

High-Precision, 5-Axis Control Vertical Machining Center

## NMV5000 DCG

NMV5000 DCG



# Three cutting-edge technologies for outstanding performance

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.



Working surface  
**φ 500 mm (φ 19.7 in.)**

Max. workpiece swing diameter  
**φ 700 mm (φ 27.5 in.)**

Max. workpiece height  
**450 mm (17.7 in.)**



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				ORC : Octagonal Ram Construction	
				MAPPS: Mori Advanced Programming Production System	

- 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.

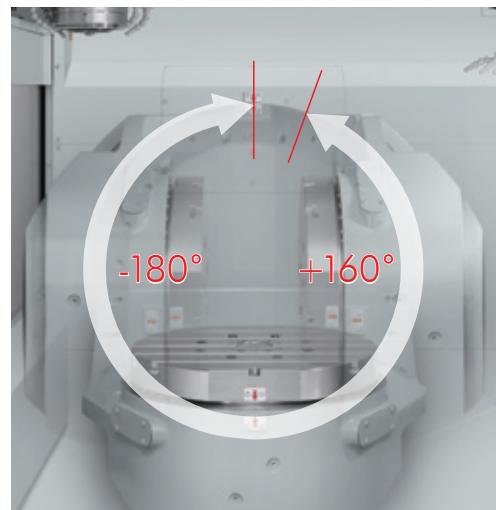
# Outstanding operability

We have reviewed the NMV Series to achieve far better access and operability than earlier 5-axis machines.

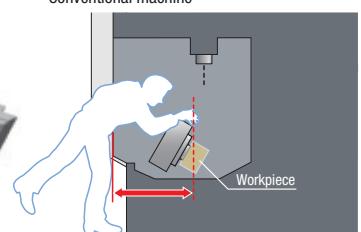
The excellent access to the spindle and table allows setup such as fixture adjustment and tool change to proceed smoothly, reducing machine down time. Maintenance inside the machine is also easier.

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.

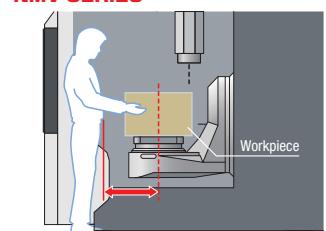
• Automatic opening/closing protector is standard



Conventional machine



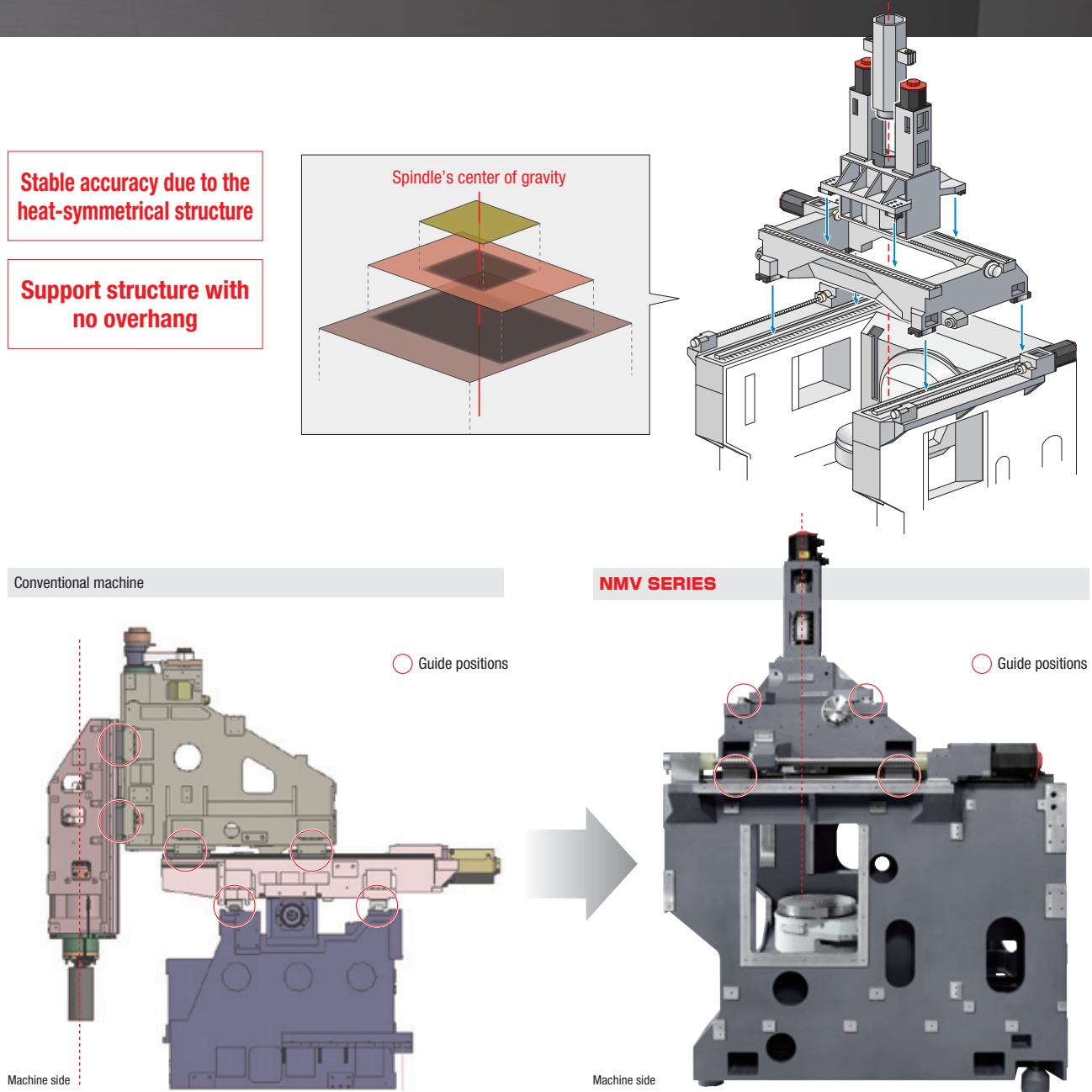
NMV SERIES



# 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.





**DDM**  
Direct Drive Motor

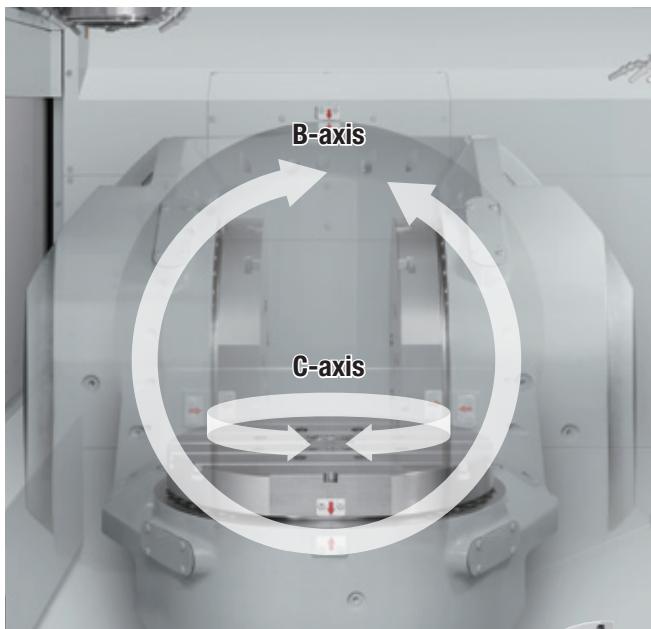
## Direct Drive Motor B-axis C-axis

### The world's fastest rotary axis drive system, with zero backlash

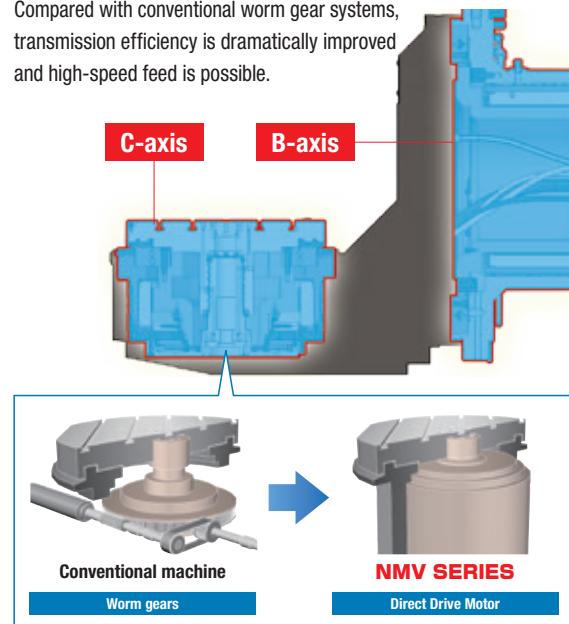
Transmitting the drive power directly to the rotary axes without using gears eliminates backlash.

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.

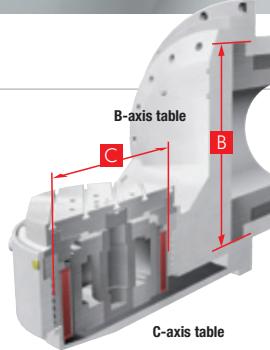


Compared with conventional worm gear systems, transmission efficiency is dramatically improved and high-speed feed is possible.



#### 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.



**NMV5000 DCG**

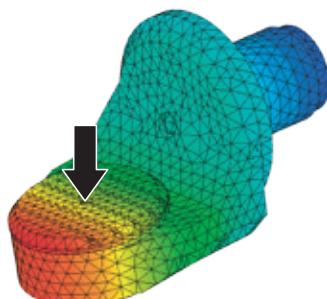
<b>B</b> B-axis bearing diameter	$\phi 740 \times \phi 560$ mm ( $\phi 29.1 \times \phi 22.0$ in.)
<b>C</b> C-axis bearing diameter	$\phi 435 \times \phi 265$ mm ( $\phi 17.1 \times \phi 10.4$ in.)

#### Table rigidity

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

##### Displacement

**NMV5000 DCG**  
**2.0**  $\mu\text{m}$   
( $F=1,200$  N)





## B-axis

### NMV5000 DCG

Min. indexing increment	<b>0.001°</b>
Indexing range	<b>+160° — -180°</b>
Indexing time (90°)	<b>0.72 sec. (35 min<sup>-1</sup>)</b> <b>0.60 sec. (50 min<sup>-1</sup>)</b>



## C-axis

### NMV5000 DCG

Min. indexing increment	<b>0.001°</b>
Indexing range	<b>360°</b>
Standard specifications	<b>0.61 sec. (120 min<sup>-1</sup>)</b>
Indexing time (90°)	<b>0.58 sec. (500 min<sup>-1</sup>)</b> Turning specifications OP <b>0.69 sec. (1,200 min<sup>-1</sup>)</b>

- 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.

#### ■ C-axis indexing time (90°)

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

Compared with conventional machine

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<sup>-1</sup>  
**NMV5000 DCG:** 120 min<sup>-1</sup>

Compared with conventional machine

**9.6** times more

Turning specifications OP: 500 min<sup>-1</sup>, 1,200 min<sup>-1</sup>

#### ■ Repeatability

**NMV5000 DCG**

B-axis **7** sec. C-axis **2** 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.

• Measured in accordance with ISO Standard 230-2 1997.

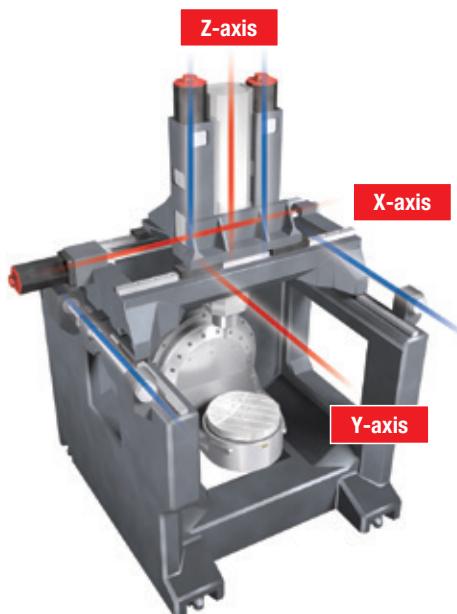


# Driven at the Center of Gravity

X-axis Y-axis Z-axis

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

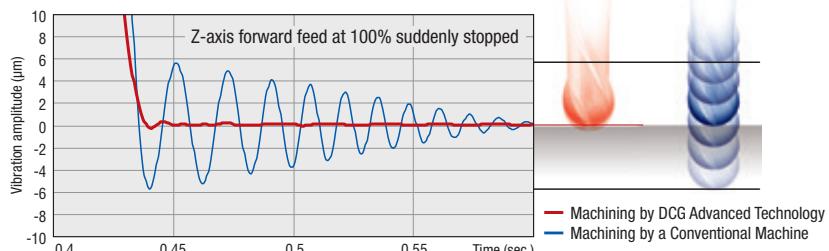
Our DCG technology controls vibration, which is one of the main enemies of high speed and high precision, by driving structural parts at their center of gravity.



### Restricting vibration

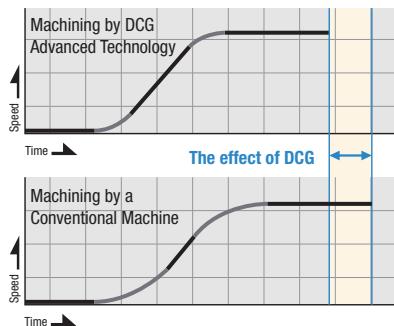
For positioning, machines with DCG virtually eliminate vibration, while machines without DCG continue to vibrate for a long time. It controls the rotational vibration which appears at every acceleration start point, and which is proportional to the distance between the drive point and the center of gravity.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

#### ■ Residual vibration comparison



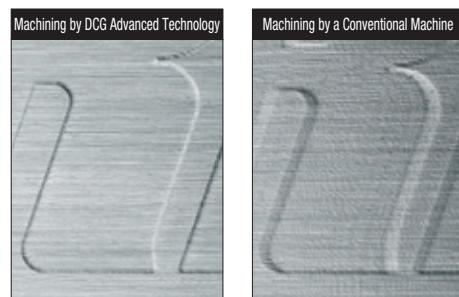
### Outstanding acceleration performance

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

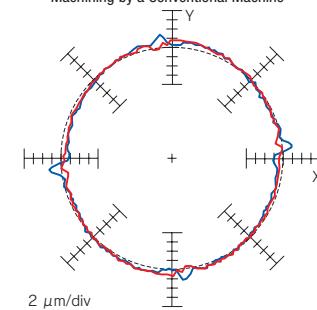
Curved machined surfaces are actually made up of many very short straight lines, which means the moving component has to change direction ever so slightly at every angle. In order to do this without dropping speed requires very fast acceleration.

