OKK

100 Years of Reliability & Precision

OKK CORPORATION

Horizontal Machining Center

HMC 500

This high-speed machine features the strongest structural rigidity in its class and attains a rapid feed rate of 63m/min(2480ipm) with 1G acceleration.

HMC 500

CONTENTS

Horizontal Machining Center

HMC 500

SPECIFICATIONS

Travel distance: 760(29.92″)x760(29.92″)x800mm(31.50″)

Pallet size: 500(19.69″)x500mm(19.69″)

Maximum workpiece size: ø800(31.50″)x1150mm(45.28″)

Rapid traverse rate: 63000(2480ipm)mm/min

Maximum acceleration: 1G

Number of stored tools: 60tools

Maximum tool diameter: ø170(6.69″)mm

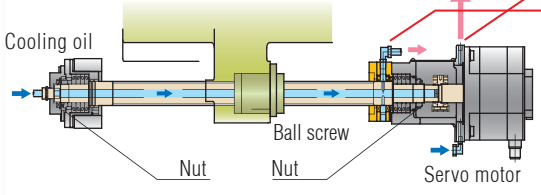
Machine design enables high-speed Production

The column mass is optimized to allow movement of 63m/min (2480ipm) rapid feed rate with acceleration of 1G. This combined with a servo driven ATC enables a C-to-C time of 2.9 seconds and large reduction of non-cutting time.

Core cooling ball screws and Double-anchor pre-tension system

Lubrication oil cooler unit

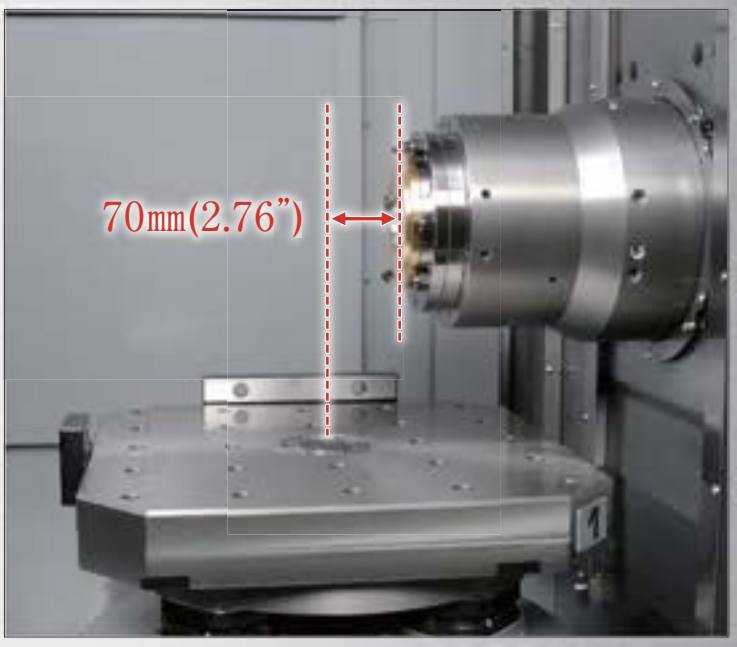
HMC500 uses core cooling ball screws on the X, Y and Z axes. Circulation of cooling oil through the ball screws, around ball screw support housings and motor mounting surfaces reduces the thermal displacement and maintains accuracy during long machining time.



The double-anchoring method limits elongation of the ball screws and improves the minute-feed characteristics and the lowers lost-motion characteristics. Accuracy in round cutting has also been improved largely.

The spindle nose reaches close to the pallet center

Reducing the minimum distance from the spindle nose to the pallet center makes it with shorter tools producing highly-rigid machining.



Highly rigid structure

The HMC500 utilizes a wide column and highly rigid roller guides. This produces great aluminum machining performance and also the machining of a wider range of workpieces, including cast iron.

Highly rigid roller guides

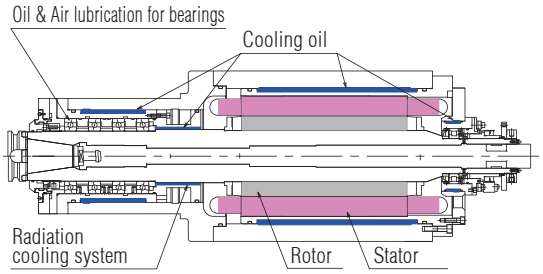
Improved reliability

HMC500 is single Z and double X axis.
This design eliminates the risk of binding during cutting and achieves an improvement in the reliability.

Spindle

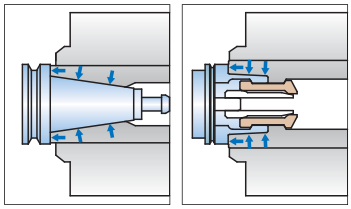
The spindle bearings are oil-air lubricated. Circulating temperature controlled oil in the casing around the spindle housing reducing the growth of the spindle. Furthermore, OKK's unique radiant cooling system prevents the conduction of heat generated from the motor into the spindle.

