

High-Precision, 5-Axis Control Vertical Machining Center

# NMV3000 DCG

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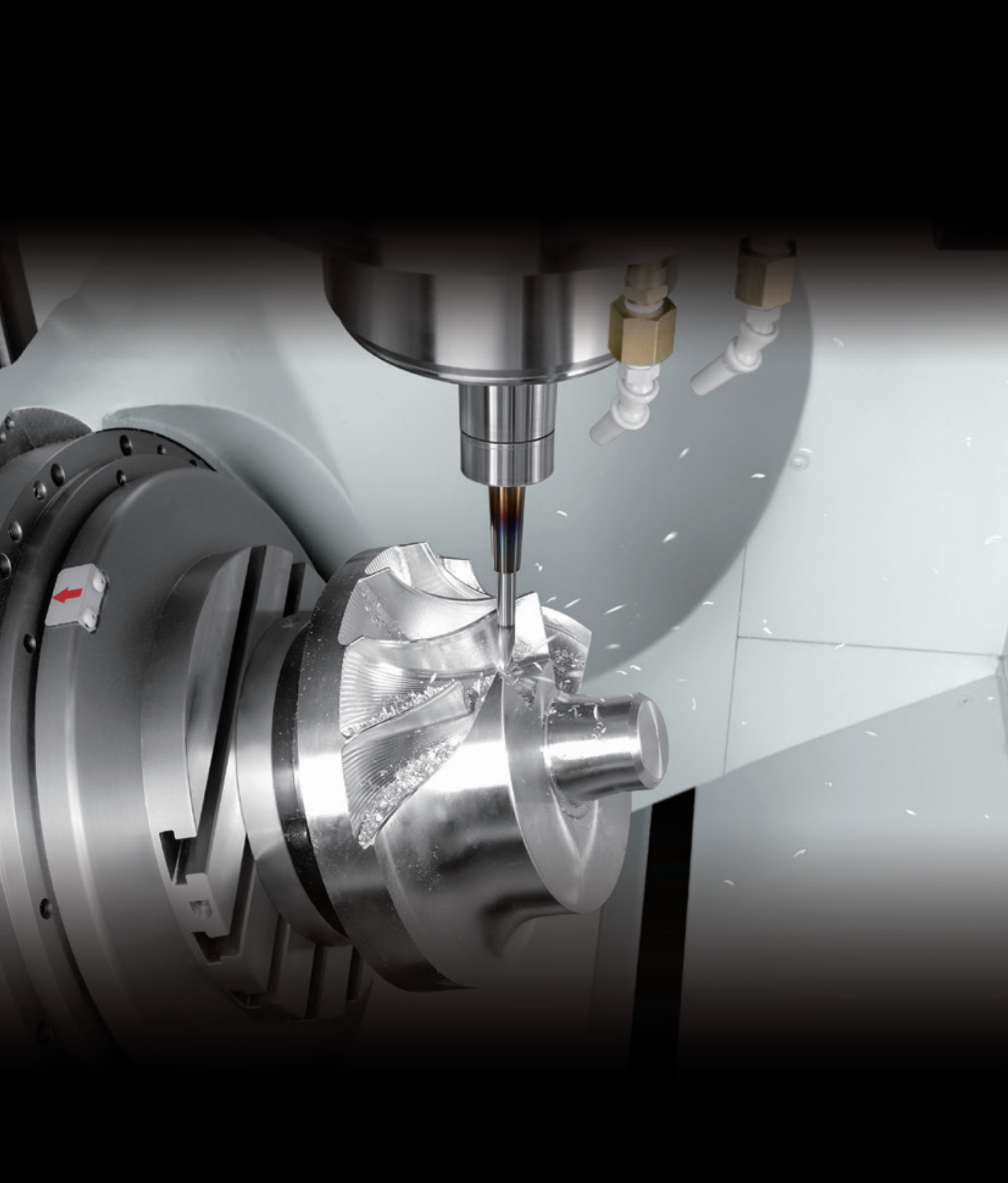


# High-precision, 5-axis control vertical machining center that uses DDM on rotary axes and maximizes your productivity

The machine features an optional large-capacity AWC (Automatic Workpiece Changer) and a variety of tool storage capacities, allowing long-term, unmanned operation, as well as high-efficiency machining for multi-item, small-lot production. The NMV3000 DCG answers the demand for high-precision, high-efficiency machining of small, complex workpieces, which has mainly come from the automobile and aircraft industries.



NMV3000 DCG



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MAPPS: Mori Advanced Programming Production System  
• Figures in inches were converted from metric measurements.

# Features of machine

## Basic structure

### Travel

Spindle

X-axis **500 mm (19.7 in.)** Y-axis **350 mm (13.8 in.)**

Z-axis **510 mm (20.1 in.)**

Table

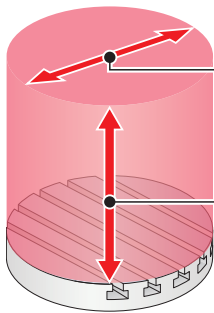
B-axis **+160° — -180°**

C-axis **360°**

### Rapid traverse rate

X/Y-axis **50 m/min (164.1 fpm)**

Z-axis **40 m/min (131.2 fpm)**

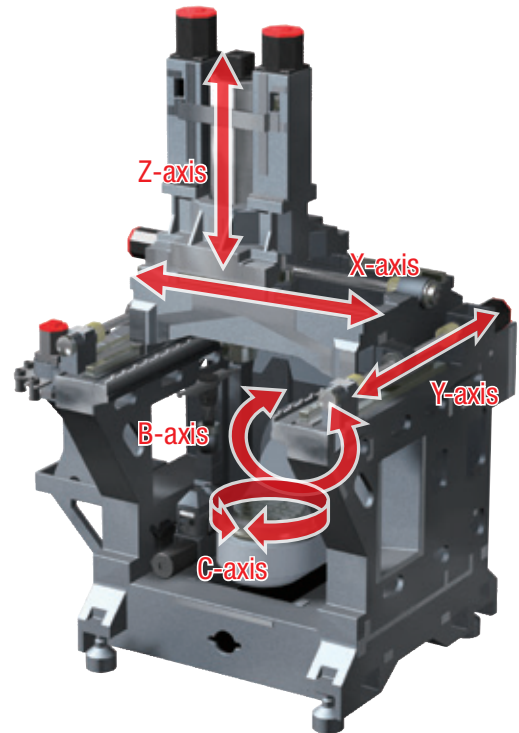


### Max. workpiece swing diameter

**φ 350 mm (φ 13.7 in.)**

### Max. workpiece height

**300 mm (11.8 in.)**



### Table loading capacity

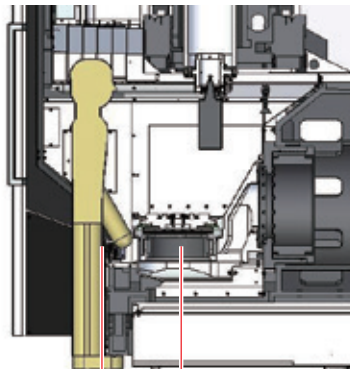
**100 kg (220 lb.)**

AWC: **80 kg (176 lb.)** OP

## Improved workability

### Access to the table

The overhead crane can be brought to the table center. The distance from the front of the machine to the center of the table is 400 mm (15.7 in.), which enables users to easily attach and remove workpieces.



