

**DMG MORI**

High-Precision, High-Speed Horizontal Machining Center

NHX 10000

**NHX 10000**



DMGMORI.COM

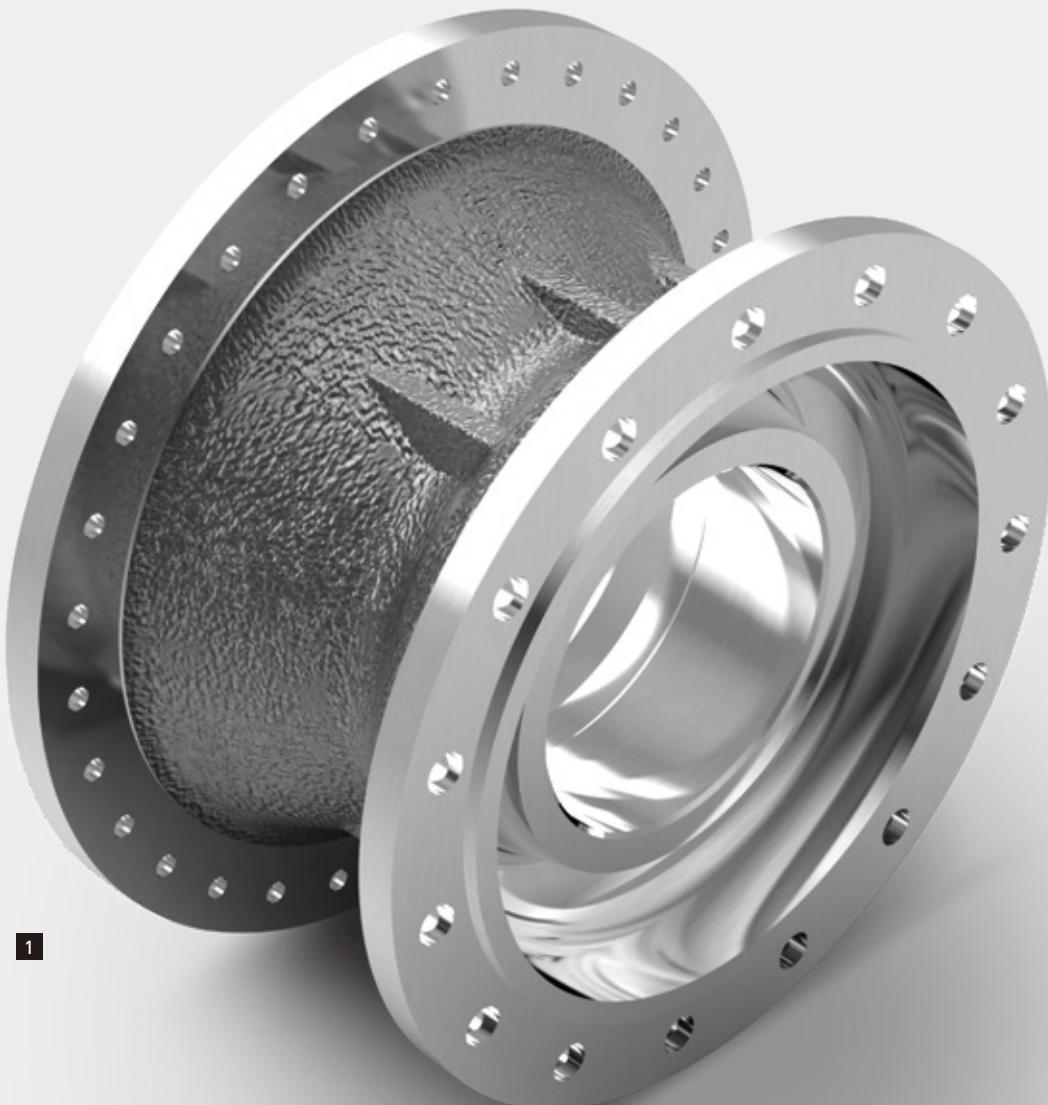
NHX 10000

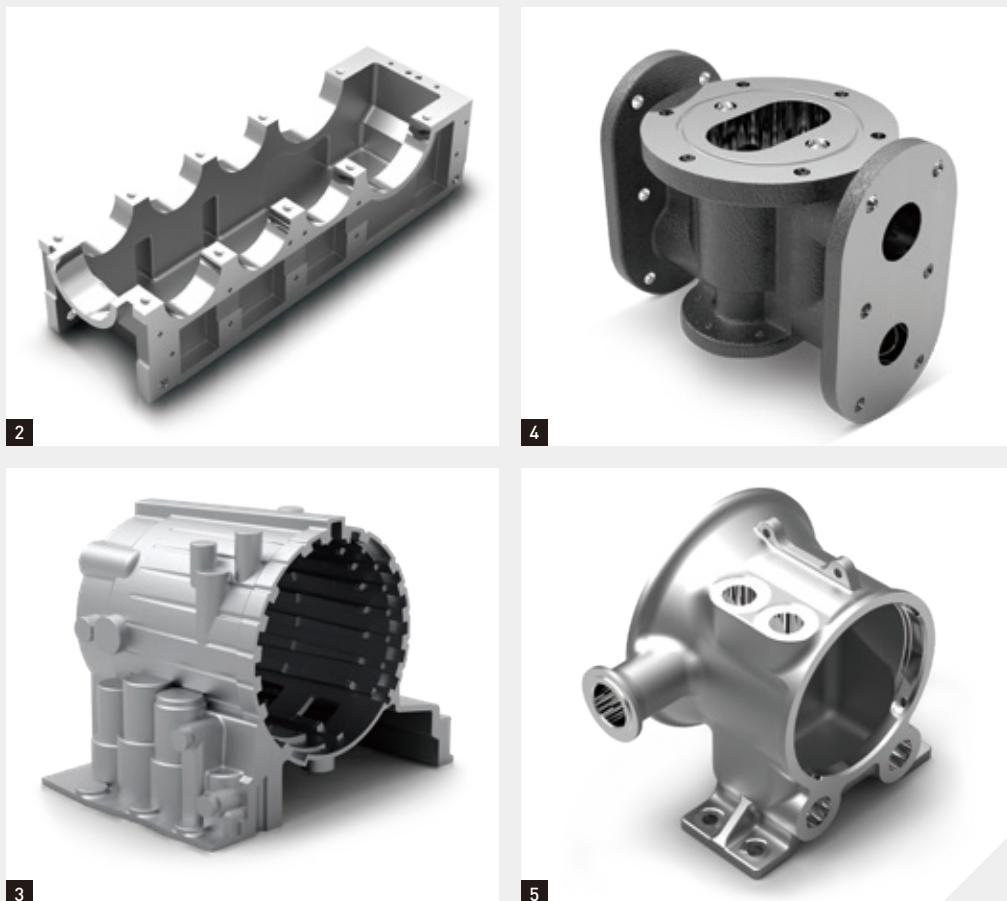
## High-precision Machining of Large & Difficult-to-machine Workpieces

The NHX 10000 is equipped with everything required for machining of large and difficult-to-cut workpieces, such as a high-rigidity structure and superior cutting ability. In response to the need for high-precision machining of large and difficult-to-machine workpieces, thorough countermeasures against vibration and thermal displacement have been taken to achieve stable machining accuracy over the entire machining envelope. With the outstanding machining performance, the NHX 10000 shows an overwhelming presence in the construction machinery, aircraft and shipbuilding industries.

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#### Construction machinery

- 1** Housing
- 2** Crankcase
- 3** Transmission case

#### Boats & Ships

- 4** Gear housing

#### Industrial machinery

- 5** Pump body

NHX 10000

# Further Evolved with Advanced Technologies

The NHX 10000, with unparalleled rigidity and durability, has evolved by employing a touch panel and "CELOS," a user interface that provides customers with optimal menus for each production process. The ergonomic cover design is created taking into account every machine operation conceivable at the shop floor.

## High precision

- + Driven at the Center of Gravity
- + Box-in-Box construction

## High speed

- + Max. acceleration <X- / Y- / Z-axis>: 0.62 / 0.51 / 0.45 G  
{6.1 / 5.0 / 4.4 m/s<sup>2</sup> [20.0 / 16.4 / 14.4 ft/s<sup>2</sup>]}
- + Rapid traverse rate <X, Y and Z axes>: 50 m/min {1,968.5 ipm}\*1
- + Cutting feedrate <X, Y and Z axes>: 50 m/min {1,968.5 ipm}\*2

\*1 The rapid traverse rate on the Y-axis is 40 m/min {1,574.8 ipm} when using the spindle with the 8,000 min<sup>-1</sup> specification <option>.

\*2 Look-ahead control

## Outstanding cutting performance

- + Standard spindle with an output of up to 40 kW (53.3 HP)
- + Max. spindle torque: 1,413 N·m (1,042.2 ft·lbf) <10%ED> (option)

## CELOS

- + Consistent administration, documentation and visualization of order, process and machine data
- + Extension of functions possible by adding applications, and high compatibility with existing information infrastructure and software

## Power-saving

- + Function for energy-saving and visualization of the effect



NHX 10000

# High-performance Structure Supporting High-speed, High-accuracy Machining

With the DCG (Driven at the Center of Gravity) technology and the Box-in-Box construction, the machine drives the moving units of the machine at the center of gravity in a well-balanced manner. The DCG controls vibration, one of the factors that hamper high-speed and high-accuracy machining. This enables high-speed traveling of large workpieces that require long-distance travel, improving productivity.

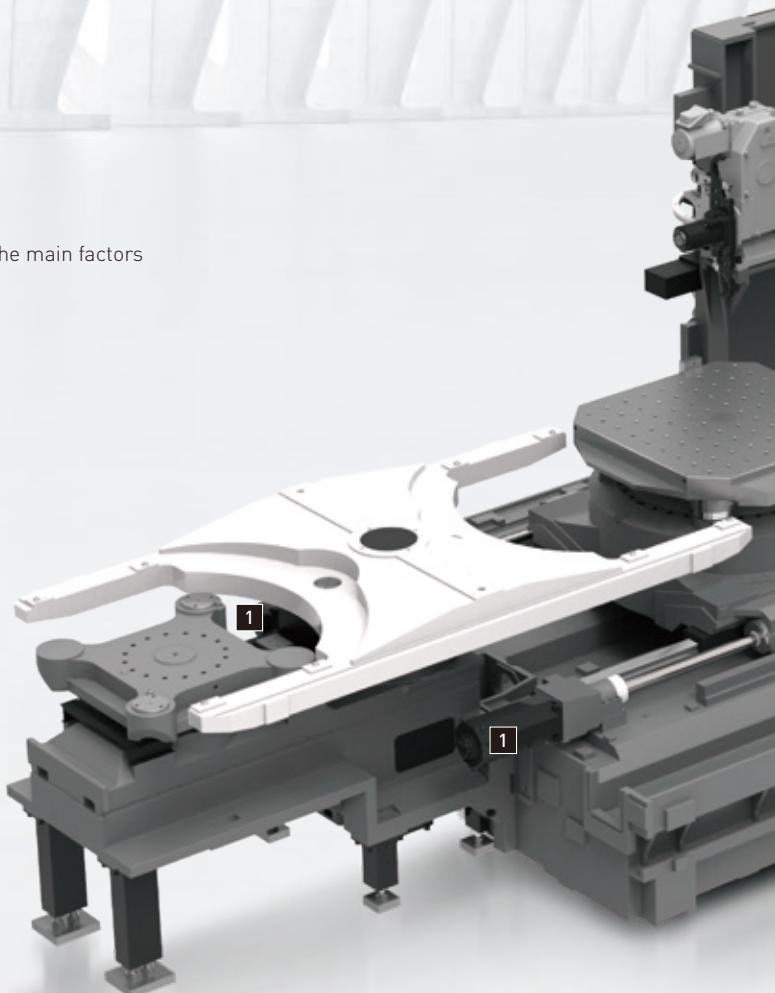
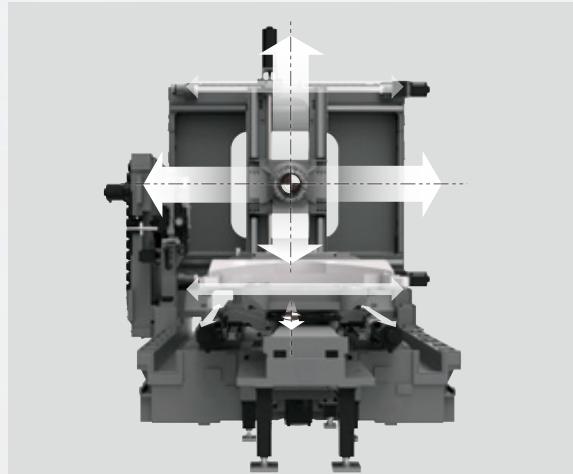
DCG: Driven at the Center of Gravity

