Mazak

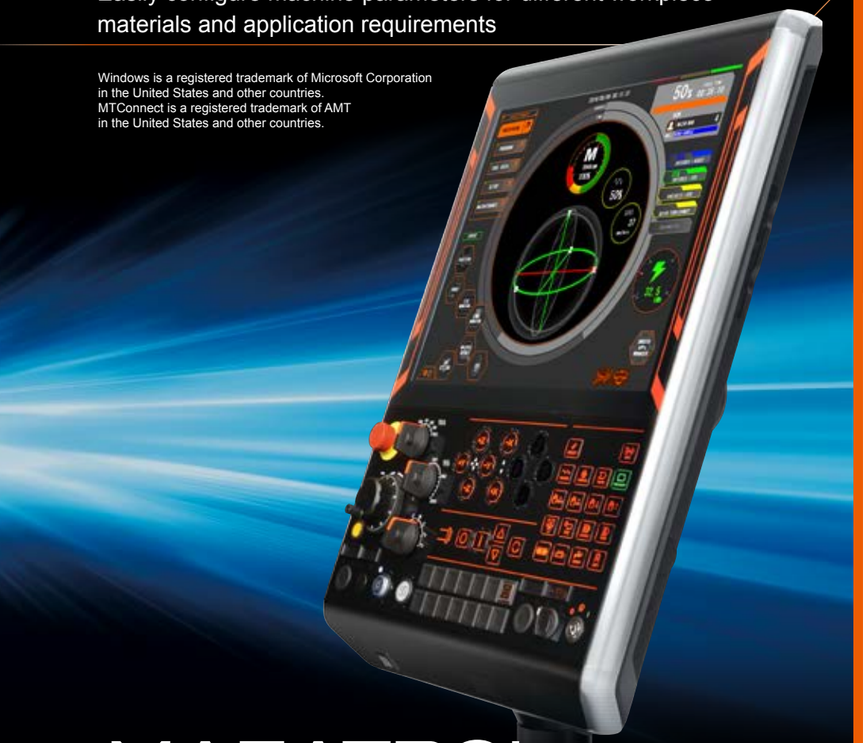
HCN

SERIES

[6800, 8800, 10800, 12800]

Advanced features of the MAZATROL SmoothG CNC

- Touch screen operation similar to your smartphone/tablet
- PC with Windows® 8 embedded OS
- Fastest CNC in the world with latest hardware and software for unprecedented speed and precision
- Easy conversational programming of multiple-surface machining
- Smooth graphical user interface and support functions for unsurpassed ease of operation
- MTConnect® ready for convenient networking
- Easily configure machine parameters for different workpiece materials and application requirements



MAZATROL SMOOTHG

Designed for unsurpassed productivity

High-speed, high-accuracy horizontal machining centers

HCN-12800
Shown with optional three-color status light

HCN SERIES

- Pallet sizes : □630 mm (24.8"), □800 mm (31.5"), □1000 mm (39.37") and □1250 mm (49.21")
- No. 50 taper spindle suitable for any production requirements:
  - Standard: 10000 rpm
  - High speed: 16000 rpm OPTION
  - High torque: 8000 rpm OPTION
  - Hard metal: 6000 rpm OPTION
- Rigid machine construction for heavy-duty machining
- Unsurpassed ease of operation

Higher Productivity

Spindle specifications for any workpiece material requirement

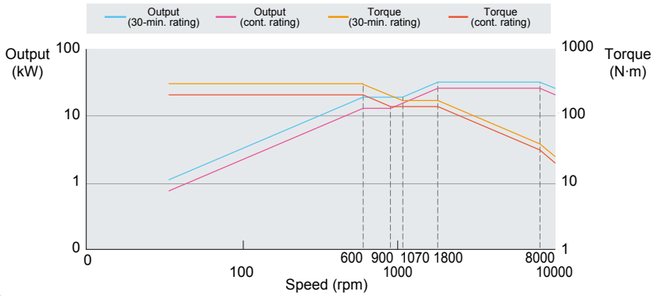
Standard 10000 rpm spindle

Integral spindle/motor | Oil & air lubrication

High performance at any speed for a wide variety of materials, including cast iron and aluminum.

Speed	10000 rpm
Output	AC 37 kW (50 hp) [30-min. rating]
	AC 30 kW (40 hp) [cont. rating]
Max. torque	350 N·m (258 ft·lbs) [30-min. rating]

10000 rpm spindle output/torque diagram



Mount (stainless steel)
Construction machinery component

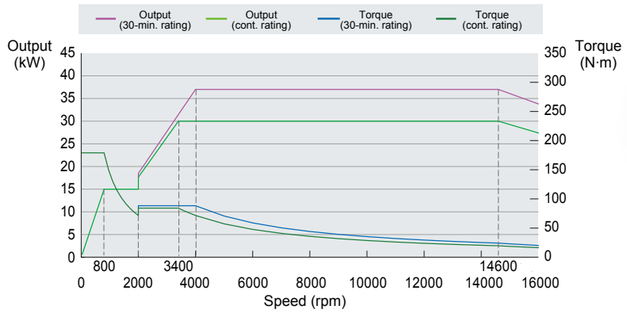
High-speed 16000 rpm spindle OPTION

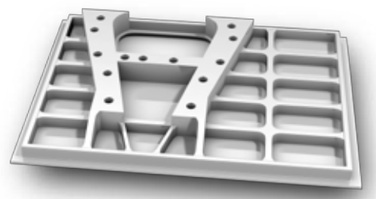
Integral spindle/motor | Oil & air lubrication | Bearing preload change

Thanks to the changeable bearing preload, rigidity is ensured during low-speed machining and high-speed aluminum machining.

Speed	16000 rpm
Output	AC 37 kW (50 hp) [30-min. rating]
	AC 30 kW (40 hp) [cont. rating]
Max. torque	179 N·m (132 ft·lbs) [30-min. rating]

16000 rpm spindle output/torque diagram





Frame (aluminum alloy)
Aerospace component

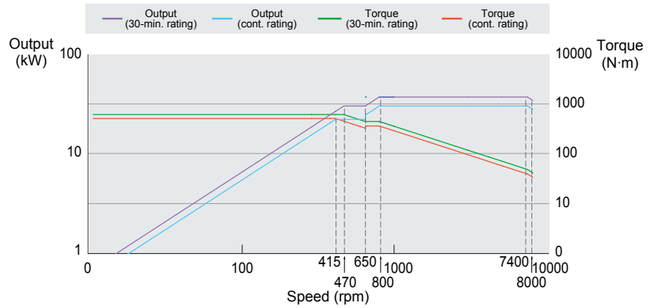
High-torque 8000 rpm spindle OPTION

Integral spindle/motor | Oil & air lubrication

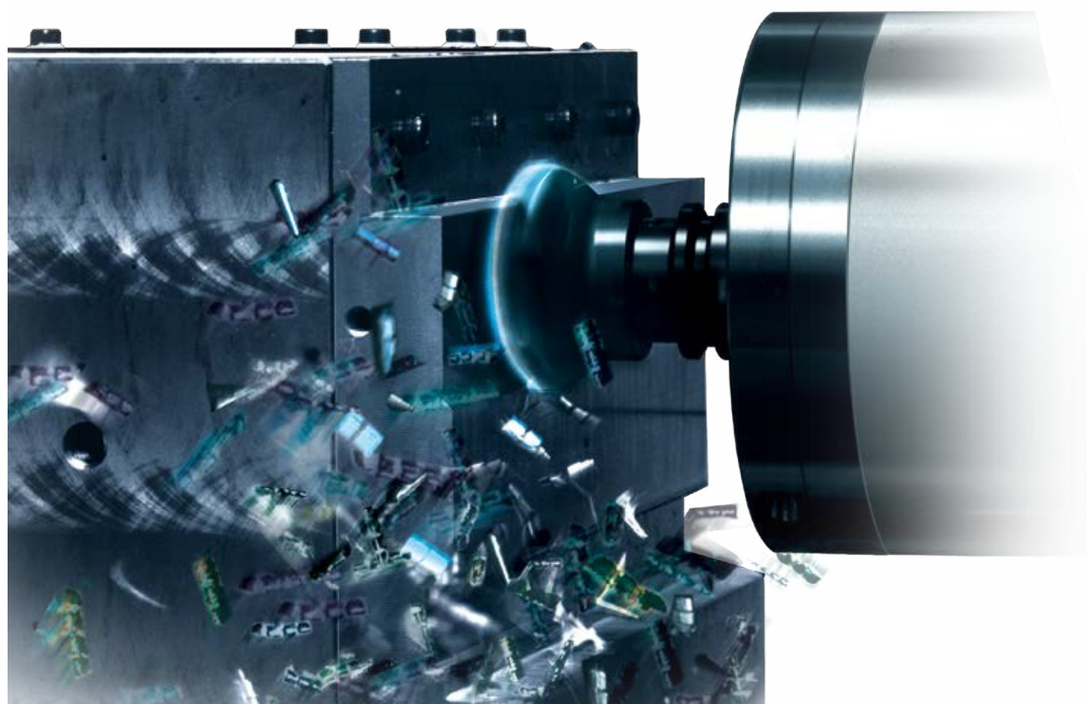
High-torque, No. 50 taper 8000-rpm integral spindle/motor for heavy-duty machining of steel and other difficult-to-machine materials.

