DMG MORI

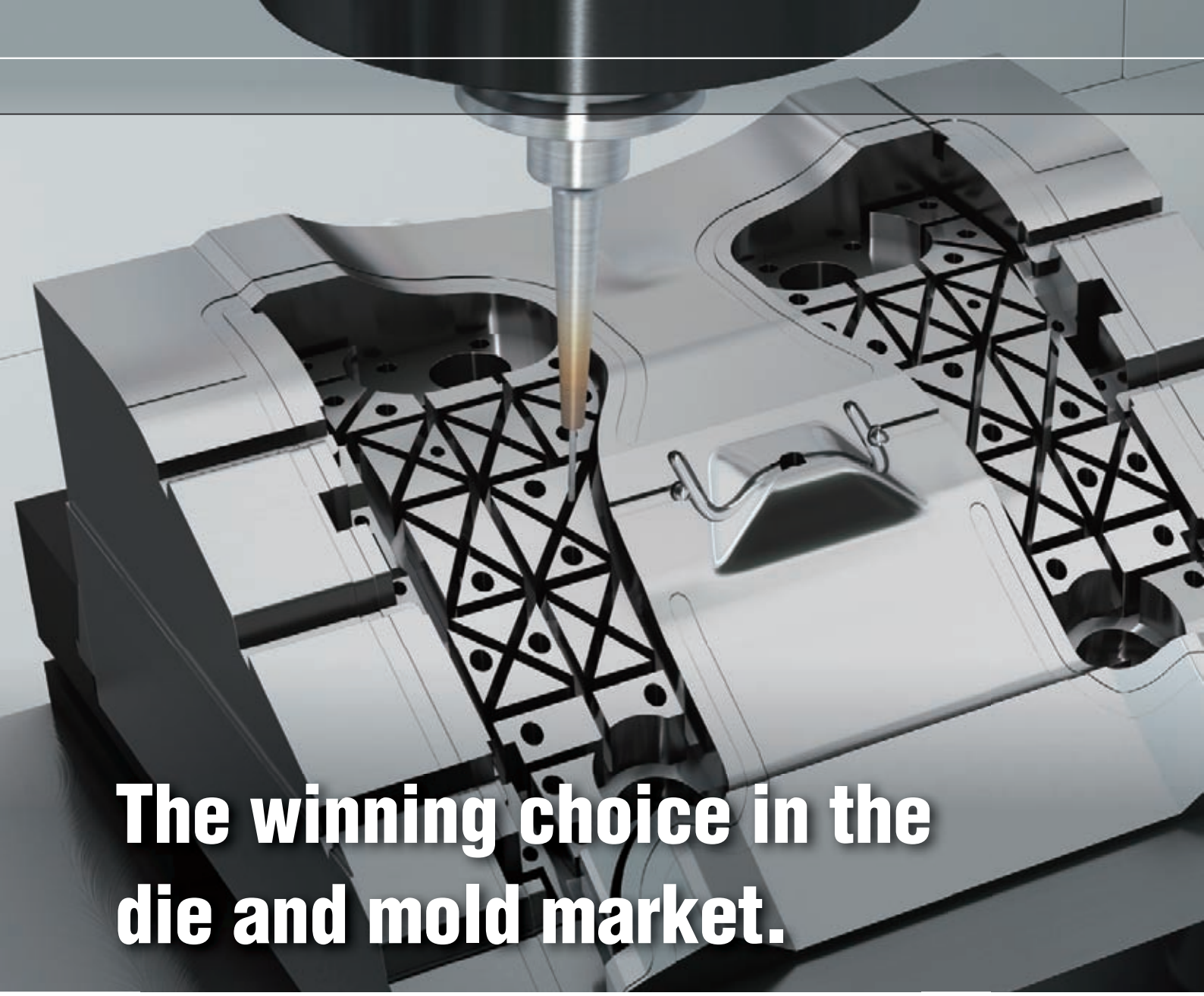
NVD6000 DCG HSC

Machining Center

High-Precision Vertical Machining Center for Die & Mold Manufacturers

NVD6000 DCG
NVD6000 DCG HSC

HSC: High Speed Cutting



The winning choice in the die and mold market.

