

# a7Inx | a8Inx

Horizontal Machining Center



Atsugi and Fuji Katsuyama works are certified for ISO14001 and ISO9001.

\*The specifications, figures, and overviews of products, peripheral devices and accessories in this catalogue may be changed without prior notice to incorporate improvements resulting from ongoing R&D programs.  
\*The all products in this catalogue include the optional specifications and equipment.  
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M486Eg 2209 (V-T)



## Pursuing reliability and productivity



a71nx / a81nx are horizontal machining centers with No.50 taper spindle, which are developed for machining cast iron parts. From heavy cutting to high-speed finish machining, their performances are stable.

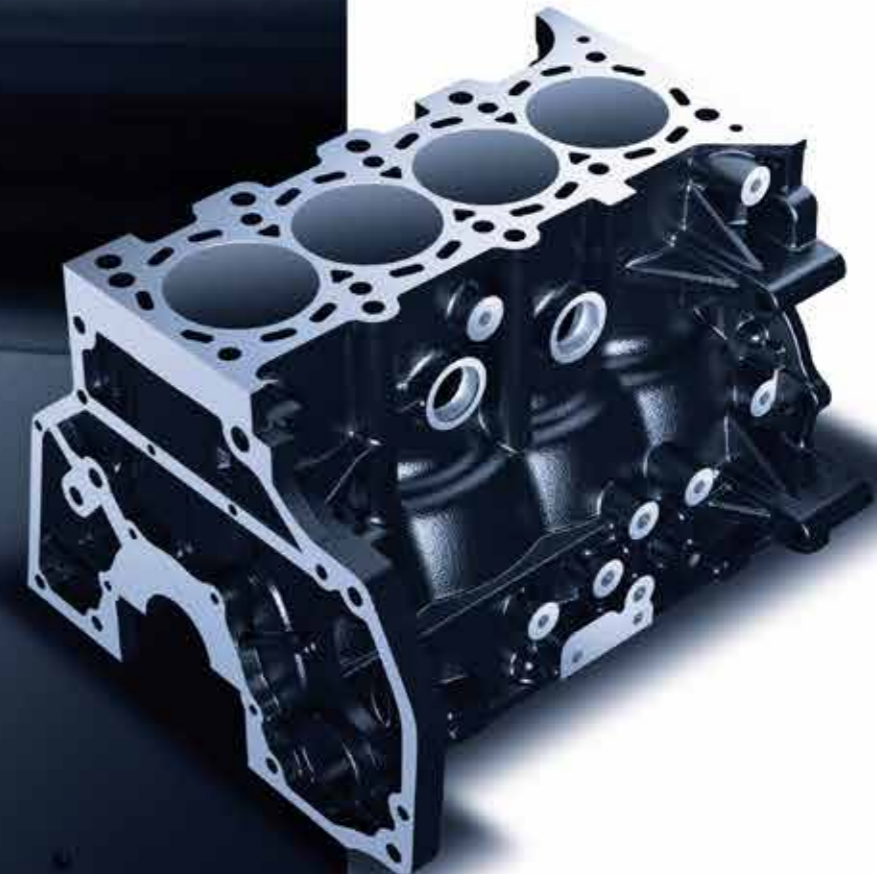
"nx" series machines have long experience in part machining field, and have proved their reliability and productivity.

### Suitable for hard-to-cut material machining and heavy cutting

Automobiles, buses and trucks

Construction machines, agricultural machines  
and hydraulic equipments

Various industrial equipment

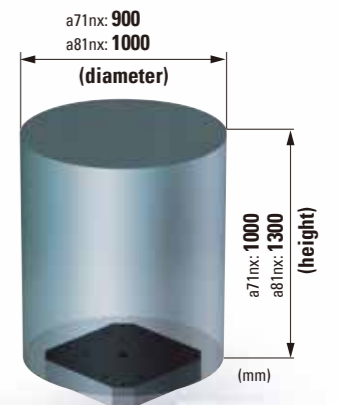


## Excellent chip removal performance in the whole machining area

	a71nx	a81nx
Axis travels (X×Y×Z)	: 800 × 750 × 830 mm	: 900 × 900 × 1020 mm
Pallet size	: 500 × 500 mm	: 630 × 630 mm
Maximum payload	: 1000 kg	: 1200 kg
Spindle interface	: BT50 (7/24 taper #50) HSK-A100*	: BT50 (7/24 taper #50) HSK-A100*
Spindle motor power (25%ED / cont.)	: 37 / 26 kW	: 45 / 26 kW

\* optional specification

Maximum workpiece size



### 160 mm diameter face mill

Material : Ductile cast iron (FCD450)  
Cutter material : Tungsten carbide

a71nx  
Axial depth of cutting : 6 mm  
Radial depth of cutting : 120 mm  
Workpiece mounting height : 810 mm from pallet top

a81nx  
Axial depth of cutting : 8 mm  
Radial depth of cutting : 120 mm  
Workpiece mounting height : 730 mm from pallet top

### 80 mm diameter end mill

a71nx  
Material : Ductile cast iron (FCD450)

Axial depth of cutting : 80 mm  
Radial depth of cutting : 22 mm

a81nx  
Material : Gray cast iron (FC250)  
Axial depth of cutting : 80 mm  
Radial depth of cutting : 50 mm

# Non-cutting time reduced, productivity enhanced

## High-acceleration spindle and agile feed axes shorten cycle time

Spindle speed range: **20 - 10000 min<sup>-1</sup>**

- Acceleration time (10000 min<sup>-1</sup>)  
3.6/3.3 sec. (a71nx/a81nx)
- 3000 min<sup>-1</sup> high-speed rigid tap

Spindle speed range: **15000 min<sup>-1</sup>** (optional specification: a81nx)

- Selectable high-speed spindle for various material, mainly aluminum alloy.

