

High-Precision, 5-Axis Control Vertical Machining Center

NMV1500 DCG
NMV1500 DCG HSC

NMV1500 DCG



The best suited machine for high-speed, 5-axis machining

The NMV1500 DCG HSC is the smallest model in the Series and is specialized in high-speed 5-axis machining. With the spindle, 5-axis feed systems and table height optimally designed for high-speed 5-axis machining, the machine can complete machining of a 50-mm-diameter turbo charger impeller for automobiles (see the photo on the front cover) in 100 seconds or less.

This machine is the best suited for complex-shaped impellers that require high-speed machining and take time to be machined, as well as high-speed and high-precision machining of crowns and complex parts of semiconductor manufacturing equipment and communication equipment.



NMV1500 DCG HSC

Features of machine

Basic structure

Travel

Spindle

X-axis **420 mm** (16.5 in.)

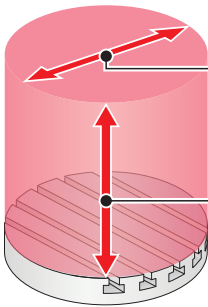
Y-axis **210 mm** (8.3 in.)

Z-axis **400 mm** (15.7 in.)

Table

B-axis **+160° — -180°**

C-axis **360°**



Max. workpiece swing diameter

φ 250 mm (φ 9.8 in.)

Max. workpiece height

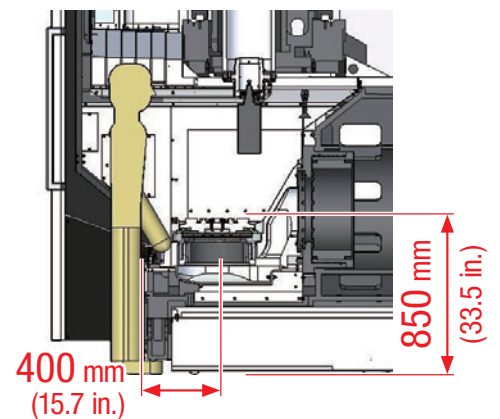
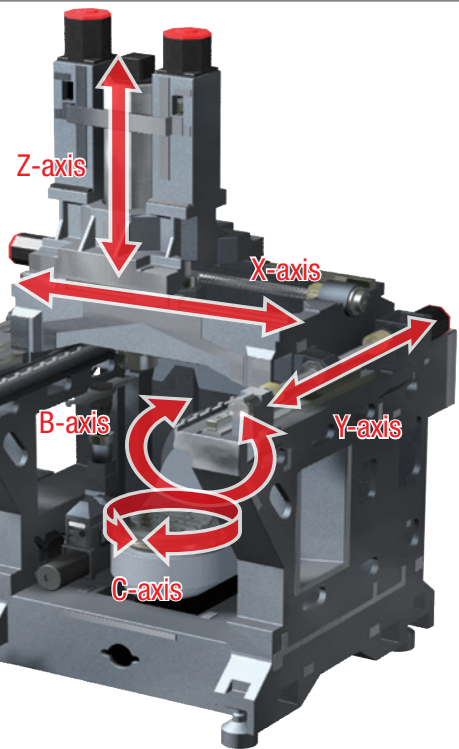
250 mm (9.8 in.)

Table loading capacity

50 kg (110 lb.)

Access to the table

The overhead crane can be brought to the table center. The distances from the front of the machine to the center of the table (400 mm <15.7 in.>) as well as from the floor to the table surface (850 mm <33.5 in.>) are optimally designed for easy loading and unloading of workpieces.



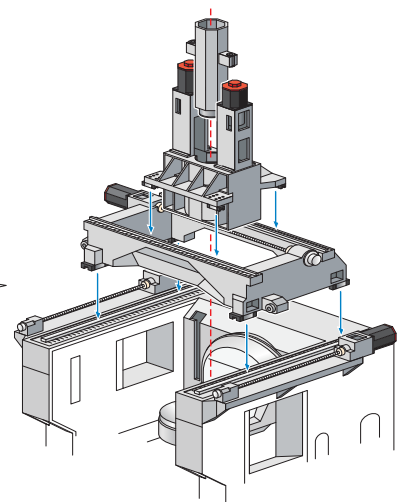
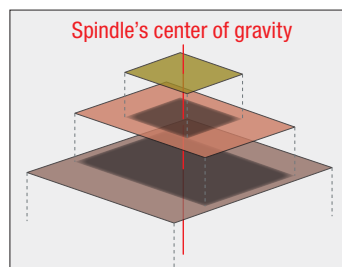
Top Box-in-Box Construction

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



Spindle

The high-speed, high-output spindle <42,000 min⁻¹, 15.5 kW (20.7 HP)> provided as standard allows the machine to perform a wide range of machining from high-speed machining to heavy-duty cutting.

