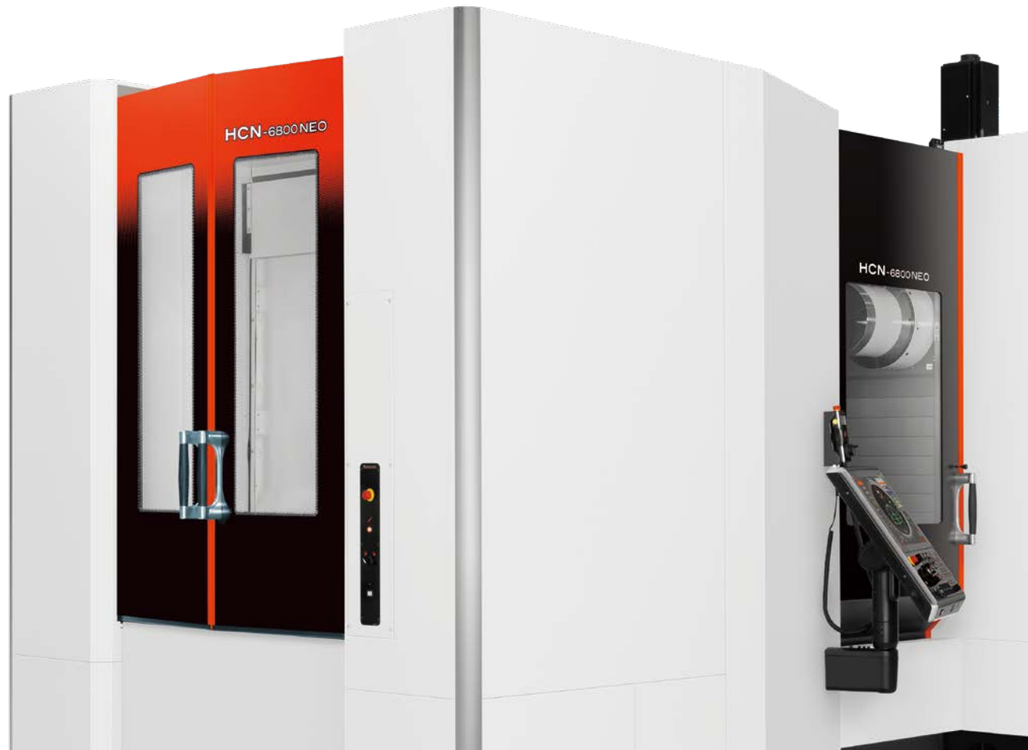
HCN-6800 NEO

Mazak

HCN-6800 NEO

[BT50 Horizontal Machining Center]



Production Support Software Free Trial

"Mazak Software" of the "APPs Manager" in the CNC control contains production support software (free trial version).
Install each software in your computer and try it.

Production Support Software	Overview
Smooth Monitor AX	Monitor and analyze machine status
Smooth Scheduler	Create production schedule
Smooth Tool Management	Centralize tool data management
Smooth Link	View and edit tool data and programs on mobile devices
Smooth Project Manager	Manage program and setup information

For details of the production support software, please visit the Yamazaki Mazak website.

YAMAZAKI MAZAK CORPORATION

1-131 Takeda, Oguchi-cho, Niwa-gun, Aichi-pref., Japan
TEL : +(81)587-95-1131

www.mazak.com

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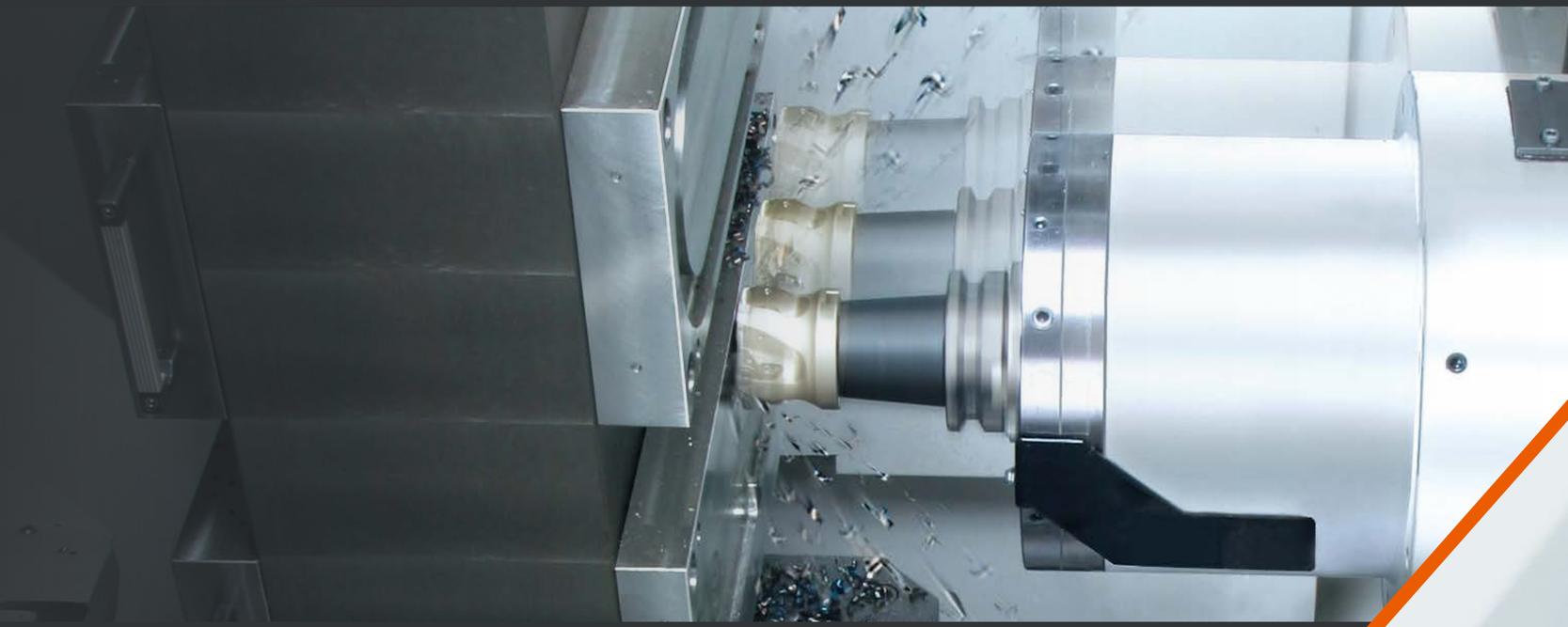
Maximize productivity with exceptional performance

Exceptional machine construction and a wide variety of options provide unsurpassed productivity

- **Reduced non-cutting time for higher productivity**
- **Spindle specifications to meet a wide variety of machining requirements**
- **High rigidity machine construction minimizes machine distortion**
- **Wide variety of automation systems available for higher productivity**



Next generation horizontal machining center

HCN-6800 NEO

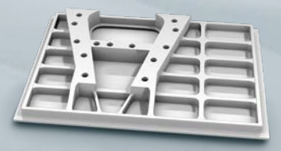
High torque spindle for heavy duty machining OPTION