High-Precision Vertical Machining Center for Die & Mold Manufacturers

Equipped with a No. 40 taper spindle

NVD6000 DCG
NVD6000 DCG HSC

DCG®
Driven at the Center of Gravity

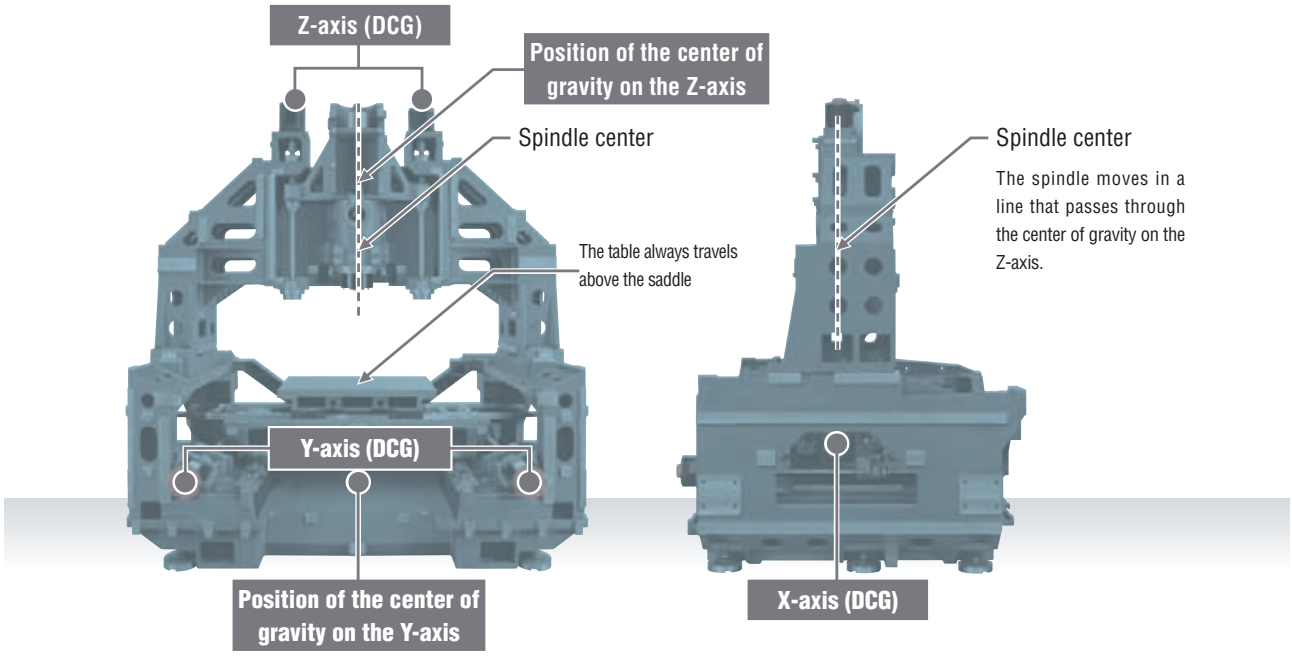
Global competition in the die and mold market is getting fiercer than ever. In order to create dies and molds with greater value for our customers, DMG MORI SEIKI has developed the next-generation die and mold machine tool. The machine uses DMG MORI SEIKI's unique technology – DCG (Driven at the Center of Gravity). This original technology, which minimizes tool tip vibration, creates high-quality machined surfaces. The NVD6000 DCG high-precision vertical machining center for die and mold machining. The winning choice for this growing market is right here.

● Figures in inches were converted from metric measurements.

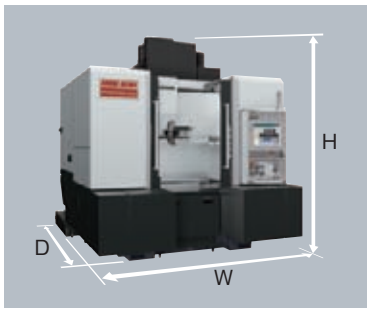
Features of machine

Structure

The NVD6000 DCG incorporates the DCG on all axes.
Also, DMG MORI SEIKI's original structure made it possible to eliminate spindle and table overhang.



Machine size



NVD6000 DCG

Width : 3,230 mm (127.2 in.)

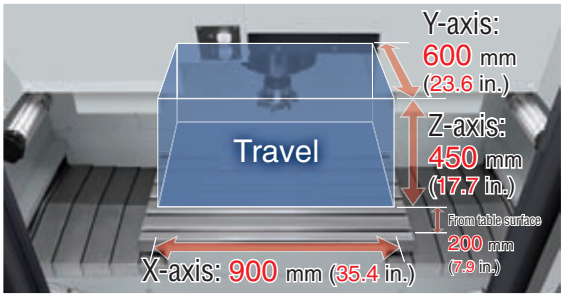
Depth : 4,189 mm (164.9 in.)

Height : 3,015 mm (118.7 in.)

● Including oil cooler (separate type)

Working area

Despite its compact body, the NV6000 DCG ensures a large work envelope suitable for various workpieces.



■ **Table working surface**

1,000×600 mm
(39.4×23.6 in.)

■ **Table loading capacity**

800 kg (1,760 lb.)