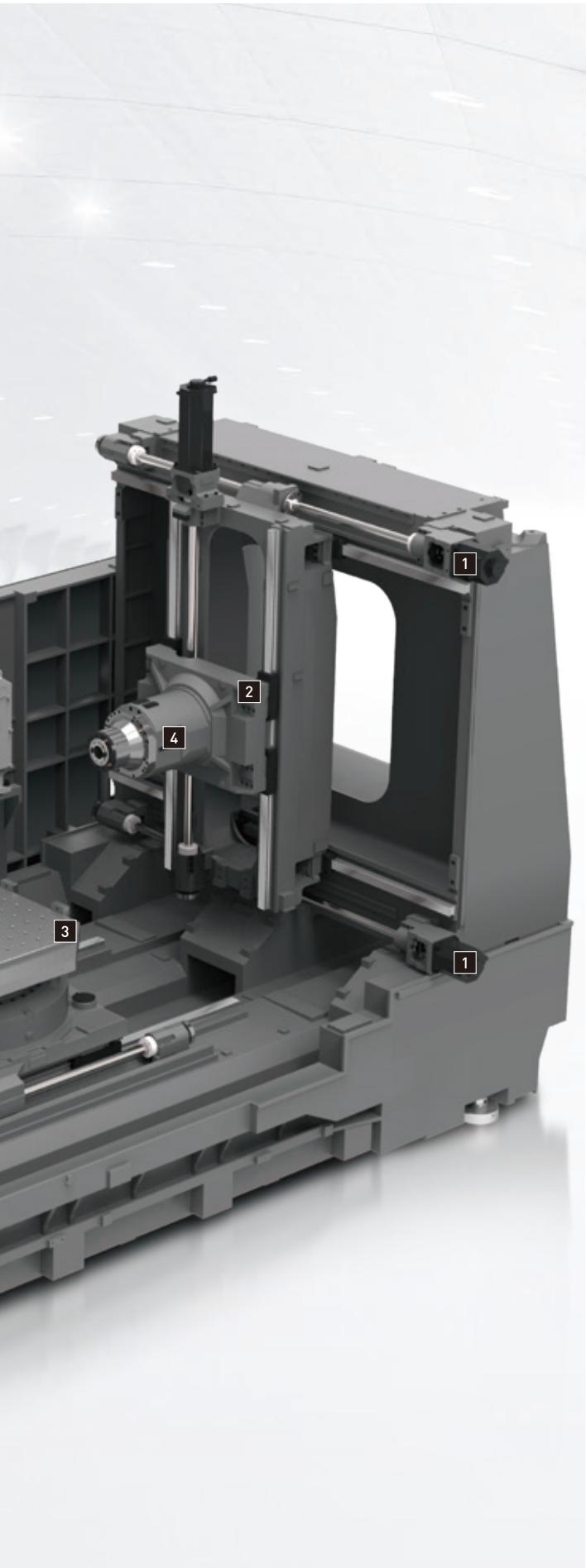
## 1 Driven at the Center of Gravity

- + The DCG technology controls vibration, which is one of the main factors that prevent high-speed and high-precision machining, by driving the moving units at the center of gravity
- + Max. acceleration: X-axis 0.62 G {6.1 m/s<sup>2</sup> [20.0 ft/s<sup>2</sup>]}
- Y-axis 0.51 G {5.0 m/s<sup>2</sup> [16.4 ft/s<sup>2</sup>]}
- Z-axis 0.45 G {4.4 m/s<sup>2</sup> [14.4 ft/s<sup>2</sup>]}

## 2 Box-in-Box construction

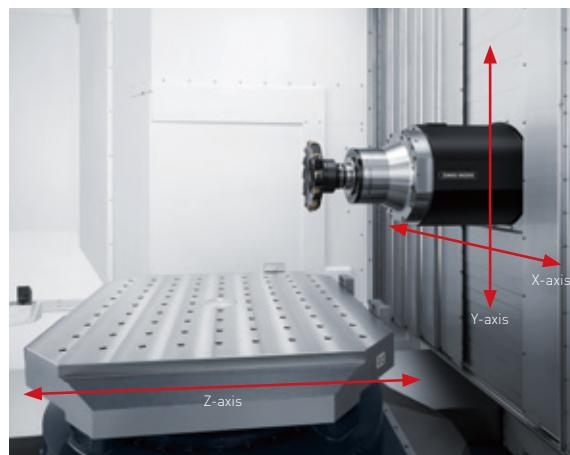
- + The Box-in-Box design, which supports the saddle from both sides, guides and drives the moving parts by its center of gravity in a more balanced manner





### 3 Travel

- + Travel: X-axis 1,700 mm (66.9 in.)
- + Y-axis 1,400 mm (55.1 in.)
- + Z-axis 1,510 mm (59.4 in.)



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### 4 Spindle structure with higher rigidity

- + The powerMASTER that achieves overwhelmingly powerful cutting performance as standard
- + Spindle bearings lined up in four rows



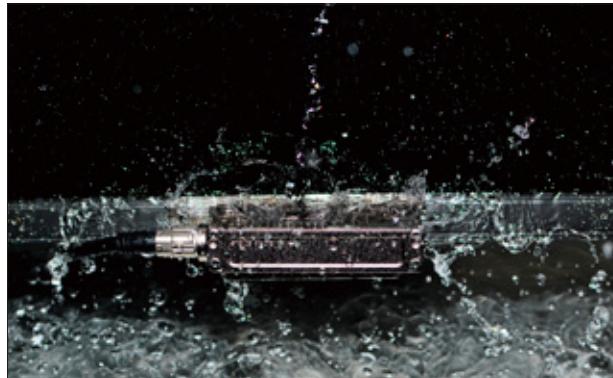
NHX 10000

# Perfect Equipment for Ultimate Machining Accuracy

The NHX 10000 model is equipped with everything required for stable high-precision machining. In addition to perfect spindle cooling, a highly reliable SmartSCALE (Magnescale) with extreme accuracy is employed on all axes as standard to ensure the best positioning accuracy for a long period of time.

**Full closed loop control (Scale feedback) as standard on all axes (SmartSCALE)**

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#### Simple non-contact structure

- + Saves space bearingless compact design
- + Can be mounted in proximity to workpieces, enabling easy installation of multiple scales on one axis

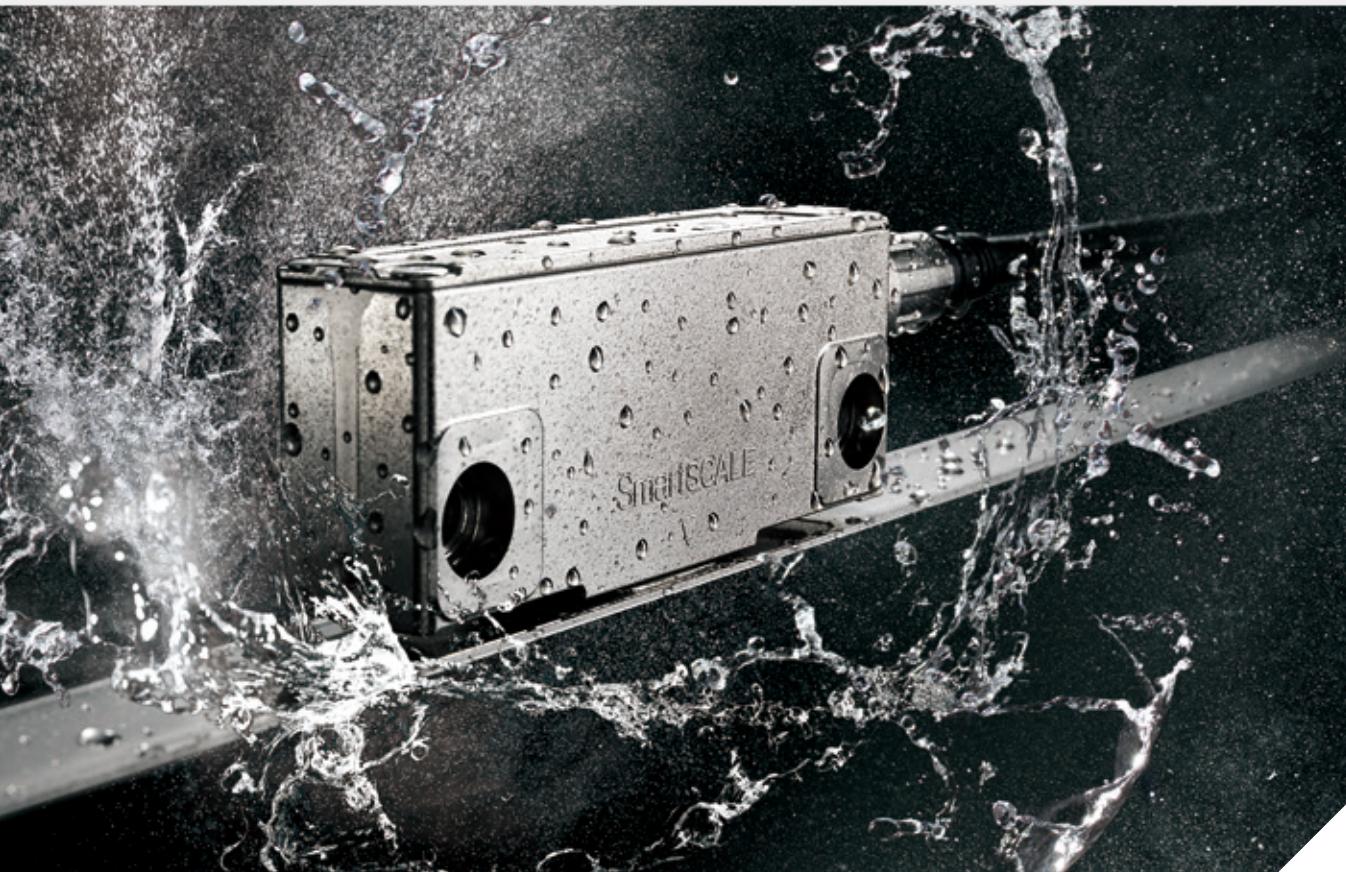


#### High resolution of 0.01 µm

- + Newly developed algorithm employed to improve the high-performance arithmetic processing circuit

#### No air purge necessary thanks to the sealing structure with a protection degree of IP67

- + The magnetic scale and the detection device surfaces completely covered with a metal cover for even higher durability against coolant and chips



#### Draw-back function for through-spindle coolant

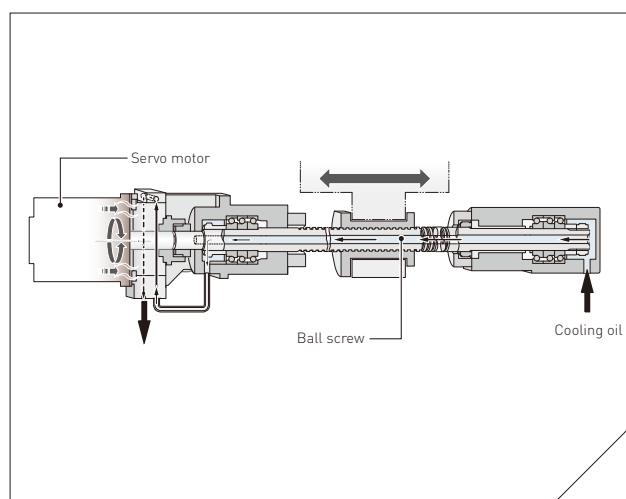
Any remaining coolant in the spindle is drawn back into the tank when the coolant flow is stopped, which minimizes the residue to ensure stable machining accuracy.