8000 min^{-1} (rpm), 1413 N·m [10% ED]

World's fastest class DDM rotary table OPTION

Indexing time (90°) **1.4 sec.**

Applicable to various workpiece materials

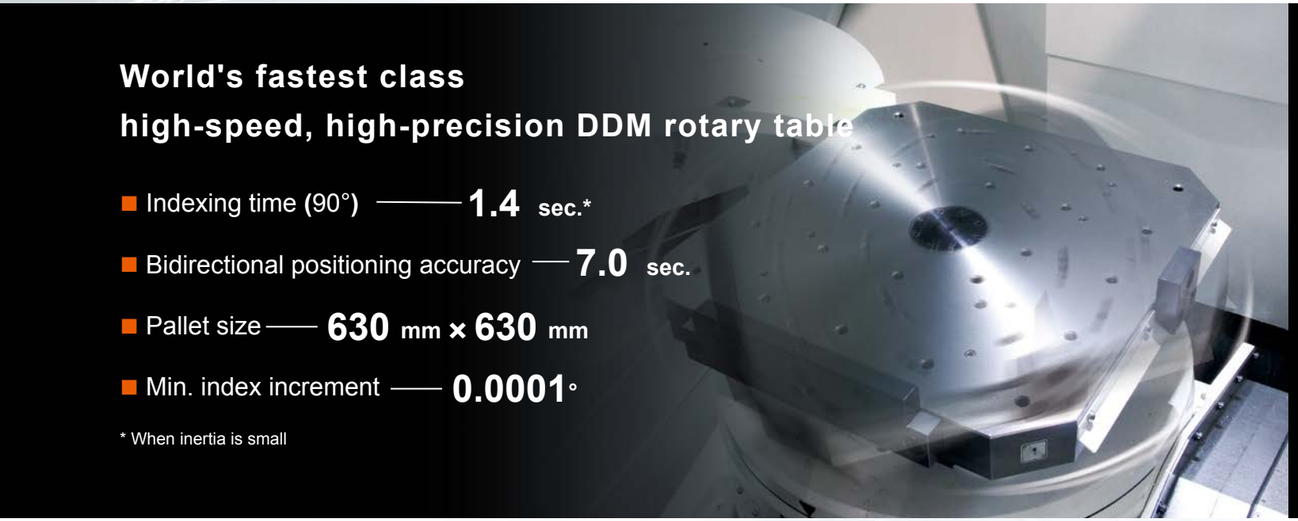


Frame (aluminum alloy)
Aerospace component

Mount (stainless)
Construction machinery component
Automotive component

Cylinder block (cast iron)
Construction machinery component
Automotive component

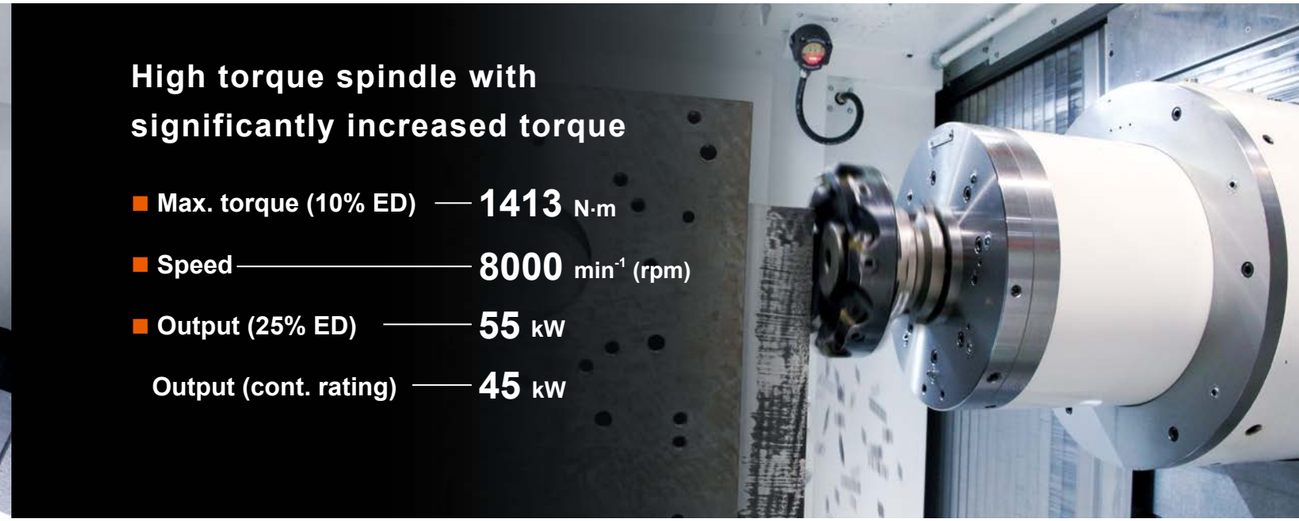
High productivity



World's fastest class high-speed, high-precision DDM rotary table

- Indexing time (90°) — **1.4** sec.*
- Bidirectional positioning accuracy — **7.0** sec.
- Pallet size — **630** mm × **630** mm
- Min. index increment — **0.0001**°

* When inertia is small



High torque spindle with significantly increased torque

- Max. torque (10% ED) — **1413** N·m
- Speed — **8000** min^{-1} (rpm)
- Output (25% ED) — **55** kW

  Output (cont. rating) — **45** kW

DDM rotary table with scale feedback OPTION

Efficient, high speed operation due to the direct transmission of driving power to the rotary table axis, eliminating power transmission components such as the worm shaft and the worm gear.
Auto tuning function optimizes acceleration / deceleration of inertia on the table to reduce positioning time.

Inertia Auto Tuning

Support inertia adjustment on the screen

Generate estimated programs
Visualize estimated results
Adjust programs

High torque 8000 min^{-1} (rpm) spindle OPTION

Ensures powerful machining of steel and cast iron. Elimination of drive gears minimizes power loss and spindle vibration, improving machine surface quality, and extending tool life. Temperature controlled cooling oil circulates around the spindle bearings and headstock to minimize any thermal change to the spindle.

Tool shank	BT50 BIG-PLUS No.50 HSK-A100

Available table specifications

0.0001° × 3600000 NC rotary table

The backlash-free rotary gear cam utilized by the NC rotary table ensures high accuracy as well as a long service life.

Index increment	0.0001° × 3600000
Clamping torque	12.25 kN·m
Table rotation speed	30 min^{-1} (rpm)
Contouring torque (cont. rating)	1.14 kN·m
Indexing time (90°)	1.5 sec.

1° × 360 index table OPTION

The 360° high index coupling provides high accuracy indexing in 1° increments.

Index increment	1° × 360
Table rotation speed	25 min^{-1} (rpm)
Indexing time (90°)	1.9 sec.