■ Rapid traverse rate X, Y and Z axes: 20 m/min (787.4 ipm) ····· P4

■ Max. spindle speed: 12,000 min^{-1} (**NVD6000 DCG**) 20,000 [30,000] min^{-1} (**NVD6000 DCG HSC**) ····· P4

[ ] Option

Original technology, Mechanism

Driven at the Center of Gravity

DCG®
Driven at the Center of Gravity

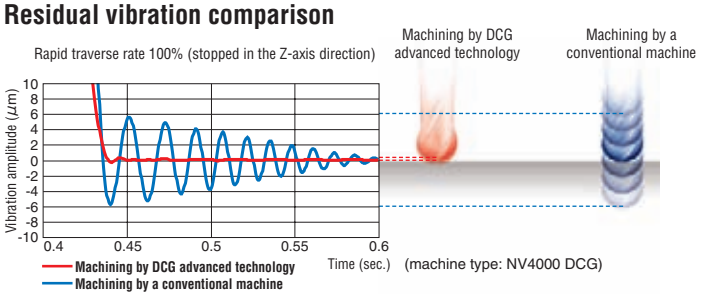
The 24th Technology Development Award from the Japan Society for Precision Engineering

Our DCG (Driven at the Center of Gravity) 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.

Vibration controlled

For positioning, machines with DCG virtually eliminate vibration, while machines without DCG continue to vibrate for a long time. DCG 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



(machine type: NV4000 DCG)

Machining by DCG advanced technology

Machining by a conventional machine

DCG effect

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

■ Rapid traverse rate <X, Y and Z axes>

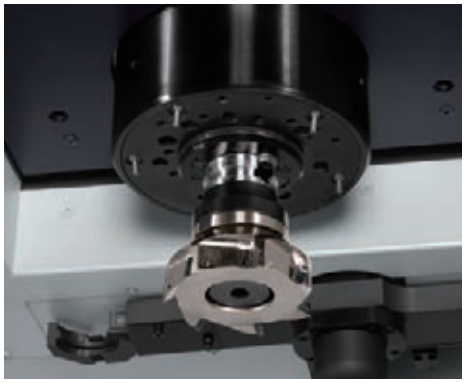
20 m/min (787.4 ipm)

■ Feedrate <X, Y and Z axes>

20 m/min (787.4 ipm)

(with AI contour control <theoretical value>)

Spindle



Equipped with the two-face contact specification that improves both the machining capability and machining accuracy as standard.

■ Max. spindle speed

NVD6000 DCG

12,000 min^{-1}

NVD6000 DCG HSC

20,000 min^{-1} 30,000 min^{-1} OP

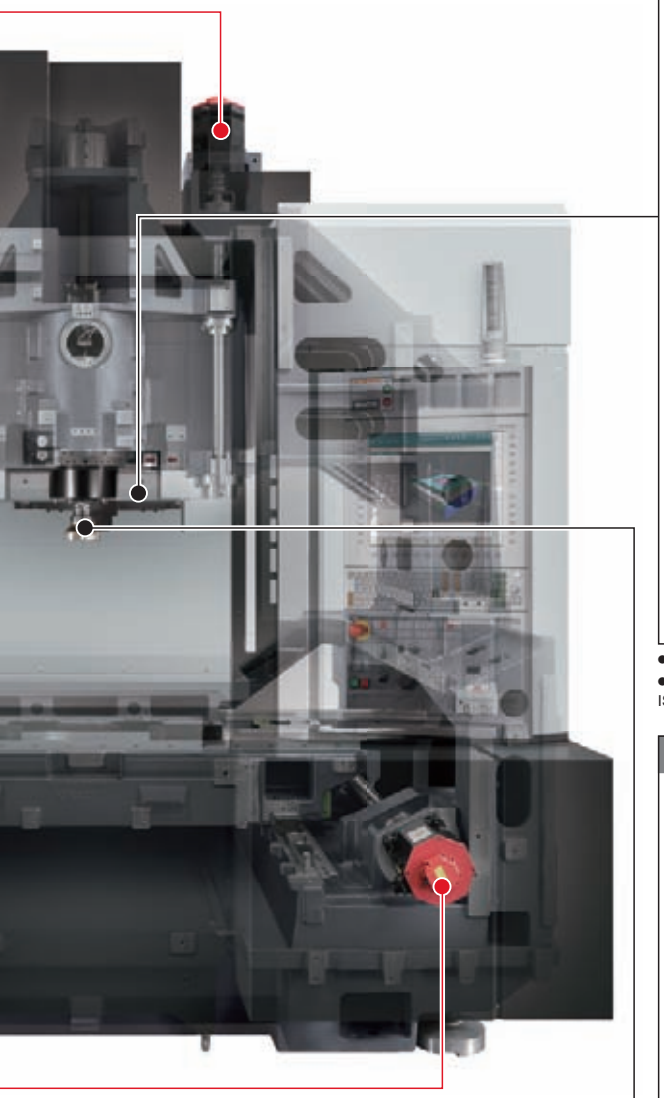
■ Tool clamp power

Previous model

9,800 N (2,203.0 lbf) ▶ 13,500 N (3,034.8 lbf)

Compared against previous model

Approx. 1.4 stronger



ATC

By using the ATC, which allows high-speed tool change, non-cutting time is dramatically reduced.