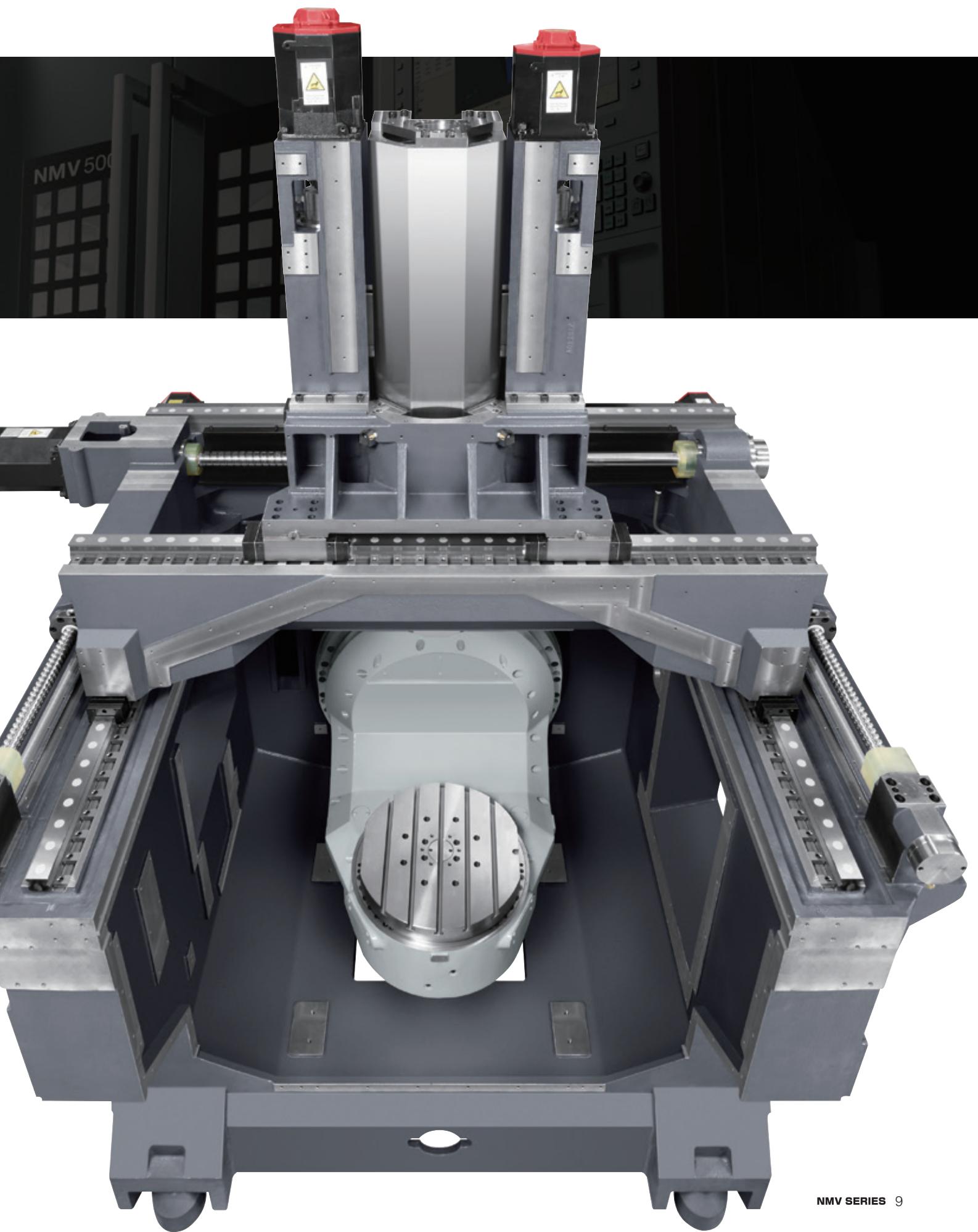


### Improved roundness

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

— Machining by DCG Advanced Technology  
— Machining by a Conventional Machine







**ORC**  
Octagonal Ram  
Construction

# Octagonal Ram Construction

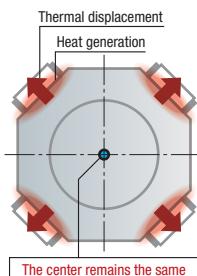
**Z-axis**

## A revolutionary structure which controls thermal displacement and offers outstanding straightness

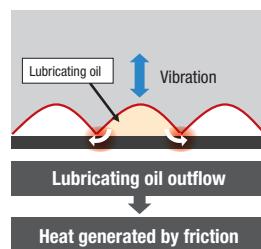
The 4 guideways are located diagonally from each other, so they distort symmetrically in response to the heat generated by high-speed travel. This means that the center stays in the same position, offering high-speed, high-precision feed.

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.



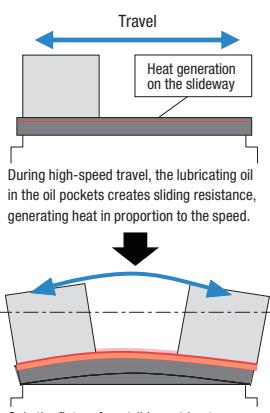
### Square guides' excellent damping characteristics



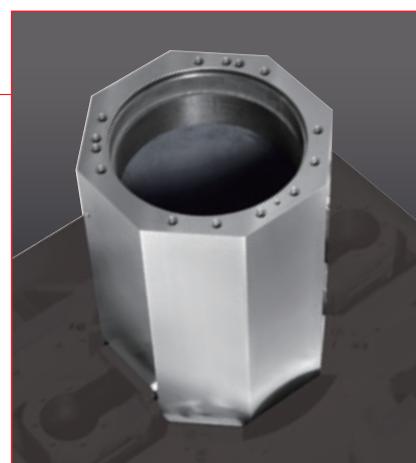
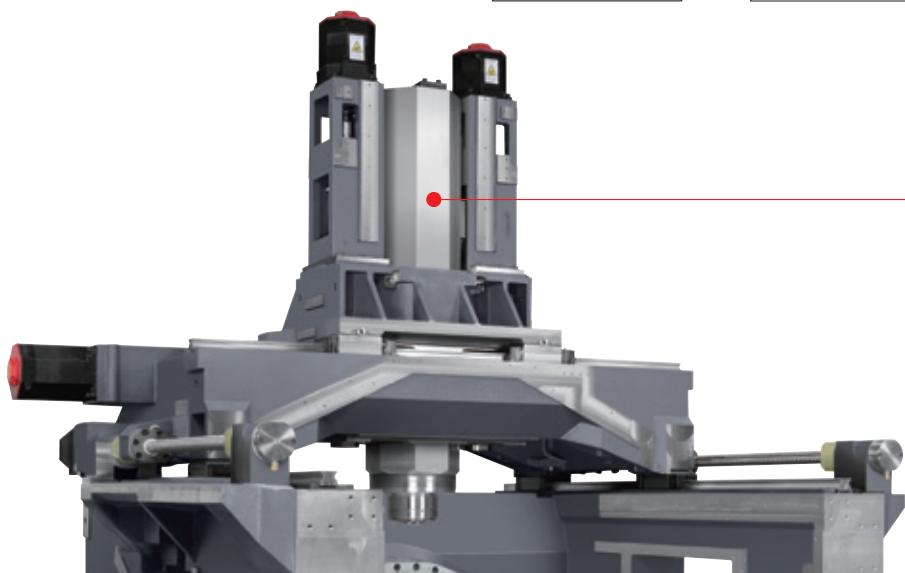
The lubricating oil in the oil pockets which were made by scraping is forced in and out through the gaps because of the contact pressure caused by vibration, generating heat.

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

### Thermal displacement caused by high-speed travel of square guides



Only the flat surface (slideway) heats up, and the guideways warp, affecting the machining accuracy.



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.

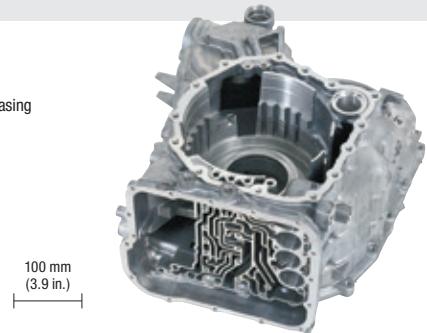
## NMV5000 DCG

### Automobile industry

Workpiece: Impeller  
Material : Aluminum



Workpiece: Transmission casing  
Material : Aluminum

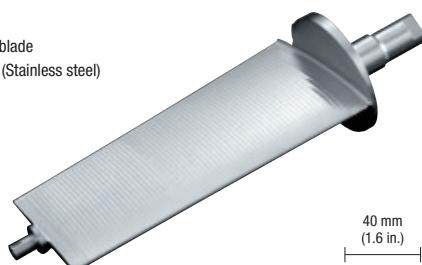


### Aircraft industry

Workpiece: Cowling latch  
Material : Stainless steel



Workpiece : Turbine blade  
Material <JIS>: SUS630 (Stainless steel)

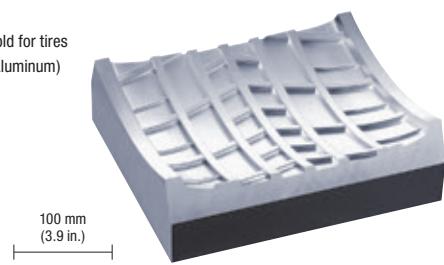


### Die & mold industry

Workpiece : Mold for engines  
Material <JIS>: SKD61 (Alloy tool steel)



Workpiece : Sample mold for tires  
Material <JIS>: A5052\* (Aluminum)



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

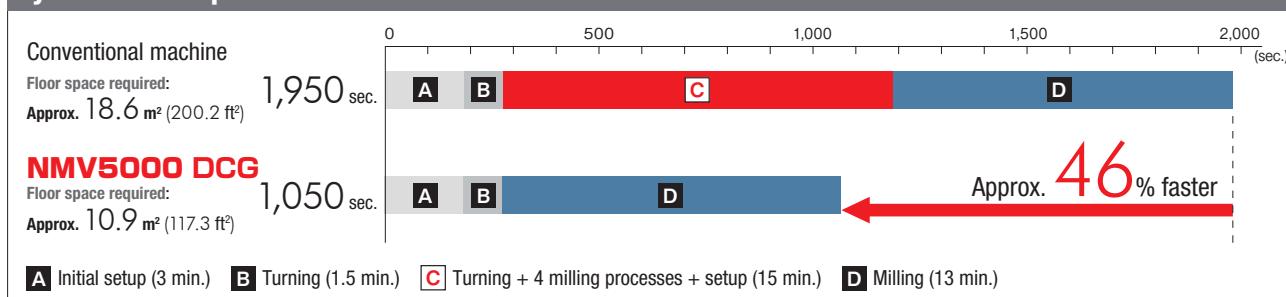
Workpiece: Valve  
Material : Aluminum  
Size : 150 mm×100 mm×40 mm  
(5.9 in.×3.9 in.×1.6 in.)



## Machining method <NMV5000 DCG>

1 I.D. roughing	6 φ 25 mm (φ 1 in.) × 90° drilling (chamfering)	11 φ 20 mm (φ ¾ in.) reaming
2 I.D. finishing	7 φ 6 mm (φ 0.24 in.) drilling	12 φ 5.1 mm (φ 0.20 in.) drilling
3 I.D. threading	8 φ 32 mm (φ 1 ¼ in.) end mill roughing	13 M6×P1.0 tapping
4 φ 40 mm (φ 1 ½ in.) drilling	9 φ 32 mm (φ 1 ¼ in.) end mill finishing	
5 φ 12 mm (φ ½ in.) drilling	10 φ 18.8 mm (φ 0.74 in.) drilling	

## Cycle time comparison



# Machining ability

## Milling

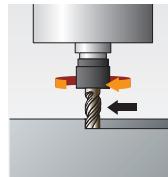
<Material <JIS>: S50C\* (Carbon steel)>

\* 1049 (ANSI), C50·C50E·C50R (BS, DIN), 50 (GB)

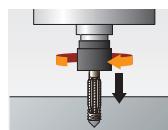
Face milling	NMV5000 DCG
Material removal rate	336 mL/min (20.5 in <sup>3</sup> /min)
Tool diameter	φ 80 mm (φ 3.1 in.) <7 flutes>
Spindle speed	1,000 min <sup>-1</sup>
Feedrate	2,100 mm/min (82.7 ipm)
Width of cut	64 mm (2.5 in.)
Depth of cut	2.5 mm (0.1 in.)

Drilling	NMV5000 DCG
Material removal rate	66 mL/min (4.0 in <sup>3</sup> /min)
Tool diameter	φ 35 mm (φ 1.4 in.)
Spindle speed	227 min <sup>-1</sup>
Feedrate	68 mm/min (2.7 ipm)



Roughing end milling	NMV5000 DCG
Material removal rate	73 mL/min (4.5 in <sup>3</sup> /min)
Tool diameter	φ 30 mm (φ 1.2 in.) <4 flutes>
Spindle speed	265 min <sup>-1</sup>
Feedrate	64 mm/min (2.5 ipm)
Width of cut	30 mm (1.2 in.)
Depth of cut	38 mm (1.5 in.)