Standard spindle 15000min^{-1}

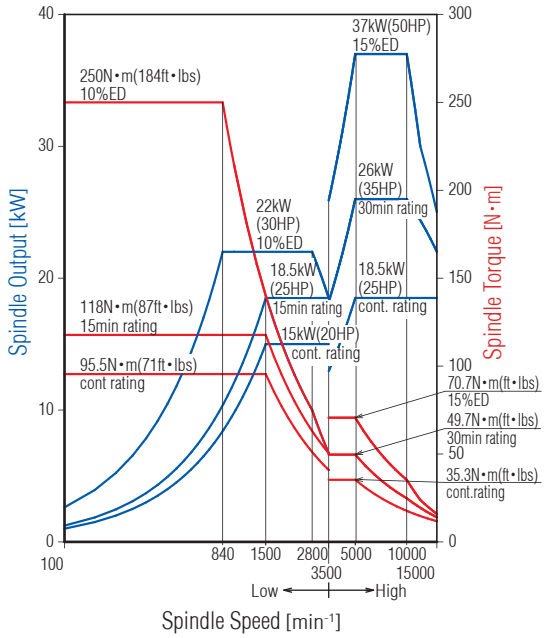


Dual contact tool BT type (Standard)

Improvements in rigidity of tools have been Achieved contact faces of spindle-nose and tool holders flange. This has a great effect not only for heavy load machining but also high speed machining.
(The performance is different due to the cutting tools and cutting conditions.)



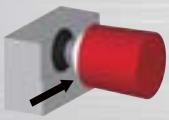
15000min^{-1} [37/18.5kW(50/25HP)MS]



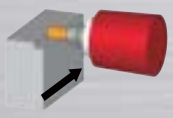
Table

Cutting data

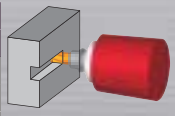
Type of machining	Face milling ø100mm (3.94")×6T
Machine model	HMC500
Spindle speed	800min^{-1}
Width of cut	80mm (3.15")
Depth of cut	4mm (0.16")
Feed rate	1320mm/min (52ipm)
Cutting amount	422cm^3/min (25.8in^3/min)
Spindle motor load	83%
Workpiece material	S45C



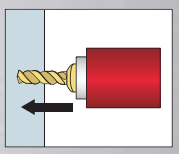
Type of machining	Side milling with End mill ø32mm (1.26")x6T
Machine model	HMC500
Spindle speed	250min^{-1}
Width of cut	15mm (0.59")
Depth of cut	20mm (0.79")
Feed rate	216mm/min(9ipm)
Cutting amount	65cm^3/min (4in^3/min)
Spindle motor load	36%
Workpiece material	S45C



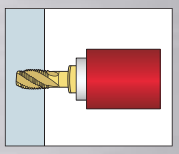
Type of machining	Slotting with End mill ø32 (1.26")x6T
Machine model	HMC500
Spindle speed	250min^{-1}
Width of cut	32mm (1.26")
Depth of cut	12mm (0.47")
Feed rate	140mm/min(6ipm)
Cutting amount	54cm^3/min (3.3in^3/min)
Spindle motor load	35%
Workpiece material	S45C



Type of machining	Drill Milling ø26.5mm (1.04")
Machine model	HMC500
Spindle speed	300min^{-1}
Width of cut	26.5mm (1.04")
Feed rate	50mm/min(2ipm)
Cutting amount	27.5cm^3/min(1.7in^3/min)
Spindle motor load	30%
Workpiece material	S45C



Type of machining	Tap Milling M30xP3.5
Machine model	HMC500
Spindle speed	100min^{-1}
Feed rate	350mm/min(14ipm)
Spindle motor load	55%
Workpiece material	S45C



Workpiece material: A7075

Workpiece material: S50C

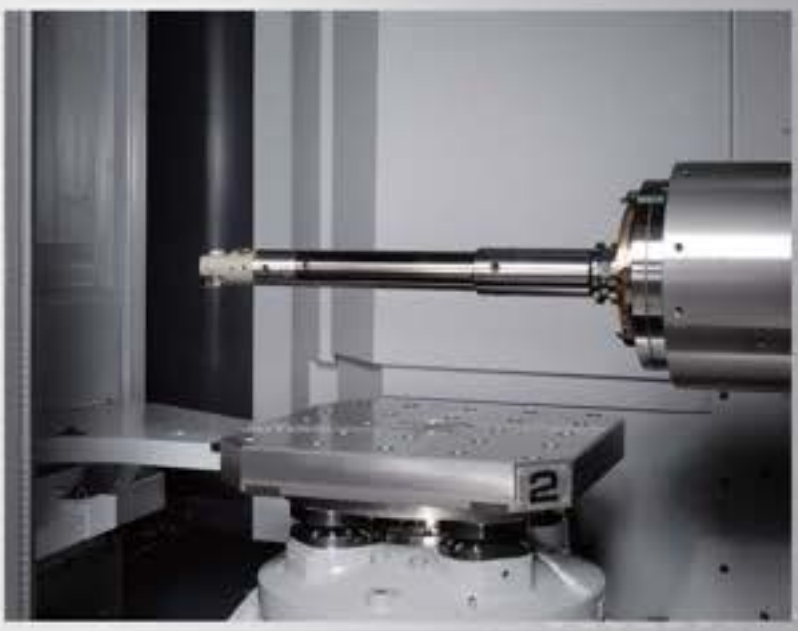
Values shown here are for reference to provide an indication of cutting capability.

High-precision Machining in a Shorter Cutting Time

The maximum tool length enables tooling longer than the pallet allowing deep boring operations without rotating the part.
This allows high-precision machining in a shorter cutting time.

*There is a limit on the diameter of a tool with length of 475mm (18.70") or longer.