**400 mm (15.7 in.)**

## Maintenance

### Centralized layout of devices

Pneumatic/hydraulic equipment is placed on the right side of the machine for easier maintenance.



**ATC/Tool magazine**

**■ Tool-to-tool**

**1.8 sec.**

**■ Chain-type**

		NMV3000 DCG				
Tool storage capacity		21 [61] [91] [121] [181]				
Max. tool diameter	With adjacent tools	mm (in.) $\phi$ 90 ( $\phi$ 3.5)				
	Without adjacent tools	mm (in.) $\phi$ 125 ( $\phi$ 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)				

[ ] Option

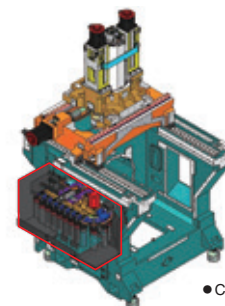
**■ Rack-type\*1**

		NMV3000 DCG				
Total		[160]	[240]	[300]*2	[320]	
Tool storage capacity	$\phi$ 70×300 mm ( $\phi$ 2.8×11.8 in.)	—	—	284	—	
	$\phi$ 90×150 mm ( $\phi$ 3.5×5.9 in.)	85	135	—	185	
	$\phi$ 90×300 mm ( $\phi$ 3.5×11.8 in.)	51	81	—	111	
	$\phi$ 125×150 mm ( $\phi$ 4.9×5.9 in.)	15		—	15	
	$\phi$ 125×300 mm ( $\phi$ 4.9×11.8 in.)	9		15	9	
Max. tool mass		kg (lb.) 8 (17.6)				
Depth		mm (in.) 4,014 (158.0)	5,064 (199.4)	2,929 (115.3)	6,114 (240.7)	

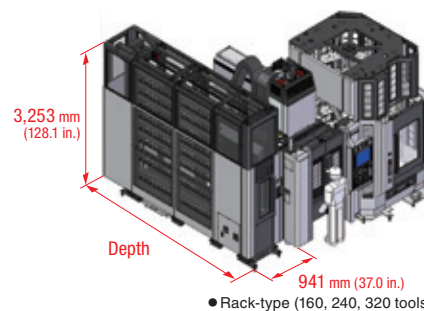
[ ] Option

\*1 Dry anchor (option) is essential.

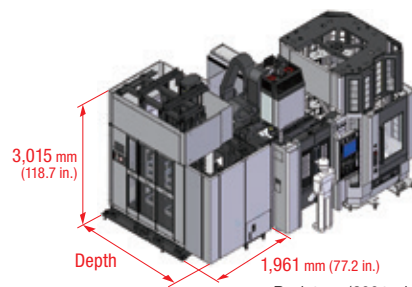
\*2 A pot transfer type magazine is used. The tool storage capacity includes a tool mounted in the spindle.



● Chain-type



● Rack-type (160, 240, 320 tools)



● Rack-type (300 tools)

**AWC**



Long-term operation is possible by using the large capacity AWC (Automatic workpiece changer).

**■ Workpiece changing time**

**28 sec.**

**■ AWC size (Width × Depth)**

**1,595 mm × 2,340 mm (62.8 in. × 92.1 in.)**

**■ Workpiece size**

		NMV3000 DCG				
AWC (stations)		34	120	114 (flexible)*1		
Max. workpiece diameter	Without adjacent workpieces	mm (in.) $\phi$ 350 ( $\phi$ 13.7)	—	$\phi$ 350 ( $\phi$ 13.7)		
	With adjacent workpieces	mm (in.) —	$\phi$ 230 ( $\phi$ 9.0)	—	$\phi$ 230 ( $\phi$ 9.0)	
Max. workpiece height		mm (in.) 300 (11.8)	150 (5.9)*2	300 (11.8)	150 (5.9)	300 (11.8)*3 150 (5.9)*4
Workpiece mass		kg (lb.) 80 (176)	50 (110)	80 (176)		50 (110)

\*1 When the workpiece size is  $\phi$  230×150 mm ( $\phi$  9.0×5.9 in.), the 114-station AWC can hold up to 114 workpieces.

Note, however, that the storage capacity may differ depending on the workpiece restrictions such as \*3 and \*4.

\*2 There are restrictions on the shape of the workpiece when the height is 105 mm (4.1 in.) or more.

\*3 There are restrictions on the shape of the workpiece when the height is 95 mm (3.7 in.) or more.

\*4 There are restrictions on the shape of the workpiece when the height is 10 mm (0.4 in.) or more.

For details, please consult with our sales representative.

● Shower coolant (option) and dry anchor (option) are essential for the machines with AWC.



**Allows long-term unmanned operation**

**Shortened Setup times**

# Original technology



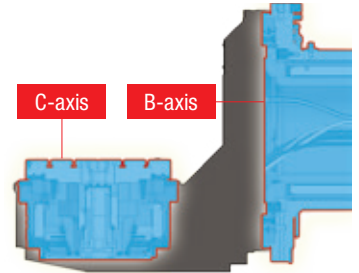
## Direct Drive Motor



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.

### ■ Effects of DDM

- High-speed rotation
- High-precision indexing
- Less maintenance
- Longer product life



## Driven at the Center of Gravity



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.

### ■ Max. acceleration

X-axis **0.46 G** {4.5 m/s<sup>2</sup>}

Y-axis **0.37 G** {3.6 m/s<sup>2</sup>}

Z-axis **0.50 G** {4.9 m/s<sup>2</sup>}

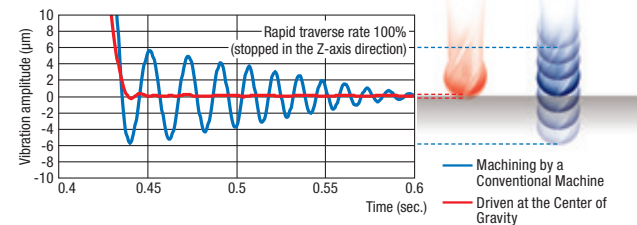
### ■ Effects of DCG

- Improved surface quality
- Outstanding acceleration
- Improved roundness
- Longer tool life

## Vibration controlled

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.

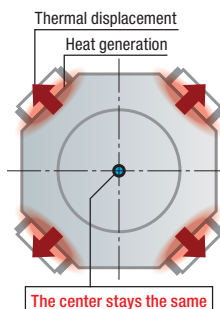
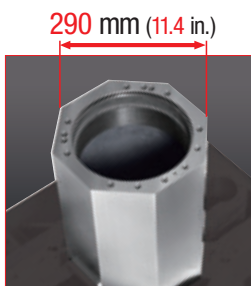
### ■ Residual vibration comparison



## Octagonal Ram Construction



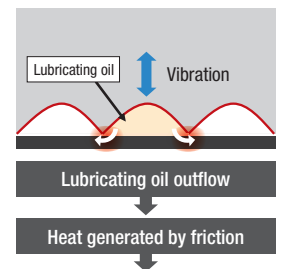
The 4 guideways are located diagonally from each other, so they distort symmetrically in response to the heat generated by high-speed travel. This means that the center stays in the same position, offering high-speed, high-precision feed.