Rapid traverse : **50 m/min** (a71nx Z axis: 60 m/min)

Cutting feedrate: **1 - 50 m/min**

**a71nx**

### B axis rotary table (DD motor)

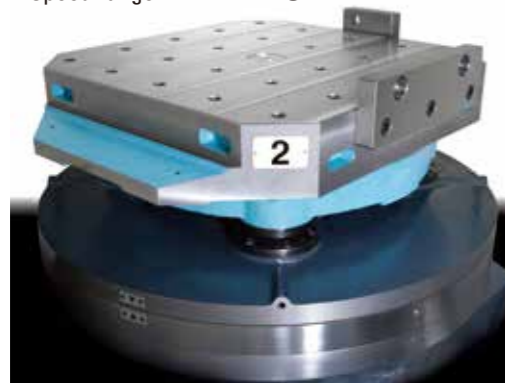
(standard specification)

Pallet size : **500 × 500 mm**

Minimum index angle: **0.0001 deg.**

Index time (90°) : **1.0 sec.**

Speed range : **125 min<sup>-1</sup>**



The rotary table is driven by DD motors. Indexing speeds up substantially.

By cooling the bearing and the jacket part of motor, heat generation is suppressed, and its posture is kept stable.

**a81nx**

### B axis 360-division (1 deg.) index table

(standard specification)

Pallet size : **630 × 630 mm**

Minimum index angle: **1 deg.**

Index time (90°) : **1.9 sec.**

### B axis rotary table

(optional specification)

Pallet size : **630 × 630 mm**

Minimum index angle: **0.0001 deg.**

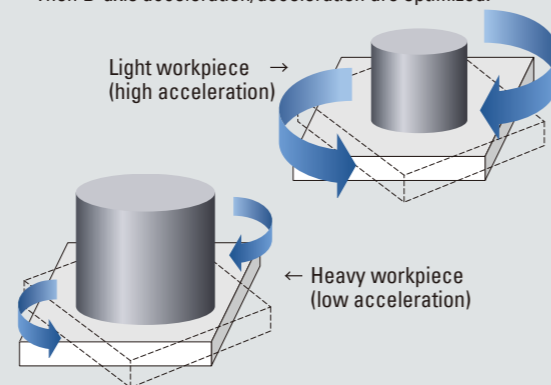
Index time (90°) : **1.5 sec.**



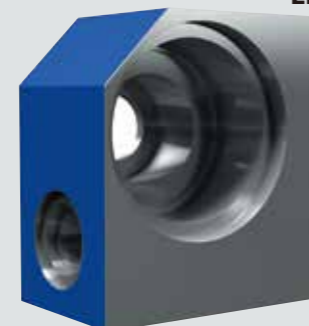
Photo: a81nx, 10000 min<sup>-1</sup> spindle (optional specification: HSK-A100)

### Inertia Active Control (patented)

Pallet inertia is automatically measured. Then B-axis acceleration/deceleration are optimized.



### Enhanced productivity

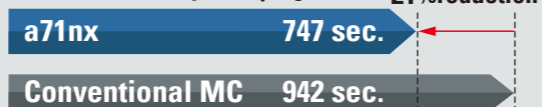


<Machining sample>

#### Housing

- Tool change :23 times
- End mill
- Drill
- Tap drill
- Chamfer
- Boring bar
- Face mill

Comparison of machining times with the currently used program



# High rigidity machine construction

### Advanced axis cooling system

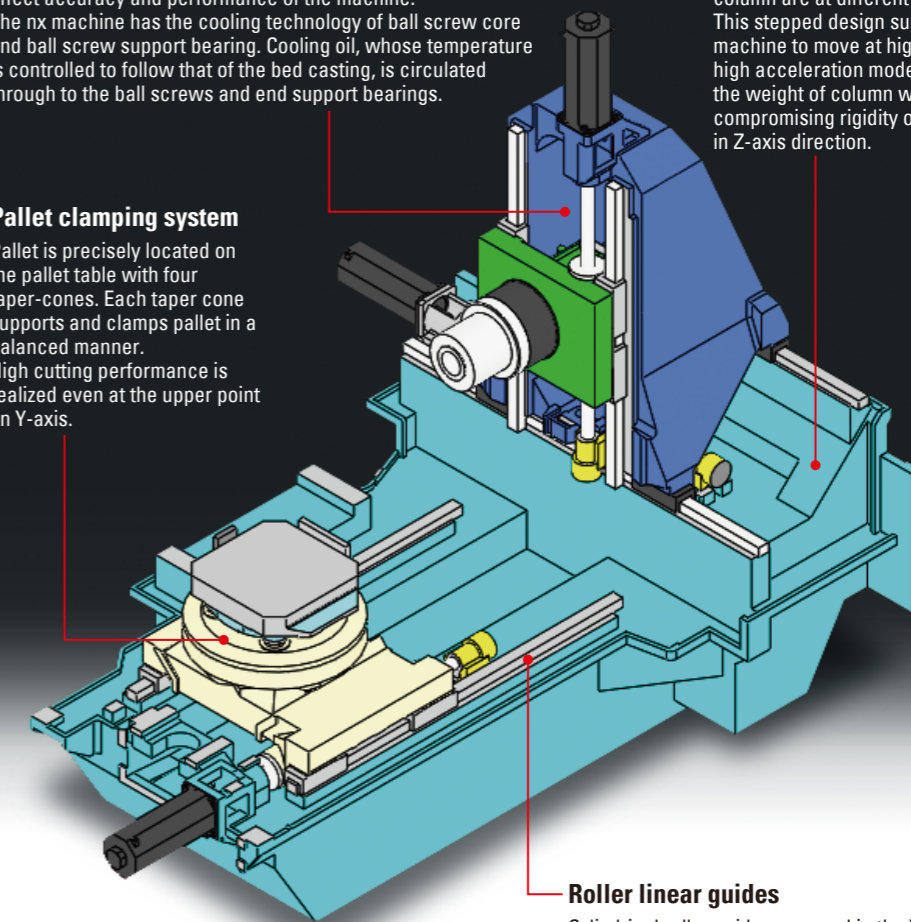
Heat generation in the axes during high speed machining can affect accuracy and performance of the machine. The nx machine has the cooling technology of ball screw core and ball screw support bearing. Cooling oil, whose temperature is controlled to follow that of the bed casting, is circulated through to the ball screws and end support bearings.