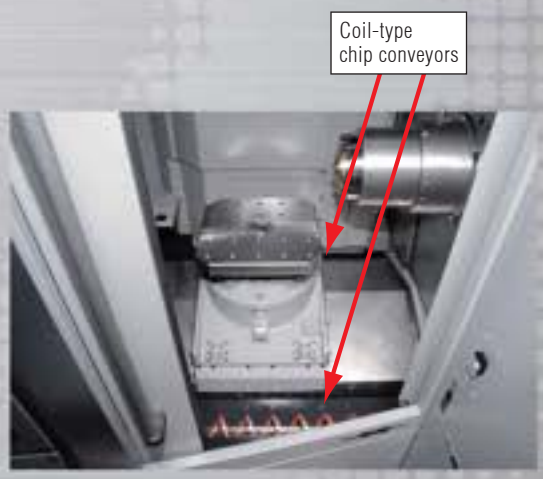
Max. tool length
550mm
(21.65")



Chip disposal measures

The standard ceiling shower and two coil-type conveyors on the left- and right-hand side thoroughly remove cutting chips from the machine. The troughs of the coil conveyors shield heat transfer from the cutting chips and coolant to the machine base.

Ceiling shower [Standard]



Coil-type chip conveyors [Standard]

ATC [Automatic Tool Changer]

The machine uses a servomotor-driven ATC and magazine, thus providing a stable tool change with excellent durability. A variable-speed ATC function, standard, automatically slows down the ATC turning speed for heavy tools. This allows the tool to be changed smoothly by simply selecting the slow turning speed during tool registration.

Max. tool diameter:
ø170mm (6.69")

Max. tool length:
550mm (21.65")

Max. tool mass:
12kg (26 lbs)

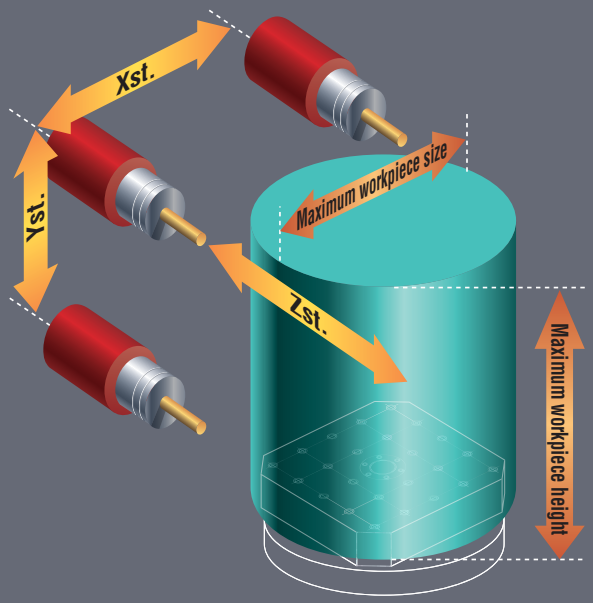
Foot-operated switch for removing a tool (Standard)

APC [Automatic Pallet Changer]

The APC unit uses a direct-drive lifting and turning mechanism. The unit has been designed for easy expansion to multiple-pallet APC or automatic pallet transfer systems for flexible integration with automation.

Maximum workpiece size

The HMC500 utilizes a table with a multi-clamp pallet system and has an extended maximum workpiece height, easily accommodating automatic fixture interfaces.



	HMC500
Xst.	760mm(29.92")
Yst.	760mm(29.92")
Zst.	800mm(31.50")
Pallet size	□500mm(19.69")
Maximum workpiece size	ø800mm(31.50")
Maximum workpiece height *1	1150mm(45.28")
Maximum load mass	700kg(1543lbs)

*1 The available workpiece height will become lower when a fixture is used.

Maintenance

All of the maintenance devices are centrally located on operator door side for simple daily inspection.

User-friendly construction

The operation panel is located on the left-hand side, which enables the operator to see the whole interior of the machine, thus increasing the operator's work efficiency. Furthermore, the front door of the APC opens wide so that the work loading/unloading and setup operations can be easily carried out.

Operator panel and inside of the machine

Environmental measures

LED lamps [Standard]

The machine incorporates LED lamps due to their low heat generation and power consumption savings. Furthermore, the LED lamps to save on replacement costs and maintenance.

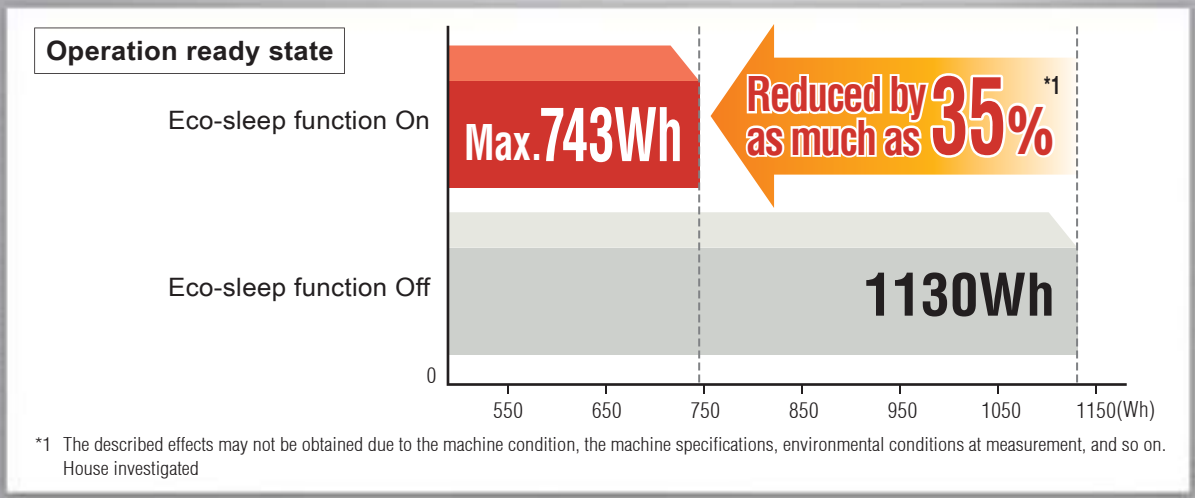
LED lamps [Standard]