### ■ Effects of ORC

- Superior damping characteristics
- Controls thermal displacement
- Achieves high-speed, high-precision feed

### 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.

## Mechanism

## Spindle

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

## ■ Max. spindle speed

12,000 min<sup>-1</sup>

20,000 min<sup>-1</sup> **OP**

## ■ Spindle acceleration time

1.92 SEC. (0→12,000 min<sup>-1</sup>)

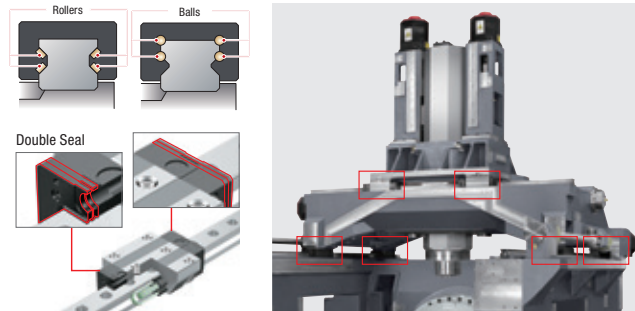
## ■ Spindle deceleration time

1.60 SEC. (12,000→0 min<sup>-1</sup>)

- Please use a dual contact tool when using a No. 40 taper spindle at 15,000 min<sup>-1</sup> or higher.

## 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.

## Table

## ■ B-axis max. rotational speed

50 min<sup>-1</sup>

## ■ C-axis max. rotational speed

150 min<sup>-1</sup>

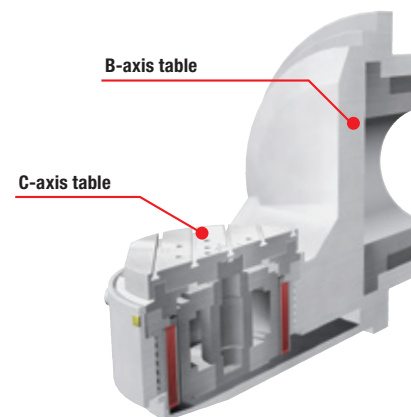
2,000 min<sup>-1</sup> **OP**  
(Turning specifications)

## ■ Table working surface

φ 350 mm (φ 13.8 in.)

## ■ 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.



- 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.

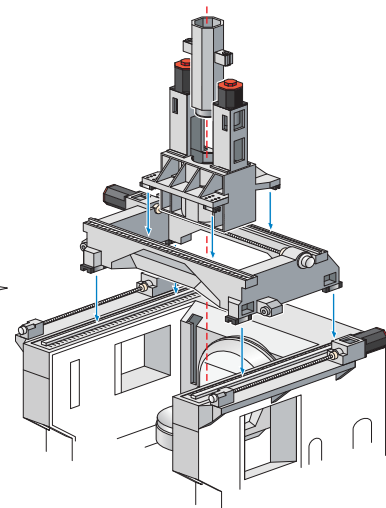
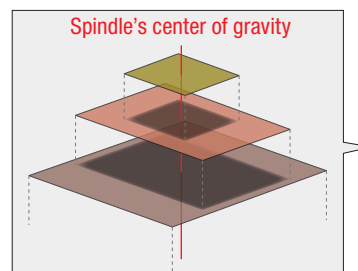
## Top Box-in-Box Construction

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.

Stable accuracy due to the heat-symmetrical structure

Support structure with no overhang

Less affected by temperature variations caused by chips or coolant



# High-precision equipment

## Full closed loop control <Scale feedback>



High-accuracy, high-resolution scale  
SmartSCALE

### Full closed loop control (Scale feedback) as standard (Magnescale)

- Superior precision with the Magnescale full closed loop control (Scale feedback)
- Magnetic measuring system with a high resolution of 0.01  $\mu\text{m}$
- Resistance to oil and condensation due to a magnetic detection principle
- Impact resistance of 980  $\text{m/s}^2$  (38,582.7  $\text{in./s}^2$ )
- Vibration resistance of 250  $\text{m/s}^2$  (9,842.5  $\text{in./s}^2$ )
- 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 with our sales representative.**

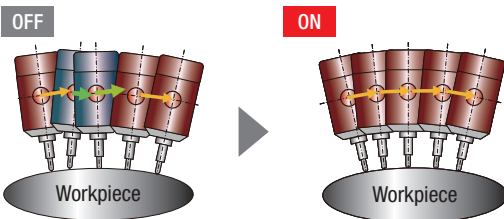
- We cannot guarantee that this unit will completely control the coolant temperature. It is designed to help prevent oil temperature increases.



## SVC function (Standard feature 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.

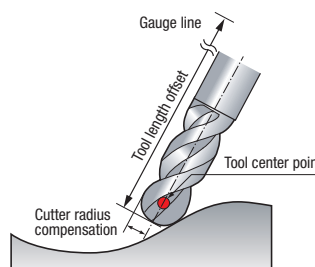
### Motion of the SVC function



The SVC function includes the following functions:

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

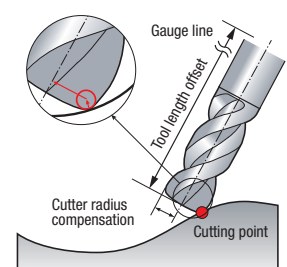
## Tool center point control\*1 /Cutting point command



### Tool center point control\*1

#### 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.

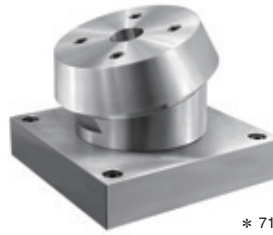
\*1 Standard features for F31iB5



# High-accuracy data

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

Circularity <Actual results>	<b>2.92 μm</b>
Material <JIS>	A7075* <Aluminum>
Tool	Carbide end mill φ 40 mm (φ 1 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)

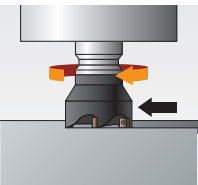
JIS: Japanese Industrial Standard • The cutting test results indicated in this catalog are provided as examples. The results indicated in this catalog may not be obtained due to differences in cutting conditions and environmental conditions during measurement.

# Cutting test

## Milling

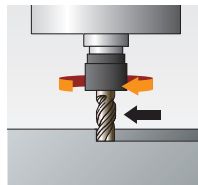
Material <JIS>: S50C\* (Carbon steel)

### Face mill



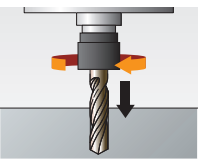
Material removal rate	<b>269 mL/min (16.4 in<sup>3</sup>/min)</b>
Tool	φ 80 mm (φ 3.1 in.) <7 Flutes>
Cutting speed	250 m/min (820.3 fpm)
Feedrate	2,100 mm/min (82.7 ipm)
Width of cut	64 mm (2.5 in.)
Depth of cut	2 mm (0.1 in.)