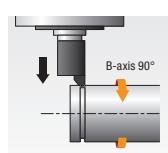
Tapping	NMV5000 DCG
Tool	M30×P3.5
Spindle speed	118 min <sup>-1</sup>
Feedrate	354 mm/min (13.9 ipm)

## Turning

OP <Material <JIS>: S45C\* (Carbon steel)>

\* 1045·1046 (ANSI), C45·C45E·C45R (BS, DIN), 45 (GB)

Heavy-duty cutting (O.D.)	NMV5000 DCG
Material removal rate	344 mL/min (21.0 in <sup>3</sup> /min) <B-axis 0°> 386 mL/min (23.5 in <sup>3</sup> /min) <B-axis 90°>
Cutting speed	105 m/min (344.5 fpm) <B-axis 0°> 120 m/min (393.7 fpm) <B-axis 90°>
Feedrate	0.5 mm/rev (0.02 ipr)
Depth of cut	6 mm (0.24 in.)



O.D. grooving	NMV5000 DCG
Groove width	7 mm (0.28 in.) <B-axis 90°>
Cutting speed	120 m/min (393.7 fpm)
Feedrate	0.1 mm/rev (0.004 ipr)

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.

# Automatic operation support OP

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

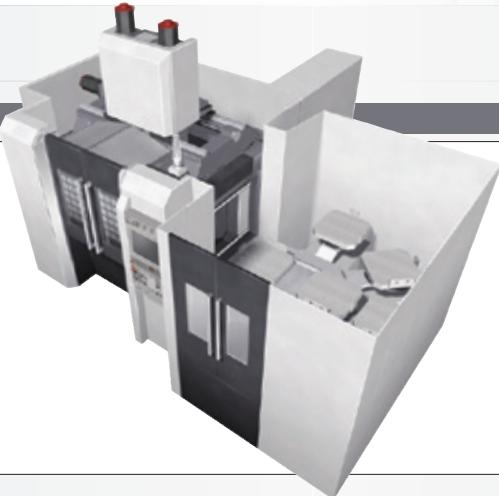
### Shape

#### Square material



### System

#### 5-station side access turn-type APC



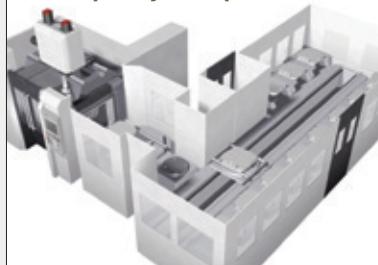
### Shape

#### Round material



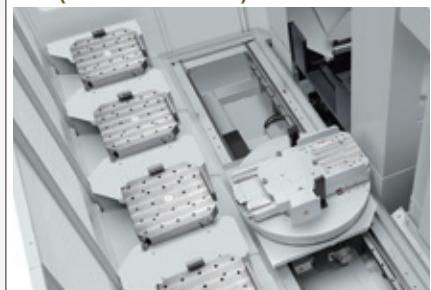
### System

#### 2-station side access turn-type APC + Pallet pool system specifications



### Transfer

#### CPP (Carrier Pallet Pool)



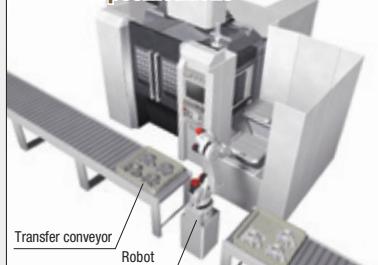
### Shape

#### Unusually shaped workpieces



### System

#### 2-station side access turn-type APC + Robot specifications



### Transfer

#### Workpiece transfer robot





## Finished product OUT

Transfer

5-station APC



LPP (Linear Pallet Pool)

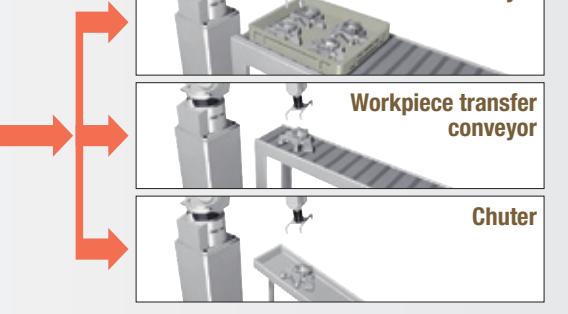


Unloading

Transfer conveyor

Workpiece transfer conveyor

Chuter



## Finished product

Workpiece: Housing

Material: Aluminum



Workpiece: Cam

Material: Cast iron



Workpiece: Knuckle

Material: Cast iron

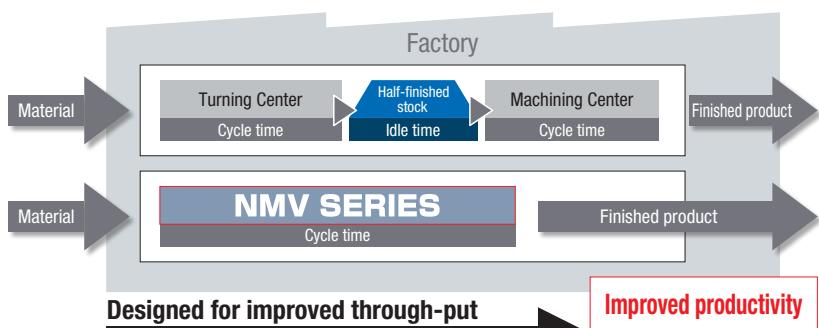


# Productivity

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

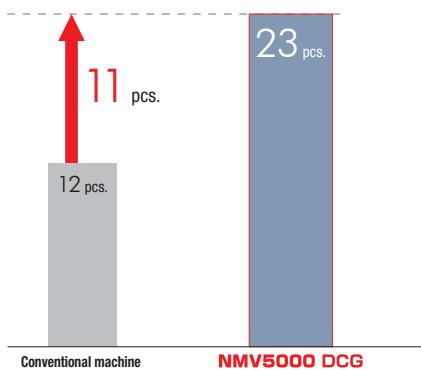
- Eliminates waiting time between processes
- Prevents deterioration in accuracy between processes
- Reduces setup time
- Reduces work in process inventory
- Shortens lead time
- Reduces fixture manufacturing costs
- Reduces intermediate transport costs



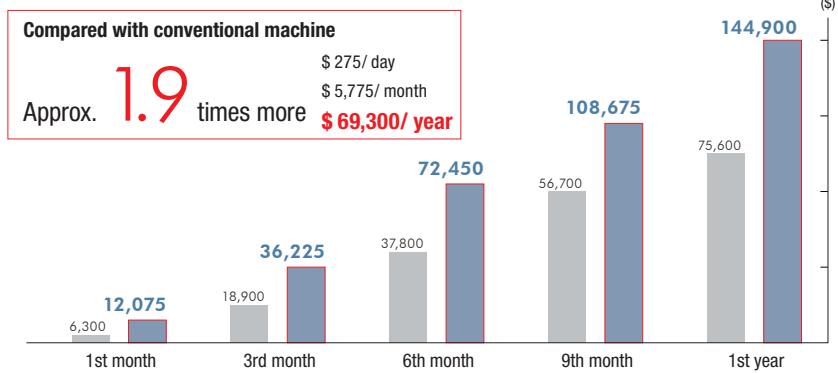
## Comparison of productivity and sales <NMV5000 DCG>

Running time (one day):  $8 \text{ hours} \times 85\% = 3,600 \text{ sec.} \times 8 \times 0.85 = 24,480 \text{ sec.}$   
 Production volume per day (pcs./day):  $24,480 \text{ sec.} \div \text{Cycle time (sec.)}$   
 Number of days operating in 1 year:  $21 \text{ days} \times 12 \text{ months} = 252 \text{ days}$

### Comparison of productivity (pcs./day)



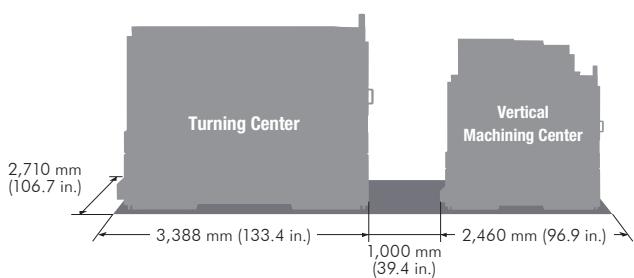
### Simulation of sales for 1 year (\$ 25 per workpiece)



## Space-saving, labor-saving

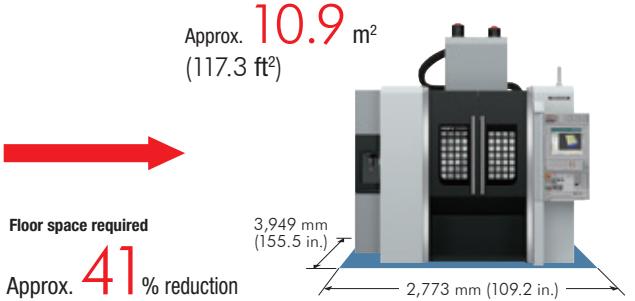
### Turning Center + Machining Center

Approx. **18.6 m<sup>2</sup>** (200.2 ft<sup>2</sup>)



### NMV5000 DCG

Approx. **10.9 m<sup>2</sup>** (117.3 ft<sup>2</sup>)



#### 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>



### Full closed loop control (Scale feedback) as standard (Magnescale) <B-, C-axis>

- 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/s<sup>2</sup> (38,582.7 in./s<sup>2</sup>)
- Vibration resistance of 250 m/s<sup>2</sup> (9,842.5 in./s<sup>2</sup>)
- 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
- X-, Y-, Z-axis: Option

## Coolant chiller (separate type) OP

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.



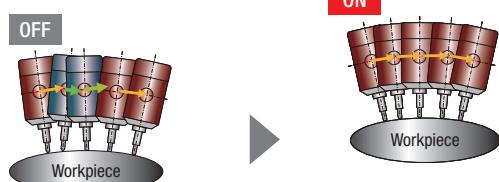
### When using oil-based coolant, please be sure to consult our sales representative.

- We cannot guarantee that this unit will completely control the coolant temperature. It is designed to help prevent oil temperature increases.

## SVC function (standard features for F31iB5)

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

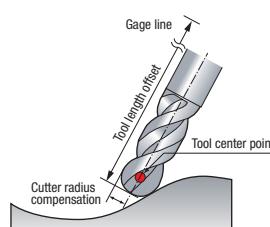


The SVC function includes the following functions:

- AI contour control II
- Nano smoothing II
- Smooth TCP
- Machining mode selection
- G332 tolerance command

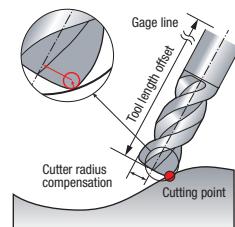
SVC: Smooth Velocity Control

## Tool center point control\*/Cutting point command



### Tool center point control\*

- 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.



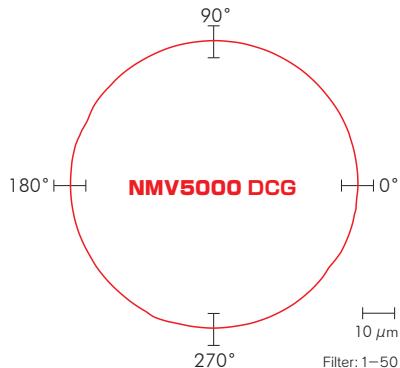
### Cutting point command

- Main features
- The tool path can be controlled from the cutting point.
  - By using cutting point commands, machining using radius end mills or square end mills can be performed without reprogramming when tool length, cutter radius or tool tip corner R are changed.

\* Standard features for F31iB5

# 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.

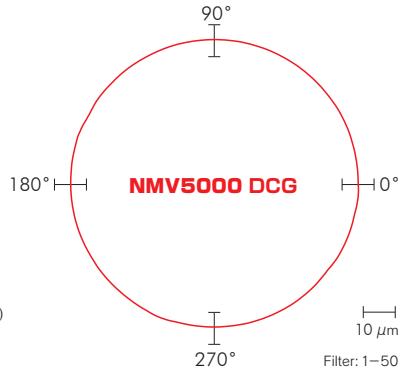
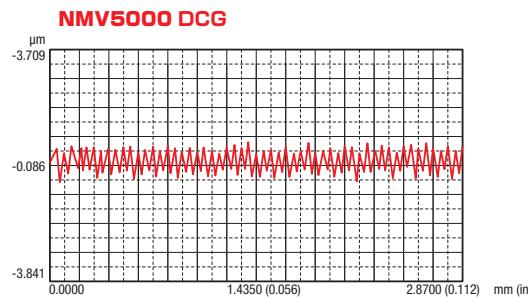
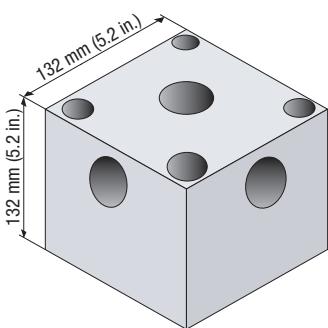
Conventional models

20–30 µm

Machine type	NMV5000 DCG
Circularity <actual results>	3.11 µm
Material <JIS>	A7075* (Aluminum)
Tool	Carbide end mill φ40 mm (φ1 1/2 in.) <2 flutes>
Spindle speed	2,000 min <sup>-1</sup>
Feedrate	2,000 mm/min (78.7 ipm)
Workpiece shape	φ 216 mm (φ 8.5 in.)×φ 250 mm (φ 9.8 in.)×height 63.5 mm (2.5 in.)