- + Prevent coolant from adhering to the spindle taper during ATC
- + Prevent mounting errors and rust caused by chips
- + Prevent coolant from entering the magazine

• This function is included in the through-spindle coolant specifications (option).

#### Ball screw center cooling



In order to control thermal displacement and to keep high-accuracy positioning, the ball screw core cooling system is used.

NHX 10000

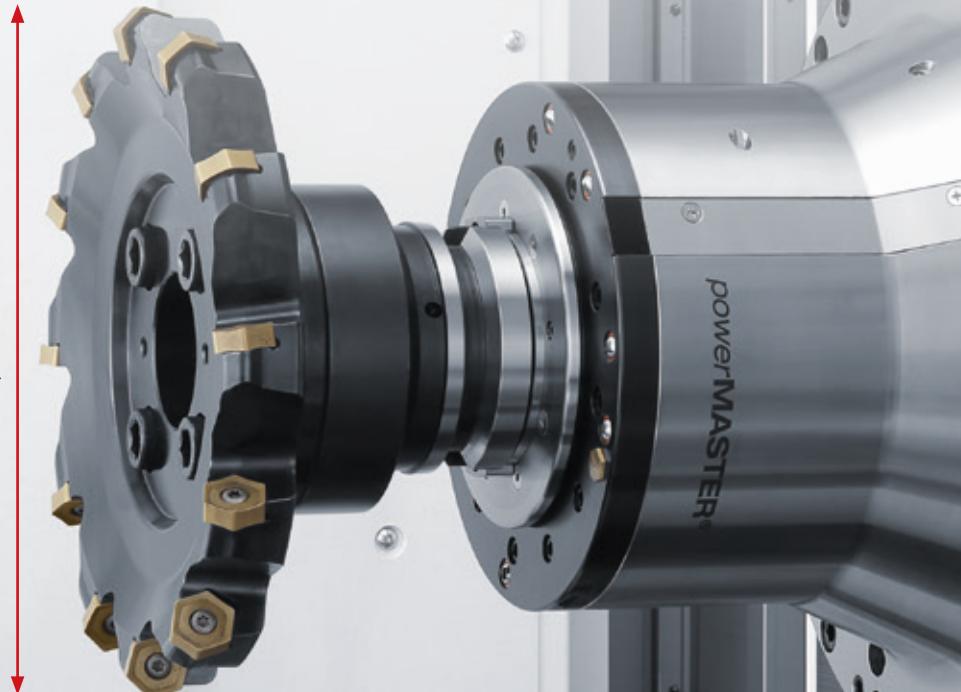
# Outstanding Machining Capability High-power Spindle powerMASTER

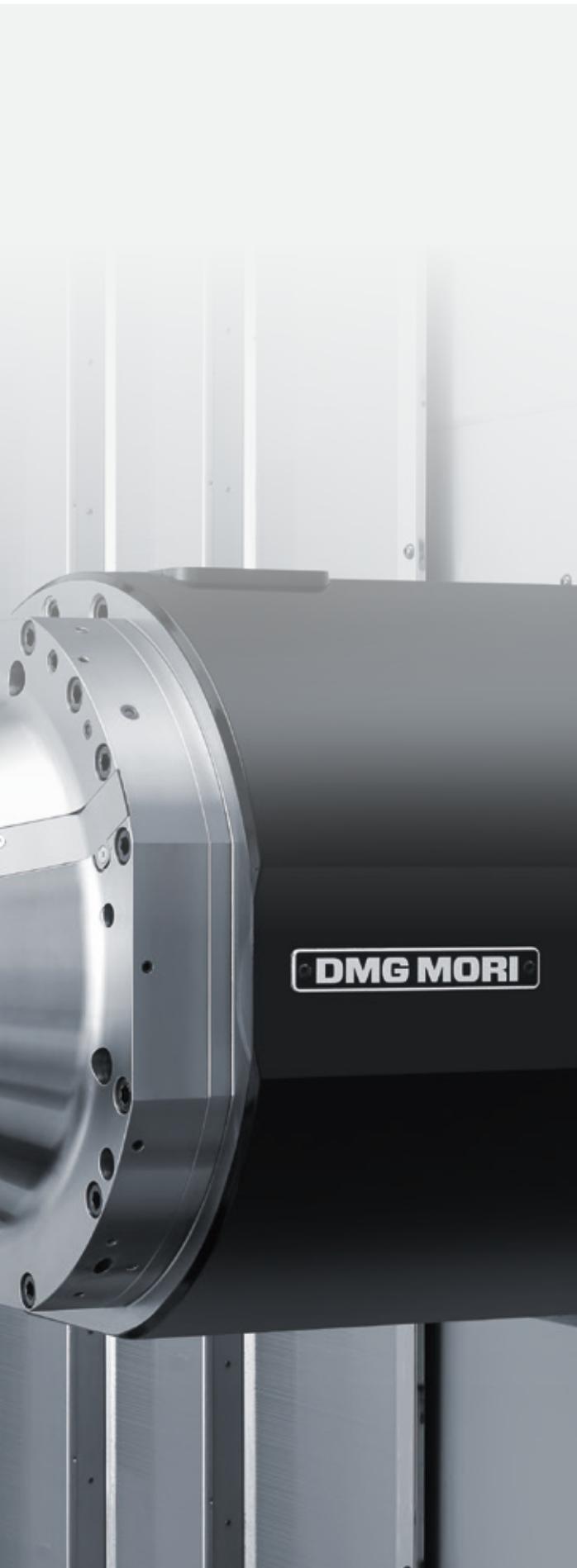
The NHX 10000 is equipped with the powerMASTER, a new spindle with high-cutting performance, and the high-efficiency DDS motor for the spindle drive to handle various machining from high-speed machining to heavy-duty machining.

The model demonstrates outstanding performance in machining of steel to non-metals such as aluminum. The high-torque specification  $<8,000 \text{ min}^{-1}>$  (option), with a max spindle output of 55 kW (75 HP)  $<25\% \text{ ED}>$  and a max. spindle torque of 1,413 N·m (1,042.2 ft·lbf)  $<10\% \text{ ED}>$ , is suited to machining of difficult-to-cut materials, which is in increasing demand, mainly in the aircraft industry.

DDS: Direct Drive Spindle

Max. tool diameter:  
320 mm (12.5 in.)  
<without adjacent tools>





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#### **Powerful tool clamping force**

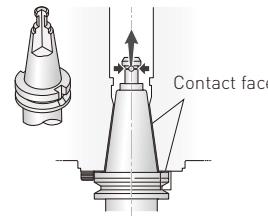
- + Using the newly developed collet, clamping power on the tool has been increased. The ability to control vibration during spindle rotation ensures high-accuracy machining
- + Tool clamp power: 30,000 N (6,743.9 lbf)

● Please use a two-face contact tool when cutting at higher than 10,000 min<sup>-1</sup>.

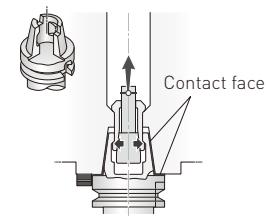
#### **Two-face contact specification (option)**

- + Coming into contact with both spindle taper and spindle nose, a tool achieves greater flexural rigidity and longer useful life

BT specification



HSK specification



- All DMG MORI spindles are made in-house to better meet our customer needs. For details, please consult our sales representative.
- When the two-face contact specification is selected, a two-face contact tool and other tools cannot be used together.

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#### **No. 50 taper spindle**

- + Type of tool shank: BT50, DIN50, CAT50, HSK-A100
- + Max. spindle speed: 12,000 min<sup>-1</sup>  
16,000 min<sup>-1</sup> <high speed>  
8,000 min<sup>-1</sup> <high torque>
- + Output:  
55 / 30 kW (75 / 40 HP) <15%ED / cont>  
37 / 26 kW (50 / 34.7 HP) <25%ED / cont> {high speed}  
55 / 45 kW (75 / 60 HP) <25%ED / cont> {high torque}
- + Max. spindle torque:  
807 N·m (595.2 ft·lbf) <10%ED>  
528 N·m (389.4 ft·lbf) <10%ED> {high speed}  
1,413 N·m (1,042.2 ft·lbf) <10%ED> {high torque}

● Please use a two-face contact tool when cutting at higher than 10,000 min<sup>-1</sup>.

NHX 10000

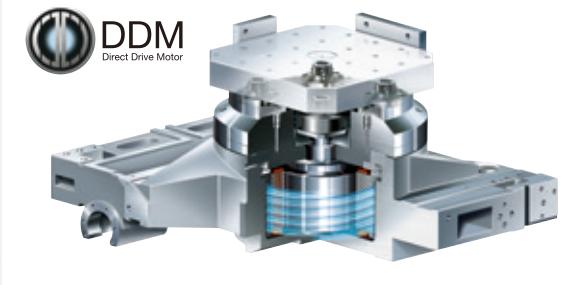
## High-precision with Minimum Indexing Angle of 0.001°

The optional rotary table uses a high-speed rotary axis drive system DDM (Direct Drive Motor) that achieves zero backlash.

The DDM transmits the drive power directly to the rotary axis, delivering high performance in machining that requires high-speed indexing and high-precision positioning.

DDM: Direct Drive Motor



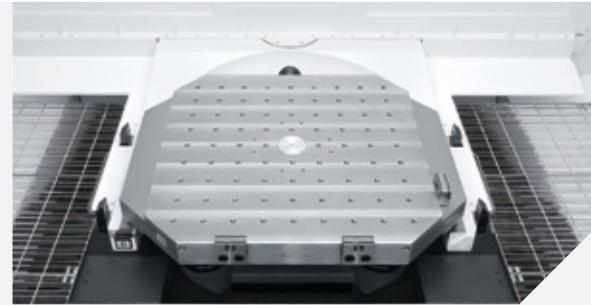


### Direct Drive Motor (option)

Until now, gears have been used to transmit the drive power to the rotary axes, but this drive system had a negative effect on drive speed and precision. By transmitting the drive power to the rotary axes directly without using gears, DDM offers outstanding transmission efficiency and high-speed feed.

DDM also achieves zero backlash for highest accuracy.

- + B-axis max. rotational speed: 20 min<sup>-1</sup>
- + High-precision indexing
- + Less maintenance
- + Longer product life



### APC

It uses a front 2-station turn-type APC. This APC offers high-speed pallet change that reduces non-cutting time.

- + Pallet changing time (2-station turn-type APC)\*1:  
22.0, 41.0\*2 sec.

\*1 When equipped with the auto-coupler, time taken to shut off / supply hydraulic pressure to the fixture is not included.

\*2 Pallet loading capacity: 5,000 kg (11,000 lb.)

### Optimal acceleration / deceleration for each workpiece

#### Servo Sense for Workpiece (Z-axis, B-axis)

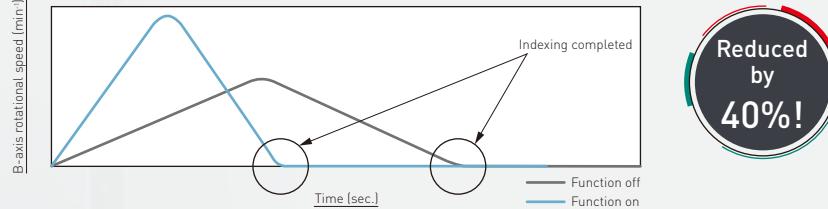
Drastically decrease overall cycle time by automatically finding the optimal acceleration / deceleration for each pallet (Z-axis and B-axis). The auto servo tuning function allows for efficient and smooth acceleration / deceleration, as well as ensuring stable positioning and higher machining accuracy. It automatically controls machine vibration and caused by gradual change in the machine and unbalanced fixtures.

- + Optimized acceleration / deceleration for reduction of machining time
- + Improved positioning accuracy
- + Reduced machine vibration

#### Example: Reduction in the B-axis indexing time

Increase acceleration according to workpiece mass and reduce positioning and machining time

Comparison of 180 degree indexing time [NHX 6300]: Workpiece mass 500 kg (1,100 lb.)