### End mill



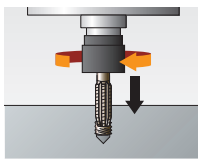
Material removal rate	<b>73 mL/min (4.5 in<sup>3</sup>/min)</b>
Tool	φ 30 mm (φ 1.2 in.) <4 Flutes>
Cutting speed	25 m/min (82.0 fpm)
Feedrate	64 mm/min (2.5 ipm)
Width of cut	30 mm (1.2 in.)
Depth of cut	38 mm (1.5 in.)

### Drill



Material removal rate	<b>66 mL/min (4.0 in<sup>3</sup>/min)</b>
Tool	φ 35 mm (1.4 in.)
Cutting speed	25 m/min (82.0 fpm)
Feedrate	68 mm/min (2.7 ipm)

### Tap



Tool	<b>M30×P3.5</b>
Cutting speed	10 m/min (32.8 fpm)
Feedrate	371 mm/min (14.6 ipm)

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

# Peripheral equipment

## External chip conveyor



Two types of chip conveyor have been made available for selection based upon chip shape and material. Please choose one suited to the type of machining you conduct.

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	×	○	○*	○	×	○	○
Magnet scraper type + Drum filter type	×	◎	◎	◎	×	×	×

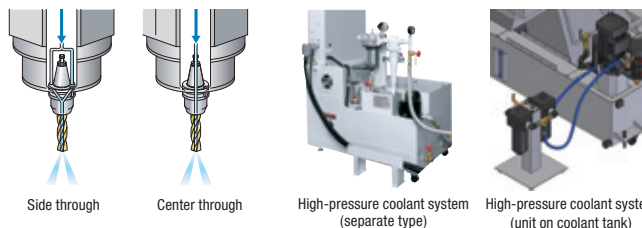
Chip size guidelines  
 Short: chips 50 mm (2.0 in.) or less in length, bundles of chips φ 40 mm (φ 1.6 in.) or less  
 Long: bigger than the above  
 \* Please use a steel filter

- The chip conveyor is rear disposal only.
- 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.
- We have prepared several options for different chip shapes and material. For details, please consult with our sales representative.

## Through-spindle coolant system



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



• Side through (option) is available only with the NMV3000 DCG.

# 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

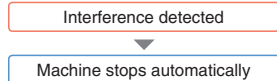
A PC-type keyboard is used as standard, making key input easy. A keyboard with a conventional key layout is also available as an option.



## 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.



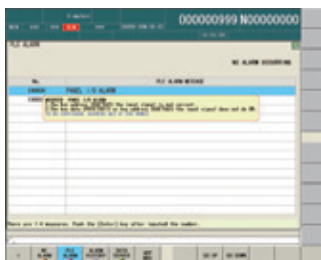
Collisions can be avoided not only during program operation but also during setup.

- 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 maintenance

### Alarm help function

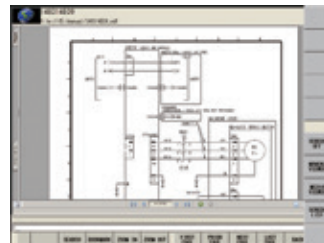
When an alarm occurs, MAPPS identifies the cause of the trouble and provides solutions.



## 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.



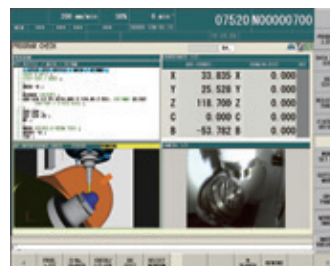
### Viewable file types

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

## Improved 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.

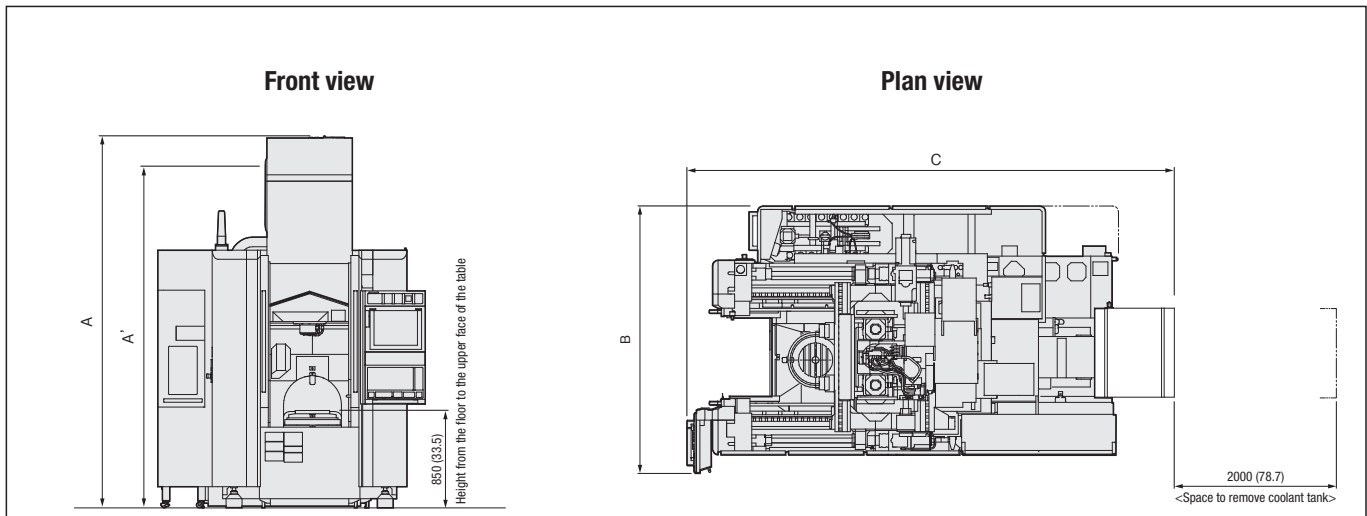


### Examples of camera locations

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

# Installation diagrams

mm (in.)