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

## Boring accuracy (B-axis 90°)/Squareness



Machine type	Other company's machine	Conventional machine	NMV5000 DCG
Circularity <actual results>	1.20 µm	1.05 µm	0.90 µm
Surface roughness <actual results>	0.37 µm Ra	0.35 µm Ra	0.27 µm Ra
Squareness <actual results>	3.52 µm	3.26 µm	B-axis rotational accuracy (A-B plane) 2.80 µm C-axis rotational accuracy (B-C plane) 1.60 µm
Material <JIS>	Aluminum	A5056* <sup>1</sup> (Aluminum)	A5052* <sup>2</sup> (Aluminum)
Tool	Boring φ 30 mm (φ1.2 in.)	Boring φ 30 mm (φ1.2 in.)	Boring φ 35 mm (φ 1.4 in.)
Spindle speed	5,000 min <sup>-1</sup>	5,000 min <sup>-1</sup>	10,000 min <sup>-1</sup>
Feedrate	1,000 mm/min (39.4 ipm)	1,000 mm/min (39.4 ipm)	500 mm/min (19.7 ipm)

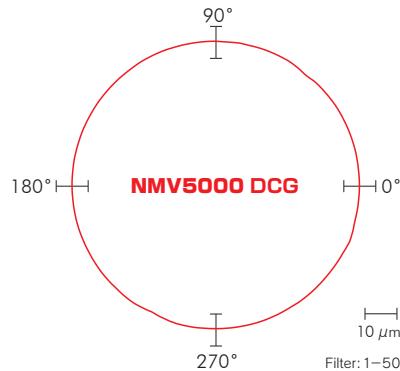
\*1 5056 (ANSI), NB6 (BS), AlMg5 (DIN), 5A05 (GB)

\*2 5052 (ANSI), NS4 (BS), AlMg2.5 (DIN), 5A02 (GB)

JIS: Japanese Industrial Standard

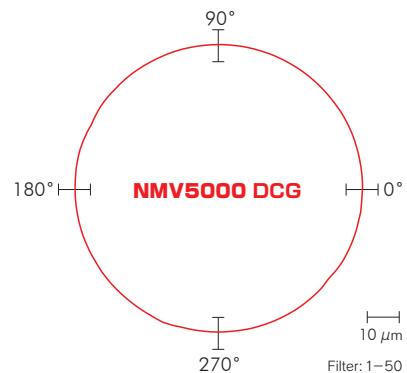
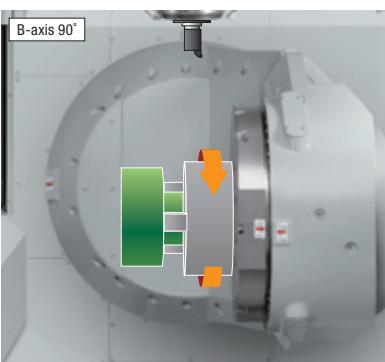
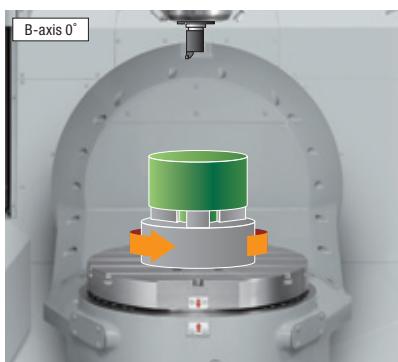
● The cutting test results indicated in this catalog are provided as examples.

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

**Circularity (X-Y plane) <milling>**

Machine type	<b>NMV5000 DCG</b>
Circularity <actual results>	<b>1.78 µm</b>
Material <JIS>	A5052* (Aluminum)
Tool	End mill φ16 mm (φ5/8 in.) <4 flutes>
Spindle speed	1,000 min <sup>-1</sup>
Feedrate	500 mm/min (19.7 ipm)

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

**Circularity/Surface roughness <turning>** OP

Machine type	Other company's machine	Conventional machine	<b>NMV5000 DCG</b>
Circularity <actual results>	1.89 µm (B-axis 0°)	1.95 µm (B-axis 0°)	<b>1.76 µm (B-axis 0°) 1.73 µm (B-axis 90°)</b>
Surface roughness <actual results>	0.19 µm Ra (B-axis 0°)	0.18 µm Ra (B-axis 0°)	<b>0.16 µm Ra (B-axis 0°) 0.17 µm Ra (B-axis 90°)</b>
Material	Brass	Brass	Brass
Tool	Diamond tool <nose radius 0.5 mm (0.02 in.)>	Diamond tool <nose radius 0.5 mm (0.02 in.)>	Diamond tool <nose radius 0.5 mm (0.02 in.)>
Spindle speed	600 min <sup>-1</sup>	600 min <sup>-1</sup>	500 min <sup>-1</sup>
Feedrate	0.05 mm/rev (0.002 ipr)	0.05 mm/rev (0.002 ipr)	0.05 mm/rev (0.002 ipr)

- 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.

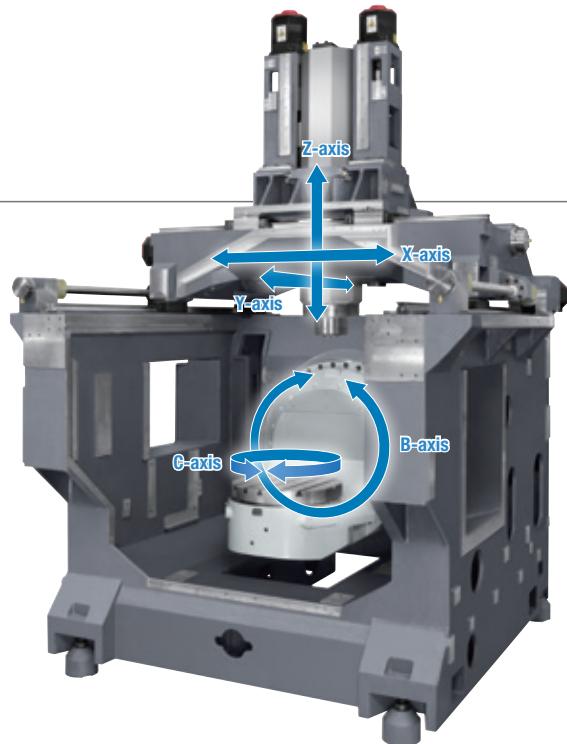
The results indicated in this catalog may not be obtained due to differences in cutting conditions and environmental conditions during measurement.

# Basic structure

## Working area

### NMV5000 DCG

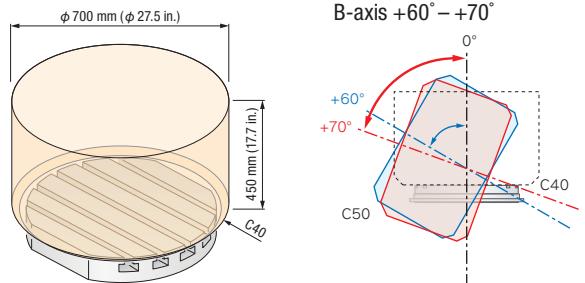
X-axis travel	730 mm (28.7 in.)
Y-axis travel	510 mm (20.1 in.)
Z-axis travel	510 mm (20.1 in.)
B-axis travel	+160°—−180°
C-axis travel	360°



## Max. workpiece size

### NMV5000 DCG

Table loading capacity	300 kg (660 lb.)
Table working surface	φ 500 mm (φ 19.7 in.)
B-axis	F31iB      35 min <sup>-1</sup> , 50 min <sup>-1</sup> [OP] F31iB5      50 min <sup>-1</sup>
Table Max. rotational speed	Table mode      120 min <sup>-1</sup> C-axis      Turning mode      500 min <sup>-1</sup> [OP], 1,200 min <sup>-1</sup> [OP]



- 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

Spindle variations	NMV5000 DCG		
	Standard	High output [OP]	High speed [OP]
Max. spindle speed	12,000 min <sup>-1</sup>	20,000 min <sup>-1</sup>	



Milling specifications



Turning specifications

- When using spindle No. 40 taper at 15,000 min<sup>-1</sup> or higher, or spindle No. 50 taper at 10,000 min<sup>-1</sup> or higher, please use two-face contact tool.

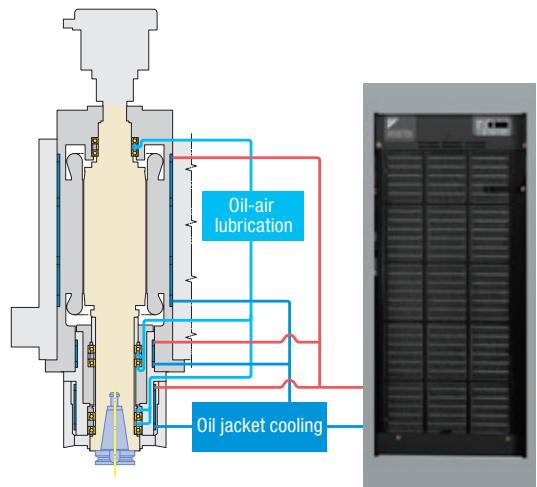
## Spindle lubrication

### [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]

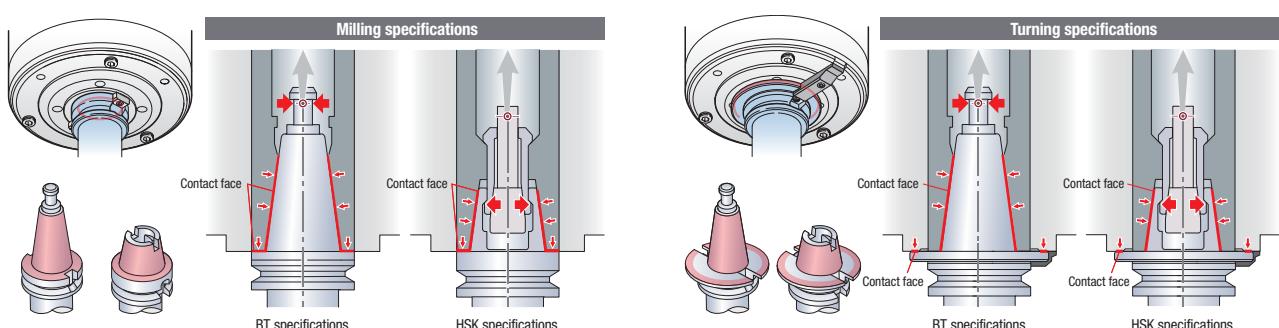
Stator coil in DDS motor: Oil jackets are placed around the stator coil, allowing forced circulation of coolant and prevents heat from spreading.



Inverter-type Oil chiller

## Two-face contact OP

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.

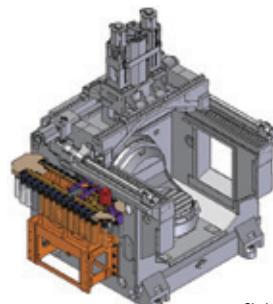


- If you select turning specifications, the through-spindle coolant system is a center-through type only.  
Please note that to attach turning tools, BT or HSK tool holder (two-face contact), which DMG MORI has prepared according to machine specifications, is required.
- When selecting the two-face contact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

# Basic structure

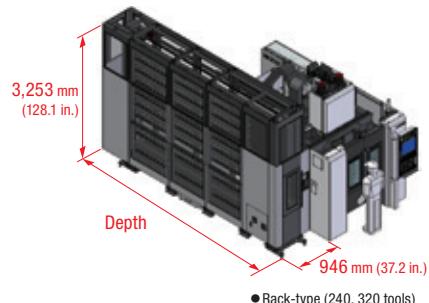
## ATC

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.



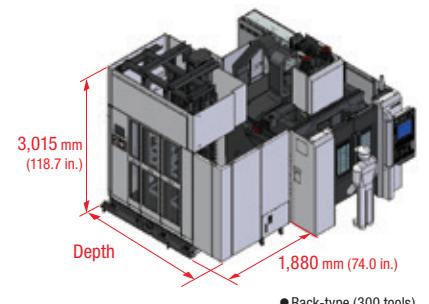
## ■ Chain-type

		NMV5000 DCG		
Tool storage capacity		31 [61] [91] [121] [181]		
Max. tool diameter	With adjacent tools mm (in.)	φ 90 (φ 3.5)		
	Without adjacent tools mm (in.)	φ 125 (φ 4.9)		
Max. tool length	mm (in.)	300 (11.8)		
Max. tool mass	kg (lb.)	8 (17.6)		
Max. tool moment	N·m (ft-lbf)	11 (8.1)		
Tool-to-tool	sec.	1.8		



## ■ Rack-type

		NMV5000 DCG		
Total	[240]	[300]*	[320]	
φ70×300 mm (φ2.8×11.8 in.)	—	284	—	
φ90×150 mm (φ3.5×5.9 in.)	135	—	185	
φ90×300 mm (φ3.5×11.8 in.)	81	—	111	
φ125×150 mm (φ4.9×5.9 in.)	15	—	15	
φ125×300 mm (φ4.9×11.8 in.)	9	15	9	
Max. tool mass kg (lb.)		8 (17.6)		
Depth mm (in.)	5,019 (197.6)	2,929 (115.3)	6,069 (238.9)	
Tool-to-tool sec.		1.8		

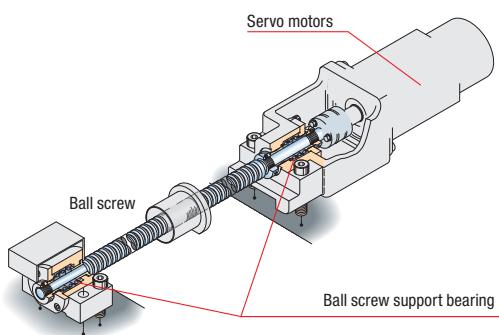


[ ] Option

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

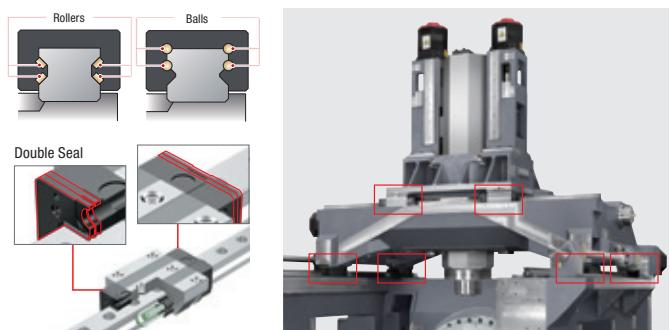
## Double-anchor support

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 slideway also come standard with Double Seal.

## Improved workability, Maintenance

### Access to the spindle



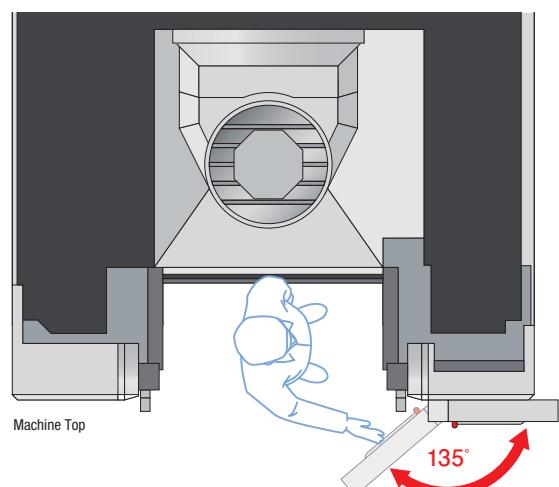
The excellent access to the spindle allows tool replacement and maintenance to be done easily.