• The data above is an example of a past test result. The results on the catalog may not be achieved according to workpieces or environmental conditions at the time of measurement.

Travel <X- / Y- / Z-axis>	mm (in.)	1,700 / 1,400 / 1,510 [66.9 / 55.1 / 59.4]	
Pallet size	mm (in.)	1,000 × 1,000 [39.4 × 39.4 ]	
Pallet loading capacity	kg (lb.)	3,000 (6,600), 5,000 (11,000)*1	
Max. workpiece size	mm (in.)	Length of one side of a workpiece*2	
Minimum pallet indexing angle		1° indexing table	Full 4th axis rotary table: DDM (option)
Pallet indexing time (90°) <including clamping and unclamping time>	sec.	1°	0.001°
		3.1, 3.6*3	1.8, 2.0*3

\*1 Not applicable for CPP, LPP specification. \*2 Length of one side of a square inscribed in a max. workpiece swing diameter range

\*3 Pallet loading capacity: 5,000 kg (11,000 lb.)

NHX 10000

## Variety of Magazines

The NHX 10000 comes standard with the 60-tool chain type magazine that enables smooth and high-speed tool indexing. Two types of magazines, the chain type and the rack type, with a maximum tool storage capacity of 330 tools are available according to customers' production needs.

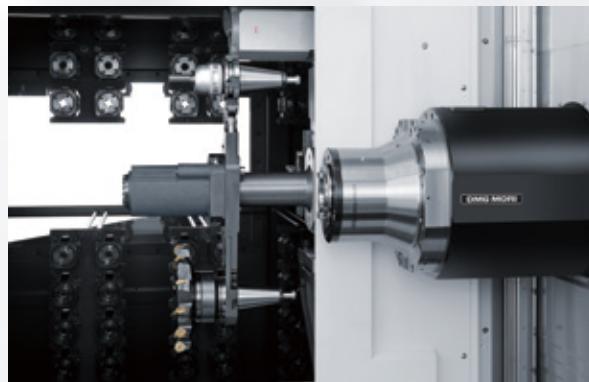
- + Tool storage capacity <chain-type / rack-type>:  
60, 100, 120 tools / 180, 240, 330 tools
- + Max. tool length: 800 mm (31.4 in.), 1,000 mm (39.3 in.)\*
- + Max. tool mass: 30 kg (66 lb.)
- + Max. tool diameter: 320 mm (12.5 in.) <without adjacent tools> /  
110 mm (4.3 in.) <with adjacent tools>

\*Long tool specifications

- Chain-type magazines (60-, 100- or 120-tool capacity) incorporate a pot tilting mechanism and the tool capacity includes one tool at the spindle side.
- Rack-type magazines (180-, 240- or 330-tool capacity) incorporate a pot transfer mechanism and the tool capacity includes one tool at the spindle side.
- The maximum tool diameter is limited to 230 mm (9.0 in.) or less when using the spindle at 10,000 min<sup>-1</sup> or higher.

### Magazine separated from the machine body (rack-type)

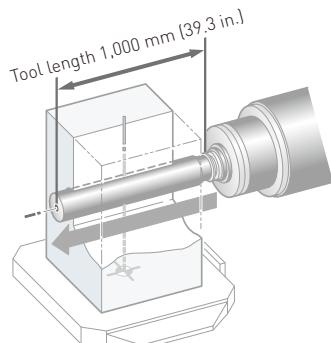
As the magazine is separated from the machine body, the load nor the vibration does not affect machining, which leads to improvement of machining accuracy.



### ATC

By using a double arm, which offers high-speed tool change, non-cutting time is dramatically reduced.

- + Cut-to-cut (chip-to-chip)\*:  
16.7 sec. (max. <ISO>) / 5.7 sec. (min. <ISO>)
- + Tool-to-tool: 1.9 sec.



### Maximum tool length equivalent to pallet size

Boring up to 1,000 mm (39.3 in.)\* can be done without turning the B-axis, reducing cutting time and achieving high-precision machining.

- + Max. tool length: 1,000 mm (39.3 in.)

\*Long tool specifications

- Depending on condition, machining may not always be possible.

ISO 10791-9 JIS B6336-9 ISO: International Organization for Standardization  
JIS: Japanese Industrial Standard

\* Chain-type: 60 tools

● 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.

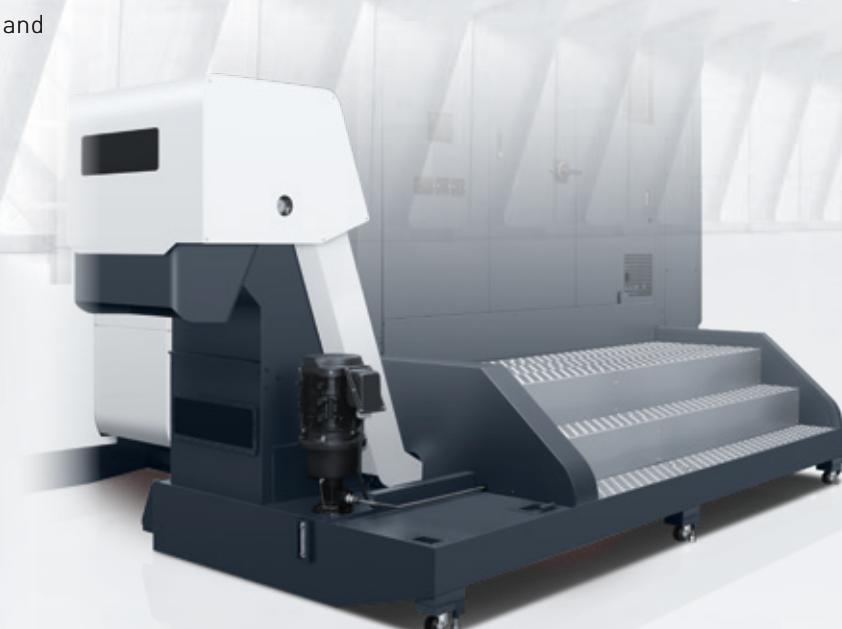
Rack-type (180 tools)



NHX 10000

# Cutting-edge Chip Disposal Solution

Chips can be one of the main causes leading to machining failure and machine stop. DMG MORI conducted an in-depth study on them by carrying out various experiments and analyses, and achieved outstanding chip disposal performance. We offer optimal chip disposal solutions according to a machining condition of each customer.



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## Zero sludge coolant tank as standard

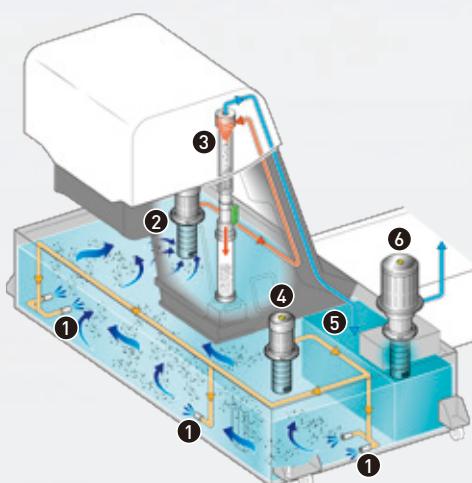
Multiple coolant nozzles are arranged to stir coolant and efficiently collect fine casting sludge with a highly accurate cyclone filter.

- + Reduce cleaning work of the coolant tank dramatically
- + Prevent clogging of pipes / coolant nozzles and pump breakage
- + Expand coolant life

- ① Coolant nozzle
- ② Inlet filter pump
- ③ Cyclone filter
- ④ Stirring nozzle coolant pump
- ⑤ Clean coolant tank (from cyclone filter)
- ⑥ Through-spindle coolant pump

● Not compatible with oil-based coolant.

Image of sludge collection



Scan the QR code for the zero sludge coolant tank movie.  
[https://www.dmgmori.co.jp/en/theme/movie/  
id=3021](https://www.dmgmori.co.jp/en/theme/movie/id=3021)

### Chip conveyor outside machine (right discharge, drum filter type)

- + Regardless of shapes or materials, any types of chips including long / short chips can be transferred on one conveyor
- + Suitable for discharging various types of chips
- + Tank capacity: 1,790 L (472.6 gal.)
- + Depth of tank: 350 mm (13.8 in.)

Workpiece material	Steel			Cast iron			Aluminum / non-ferrous metal		
Chip form									
Chip size	Long	Short	Powdery	Short	Powdery	Long	Short	Powdery	
Scraper type (drum filter type)	○ *1	○	○ *2	○	○ *2	—	○ *3	○ *2	
Hinge + Scraper 2-stage chip discharge (drum filter type)	○	○	○ *2	○	○ *2	○	○	○ *2	

\*1 For long chips <100 mm (3.9 in.) or longer, select the optional "Hinge + Scraper 2-stage chip discharge (with drum filter)."

\*2 Depending on the size, some chips may pass through the drum filter and accumulate in the coolant tank.

It is recommended to use the zero sludge coolant tank to minimize the impact on machining accuracy.

\*3 When chips are easy to float on coolant [aluminum, titanium etc.] and lumps of over ø 40 mm (ø 1.6 in.) chips are often generated in large amount, please select "Hinge + Scraper 2-stage chip discharge (with drum filter)" <option>.

● <Chip size guidelines> Powdery: minute particles / Short: chips 50 mm (2.0 in.) or less in length, bundles of chips ø 40 mm (ø 1.6 in.) or less / Long: over 50 mm (2.0 in.)

● 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.

● Be sure to select a chip conveyor that suits the shape of your chips.

When using special or difficult-to-cut material (chip hardness HRC45 or higher), please consult our sales representative.

● Please consult our sales representative for dry machining, or machining of carbon fibers or resins.

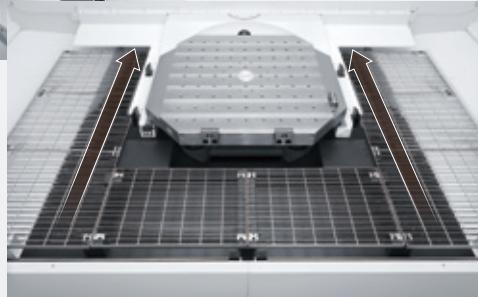
● Chip conveyors are available in various types for handling chips of different shape and material. For details, please consult our sales representative.

### Chip conveyor inside machine (spiral type)

Triple spiral conveyors, which are used for the first time in the NHX Series, offers excellent chip disposal. The right and left spiral conveyors that extend to the setup station transfer chips to the external conveyor.



The machining area



Setup station

### Shower coolant

Washes chips off the machining chamber walls and discharges them smoothly into the in-machine conveyor.