### Pallet clamping system

Pallet is precisely located on the pallet table with four taper-cones. Each taper cone supports and clamps pallet in a balanced manner. High cutting performance is realized even at the upper point on Y-axis.

### Stepped column

The two X-axis guides under the column are at different heights. This stepped design supports the machine to move at high speed and high acceleration modes by reducing the weight of column without compromising rigidity of the machine in Z-axis direction.



### Roller linear guides

Cylindrical roller guides are used in the X-, Y- and Z-axis. Rollers provide line contact area, which enhances rigidity and load capacity of machine.

### Three-points support

The machine body is designed to sit on the shop floor with only three-point support. This structure reduces installation time and makes relocation work easy.

### Tolerances measured at Makino's assembly plant

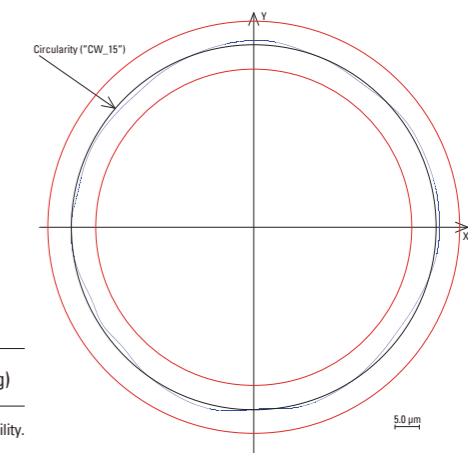
Positioning accuracy: **±2.0 μm** (with scale feedback)  
**±2.5 μm** (without scale feedback)

Repeatability : **±1.0 μm** (with scale feedback)  
**±1.5 μm** (without scale feedback)

\* Scale feedback: optional specification  
\* Measured according to JIS standard/ISO standard.

Roundness: **2.0 μm** (218 mm diameter outside surface machining)

\* Actual value measured in Makino facility.



## Chip evacuation system

Large volumes of chips of various sizes are evacuated quickly and effectively.

Highly productive machining centers generate large volumes of chips.

To ensure efficient and reliable chip removal, chamber of machine is composed almost entirely of slanted panels.

Coolant from the spindle head and ceiling of the chamber flush chips directly into the center trough under the table.

Large volume base coolant in the center trough washes chips towards the lift up chip conveyor.

Spindle head washing nozzle coolant



(Photo: a71nx)

- 8-nozzle coolant
- Through spindle coolant (1.5 / 2.2 MPa)
- Overhead shower coolant
- Spindle head washing nozzle coolant

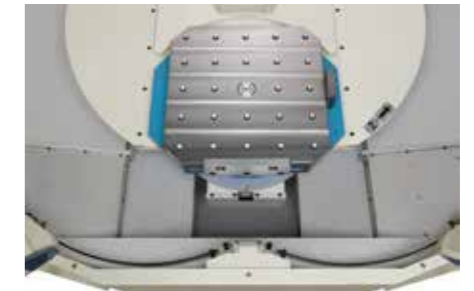
Two fixed nozzles are equipped to wash away chips from the top of spindle. Chips don't enter the spindle taper in tool changing operation.

### Z-axis cover

Z-axis cover of a single plate is adopted to avoid chip intrusion and protect guideways.



(Photo: a71nx)



(Photo: a71nx)

### Center trough structure

The center trough for chip evacuation extends through the machine from the pallet loading station (PLS) to the coolant tank. This structure keeps PLS area clean by allowing chips to fall into the center trough, where they are flushed away by the base coolant.

### Lift up chip conveyor



(Photo: a71nx)

### Main filter

Durable stainless steel wire mesh filter prevents clogging of hoses and pipes. A stainless filter or a nylon filter is available.

### Cyclone type secondary filter

Fine sludge, which cannot be filtrated by the main filter, is completely separated from coolant.



### Coolant draw-back

The through spindle coolant mechanism includes a unique coolant draw-back system. The coolant stop command activates the draw back system, which sucks excess coolant from the tool and spindle. The spindle taper is always kept clean.



0.5 sec.