■ Tool changing time

20 tools

Cut-to-cut (chip-to-chip)

<ISO>
5.9 sec. (max.)
4.2 sec. (min.)

<MAS>
4.3 sec.

Tool-to-tool
1.6 sec.

- Without ATC shutter
- ISO 10791-9, JIS B6336-9

- The time differences are caused by the different conditions (travel distances, etc) for each standard.
- Depending on the arrangement of tools in the magazine, the cut-to-cut (chip-to-chip) time may be longer.

ISO: International Organization for Standardization JIS: Japanese Industrial Standard

Magazine

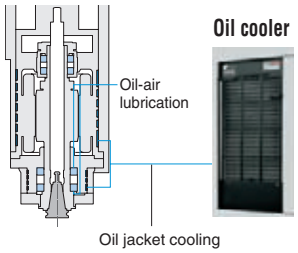
Adopting tool magazines with an original space-saving design.

■ Tool storage capacity

20 tools
40 tools OP
60 tools OP

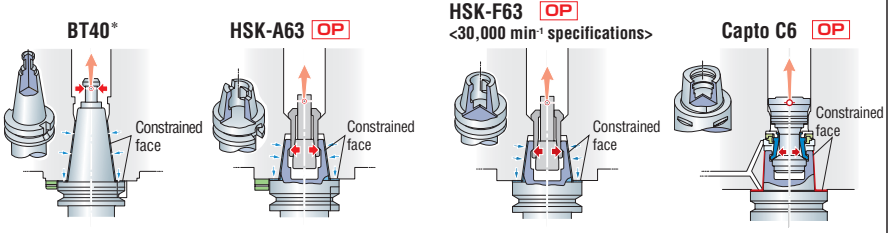
Spindle cooling

Stator coil in DDS motor: the coolant supplied by the oil cooler minimizes heat diffusion by circulating through an oil jacket, which is placed around the stator coil.



Two-face contact specifications

Tool rigidity has been improved by contact of both the spindle taper and the tool flange.
This extends the useful life of a tool, raises cutting power and improves the machining precision.



*When the two-face contact specification is selected, a two-face contact tool and other tools cannot be used together.

- See the page 14 for details.
- All DMG MORI SEIKI spindles are made in-house to better meet our customer needs. For details, please consult with our sales representative.

HSC: High Speed Cutting

Loaded with functions and features to achieve high-accuracy machining as standard

Cooling of the motor bracket

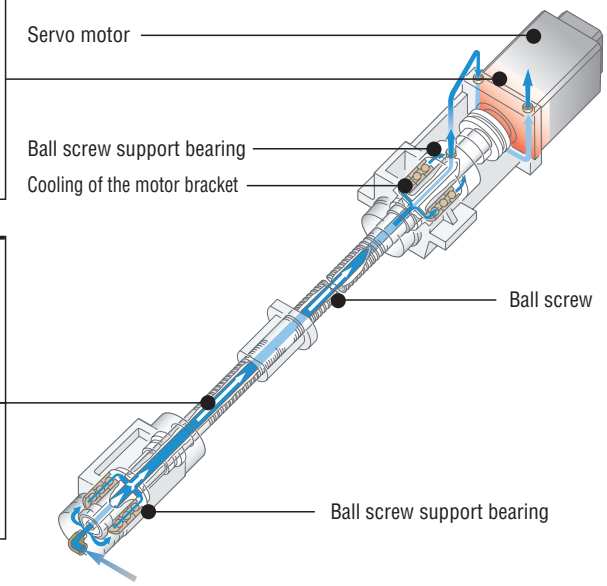
We have reduced the thermal displacement from the motor to the casting body by passing coolant through the motor base. This is standard on all axes - X-axis (saddle), Y-axis (bed), and Z-axis (columns).

Ball screw shaft cooling

The ball screw core cooling system in which cooling oil circulates through support bearings is adopted to maintain high positioning accuracy by suppressing the displacement due to generated heat.

High-rigidity double-anchor support

As well as ball screw core cooling, it uses a double-anchor support for highly rigid feed.



Direct scale feedback

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

Magnescale
High accuracy absolute scale SR87

Resolution (X, Y and Z axes) 0.01 μm

- High accuracy, high resolution
- Greater accuracy than optical scale
- Highly resistant to condensation and oil
- Vibration and impact resistant characteristics

Fine-lead ball screws

The lead of the ball screws is set to 10 mm (0.4 in.) in order to raise feed rigidity.

Ball screw lead

10 mm
(0.4 in.)

Oil cooler

An energy-saving oil cooler is used that delivers very little temperature fluctuation.