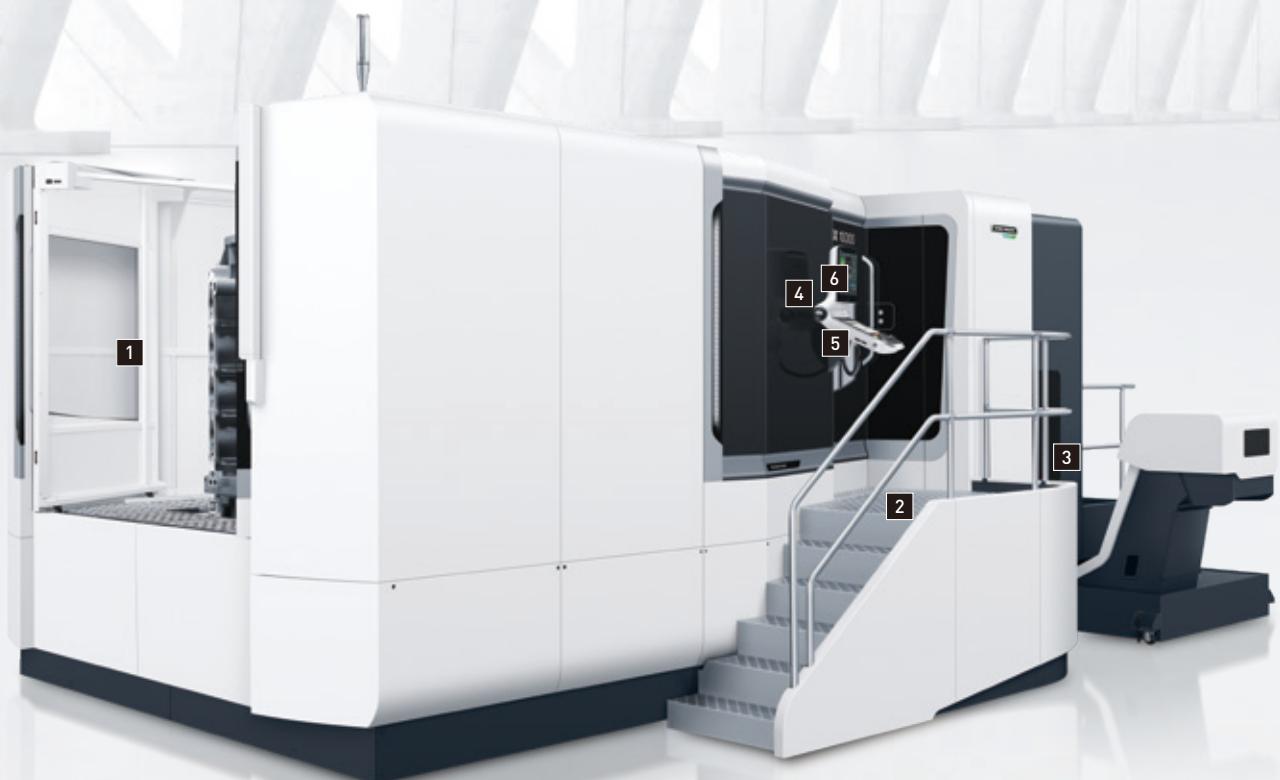


NHX 10000

## Pursuit of Usability

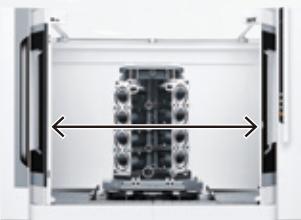
The NHX 10000 features good accessibility to the machining chamber and the setup station as well as a sophisticated cover design.

What's more, the model is equipped with various mechanical ingenuities in every part of the body such as centrally arranged hydraulic unit and other equipment for easy maintenance.



## **1** Door opening (setup station)

A two-stage double door is used to provide wide door opening, which allows easy loading and unloading of workpieces up to 2,000 mm (78.7 in.) in diameter.

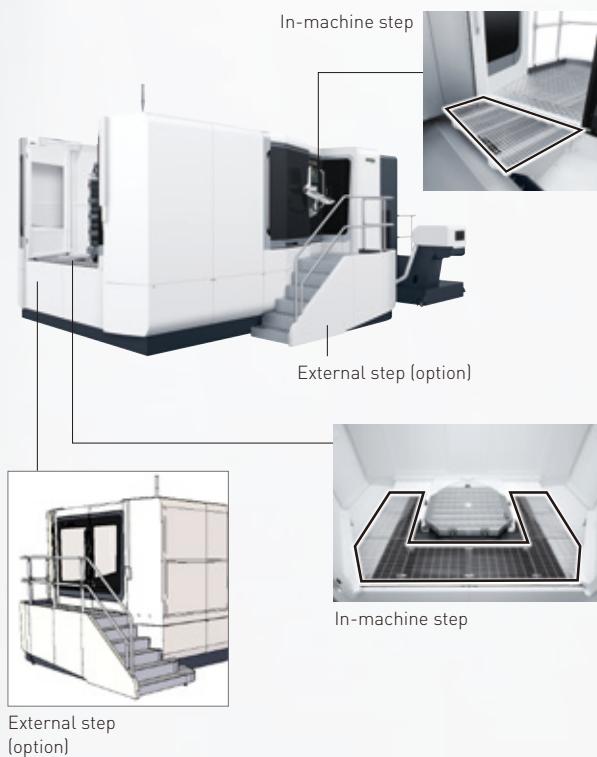


+ Door opening: 2,290 mm (90.2 in.)

- Automatic indexing setup station (option) is required for turning a pallet at the setup station.

## **2** Step

Steps inside and outside the machine eliminate the level difference to give excellent accessibility.



External step  
(option)

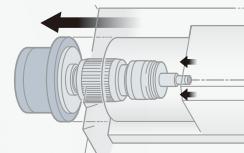
## **3** Centralized layout of devices

Peripherals requiring periodic maintenance are located in one place, which contributes to improving operators' work efficiency.



## **4** Replacement of spindle unit

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



## **5** CELOS / ERGOLINE Touch

Improved access to the spindle and workpieces thanks to the touch screen operation panel with a turning mechanism.

+ Swivel angle: 105°



## **6** Display of manuals

As well as viewing operation manuals on the CELOS screen, you can perform keyword searches and jump to links in the same way as you do on a PC. This is particularly convenient when searching for information during maintenance.

CELOS: Control Efficiency Lead Operation System

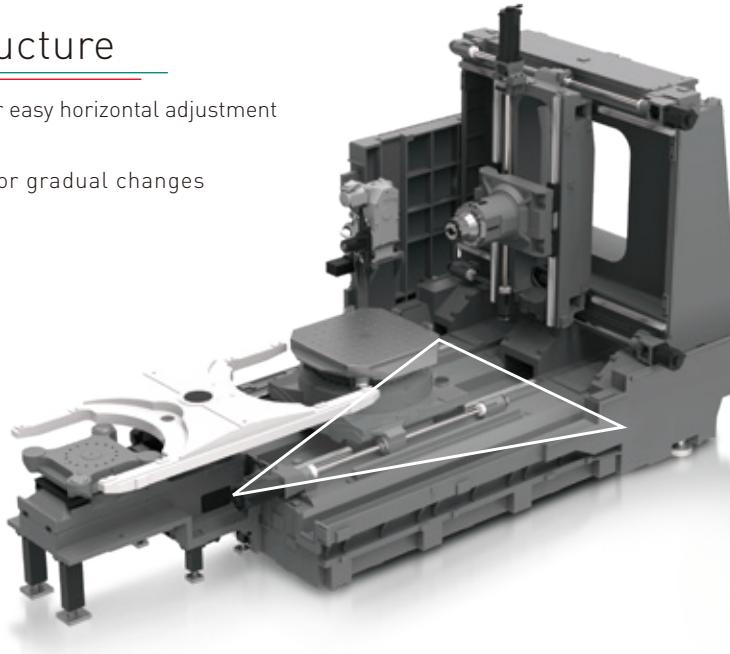
NHX 10000

# NHX 10000 $\mu$ Precision High Volumetric Accuracy

The NHX 10000  $\mu$ Precision was built especially to meet the demand for high-precision machining of large and difficult-to-machine workpieces. Its high accuracy over the full work envelope is the result of several unique twists.

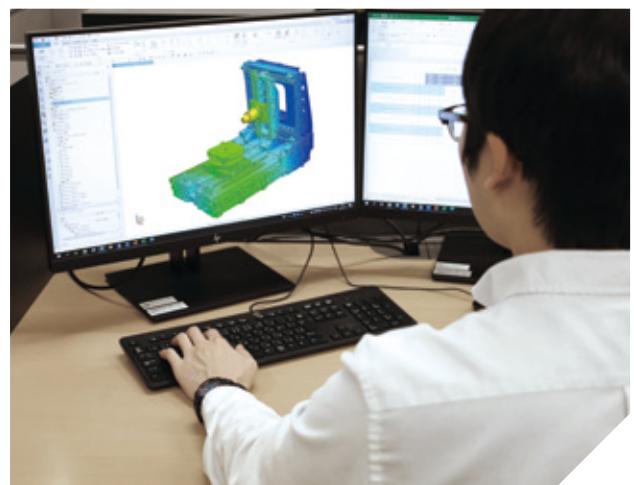
## 3-point support structure

- + 3-point support machine structure for easy horizontal adjustment drastically reduces installation time
- + Not affected by ground conditions or gradual changes

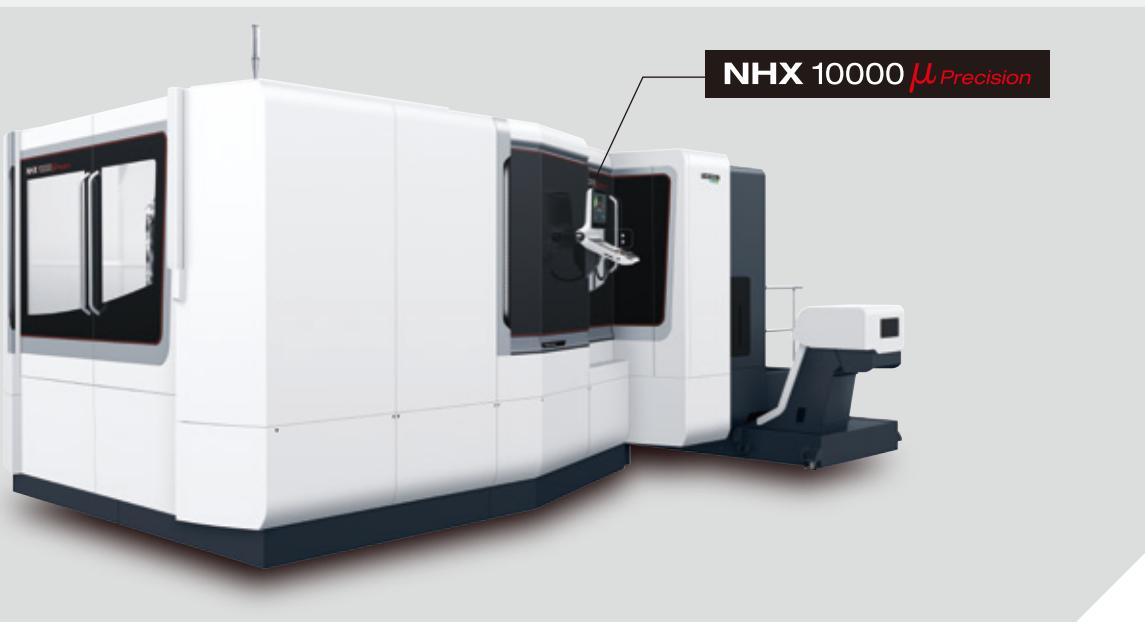


## High straightness & squareness

For the NHX 10000  $\mu$ Precision, we adjusted the guideway surfaces by machining and scraping based on technical analyses. This process reduces angular deviation during machine motion and ensures straightness and squareness for a much higher overall machine accuracy.

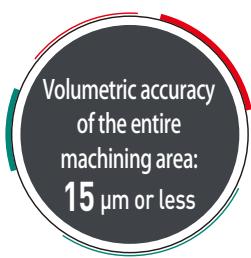


Highly optimized machine structure through advanced analysis technology

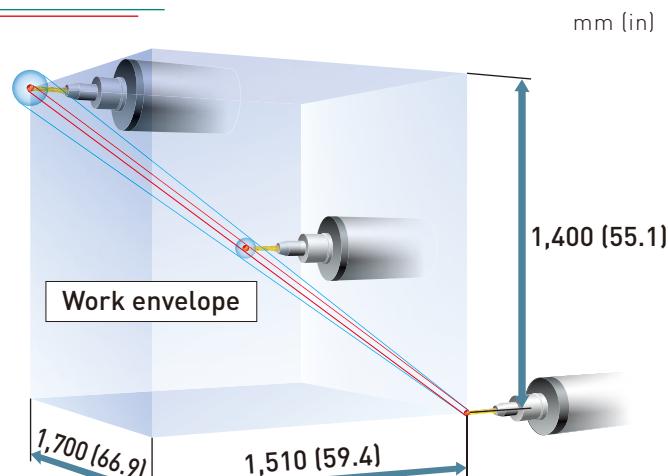


## Volumetric accuracy: 15 µm or less

Straightness and squareness are highly accurate themselves, and volumetric compensation is only applied on top. Volumetric accuracy is kept at 15 µm or less over the entire 1,700 × 1,400 × 1,510 mm (66.9 × 55.1 × 59.4 in) full-stroke work envelope.