Speed	8000 rpm
Output	AC 37 kW (50 hp) [30-min. rating]
	AC 30 kW (40 hp) [cont. rating]
Max. torque	609 N·m (449 ft·lbs) [30-min. rating]

8000 rpm spindle output/torque diagram



Cylinder block (cast iron)
Automotive component



Higher Productivity

Hard Metal package OPTION

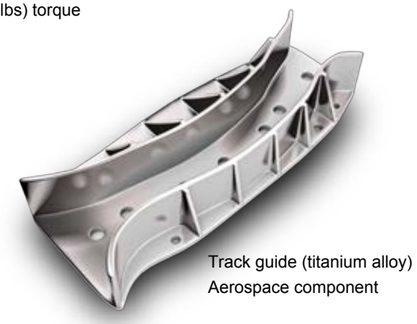
A Hard Metal (HM) package with protective functions is available as an option. Its high-torque spindle, greater thrust force on feed axes and high-rigidity base are designed for high-productivity machining of challenging materials.

High-torque 6000 rpm spindle

Integral spindle/motor with a maximum torque of 800 N·m (590 ft·lbs) torque (continuous rating) for high-performance, heavy-duty machining.

Integral spindle/motor | Oil & air lubrication

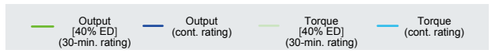
Speed		6000 rpm
Output	HCN-6800 HCN-8800 HCN-10800	AC 37 kW (50 hp) [40% ED (30-min. rating)]
		AC 30 kW (40 hp) [cont. rating]
	HCN-12800	AC 56 kW (75 hp) [40% ED (30-min. rating)]
		AC 45 kW (60 hp) [cont. rating]
Torque		955 N·m (704 ft·lbs) [40% ED (30-min. rating)]

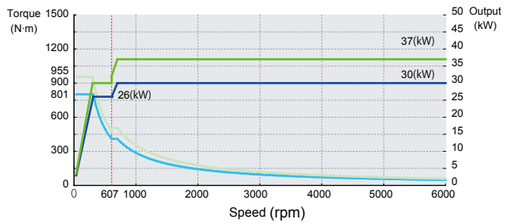


Track guide (titanium alloy)
Aerospace component

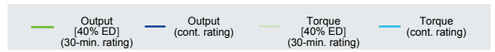
6000 rpm spindle output/torque diagram

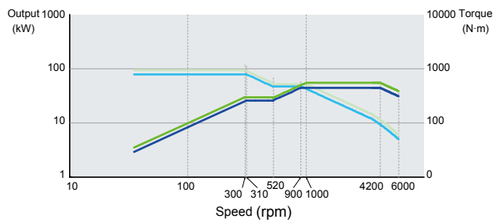
HCN-6800, HCN-8800, HCN-10800





HCN-12800





X, Y and Z-axis thrust

Feed thrust on all axes is 20 kN (4496 lbf)*1 for heavy-duty machining.*2

*1 HCN-12800 X axis: 31.53 kN (7088 lbf), Y axis: 19 kN (4271 lbf), Z axis: 42.21 kN (9489 lbf).
HCN-6800 acceleration/deceleration: 0.59 G
*2 HCN-6800 has Hard Metal base specification

Protective functions

Minimize damage to workpieces and the machine by detecting abnormal errors.

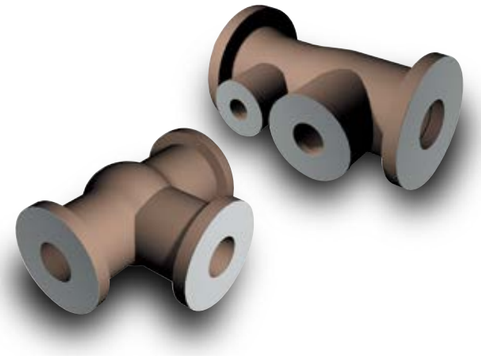
- **Crash detection**
  Feed is stopped when the registered thrust force is exceeded
- **Pallet displacement**
  Detects displacement of pallet on pallet seats
- **Spindle clamp sensor**
  Confirms proper tool clamping

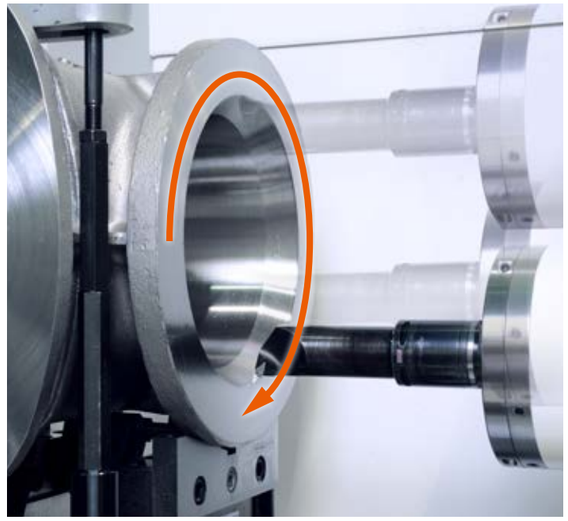
Orbit machining OPTION

Turned workpiece features on a machining center

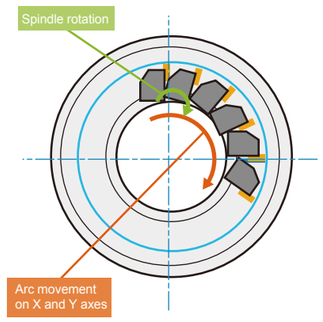
Machine turning features with the high-speed feed performance of the HCN Series and the high-speed, high-accuracy MAZATROL SmoothG CNC.

- Machine taper bores
- Machine different bore diameters with a single tool
- A single tool can machine a wide range of bore sizes and outer diameters





The spindle orientation is controlled so that the boring tool's tip can machine turning features while it moves in an arc along the X and Y axes. As a result, turning features can be machined without U-axis tool control.



Extensive Series Range

Horizontal machining centers with No. 50 spindles for large workpieces

HCN-8800
Shown with optional three-color status light

HCN-12800
Shown with optional three-color status light and chip conveyor

HCN-6800
Shown with optional three-color status light

HCN-10800
Shown with optional three-color status light and chip conveyor

Machines	HCN-6800	HCN-8800	HCN-10800	HCN-12800
Max. workpiece diameter × Max. workpiece height	ø1050 mm (ø41.34") × 1300 mm (51.18")	ø1450 mm (ø57.09") × 1450 mm (57.09")	ø2050 mm (ø80.71") × 1600 mm (62.99")	ø2400 mm, ø3000 mm[*1] (ø94.49", ø118.11"[*1]) × 2000 mm (78.74")
Max. load on pallet (evently distributed)	1500 kg (3307 lbs)	2200 kg, 3000 kg[*1] (4850 lbs, 6614 lbs[*1])	3000 kg, 4000 kg[*1] (6614 lbs, 8818 lbs[*1])	6000 kg, 8000 kg[*1], 10000 kg[*2] (13228 lbs, 17637 lbs[*1] 22046 lbs[*2])
Pallet size	☐ 630 mm (☐ 24.8") 630 mm × 800 mm[*1] (24.8" × 31.5"[*1]) ☐ 800 mm[*1] (☐ 31.5"[*1])	☐ 800 mm (☐ 31.5") 800 mm × 1000 mm[*1] (31.5" × 39.37"[*1]) ☐ 1000 mm[*1] (☐ 39.37"[*1])	☐ 1000 mm (☐ 39.37") 1000 mm × 1250 mm[*1] (39.37" × 49.21"[*1]) ☐ 1250 mm[*1] (☐ 49.21"[*1])	☐ 1250 mm (☐ 49.21") 1250 mm × 1600 mm[*1] (49.21" × 62.99"[*1]) ☐ 1600 mm[*1] (☐ 62.99"[*1])
Stroke (X/Y/Z)	1050 mm/900 mm/980 mm (41.34"/35.43"/38.58")	1400 mm/1200 mm/1325 mm (55.12"/47.24"/52.17")	1700 mm/1400 mm/1525 mm (66.93"/55.12"/60.04")	2200 mm, 2800 mm[*1]/1600 mm/1850 mm (86.61", 110.24"[*1]/62.99"/72.83")