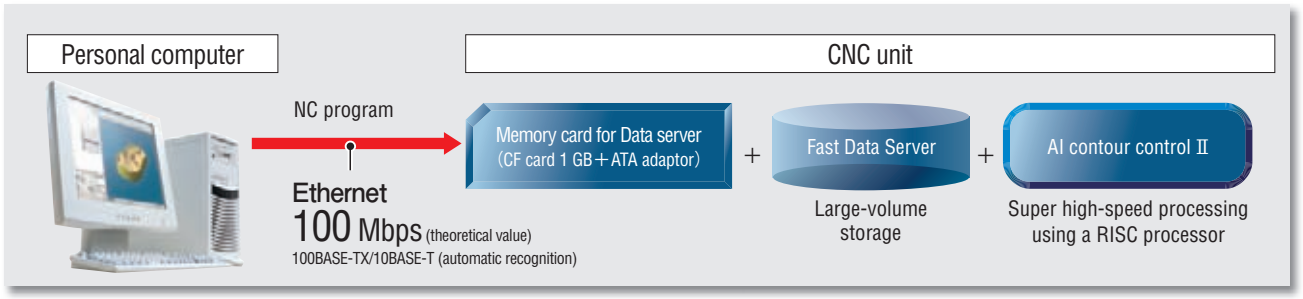
Coolant cooling system (separate type) OP

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.

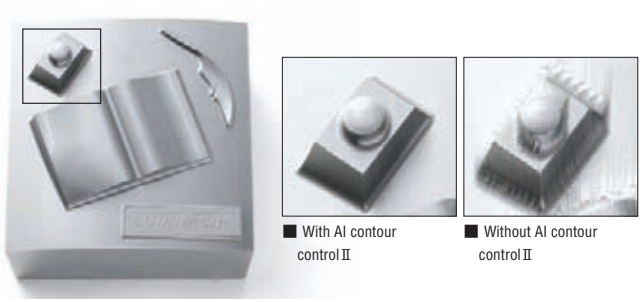
When using oil-based coolant, please be sure to consult with our sales representative.

- While this unit is not the only way to completely control the temperature of the coolant, it makes a major contribution to preventing increases in the oil temperature.

Die & Mold Specifications (Standard)



AI contour control Ⅱ



■ With AI contour control Ⅱ

■ Without AI contour control Ⅱ

Cutting mode selection function

■ Time priority mode

Top priority at cutting time. Use when required accuracy is in low level like roughness cutting etc. The cutting time is the shortest.

■ Middle mode

Middle mode in time priority mode and accuracy priority mode.

■ Accuracy priority mode (the standard setting)

The mode which prioritizes the cutting accuracy. Recommended mode.

■ Custom mode

The mode which further prioritizes cutting accuracy.
This mode produces the longest machining time of all four modes.

Safety device

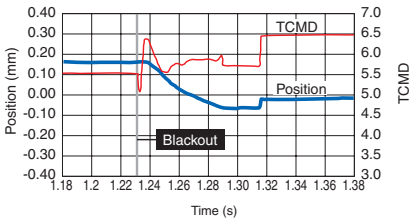
Z-axis drop prevention function ideal for blackouts

Raising the spindle slightly during blackouts prevents any contact between the tool and the workpiece caused by the spindle dropping.

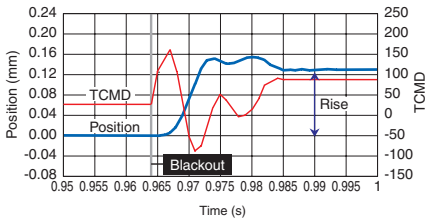
※ The Z-axis drop prevention function is not available in the following situations.

1. When the feed axis servo alarm has gone off.
2. When the power supply module alarm has gone off.
3. When the communication alarm between the CNC and the amp has gone off.

Before blackout countermeasure



After blackout countermeasure (Z-axis raised)



TCMD: Torque command

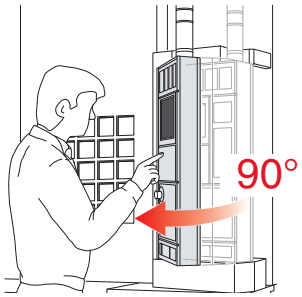
● Depending on how voltage drops (slowly or suddenly), it may not always be possible to detect a blackout.

Improved convenience

Excellent access to the table and a smoothly opening roof for easier setup when using a crane. The NVD6000 DCG was designed as a vertical machining center with maximum ease of use and setup.

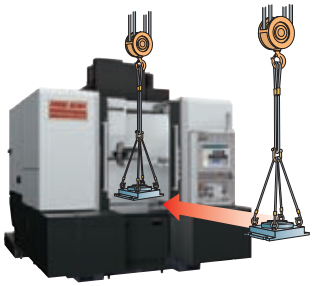
Swivel-type operation panel

The operation panel which can swivel from 0 degree to 90 degrees improves operability and visibility.