### Access to the table



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

### Swivel-type operation panel

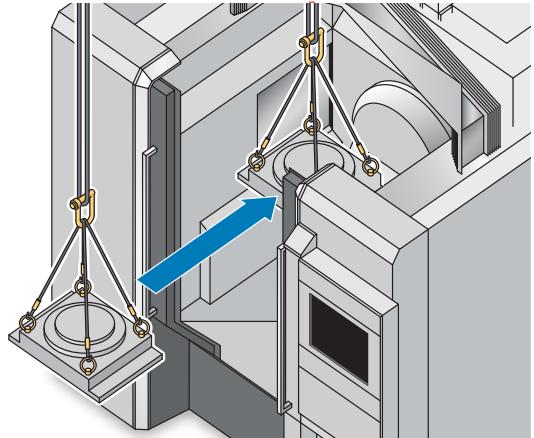
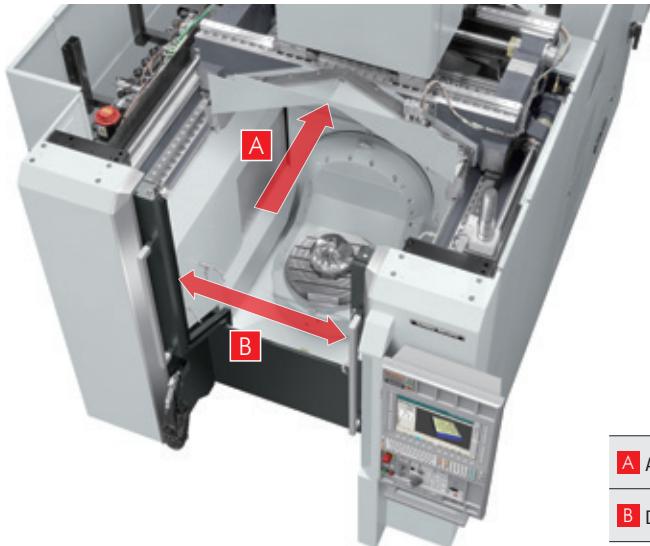


The operation panel which swivels from 0 to 135 degrees improves visibility during operation.

# Improved workability, Maintenance

## Automatic opening/closing protector

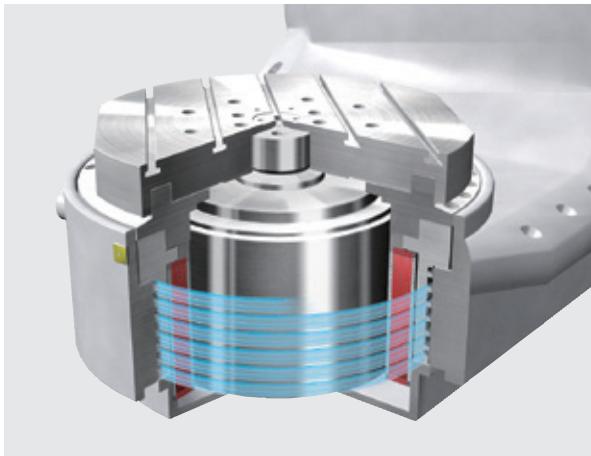
The Y-axis can move further beyond the work envelope. This allows workpieces to be loaded easily using a crane.



**NMV5000 DCG**

A Automatic opening/closing protector travel	860 mm (33.9 in.)
B Door opening width	926 mm (36.5 in.)

## 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.

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

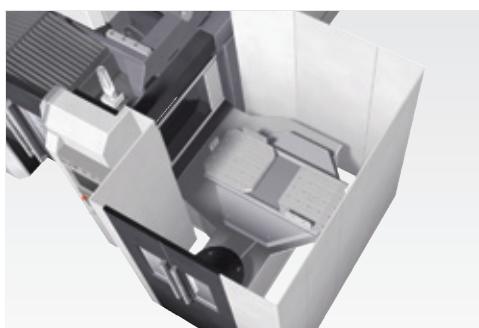


**NMV5000 DCG**



- Shower coolant (option) is essential.
- The machine shown in the photo is equipped with a separate manual pulse handle as an option.

**2-station side access turn-type APC** OP



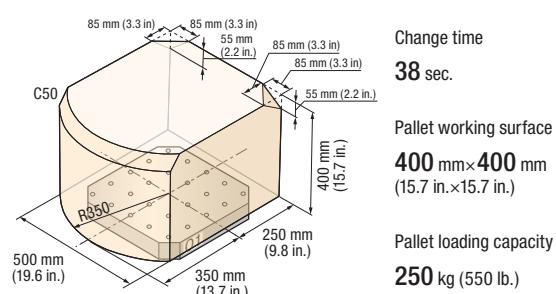
**5- / 16-station side access turn-type APC** OP



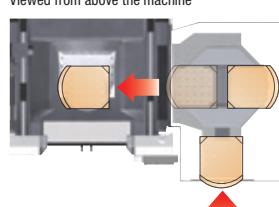
● Diagram: 5-station turn-type APC

## [Max. workpiece size]

### ■ APC <NMV5000 DCG>

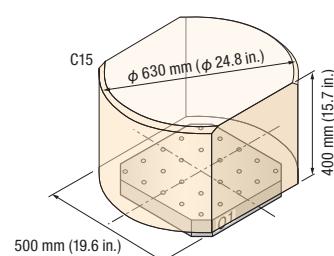


Viewed from above the machine



- The picture shows the orientation of a workpiece in the setup station.

### ■ CPP/LPP <NMV5000 DCG>



# Peripheral equipment

## In-machine measuring system (spindle) [OP](#)

Touch sensor (optical signal transmission type)	Automatic	Centering Measurement
Sensor Receiver		
<p>Workpiece zero point setting and centering are possible</p>		

## In-machine measuring system (table) [OP](#)

Touch sensor	Automatic	Tool length measurement Tool breakage detection	Touch sensor	Automatic	Tool length measurement Tool breakage detection
Z: Tool length			Z: Tool length		
<p>Allows tool length offset</p>					

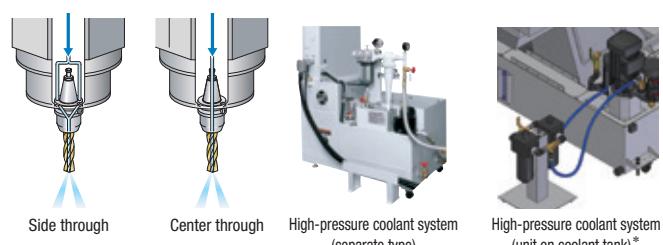
## In-machine measuring system (table) <turning specifications> [OP](#)

Touch sensor	Automatic	Tool length measurement Tool breakage detection	Touch sensor	Manual	Allows tool geometry offset
Z: Tool length			Z: Tool length		
<p>Allows tool length offset and tool diameter offset</p>					

● The tool setter function is attached.

## Through-spindle coolant system [OP](#)

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

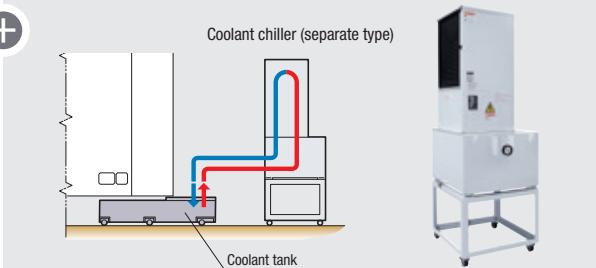


\*The illustrations show the 1.5 MPa (217.5 psi) specification.  
For the 7.0 MPa (1,015 psi) specification, the location of a coolant pump differs.  
For details, please consult our sales representative.

### 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, tools and table, ensuring stable machining accuracy. This is essential equipment when using high-pressure coolant. A unit with a heater will be customized.



# Peripheral equipment

## External chip conveyor OP

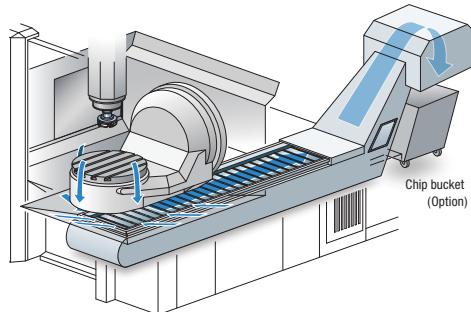
Available specifications	Workpiece material and chip size						
	Steel			Cast iron	Aluminum, non-ferrous metal		
	Long	Short	Powdery	Short	Long	Short	Powdery
Hinge type + Drum filter type	○	○	○	○	○	○	○
Scraper type + Drum filter type	×	○	Please use a steel filter	○	○	×	○
Magnet scraper type + Drum filter type	×	○	○	○	×	×	×

Chip size guidelines

Short: Chips shorter than 50 mm (2.0 in.), blocks of chips shorter than  $\phi$  40 mm ( $\phi$  1.6 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] OP

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.

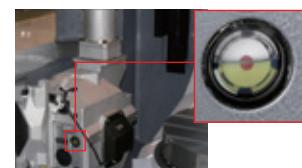
	Conventional machine	<b>NMV5000 DCG</b>
Consumption of lubricating oil	11.87 mL/h	<b>6.08 mL/h</b>

Consumption of lubricating oil per hour

Compared with conventional machine Approx. **1/2**

#### [Oil-bath ATC]

Uses an oil bath for the ATC unit, which uses less lubricating oil than the conventional oil-drip type.



### 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.



Power-saving settings screen

# MAPPS IV

High-Performance Operation System  
for Machining Centers



• 19-inch operation panel

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** OP

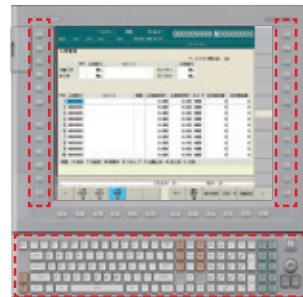
## Outstanding operability

### 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

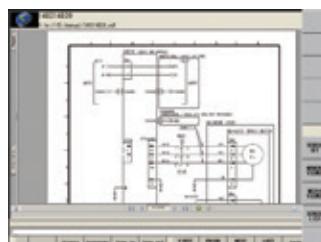
Collisions can be avoided not only during program operation but also during setup.

- 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

### 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.



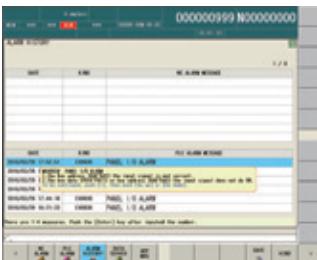
### Viewable file types

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

## Improved ease of maintenance

### Alarm help function

When an alarm occurs, MAPPS identifies the cause of the trouble and provides solutions.

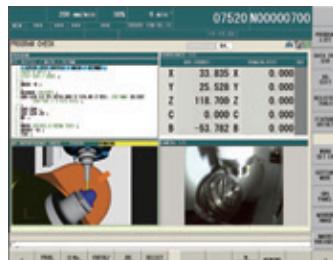


## Improved work efficiency

### Fixed-point in-machine camera

OP Consultation is required

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

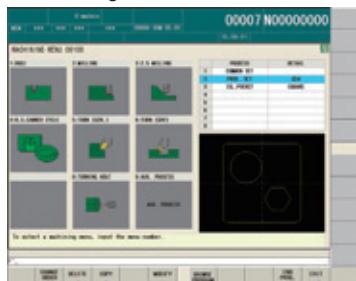
- Inside machine (to check machining)
- Tool magazine (to check cutting tools)
- Chip bucket (to check chip accumulation)

## 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.

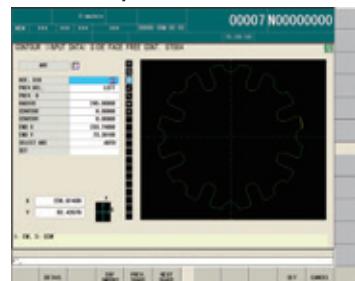
### Machining menu



### List display function



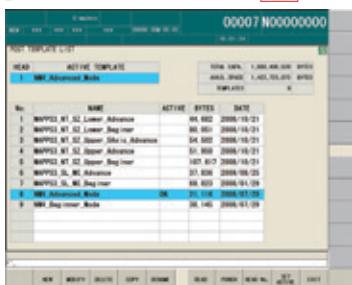
### Contour input



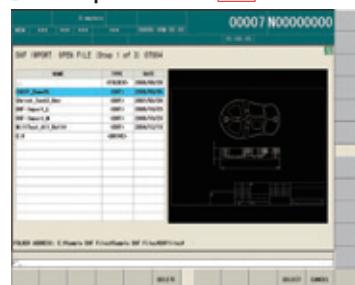
### Islands, open pockets OP



### MORI-POST advanced mode OP



### DXF import function OP



## Application System

### MORI Automatic Programming System for Machining Center

## MORI-APM OP

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



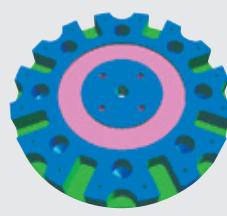
#### 1. Simple programming



##### [Conversational automatic programming]

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

#### 2. Reduce programming time



##### [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



##### [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.

## For shorter total production time for all our customers

### DMG MORI's software Line-up

This network system application achieves fast information sharing and increased production efficiency.