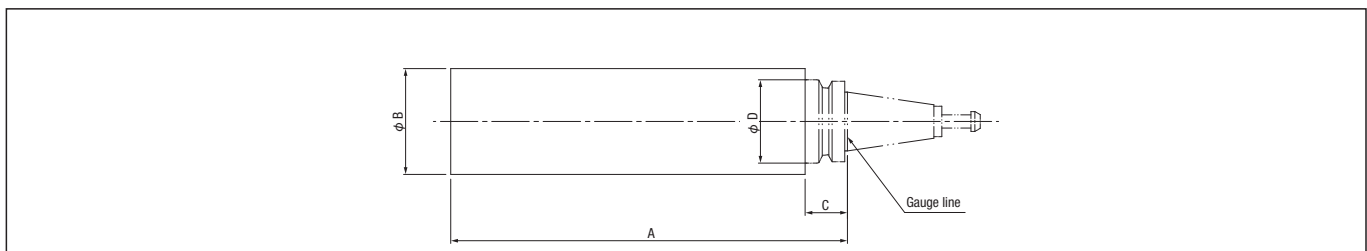
Q55182C04 Q55183B05 Q55387A02

		NMV3000 DCG								
		21 tools	[61 tools]	[91 tools]	[121 tools]	[181 tools]	[160 tools]	[240 tools]	[300 tools]	[320 tools]
<b>A</b>	Machine height Standard	3,250 (128.0)			3,253 (128.1)		3,250 (128.0)	3,253 (128.1)		
<b>A'</b>	Machine height [Z-axis servo motor detaching shipment]	2,986 (117.6)			3,253 (128.1)		3,231 (127.2)	3,253 (128.1)		
<b>B</b>	Machine width	2,339 (92.1)		2,829 (111.3)		2,805 (110.4)		3,824 (150.6)	2,805 (110.4)	
<b>C</b>	Machine depth [Hinge type + Drum filter type]	4,269 (168.1)	5,209 (205.1)	4,269 (168.1)	5,209 (205.1)	4,546 (179.0)	5,596 (220.3)	4,269 (168.1)	6,646 (261.7)	
	[Scraper type + Drum filter type]	4,172 (164.3)	5,209 (205.1)	4,172 (164.3)	5,209 (205.1)	4,546 (179.0)	5,596 (220.3)	4,172 (164.3)	6,646 (261.7)	
	[Magnet scraper type + Drum filter type]									
Discharge height of chip conveyor		Hinge type + Drum filter type: 1,017 (40.0) Scraper type + Drum filter type, Magnet scraper type + Drum filter type: 820 (32.3)								

[ ] Option

# Tool capacity diagram

mm (in.)