■ Max. spindle speed

42,000 min⁻¹

■ Spindle output

15.5/14.7/13.5 kW (**20.7/19.6/18.0** HP)
(S6-40% <2 min.>/S6-60% <2 min.>/cont)*

12,000 min⁻¹ OP

7.5/5.5 kW (**10/7.5** HP) (30 min./cont) OP

20,000 min⁻¹ OP

7.5/5.5 kW (**10/7.5** HP) (25%ED/30 min./cont) OP

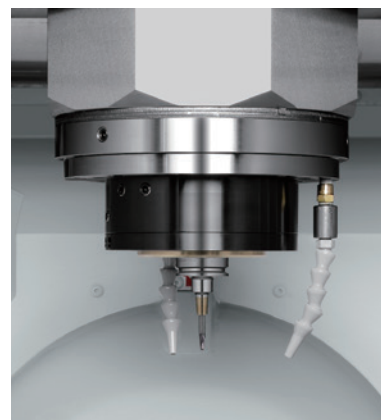
60,000 min⁻¹ OP

9.6/8.5/7.4 kW (**12.8/11.3/9.9** HP)
(S6-40% <2 min.>/S6-60% <2 min.>/cont)* OP

* "S6-40% (2 min.)" is a continuous running cycle.

The spindle can cut at the rated power for 48 seconds & then must run with no load for 72 seconds.

● If you select a spindle speed of 12,000 min⁻¹, the machine name will be the NMV1500 DCG.



Table

■ B-axis max. rotational speed

50 min⁻¹

■ C-axis max. rotational speed

150 min⁻¹

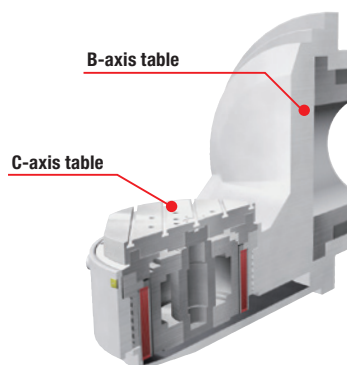
3,000 min⁻¹* OP
(Turning specifications)

■ Table working surface

φ 250 mm (φ **9.8** 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.



* Max. spindle speed: 12,000 min⁻¹, 20,000 min⁻¹

● 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.

Original technology

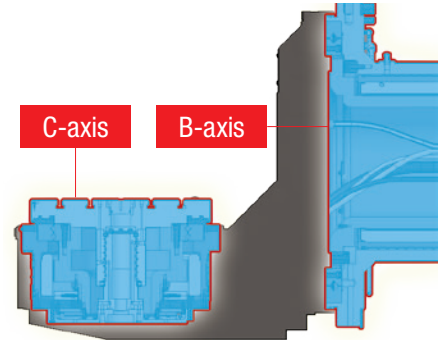
Direct Drive Motor



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 **0.37 G** {3.6 m/s²}

Y-axis **0.38 G** {3.7 m/s²}

Z-axis **2.12 G** {20.8 m/s²}

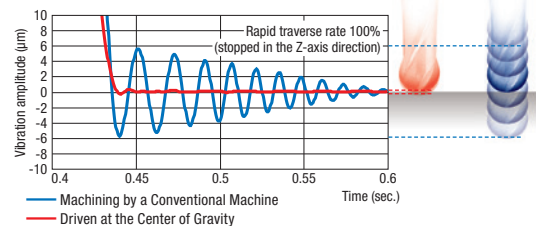
Effects of DCG

- 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.