## Large diameter / long tools

Tool-to-tool: **1.7 sec.**

A servo type ATC shutter and a cam type ATC mechanism, which have been used long on Makino's machining centers, are equipped. Tool can be changed in a short time.  
Large flow air cleans the spindle taper hole to prevent chips from entering.



	a71nx	a81nx	(Photo: a71nx)
Tool magazine	: 60 tools	: 60 tools	
Maximum tool diameter (without limitation / with limitation)	: 115 / 300 mm	: 115 / 356 mm	
Maximum tool length (BT / HSK)	: 480 / 570 mm	: 690 mm	

### Broken Tool Sensor **Vision B.T.S.** (patented)

The broken tool sensor (BTS) is a device detecting tool breakage. A camera is in the tool magazine. By taking photos of tools at the standby position before and after machining, the BTS detects breakage. Compared with the conventional method of touch-type probe, detecting time is drastically shortened.



- Tool change speed optimized  
Weight of each tool is automatically estimated, based on its silhouette. Tool change speed is optimized according to the information.
- ATC shutter opening width adjusted  
Length of each tool is automatically measured. ATC shutter opening width is adjusted to the length.
- Z-axis retract minimized  
Parameter of workpiece size is input by operator. Together with the information of tool length, necessary distance of Z-axis retract is calculated.

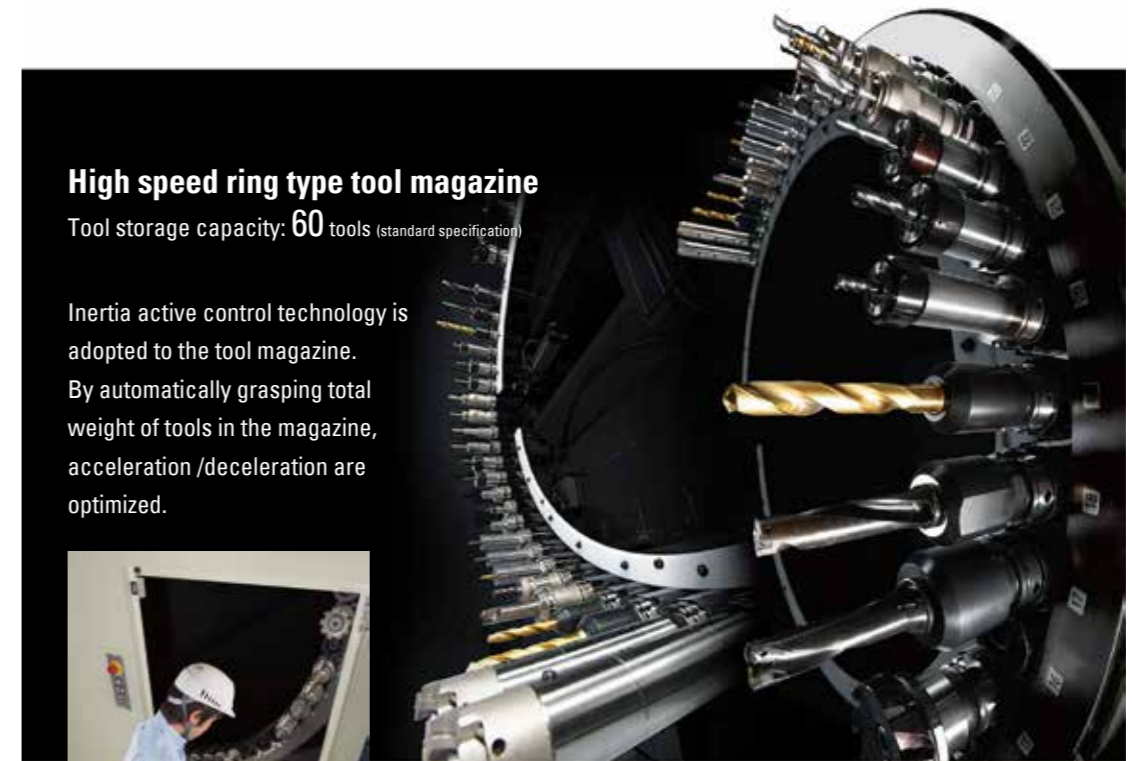
## Shortening tool change time

Tool preparation time: **5 sec.**

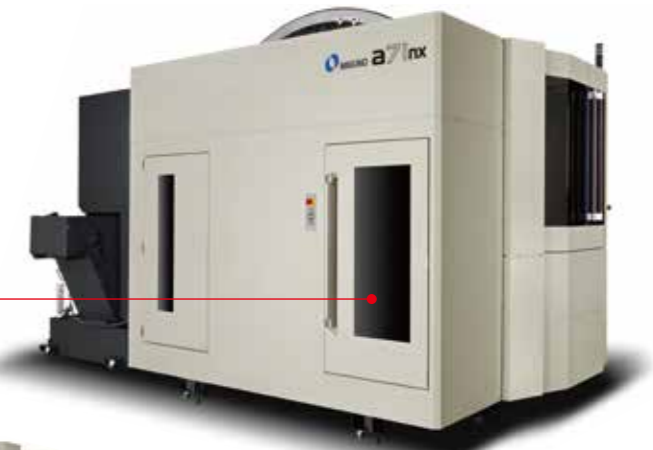
### High speed ring type tool magazine

Tool storage capacity: **60 tools** (standard specification)

Inertia active control technology is adopted to the tool magazine. By automatically grasping total weight of tools in the magazine, acceleration /deceleration are optimized.