Available spindle specifications

Standard 10000 min^{-1} (rpm) spindle

Spindle power output is 45 kW (40% ED).
Designed for high efficiency machining of a wide variety of applications from steel to non ferrous material

Speed	10000 min^{-1} (rpm)
Output	AC 45 kW (60 HP) (40% ED)
	AC 37 kW (50 HP) (cont. rating)
Spindle torque	350 N·m (40% ED)

High speed 16000 min^{-1} (rpm) spindle OPTION

Due to the changeable bearing preload, rigidity is ensured during low speed machining as well as high speed machining of aluminum.

Speed	16000 min^{-1} (rpm)
Output	AC 37 kW (50 HP) (40% ED)
	AC 30 kW (40 HP) (cont. rating)
Spindle torque	221 N·m (40% ED)

High productivity

High-speed drum type tool magazine - Improved max. tool length and max. moment

- Max. tool length —— 690 mm
- Max. moment —— 49 N·m*
- Tool change time —— Min. 6.0 sec.

* Limitation varies by number of tools stored.

Drum type tool magazine

Drum type tool magazine with high speed tool index. By positioning tools at an angle, the long tool can be stored so the machine width is reduced.

Tool magazine capacity : 43
Tool magazine capacity : 60 OPTION

Available tool magazine specifications

80, 120, 160 tool magazine OPTION

The tool magazine is capable of performing high-mix, low-volume production. Tool selection method is random, shortest path (fixed pocket assignment).

240, 348 TOOL HIVE OPTION

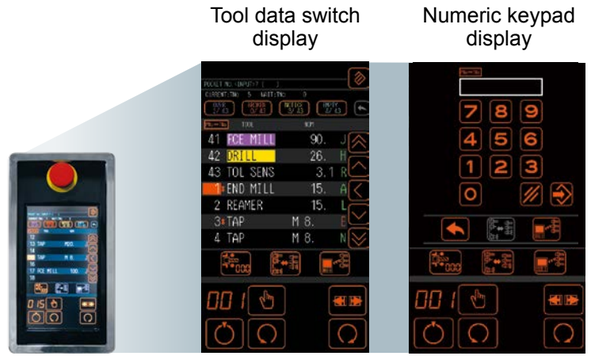
The TOOL HIVE can store a large number of tools in a small space. Operation and tool data editing can be performed on the TOOL HIVE TERMINAL control panel to reduce the time required for tool setup.

206, 348 TOOLTECH OPTION

Compact rack-type tool magazine with large tool storage capability. Comes with tool cart for easy loading of multiple tools as well as large tools.
Note: Available on BT50 and BIG-PLUS BT50

Tool magazine operation panel (touch panel)

The tool magazine operation panel is designed for increased ease of operation. Instead of having just a forward / reverse button for indexing the tool magazine and manually positioning the desired tool pocket, the pocket number or tool number can be input into the operation panel numeric keyboard and the desired pocket will be automatically brought into position. Additionally, tool data are displayed on this panel eliminating trips back to the machine CNC. By touching the tool data, the tool magazine will be indexed to the selected tool. The sort key quickly shows which tool pockets are empty.



Tool ID OPTION

Tool ID allows automatic input and update of tool data into the CNC for machines in a network. It eliminates mistakes when loading tools into the magazine and tool data input, reducing setup time. (requires retention bolt with tool ID and tool presetter)

Smooth Machining Configuration

Adjust machining features including cycle time, finished surface and machining shape with slider switches on the display to match material requirements and machining methods. This is especially effective for complex workpiece contours defined in small program increments. Newly added "2X-R" function reduces rough machining time (standard equipment).

High accuracy

Automatic tool length measurement & tool breakage detection OPTION

Tool length is automatically measured and registered in CNC system. Tool breakage can be detected during automatic operation.

Smooth OMM
(on machine measurement software) OPTION

By manual operation, the touch probe can be moved to a measurement point and after the point is registered, a measurement program can be created. In addition to the automatic update of work coordinates and tool compensation using measurement results, geometric tolerances of workpiece features can also be measured.
All functions are available for free for a 120-day trial period. The work coordinate measuring function can be used even after exceeding the trial period.

Note : The user is required to prepare the touch probe and reference sphere for on machine measurement. Additional purchases may be necessary depending on the customer environment. For further details, please contact your nearest Mazak office.

Smooth Set and Inspect OPTION
(on machine measurement software)

Inspection programs can be easily made. Work coordinates and tool compensation can automatically be updated using measurement results.

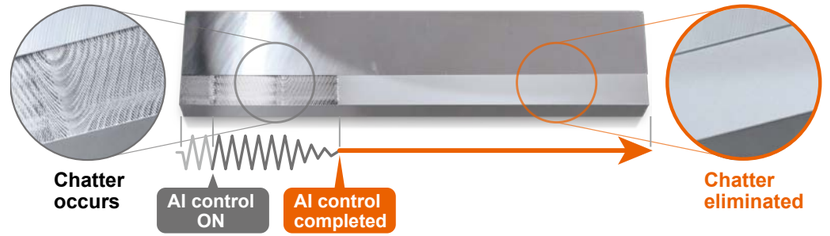
Note : The user is required to prepare the touch probe and reference sphere for on machine measurement. Additional purchases may be necessary depending on the customer environment. For further details, please contact your nearest Mazak office.

Mazak monitoring system B (OMP60) OPTION

Coordinate values are automatically shifted according to the results of probing a workpiece by a touch sensor mounted in the machine spindle.

Smooth Ai Spindle OPTION

Using AI, the milling spindle vibration is detected and machining conditions are automatically changed to produce unsurpassed surface finishes and high productivity. Thanks to AI, adjustments can be easily made in a short time without a skilled operator.



Ball screw core cooling

Temperature controlled cooling oil circulates through the ball screw cores to ensure stable machining accuracy over extended periods of high speed operation.

Ai Thermal Shield

New algorithms automatically determine the amount of compensation to be automatically applied according to changes in the temperature to ensure even higher machining accuracy.

High rigidity construction

High rigidity construction for high accuracy machining

High rigidity bed

High rigidity is ensured for the mounting surface of the X-, Y-axis linear roller guides to minimize distortion on the bed when the X-, Y-axis are traveled.

■ Max. workpiece dimensions

Φ1050 mm × 1300 mm

■ Max. load on pallet (evently distributed)

1500 kg

Linear roller guides utilized on the X-, Y-, and Z-axis

Linear roller guides on the X-, Y- and Z-axis are utilized by the HCN series in order to provide high accuracy and heavy duty machining.