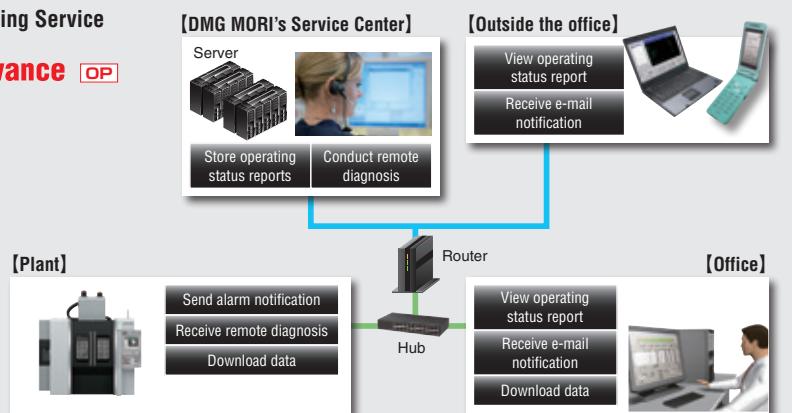
[Internet]  
 [LAN]

#### 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

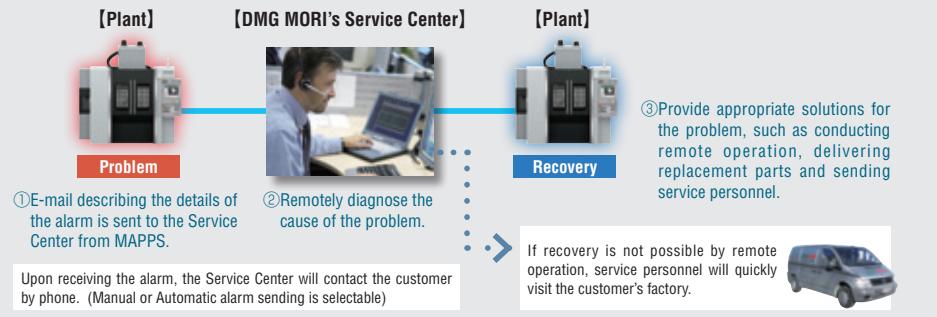


#### ■ Remote alarm support

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.

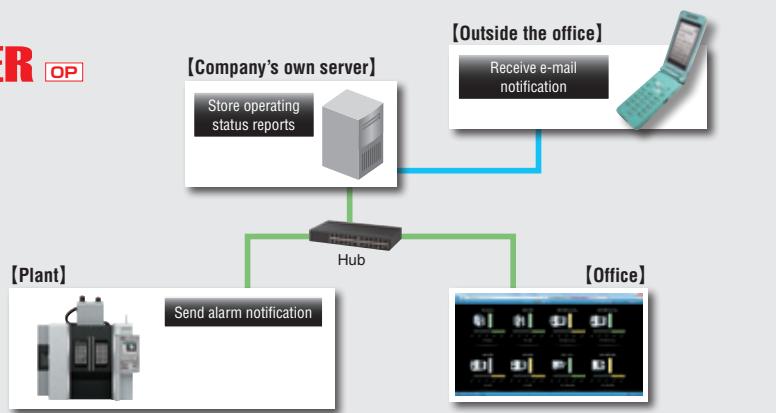


#### Machine Operation Monitoring System

### 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.

— [Internet]  
— [LAN]

## Industrial Network for Peripheral Equipment Control

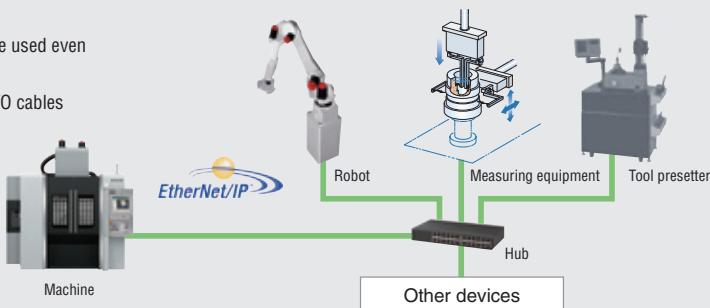
### MAPPS EtherNet/IP I/F OP

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

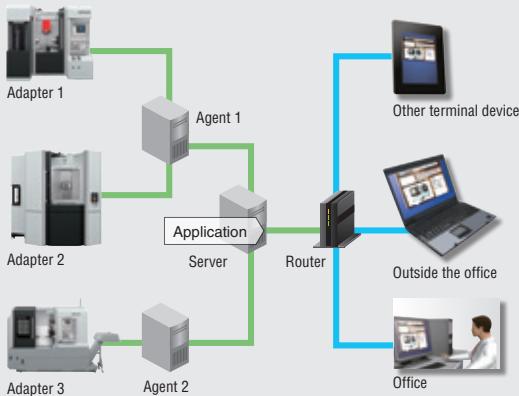
### MAPPS MTConnect I/F

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



#### ■ Application examples



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



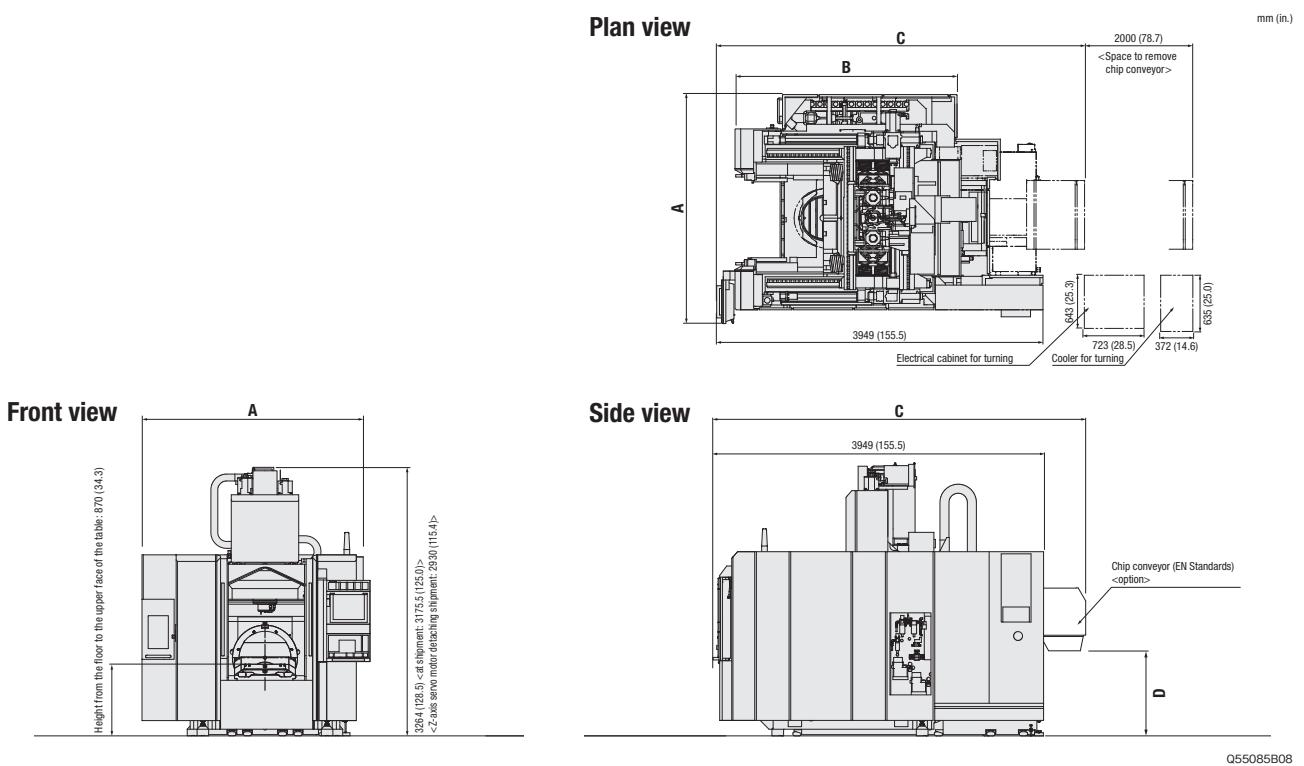
Operating status can be checked in real time.



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)

	31 tools	61 tools (option)	91 tools (option)	121 tools (option)	181 tools (option)
A (Width) mm (in.)		2,773 (109.2)			3,263 (128.5)
B (Depth) mm (in.)	2,686 (105.7)	3,817 (150.3)	5,246 (206.5)	3,817 (150.3)	5,246 (206.5)

### Tool storage capacity (Rack-type)

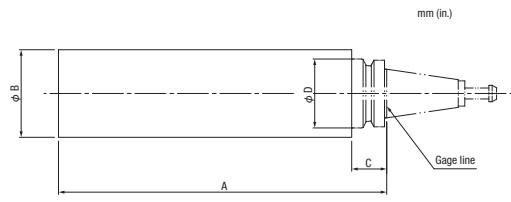
	240 tools (option)	300 tools (option)	320 tools (option)
A (Width) mm (in.)	3,304 (130.1)	4,239 (166.9)	3,304 (130.1)
B (Depth) mm (in.)	5,589 (220.0)	3,553 (139.9)	6,639 (261.4)

### Chip conveyor

	Hinge type + Drum filter type (option)	Scrapper type + Drum filter type (option) Magnet scrapper type + Drum filter type (option)
C (Depth) mm (in.)	4,453 (175.3)	4,354 (171.4)
D (Discharge height) mm (in.)	1,017 (40.0)	820 (32.3)

## Tool capacity diagram

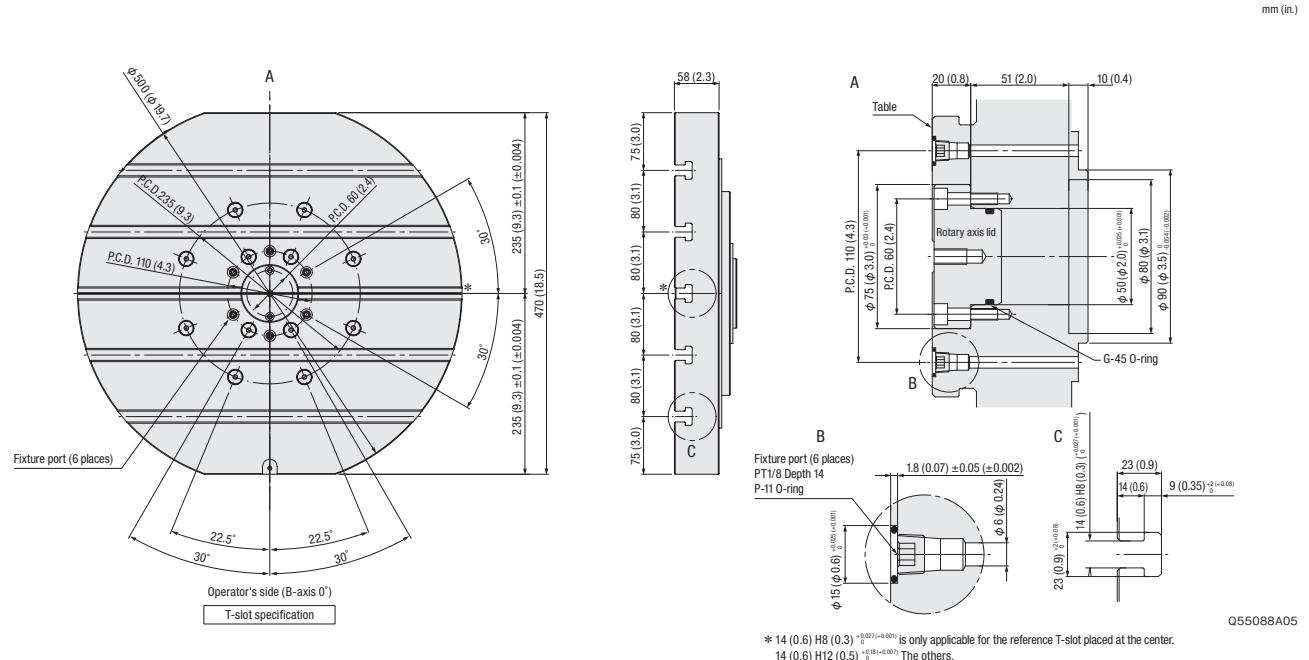
Shank size		BT40			
Standards		MAS	CAT	DIN	HSK-A63
A Max. tool length mm (in.)		300 (11.8)			
B Max. tool diameter <with adjacent tools> mm (in.)		90 (3.5)/70 (2.8) <Rack magazine 300-tools specification>			
B Max. tool diameter <without adjacent tools> mm (in.)		125 (4.9)			
C Tool capacity (Min.) mm (in.)		35 (1.4)		42 (1.7)	
D Tool capacity (Max.) 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> N·m (ft·lbf)	11 (8.1)				



Q81087A04

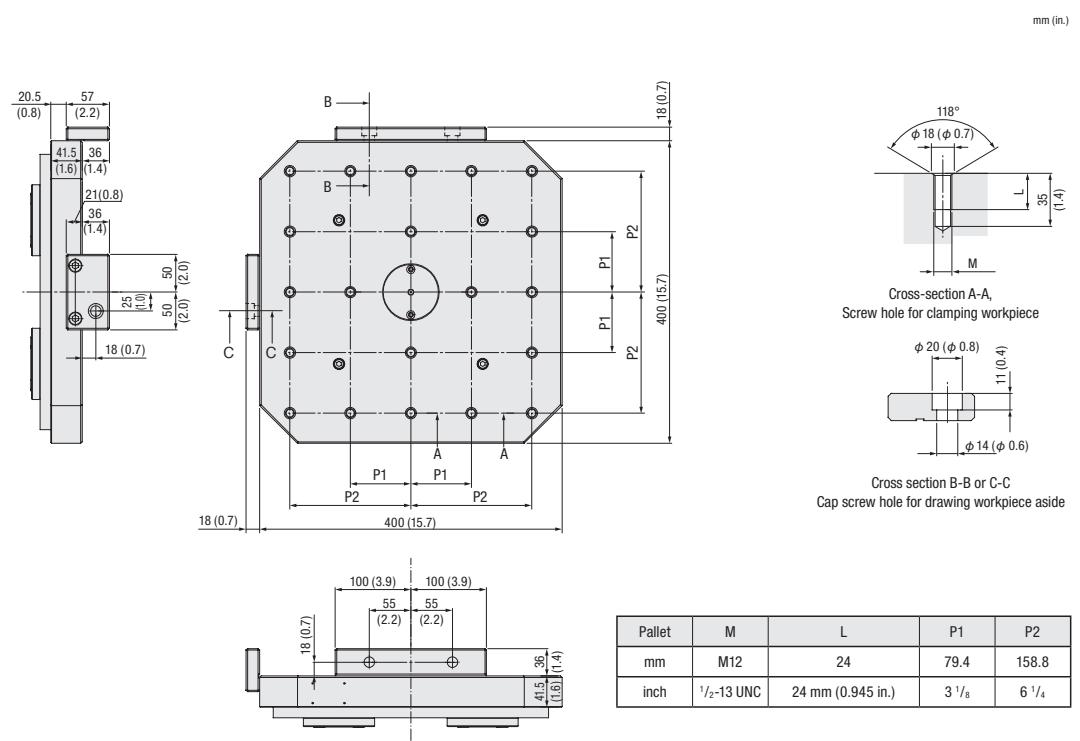
- When the machine is equipped with a 300-tool rack magazine, any tools cannot be stored next to turning tools.
- If a tool greater than O.D. 70 mm (2.8 in.) is stored in the column 10, tools cannot be stored in the adjacent tools.
- No.300 pot is a waiting pot. Do not store a tool.