ECO sleep function [Standard]

If the machine remains idle longer than the specified time period, the machine's present mode is switched to a power-saving mode to reduce wasteful consumption of power, air and so on. When the power-saving mode is active, the equipment such as servos and chip conveyors are turned off. It is cancelled automatically when the setup operation is completed i.e. when the doors are closed.

Power consumption comparison

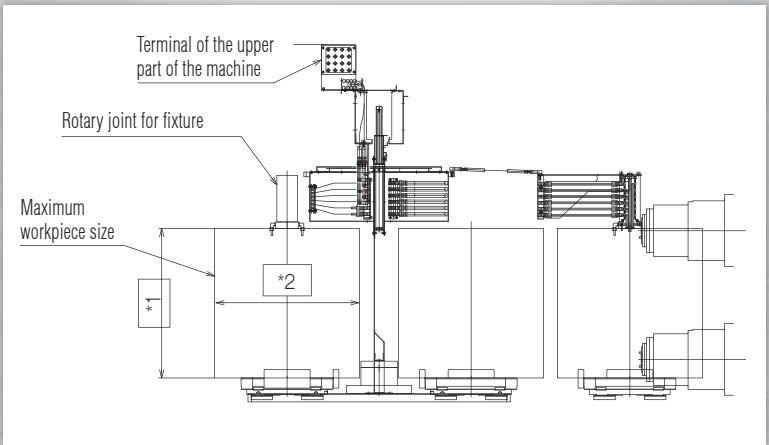
A power consumption of 1130Wh under normal standby condition is reduced to Maximum 743Wh with the eco-sleep function, a reduction of the about 35%*1.



*1 The described effects may not be obtained due to the machine condition, the machine specifications, environmental conditions at measurement, and so on. House investigated

Optional accessories

Constant auto fixture coupler with rotary joints



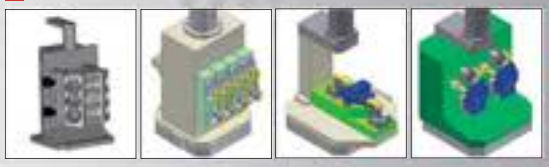
Dimensions of *1

	HMC500
3-port	980mm (38.58")
4-port	950mm (37.40")
6-port	900mm (35.43")
8-port	850mm (33.46")

Dimensions of *2

	HMC500
Maximum workpiece size	ø800mm (31.50")

Fixture example



Lift-up chip conveyor [Option]

Suitable lift up chip conveyor according to type of chips

◎Most suitable ○ Usable △ Usable under condition × Not usable – Not applicable

Type of chip conveyors				Hinge type		Scraper type		Magnet Scraper type		Scraper type with drum filter		Magnet scraper type with drum filter	
Use or not use coolant oil				Use	Not use	Use	Not use	Use	Not use	Use	Not use	Use	Not use
Type of chips	Magnetizable chips	Steel	Short curl	◎	◎	○	○	◎	◎	○	–	◎	–
			Spiral	◎	◎	△*2	△*2	△*2	△*2	×	–	×	–
			Long	◎	◎	×	×	×	×	×	–	×	–
			Needle shape	×	△*1	×	○	○*3	○	○	–	◎	–
			Powder and small lump	×	△*1	×	○	○*3	○	○	–	◎	–
		Cast iron	Needle shape	×	△*1	×	○	○*3	○	○	–	◎	–
			Powder and small lump	×	△*1	×	○	○*3	○	△*3	–	◎	–
	Non-magnetizable chips	Alminum	Short curl	×	◎	△*4	○	–	–	◎	–	◎	–
			Spiral	○	◎	○	○	–	–	△*5	–	△*5	–
			Long	○	◎	○	○	–	–	△*5	–	△*5	–
			Needle shape	×	△*1	×	○	–	–	◎	–	◎	–
			Powder and small lump	×	△*1	×	○	–	–	◎	–	◎	–

*1 Minute chips can enter the conveyor through a gap on the hinged plate. So, inside of the conveyor needs frequent cleaning.
*2 Scraper can easily catch long chips. So, shortening the chips (for example by using the step feed) or removing such chips is required.
*3 When flow rate of the coolant is large, filters can be clogged with chips flowed out of the conveyor case. Therefore, combined use with a magnet plate is recommendable.
*4 When flow rate of the coolant is large, filters can be clogged with chips flowed out of the conveyor case. Therefore, filters require frequent cleaning.
*5 Scraper can easily catch long chips. Therefore, periodical removal of chips is needed. If they remain, a drum filter may be damaged.

