
<td>Height from the floor to the upper face of the table (Palet)</td>
<td>mm (in.)</td>
</tr>
<tr>
<td>Table (Palet) working surface</td>
<td>mm (in.)</td>
</tr>
<tr>
<td>Table (Palet) loading capacity</td>
<td>kg (lb.)</td>
</tr>
<tr>
<td>Table (Palet) surface configuration</td>
<td>mm</td>
</tr>
<tr>
<td>Max. workpiece swing diameter</td>
<td>mm (in.)</td>
</tr>
<tr>
<td>Max. workpiece height</td>
<td>mm (in.)</td>
</tr>
<tr>
<td>Rotational speed of the table</td>
<td>min⁻¹</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Spindle</strong></td>
<td></td>
</tr>
<tr>
<td>Max. spindle speed</td>
<td>min⁻¹</td>
</tr>
<tr>
<td>Type of spindle taper hole</td>
<td>No.40 [HSK-A63]</td>
</tr>
<tr>
<td><strong>Feedrate</strong></td>
<td></td>
</tr>
<tr>
<td>Rapid traverse rate With Al contour control</td>
<td>mm/min (ipm)</td>
</tr>
<tr>
<td>Cutting feedrate Without Al contour control</td>
<td>mm/min (ipm)</td>
</tr>
<tr>
<td>Jog feedrate</td>
<td>mm/min (ipm)</td>
</tr>
<tr>
<td>Type of tool shank</td>
<td>B740* [CAT40] [DN60] [HSK-A63]</td>
</tr>
<tr>
<td>Type of retention knob</td>
<td>DMC MORI 90° type [45°(MAS-1)] [60°(MAS-3)] [SIN] (Special (center through))</td>
</tr>
<tr>
<td>Tool storage capacity</td>
<td>31 [61] [91] [121] [181] [Chain-type]</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>ATC</td>
<td></td>
</tr>
<tr>
<td>Max. tool diameter</td>
<td>mm (in.)</td>
</tr>
<tr>
<td>Max. tool length</td>
<td>mm (in.)</td>
</tr>
<tr>
<td>Max. tool mass</td>
<td>kg (lb.)</td>
</tr>
<tr>
<td>Method of tool selection</td>
<td>Fixed address, shorter route access</td>
</tr>
<tr>
<td>Tool changing time</td>
<td>Tool-to-tool</td>
</tr>
<tr>
<td>Max. tool moment (from spindle gage line)</td>
<td>N·m (ft·lbf)</td>
</tr>
<tr>
<td><strong>Motors</strong></td>
<td></td>
</tr>
<tr>
<td>Spindle drive motor (12,000 min⁻¹&lt;sup&gt;−1&lt;/sup&gt;)</td>
<td>kW (HP)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Feed motor</td>
<td>kW (HP)</td>
</tr>
<tr>
<td>B-axis table</td>
<td>35 min⁻¹</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>C-axis table</td>
<td>120 min⁻¹</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Coolant pump motor</td>
<td>kW (HP)</td>
</tr>
<tr>
<td>Electrical power supply [cont.]</td>
<td>kVA</td>
</tr>
<tr>
<td><strong>Power sources</strong></td>
<td></td>
</tr>
<tr>
<td>Compressed air supply</td>
<td>MPa (psig), L/min (gpm)</td>
</tr>
<tr>
<td>Tank capacity</td>
<td>L (gal.)</td>
</tr>
<tr>
<td><strong>Machine size</strong></td>
<td></td>
</tr>
<tr>
<td>Machine height</td>
<td>mm (in.)</td>
</tr>
<tr>
<td>Floor space</td>
<td>mm (in.)</td>
</tr>
<tr>
<td>Mass of machine</td>
<td>kg (lb.)</td>
</tr>
</tbody>
</table>

- **Option**: Only when selecting the two-face contact tool specification, be sure to use a two-face contact tool.
- **Max. spindle speed**: Depending on restrictions imposed by the workpiece clamping device, fixture and tool used, it may not be possible to rotate at the maximum spindle speed.
- **Rapid traverse rate**: Use an Al contour control with Al contour feed. With Al contour control, the tool approach accuracy can be improved.
- **Cutting feedrate**: The tool feedrate is set with the tool feedrate menu. Without Al contour control, the tool feedrate is set with the rapid traverse rate menu.
- **Jog feedrate**: Use the jog feedrate menu.
- **Type of tool shank**: Use the B740 type [CAT40] [DN60] [HSK-A63].
- **Type of retention knob**: Use the DMC MORI 90° type [45°(MAS-1)] [60°(MAS-3)] [SIN] (Special (center through)).
- **Tool storage capacity**: Use the tool storage capacity menu.
- **ATC**: Fix the tool to the tool magazine and use the ATC menu to select the tool.
- **Max. tool diameter**: Use the tool diameter menu.
- **Max. tool length**: Use the tool length menu.
- **Max. tool mass**: Use the tool mass menu.
- **Method of tool selection**: Use the tool selection menu.
- **Tool changing time**: Use the tool changing time menu.
- **Max. tool moment (from spindle gage line)**: Use the tool moment (from spindle gage line) menu.
- **Power sources** (Standard): Use the power sources menu.
- **Electrical power supply**: Use the electrical power supply menu.
- **Compressed air supply**: Use the compressed air supply menu.
- **Tool changing time**: Use the tool changing time menu.
- **Max. tool moment (from spindle gage line)**: Use the tool moment (from spindle gage line) menu.
- **Coolant pump motor**: Use the coolant pump motor menu.

For details, please consult our sales representative.

The information in this catalog is valid as of April 2019.
<Precautions for Machine Relocation>

**EXPORTATION:**
All contracts are subject to export permit by the Government of Japan. Customer shall comply with the laws and regulations of the exporting country governing the exportation or re-exportation of the Equipment, including but not limited to the Export Administration Regulations. The Equipment is subject to export restrictions imposed by Japan and other exporting countries and the Customer will not export or permit the export of the Equipment anywhere outside the exporting country without proper government authorization.

To prevent the illegal diversion of the Equipment to individuals or nations that threaten international security, it may include a "Relocation Machine Security Function" that automatically disables the Equipment if it is moved following installation. If the Equipment is so-disabled, it can only be re-enabled by contacting DMG MORI or its distributor representative. DMG MORI and its distributor representative may refuse to re-enable the Equipment if it determines that doing so would be an unauthorized export of technology or otherwise violates applicable export restrictions. DMG MORI and its distributor representative shall have no obligation to re-enable such Equipment.

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*The information in this catalog is valid as of April 2019. Designs and specifications are subject to changes without notice.

*The names shown in the catalog may differ from the actual machines. The location and the size of the nameplates may also differ from the actual machines, or the nameplates may not be attached to some machines.

*DMG MORI is not responsible for differences between the information in the catalog and the actual machine.