OKUMA

OPEN POSSIBILITIES

Horizontal Machining Center

SPACE CENTER MA-400HA

Horizontal Machining Center

SPACE CENTER MA-400HA

Intelligent Technology | Thermo-Friendly Concept | Collision Avoidance System | Machining Navi

Machining dimensional change over time: Less than 8 µm Per 8°C room temp change. (actual data with TAS-C)

Stable machining accuracies and greater reliability for even higher productivity — per Okuma's Thermo–Friendly Concept.

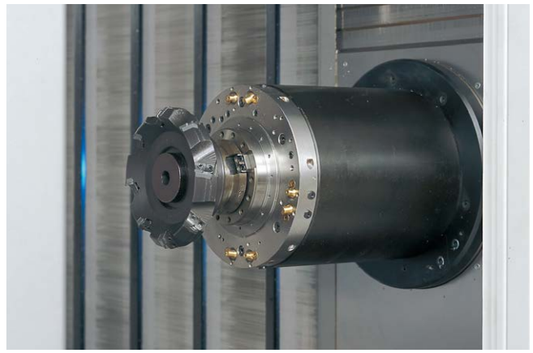
Achieves stable machining accuracies that are unsurpassed as a general purpose horizontal machining center with superb thermal deformation control system, based on Okuma's original Thermo-Friendly Concept.

This high-performance machine gives improved productivity with a large machining area, high-speed rapid feed rate, and reduced running costs thanks to longer spindle service life, easier maintenance, and outstanding lubrication control.

Photographs used in this brochure may show optional equipment.

Improved productivity

Examples of powerful machining



15,000 min^{-1} (26/18.5 kW) spindle (Optional)

S45C (actual data)

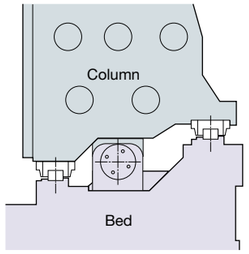
Tool \ CC*	Spindle speed min^{-1}	Cutting speed m/min	Feed rate mm/min	Width mm	Depth mm	Chip volume cm^3/min
ø80 face mill 8-blade (carbide)	895	225	2,880	56	3	**484**
ø20 roughing end mill 7-flute (carbide)	4,000	251	8,400	4	20	**672**
ø50 insert drill (carbide)	637	100	95.5	–	–	–
Tapping M30 P3.5	318	30	1,113	–	–	74% (Spindle load)

* CC: Cutting conditions

Fast feeds (X-Y-Z axes)

With a lighter column
(Stepped mounting surface)

- Stronger motor on each axis
  X-Y-Z axes: 4.6 kW (6.3 hp)
- Rapid traverse: 60 m/min (2,362 ipm)
- Max rapid traverse acceleration: 0.7 G
- High-speed application ball screws
  X-Y-Z axes: ø45, Screw lead: 25 mm (0.9 in), stronger brackets



Quick ATC

With less non-cutting time and more reliability

- Tool change
  T-T: 1.3 sec, C-C: 3.0 sec
  Okuma measurements based on JIS
- Tool magazine: 30 tools

(Options:
40, 60 tools chain
110, 146, 182, 218, 326 tools matrix)

Speedy 2-pallet rotary-shuttle APC

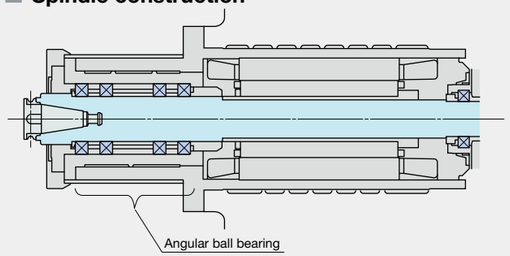
Pallet change time: 7 sec
(Okuma measurements based on MAS)

Also compatible with multipallet APC and FMS (Flexible Manufacturing System)

Superb machining with rich array of spindle variations

- Standard: 8,000 min^{-1}; 15/11 kW, 270 N-m
- Wide-range: 15,000 min^{-1}; 26/18.5 kW, 199 N-m
- High-speed: 25,000 min^{-1}; 15/11 kW, 29.1 N-m
  35,000 min^{-1}; 15 kW, 4.1 N-m
- High-speed: (aluminum) 20,000 min^{-1}; 30/22 kW, 57 N-m

Spindle construction



Note: The “actual data” referred to above for this brochure represent examples, and may not be obtained due to differences in specifications, tooling, cutting, and other conditions.