Specifications

Item			HMC500
Travel on X axis (Column: right/left)		mm	760 (29.92")
Travel on Y axis (Spindle head: up/down)		mm	760 (29.92")
Travel on Z axis (Pallet: back/forth)		mm	800 (31.50")
Distance from table top surface to spindle center		mm	80~840 (3.15"~33.07")
Distance from table center to spindle nose		mm	70~870 (2.76"~34.25")
Table (Pallet) work surface area		mm	□500 (19.69")
Max. workpiece weight loadable on table (pallet)		kg	700 (1543lbs) [Uniformly distributed load]
Max. workpiece weight loadable on table (pallet)		mm	ø800×1150 (ø31.50"×45.28")
Table (Pallet) top surface configuration			24×M16 tap
Min. indexable angle of table (pallet)		deg	0.001°
Spindle speed		min^{-1}	100~15000
Number of spindle speed			2-step (Winding change system)
Spindle nose (nominal number)			7/24 taper No.40 Dual-contact type
Spindle bearing bore diameter		mm	ø70 (2.76")
Rapid traverse rate	X×Y×Z	m/min	63 (2480opm)
	B	min^{-1}	40
Cutting feed rate *1	X×Y×Z	mm/min	1~40000 (0.04~1575ipm) *1
	B	min^{-1}	1~27.7 *1
Tool shank (nominal number)			JIS B 6339 BT40
Pull stud (nominal number)			MAS Ⅰ (45°)
Number of storable tools		tool	60 *2
Max. tool diameter		mm	ø95 (3.74") [ø170 (6.69") with no tools in adjacent pots]
Max. tool length (from the gauge line)		mm	550 (21.65") *3
Max. tool weight		kg	5 (11lbs) [12 (26lbs) with slow ATC cycle] / Total 300 (661lbs)
Max. tool moment		N·m	9.8 (7.2ft·lbs)
Tool selection method			Address fixed random method
Tool exchange time (cut-to-cut)		sec	2.9
Pallet exchange method			Direct turn method
Pallet exchange time (JIS evaluation time)		sec	13
Spindle motor (15%ED/30min/Continuous rating)		kW	37/26/18.5 (50HP/35HP/25HP)
Feed motors		kW	X,Y,Z: 5.5 (7.4HP) B: 4.5 (6.0HP)
Coolant pump motor		kW	60Hz: 1.2 (1.6HP) 50Hz: 0.7 (0.9HP)
Hydraulic pump motor		kW	1.5 (2HP)
Spindle and feed system cooling oil pump motor (oil cooler)		kW	1.1/0.4 (1.5HP/0.5HP) [compression/discharge]
Tool Magazine motor		kW	0.017 (0.02HP)
ATC motor		kW	1.2 (1.6HP)
Tool Magazine motor		kW	1.4 (1.9HP)
APC motor		kW	2.5 (3.4HP)
Power supply AC200V±10% 50/60Hz±1Hz AC220V±10% 60Hz±1Hz		kVA	48
Compressed air supply		Mpa,ℓ/min[ANR]	0.4~0.6 (58~87psi) *4, Min.500 (132gpm) *4 *5
Coolant tank capacity		L	530 (140gal)
Spindle and feed system cooling oil tank capacity (oil cooler)		L	20 (5gal)
Spindle lubrication oil tank capacity (oil air lubrication)		L	2 (0.5gal)
Lubrication oil tank capacity		L	20 (5gal)
Machine height (from floor surface)		mm	3605 (141.93")
Required floor space		mm	2750×4845 (108.27"×190.75")
Machine weight		kg	10500 (23148lbs)
Operating environment temperature		˚C	5~40

Standard accessories

Item	Qty	Remarks
LED lamp	1set	
Coolant tank (installed separately)	1set	Tank capacity 530L (140gal)
Coolant-through-spindle	1set	Center through
Coolant unit	1set	7 Mpa (1050psi)
Splash Guard/APC safty guard	1set	
Slide way protection sliding covers for X,Y and Z axes	1set	
Earth leakage breaker	1set	
Automatic power off	1set	
Edge locator	1set	
Signal lamp	1set	3-lamps type without buzzer
Direct-turn APC unit	1set	
Coil-type chip conveyor	1set	1 set for each of right and left

Item	Qty	Remarks
Hydraulic unit (installed separately)	1set	
Ceiling shower	1set	
Spindle head and ball screw cooling oil temperature controller (installed separately)	1set	
Ball screw and tool magazine automatic grease lubrication unit	1set	
Oil air lubrication unit	1set	
Foundation parts for machine anchoring (Bond anchoring method)	1set	with bond
Magazine tool holder remove device	1set	
Instruction manual	1set	
Electrical instruction manual (including electrical diagrams)	1set	

*1: Under the HQ or Hyper HQ control

*2: The number of storable tools refers the total number of tools including the one attached to the spindle i.e. subtract one from the above for the number of tools storable in the tool magazine.

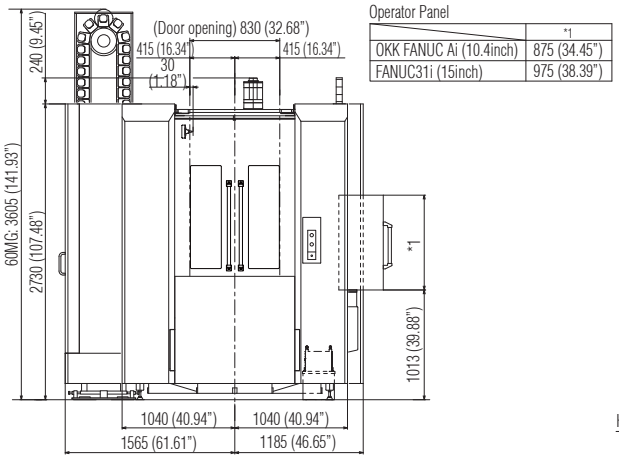
*3: Conditional.For details, refer to tool limits drawing.