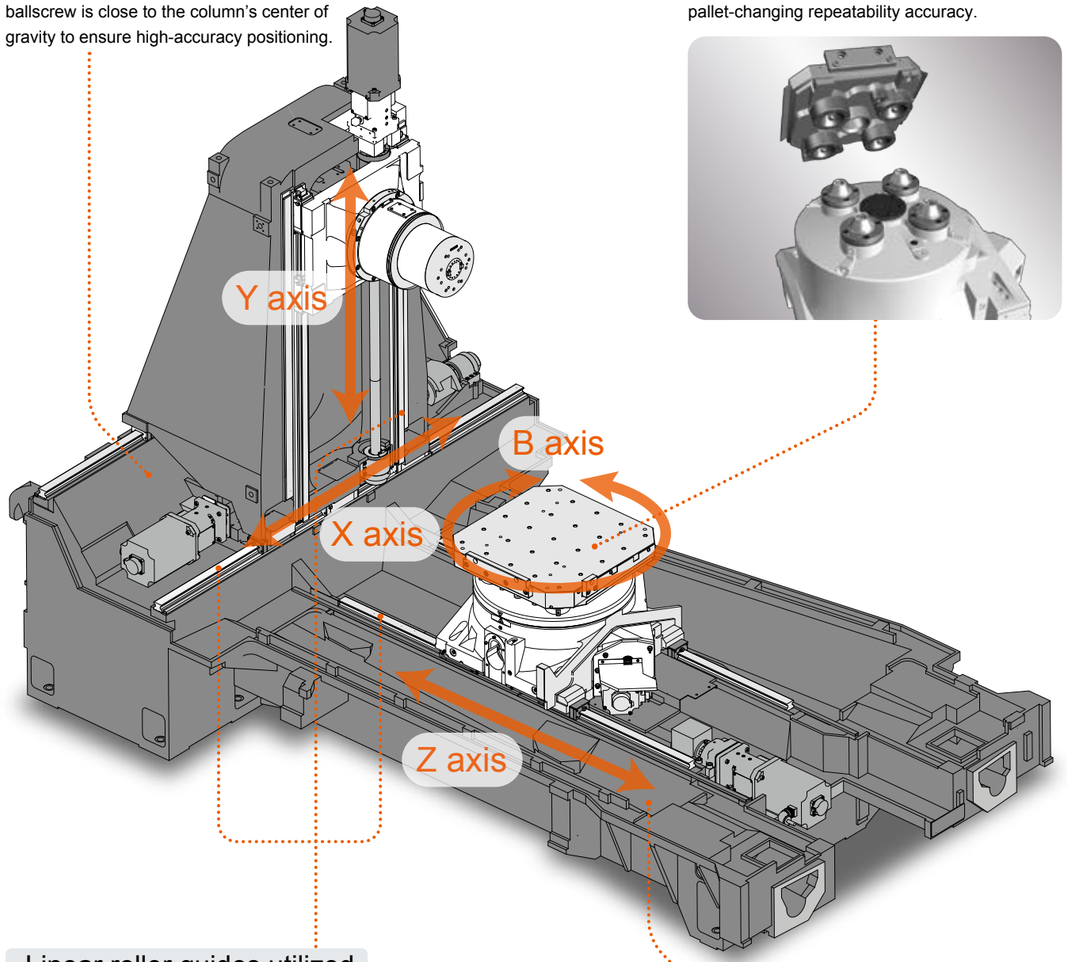
[*1] Option
[*2] Single table (option) specification (not available with FMS)

Higher Accuracy, Higher Productivity

High-rigidity construction for high-accuracy machining

Base X-axis construction

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



Linear roller guides utilized on the X, Y and Z axes

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

Table clamping

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

High-rigidity bed

The high-rigidity bed is reinforced with strategically located ribs to ensure stability during heavy-duty machining.

Designed for high-accuracy machining

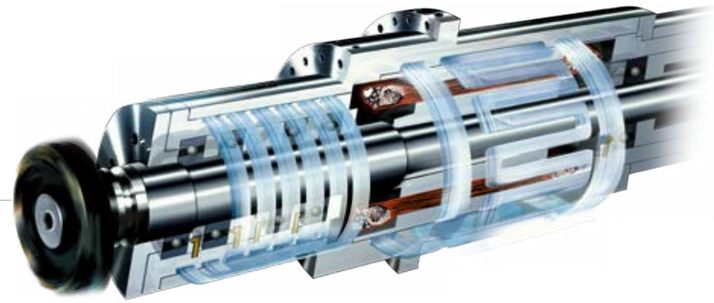
Spindle

Integral spindle/motor

Thanks to the integral spindle/motor design, vibration is minimized during high-speed operation to ensure exceptional surface finishes and maximum tool life.

Spindle temperature control

For high-accuracy machining, temperature-controlled cooling oil is circulated around the spindle bearings and headstock to minimize any thermal change to the spindle.



X, Y and Z-axis ballscrew core cooling

Ballscrew core cooling

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

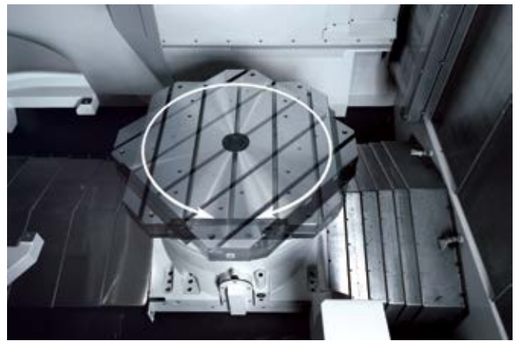
Tables

High-index coupling

To realize high-accuracy indexing, the standard 1° indexing table of the HCN-6800 and HCN-8800 uses 360° high-index coupling.

Roller gear cam

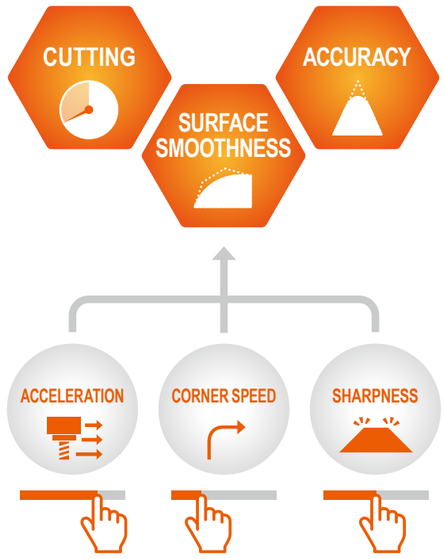
The NC rotary table uses a roller gear cam system for 0.0001° positioning increments and high-accuracy performance. (Standard on the HCN-10800 and HCN-12800. Optional for the HCN-6800 and HCN-8800)



Higher Accuracy, Higher Productivity

SMOOTH Machining Configuration

Optimize programs using a touchscreen slider



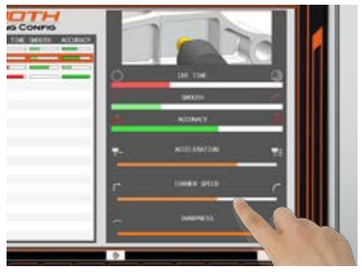
When a machine tool is shipped from the factory where it was manufactured, all of the CNC parameter settings are made for general-purpose machining. In most cases, these settings are satisfactory for a large percentage of users and will rarely require changes.

However, for aerospace workpieces or workpieces with complex surfaces, such as dies and molds, these machine parameter settings must be manually changed in order to produce workpieces with the required accuracy and minimal cycle times. To optimize these settings, they must be changed according to the material, tooling and machining process. This is a complex procedure that requires a skilled technician to perform efficiently.

As the parameter settings are changed, the default settings for acceleration, electrical gain, tolerances and other items will be modified. As each is changed, it will have a corresponding impact on others, which must also change. For instance, if acceleration is increased in order to reduce the cycle time, the accuracy and surface finish may be impacted (corners may not be sharp, gouges may occur in surfaces).

One must know which settings to change, how much to change each setting, and the corresponding effect on other settings for each change to tune a machine efficiently. After the workpiece is completed, all settings must be returned to their default settings.

These complicated procedures are eliminated with the MAZATROL SMOOTH Machining Configuration

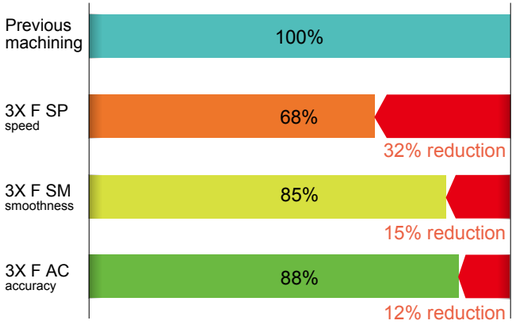


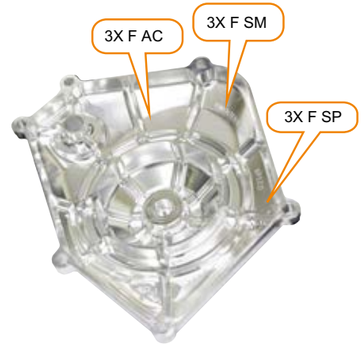
While watching the machining of a complex surface, simply use the touchscreen slider switch to change the settings for accuracy, speed or smoothness. As changes in one factor are made, you can see the automatic changes in others. For example, if accuracy is increased, there will be a corresponding decrease in speed.

When the optimal cutting conditions are obtained, these settings can be stored in the CNC memory easily. The next time the same type of material is machined by the same type of tool, these settings can be easily called up by M/G code. Conventionally, the same parameter settings are used for the entire program, but several different settings may be used in a single program with SMOOTH Machining Configuration.

Seven different settings are registered in the CNC memory at the factory (shown to the left). You are able to add your own settings up to a maximum storage capacity of 20 settings.

Finishing time comparison

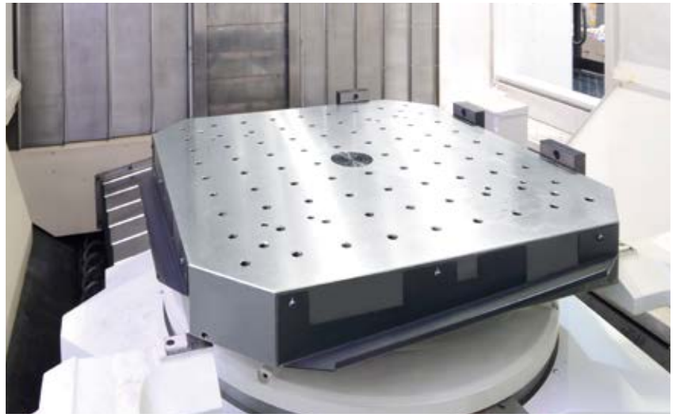




Automation

Wide variety of tables available

For production flexibility, a 0.0001°× 3600000 position NC rotary table is available on all machines (standard on the HCN-10800 and HCN-12800). On the HCN-6800 and HCN-8800, a 1° index table is standard equipment and a 0.001° index table is optionally available.