## Table dimensions



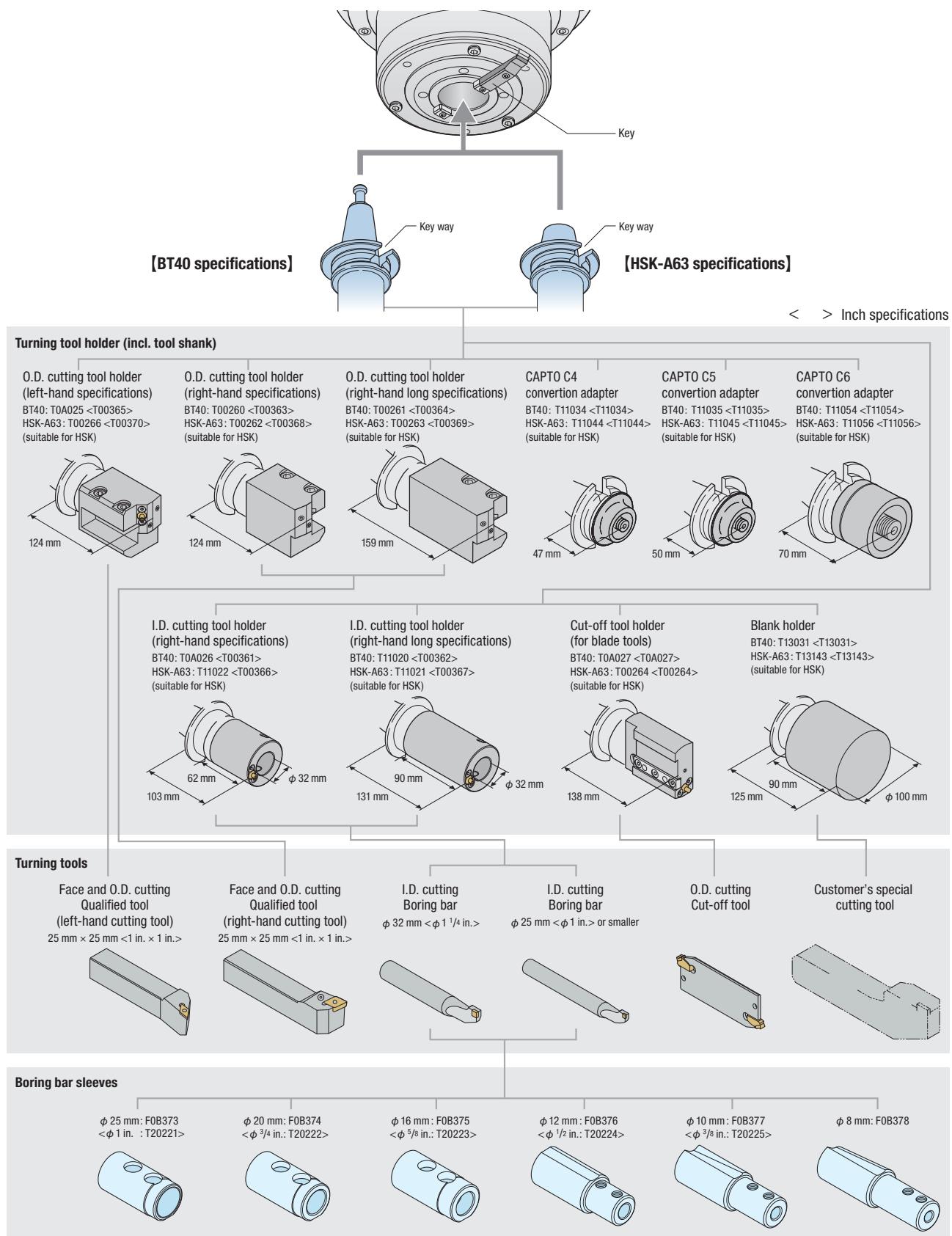
- The concentricity of the table center hole and the C-axis rotation center is not guaranteed. If the concentricity is required, consult with our sales representative.
- Do not remove the plug of the rotation axis from the table center hole when using the machine. If the plug is removed, chips and coolant could enter the table, damaging the machine.

## Pallet dimensions



- 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)



● If you select the turning specification, the through-spindle coolant system is a center-through type only.

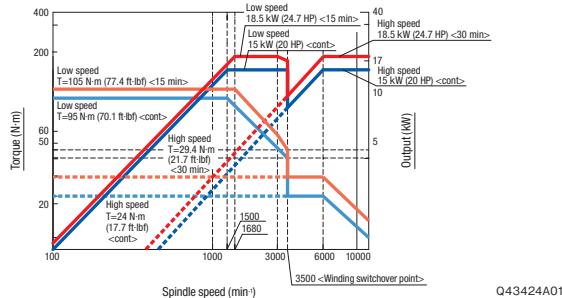
Please note that to attach turning tools, either a BT or HSK tool holder (two-face contact), which we have prepared according to machine specifications, is required.

Q81089B04 Q81095A07

## Spindle speed-torque/output-rotation speed diagram

### [Standard]

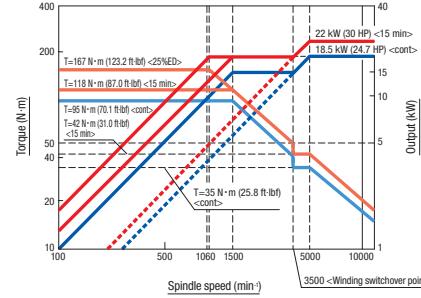
Max. spindle speed: 12,000 min<sup>-1</sup>  
 Spindle drive motor: 18.5/15 kW (24.7/20 HP) <15 min>·30 min/cont>  
 Max. spindle torque: 105 N·m (77.4 ft-lbf) <15 min>



Q43424A01

### [High output/Option]

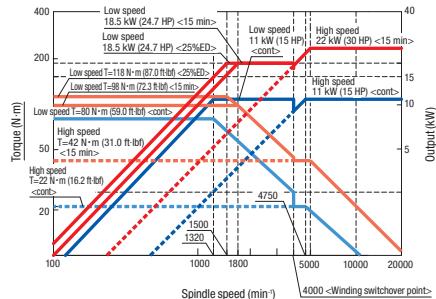
Max. spindle speed: 12,000 min<sup>-1</sup>  
 Spindle drive motor: 22/18.5 kW (30/24.7 HP) <15 min/cont>  
 Max. spindle torque: 167 N·m (123.2 ft-lbf) <25% ED>



Q43425A01

### [High speed/Option]

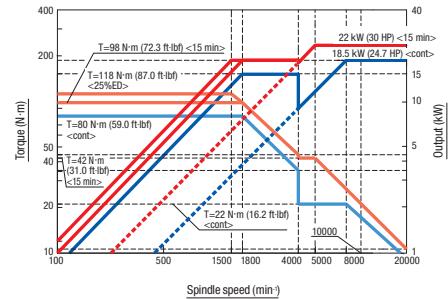
Max. spindle speed: 20,000 min<sup>-1</sup>  
 Spindle drive motor: 22/11 kW (30/15 HP) <15 min/cont>  
 Max. spindle torque: 118 N·m (87.0 ft-lbf) <25% ED>



Q43426B01

### [High speed·High output/Option]

Max. spindle speed: 20,000 min<sup>-1</sup>  
 Spindle drive motor: 22/18.5 kW (30/24.7 HP) <15 min/cont>  
 Max. spindle torque: 118 N·m (87.0 ft-lbf) <25% ED>

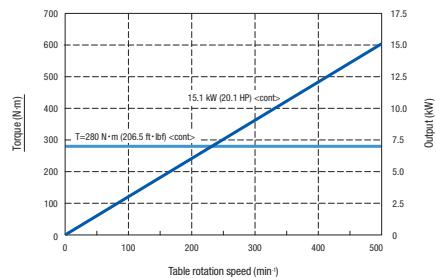


Q43442A01

## Table speed-torque/output-rotation speed diagram

### [Turning mode/Option]

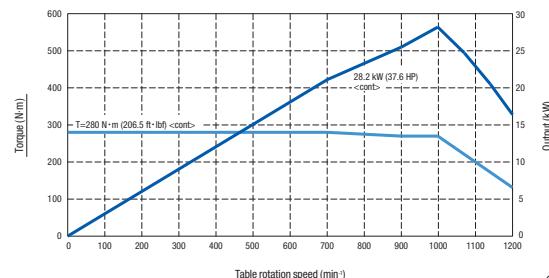
Max. table rotation speed: 500 min<sup>-1</sup>  
 Table rotation motor: 15.1 kW (20.1 HP) <cont>  
 Max. table torque: 280 N·m (206.5 ft-lbf) <cont>



Q43469A01

### [Turning mode/Option]

Max. table rotation speed: 1,200 min<sup>-1</sup>  
 Table rotation motor: 28.2 kW (37.6 HP) <cont>  
 Max. table torque: 280 N·m (206.5 ft-lbf) <cont>



Q43470A01

## Standard & optional features

### Spindle

12,000 min <sup>-1</sup> : 18.5/15 kW (24.7/20 HP) <30 min/cont>	●
12,000 min <sup>-1</sup> : 22/18.5 kW (30/24.7 HP) <15 min/cont> <high output>	○
20,000 min <sup>-1</sup> : 22/11 kW (30/15 HP) <15 min/cont> <high speed>	○
20,000 min <sup>-1</sup> : 22/18.5 kW (30/24.7 HP) <15 min/cont> <high speed-high output>	○
Oil chiller	●
BT40 (two-face contact) <sup>*1</sup>	○
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<sup>-1</sup> or higher, please use two-face contact tool.

### Table

B-axis max. rotational speed	F31iB	35 min <sup>-1</sup>	●
		50 min <sup>-1</sup>	○
	F31iB5	50 min <sup>-1</sup>	●
		120 min <sup>-1</sup>	●
Table C-axis rotational speed		500 min <sup>-1</sup> <turning specifications>	○
		1,200 min <sup>-1</sup> <turning specifications>	○
Table		T-slot	●
		Tap	○
Sub table			☆
Table chuck			☆
Interface for fixture clamping		hydraulic 1 circuit (2 ports) (inside machine)	☆
Pneumatic/Hydraulic fixture interface <sup>*2</sup>		6 ports	☆

\*2 Not available for turning specifications + APC

### Pallet/APC

2-station side access turn-type APC <sup>*3</sup>	T-slot pallet	○
	Tapped pallet	○
5-station side access turn-type APC <sup>*3</sup>	T-slot pallet	○
	Tapped pallet	○
16-station side access turn-type APC <sup>*3</sup>	T-slot pallet	○
	Tapped pallet	○
Built in arbor clamping device (table)	BT-50	○
One additional pallet	T-slot	○
	Tap	○

\*3 Shower coolant (option) is essential.

- 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.
- 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.
- The details given above and the specifications are subject to change without notice.
- Specifications, accessories, safety device and function are available upon request.
- Some options are not available in particular regions.  
For details, please consult our sales representative.
- The information in this catalog is valid as of April 2019.

**⚠** 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.

### Magazine

Tool storage capacity	Chain-type	31 tools	●
		61 tools	○
		91 tools	○
		121 tools	○
		181 tools	○
	Rack-type	240 tools	○
Type of tool shank		300 tools	○
		320 tools	○
		BT40	●
		DIN40	○
		CAT40	○
		HSK-A63	○
Type of retention knob		DMG MORI 90° type	●
		45° (MAS-I)	○
		60° (MAS-II)	○
		DIN	○
		Special (center through)	○

### Coolant

Chip flushing coolant	●
Air blow	Tool tip
Shower coolant	○
Oil skimmer	○
Through-spindle coolant system (separate type) interface	○
Separate type	Center through
	Side through
Through-spindle coolant system <sup>*4</sup>	Unit on coolant tank <1.5 MPa (217.5 psi)>
	Center through
	Side through
Unit on coolant tank <7.0 MPa (1,015 psi)>	Center through
	Side through
Oil mist	Can switch to the air blow system (tool tip)
Coolant gun (machining side)	○
Coolant float switch	○
Coolant chiller (separate type) interface	○
	Optional when using water-soluble coolant
Coolant chiller (separate type)	Compulsory when using oil-based coolant (For details, please consult our sales representative)
Coolant chiller (standard coolant + for through-spindle coolant system)	○
Semi dry unit	Need to select Through-spindle coolant (center through) specifications
Mist collector	Interface
	HVS-220
	HVS-220 interface
	AFS-1600 <sup>*5</sup>
	AFS-1600 interface <sup>*5</sup>

\*4 When using oil-based coolant, please consult our sales representative.

\*5 Oil-based coolant cannot be used for the mist collector AFS-1600.

When using oil-based coolant, select HVS-220.