*4: Purity of the supplied air should be equivalent to or higher than Class 3.5.4 specified in ISO 8573-1/JIS B8392-1.

*5: The flow rate for the standard specification machine is specified in the above. When optional specifications such as an air blower is added,add the corresponding air supply according to the operating frequency.

Dimensions [mm]

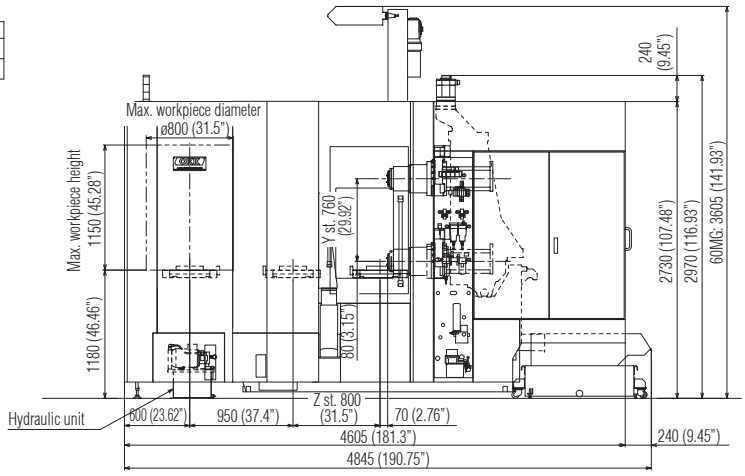
Front view



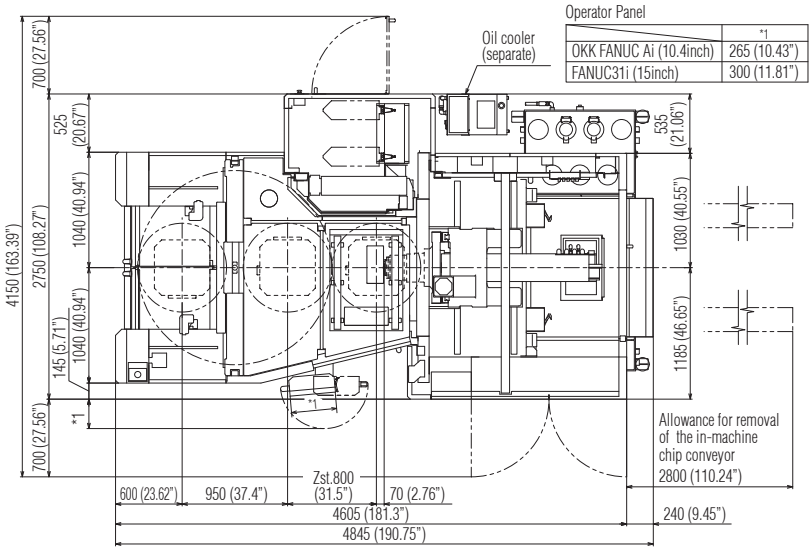
Operator Panel

	*1
OKK FANUC Ai (10.4inch)	875 (34.45")
FANUC31i (15inch)	975 (38.39")

Side view



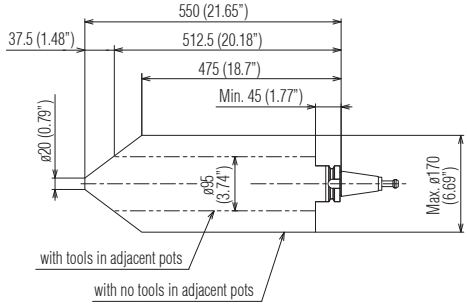
Floor space



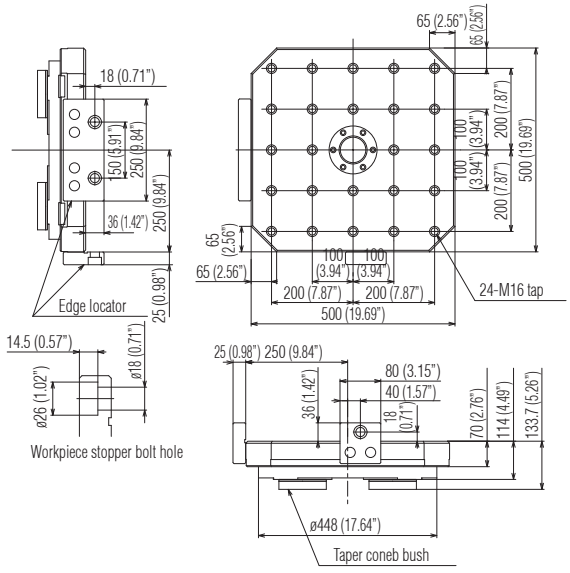
Operator Panel

	*1
OKK FANUC Ai (10.4inch)	265 (10.43")
FANUC31i (15inch)	300 (11.81")