1° × 360 index table

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

0.001° × 360000 NC positioning table

The table can be indexed in 0.001°increments (contouring is not available). Hydraulic power supply through the table is available as an option.

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.
A scale feedback system for the rotary axis is available as an option.

●: Standard ○: Option —: N/A

	1° × 360 index table	0.001° × 360000 NC positioning table	NC rotary table
HCN-6800	●	○	○
HCN-8800	●	○	○
HCN-10800	—	—	●
HCN-12800	—	—	●

Tool changing of heavy, large-diameter tools

Handles long boring bars and large-diameter mills for higher productivity.

ATC Specifications

Machines		HCN-6800	HCN-8800	HCN-10800	HCN-12800
Max. tool diameter	With tools in adjacent pockets	ø125 mm (ø4.92")	ø125 mm (ø4.92")	ø135 mm (ø5.31")	ø135 mm (ø5.31")
	With adjacent pockets empty	ø250 mm (ø9.84")	ø250 mm (ø9.84")	ø260 mm (ø10.24")	ø260 mm (ø10.24")
	When adjacent pockets are empty and pockets next to them have tools less than ø240 mm (9.45")	ø260 mm (ø10.24")	ø260 mm (ø10.24")	—	—
	When adjacent pockets are empty and pockets next to them have tools less than ø200 mm (7.87")	ø300 mm* (ø11.81"*)	—	ø320 mm* (ø12.60"*)	ø320 mm (ø12.60")
	When adjacent pockets are empty and pockets next to them have tools less than ø180 mm (7.09")	—	ø320 mm* (ø12.60"*)	—	—
	When adjacent pockets are empty and pockets next to them have tools less than ø160 mm (6.30")	—	—	ø360 mm* (ø14.17"*)	ø360 mm (ø14.17")
	With X-axis stroke limitation	ø300 mm* (ø11.81"*)	ø320 mm* (ø12.60"*)	ø360 mm* (ø14.17"*)	—
Max. tool length		630 mm (24.8")	630 mm (24.8") 800 mm* (ø31.5"*)	650 mm (25.59") 800 mm* (ø31.5"*)	800 mm (ø31.5")
Max. tool weight		30 kg (66 lbs)	30 kg (66 lbs)	30 kg (66 lbs)	30 kg (66 lbs)

* Option

Large-capacity tool magazine

Large-capacity tool magazines make it possible to machine of a wide variety of workpieces in small-size lots and store spare tools for unmanned operation.

For tool storage capacities larger than 180 tools, two types of rack-type tool magazines are available:
• The TOOL HIVE stores No. 50 or HSK-A100 tools horizontally.
• The TOOLTECH stores tools (No. 50 tools only) vertically with minimal floor-space requirements.

●: Standard ○: Option —: N/A

	Chain-type magazine						
	43	60	80	100	120	140	160
HCN-6800	●	○	○	○	○	○	○
HCN-8800	—	●	○	○	○	○	○
HCN-10800	—	—	●	○	○	○	○
HCN-12800	—	—	●	○	○	○	○

	TOOL HIVE (rack-type magazine)						TOOLTECH (rack-type magazine)		
	180	204	240	288	312	348	206	276	348
HCN-6800	○	○	○	○	○	○	○	○	○
HCN-8800	○	○	○	○	○	○	○	○	○
HCN-10800	○	○	○	○	○	○	○	○	○
HCN-12800	○	○	○	○	○	○	○	○	○

Automation

Automation for single machines and multiple-machine systems

Pallet changer

Rotary 2-pallet changer and optional 6-pallet changer

2-pallet changer

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

	Pallet change time	Pallet load capacity (evenly distributed)	Max. workpiece diameter
HCN-6800	10.0 sec	1500 kg (3307 lbs)	ø1050 mm (ø41.34") × 1300 mm (51.18")
HCN-8800	13.0 sec	2200 kg (4850 lbs)	ø1450 mm (ø57.09") × 1450 mm (57.09")
HCN-10800	25.0 sec	3000 kg (6614 lbs)	ø2050 mm (ø80.71") × 1600 mm (62.99")
HCN-12800*	48.0 sec	6000 kg (13228 lbs)	ø2400 mm (ø94.49") × 2000 mm (78.74")

*Shuttle type pallet changer

6-pallet changer OPTION

Multiple workpieces can be set up on the six pallets, allowing for longer periods of unmanned operation. Available for the HCN-6800 and HCN-8800.

HCN-6800 with 6-pallet changer

Robot system OPTION

An interface for connecting external robots for workpiece loading/unloading to/from automatic hydraulic fixtures is available as an option.

- Field network available
- Cycle start, door open/close, work loading confirmation, hydraulic fixture operation and table position interface are available as options.

PALLETECH Manufacturing Cell OPTION

The modular design of the PALLETECH system 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 or three levels for large pallet-storage capacity with minimal floor-space requirements.

System specifications

		Minimum	Maximum
Machine(s)		1	16
Number of pallets	1 level	6	240
	2 levels	12	240
	3 levels	18	240
Loading station(s)		1	8
Loading robot		1	1

Pallet stocker	HCN-6800	HCN-8800	HCN-10800	HCN-12800
1 level	○	○	○	○
2 levels	○	○	—	—
3 levels	○	—	—	—

○: Available —: N/A

SMOOTH PMC

FMS control/management software provides unsurpassed ease of system operation to help meet sudden schedule changes.

Automation

Optimal system for maximum versatility

Integration of multiple machine models in a PALLETECH system

Horizontal machining centers, 5-axis machining centers, Multi-Tasking machines and turning centers can be integrated to create a system with unsurpassed versatility.

PALLETECH with single-level, 12-pallet stocker
SMOOTH PMC
Loading station
VORTEX i-630V/6
HCN-6800

PALLETECH system combination: applicable machine models

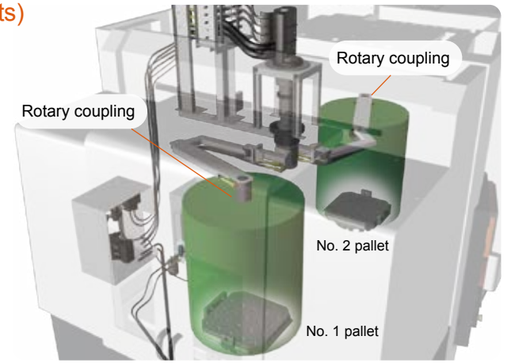
PALLETECH system pallet size	Horizontal machining center	5-axis machining center	Multi-Tasking machines	Turning center
630 mm × 630 mm (24.8" × 24.8")	HCN-6800	VORTEX i-630V/6	INTEGREX i-630V/6	ORBITEC 20
800 mm × 800 mm (31.5" × 31.5")	HCN-8800	VORTEX i-800V/8	INTEGREX e-1250V/8 INTEGREX i-800V/8	—
1000 mm × 1000 mm (39.37" × 39.37")	HCN-10800	—	INTEGREX e-1600V/10	—

Tool ID

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 entering tool data, reducing setup time. Requires retention bolt with tool ID and tool presetter.

Hydraulic power supply OPTION

Type A (Hydraulic power supply from top)



Type A
(supply from machine top, maximum: eight ports)

Hydraulic power is supplied from the top part of the pallet changer to fixtures mounted on each pallet using hydraulic hoses.

Type B
(supply through pallet, maximum: three ports)

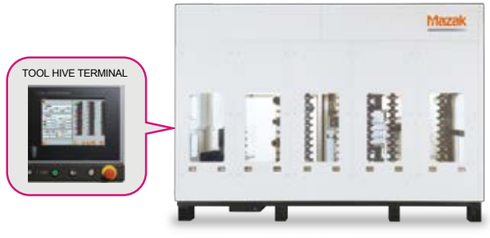
By using a leak-free coupling, hydraulic power is supplied to the supply port on the pallet bottom.

TOOL HIVE OPTION

The TOOL HIVE can store more than 180 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. The TOOL HIVE's tool storage capacity can be expanded after the initial installation.

TOOL HIVE specifications

Tool storage	180, 204, 240, 288, 312, 348
Tool shank	No. 50, HSK-A100
Magazine	Rack type



240 tool TOOL HIVE magazine

TOOLTECH OPTION

No. 50 tools are stored vertically in a magazine with minimal floor-space requirements.

TOOLTECH specifications

Tool storage	206, 276, 348
Tool shank	No. 50
Magazine	Rack type

206 tool TOOLTECH magazine

Ergonomics

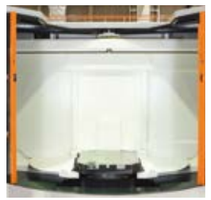
Design focus on ergonomics provides unsurpassed ease of operation

Large window

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 overhead crane can be used for the loading/unloading of heavy workpieces and fixtures.



Large window

The large operation window allows the operator to easily monitor workpiece machining.

Convenient setup

The 2-pallet changer on the HCN-10800 and HCN-12800 has a platform inside the setup station for convenient operation.

Maintenance area

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

*Instead of a 2-pallet safety cover door, the HCN-12800 has an area sensor in the setup station.

Adjustable CNC operation

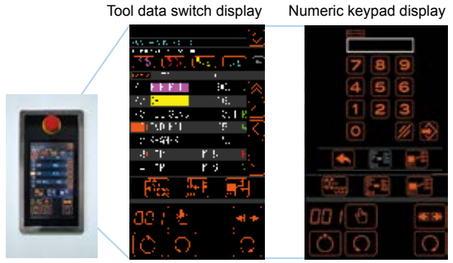
Touch panel can be tilted to the optimal position for any operator's height to ensure ease of operation.