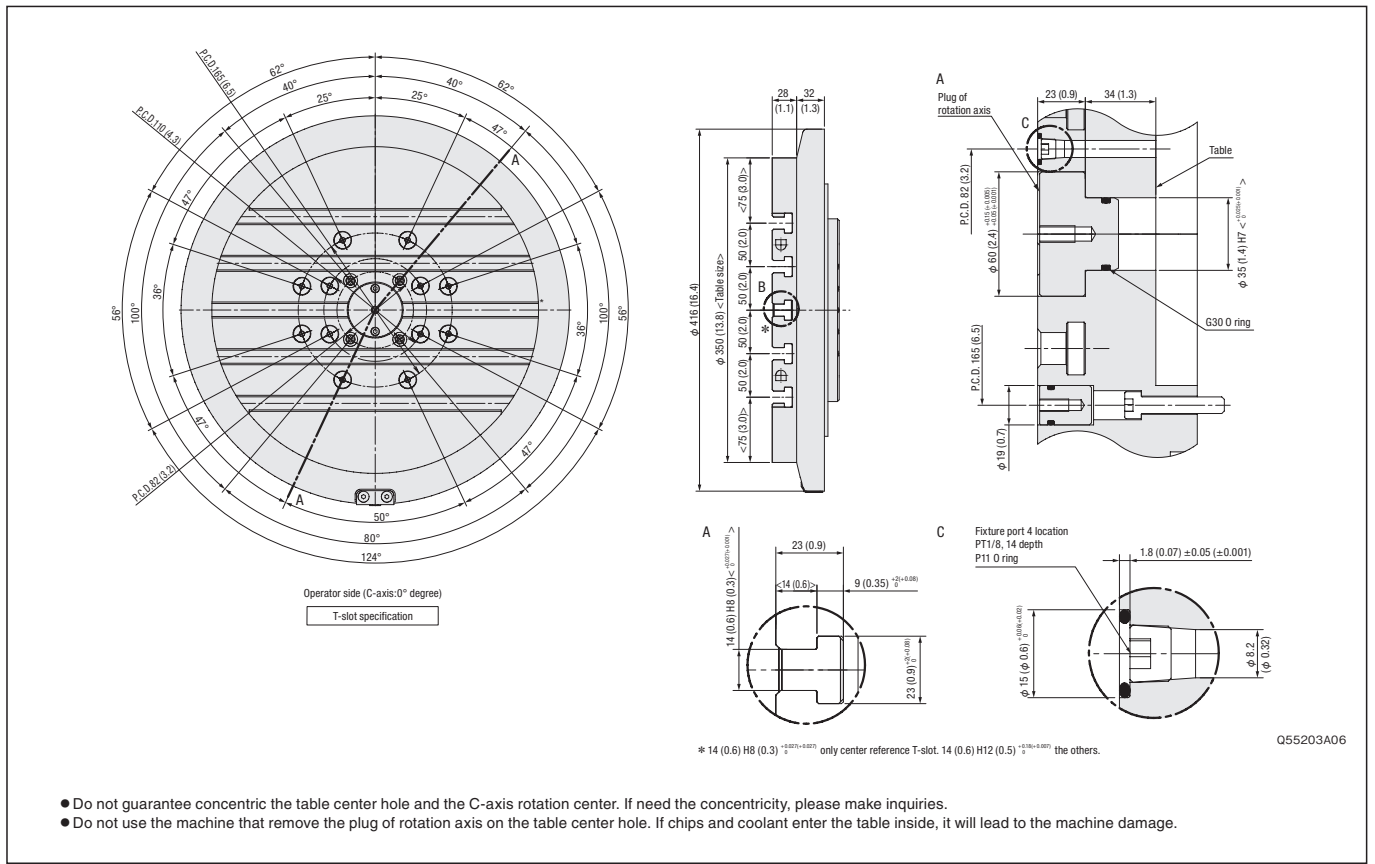
Q81087A04

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

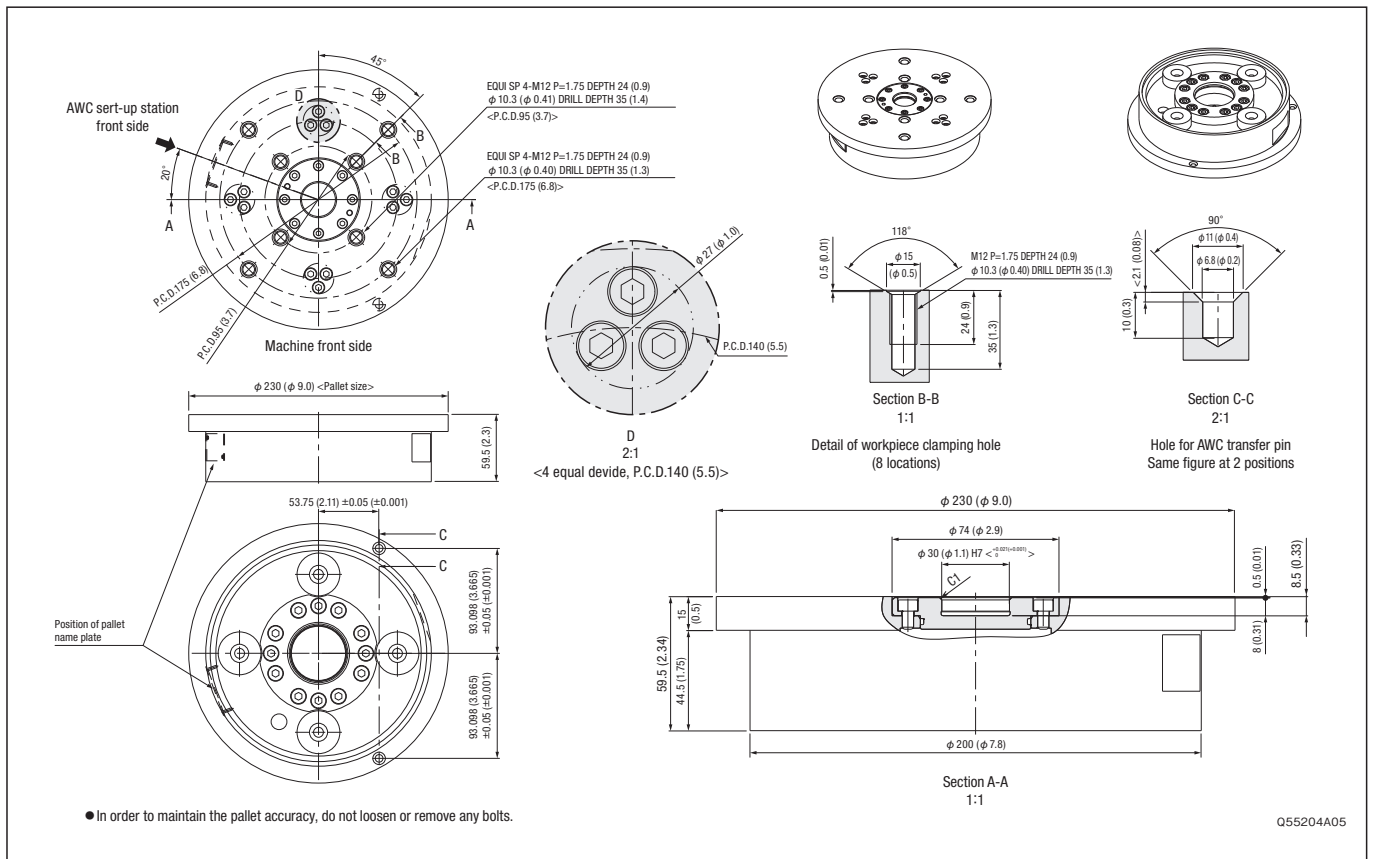
# Table dimension

mm (in.)

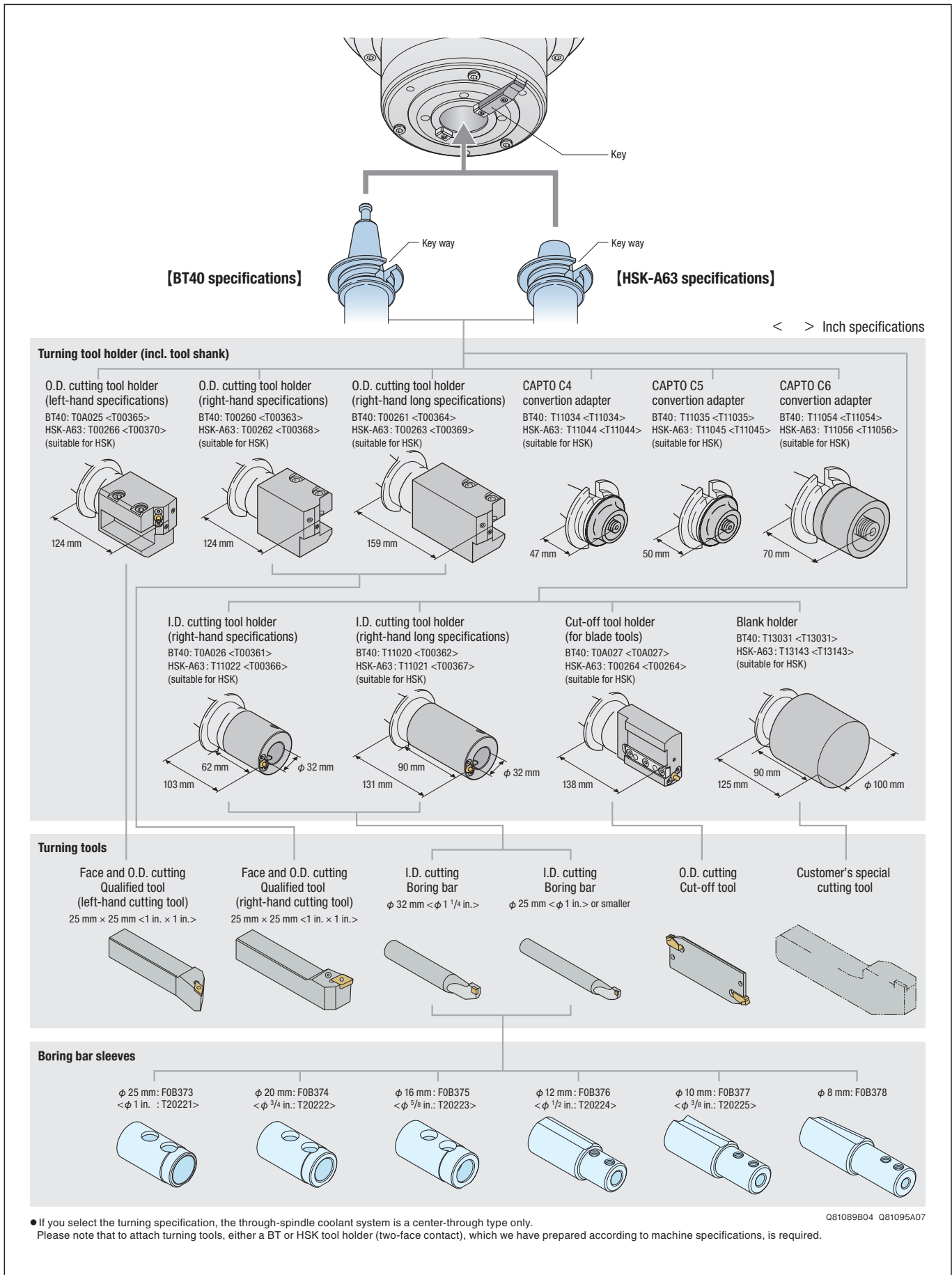


# Pallet dimension diagram

mm (in.)