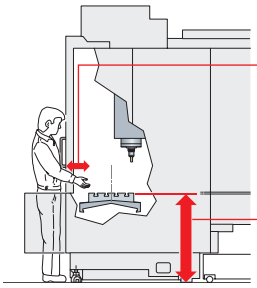
The open/close ceiling

The top panel can be opened and closed, making crane accessibility quick and easy.



Setup station

With excellent access to the table and a wide door opening, setup operations such as fixture adjustment can be done smoothly.

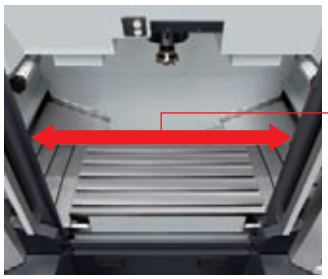


Distance from table

161 mm (6.3 in.)

Height of table top surface

975 mm (38.4 in.)

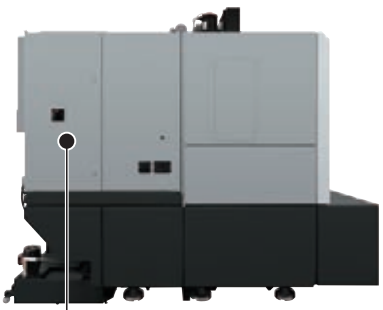


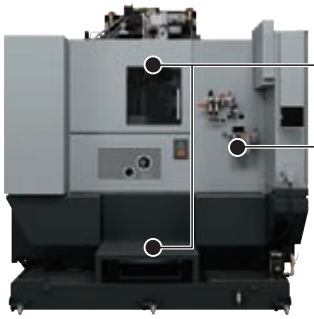
Door opening

910 mm (35.8 in.)

Maintenance

The NVD6000 DCG is designed with features for ease of maintenance to increase the machine operating rate.





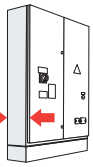
Access to equipment

Visibility of the magazine has been improved with the addition of a door with a window. In addition, the coolant tank can be used as steps to facilitate access to gauges and other instruments.

Slimmer electrical cabinet

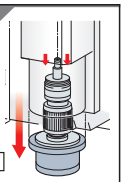
A slim electrical cabinet closes the proximity between you and the insides of the machine during maintenance.

300 mm (11.8 in.) <including doors>



Replacement of spindle unit

By changing the spindle unit to a cartridge, which even includes the rear bearings, we have dramatically reduced replacement time.



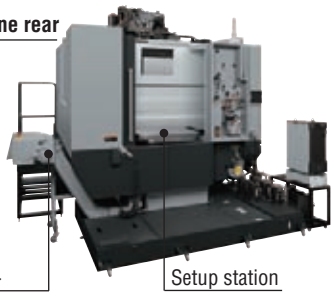
Centralized layout of devices

Devices which need to be inspected every day are gathered together at the rear of the machine.

2-station turn-type APC OP

Machine front

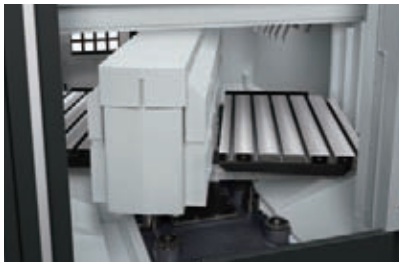
Machine rear



Chip conveyor (external) <option>

Setup station

- The APC uses a 2-station turn-type design. Cycle time is shorter than that of a shuttle-type machine.
- A new design allows access from the back of the machine when setting up the APC. This contributes to space savings.



Pallet changing time

25 sec.

- To prevent APC interference, this specification includes time required for the spindle protection tool to be moved until after the APC turning is complete.
- When there are adjacent tools. Depending on the arrangement of tools in the magazine, the APC time may be longer.
- Without ATC shutter

Pallet size

900×600 mm (35.4×23.6 in.)

Tool storage capacity

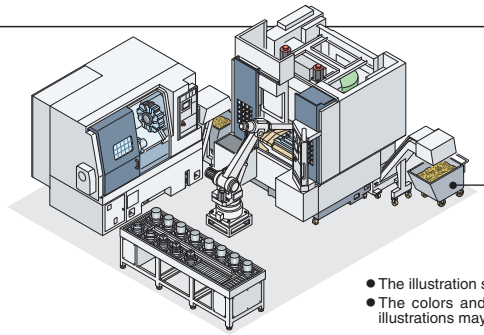
40/60 tools

- For APC specifications, a dummy tool which is mounted on the spindle during APC operation is included.

- The photo shows the NV4000 DCG.

Workpiece transfer robot OP Consultation is required

Robots make workpiece loading and unloading more efficient, improving productivity.