- + Powerful support for high-precision machining of large workpieces

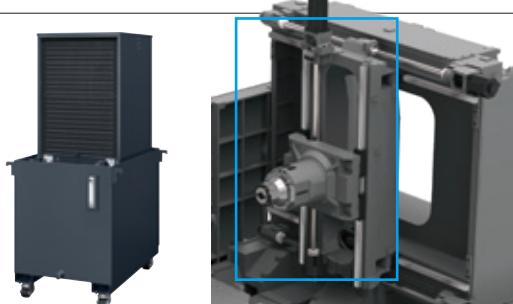


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## Effective measures against thermal displacement

Thorough measures are taken to prevent thermal deformation, which can hinder high-precision machining, including spindle cooling and ball screw shaft center cooling for all axes. This suppresses heat-caused changes in machine posture and supports high-precision machining.

### Oil chiller



- + Including a standard oil cooling system for the Y-axis ball screw (the gravity axis) to minimize thermal deformation of the saddle
- + Main machine separated from heat sources (hydraulic and chiller unit)

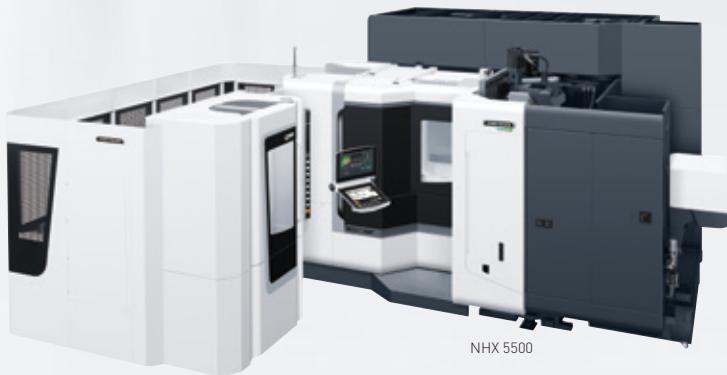
NHX 10000

# Flexible Automation Solutions

DMG MORI provides number of proven automation solutions for our customer diverse production requirements. We have installed automation systems around the world. With the advanced know-how we provide our customers with modular of fully customized solutions best suited for your floor.

## 1 CPP system (Compact Pallet Pool System)

With its simple construction provided in predefined packages, this system is easy to introduce. For the system configuration, the customer can select from 8 packages to provide the optimum specifications for their needs.



NHX 5500

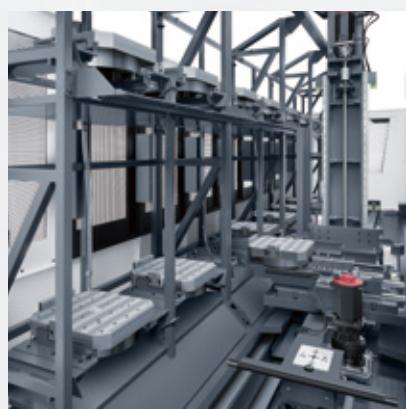
- LPS 4<sup>th</sup> Generation is available as an option.
- When the number of machines or workpiece setup stations is two or more, the LPS 4<sup>th</sup> Generation is required.
- For models and systems, please consult our sales representative.



Scan the QR code for the LPP movie.  
[https://www.dmgmori.co.jp/en/movie\\_library/movie/id=4518](https://www.dmgmori.co.jp/en/movie_library/movie/id=4518)

## 2 LPP system (Linear Pallet Pool System)

This system can be equipped with multi-level pallet racks, providing a high level of automation. The system construction can also be customized however you wish, achieving the optimum productivity and operation rate.

NHX 5000 3<sup>rd</sup> Generation

## Simple Control System

### PALLET MANAGER\*

\* MAPPS V function, available to RPS and CPP only.

#### Easy check of pallet status on CELOS



- + Displays the entire system layout in an easy-to-see manner
- + Able to check the latest pallet status and shorten setup time
- + Able to transfer pallets by drag and drop of the pallet icon on the screen

#### Tool check to prevent troubles in advance



- + Automatically identifies and displays tools that are not suitable for machining by central tool management
- + Prevents machining failure and troubles caused by tool breakage
- + Improves productivity by minimizing problem-caused rework

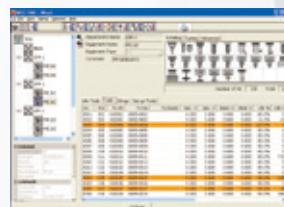
### LPS 4<sup>th</sup> Generation (Linear Pallet Pool Control System)



- + Easy operation / management of the pallet transfer system
- + Machining programs can be managed and automatically downloaded
- + Able to flexibly change production priority in response to urgent requests

MAPPS: Mori Advanced Programming Production System  
CELOS: Control Efficiency Lead Operation System  
RPS: Rotary Pallet Storage

### MCC-TMS (The Tool Management System)

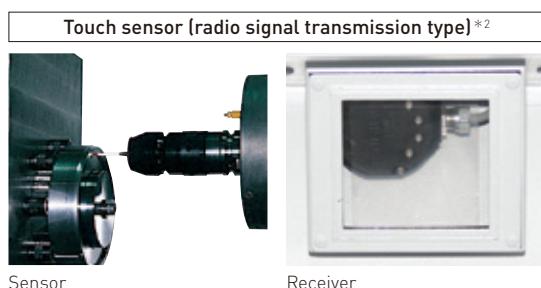


- + Improves the system operating rate through highly efficient, centralized tool management
- + Compatible with ID tags
- + Compatible with tool presetter interface

## Automatic measurement (option)

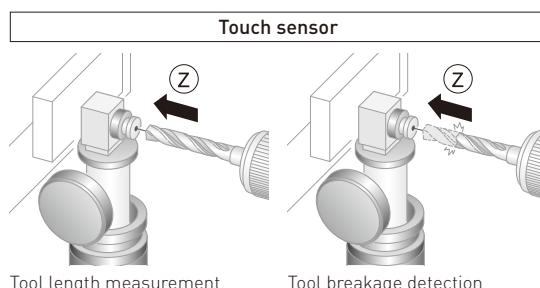
### In-machine measuring system (spindle)\*1

- + Automatic centering and automatic measurement are possible
- + The manual workpiece setter function that enables workpiece zero point setting and centering is available



### In-machine measuring system (table)

- + Automatic tool length measurement and automatic breakage detection are possible
- + The manual tool setter function that enables tool length offset is available



\*1 Equipped with the spindle for which the spindle bearing uses a high wear resistance ceramic ball. So the energization type touch sensor cannot be used.  
\*2 Please note that there are a few countries where the radio signal transmission type cannot be used because no radiowave license in those countries has been obtained yet. For details, please consult our sales representative.

NHX 10000



## One Stop Service for Various Needs DMG MORI Qualified Products

The DMG MORI Qualified Products (DMQP) program <option> is designed to certify peripherals that meet DMG MORI standards in quality, performance and maintainability. DMG MORI collaborates with our partners in the world and provides customers with peripherals required for their machining. We take care of the arrangement from selection to installation to support best-quality machining. DMG MORI helps customers improve productivity by offering the total solutions including quality peripherals as well as machine tools.

- + Offer peripheral equipment optimal for each customer at one stop
- + Provide support including connection and setup of machines and peripheral equipment
- + Achieve efficient connections with optimal interfaces



### Four DMQP categories

#### Handling

Robot system

Chip conveyor (external)

#### Shaping

Coolant chiller

High-pressure coolant system

Oil skimmer

Mist collector

#### Measuring

In-machine measuring system (tool)

Tool presetter

In-machine measuring system (workpiece)

Surface roughness measuring system

#### Monitoring

Electrical cabinet chiller

Rotary window

Coolant float switch

Signal lamp

Robot



In-machine measuring system (workpiece)



Tool presetter



Tool balance measuring system



Shrink fit system



Coolant filtration filter



Air dryer



Air compressor



Electrical cabinet chiller



Oil skimmer



Tool



NHX 10000

# DMG MORI Technology Cycles

Technology Cycles are complete solutions that achieve complex machining easily in a short time. They enable every operator to easily perform high-quality machining, setups and measurements with general-purpose machine tools and standard tools / fixtures, which used to require specialized machines, programs and tools.

Shaping



Measuring



Monitoring



Handling



- The availability of the functions differ depending on the machine. For details, please consult our sales representative.
- The above is an image picture.

## Interpolation turning<sup>\*1</sup>



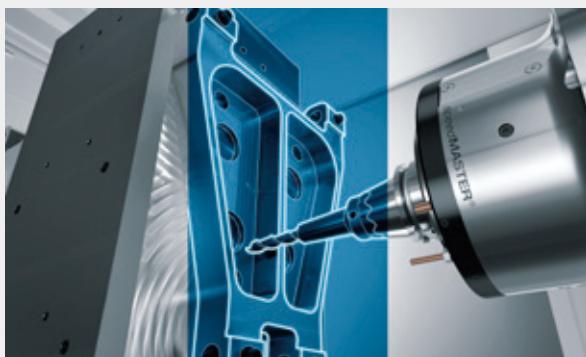
Easy programming of interpolation turning

## DMG MORI gearMILL<sup>\*2</sup>



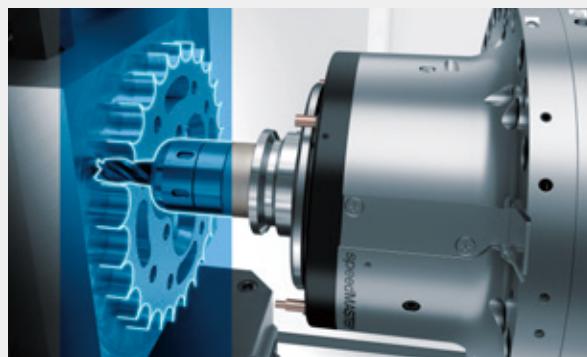
Integrating gear cutting into milling

## MVC (Machine Vibration Control)<sup>\*1</sup>



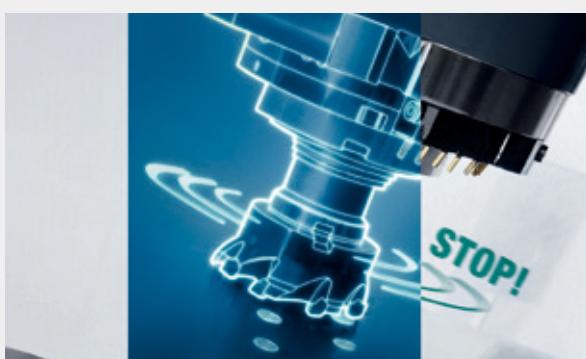
Selects optimum conditions for preventing chatter

## ATC (Application Tuning Cycle)



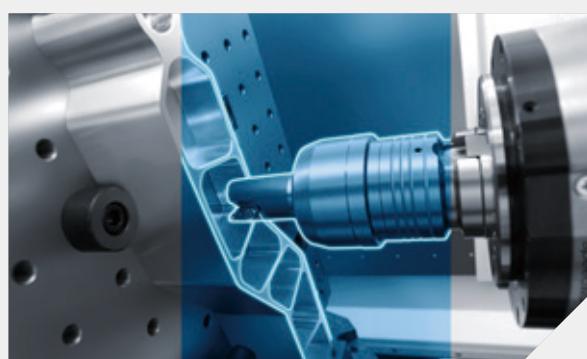
Easy setting of optimum feed according to the machining operation

## MPC (Machine Protection Control)<sup>\*1</sup>



Minimizing load to the spindle when interference occurs

## Efficient Production Package (High-speed canned cycle)<sup>\*1</sup>



Easy inputting of various machining patterns

NHX 10000

## From the Idea to the Finished Product

DMG MORI's cutting-edge operation system, CELOS, enables consistent management, documentation and visualization of orders, processes and machine data. CELOS can be extended with apps and is also compatible with your company's existing infrastructures and programs.

CELOS APPs facilitate quick and easy operation: three examples »»



### JOB MANAGER

Systematic planning, administration and preparation of work orders

- + Machine related creation and configuration of new work orders
- + Structured storage of all production related data and documents
- + Easy visualization of job information on drawings, models, tools, fixtures, etc.