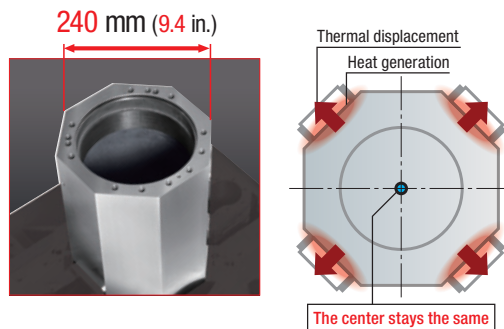
Residual vibration comparison



Octagonal Ram Construction



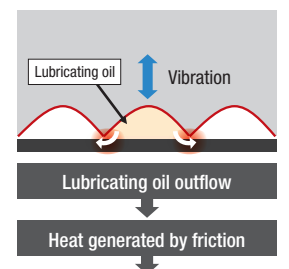
The 4 guideways are located diagonally from each other, so they distort symmetrically in response to the heat generated by high-speed travel. This means that the center stays in the same position, offering high-speed, high-precision feed.



Effects of ORC

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

Square guides' excellent damping characteristics

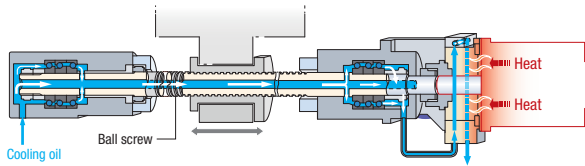


The lubricating oil in the oil pockets which were made by scraping is forced in and out through the gaps because of the contact pressure caused by vibration, generating heat. Vibration is reduced by converting vibrational energy into heat energy. This helps control chattering caused by vibration.

High-precision equipment

Ball screw core cooling

The ball screw core cooling system circulates cooling oil through the support bearings, maintaining high-precision machining.



Direct scale feedback



Magnescape

Resolution

0.01 μm

An absolute magnetic linear scale (full closed-loop control) made by Magnescape is equipped as standard to offer high-precision positioning.

- High accuracy, high resolution
- Greater accuracy than optical scale

- Highly resistant to condensation and oil
- Vibration and impact resistant characteristics

● X-, Y-, Z-axis: Option

Coolant cooling system (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.

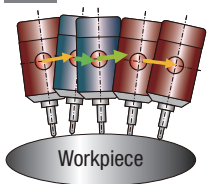


SVC function (Standard feature for F31iA5)

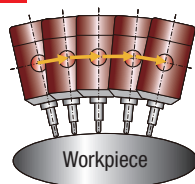
The SVC function, in which the program commands for tool tip control are read in advance and compensation is automatically applied to achieve smooth tool feed, is equipped as standard. By combining this function with DDM (Direct Drive Motor), the machine offers greatly improved surface quality and reduced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

Motion of the SVC function

OFF



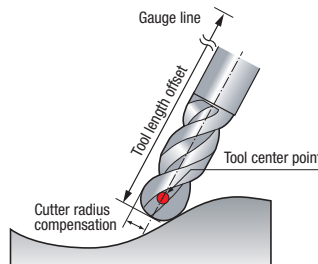
ON



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/Cutting point command* (Standard features for F31iA5)

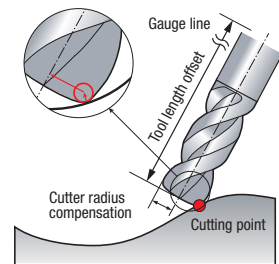


Tool center point control

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 is available as standard for the turning specification only.



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.