Large tools can be easily set and taken out at the tool loading station (TLS).



(Photo: a71nx / 60 tools magazine)

### Large capacity matrix magazine

(optional specification)

Tool storage capacity: **136, 187, 299 tools**



(Photo: a71nx / 136 tools magazine)

## Ease of operation

### Operator friendly machine design



(Photo: a71nx)

#### Excellent spindle accessibility

Operator can easily access to spindle and table to check workpiece, fixture and tool.



(Photo: a71nx)

#### Pallet loading station (PLS)

The doors, which open widely, provide easy access of crane for loading workpiece and fixture.



(Photo: a71nx)

#### Control panel

The control panel is mounted on the left side of the operator door and can be rotated 180 degrees.



(Photo: a71nx)

#### Easy maintenance

Units that require daily check are placed together on the rear panels of the machine.

## Professional 6

### Control unit that maximizes machine performance

Professional 6 optimizes machine motion, according to machining conditions. Even in machining with high-speed and high-acceleration, machining surface quality and shape accuracy can be kept. Machining efficiency is totally enhanced. A variety of machining modes are preset. Operator can easily choose suitable one for its purpose.

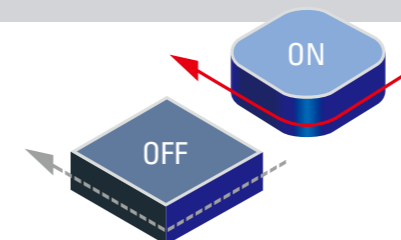
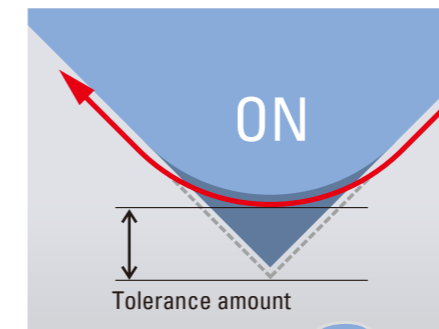
(Photo: a61nx)



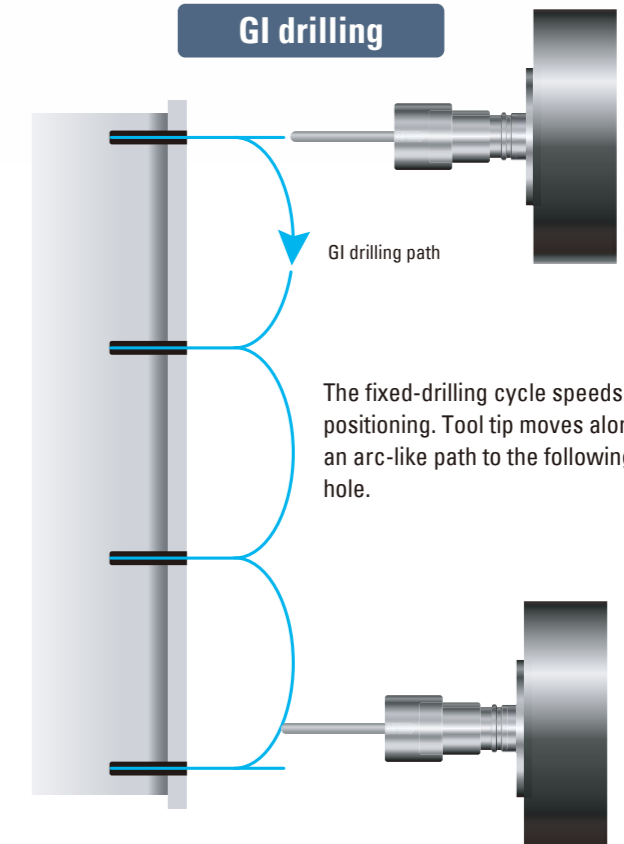
### Advanced control technology (for reducing non-cutting time)

#### GI milling

Tolerance amount at the corner section of the tool path can be defined. Accordingly, the corner section movement can be made smoothly by reducing deceleration range of federate.



#### GI drilling



# Automation

Suitable for small and medium batch production



**Pallet magazine specification** (optional specification)

(7 pallets + 1 WSS)



Compact system for pursuing maximum production **μMMC**

(Photo: a81nx + μMMC)

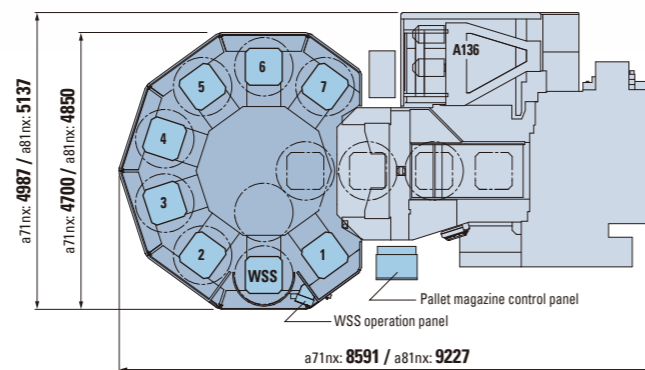
**CPH upper on-line type hydraulic and pneumatic pipe** (optional specification)

12+12 ports



Up to 12 ports per pallet can be used to supply hydraulic and pneumatic pressure. Another port is also equipped for supplying jig wash coolant.