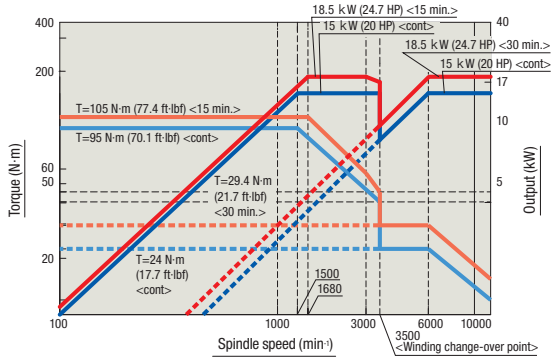
# Installation diagrams



# Spindle speed-torque/Output-rotation speed diagram

## Standard

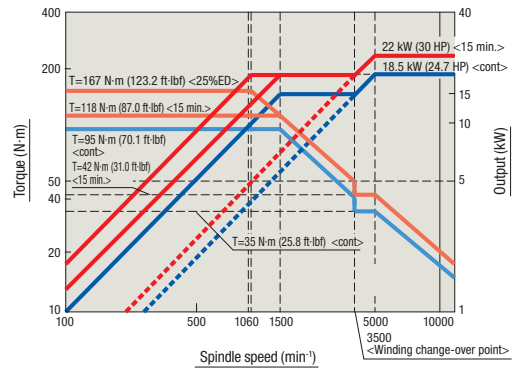
Max. spindle speed: 12,000 min<sup>-1</sup>  
 Spindle drive motor: 18.5/15 kW (24.7/20 HP) <30 min./cont>  
 Max. spindle torque: 105 N·m (77.4 ft·lbf) <15 min.>



Q43424A01

## High output **OP**

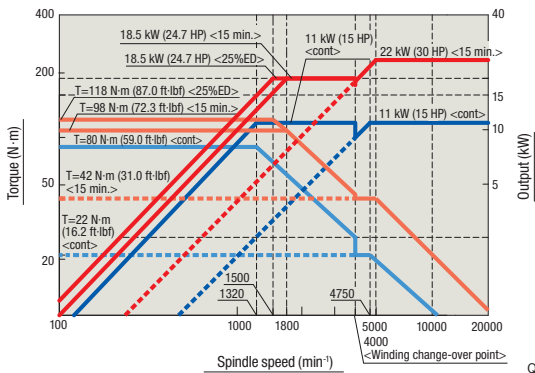
Max. spindle speed: 12,000 min<sup>-1</sup>  
 Spindle drive motor: 22/18.5 kW (30/24.7 HP) <15 min./cont>  
 Max. spindle torque: 167 N·m (123.2 ft·lbf) <25%ED>



Q43425A01

## High-speed **OP**

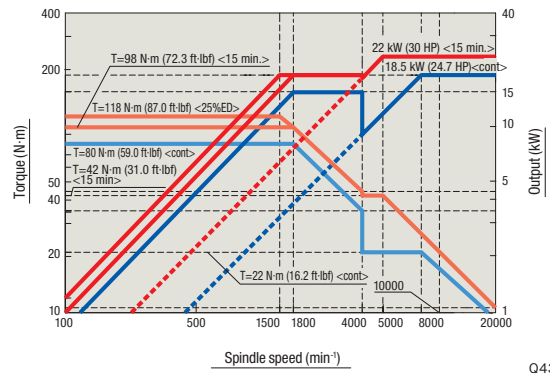
Max. spindle speed: 20,000 min<sup>-1</sup>  
 Spindle drive motor: 22/11 kW (30/15 HP) <15 min./cont>  
 Max. spindle torque: 118 N·m (87.0 ft·lbf) <25%ED>



Q43426B01

## High-speed-High output **OP**

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: 98 N·m (72.3 ft·lbf) <15 min.>

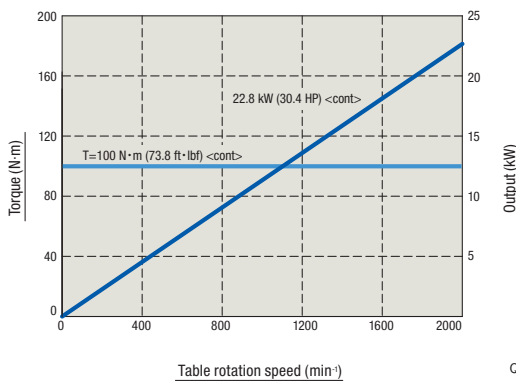


Q43442A01

# Table speed-torque/output-rotation speed diagram

## Turning mode **OP**

Max. table rotation speed: 2,000 min<sup>-1</sup>  
 Table rotation motor: 22.8 kW (30.4 HP) <cont>  
 Max. table torque: 100 N·m (73.8 ft·lbf) <cont>



Q43486A01

# Standard & optional features

● : Standard features ○ : Option

## 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>	○
BT40 (Two-face contact)* <sup>1</sup>	●
DIN40 (Two-face contact)	○
CAT40 (Two-face contact)	○
HSK-A63 (Two-face contact)	○

\*1 When selecting the two-face contact tool specification, be sure to use a two-face contact tool.

## Table

Table	T-slot	●
Table C-axis rotational speed	2,000 min <sup>-1</sup> <Turning specifications>	○

## Pallet/APC

AWC (tapped pallet)* <sup>2</sup>	34 stations/120 stations/114 stations (Flexible)	○
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\*2 Shower coolant (option) and dry anchor (option) are essential.

## Magazine

Tool storage capacity	21 tools (chain-type)	●
	61/91/121/181 tools (chain-type)	○
	160/240/300/320 tools (rack-type)* <sup>3</sup>	○
Type of tool shank	BT40	●
	DIN40	○
	CAT40	○
	HSK-A63	○
Type of retention knob	DMG MORI 90°	●
	45° (MAS-I)/60° (MAS-II)/DIN/Special (center through)	○

\*3 Dry anchor (option) is essential.

## Coolant

Coolant system	●	
Chip flushing coolant	●	
Shower coolant	○	
Oil skimmer	○	
Coolant gun	○	
Through-spindle coolant system (separate type) interface	Center through: 1.5/3.5/7.0 MPa (217.5/507.5/1,015.0 psi)	○
	Side through: 1.5/3.5/7.0 MPa (217.5/507.5/1,015.0 psi)	○
	Center through: 7.0 MPa (1,015.0 psi) <KNOLL>	○
	Side through: 7.0 MPa (1,015.0 psi) <KNOLL>	○
	Center through: 7.0 MPa (1,015.0 psi) <Chip braster>	○
	Side through: 7.0 MPa (1,015.0 psi) <Chip braster>	○
Through-spindle coolant system** <sup>4</sup> (separate type)	Center through: 3.5/7.0 MPa (507.5/1,015.0 psi)	○
	Side through: 3.5/7.0 MPa (507.5/1,015.0 psi)	○
Through-spindle coolant system** <sup>4</sup> (unit on coolant tank)	Center through: 1.5 MPa (217.5 psi)	○
	Side through: 1.5 MPa (217.5 psi)	○
Through-spindle coolant/ air (switching specifications)	○	
Coolant float switch	○	
Oil mist	○	

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

## Coolant

Coolant chiller (separate type)	Optional when using water-soluble coolant	○
	Compulsory when using oil-based coolant (For details, please consult with our sales representative)	○
Coolant cooling system (for through-spindle coolant system)		○
Mist collector interface	HVS-150	○
	AFS-1100* <sup>5</sup>	○
Mist collector	HVS-150 (cannot be used in Europe)	○
	AFS-1100* <sup>5</sup>	○

\*5 Not compatible with oil-based coolant. If using oil-based coolant, select the HVS-150.