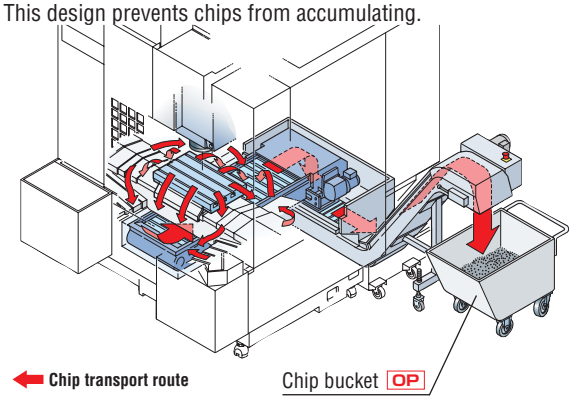
Chip bucket OP

- The illustration shows the NV4000 DCG.
- The colors and configurations shown in the photographs or illustrations may differ from those of the actual product.

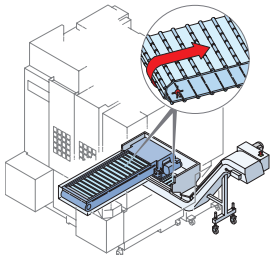
Peripheral equipment

Chip conveyor OP

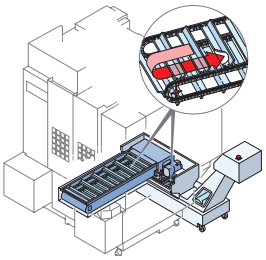
Chips that fall from the Y-axis tilted panel down into the center trough are automatically discharged out of the machine by the chip conveyor. This design prevents chips from accumulating.



■ Hinge type



■ Scraper type＋drum filter type



Specifications	Workpiece material and chip size ○: Suitable ×: Not suitable				
	Steel		Cast iron	Aluminum/non-ferrous metal	
	Long	Short	Short	Long	Short
Hinge type＋drum filter type Consultation is required	○	○	○	○	○
Hinge type	○	○	×	○	×
Scraper type＋drum filter type	×	○	○	×	○
Magnet scraper type Consultation is required	×	○	○	×	×

- 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
- The options table below 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.

Coolant tank

A high capacity coolant tank comes as a standard feature.

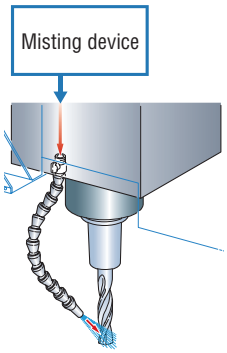
Tank capacity
345 L (91.1 gal.)
<without chip conveyor>

Shower coolant OP

As well as preventing chips from scattering during machining, this allows them to fall smoothaly into the center conveyor.

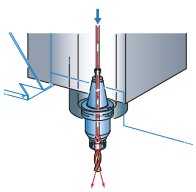
Semi dry unit OP

Supplies air and oil mist to the cutting tip. An environmentally friendly device which reduces oil consumption. We recommend using this unit together with a mist collector.

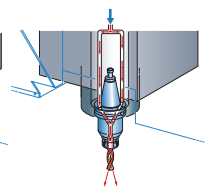


Through-spindle coolant system OP

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



Center through



Side through

High-pressure coolant system (separate type)

- The colors and configurations shown in the photographs or illustrations may differ from those of the actual product.

		Unit on coolant tank	Separate type
Discharge pressure	MPa (psi)	1.5 (217.5)	1.5/3.5/7.0(217.5/507.5/1,015)
Installation space <width×depth>	mm (in.)	360×360 (14.2×14.2) <line filter unit>	780×1,085 (30.7×42.7) <high-pressure coolant system>
Water-soluble coolant		○	○
Oil-based coolant		×	○*
Coolant filtration accuracy		40 μm	20 μm

*Oil-based coolant may not be filtered appropriately depending on its viscosity. In such cases it is advisable to select the high-pressure coolant unit (special option), which uses a ceramic backwashing filter in the filtration system instead of a regular cyclone filter. For details, please consult with our sales representative.

⚠ Do not use a flammable coolant or oil-based coolant because it may ignite and cause fire or machine breakage. If you have to use a flammable coolant for any reason, please consult with our sales representative.

MAPPS Ⅳ

A New High-Performance Operating System
for Machining Centers

● 19-inch operation panel

A new 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 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.

Advanced hardware

Reduction of drawing time

Shorter drawing time was achieved thanks to increased CPU performance.

MAPPS Ⅲ 68 sec.
MAPPS Ⅳ 45 sec.

Approx. Reduced by 33 %

Main specifications

Main memory	3 GB
User area	Standard: 6 GB Option: 20 GB
Interface	・USB 2.0 3 ports (Screen side: 1, Bottom and back of operation panel: each 1) ・LAN 2 ports (1000BASE-T) ・RS-232-C port ・Memory card slot
Soft-keys	Left/right 12 keys Bottom 12 keys

Faster creation of programs

CAM software ESPRIT

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 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)

MAPPS: Mori Advanced Programming Production System

● The photo shown may differ from actual machine.
● Information about the screen is current as of August 2012.