Rotate 90°


Tilt 45°

Tool magazine operation panel/Tool ID

The tool magazine operation panel is designed for increased ease of operation. Instead of simply having 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's numeric keyboard and the desired pocket will be automatically brought into position. Tool data are displayed on this panel, eliminating trips back to the machine's CNC. By selecting the tool data, the tool magazine will be indexed to the selected tool. The sort key quickly shows which tool pockets are empty.



Remote manual pulse generator

The remote manual pulse generator provides convenient operation even when the operator is not near the CNC operation panel. Its display shows the position display and the machine coordinate values.

Four different positions can be registered in memory by the remote manual pulse generator. A wireless remote manual pulse generator is available as an option.

MAZATROL CNC System

MAZATROL SMOOTH G

4 axes simultaneous CNC

Fastest CNC in the world

Latest hardware and software for unprecedented speed and precision

Smooth graphical user interface

PC with Windows® 8 embedded OS
MAZATROL Smooth graphical user interface offers unsurpassed ease of operation
Touch screen operation similar to your smartphone/tablet

Ease of operation

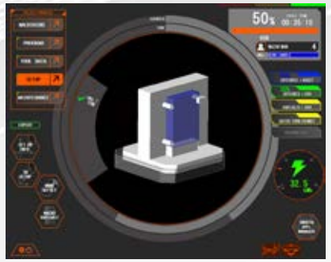
Designed for unsurpassed ease of operation with advanced functions

Process home screens

Five different home screens display the appropriate data in an easy-to-understand manner. Touch icons in each process display for additional screen displays.

Programming

Tool data



Setup

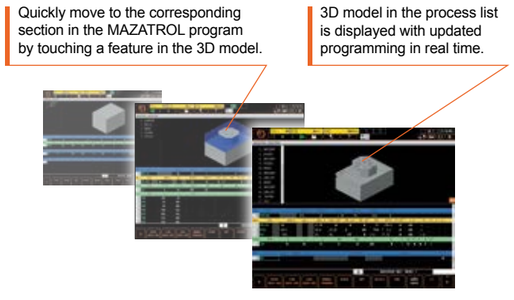
Machining

Maintenance

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

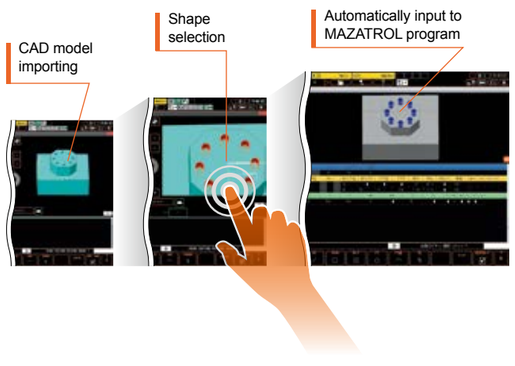
QUICK MAZATROL

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 displayed immediately to check for any programming error easily and quickly.



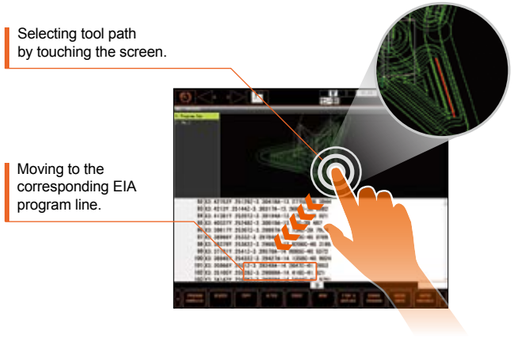
3D ASSIST

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



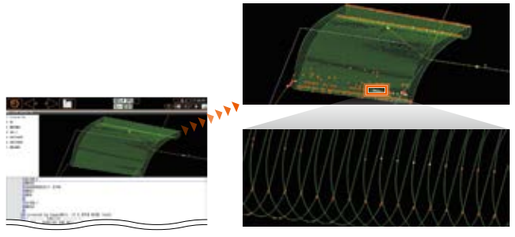
QUICK EIA

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.



VIEW SURF

Analyze the tool path to visualize any predictable failure on the finished surface. Perform program modification before machining to minimize the time for test cutting.



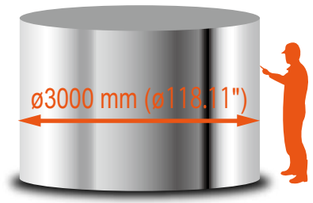
Optional Equipment

A variety of optional equipment is available for increased versatility in machining large workpieces

ø3000 mm (ø118.11") workpiece diameter

2800 mm (110.24") X-axis stroke (HCN-12800) OPTION

The X-axis stroke can be increased by 600 mm (23.62"). This may be applied with the optional single-table specification and heavy-workpiece specification [8000 kg (17637 lbs) and 10000 kg (22046 lbs)].



Specifications

Max. workpiece diameter	ø3000 mm (ø118.11")
X-axis max. acceleration	2.4 m/s²
Pallet change time	76 sec

8000 kg (17637 lbs) workpiece specifications (HCN-12800) OPTION

Available for 2-pallet changer and single-table machine

Specifications

Table load (evenly distributed)	8000 kg (17637 lbs) (pallet weight included)
Z-axis rapid traverse rate	34000 mm/min (1339 ipm)
Z-axis max. acceleration	2.4 m/s²
Table positioning time	3.8 sec/90°

4000 kg (8818 lbs) workpiece specifications (HCN-10800) OPTION

Specifications

Pallet load	4000 kg (8818 lbs)
Z-axis max. acceleration	3.43 m/s²

Considerable reduction in floor space

Single table specification (HCN-12800) OPTION

Floor space is reduced by eliminating the 2-pallet changer. Available for both single machines and multiple machines integrated into a FMS. Can be applied with the optional 2800 mm (110.24") X-axis stroke and the 8000 kg (17637 lbs), 10000 kg (22046 lbs) heavy-workpiece specification.

Note: When applied with the 10000 kg (22046 lbs) heavy-workpiece specification, it cannot be used with an FMS, as the pallet is bolted directly to the machine table.

10000 kg (22046 lbs) workpiece specifications (HCN-12800) OPTION

Available on single-table machine only

Specifications

Table load (evenly distributed)	10000 kg (22046 lbs) (pallet weight included)
Z-axis rapid traverse rate	24000 mm/min (945 ipm)
Z-axis max. acceleration	2.4 m/s²
Table positioning time	4.2 sec/90°

3000 kg (6614 lbs) workpiece specifications (HCN-8800) OPTION

Specifications

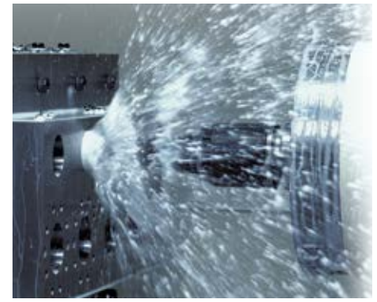
Pallet load	3000 kg (6614 lbs)
Z-axis rapid traverse rate	52 m/min (2047 ipm)
Z-axis max. acceleration	3.43 m/s²
Table rotating time	2.4 sec/90° (NC rotary table) 4.5 sec/90° (1° index table)
Pallet change time	25 sec

Coolant system for longer tool life and higher productivity

- Reduces tool wear by controlling rises in tool tip temperature
- Higher quality surfaces and machining performance thanks to tool and workpiece lubrication
- Prevents tool damage by removing long chips from tool and workpiece

SUPERFLOW coolant system OPTION

- Max. 7 MPa (1015 psi) coolant pressure
- Adjustable coolant pressure
- High-performance cyclone filter with minimal maintenance requirements



Coolant through spindle OPTION

Coolant is fed to the tool tip by passages through the tool holder and tool. Three pump pressure specifications are available: a standard 0.8 MPa (116 psi) pump and 1.5 MPa (218 psi) or 7 MPa (1015 psi) pumps as options.

Flood coolant

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

Niagara coolant

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

Smooth Process Support Software

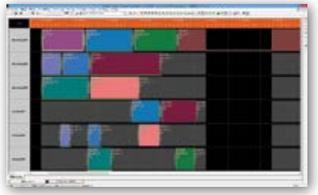
Production support software for optimum factory management

SMOOTH CAM RS OPTION

- Machining program development
- Machining simulation
- Time studies

SMOOTH SCHEDULER OPTION

- Production scheduling of machines
- Higher equipment utilization
- Visual monitoring of production progress



SMOOTH TOOL MANAGEMENT OPTION

- Centralized tool-data management
- Simplified operation and setup with tool ID

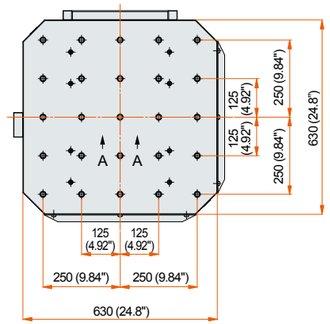
SMOOTH MONITOR AX OPTION

- Timely action by monitoring the operation of an entire plant
- Improved productivity through manufacturing data analysis
- Production results database
- Accessible by smartphone/tablet