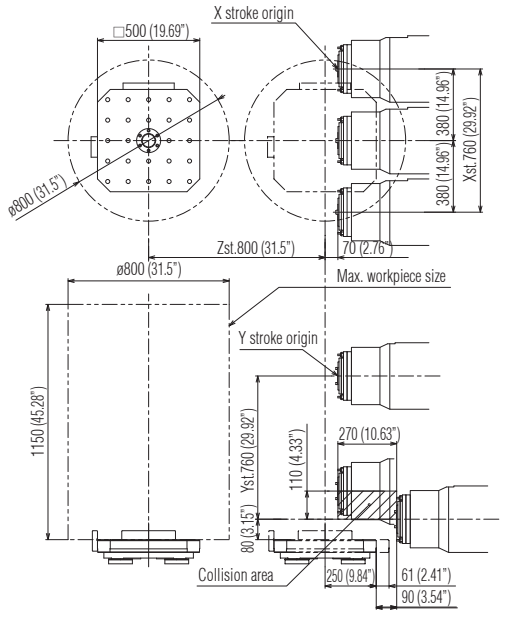
Restrictions on tool



Pallet



Stroke diagram



Optional accessories

Air blow nozzle

For dry cutting applications.

Mist collector

Mist collector suctions mist from the splash guards and is recommended when high-pressure coolant is used.

Oil skimmer

Oil skimmer collects contaminated oil from a coolant tank.

116 tool magazine

Lift-up chip conveyor

To separate chips and coolant, and discharge to the outside only chips.

T1-C

Tool length measurement/ Tool break detection

Set-up LED

Set-up station incorporates LED lamps improves work efficiency.

Option check sheet

Item	Description
☐ Changing the type of pull stud	☐ MASⅡ 60°
☐ Dual-contact tool	☐ HSK-A63
☐ Tool magazine	HMC500: ☐ 40tools, ☐ 116tools
☐ Multi-pallet APC	☐ 7APC
☐ Pallet top surface	☐ T-slot
☐ Additional pallet	
☐ APC safety door automatic open / close	
☐ Oil skimmer	
☐ Addition of lighting system	☐ LED lamp in the APC setup station
☐ Signal lamp	☐ 3-lamps type with buzzer
☐ Coolant-through-spindle	
☐ Coolant unit	☐ Coolant cooler
☐ Air blow nozzle	☐ 1 nozzle
☐ Swirl stopper block	☐ For angle attachment
☐ Workpiece flushing equipment	☐ Shower gun type
☐ Mist collector	
☐ Lift-up chip conveyor	☐ Hinged type ☐ Scraper type ☐ Magnet scraper type ☐ Scraper type with drum filter (for aluminum + iron) ☐ Magnet scraper type with drum filter (for aluminum + casting)
☐ Chip bucket	☐ Fixed type ☐ Swing type
☐ Standard tool set	☐ Including a tool box
☐ Mass block	
☐ Angle plate	
☐ 2-face angle plate	
☐ Fixture interface	☐ 3ports ☐ 4ports ☐ 6ports ☐ 8ports ☐ 12+1ports
☐ Touch sensor system T1	☐ Workpiece measurement ☐ Tool length measurement / Tool break detection
☐ Tool break detection inside the magazine	
☐ Automatic restart at tool damage	
☐ Tool presence/absence detection	

Controller

FANUC Controller F31i-B

(Windows CE-installed Open CNC)

Standard Specification
No. of controlled axes: 4 axes (X, Y, Z, B)
No. of simultaneously controlled axes: 4 axes
Least input increment: 0.001mm / 0.0001"
Max.programmable dimension: ±999999.999mm / ±39370.0787"
Absolute / Incremental command: G90 / G91
Decimal point input / Pocket calculator type decimal point input
Inch / Metric conversion: G20 / G21
Program code: ISO / EIA automatic discriminaton
Program format: FANUC standard format
Nano interpolation (internal)
Positioning: G00
Linear interpolation: G01
Circular interpolation: G02 / G03 (CW / CCW), including radius designation
Cutting feed rate: 6.3-digit F-code, direct command
Dwell: G04
Manual handle feed: manual pulse generator 1 set(0.001, 0.01, 0.1mm)
Rapid traverse override: 0 / 1 / 10 / 25 / 50 / 100%
Cutting feed rate override: 0 to 200% (every 10%)
Feed rate override cancel: M49 / M48
Rigid tapping: G84, G74 (Mode designation: M29)
Part program storage capacity: 160m[64KB]
No. of registered programs: 120
Part program editing
Background editing
Extended part program editing
15" color LCD/QWERTY key MDI
Clock function
MDI (Manual Data Input) operation
Memory card interface
Spindle function: 5-digit S-code direct command
Spindle speed override: 50 to 150% (every 5%)
Tool function: 4-digit T-code direct command
ATC tool registration
Auxiliary function: 3-digit M-code programming
Multiple M-codes in 1 block: 2 codes (HM400/HM500S/HM5000/HM6300S: 3 codes (Max. 20 settings))
Tool length offset: G43, G44/G49
Tool diameter and cutting edge R compensation: G41, G42/G40
Tool offset sets: 99 sets in total
Tool offset memory C
Manual reference position return
Automatic reference position return: G28/G29
2nd reference position return: G30
Reference position return check: G27
Automatic coordinate system setting
Coordinate system setting: G92
Machine coordinate system: G53
Workpiece coordinate system: G54 to G59
Local coordinate system: G52
Program stop: M00
Optional stop: M01
Optional block skip: /
Dry run
Machine lock
Z-axis feed cancel
Auxiliary function lock
Graphic display
Program number search