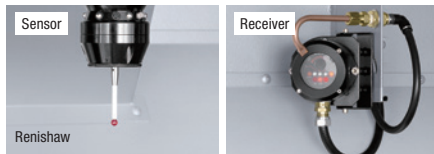
Peripheral equipment

In-machine measuring system

OP

Spindle

Optical type



Automatic

- Centering
- Measurement

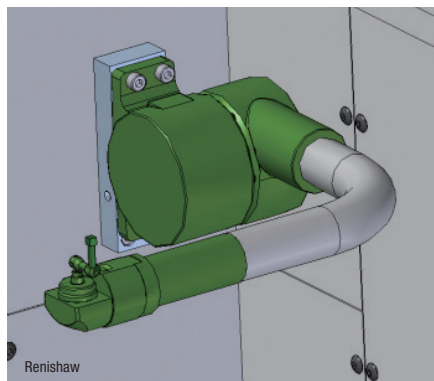
Manual

The workpiece setter function can be added **OP**

Workpiece zero point setting and centering are possible

Table

Touch sensor



Automatic

- Tool length measurement
- Tool breakage detection

Manual

The tool setter function can be added **OP**

Allows tool length offset and tool diameter offset

<Turning specifications>

Automatic

- Tool length measurement
- Tool breakage detection

Manual

Allows tool length offset and tool diameter offset

<Turning specifications>

Manual

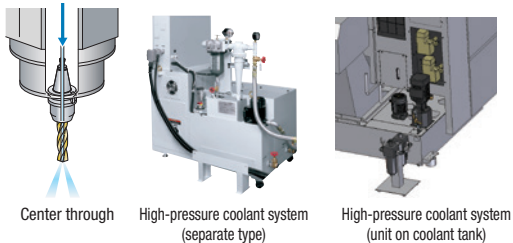
Allows tool geometry offset

● The tool setter function is included.

Through-spindle coolant system

OP

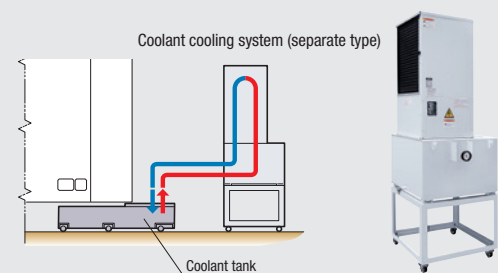
The through-spindle coolant system effectively eliminates chips, cooling the machine point and lengthening the lives of your tools.



Recommended equipment

Coolant cooling system (separate type)

The high-pressure coolant system generates a lot of heat because it discharges coolant at high pressure. The coolant cooling system 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.



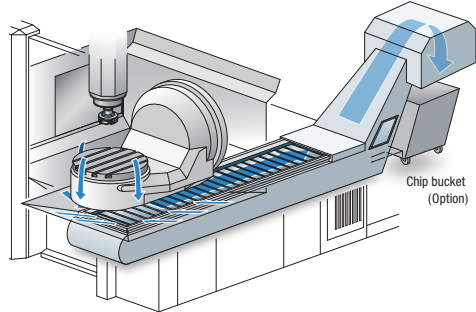
External chip conveyor

OP

Available specifications	Workpiece material and chip size ○: Possible ×: Not suitable						
	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	○	○	×	○	○

Chip size guidelines

Short: Chips shorter than 50 mm (2.0 in.), blocks of chips shorter than ϕ 40 mm (ϕ 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.

AWC

OP

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

Allows long-term unmanned operation

Shortened Setup times



• Photo: NMV3000 DCG

■ AWC size (Width × Depth)

1,498 mm × 2,140 mm (59.0 in. × 84.3 in.)

■ Workpiece size

		NMV1500 DCG HSC					
AWC		Stations	34	96	90 (flexible) *1		
Max. workpiece diameter	Without adjacent workpieces	mm (in)	ϕ 250 (ϕ 9.8)	—	ϕ 250 (ϕ 9.8)		—
	With adjacent workpieces	mm (in)	—	ϕ 200 (ϕ 7.8)	—		ϕ 200 (ϕ 7.8)
Max. workpiece height		mm (in)	250 (9.8)	150 (5.9) *2	250 (9.8)	150 (5.9)	250 (9.8) *3 150 (5.9) *4
Workpiece mass		kg (lb)	50 (110)	50 (110)	50 (110)		

- *1 When the workpiece size is ϕ 200×150 mm (ϕ 7.8×5.9 in.), the 90-station AWC can hold up to 90 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 114 mm (4.5 in.) or more.
*3 There are restrictions on the shape of the workpiece when the height is 100 mm (3.9 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.

MAPPS IV

High-Performance Operating System
for Machining Centers



● 19-inch operation panel

High-performance operating 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
- ▶ Enhanced functionality by using CAM software
- ▶ New 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 SEIKI's remote maintenance service solves it smoothly **MORI-NET Global Edition Advance**

Outstanding operability

Vertical soft-keys

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

Keyboard

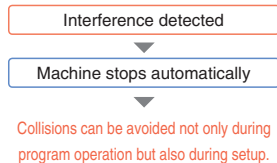
A PC-type keyboard is used as standard, making key input easy. A keyboard with a conventional key layout is also available as an option.