■ Rapid traverse rate, Cutting feedrate

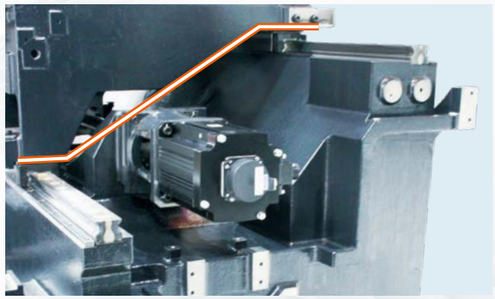
60 m/min (X, Y, Z-axis)

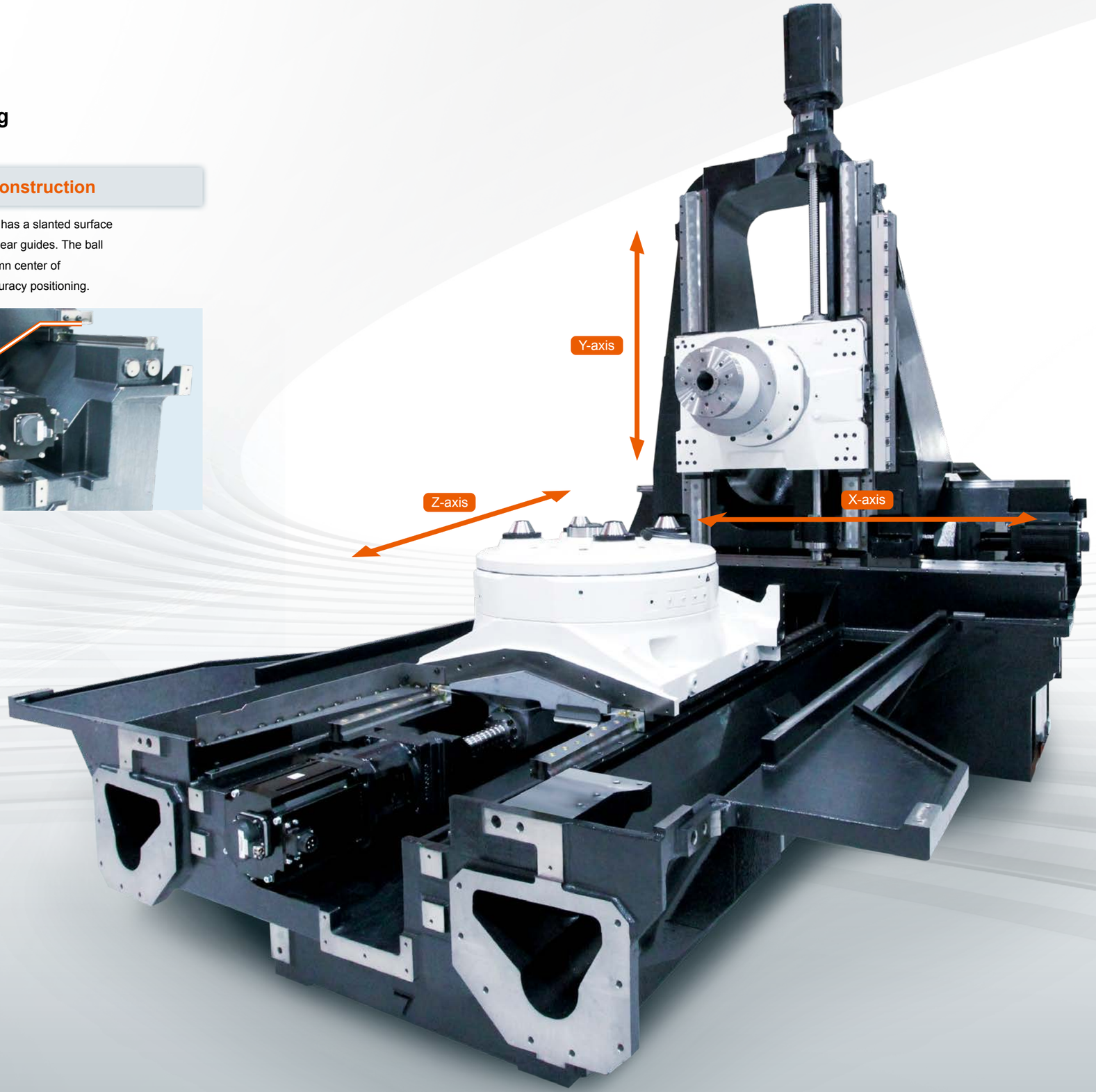
Table clamping

The table and pallet are clamped on taper cones. This construction ensures high rigidity and pallet changing repeatability accuracy.

Base X-axis construction

The bottom of the column has a slanted surface for mounting the X-axis linear guides. The ball screw is close to the column center of gravity to ensure high accuracy positioning.



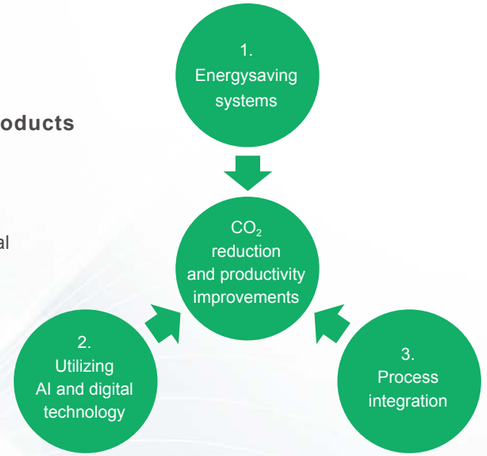


Environmental Friendly

Mazak Go GREEN

Decarbonization-related technology for Mazak products

We are committed to developing technology for decarbonization through productivity improvements. Mazak promotes the three comprehensive approaches to the reduction of our environmental impact in support of achieving a sustainable society.

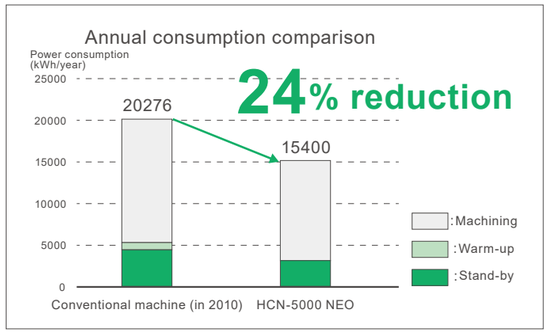


HCN-5000 NEO Reference data

Energy-saving equipment reduces power consumption

◎ Hydraulic unit utilizing accumulator
◎ Inverter type chiller unit
◎ Reduced warm-up time by stable machining accuracy

Annual power consumption 24% reduction



Energy saver

Energy consumption and the regenerative power produced through the energy saving equipment can be viewed visually on the CNC system - control/management of coolant and other equipment.

Graphical display

Display instantaneous power / consumed power / regenerated power / actual power graphically.

Trend display

Display power consumption by hour / day / week / month.

Optimal control function

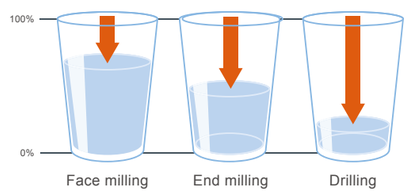
Displays the energy-saving status of each piece of equipment.
Energy-saving level can be adjusted.

Smooth coolant system OPTION

Optimal control of coolant discharge amount

Energy saver automatically determines the optimal coolant discharge for energy-saving machining.