### JOB ASSISTANT

Process-defined orders

- + Menu guided set-up of the machine and conversational processing of production orders
- + Reliable error prevention thanks to windows-based assistance instructions with a mandatory acknowledgement function



### APPLICATION CONNECTOR

CAD / CAM operation by remote access to external computer

- + Direct remote access to external CAD / CAM workstations
- + Central master data as basis for component viewing
- + Immediate change options for machining steps, NC programs and CAM strategies, directly in the CNC system



# CELOS

## APP menu:

Central access to all available applications



ERGOline operation panel with 21.5-inch multi-touch screen and NC unit from FANUC

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### **STANDARD**

Standard user interfaces for all new high technology machines from DMG MORI

### **CONSISTENT**

Consistent administration, documentation and visualization of order, process and machine data

### **COMPATIBLE**

Compatible with PPS and ERP systems  
Can be networked with CAD / CAM products  
Open to trendsetting CELOS APP extensions

PPS: Production Planning and Scheduling System  
ERP: Enterprise Resource Planning

NHX 10000

# DMG MORI Digital Factory



Find detailed information on Digital Factory here.  
<https://www.dmgmori.co.jp/en/knowledge/category/?type=digitalization>

## PLANNING

Production planner

## PREPARATION

Process designer

## PRODUCTION

Operator

### CELOS / CELOS PC Version

CELOS PC Version (PC)



CELOS (Machine)



#### JOB MANAGER

(on-machine and PC)



- + Registration of workpiece information (drawings, materials)



#### JOB SCHEDULER

(on-machine and PC)



- + Creation and change of work schedule by setting start / end dates of machining



#### ORGANIZER

(on-machine and PC)



- + Setting of memos and alarms



#### APPLICATION CONNECTOR

(on-machine and PC)

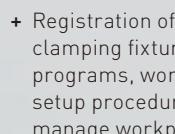


- + Remote connection with CAD / CAM, operation and check on CELOS



#### JOB MANAGER

(on-machine and PC)



- + Registration of cutting tools, clamping fixtures, machining programs, work instructions and setup procedures to centrally manage workpiece information



#### TECHNOLOGY CYCLE

(on-machine only)



- + Complex machining easily realized in a short time

### CELOS Machine



- + A wide variety of apps facilitate machining operation



#### JOB ASSISTANT

(on-machine only)



- + The operator can check the information registered in JOB MANAGER and do setups for machining
- + NC data and information about tools and a clamping device are transferred to the machine



#### TOOL HANDLING

(on-machine only)

- + Tool management by checking and registering tools to be used

DMG MORI realizes "Digital Factory" that drastically improves customer productivity and profits, using the cutting-edge technologies. The DMG MORI Digital Factory largely consists of five steps. Our cutting-edge operating system "CELOS" connects humans, machines and factories, enabling visualization and analysis of information which were difficult before. We make clear customers' production issues by shop digitization and provide optimal solutions for them.

## MONITORING

Factory manager

## SERVICE

Service engineer

# CELOS / CELOS PC Version



### MESSENGER (on-machine and PC)



- + Visualizes operating status of networked machines
- + Collects alarm history and identifies reasons for machine stops
- + Possible to check from a machines, PC or smartphone anytime, anywhere

Find a video about MESSENGER here.



### CONDITION ANALYZER

(on-machine only)

- + Allows for early identification of machine and machining problems based on machine data recorded by on-machine sensors



### IoT connector

- + Compatible with widely used communication protocols (MTConnect, OPC UA, MQTT, etc.)
- + Communication PC equipped with the enhanced data connection function to boost the machine's network performance



### Use of AI (under development)

- + AI learns information sent from a sensor and estimates & corrects thermal displacement to achieve higher machining accuracy
- + Preventive maintenance to prevent machine problems in advance

### myDMG MORI



- + Your online service manager
- + Visualize service history
- + Manage documents digitally
- + Order services online
- + Track & Trace Order status

### WERKBLIQ



Integral solution for the digital shop floor, available for both DMG MORI & 3rd party products

- + Manage documents centrally
- + Control service precisely
- + Implement service sustainably
- + Learn continuously with analyses



### NET SERVICE

(on-machine only)

- + Remote support by DMG MORI Service Center minimizes machine downtime caused by machine trouble



### SERVICE AGENT

(on-machine and PC)

- + Regular machine maintenance in an accurate and attentive manner
- MTConnect is a trademark or registered trademark of The Association For Manufacturing Technology.  
 ● OPC UA is a trademark or registered trademark of OPC Foundation.  
 ● MQTT is a trademark or registered trademark of International Business Machines Corporation.  
 ● These functions may differ in your country. Please consult our local sales representative for more detailed information.

NHX 10000

# High-Performance Operation System MAPPS V

MAPPS V is a high-performance, smart operation system mounted on CELOS. It enables operators to easily control machine operation with touch operation.

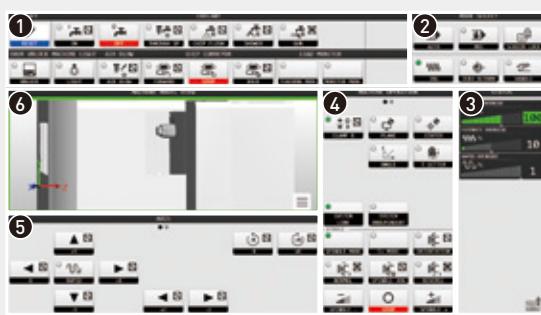


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The 6-window display provides access to a variety of information at the same time »»

The screen combinations can be freely customized »»

MAPPS: Mori Advanced Programming Production System  
CELOS: Control Efficiency Lead Operation System



## Lower Touch Panel Screen Layout

- ① Individual function operation area : Displays function buttons at all times regardless of the operation mode.
- ② Operation mode selection area : Displays mode selection buttons at all times.
- ③ Status display area : Displays the override status.
- ④ Machine operation area : Displays buttons related to spindle / turret operation and optional functions over multiple pages.
- ⑤ Mode-by-mode operation area : Displays buttons related to axis feed, zero return or automatic operation over multiple pages. The available buttons will change depending on the mode selected.
- ⑥ In-machine display area : Displays the machine model view.



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## CELOS with FANUC

- + User memory area with large capacity of 6 GB as standard
- + Equipped with simple and easy-to-follow conversational programming function
- + Quick access to necessary information in manual data by searching function
- + Two multi-touch panels
- + 3D machining simulation for easy geometry check
- + 6-window display for checking necessary machine information all at once
- + Improved setups by displaying necessary machine information according to operation

## CELOS with SIEMENS

- + Highly simplified interactive programming
- + SINUMERIK Operate new user interface
- + ATC\*, 3D quickSET\*
- + Fast block processing time of approx. 0.6 ms
- + Look-ahead function for up to 150 NC blocks (capable of parameterisation)
- + Graphic simulation of the machining process with overhead view, triple-plane display and 3D display; synchronised display during the machining process
- + 3D machining, optional 3D tool correction via the surface normal vector

\* Option

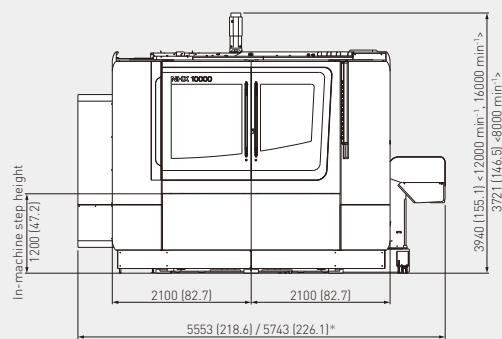
NHX 10000

# Machine Size

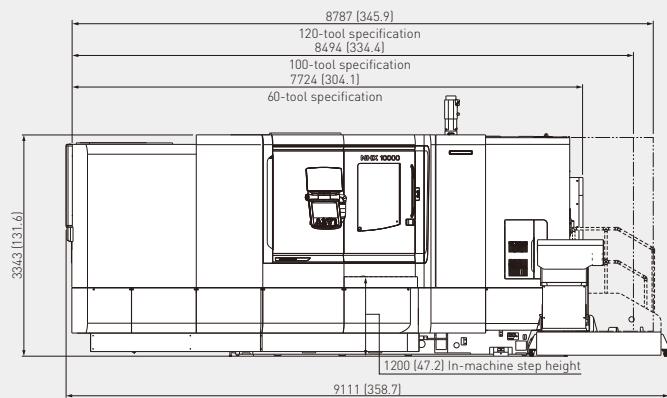
mm [in.]

Chain-type magazine

Front view



Side view

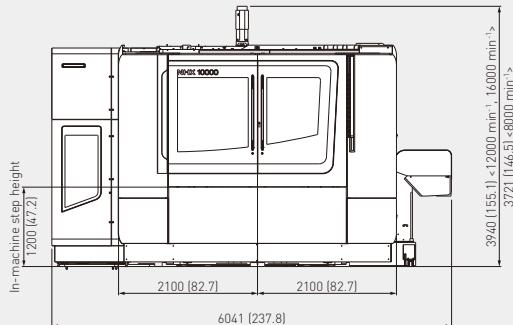


\* NHX 10000 µPrecision

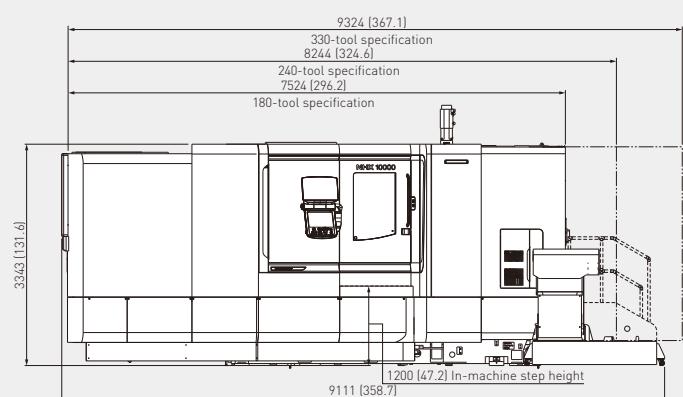
mm [in.]

Rack-type magazine (option)

Front view



Side view



Q55870-A01

NHX 10000

# Machine Specifications

		NHX 10000	NHX 10000 μPrecision
<b>Travel</b>			
X-axis travel <longitudinal movement of saddle>	mm (in.)	1,700 (66.9)	
Y-axis travel <vertical movement of spindle head>	mm (in.)	1,400 (55.1)	
Z-axis travel <cross movement of pallet>	mm (in.)	1,510 (59.4) <1,550 (61.0) when B-axis is at 0°>	
Distance from pallet center to spindle gauge plane	mm (in.)	140—1,650 (5.5—65.0) <100—1,650 (3.9—65.0) when B-axis is at 0°>	
<b>Pallet</b>			
Pallet working surface	mm (in.)	1,000 × 1,000 (39.4 × 39.4)	
Pallet loading capacity	kg (lb.)	3,000 (6,600), 5,000 (11,000) <not applicable for CPP, LPP specification>	
Max. workpiece swing diameter	mm (in.)	2,000 (78.7)	
Max. workpiece height	mm (in.)	1,600 (62.9)	
Pallet indexing time <90°>	1° indexing Full 4th axis rotary table	s s	3,000 kg (6,600 lb.): 3.1, 5,000 kg (11,000 lb.): 3.6* <sup>1</sup> 3,000 kg (6,600 lb.): 1.8, 5,000 kg (11,000 lb.): 2.0* <sup>1</sup>
<b>Spindle</b>			
Max. spindle speed	min <sup>-1</sup>	12,000, 16,000, 8,000	
<b>Feedrate</b>			
Rapid traverse rate	12,000 min <sup>-1</sup> 16,000 min <sup>-1</sup> <high speed> 8,000 min <sup>-1</sup> <high torque>	mm/min (ipm) mm/min (ipm) mm/min (ipm)	X, Y, Z: 50,000 (1,968.5) X, Y, Z: 50,000 (1,968.5) X, Z: 50,000 (1,968.5) Y: 40,000 (1,574.8)
Cutting feedrate	mm/min (ipm)		X, Y, Z: 1—50,000 (0.04—1,968.5) <look-ahead control>
<b>ATC</b>			
Type of tool shank			BT50* <sup>2</sup> , DIN50* <sup>2</sup> , CAT50* <sup>2</sup> , HSK-A100
Tool storage capacity <including one tool at the spindle side>			Chain-type: 60, 100, 120 Rack-type* <sup>3</sup> : 180, 240, 330
Max. tool diameter <with adjacent tools>	mm (in.)	110 (4.3)	
Max. tool diameter <without adjacent tools>	mm (in.)	320 (12.5)	
Max. tool length	mm (in.)	800 (31.4), 1,000 (39.3) <long tool specifications>	
Max. tool mass	kg (lb.)	30 (66)	
Tool changing time	Tool-to-tool Cut-to-cut (Chip-to-chip)	s s	1.9 60-tool specification: 5.7 <min.> / 16.7 <max.> 120-tool specification: 5.9 <min.> / 41.5 <max.>

ISO: International Organization for Standardization JIS: Japanese Industrial Standard

\*<sup>1</sup> Including clamping and unclamping time\*<sup>2</sup> When the two-face contact specification is selected, a two-face contact tool and other tools cannot be used together.\*<sup>3</sup> With rack type 180-, 240- or 330-tool magazines, the number of tools with a diameter of 110 mm (4.3 in.) or greater that can be stored in the magazine is restricted. Up to nine of the tools with the maximum permissible diameter of 320 mm (12.5 in.) can be stored.