Floor plan: a81nx (7 pallets specification)

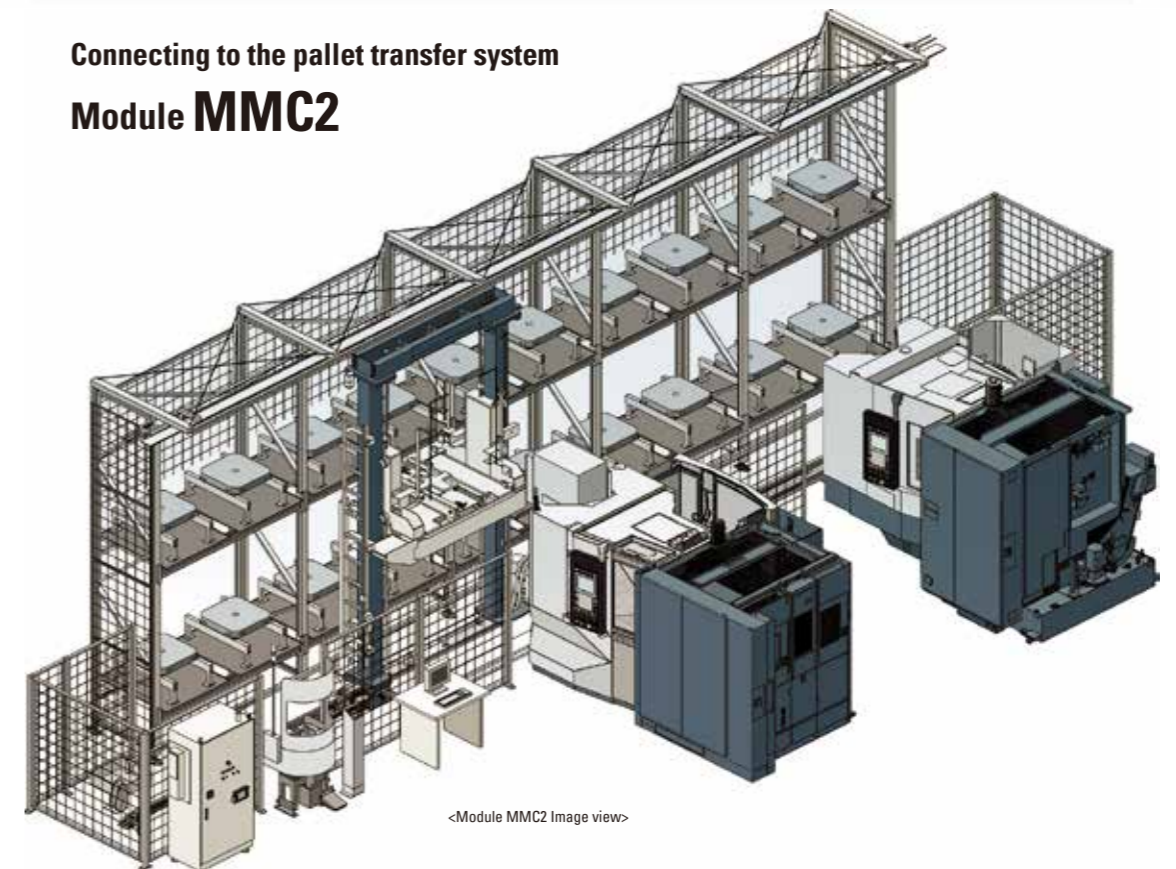


**Robot automation specification** (optional specification)



Connecting to the pallet transfer system

**Module MMC2**



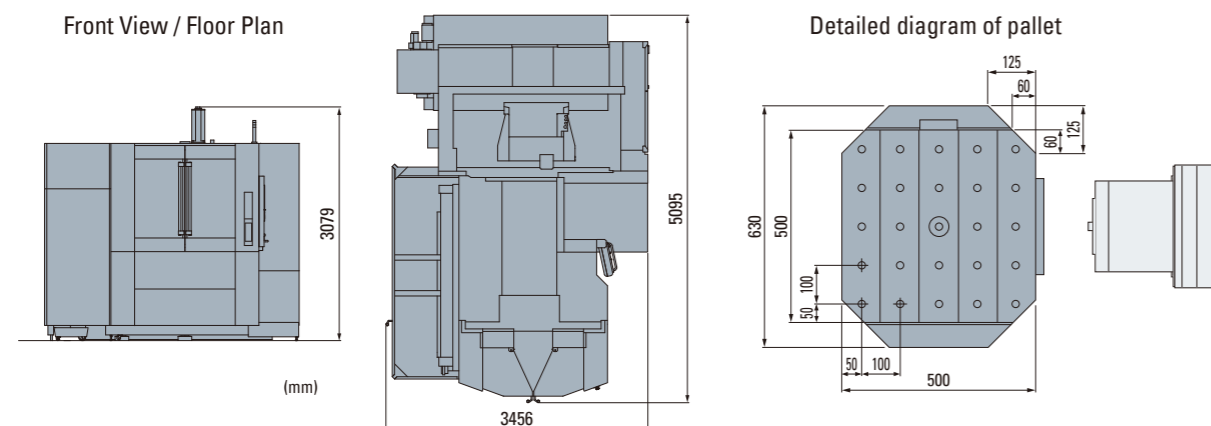
<Module MMC2 Image view>



## Specifications

Axis travels	X × Y × Z	800 × 750 × 830 mm
	Distance from pallet top to spindle center (Y min)	100 - 850 mm
	Distance from pallet center to spindle end (Z min)	100 - 930 mm
Pallet table	Size	500 × 500 mm
	Maximum payload	1000 kg
	Maximum workpiece size (diameter × height)	900 × 1000 mm
	Surface configuration	Tapped hole M16 × 24 hole (pitch 100 mm)
	Minimum index angle	0.0001 deg.
	Index time (90° / 180°)	1.0 sec. / 1.2 sec.
Spindle	Height from floor to pallet surface	1200 mm
	Speed	20 - 10000 min <sup>-1</sup>
	Interface	BT50 (7/24 taper #50), (HSK-A100*)
	Bearing diameter (inner/ outer)	110 mm / 170 mm
	Motor power (25%ED / cont.)	37 kW / 26 kW
Feedrates	Torque (25%ED / cont.)	512 N·m / 305 N·m
	Rapid traverse (X, Y axes / Z axis)	50000 mm/min / 60000 mm/min
Automatic tool changer	Cutting feedrate (X, Y, Z axes)	1 - 50000 mm/min
	Tool shank	JIS B6339 50T
	Retention knob	JIS B6339 50P
	Tool storage capacity	60 tools (136, 187, 299 tools*)
	Maximum tool diameter (with adjacent tools / without adjacent tools)	115 mm / 300 mm
	Maximum tool length (BT / HSK)	480 mm / 570 mm
Machine size (standard specification)	Maximum tool weight / Moment	60 tools magazine 30 kg / 45 N·m (number of the tool exceeding 20kg / 19.6 N·m: 6 tools)
	136, 187, 299 tools magazine	35 kg / 50 N·m
Floor space	Height	3079 mm
	Width × Depth	3456 × 5095 mm
	Weight	12700 kg
Floor space	Width × Depth	5300 × 6500 mm

\* optional specification



## Standard specifications

- 10000 min<sup>-1</sup> spindle (305 N·m)
- Spindle temperature controller
- 60 tools magazine
- Broken Tool Sensor Vision B.T.S.
- Tapped holes (2 pallets)
- Pallet changer
- Rotary table (DD motor specification)
- Pallet clamp confirmation function
- Random program calling function
- Tool magazine door (with door lock)
- Pallet changer safety guard (Not available MMC connection and pallet magazine specifications)
- APC safety guard door (with door lock)
- Operator door lock (operation mode)