◎The cutting volume is calculated by simulation
◎The optimal discharge amount is automatically determined



Energy-saving coolant system with sludge removal performance

No need to frequently clean the tank

The coolant tank has a coolant jet that makes a vortex in the center so that small machined chips will not settle in the tank. Thanks to this feature, the coolant tank stays clean and the service life of the coolant is extended. Ease of maintenance is also ensured.
The frequency of coolant changes is reduced as well as CO_2 emissions at coolant disposal

High performance filter removes 99% of sludge

The high-performance filter suctions the chips along with the coolant, separates them, and removes 99% of the sludge

Sludge removal rate
99%

Reduced running cost / environmental impact

Reduced tank cleaning, optimal control of coolant discharge and the efficient pump operation with inverters, reduces power consumption and CO_2 emissions.

Smooth coolant system deployment

Conventional coolant tank	Smooth coolant system
Coolant degradation	Coolant degradation prevention and prolonged lifespan

Chip disposal

Optimum chip disposal for a wide range of applications

Chips contained in the coolant can cause filter clogging inside the coolant circuit, operation failure of valves, and quality deterioration of the machining surface.
To prevent these problems, chips are separated from the coolant and discharged.
Chip shapes and sizes differ according to the workpiece material and machining method.
A wide range of chip conveyors and filters are available to suit various kind of machined chips.

Magnetic separator OPTION

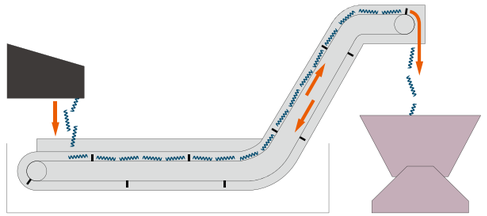
The magnetic separator which is inside the coolant tank separates ferrous chips from the coolant.

Chip disposal (setup station)

Accumulated machined chips on the 2-pallet changer are smoothly removed by the conveyor inside the machine to prevent the accumulation of chips.

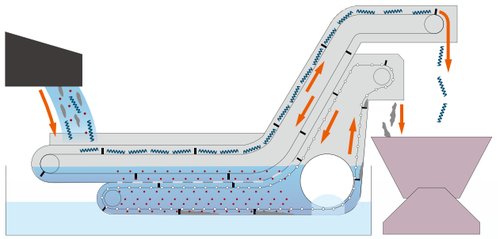
Chip conveyor (hinge) OPTION

Chips are removed by the hinge-plate belt and discharged from the side of machine. Very suitable for curly shaped steel chips from 30 mm to 150 mm long.



Chip conveyor (ConSep 2000) OPTION

The upper conveyor discharges long and curly chips. The lower conveyor discharges fine chips and performs coolant filtration using the drum filter.



Chip conveyor

The type of chip conveyor to be selected is based on the type of machined chips that will be produced.

○ : Applicable ✕ : Not applicable

Chip shape		Sludge-like chips (0.25 mm to 1 mm)	Needle-like chips (to 0.5 mm)	1 ~ 5 mm	5 ~ 30 mm (Max. 30 mm)	30 to 70 mm (Max. 70 mm)	70 mm	Features
Hinge	For ferrous machining	✕	✕	✕	✕	○	○	Applicable for long, steel chips
ConSep	For ferrous / aluminium / cast-iron machining	○	○	○	○	○	○	Applicable regardless of chip length

Automation

Automatic loading station rotation OPTION

Pallet on the loading station can be indexed in 4 positions, every 90°.
Workpiece loading / unloading on multiple surface fixture by robot can be easily performed with optional hydraulic power supply.

2-pallet changer

Rotary-type pallet changers quickly change pallets with heavy workpieces for higher productivity.

PALLETECH SYSTEM OPTION

The modular design of the PALLETECH conveniently allows more machines and increased pallet storage capacity to be added to the system after the initial installation in response to changing production requirements. The pallet stocker is available with one, two and three levels for large pallet storage capacity with small floor space requirements.

PALLETECH MANUFACTURING CELL (1 level)

PALLETECH HIGH RISE SYSTEM (3 levels)

System specifications

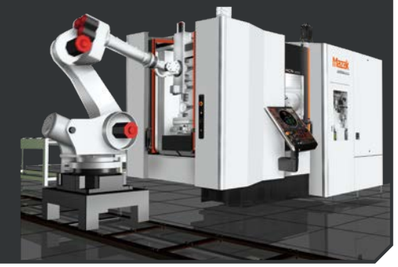
		Minimum	Maximum
Machine (s)		1	15
Number of pallets	1 level	6	240
	2 levels	12	240
	3 levels	18	240
Loading station (s)		1	8
Loading robot		1	1

Hydraulic fixtures for higher productivity

Optional hydraulic fixtures are available with multiple ports with pneumatic seating detection.This not only increases the efficiency of workpiece loading/unloading, but productivity is also further improved by connecting workpiece transfer units such as robots.

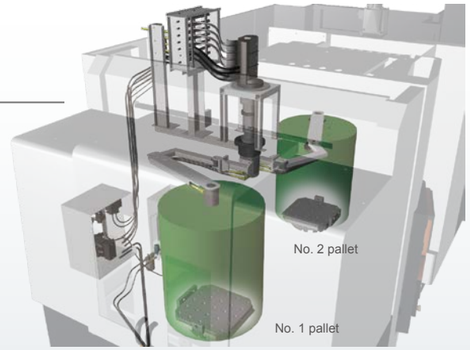
- **Hydraulic power supply*** —— **8 ports**
- **Workpiece seating detection*** —— **4 ports**
- **Max. hydraulic power supply** —— **7 MPa**

* 1 pallet / hydraulic power supply (supply from machine top)



Hydraulic power supply A (supply from machine top) OPTION

By hydraulic hoses, hydraulic power is supplied from the top part of the pallet changer to fixtures mounted on each pallet.
The number of ports can be arranged and the max. number is 12.



Hydraulic power supply B (supply through pallet) OPTION

By using a leak-free coupling system, hydraulic power is supplied to the supply port on the pallet bottom.
Unlike hydraulic power supply from machine top, hydraulic hose and hydraulic rotary coupling is not required.
This minimizes interference, enabling easy fixture design and workpiece machining.
In addition, the automatic indexing of the loading station makes it even easier to automate workpiece loading / unloading by robots.
NC rotary table and DDM rotary table can be equipped.

Loading station	Inside machine
Hydraulic power supply : **8 ports**	Hydraulic power supply : **4 ports**

Ergonomics

Design focus on ergonomics provides unsurpassed ease of operation

Large window on the 2-pallet changer cover door

The large windows on the 2-pallet changer cover door allow the operator to easily see the status of the workpiece in the setup station.

Convenient workpiece loading / unloading

An over head crane can be easily used for the loading / unloading of heavy workpieces and fixtures.

Large operation window

The large operation window for convenient monitoring machine operation.

Convenient setup

The loading station can be manually indexed to four positions, to every 90°, which makes it even easier loading / unloading of workpieces on multiple surface fixtures.

Convenient setup

For ease of setup, 2-pallet changer operation panel is located next to the door at optimum height for setup.