Standard Specification
Sequence number search
Program restart
Cycle start
Auto restart
Single block
Feed hold
Manual absolute on/off: parameter
Sub program control
Canned cycle: G73, G74, G76, G80 to G89
Mirror image function: parameter
Automatic corner override
Exact stop check/mode
Programmable data input: G10
Backlash compensation for each rapid traverse and cutting feed
Smooth backlash compensation
Memory pitch error compensation (interpolation type)
Skip function
Tool length manual measurement
Emergency stop
Data protection key
NC alarm display / alarm history display
Machine alarm display
Stored stroke check 1
Stored stroke check 2, 3
Load monitor
Self-diagnosis
Absolute position detection
Manual guide i (Basic)

Optional Specification	
Additional one axis control: name of axis(A, B, C, U, V, W)*	
Additional two axes control: name of axis(A, B, C, U, V, W)*	
Least input increment: 0.0001mm / 0.00001"	
FS15 tape format	
Unidirectional positioning: G60	
Helical interpolation	PK1
Cylindrical interpolation	
Hypothetical axis interpolation	
Spiral/Conical interpolation	
Smooth interpolation (Hyper HQ control B mode is required)	
NURBS interpolation (Hyper HQ control B mode is required)	
Involute interpolation	
One-digit F code feed	
Handle feed 3 axes (Standard pulse handle is removed)	
Part program storage capacity: 320m[128KB](250 in total)	
Part program storage capacity: 640m[256KB](500 in total)	
Part program storage capacity: 1280m[512KB](1000 in total)	PK1
Part program storage capacity: 2560m[1MB](1000 in total)	
Part program storage capacity: 5120m[2MB](1000 in total)	
Part program storage capacity: 10240m[4MB](1000 in total)	
Part program storage capacity: 20480m[8MB](1000 in total)	
RS232C interface: RS232C-1CH	
Data server: ATA card (1GB)	PK2
Data server: ATA card (4GB)	
Spindle contour control (Cs contour control)	
Tool position offset	

Optional Specification	
3-dimensional cutter compensation	
Tool offset sets: 200 sets in total	PK1
Tool offset sets: 400 sets in total	
Tool offset sets: 499 sets in total	
Tool offset sets: 999 sets in total	
Addition of workpiece coordinate system (48 sets in total): G54.1 P1 to P48	PK1
Addition of workpiece coordinate system (300 sets in total): G54.1 P1 to P300	
Machining time stamp	
Addition of optional block skip: 9 in total	
Tool retract and return	
Sequence number comparison and stop	
Manual handle interruption	
Programmable mirror image	PK1
Optional chamfering / corner R	
Custom macro	PK1
Interruption type custom macro	
Addition of custom macro common variables: 600	
Figure copy	
Coordinate system rotation: G68, G69	
Scaling: G50, G51	
Chopping (Axis control by PMC)	
Playback	
Tool life management: 256 sets in total	PK1
Addition of tool life management sets: 1024 sets in total	
High-speed skip	
Run hour and parts count display	PK1
Manual guide i (Milling cycle)	

Original OKK Software	
Machining support integrated software (including Help guidance, etc.)	STD
Tool support	STD
Program editor	STD
EasyPRO	STD
Work manager	OP
HQ control	STD
Hyper HQ control mode A	OP
Hyper HQ control mode B	PK2 OP
Hyper HQ value kit (including the items with "PK2")	OP
NC option package (including the items with "PK1")	OP
Special canned cycle (including circular cutting)	OP
Cycle mate F	OP
Soft scale Ⅱm	STD
Touch sensor T0 software	OP
Tool failure detection system (Soft CCM)	OP
Adaptive control (Soft AC)	OP
Automatic restart at tool damage	OP

STD: Standard

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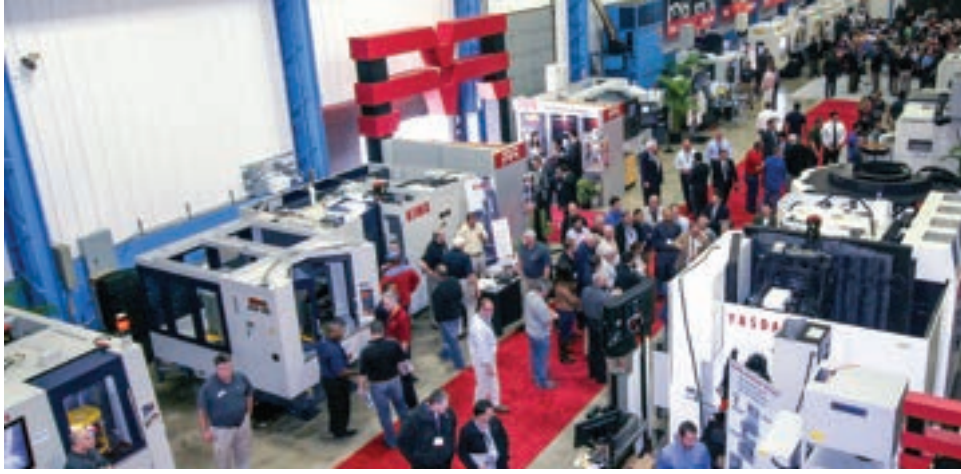

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*Limited Availability