● Max. spindle speed: depending on restrictions imposed by the workpiece clamping device, fixture and tool used, it may not be possible to rotate at the maximum spindle speed.

● Please use a two-face contact tool when cutting at higher than 10,000 min<sup>-1</sup>.● Max. tool diameter: the maximum tool diameter is limited to 230 mm (9.0 in.) or less when using the spindle at 10,000 min<sup>-1</sup> or higher.

● Tool changing time: the time differences are caused by the different conditions (travel distances, etc.) for each standard.

● For details, please check the Detailed Specifications.

● The information in this catalog is valid as of August 2022.

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# Machine Specifications

	NHX 10000	NHX 10000 μPrecision
<b>APC</b>		
Number of pallets		2
Pallet changing time* <sup>4</sup>	s	22, 41 <5,000 kg [11,000 lb.]>
<b>Motor</b>		
	12,000 min <sup>-1</sup>	kW (HP)
Spindle drive motor	16,000 min <sup>-1</sup> <high speed>	kW (HP)
	8,000 min <sup>-1</sup> <high torque>	kW (HP)
<b>Machine size</b>		
Machine height {from floor} <60-tool specifications>	mm (in.)	3,940 (155.1) <12,000 min <sup>-1</sup> > 3,940 (155.1) <16,000 min <sup>-1</sup> >, 3,721 (146.5) <8,000 min <sup>-1</sup> >
Floor space {width <60-, 100-, 120-tool specifications > × depth}	mm (in.)	5,553 × 9,111 (218.6 × 358.7) <including chip conveyor> 5,743 × 9,111 (226.1 × 358.7) <including chip conveyor>
Mass of machine <60-tool specifications>	kg (lb.)	41,500 (91,300) 45,500 (100,100)
<b>Control unit</b>		
FANUC		F31iB

\*4 When equipped with the auto-coupler, time taken to shut off / supply hydraulic pressure to the fixture is not included.

- Machine size: please see the machine diagram on page 34 for a machine with an optional tool storage capacity.
- For details, please check the Detailed Specifications.
- The information in this catalog is valid as of August 2022.

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# Standard & Optional Features

●: Standard features  
○: Options

Spindle	
BT50	●
CAT50	○
DIN50	○
HSK-A100	○
12,000 min <sup>-1</sup> : 55 / 30 kW (75 / 40 HP) <15%ED / cont>	●
16,000 min <sup>-1</sup> : 37 / 26 kW (50 / 34.7 HP) <25%ED / cont> {high speed}	○
8,000 min <sup>-1</sup> : 55 / 45 kW (75 / 60 HP) <25%ED / cont> {high torque}	○
Table	
Pallet loading capacity	3,000 kg (6,600 lb.) 5,000 kg (11,000 lb.) <sup>*1</sup>
Pallet / APC	
2-station turn-type APC	●
Pallet	Tap (metric, inch) T-slot
Magazine	
Tool storage capacity	60 tools (chain-type) <sup>*2</sup> 100 tools (chain-type) <sup>*2</sup> 120 tools (chain-type) <sup>*2</sup> 180 tools (rack-type) <sup>*3</sup> 240 tools (rack-type) <sup>*3</sup> 330 tools (rack-type) <sup>*3</sup>
Coolant	
Coolant system (spindle)	●
Shower coolant	●
Chip flushing coolant	●
Coolant gun	Machining side Setup station Setup station + machining side
Through-spindle coolant / air (switching specifications) <through-spindle coolant system is necessary required separating>	○
Through-spindle coolant system (unit on coolant tank) center through	1.5 MPa (217.5 psi) 7.0 MPa (1,015 psi) 1.5 MPa (217.5 psi)
Through-spindle coolant system (separate type) center through	7.0 MPa (1,015 psi) Interface <1.5 MPa (217.5 psi)> Interface <7.0 MPa (1,015 psi)>

\*1 Not applicable for CPP, LPP specification.

\*2 Chain-type magazines (60-, 100-, or 120-tool capacity) incorporate a pot tilting mechanism and the tool capacity includes one tool at the spindle side.

\*3 Rack-type magazines (180-, 240- or 330-tool capacity) incorporate a pot transfer mechanism and the tool capacity includes one tool at the spindle side.

\*4 DMQP (DMG MORI Qualified Products)

● Please use a two-face contact tool when cutting at higher than 10,000 min<sup>-1</sup>.

● DMQP: Please see Page 24 for details.

● For details, please check the Detailed Specifications.

● The information in this catalog is valid as of August 2022.

● Specifications, accessories, safety device and function are available upon request.

● Some options are not available in particular regions. For details, please consult our sales representative.

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

NHX 10000

# Standard & Optional Features

Standard features  
 Options

<b>Coolant</b>		
Through-spindle coolant system (center through)	Interface <7.0 MPa (1,015 psi), KNOLL>	<input type="circle"/>
Through-spindle coolant system (unit on coolant tank) side through	Interface <7.0 MPa (1,015 psi), Chip braster> 1.5 MPa (217.5 psi) 7.0 MPa (1,015 psi)	<input type="circle"/> <input checked="" type="circle"/> <input type="circle"/> <input type="circle"/>
Through-spindle coolant system (separate type) side through	1.5 MPa (217.5 psi) 7.0 MPa (1,015 psi) Interface <1.5 MPa (217.5 psi)> Interface <7.0 MPa (1,015 psi)>	<input type="circle"/> <input checked="" type="circle"/> <input type="circle"/> <input type="circle"/>
Through-spindle coolant system (side through)	Interface <7.0 MPa (1,015 psi), KNOLL> Interface <7.0 MPa (1,015 psi), Chip braster> Optional when using water-soluble coolant	<input type="circle"/> <input type="circle"/> <input type="circle"/>
Coolant chiller (unit on coolant tank)	Essential when using oil-based coolant (please be sure to consult our sales representative)	<input type="circle"/>
Mist collector HVS-300	Including stand <sup>5</sup>	<input checked="" type="circle"/>
Mist collector AFS-1600 <sup>6</sup>	Including stand	<input type="circle"/> <input checked="" type="circle"/>
<b>Chip disposal</b>		
Chip conveyor <sup>7</sup>	Right discharge, scraper type [drum filter type] Right discharge, Hinge + Scraper 2-stage chip discharge [drum filter type]	<input checked="" type="circle"/> <input type="circle"/>
Zero sludge coolant tank <sup>8</sup>		<input checked="" type="circle"/>
<b>Measurement</b>		
In-machine measuring system (table) <sup>9</sup>	Touch sensor Touch sensor Touch sensor + tool setter function (tool length + diameter) Touch sensor + tool setter function (tool length + diameter)	<input type="circle"/> <input type="circle"/> <input checked="" type="circle"/> <input type="circle"/>
In-machine measuring system (spindle) <sup>9+10</sup>	Touch sensor (radio signal transmission type) <sup>11</sup> Touch sensor (radio signal transmission type) <sup>11</sup> + workpiece setter function	<input type="circle"/> <input checked="" type="circle"/>
<b>Improved accuracy</b>		
Full closed loop control (Scale feedback)		<input checked="" type="circle"/>
Oil chiller		<input checked="" type="circle"/>
<b>Automation</b>		
Manual pulse generator (separate type)		<input checked="" type="circle"/>
<b>Other</b>		
Signal lamp	4 colors (LED type: red, yellow, green, blue)	<input type="circle"/>

\*4 DMQP (DMG MORI Qualified Products)

\*5 Cannot be used in Europe.

\*6 Not compatible with oil-based coolant. If using oil-based coolant, select the HVS-300.

\*7 Including in-machine chip conveyor (spiral type).

\*8 Not compatible with oil-based coolant.

\*9 The specifications vary depending on the manufacturers. (M: made by Magnescate R: made by RENISHAW)

\*10 Equipped with the spindle for which the spindle bearing uses a high wear resistance ceramic ball. So the energization type touch sensor cannot be used.

\*11 Please note that there are a few countries where the radio signal transmission type cannot be used because no radiowave license in those countries has been obtained yet.

For details, please consult our sales representative.

● DMQP: Please see Page 24 for details.

● For details, please check the Detailed Specifications.

● The information in this catalog is valid as of August 2022.

● Specifications, accessories, safety device and function are available upon request.

● Some options are not available in particular regions. For details, please consult our sales representative.

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



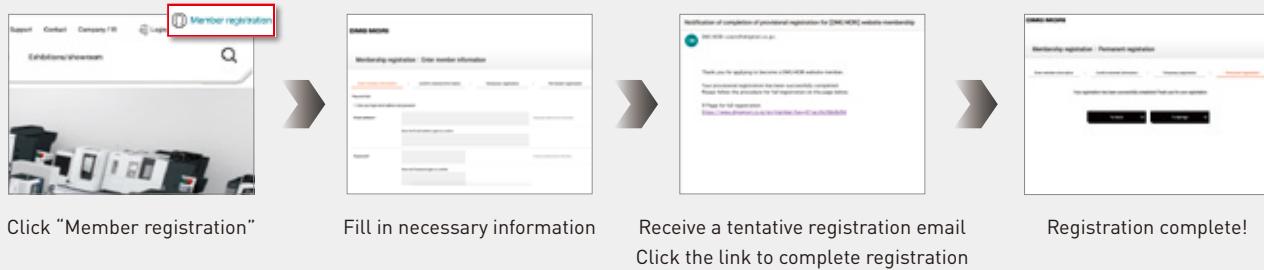
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### <Precautions for Machine Relocation>

This product is deemed regulated cargo when exported under the Japanese government's Foreign Exchange and Foreign Control Trade Law. Government authorization is required when exporting this product.

The product shipped to you (the machine and accessory equipment) has been manufactured in accordance with the laws and standards that prevail in the relevant country or region. If it is exported, sold, or relocated to a destination in a country with different laws or standards, it may be subject to export restrictions of that country.

This product detects machine relocation. Once the machine is relocated, it is not operable unless its legitimate relocation is confirmed by DMG MORI or its distributor representative.

If the restart of the machine can result in unauthorized export of cargo or technology or will violate legitimate export controls, DMG MORI and its distributor representative can refuse to restart the machine.

In that case, DMG MORI and its distributor representative do not assume any loss due to the inability to operate the machine or any liability during the warranty period.

+ DCG, DDM, ORC, speedMASTER, powerMASTER, 5X-torqueMASTER, DMQP, DDRT, MATRIS, Robo2Go, RPS, Zero sludge coolant tank, ZEROCHIP, smartTilt, CELOS, ERGOline, SLIMline, COMPACTline, DMG MORI SMARTkey, proTIME and names of each Technology Cycle are trademarks or registered trademarks of DMG MORI CO., LTD. or its group companies 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 October 2022. 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.

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