### Chip disposal

	Rear discharge, Hinge type + Drum filter type	<input type="radio"/>
Chip conveyor	Rear discharge, Scraper type + Drum filter type	<input type="radio"/>
	Rear discharge, Magnet scraper type+Drum filter type	<input type="radio"/>
Chip conveyor interface (rear discharge) (There are limitations to the chip conveyor manufacturers which are compatible with the chip conveyor interface)	Hinge type + Drum filter type	<input type="radio"/>
Chip bucket		<input type="radio"/>

### 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	5 10
Manual pulse generator (separate type)	○
Refrigerating type air dryer	○
Dry anchor	○
Z-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)

Discharge pressure (MPa)	Side through	Center through (special retention knobs are required)
1.5 (217.5)	<input type="radio"/>	<input type="radio"/>
3.5 (507.5)	<input type="radio"/>	<input type="radio"/>
7.0 (1,015)	<input type="radio"/>	<input type="radio"/>

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

● The specifications vary depending on the manufacturers.

### Improved accuracy

	X-axis	<input type="radio"/>
	Y-axis	<input type="radio"/>
Full closed loop control (Scale feedback)	Z-axis	<input type="radio"/>
	B-axis	●
	C-axis	●

### Automation

Automatic power off device	●
EtherNet/IP interface	<input type="radio"/>
Automatic door	<input type="radio"/>

# Numerical control unit specifications F31iB, F31iB5

## Controlled axes

Controlled axes	X, Y, Z, B, C
Simultaneously controllable axes	F31iB: 4-axis F31iB5: 5-axis
Least input increment	0.001 mm (0.0001 in.)
Least command increment	0.001 mm (0.0001 in.)
Max. command value	±999,999.999 mm (±99,999.9999 in.)
Inch/Metric conversion	G20/G21
Machine lock	
Overtavel	
Door interlock	
Mirror image	
Unexpected disturbance torque detection function	
Load monitoring function	
Stroke limit check before movement	
Programming resolution multiplied by 1/10	
Chopping	

## Operation

Dry run	
Single block	
Manual jog feed	0—5,000 mm/min (0—196.9 ipm) <20 steps>
Manual zero return	
Manual pulse handle feed	Manual pulse generator: 1 units ×1, ×10, ×100 (per pulse)
Sequence number collation and stop	
Program restart	
Tool retract and recover	
Manual handle interruption	

## Interpolation functions

Nano interpolation	
Positioning	G00
Single direction positioning	
Exact stop mode	G61
Tapping mode	G63
Cutting mode	G64
Exact stop	G09
Helical interpolation	Full 2nd axis and 1 other axis
Reference position return	G28
Reference position return check	G27
Return from reference position	G29
2nd reference position return	G30 (it is used on ATC)
Cutting point interpolation for cylindrical interpolation (includes cylindrical interpolation)	
Involute interpolation	G2.2/G3.2
Spiral/conical interpolation	
Smooth interpolation	
3rd, 4th reference position return	
Tool spindle Cs control (Cs contour control+normal direction control) <consultation is required if orbit machining or hale machining needs to be performed>	
NURBS interpolation	
Polar coordinate interpolation	G12.1, G13.1
Thread cutting/synchronous cutting/ Feed per revolution	Standard features for turning specifications
Cylindrical interpolation	G7.1
Hypothetical axis interpolation	
Exponential interpolation	
Retract during thread cutting cycle*	☆
Variable lead thread cutting*	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) Z-axis: Max. 40,000 mm/min (1,574.8 ipm)
Cutting feedrate	For AI contour control: X, Y-axis: 1—50,000 mm/min (0.01—1,968.5 ipm) Z-axis: 1—40,000 mm/min (0.01—1574.8 ipm)
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	
AI contour control I (Number of look-ahead blocks: Max. 30)	F31iB
AI contour control II (Number of look-ahead blocks: Max. 200)	F31iB F31iB5
One-digit F code feed	F1—F9
Inverse time feed	
Small-hole peck drilling cycle	(the arbor with the overload torque detection function must be attached)
<b>Program input</b>	
Optional block skip	
Max. command value	±9 digits (R, I, J, K is ±12 digits)
Program number/program name	Program number: 4 digit (Program number 8 digits: Option) Program name: 48 characters
Absolute/incremental programming	G90/G91
Decimal point input	You can change the electrical calculator type decimal point programming by changing a parameter
Diameter/radius programming	
Plane selection	G17, G18, G19
Rotary axis designation	
Rotary axis roll-over	
Coordinate system setting	G92
Automatic coordinate system setting	
Workpiece coordinate system	G52—G59
Programmable data input	G10
Sub-program call	Up to 10 nestings
Custom macro	
Drilling cycle	G80—G89
F15 format	
Custom macro common variables 600 in total	#100—#199, #500—#999
Additional workpiece coordinate systems 48 sets	
Additional workpiece coordinate systems 300 sets	
Addition of optional block skip	Soft key type (2—9)
Optional chamfering/corner R	
Interruption type custom macro	
Automatic corner override	
Scaling	
Coordinate system rotation	
Programmable mirror image	
Graphic copy	G72.1/G72.2
3-D coordinate conversion	
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>	

●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		●
Multiple M cords in single block (Multi M code function) (Includes M code group check)		○
Constant surface speed control*	G96	○

\* It is standard for the C-axis turning specification.

### Tool functions/Tool offset functions

Tool functions (T function)	4 digits T code	●
Number of tool offsets	64 sets (length, radius, wear and geometry)	●
Tool offset data memory C	D/H code, geometry and wear offset data	●
Tool length compensation	G43, G44, G49	●
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 management system + Tool ID (MAPPS software only)	Includes common variable 600 for custom macro. Need "order design spec. sheet" for hardware and software change of tool ID.	○
Tool offsets 99 sets in total		○
Tool offsets 200 sets in total		○
Tool offsets 400 sets in total		○
Tool offsets 499 sets in total		○
Tool offsets 999 sets in total		○
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

I/O interface	USB memory RS-232C	Operating panel Inside electrical cabinet	● ○
6 GB Program Storage Area, Updatable (for MAPPS-DNC operation, for data backup)<MAPPS>	Files up to 10 MB in size can be edited		●
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*			○

\* CF card (4 GB/2 GB/512 MB)+ATA adapter

### Number of registerable programs <in total>

Part program storage length <in total>	Number of registerable programs <in total>		
	Without expansion	Expansion 1	Expansion 2
320 m (1,050 ft) <128 KB>		63	●
320 m (1,050 ft) <128 KB>	250	-	○
640 m (2,100 ft) <256 KB>	500	-	○
1,280 m (4,200 ft) <512 KB>	1,000	-	○
2,560 m (8,400 ft) <1 MB>	1,000	2,000	○
5,120 m (16,800 ft) <2 MB>	1,000	4,000	○
10,240 m (33,600 ft) <4 MB>	1,000	4,000	○
20,480 m (67,200 ft) <8 MB>	1,000	4,000	○

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

	F31iB	F31iB5
Interpolation functions	Nano smoothing	○ ●
Feed functions	AI contour control II	○ ●
Program input	Tilted working plane command	○ ●
	Cutting point command	— ●
Tool functions/ Tool offset functions	Tool center point control	○ ●
	3-D cutter compensation	○ ●
	SVC function	— ●
	Workpiece position error compensation	○ ●
	Rotary table dynamic fixture offset	○ ●
I/O Functions and units	Fast data server+ Memory card for Data server* <sup>1</sup>	○ ●

\*1 CF card 1 GB+ATA adapter

### 3D interference checking function <MAPPS>

3D interference checking function*	Standard internal cover, spindle, and table	●
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\* Customized design is required for special shape.

I95028C04

## Machine specifications

Item		NMV5000 DCG	
Travel	X-axis travel <longitudinal movement of spindle head>	mm (in.)	730 (28.7)
	Y-axis travel <cross movement of saddle>	mm (in.)	510 (20.1)
	Z-axis travel <vertical movement of ram>	mm (in.)	510 (20.1)
	Distance from table surface to spindle gauge plane <horizontal table position>	mm (in.)	130 – 640 (5.1 – 25.2) [APC: 50 – 560 (2.0 – 22.0)]
	B-axis travel		+160° – –180°
	C-axis travel		360°
Table	Height from the floor to the upper face of the table (Pallet)	mm (in.)	870 (34.3) [APC: 950 (37.4)]
	Table (Pallet) working surface	mm (in.)	φ 500 (φ 19.7) [APC: 400×400 (15.7×15.7)]
	Table (Pallet) loading capacity	kg (lb.)	300 (660) [APC: 250 (550)]
	Table (Pallet) surface configuration		14 mm (0.6 in.) T-slot ×5 [APC: Tap M12×20]
	Max. workpiece swing diameter	mm (in.)	φ 700 (φ 27.5)
	Max. workpiece height	mm (in.)	450 (17.7) [APC: 400 (15.7)]
	Rotational speed of the table	B-axis min⁻¹	35 [50]
		C-axis min⁻¹	120 [500] [1,200]
Spindle	Max. spindle speed	min⁻¹	12,000 [20,000]
	Type of spindle taper hole		No.40 [HSK-A63]
Feedrate	Rapid traverse rate	mm/min (ipm)	X, Y: 50,000 (1,968.5) Z: 40,000 (1,574.8)
		mm/min (ipm)	X, Y: 50,000 (1,968.5) Z: 40,000 (1,574.8)
	With AI contour control	min⁻¹	B: 13.88 [33.33] C: 120
	Cutting feedrate	mm/min (ipm)	X, Y, Z: 6,000 (236.2)
		min⁻¹	B: 5.55 C: 16.66
	Without AI contour control	mm/min (ipm)	X, Y, Z: 0 – 5,000 (0 – 196.9)
	Jog feedrate	min⁻¹	B, C: 0 – 13.88
ATC	Type of tool shank		BT40° [CAT40] [DIN40] [HSK-A63]
	Type of retention knob		DMG MORI 90° type [45°(MAS-I)] [60°(MAS-II)] [DIN] [Special (center through)]
	Tool storage capacity		31 [61] [91] [121] [181] (Chain-type) [240] [300] [320] (Rack-type)
	Max. tool diameter	With adjacent tools mm (in.)	φ 90 (φ 3.5)
		Without adjacent tools mm (in.)	φ 125 (φ 4.9)
	Max. tool length	mm (in.)	300 (11.8)
	Max. tool mass	kg (lb.)	8 (17.6)
	Method of tool selection		Fixed address, shorter route access
	Tool changing time	Tool-to-tool	s
			1.8
	Max. tool moment (from spindle gage line)	N·m (ft·lb)	11 (8.1)
Motors	Spindle drive motor	12,000 min⁻¹	kW (HP)
		[12,000 min⁻¹ <high output>]	kW (HP)
		[20,000 min⁻¹ <high speed>]	kW (HP)
		[20,000 min⁻¹ <high speed·high output>]	kW (HP)
	Feed motor		[22/18.5 (30/24.7) <15 min/cont>]
		X: 4 (5.3) Y: 4 (5.3)×2 Z: 3 (4.0)×2	
			[22/18.5 (30/24.7) <15 min/cont>]
	B-axis table	35 min⁻¹	kW (HP)
		[50 min⁻¹] F31iB5 is standard	kW (HP)
	C-axis table	120 min⁻¹	kW (HP)
		[500 min⁻¹]	kW (HP)
		[1,200 min⁻¹]	kW (HP)
	Coolant pump motor		2.2 (3)
Power sources (Standard)	Electrical power supply <cont>	I94368B01 kVA	35.6
	Compressed air supply	MPa (psi), L/min (gpm)	0.5 (72.5), 500 (132) <ANR> <A compressed air supply may be needed, depending on options and peripheral equipment. >
Tank capacity	Coolant tank capacity	L (gal.)	750 (198.0)
Machine size	Machine height <from floor>	mm (in.)	3,264 (128.5) <at shipment: 3,175.5 (125.0)>
	Floor space <width × depth>	mm (in.)	2,773×3,949 (109.2×215.5) <excluding chip conveyor>
	Mass of machine	kg (lb.)	12,400 (27,280)
Noise data	A-weighted, time-average radiated sound pressure level	dB	65 – 82 (measurement uncertainty is 4 dB)

[ ] Option

- \* 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.
  - Please use a two-face contact tool when using a No. 40 taper spindle at 15,000 min⁻¹ or higher.
  - A tool with a mass moment greater than the maximum tool mass moment may cause problems during ATC operations even if it satisfies other conditions.
  - Compressed air supply: Please be sure to supply clean compressed air <air pressure: 0.7 MPa (101.5 psi), pressure dew point: 10°C (50°F) or below>.
  - A criterion capacity to select a compressor is 90 L/min (23.8 gpm) per 0.75 kW (1 HP). However, this figure may differ depending on the type of compressors and options attached. For details, please check the compressor specifications.
  - When the tool tip air blow is regularly used, air supply of more than 300 L/min (79.2 gpm) is separately required.
  - ANR: ANR refers to a standard atmospheric state; i.e., temperature at 20°C (68°F); absolute pressure at 101.3 kPa (14.7 psi); and relative humidity at 65%.
  - Power sources, machine size: the actual values may differ from those specified in the catalogue, depending on the optional features and peripheral equipment.
  - 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.
- 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.
  - Noise data: the measurement was performed at the front of the NMV5000 DCG machine with a maximum spindle speed of 12,000 min⁻¹. 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.

DMG MORI and its distributor representative shall have no liability (including for lost profits or business interruption or under the limited service warranty included herein) as a result of the Equipment being disabled.

+ DCG, DDM, ORC, speedMASTER, powerMASTER, SX-torqueMASTER, ZEROCHIP, CELOS, ERGOline, SLIMline, COMPACTline, DMG MORI SMARTkey, DMG MORI gearMILL and 3D quickSET are trademarks or registered trademarks of DMG MORI CO., LTD. In Japan, the USA and other countries.

+ If you have any questions regarding the content, please consult our sales representative.

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

+ The machines 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.

#### **DMG MORI CO., LTD.**

Nagoya Head Office ☐ 2-35-16 Meieki, Nakamura-ku, Nagoya City, Aichi 450-0002, Japan Phone: +81-52-587-1811  
Tokyo Global Headquarters ☐ 2-3-23, Shiom, Koto-ku, Tokyo 135-0052, Japan Phone: +81-3-6758-5900

Iga Campus ☐ 201 Midai, Iga City, Mie 519-1414, Japan Phone: +81-595-45-4151  
Nara Campus ☐ 362 Idono-cho, Yamato-Koriyama City, Nara 639-1183, Japan Phone: +81-743-53-1121

**DMG MORI**