High-accuracy machining

“Working with temperature changes”

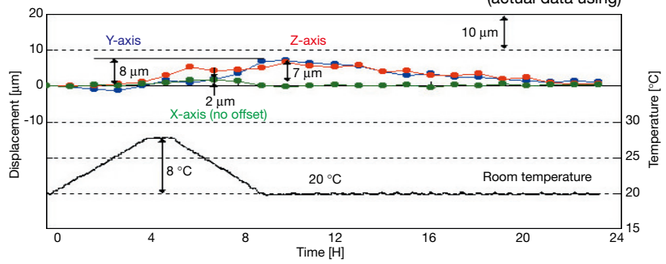
Manageable Deformation—Accurately Controlled

Thermo-Friendly Concept

Thermo-Friendly Concept

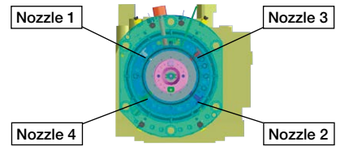
The “Thermo-friendly” concept enables remarkable machining accuracy through original structural design and thermal deformation control technology. If frees you from troublesome dimensional compensation and warm-up. Exhibits excellent dimensional stability even during consecutive operation over long periods and environmental temperature change in the plant.

Machining dimensional change over time: Less than 8 µm Per 8°C room temp change. (actual data using)



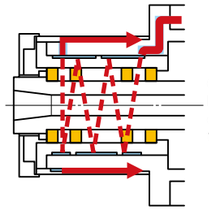
Measures to deal with heat in spindle bearing

Thermally symmetric cooling arrangement



Oil air lubrication for spindle bearing is supplied from 4 nozzles arranged evenly on left and right for uniform bearing temperature on the circumference.

Double cooling oil jacket



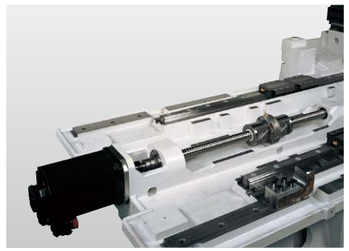
Outer perimeters of bearing housing and spindlehead are cooled to make spindlehead temperature uniform.

TAS-C: Thermo Active Stabilizer—Construction [Optional]
“Proactively” keeps the machine [construction] in optimum, stable condition during shop environment temperature change–resulting in superb (stable) machining accuracies.

TAS-S: Thermo Active Stabilizer—Spindle [Optional]
Spindle deformation will be accurately controlled even during operations with frequent speed changes.

High accuracy

- Ball screw brackets on both ends have been strengthened (integrated into the casting)
- Further enhancement of accuracy by cooling the Y-axis motor bracket (Standard) and the ball screw (Optional)



Integration of ball screw bracket

High-precision index table

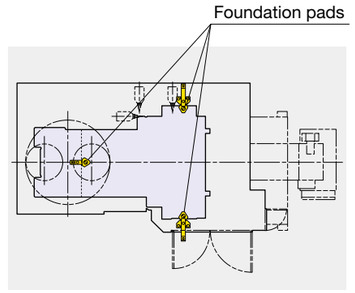
Highly-accurate positioning with taper cone type pallet seat.

- Curvic coupling 1° indexing (Standard), NC 0.001° indexing (Optional)
- Indexing time (90°/180°)
  1° indexing: 1.2/1.5 sec, 0.001° indexing: 1.4/1.7 sec
  (Okuma measurements based on JIS)

Washing with coolant under pallet

Highly rigid 3-point supported bed

- Machine installation itself is easy, and the sturdier triangular positioning of the foundation pads also help stabilize high accuracies.