- Cooling ball screw core and support bearing
- Automatic grease supply unit
- Through spindle coolant and air (1.5 / 2.2 MPa)
- 8-nozzle coolant
- Base coolant
- Shower coolant system
- Terrace washing coolant system
- Lift up chip conveyor (left discharge)
- Secondary filter for through spindle coolant (cyclone filter)
- Signal light 3- layer
- Lighting unit (machining chamber internal)
- Portable manual pulse generator
- Interface for automatic extinguisher
- Rigid tap
- Professional 6
- GI control
- Tool life monitoring function
- User memory storage capacity 3GB
- ECO mode functions
- Automatic power-off
- MRDF (Machine Retransfer Detect Function)

## Optional specifications (○) / Optional equipment (★)

- HSK-A100
- BIG-PLUS (BBT50)
- Scale feedback (X, Y, Z axes 0.05 μm)
- 136, 187, 299 tools magazine
- ★ Lighting inside tool magazine
- ★ APC safety guard automatic open/close door
- CPH upper on-line type hydraulic and pressure pipe (12+12 ports)
- Compatible with through pallet oil pneumatic supply specifications PLS
- 7 pallets magazine (1 WSS)
- 14 pallets vertical 2-tire pallet magazine (1 WSS)
- 21 pallets vertical 3-tire pallet magazine (1 WSS)
- T slots pallet specification (2 pallets)
- ★ 2- or 4-face angle plate (T-slots)
- ★ High rigid 2-face angle plates (tapped holes)
- ★ Table washing coolant (external nozzle type)
- Through spindle coolant and air (3 / 7 MPa)
- ★ Oil skimmer
- ★ Workpiece washing gun (operator side, PLS side)
- ★ Coolant temperature controller (with heater)
- Lift up chip conveyor (left discharge, double layer, for cast iron)
- Lift up chip conveyor (rear discharge, double layer, for cast iron)
- Conveyor in splash guard
- ★ Casting processing magnet
- ★ Magnetic barrier in clean tank
- ★ Chip bucket (tiltable)
- ★ Rotary wiper for splash guard window
- Coolant manifold preparation
- ★ Mist collector
- ★ Air dryer
- ★ Automatic tool length measuring device (retractable)
- ★ Automatic workpiece measuring device
- Portable manual plus generator with tool position display (with coordinate origin function and handle enable button)
- ★ MTConnect interface
- ★ OPC UA interface
- ★ Super GI.5 control
- Customer specified machine color

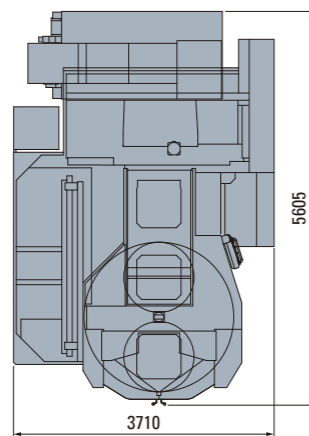
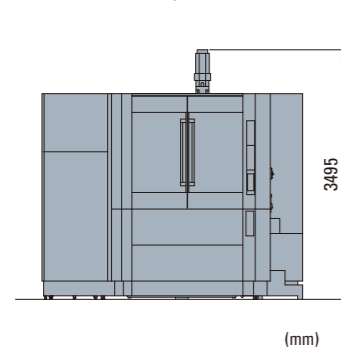