## Chip disposal

Air blow* <sup>6</sup>	Tool tip	●
Chip conveyor	Rear discharge, Hinge type + Drum filter type	○
	Rear discharge, Scraper type + Drum filter type	○
	Rear discharge, Magnet scraper type + Drum filter type	○
Chip bucket (for chip conveyor)		○

\*6 When the tool tip air blow is regularly used, air supply of more than 300 L/min (79.2 gpm) is separately required.

## Measurement

In-machine measuring system (spindle)	Touch sensor (optical signal transmission type)	○
In-machine measuring system (table)	Touch sensor (Renishaw)	○

## Improved accuracy

Full closed loop control (Scale feedback)	X, Y, Z-axis	○
	B, C-axis	●


## Automation

Automatic power off device	●
EtherNet/IP interface	○
Automatic door	○

## Other

· Full cover · Door interlock system · Low air pressure detecting switch	●
· Built-in worklight · T-nuts for table slots · Leveling blocks · Hand tools · Signal light 3 layers (LED type: Red, Yellow, Green)	●
Earth leakage breaker	○
Power failure dropping prevention unit	○
Danger sensing device interface (Recommended when oil-based coolant is used or during unmanned operation.)	○
Refrigerating type air dryer	○
Dry anchor	○
Z-axis servo motor detaching shipment	○
Weekly timer	○
External M-code	5/10
Electrical cabinet lighting	○

● The information in this catalog is valid as of January 2018.  
 ● The details given above are subject to change without notice.  
 ● Some options are not available in particular regions.  
 Please contact our sales representative for details.

 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 consult with our sales representative.

# 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		●
Overtravel		●
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)		○

## Program input

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 January 2018.  
○ The details given above are subject to change without notice.



● : Standard ○ : Option ☆ : Consultation is required — : Not applicable

### 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	
USB memory input/output		●
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>	63	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	○	●
I/O Functions and units	Rotary table dynamic fixture offset	○	●
	Fast data server+ Memory card for Data server*1	○	●

\*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		NMV3000 DCG		
<b>Travel</b>	X-axis travel <longitudinal movement of spindle head>	mm (in.)	500 (19.7)	
	Y-axis travel <cross movement of saddle>	mm (in.)	350 (13.8)	
	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.)	150–660 (5.9–26.0) [AWC: 125–635 (4.9–25.0)]	
	B-axis travel		+160° – -180°	
	C-axis travel		360°	
<b>Table</b>	Height from the floor to the upper face of the table (Pallet)	mm (in.)	850 (33.5) [AWC: 875 (34.4)]	
	Table (Pallet) working surface	mm (in.)	φ 350 (φ 13.8) [AWC: φ 230 (9.1)]	
	Table (Pallet) loading capacity	kg (lb.)	100 (220) [AWC: 80 (176)]	
	Table (Pallet) surface configuration		14 mm (0.6 in.) T-slot × 5 [AWC: Tap M12×8]	
	Max. workpiece swing diameter	mm (in.)	φ 350 (φ 13.7)	
	Max. workpiece height	mm (in.)	300 (11.8)	
	Rotational speed of the table	B-axis C-axis	min <sup>-1</sup> min <sup>-1</sup>	50 150 [2,000]
<b>Spindle</b>	Max. spindle speed	min <sup>-1</sup>	12,000 [20,000]	
	Type of spindle taper hole		No. 40 [HSK-A63]	
<b>Feedrate</b>	Rapid traverse rate	mm/min (ipm)	X, Y: 50,000 (1,968.5) Z: 40,000 (1,574.8)	
	Cutting feedrate	With AI contour control	mm/min (ipm)	X, Y: 50,000 (1,968.5) Z: 40,000 (1,574.8)
			min <sup>-1</sup>	B: 50 C: 150
		Without AI contour control	mm/min (ipm)	X, Y, Z: 6,000 (236.2)
			min <sup>-1</sup>	B, C: 16.66
Jog feedrate	mm/min (ipm)	min <sup>-1</sup>	X, Y, Z: 0–5,000 (0–196.9) B, C: 0–13.88	
<b>ATC</b>	Type of tool shank		BT40* [CAT40] [DIN40] [HSK-A63]	
	Type of retention knob		DMG MORI 90° [45° (MAS-I)] [60° (MAS-II)]	
	Tool storage capacity		21 [61] [91] [121] [160] [181] [240] [300] [320]	
	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 mass moment		N·m (ft·lbf)	11 (8.1)
	Method of tool selection			Fixed address
Tool changing time	Tool-to-tool	sec.	1.8	
<b>Motors</b>	Spindle drive motor	12,000 min <sup>-1</sup>	kW (HP)	18.5/15 (24.7/20) <30 min./cont>
		[12,000 min <sup>-1</sup> <high output>]	kW (HP)	[22/18.5 (30/24.7) <15 min./cont>]
		[20,000 min <sup>-1</sup> <high-speed>]	kW (HP)	[22/11 (30/15) <15 min./cont>]
		[20,000 min <sup>-1</sup> <high-speed-high output>]	kW (HP)	[22/18.5 (30/24.7) <15 min./cont>]
	Feed motor		kW (HP)	X: 4 (5.3) Y: 3 (4.0)×2 Z: 3 (4.0)×2
	B-axis table	50 min <sup>-1</sup>	kW (HP)	6.5 (8.7)
	C-axis table	150 min <sup>-1</sup> [2,000 min <sup>-1</sup> ]	kW (HP)	3.5 (4.7) [26 (34.7)]
Coolant pump motor		kW (HP)	2.2 (3)	
<b>Power sources (Standard)</b>	Electrical power supply <cont>	194372A01 kVA	35.1	
	Compressed air supply	MPa (psi), L/min (gpm)	0.5 (72.5), 500 (132.0) <ANR>	
<b>Tank capacity</b>	Coolant tank capacity	L (gal.)	750 (198.0)	
<b>Machine size</b>	Machine height <From floor>	mm (in.)	3,250 (128.0)	
	Floor space <Width × Depth>	mm (in.)	2,339×3,820 (92.1×150.4) <excluding chip conveyor>	
	Mass of machine	kg (lb.)	9,400 (20,680)	
<b>Noise data</b>	A-weighted, time-average radiated sound pressure level	dB	57–73 (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 dual contact tool when using a No. 40 taper spindle at 15,000 min<sup>-1</sup> 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 NMV3000 DCG machine with a maximum spindle speed of 12,000 min<sup>-1</sup>. For details, please consult with our sales representative.

● The information in this catalog is valid as of January 2018.



## <Precautions for Machine Relocation>

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### 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.

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+ DCG, DDM, ORC, speedMASTER, powerMASTER, 5X-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 January 2018. 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.

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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, Shiomis, 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

The logo for DMG MORI, with "DMG" in green and "MORI" in red, both in a bold, sans-serif font.