Maintenance area

Hydraulic and air pressure inlets and lubrication reservoirs are conveniently arranged in a central location for convenient maintenance.

CNC System

Overwhelmingly high-speed and high-accuracy CNC

Latest hardware and software for
unprecedented speed and precision

Smooth graphical user interface

MAZATROL Smooth graphical user interface for
unsurpassed ease of operation
Touch screen operation - operate similar to
your smartphone / tablet

Ease of operation

Designed for unsurpassed
ease of operation

Shown with optional dual monitor

4-axis simultaneous CNC

MAZATROL SMOOTH G

Process home screens

Five different home process screens - each home screen displays the appropriate data in an easy-to-understand manner. Icons can be touched in each process display for additional screen displays.

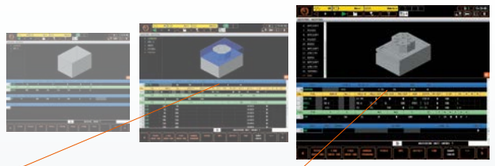
Programming | Tool data | Set up | Machining | Maintenance

Programming screen links tool path, workpiece shape and programming to reduce programming time.

QUICK MAZATROL

Reduced time for conversational programming

MAZATROL program, unit list and 3D workpiece shape are linked to each other. After defining a machining unit in a MAZATROL program, the 3D shape is immediately displayed to easily and quickly check for any programming error.



Quickly move to the corresponding section in the MAZATROL program by touching a feature in the 3D model.

3D model in the process list is displayed with updated programming in real time.

3D ASSIST

Making a program directly from 3D CAD data

Workpiece and coordinate data can be imported from 3D CAD data to a MAZATROL program. No coordinate value inputs are required.
Can reduce input errors and time for program checking.

CAD model importing

Shape selection

Automatically input to MAZATROL program

QUICK EIA

EIA program Visualization

Program, process list and 3D tool path display are linked to each other. Visible search on touch screen can reduce the time for program checking.

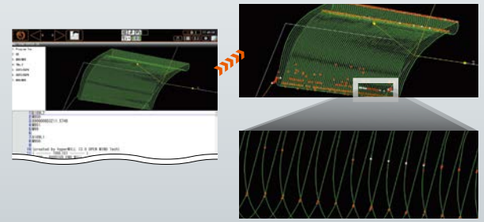
Selecting tool path by touching the screen.

Moving to the corresponding EIA program line.

VIEW SURF

Analyzing EIA programs

By analyzing tool path, any predictable failure on the finished surface can be visualized. Program modification can be done before machining to minimize the time for test cutting.



Standard and Optional Equipment

Manual pulse generator (wired)

The remote manual pulse generator provides convenient operation when the operator is not close to the CNC operation panel. Its display shows the position display and the machine coordinate values.
4 different positions can be registered in memory by the remote manual pulse generator.
A wireless version, with the same functions, is optionally available.

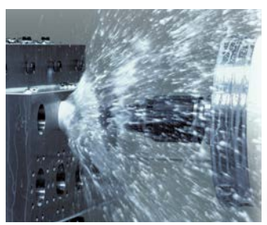
Manual pulse generator (wireless) OPTION

Wireless manual pulse generator connects to MAZATROL SmoothG through radio wave, enabling convenient operation without any limitation of connecting cable.
(Note: The wireless remote manual pulse generator is not available in some countries.)

SUPERFLOW coolant system OPTION

The SUPERFLOW coolant system features lower tool tip temperatures, improved coolant lubrication and chip disposal by supplying a maximum 7.0 MPa (70 kgf/cm^2) coolant pressure.

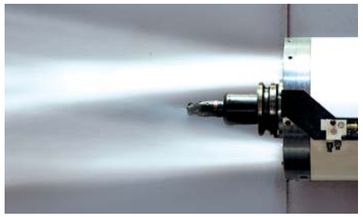
- Adjustable coolant pressure
- High performance cyclone filter with minimum maintenance requirements to reduce running cost



High pressure pump unit

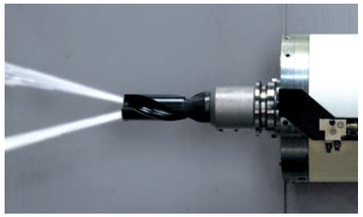
Flood coolant

Coolant is discharged from nozzles on spindle housing to cool workpiece and remove chips.



Coolant through spindle OPTION

Coolant is fed to the tool tip by passages through the tool.
3 pump pressure specifications are available : 0.8 MPa (8 kgf/cm^2), 1.5 MPa (70 kgf/cm^2) (option) and 7 MPa (70 kgf/cm^2) (option).



Niagara coolant system OPTION

Large volume of coolant is discharged from the nozzles mounted on the machine top cover to flush chips from the workpiece to conveyors on both sides of the table.

● : Standard ○ : Option

Spindle	10000 min^{-1} (rpm) (BT50) spindle	●
	10000 min^{-1} (rpm) (BIG-PLUS No.50, HSK-A100) spindle*1	○
	8000 min^{-1} (rpm) (BT50, BIG-PLUS No.50, HSK-A100) high torque spindle*1	○
	16000 min^{-1} (rpm) (HSK-A100) high speed spindle	○
Tool magazine	43 tool (BT50) drum type magazine	●
	43 tool (HSK-A100) drum type magazine	○
	60 tool (BT50, HSK-A100) drum type magazine	○
	80, 120, 160 tool (BT50, HSK-A100) chain type magazine	○
	240, 348 tool (BT50, HSK-A100) TOOL HIVE	○
	206, 348 tool (BT50, BIG-PLUS No.50) TOOLTECH	○
Table	NC rotary table	●
	DDM rotary table with scale feedback	○
	1° × 360 index table	○
Pallet	630 mm × 630 mm tapped pallet	●
	630 mm × 630 mm tapped pallet with location bore	○
	630 mm × 630 mm T-slot pallet with location bore	○
	630 mm × 800 mm tapped pallet	○
	630 mm × 800 mm tapped pallet with location bore	○
	630 mm × 800 mm T-slot pallet with location bore	○
	800 mm × 800 mm tapped pallet	○
	800 mm × 800 mm tapped pallet with location bore	○
	800 mm × 800 mm T-slot pallet with location bore	○
Automation	2-pallet changer	●
	6-pallet changer / pallet changer management / hand held coolant nozzle	○
	Hydraulic power supply B (supply through pallet) 2 ports × 2 pallets (1° × 360 index table not available)	○
	Tapped pallet with location bore for hydraulic power supply B (2 ports)	○
	T-slot pallet with location bore for hydraulic power supply B (2 ports)	○
	Hydraulic power supply A (supply from machine top) 2 ports × 2 pallets	○
	Workpiece seating detection, ON / OFF switch (requires hydraulic fixture)	○
	Automatic loading station rotation (90°index, 4 positions)	○
	Automatic front door	○
	Robot interface	○
	PMC application	○
	Automatic power ON / OFF + warm-up operation	●
Setup	Smooth Ai spindle	○
	Dual monitor for MAZATROL SmoothG CNC	○
	Remote manual pulse generator (wired)	●
	Remote manual pulse generator (wireless)	○
	Magazine operation panel (without Tool ID)	●
	Mazak monitoring system B (optical) OMP60	○
	Smooth OMM (on machine measurement software)	○
	Smooth Set and Inspect (on machine measurement software)	○
	Automatic tool length measurement & tool breakage detection	●
	RENISHAW NC 4 laser tool length measurement*2	○
	Tool breakage detection (ATC areas / up to standard tool length)	○
Safety equipment	Tool run out detection (due to chip contamination between spindle & tool holder)	○
	Operator door interlock	●
High accuracy	Scale feedback (X-, Y-, Z-axis)	○
	Chiller unit	●
	Coolant temperature control	○
	Ball screw core cooling	●
Coolant / chip disposal	Flood coolant	●
	Niagara coolant	●
	Oil mist coolant	○
	Coolant through spindle 0.8 MPa (8 kgf/cm^2)	●
	High pressure coolant through spindle 1.5 MPa (17 kgf/cm^2)	○
	Preparation for high pressure coolant through milling spindle 7.0 MPa (70 kgf/cm^2)	○
	SUPERFLOW coolant system	○
	Air through spindle (cannot be used with spindle rotating)	●
	Work air blast	○
	Hand held coolant nozzle (workpiece setup side)	○
	Oil skimmer (RB-200)	○
	Mist collector	○
	Chip conveyor (side disposal) *3	○
	Chip conveyor (rear disposal)	○