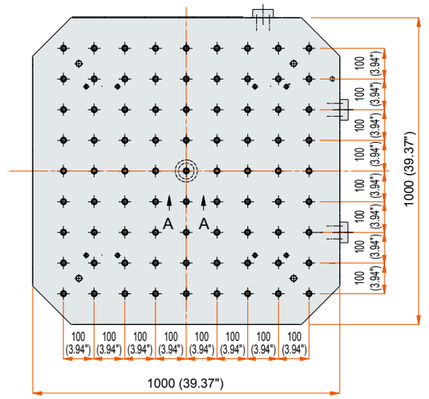
Standard Pallet Dimensions

Unit: mm (inch)

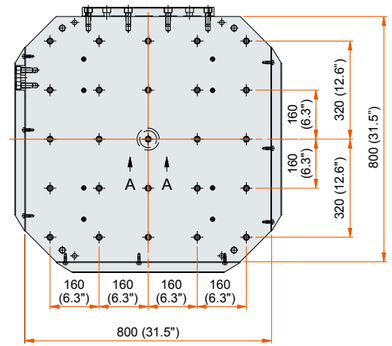
HCN-6800 630 mm × 630 mm (24.8" × 24.8")
tapped pallet



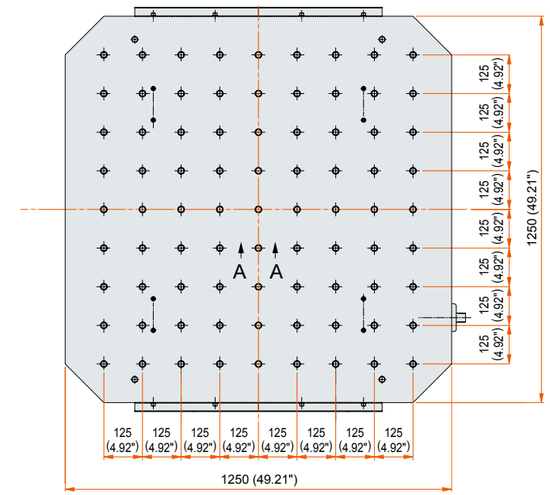
HCN-10800 1000 mm × 1000 mm (39.37" × 39.37")
tapped pallet



HCN-8800 800 mm × 800 mm (31.5" × 31.5")
tapped pallet

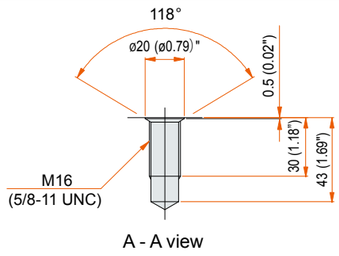


HCN-12800 1250 mm × 1250 mm (49.21" × 49.21")
tapped pallet

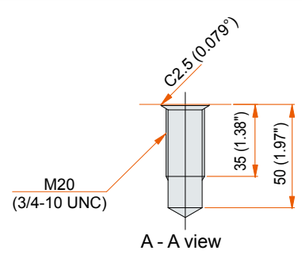


Note: Edge locator is optionally available.

HCN-6800, HCN-8800 tapped pallet



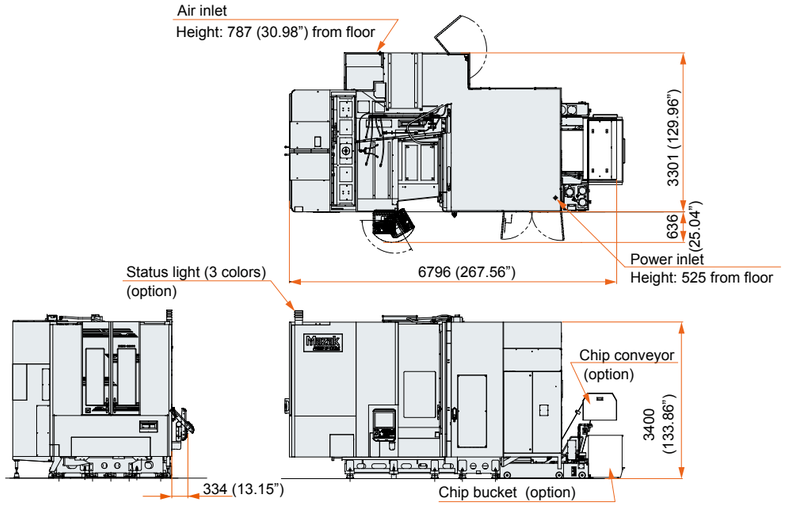
HCN-10800, HCN-12800 tapped pallet



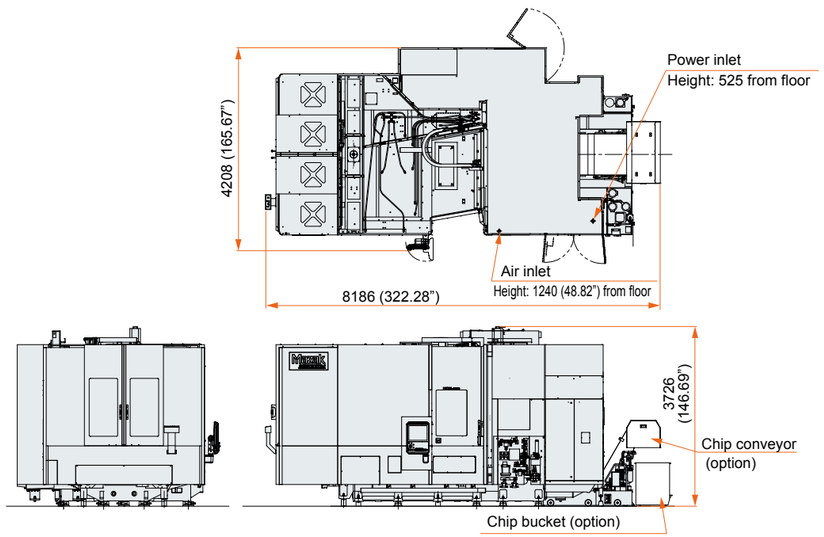
Machine Dimensions

Unit: mm (inch)