Functions for multi-axis machining

3D interference checking function

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

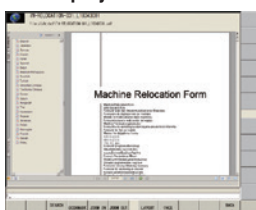


- The 3D interference checking function will check for interference accurately as long as the 3D model exactly matches the actual configuration of the spindles, tables, tools, workpieces and fixtures.
- Customized design is required for special shape. For details, please refer to the description of "3D 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.

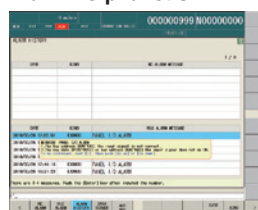
Improved ease of setup and maintenance

MAPPS IV is packed with new functions for easier setup and maintenance, including the File Display and Memo function that displays operating instructions and manuals on the screen and the Alarm help function that provides instructions when alarms occur.

File display and Memo function



Alarm help function



Faster creation of programs

CAM software

ESPRIT® allows you to create complex 3D programming with high-added value. By just installing the software on your PC with connection to LAN, you will be able to use it. (Once the software is started on the computer, it can be used for up to 7 days without LAN connection.)

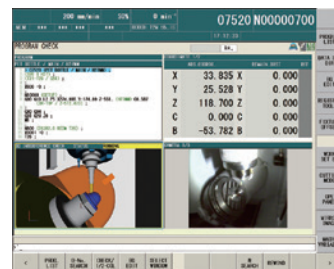
- Postprocessor as standard
- CAM software will be ready to use once your machine is installed
- Cost for introducing CAM software can be saved
- ESPRIT® data can be modified on the machine (through Remote Desktop connection*)
- The software can be installed on multiple PCs on the network (It cannot be simultaneously started up on more than one PC)
- 2-year warranty support (including free update)

* Applicable Operating Systems: Windows Vista Business/Ultimate, Windows 7 Professional/Ultimate
● A PC is required to use ESPRIT®. Please prepare PCs by yourself.

Improved work efficiency

Fixed-point in-machine camera **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)