*1 Requires tool magazine for HSK
*2 Not available with automatic tool length measurement
*3 Not available with 6 pallet changer and PALLETECH system

Standard Machine Specifications

Stroke	X-axis (column right / left)	1050 mm
	Y-axis (spindle up / down)	900 mm
	Z-axis (table back / forth)	980 mm
	Distance between table center to spindle nose	100 mm to 1080 mm
	Distance between pallet top to spindle center	100 mm to 1000 mm
Pallet	Pallet size	630 mm × 630 mm
	Max. workpiece dimensions	Φ1050 mm × 1300 mm
	Pallet load capacity (evenly distributed)	1500 kg
	Pallet top surface	M16, tapped 24 places, pitch 125 mm
Table	Minimum indexing angle increment	0.0001°
	Indexing time	1.5 sec. / 90°
Spindle	Max. spindle speed	10000 min^{-1} (rpm)
	Spindle taper	7/24 taper No.50
	Spindle motor (40% ED / cont.rating)	45 kW (60 HP) / 37 kW (50 HP)
Feedrate	Rapid traverse rate (X-, Y-, Z-axis)*1	60000 mm/min
	Cutting feedrate (X-, Y-, Z-axis)*1	1 to 60000 mm/min
Automatic tool changer	Tool shank	No.50
	Tool magazine capacity	43
	Max. tool dia. / length (from gauge line) / weight	Φ125 mm / 690 mm*2 / 30 kg
	Max. tool diameter (when adjacent pockets empty)	Φ250 mm*3
	Tool selection method	MAZATROL Random memory (random pocket assignment)
	Tool change time (chip-to-chip)	4.2 sec.
Automatic pallet changer	Number of pallets	2
	Change system	Rotary type
	Pallet change time	11.0 sec.
Machine size	Machine height	3344 mm
	Floor space requirement	3405 mm × 6772 mm

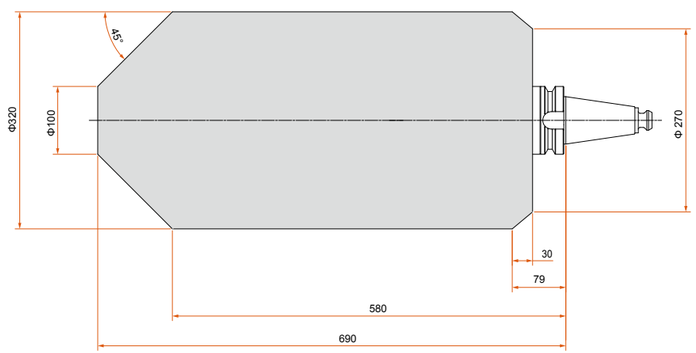
*1 Limited feedrate with continuous axis movement

*2 Pallet change cannot be performed depending on tool length

*3 When adjacent pockets are empty and pockets next to them have tools less than Φ240 mm, maximum tool diameter is Φ260 mm

Max. tool dimensions OPTION

Unit : mm



Max. tool weight : 30 kg

Max. moment : 49 N·m*

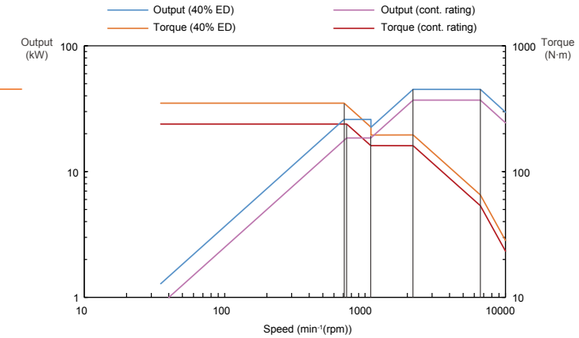
* Standard 43 tool magazine can store four tools.

Note
- When adjacent pockets are empty and pockets next to them have tools less than Φ180 mm
- X-axis stroke limit : 10 mm according to the tool diameter mounted on the spindle
- Pallet change cannot be performed depending on tool length

Output / torque diagram

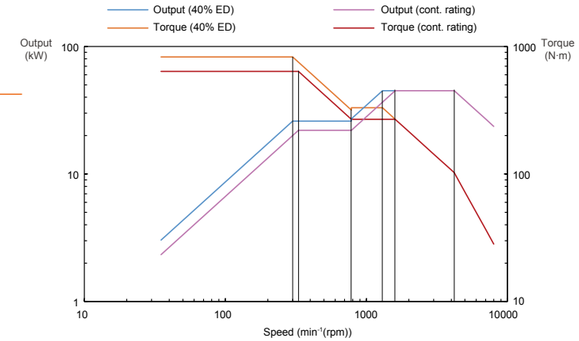
Standard spindle

No.50, 10000 min^{-1} (rpm), 45 kW (40% ED)



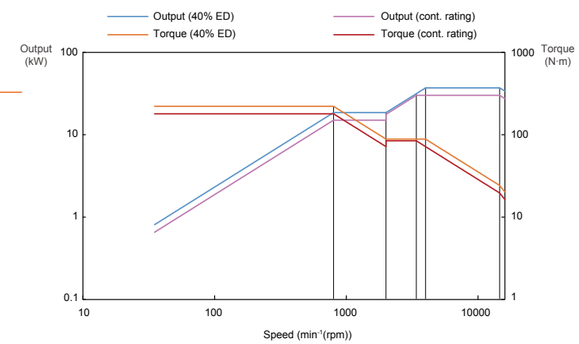
High torque spindle OPTION

No.50, 8000 min^{-1} (rpm), 45 kW (40% ED)