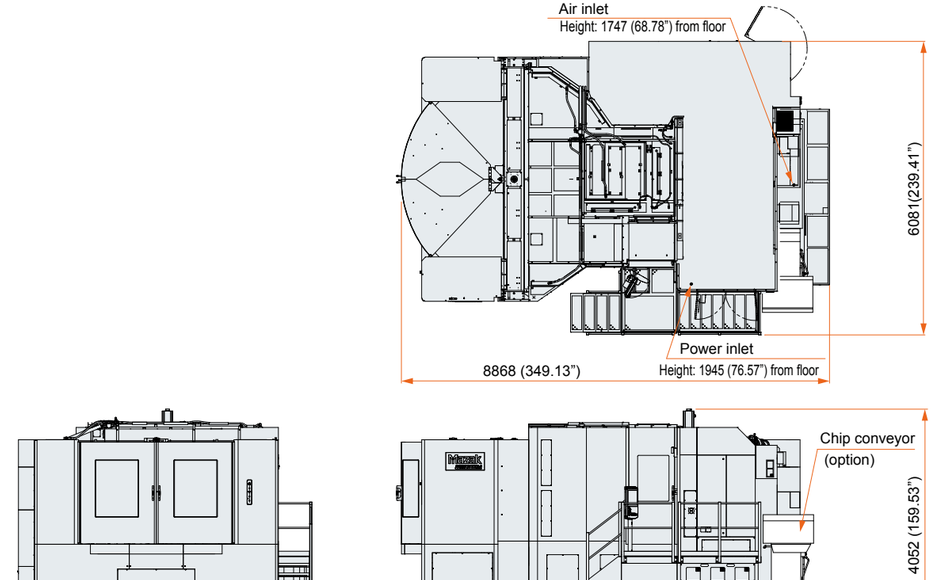
HCN-6800



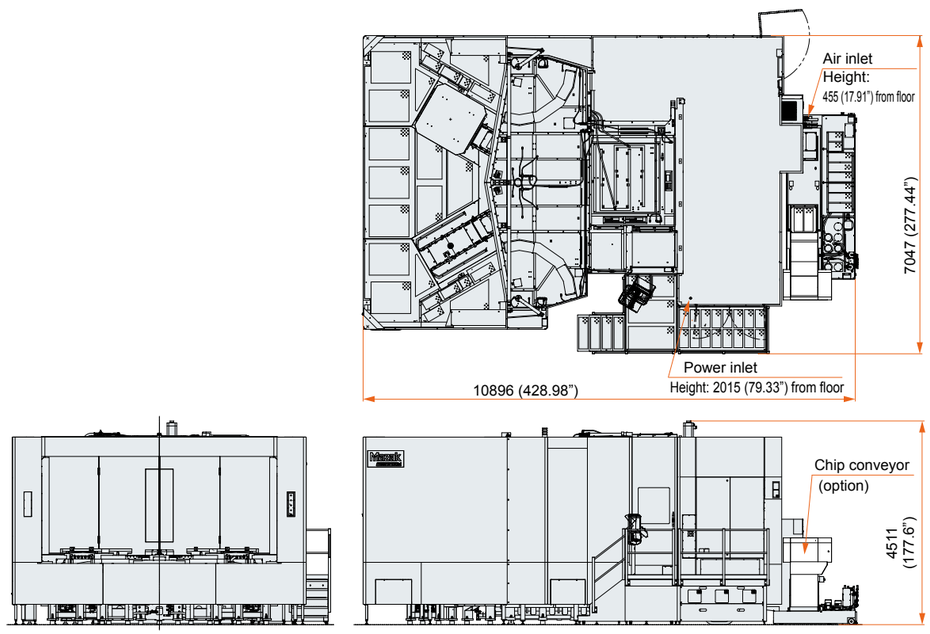
HCN-8800



HCN-10800



HCN-12800



Standard Machine Specifications

		HCN-6800		HCN-8800	
		Standard	Hard Metal package	Standard	Hard Metal package
Stroke	X axis (column right/left)	1050 mm (41.34")		1400 mm (55.12")	
	Y axis (spindle up/down)	900 mm (35.43")		1200 mm (47.24")	
	Z axis (table back/forth)	980 mm (38.58")		1325 mm (52.17")	
	Distance between table center to spindle nose	100 mm ~ 1080 mm (3.94" ~ 42.52")		100 mm ~ 1425 mm (3.94" ~ 56.1")	
	Distance between pallet top to spindle center	100 mm ~ 1000 mm (3.94" ~ 39.37")		100 mm ~ 1300 mm (3.94" ~ 51.18")	
Table	Pallet size	630 mm × 630 mm (24.8" × 24.8")		800 mm × 800 mm (31.5" × 31.5")	
	Max. workpiece dimensions	ø1050 mm × 1300 mm (ø41.34" ×51.18")		ø1450 mm × 1450 mm (ø57.09" × 57.09")	
	Pallet load capacity (evenly distributed)	1500 kg (3307 lbs)		2200 kg (4850 lbs)	
	Pallet top surface	M16 × P2 (5/8-11 UNC), tapped 25 places, pitch 125 mm (4.25")		M16 × P2 (5/8-11 UNC), tapped 25 places, pitch 160 mm (6.3")	
	Minimum indexing angle increment	1°		1°	
	Indexing time	1.9 sec/90°		3.2 sec/90°	
Spindle	Max. spindle speed	10000 rpm	6000 rpm	10000 rpm	6000 rpm
	Spindle gear range	2 (electric)	2 (electric)	2 (electric)	2 (electric)
	Spindle taper	7/24 taper No. 50	HSK-A100	7/24 taper No. 50	HSK-A100
	Spindle bearing ID	ø100 mm (ø3.94")	ø120 mm (ø4.72")	ø100 mm (3.94")	ø120 mm (ø4.72")
	Spindle acceleration	3.0 sec (0 → 10000 rpm)	3.5 sec (0 → 6000 rpm)	3.0 sec (0 → 10000 rpm)	3.5 sec (0 → 6000 rpm)
Feedrate	Rapid traverse rate (X, Y, Z axis)*1	60 m/min (2362 ipm)		60 m/min (2362 ipm)	
	Cutting feedrate (X, Y, Z axis)*1	1 ~ 60000 mm/min (2362 ipm)		1 ~ 60000 mm/min (2362 ipm)	
	Axis acceleration/deceleration	0.8 G	0.6 G	0.5 G	
Automatic tool changer	Tool shank	CAT No. 50	HSK-A100	CAT No. 50	HSK-A100
	Tool magazine capacity	43		60	
	Max. tool dia./ length (from gauge line)/weight	ø125 mm/630 mm/30 kg (ø4.92"/24.8"/66 lbs)		ø125 mm/630 mm/30 kg (ø4.92"/24.8"/66 lbs)	
	Max. tool diameter (when adjacent pockets empty)	ø250 mm (ø9.84")*2		ø250 mm (ø9.84")*2	
	Tool selection method	Random selection/shortest path		Random selection/shortest path	
	Tool change time (chip-to-chip)	4.2 sec		5.0 sec	
Automatic pallet changer	Number of pallets	2		2	
	Change system	Rotary type		Rotary type	
	Pallet change time	10.0 sec		13.0 sec	
Motors	Spindle motor (30-min. rating/cont. rating)	37 kW/30 kW (50 hp/40 hp)	—	37 kW/30 kW (50 hp/40 hp)	—
	Spindle motor (40% ED/cont. rating)	—	37 kW/30 kW (50 hp/40 hp)	—	37 kW / 30 kW (50 HP/40 HP)
Power requirement	60 Hz Motor (30-min. rating/cont. rating)	92.44 kVA/82.51 kVA	—	98.68 kVA/88.75 kVA	—
	60 Hz Motor (40% ED/cont. rating)	—	105.08 kVA/95.10 kVA	—	107.35 kVA/97.36 kVA
	50 Hz Motor (30-min. rating/cont. rating)	90.55 kVA/80.61 kVA	—	96.79 kVA/86.86 kVA	—
	50 Hz Motor (40% ED/cont. rating)	—	103.19 kVA/93.21 kVA	—	105.46 kVA/95.47 kVA
	Air supply (pressure/volume)	0.5 MPa (73 psi) ~ 0.9 MPa (131 psi)/350 L/min (12.36 ft^3/min)		0.5 MPa (73 psi) ~ 0.9 MPa (131 psi)/350 L/min (12.36 ft^3/min)	
Machine size	Machine height	3400 mm (133.86")		3726 mm (146.69")	
	Floor space requirement	3635 mm × 6796 mm (143.11" × 267.56")		4208 mm × 8186 mm (165.67" × 322.28")	
	Machine weight	19000 kg (41887 lbs)	21000 kg (46296 lbs)	30000 kg (66138 lbs)	

*1 Limited feedrate with continuous axis movement
*2 When adjacent pockets are empty and pockets next to them have tools less than ø240 mm (ø9.45"), maximum tool diameter is ø260 mm (ø10.24")

		HCN-10800		HCN-12800	
		Standard	Hard Metal package	Standard	Hard Metal package
Stroke	X axis (column right/left)	1700 mm (66.93")		2200 mm (86.61")	
	Y axis (spindle up/down)	1400 mm (55.12")		1600 mm (62.99")	
	Z axis (table back/forth)	1525 mm (60.04")		1850 mm (72.83")	
	Distance between table center to spindle nose	150 mm ~ 1675 mm (5.91" ~ 65.94")		250 mm ~ 2100 mm (9.84" ~ 82.68")	
	Distance between pallet top to spindle center	100 mm ~ 1500 mm (3.94" ~ 59.06")		100 mm ~ 1700 mm (3.94" ~ 66.93")	
Table	Pallet size	1000 mm × 1000 mm (39.37" × 39.37")		1250 mm × 1250 mm (49.21" × 49.21")	
	Max. workpiece dimensions	ø2050 mm × 1600 mm (ø80.71" × 62.99")		ø2400 mm × 2000 mm (ø94.49" × 78.74")	
	Pallet load capacity (evenly distributed)	3000 kg (6614 lbs)		6000 kg (13228 lbs)	
	Pallet top surface	M20 (3/4-10 UNC), tapped 81 places, pitch 100 mm (3.94")		M20 (3/4-10 UNC), tapped 81 places, pitch 125 mm (4.92")	
	Minimum indexing angle increment	0.0001°		0.0001°	
	Indexing time	2.4 sec/90°		3.6 sec/90°	
Spindle	Max. spindle speed	10000 rpm	6000 rpm	10000 rpm	6000 rpm
	Spindle gear range	2 (electric)	2 (electric)	2 (electric)	2 (electric)
	Spindle taper	7/24 taper No. 50	HSK-A100	7/24 taper No. 50	HSK-A100
	Spindle bearing size ID	ø100 mm (ø3.94")	ø120 mm (ø4.72")	ø100 mm (ø3.94")	ø120 mm (ø4.72")
	Spindle acceleration	3.0 sec (0 → 10000 rpm)	3.5 sec (0 → 6000 rpm)	3.0 sec (0 → 10000 rpm)	2.3 sec (0 → 6000 rpm)
Feedrate	Rapid traverse rate (X, Y, Z axis)*1	52 m/min (2047 ipm)		43 m/min (1693 ipm)	
	Cutting feedrate (X, Y, Z axis)*1	1 ~ 52000 mm/min		1 ~ 43000 mm/min (1693 ipm)	
	Axis acceleration/deceleration	0.4 G		X, Y axis: 0.35 G/Z axis: 0.3 G	
Automatic tool changer	Tool shank	CAT No. 50	HSK-A100	CAT No. 50	HSK-A100
	Tool magazine capacity	80		80	
	Maximum tool dia./ length (from gauge line)/weight	ø135 mm /650 mm/30 kg (ø5.31"/25.59"/66 lbs)		ø135 mm/800 mm/30 kg (ø5.31"/31.5"/66 lbs)	
	Maximum tool diameter (when adjacent pockets empty)	ø260 mm (ø10.24")*2		ø260 mm (ø10.24")*2	
	Tool selection method	Random selection/shortest path		Random selection/shortest path	
	Tool change time (chip-to-chip)	5.7 sec		6.8 sec	
Automatic pallet changer	Number of pallets	2		2	
	Change system	Rotary type		Shuttle type	
	Pallet change time	25 sec		48 sec	
Motors	Spindle motor (30-min. rating/cont. rating)	37 kW/30 kW (50 hp/40 hp)	—	37 kW/30 kW (50 hp/40 hp)	—
	Spindle motor (40% ED/cont. rating)	—	37 kW/30 kW (50 hp/40 hp)	—	56 kW/45 kW (75 hp/60 hp)
Power requirement	60 Hz Motor (30-min. rating/cont. rating)	107.84 kVA/97.86 kVA	—	117.68 kVA/107.75 kVA	—
	60 Hz Motor (40% ED/cont. rating)	—	116.04 kVA/106.06 kVA	—	153.69 kVA/135.08 kVA
	50 Hz Motor (30-min. rating/cont. rating)	105.95 kVA/95.97 kVA	—	115.36 kVA/105.43 kVA	—
	50 Hz Motor (40% ED/cont. rating)	—	114.15 kVA/104.17 kVA	—	151.37 kVA/132.76 kVA
	Air supply (pressure/volume)	0.5 MPa (73 psi) ~ 0.9 MPa (131 psi)/600 L/min (21.19 ft^3/min)		0.5 MPa (73 psi) ~ 0.9 MPa (131 psi)/700 L/min (24.72 ft^3/min)	
Machine size	Machine height	4052 mm (159.53")		4511 mm (177.60")	
	Floor space requirement	6081 mm × 8868 mm (239.41" × 349.13")		7047 mm × 10896 mm (277.44" × 428.98")	
	Machine weight	45000 kg (99206 lbs)		57500 kg (126764 lbs)	