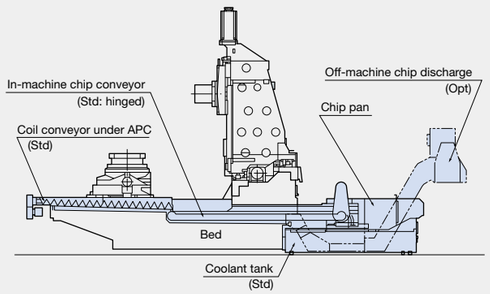
Eco-friendly equipment — easy on the operator & the machine

Chip handling

Chip discharge from right under the spindle with center trough design

- Wider chip catch increases chip collection efficiency
- Immediate discharge of hot chips

Chips discharged by conveyor



Lift-up chip conveyor (Optional)

User-friendly operation

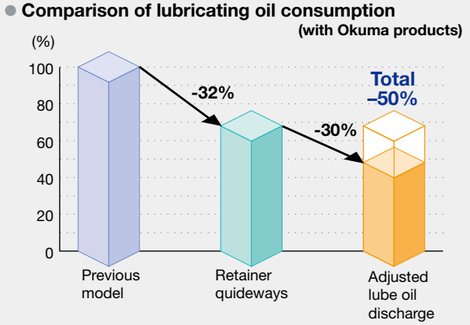
- Column traverse system provides an easy access to the spindle and workpiece.
- Overhead door
  (Lets light in, eliminates coolant drops)

Eco-friendly equipment

50% less lubricating oil than previous model, and noise has been reduced

- Uses guideway with retainer
- Superb lubricating oil pump control

Comparison of lubricating oil consumption



Machine Specifications

	Item	Unit	MA-400HA		
Travels	X-axis travel (column left/right)	mm (in)	560 (22.05)		
	Y-axis travel (spindle up/down)	mm (in)	610 (15.49)		
	Z-axis travel (table front/back)	mm (in)	625 (24.61)		
	Spindle center to pallet top	mm (in)	50 to 660 (1.97 to 25.98)		
	Spindle nose to pallet center	mm (in)	85 to 710 (3.35 to 27.95)		
Pallet	Work area	mm (in)	400 x 400 (15.75 x 15.75)		
	Indexing angle	deg	1 [0.001]		
	Max workpiece dimensions	mm (in)	ø600 x 710*1 (ø23.62 x 27.95)		
	Max load capacity	kg (lb)	400 (880)		
Spindle	Spindle speed	min-1	Standard 50 to 8,000	Wide-range [50 to 15,000]	High-speed [50 to 20,000 50 to 25,000, 35,000
	Tapered bore		7/24 taper No. 40 [HSK-A63]		[HSK-A63, A63, F63
	Bearing dia	mm (in)	ø70 (ø2.76)		[ø70, ø60, ø60] (ø2.76, ø2.36, ø2.36)
Feed rate	Rapid traverse	mm/min (ipm)	X-Y-Z: 60 (2,362)		
	Cutting feed rate	mm/min (ipm)	X-Y-Z: 1 to 60,000 (0.04 to 2,362)		
Motors	Spindle (10 min/cont)	kW (hp)	15/11 (20/15)	[26/18.5 (35/25)]	[30/22, 15/11, 15 (40/30, 20/15, 20)]
	Feed axis motors	kW (hp)	X-Y-Z: 4.6 (6.3)		
	Table indexing	kW (hp)	3.0 (4.1)		
ATC	Tool shank		MAS-403 BT40 [HSK-A63]		HSK-A63, A63, F63
	Pull stud		MAS-2*2*3		—
	Magazine capacity	tools	30 [40, 60, 110, 146, 182, 218, 326]*4		
	Max tool dia (w/ adjacent)	mm (in)	ø100 (3.94)		
	Max tool dia (w/o adjacent)	mm (in)	ø150 (5.91)		
	Max tool length	mm (in)	300 (11.81) [400 (15.75)]*5		
	Max tool weight	kg (lb)	10 (7.4)		
	Tool selection		Memory random (Fixed with 110 or more tools)		
Machine Size	Height	mm (in)	2,759 (108.62)		
	Floor space; width x depth	mm (in)	2,414 x 4,532 (95.04 x 178.43)		
	Mass	kg (lb)	11,400 (25,080)		
CNC control			OSP-P300MA		