## Specifications

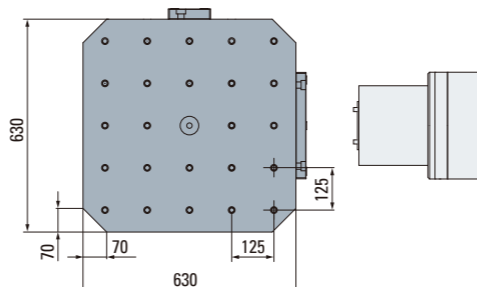
Axis travels	X × Y × Z	900 × 900 × 1020 mm
	Distance from pallet top to spindle center (Y min)	100 - 1000 mm
	Distance from pallet center to spindle end (Z min)	100 - 1120 mm
Pallet table	Size	630 × 630 mm
	Maximum payload	1200 kg (1500 kg*)
	Maximum workpiece size (diameter × height)	1000 × 1300 mm
	Surface configuration	Tapped hole M16 × 24 hole (pitch 125 mm)
	Minimum index angle	1 deg.
	Index time (90° / 180°)	1.9 sec. / 2.6 sec.
	Height from floor to pallet surface	1300 mm
Spindle	Speed	20 - 10000 min <sup>-1</sup>
	Interface	BT50 (7/24 taper #50), (HSK-A100*)
	Bearing diameter (inner/ outer)	110 mm / 170 mm
	Motor power (25%ED / cont.)	45 kW / 26 kW
Feedrates	Rapid traverse (X, Y, Z axes)	50000 mm/min (8000 min <sup>-1</sup> spindle*: 36000 mm/min)
	Cutting feedrate (X, Y, Z axes)	1 - 50000 mm/min (8000 min <sup>-1</sup> spindle*: 1- 36000 mm/min)
Automatic tool changer	Tool shank	JIS B6339 50T
	Retention knob	JIS B6339 50P
	Tool storage capacity	60 tools (80, 136, 187, 299 tools*)
	Maximum tool diameter (with adjacent tools / without adjacent tools)	115 mm / 356 mm
	Maximum tool length (BT / HSK)	690 mm
	Maximum tool weight / Moment	60 tools magazine
136 tools magazine		35 kg / 50 N·m
136, 187, 299 tools magazine		35 kg / 50 N·m
Machine size (standard specification)	Height	3495 mm (8000 min <sup>-1</sup> spindle*: 3586 mm)
	Width × Depth	3710 × 5605 mm
	Weight	17700 kg
Floor space	Width × Depth	5900 × 7800 mm

\* optional specification

Front View / Floor Plan



Detailed diagram of pallet



## Standard specifications

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- Spindle temperature controller
- 60 tools magazine
- Broken Tool Sensor Vision B.T.S.
- Tapped holes (2 pallets)
- Pallet changer
- Pallet clamp confirmation function
- Random program calling function
- Tool magazine door (with door lock)
- Pallet changer safety guard (Not available MMC connection and pallet magazine specifications)
- APC safety guard door (with door lock)
- Operator door lock (operation mode)
- 360-division (1 degree) index table
- Cooling ball screw core and support bearing
- Automatic grease supply unit
- Through spindle coolant and air (1.5 / 2.2 MPa)
- 8-nozzle coolant
- Base coolant
- Shower coolant system
- Terrace washing coolant system
- Lift up chip conveyor (left discharge)
- Secondary filter for through spindle coolant (cyclone filter)
- Signal light 3- layer
- Lighting unit (machining chamber internal)
- Portable manual pulse generator
- Interface for automatic extinguisher
- Rigid tap
- Professional 6
- GI control
- Tool life monitoring function
- User memory storage capacity 3GB
- ECO mode functions
- Automatic power-off
- MRDF (Machine Retransfer Detect Function)

## Optional specifications (○) / Optional equipment (★)

- High-torque spindle (8000 min<sup>-1</sup>)
- 15000 min<sup>-1</sup> spindle (HSK-A100)
- HSK-A100
- Maximum payload 1500 kg specification
- Scale feedback (X, Y, Z axes 0.05 μm)
- 80, 136, 187, 299 tools magazine
- Rotary table
- ★ APC safety guard automatic open/close door
- CPH upper on-line type hydraulic and pressure pipe (12+12 ports)
- Compatible with through pallet oil pneumatic supply specifications PLS
- 7 pallets magazine (1 WSS)
- 14 pallets vertical 2-tire pallet magazine (1 WSS)
- 21 pallets vertical 3-tire pallet magazine (1 WSS)
- T slots pallet specification (2 pallets)
- ★ 1-, 2- or 4-face angle plate (T-slots)
- ★ High rigid 2-face angle plates (tapped holes)
- ★ Table washing coolant (external nozzle type)
- Through spindle coolant and air (3 / 7 MPa)
- ★ Oil skimmer
- ★ Workpiece washing gun (operator side, PLS side)
- ★ Coolant temperature controller (with heater)
- Lift up chip conveyor (left discharge, double layer, for cast iron)
- Lift up chip conveyor (rear discharge, double layer, for cast iron)
- Conveyor in splash guard
- ★ Casting processing magnet
- ★ Magnetic barrier in clean tank
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- ★ Rotary wiper for splash guard window
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