*1 Limited feedrate with continuous axis movement
*2 When adjacent pockets are empty and pockets next to them have tools less than ø160 mm (ø6.30"), maximum tool diameter is ø360 mm (ø14.17")

Standard and Optional Equipment

●: Standard ○: Option —: N / A

		6800	8800	10800	12800
Spindle	10000 rpm (7/24 taper No. 50) spindle	●	●	●	●
	10000 rpm (BBT-50, HSK-A100) spindle	○	○	○	○
	6000 rpm, 37 kW (BBT-50, HSK-A100) Hard Metal specification	○	○	○	—
	6000 rpm, 56 kW (BBT-50, HSK-A100) Hard Metal specification	—	—	—	○
	8000 rpm (7/24 taper No. 50, BBT-50, HSK-A100) high-torque spindle	○	○	○	○
	16000 rpm (HSK-A 100) high speed spindle	○	○	○	○
Tool magazine	43-tool chain-type magazine	●	—	—	—
	60-tool chain-type magazine	○	●	—	—
	80-tool chain-type magazine	○	○	●	●
	100, 120, 140, 160-tool chain-type magazine	○	○	○	○
	180, 204, 240, 288, 312, 348 tool TOOL HIVE	○	○	○	○
	206, 276, 348-tool (No. 50 tools only) TOOLTECH	○	○	○	○
Table	1° indexing table	●	●	—	—
	NC positioning table (contouring not available)	○	○	—	—
	NC rotary table	○	○	●	●
	NC rotary table with scale	○	○	○	○
	3 ton pallet load for □800 mm (31.5") pallet	—	○	—	—
	4 ton pallet load	—	—	○	—
	8 ton table load	—	—	—	○
	10 ton table load (single table machine)	—	—	—	○
Pallet	□630 mm (24.80") tapped pallet	●	—	—	—
	□630 mm (24.80") tapped pallet with location bore	○	—	—	—
	630 mm × 800 mm (24.80" × 31.50") tapped pallet	○	—	—	—
	630 mm × 800 mm (24.80" × 31.50") tapped pallet with location bore	○	—	—	—
	630 mm × 800 mm (24.80" × 31.50") T-slot pallet with location bore	○	—	—	—
	□800 mm (31.50") tapped pallet	○	●	—	—
	□800 mm (31.50") tapped pallet with location bore	○	○	—	—
	□800 mm (31.50") T-slot pallet with location bore	○	○	—	—
	800 mm × 1000 mm (31.50" × 39.37") tapped pallet	—	○	—	—
	800 mm × 1000 mm (31.50" × 39.37") tapped pallet with location bore	—	○	—	—
	800 mm × 1000 mm (31.50" × 39.37") T-slot pallet with location bore	—	○	—	—
	□1000 mm (39.37") tapped pallet	—	○	●	—
	□1000 mm (39.37") tapped pallet with location bore	—	○	○	—
	□1000 mm (39.37") T-slot pallet with location bore	—	○	○	—
	1000 mm × 1250 mm (39.37" × 49.21") tapped pallet	—	—	○	—
	1000 mm × 1250 mm (39.37" × 49.21") tapped pallet with location bore	—	—	○	—
	1000 mm × 1250 mm (39.37" × 49.21") T-slot pallet with location bore	—	—	○	—
	□1250 mm (49.21") tapped pallet without edge locator	—	—	○	●
	□1250 mm (49.21") tapped pallet with edge locator	—	—	○	○
	□1250 mm (49.21") tapped pallet with location bore	—	—	○	○
	□1250 mm (49.21") T-slot pallet with location bore	—	—	○	○
	1250 mm × 1600 mm (49.21" × 62.99") tapped pallet	—	—	—	○
	1250 mm × 1600 mm (49.21" × 62.99") tapped pallet with location bore	—	—	—	○
	1250 mm × 1600 mm (49.21" × 62.99") T-slot pallet with location bore	—	—	—	○
	□1600 mm (62.99") tapped pallet	—	—	—	○
	□1600 mm (62.99") tapped pallet with location bore	—	—	—	○
	□1600 mm (62.99") T-slot pallet with location bore	—	—	—	○

●: Standard ○: Option —: N / A

		6800	8800	10800	12800
Automation	2-pallet changer	●	●	●	●
	6-pallet changer	○	○	—	—
	Hydraulic power supply through pallet (N/A 1°indexing table and NC rotary table)	○	○	—	—
	Tapped pallet for hydraulic power supply through pallet	○	○	—	—
	Tapped pallet with location bore for hydraulic power supply through pallet	○	○	—	—
	T-slot pallet for hydraulic power supply through pallet	○	○	—	—
	T-slot pallet with location bore for hydraulic power supply through pallet	○	○	—	—
	Hydraulic power supply from top of pallet changer (2 ports × 2 pallets)	○	○	—	—
	Workpiece seating detection, ON/OFF switch	○	○	○	—
	Preparation for PALLETECH	○	○	○	○
	Automatic power ON/OFF + warm-up operation	●	●	●	●
Setup	Remote manual pulse generator (wired)	●	●	●	●
	Remote manual pulse generator (wireless)	○	○	○	○
	Tool ID magazine operation panel	●	●	●	●
	Mazak monitoring system B (optical) OMP60	○	○	○	—
	Mazak monitoring system B (electrical) RMP60	—	—	—	○
	Automatic tool length measurement & tool breakage detection	●	●	●	●
Safety equipment	Operator door interlock	●	●	●	●
High accuracy	Hydraulic unit temperature control	○	○	○	○
	Scale feedback (X, Y, Z axis)	○	○	○	—
	Scale feedback (Y axis)	—	—	—	●
	Scale feedback (X, Z axis)	—	—	—	○
	Chiller unit	●	●	●	●
	Coolant temperature control	○	○	○	○
	Ballscrew core cooling	●	●	●	●
Coolant/chip disposal	Flood coolant	●	●	●	●
	Niagara coolant	●	●	●	●
	Oil mist coolant	○	○	○	○
	Coolant through spindle 0.8 MPa (116 psi)	●	●	●	●
	High-pressure coolant through spindle 1.5 MPa (218 psi)	○	○	○	○
	High-pressure coolant through spindle 3.5 MPa (508 psi)	○	○	○	○
	SUPERFLOW coolant system 7.0 MPa (1015 psi)	○	○	○	○
	Air through spindle	○	○	○	○
	Work air blast	○	○	○	○
	Hand-held coolant nozzle	○	○	○	○
	Secondary coolant filter for aluminum	○	○	○	○
	Oil skimmer (RB-200)	○	○	○	○
	Magnetic plate	○	○	○	○
	Magnetic separator for cast iron	○	○	○	○
	Mist collector	○	○	○	○
	Chip conveyor (side disposal, hinge) (not available with 6PC)	○	○	—	—
	Chip conveyor (side disposal, ConSep) (not available with 6PC)	○	○	—	—
	Chip conveyor (rear disposal, hinge)	○	○	—	—
	Chip conveyor (rear disposal, ConSep)	○	○	—	—
	Chip conveyor (rear right disposal, hinge)	—	—	○	○
	Chip conveyor (rear right disposal ConSep)	—	—	○	—
	Chip conveyor (rear right disposal, ConSep 2 WS)	—	—	—	○
	Inverter system for hinge chip conveyor	○	○	○	○

MAZATROL SmoothG Specifications

	MAZATROL	EIA
Number of controlled axes	Simultaneous 2 ～ 4 axes	
Least input increment	0.0001 mm, 0.00001", 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, Cylindrical interpolation, Polar coordinate 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: 2MB, Program memory expansion: 8MB*, 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	–	Shaping function*, Dynamic compensation II*
Machine compensation	Backlash compensation, Pitch error compensation, 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, WPC coordinate 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	Partial auto tool length measurement, Auto tool length measurement, Coordinate measurement	
Interface	PROFIBUS-DP*, EtherNet/IP*, CC-Link*	
Card interface	SD card interface, USB	
EtherNet	10M/100M/1Gbps	

* Option

Environmentally friendly

Designed with environmental considerations

The environment and our impact on natural surroundings have always been important concerns for Mazak. All factories in Japan that produce Mazak machine tools are ISO 14001 certified, an international standard confirming that the operation of our production facilities does not adversely affect air, water or land.

Reduced electrical power consumption

An automatic-off LED worklight and CNC screen are standard equipment. The chip conveyor stops operation automatically after cycle completion for reduced electrical power consumption.

Reduced lubricant consumption

High-efficiency lubrication system delivers the optimal amount of grease to the linear roller guides and ballscrew for lower lubricant consumption.

Extended coolant service life

The grease lubrication system eliminates tramp oil for extended coolant service life.

Energy Dashboard OPTION

Process screen displays total energy consumption

Electrical consumption display

Electrical consumption statistics/analysis display

HCN SERIES

Mazak

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