Machine specifications

Item			NMV1500 DCG HSC	
Travel	X-axis travel <longitudinal movement of spindle head>	mm (in.)	420 (16.5)	
	Y-axis travel <cross movement of saddle>	mm (in.)	210 (8.3)	
	Z-axis travel <vertical movement of ram>	mm (in.)	400 (15.7)	
	Distance from table surface to spindle gauge plane <horizontal table position>	mm (in.)	100–500 (3.9–19.7)	
	B-axis travel		+160°––180°	
	C-axis travel		360°	
Table	Height from the floor to the upper face of the table	mm (in.)	850 (33.5) <Standard>	
	Table working surface	mm (in.)	φ 250 (φ 9.8)	
	Table loading capacity	kg (lb.)	50 (110)	
	Table surface configuration		12 mm (0.5 in.) T-slot×8 <radial arrangement>	
	Max. workpiece swing diameter	mm (in.)	φ 250 (φ 9.8)	
	Max. workpiece height	mm (in.)	250 (9.8)	
	Rotational speed of the table	B-axis	50	
		C-axis	150 [3,000]	
Spindle	Max. spindle speed	min ⁻¹	42,000 [12,000] [20,000] [60,000]	
	Type of spindle taper hole		HSK-E40 [HSK-A40 (12,000 min ⁻¹ , 20,000 min ⁻¹)] [HSK-E32 (60,000 min ⁻¹)]	
Feedrate	Rapid traverse rate	mm/min (ipm)	X: 50,000 (1,968.5) Y: 45,000 (1,771.7) Z: 40,000 (1,574.8)	
	Cutting feedrate	mm/min (ipm)	X: 50,000 (1,968.5) Y: 45,000 (1,771.7) Z: 40,000 (1,574.8)	
		min ⁻¹	B: 50 C: 150	
		mm/min (ipm)	X, Y, Z: 6,000 (236.2)	
		min ⁻¹	B, C: 16.67	
	Jog feedrate	mm/min (ipm)	X, Y, Z: 0–5,000 (0–196.9)	
		min ⁻¹	B, C: 0–13.88	
ATC	Type of tool shank		HSK-E40 [HSK-A40 <12,000 min ⁻¹ , 20,000 min ⁻¹ >] [HSK-E32 <60,000 min ⁻¹ >]	
	Tool storage capacity		21 [61] [121]	
	Max. tool diameter	With adjacent tools	mm (in.) φ 52 (φ 2.0) [φ 52 (φ 2.0) <12,000 min ⁻¹ , 20,000 min ⁻¹ >] [φ 30 (φ 1.1) <60,000 min ⁻¹ >]	
		Without adjacent tools	mm (in.) φ 52 (φ 2.0) [φ 65 (φ 2.5) <12,000 min ⁻¹ , 20,000 min ⁻¹ >] [φ 30 (φ 1.1) <60,000 min ⁻¹ >]	
	Max. tool length	mm (in.)	200 (7.8)	
	Max. tool mass	kg (lb.)	2 (4.4) [2 (4.4) <12,000 min ⁻¹ , 20,000 min ⁻¹ >] [1 (2.2) <60,000 min ⁻¹ >]	
	Max. tool mass moment	N·m (ft·lbf)	1.8 (1.32) [1.8 (1.32) <12,000 min ⁻¹ , 20,000 min ⁻¹ >] [0.8 (0.59) <60,000 min ⁻¹ >]	
	Method of tool selection		Fixed address	
Motors	Spindle drive motor	42,000 min ⁻¹	kW (HP)	15.5/14.7/13.5 kW (20.7/19.6/18.0 HP) <S6-40% <2 min.>/S6-60% <2 min.>/cont> *
		[12,000 min ⁻¹]	kW (HP)	[7.5/5.5 (10/7.5) <30 min. /cont>]
		[20,000 min ⁻¹]	kW (HP)	[7.5/5.5 (10/7.5) <25%ED/30 min. /cont>]
		[60,000 min ⁻¹]	kW (HP)	[9.6/8.5/7.4 (12.8/11.3/9.9) <S6-40% <2 min.>/S6-60% <2 min.>/cont> *]
	Feed motor		kW (HP)	X: 3 (4.0) Y: 3 (4.0)×2 Z: 2.5 (3.3)×2
	B-axis table	50 min ⁻¹	kW (HP)	5.2 (6.9)
	C-axis table	150 min ⁻¹	kW (HP)	3.2 (4.3)
		[3,000 min ⁻¹]	kW (HP)	[22 (30) <12,000 min ⁻¹ , 20,000 min ⁻¹ >]
Power sources (Standard)	Coolant pump motor		kW (HP)	1.2 (1.6)
	Electrical power supply <cont>	I94271B05	kVA	42.1
Tank capacity	Compressed air supply	MPa (psi), L/min (gpm)	0.5 (72.5), 500 (132.0) <ANR>	
	Coolant tank capacity	L (gal.)	550 (145.2)	
Machine size	Machine height <From floor>	mm (in.)	2,820 (111.0) [2,856 (112.4) <60,000 min ⁻¹ >]	
	Floor space <Width × Depth>	mm (in.)	1,995×3,190 (78.5×125.6) <excluding chip conveyor>	
	Mass of machine	kg (lb.)	7,500 (16,500)	
Noise data	A-weighted, time-average radiated sound pressure level	dB	61–73 (measurement uncertainty is 4 dB)	

[] Option

* "S6-40% (2 min.)" is a continous running cycle. The spindle can cut at the rated power for 48 seconds & then must run with no load for 72 seconds.

● If you select a spindle speed of 12,000 min⁻¹, the machine name will be the NMV1500 DCG.

● 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.

● 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 selecting the two-face contact tool specification, be sure to use a two-face contact tool.

● 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 NMV1500 DCG HSC machine with a maximum spindle speed of 40,000 min⁻¹.

For details, please consult with our sales representative.

● The information in this catalog is valid as of January 2014.

NMV1500 DCG (130619)

DMG MORI

2-year warranty, twice the peace of mind.

For machines delivered outside of Japan, parts relating to machine breakdown will be guaranteed free for 2 years from the date of installation, and labor costs to repair will be free for 1 year. Please contact our sales representative for details.



<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 SEIKI or its distributor representative. DMG MORI SEIKI 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 SEIKI and its distributor representative shall have no obligation to re-enable such Equipment. DMG MORI SEIKI 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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- If you have any questions regarding the content, contact our sales representative.
- The information in this catalog is valid as of January 2014. 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 SEIKI is not responsible for differences between the information in the catalog and the actual machine.

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