Machine specifications

Item			NVD6000 DCG	NVD6000 DCG HSC	
			12,000 min^{-1}	20,000 min^{-1}	[30,000 min^{-1}]
Travel	X-axis travel <longitudinal movement of table>	mm (in.)	900 (35.4)		
	Y-axis travel <cross movement of saddle>	mm (in.)	600 (23.6)		
	Z-axis travel <vertical movement of spindle head>	mm (in.)	450 (17.7)		
	Distance from table surface to spindle gauge plane	mm (in.)	200—650 (7.9—25.6)		
Table	Distance from table surface to floor surface	mm (in.)	975 (38.4)		
	Table working surface	mm (in.)	1,000×600 (39.4×23.6)		
	Table loading capacity	kg (lb.)	800 (1,760)		
	Table surface configuration <T slots width×pitch×No. of T slots>		18 mm×100 mm×6 (0.7 in.×3.9 in.×6)		
Spindle	Max. spindle speed	min^{-1}	12,000	20,000	30,000
	Number of spindle speed ranges		1		
	Type of spindle taper hole		No. 40		No. 40 (HSK-F63)
	Spindle bearing inner diameter	mm (in.)	70 (2.8)		60 (2.4)
Feedrate	Rapid traverse rate	mm/min (ipm)	X, Y, Z: 20,000 (787.4)		
	Cutting feedrate	mm/min (ipm)	1—20,000 (0.04—787.4) <with AI contour control>		
	Jog feedrate	mm/min (ipm)	0—5,000 (0—197.0) <20 steps>		
ATC	Type of tool shank		BT40* [HSK-A63] [DIN40] [CAT40] [Capto C6]		HSK-F63
	Type of retention knob		DMG MORI SEIKI 90° type [45° (MAS-Ⅰ)] [60° (MAS-Ⅱ)] [HSK-A63]		HSK-F63
	Tool storage capacity		20 [40] [60]		
	Max. tool diameter — With adjacent tools	mm (in.)	80 (3.1) [70 (2.8) <40-, 60-tool>]		
	Max. tool diameter — Without adjacent tools	mm (in.)	125 (4.9)		
	Max. tool length	mm (in.)	300 (11.8)		
	Max. tool mass	kg (lb.)	8 (17.6)		3 (6.6)
	Max. tool mass moment <from spindle gauge line>	N•m (ft•lbf)	11 (8.1)<a tool with a mass moment greater than the maximum tool mass moment may cause problems during ATC operations even if it satisfie other conditions.>		
	Method of tool selection		Fixed address, shorter route access		
	Tool changing time — Tool-to-tool	s	1.6		
	● The time differences are caused by the different conditions (travel distances, etc) for each standard. ● Depending on the arrangement of tools in the magazine, the chip-to-chip time may be longer. — Cut-to-cut (chip-to-chip) <MAS>	s	4.3		
	Cut-to-cut (chip-to-chip) ISO 10791-9 JIS B6336-9	s	20-tool <without ATC shutter>: 5.9 (max.)/4.2 (min.)		
Motor	Spindle drive motor	kW (HP)	18.5/15/11 (24.7/20/15) <10 min/30 min/cont> (high-speed winding side)		18.5/13 (24.7/17.3) <1 min/cont>
	Feed motor	kW (HP)	X: 3 (4), Y, Z: 3 (4)×2		
	Coolant pump motor <50/60 Hz>	kW (HP)	0.6/1.02 (0.8/1.36)		
Power sources	Electrical power supply <cont>	I94056D01 kVA	31.4		
<standard>	Compressed air supply	MPa (psi), L/min (gpm)	0.5 (72.5), 200 (52.8) (when the tool tip air blow is regularly used, air supply of more than 300 L/min (79.2 gpm) is separately required) <ANR>		
Tank capacity	Hydraulic oil tank capacity	L (gal.)	20 (5.3)		
	Coolant tank capacity	L (gal.)	345 (91.1) <without chip conveyor>		
Machine size	Machine height	mm (in.)	3,015 (118.7) [3,215 (126.6) <APC specifications>]		
	Floor space <width×depth>	mm (in.)	3,230×4,189 (127.2×164.9)		
	Mass of machine	kg (lb.)	10,160 (22,352)		
Noise data	A-weighted, time-average radiated sound	dB	63—78 (Measurement uncertainty is 4 dB)		

[ ] Option ISO: International Organization for Standardization JIS: Japanese Industrial Standard

NVD6000DCG(090917)

* When the two-face contact specification is selected, a two-face contact tool and other tools cannot be used together.
- 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.
- Tool storage capacity (40 tools, 60 tools): with the APC specifications, a dummy tool to be mounted on the spindle during APC operation will be included.
- 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.
- 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.
- Noise data: the measurement was performed at the front of the machine with a maximum spindle speed of 20,000 min-1. 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.

- If you have any questions regarding the content, contact our sales representative.
- The information in this catalog is valid as of October 2013. 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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