High speed spindle OPTION

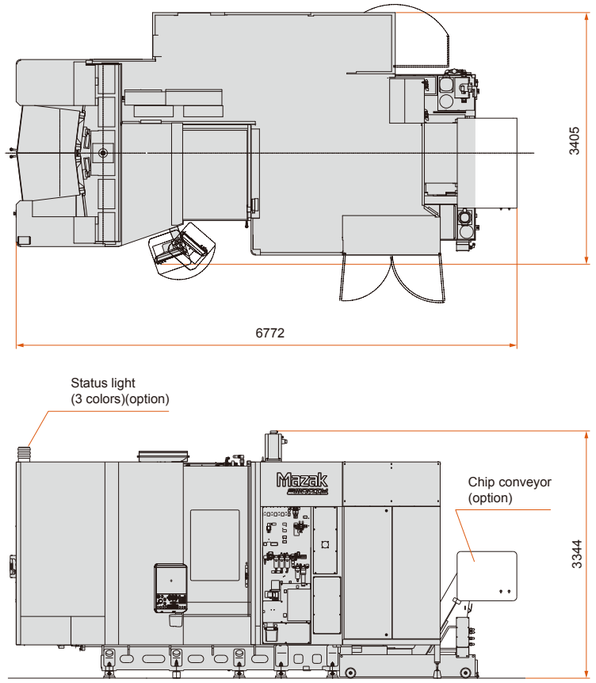
HSK-A100, 16000 min^{-1} (rpm), 37 kW (40% ED)



Dimensions

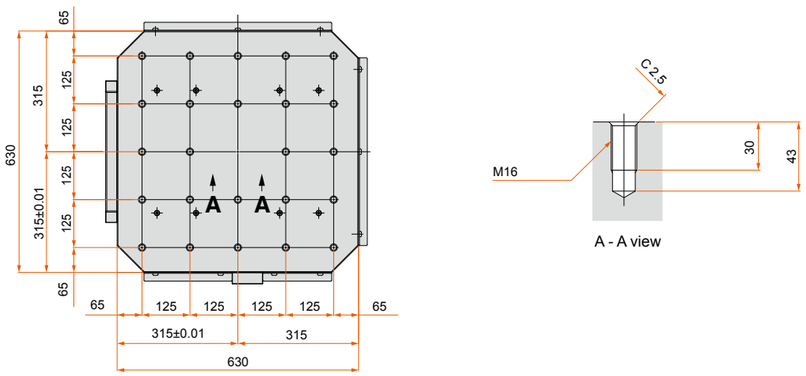
Machine Dimensions

Unit : mm



Standard Pallet Dimensions

Unit : mm



MAZATROL SmoothG Specifications

	MAZATROL	EIA
Number of controlled axes	Simultaneous 2 to 4 axes	
Least input increment	0.0001 mm, 0.00001 inch, 0.0001 deg	
High speed, high precision control	Shape compensation, Smooth corner control, Rapid traverse overlap, Rotary axis shape compensation	Shape compensation, Smooth corner control, Rapid traverse overlap, Rotary axis shape compensation, High-speed machining mode, High-speed smoothing control
Interpolation	Positioning (interpolation), Positioning (non-interpolation), Linear interpolation, Circular interpolation, Synchronous tapping*	Positioning (interpolation), Positioning (non-interpolation), Linear interpolation, Circular interpolation, Spiral interpolation, Helical interpolation, Cylindrical interpolation*, Fine spline interpolation*, NURBS interpolation*, Polar coordinate interpolation*, Synchronous tapping*
Feedrate	Rapid traverse, Cutting feed, Cutting feed (per minute), Cutting feed (per revolution), Dwell (time / rotation), Rapid traverse override, Cutting feed override, G0 speed variable control, Feedrate limitation, Variable acceleration control, G0 slope constant*	Rapid traverse, Cutting feed, Cutting feed (per minute), Cutting feed (per revolution), Inverse time feed, Dwell (time / rotation), Rapid traverse override, Cutting feed override, G0 speed variable control, Feedrate limitation, Time constant changing for G1, Variable acceleration control, G0 slope constant*
Program registration	Number of programs : 256 (Standard) / 960 (Max.), Program memory : 2 MB, Program memory expansion : 8 MB*, Program memory expansion : 32 MB*	
Control display	Display : 19" touch panel, Resolution : SXGA	
Spindle functions	S code output, Spindle speed limitation, Spindle speed override, Spindle speed reaching detection, Multiple position orient*, Constant surface speed, Spindle speed command with decimal digits, Synchronized spindle control, Spindle speed range setting	
Tool functions	Number of tool offset : 4000, T code output for tool number, Tool life monitoring (time), Tool life monitoring (number of machined workpieces)	Number of tool offset : 4000, T code output for tool number, T code output for group number, Tool life monitoring (time), Tool life monitoring (number of machined workpieces)
Miscellaneous functions	M code output, Simultaneous output of multiple M codes	
Tool offset functions	Tool position offset, Tool length offset, Tool diameter / tool nose R offset, Tool wear offset	
Coordinate system	Machine coordinate system, Work coordinate system, Local coordinate system, Additional work coordinates (300 set)	
Machine functions	-	Tilted working plane**, Shaping function*, Dynamic compensation II*, Tool center point control***, Workpiece positioning error compensation***
Machine compensation	Backlash compensation, Pitch error compensation, Ai Thermal shield, Volumetric compensation*	
Protection functions	Emergency stop, Interlock, Pre-move stroke check, SAFETY SHIELD (manual mode), SAFETY SHIELD (automatic mode)*, VOICE ADVISER	
Automatic operation mode	Memory operation	Memory operation, Tape operation, MDI operation, EtherNet operation*
Automatic operation control	Optional stop, Dry run, Manual handle interruption, MDI interruption, TPS, Restart, Machine lock	Optional block skip, Optional stop, Dry run, Manual handle interruption, MDI interruption, TPS, Restart, Restart 2, Collation stop, Machine lock
Manual measuring functions	Tool length teach, Touch sensor coordinates measurement, Workpiece offset measurement, WPC coordinate measurement, Measurement on machine	Tool length teach, Tool offset teach, Touch sensor coordinates measurement, Workpiece offset measurement, Measurement on machine
Automatic measuring functions	WPC coordinate measurement, Automatic tool length measurement, Sensor calibration, Tool breakage detection, External tool breakage detection*	Automatic tool length measurement, Sensor calibration, Tool breakage detection, External tool breakage detection*
MDI measurement	Semi automatic tool length measurement, Full automatic tool length measurement, Coordinate measurement	
Peripheral network	PROFIBUS-DP*, EtherNet/IP*, CC-Link*, CC-Link IE Field Basic	
Interface	SD card interface, USB	
EtherNet	10 M / 100 M / 1 Gbps	
Security software	Security software	

* Option

** Simultaneous 4-axis control