*1. ø500 x 710 (ø19.68 x 27.95) when the spindle must operate within 50 mm (1.97 in) from the pallet (X-Y-Z telescopic cover interference).
*2. Thru-spindle coolant specs use JIS standard specs.
*3. Pull studs not supplied with HSK toolholders
*4. Matrix system with more than 110 tools.
*5. "Long tools" may require the shutter to wait and result in longer ATC C-C times.

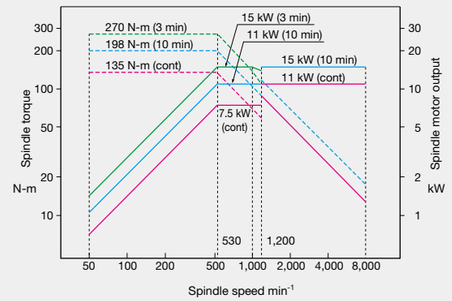
[ ]: Optional specifications

Standard Specifications/Accessories

Spindle speed	Taper No. 40 50 to 8,000 min-1
Motor	15/11 kW (10 min/cont)
Spindle/spindlehead cooler	Oil controller
Hydraulic unit	
Coolant system	Coolant tank 610 L (effective 380 L)
	Coolant pump 400 W
	Table area wash pump 550 W
	Coolant nozzle Eyeball type
ATC air blower (blast)	
Chip air blower (blast)	Nozzle type
Full enclosure shielding	Operation door interlock
Hand tools	
Tool release lever	
Tapered bore cleaning bar	
Status indicator	3-step
Foundation washers	
Machine slip stoppers	Chemical anchors included
ATC	Tool capacity 30
Tool shank	MAS BT40
Pull stud	MAS-2
APC	2-pallet rotary shuttle
Pallet size	400 x 400
Pallet top face	Tapped hole MAS screw
In-machine chip discharge (bed)	Hinge type chip conveyor
In-machine chip discharge (below APC)	Coil type chip conveyor

Standard spindle

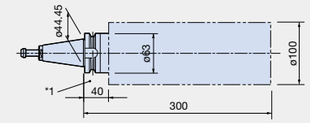
- 8,000 min-1
- 15/11 kW (10 min/cont), 270 N-m
- 7/24 taper No. 40



Tool dimensions

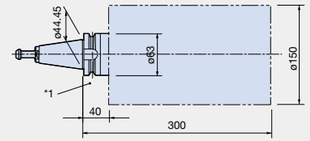
Max tool size

Adjacent tools



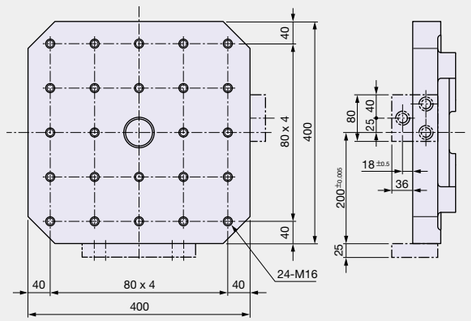
Max single tool size

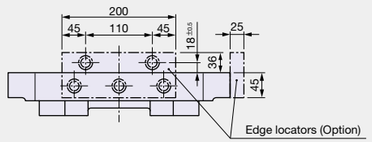
No adjacent tools

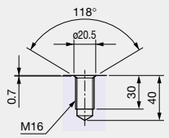


*1. Commercially sold milling chucks and similar parts may cause collision between the ATC tool change arm and the outer part of the milling. Please make sure to confirm the dimensions with the tool manufacturer's catalog, etc. before use.

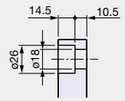
Pallet size (standard metric tap pallet)







Workpiece clamp tapped hole detail



Edge locator bolt hole detail

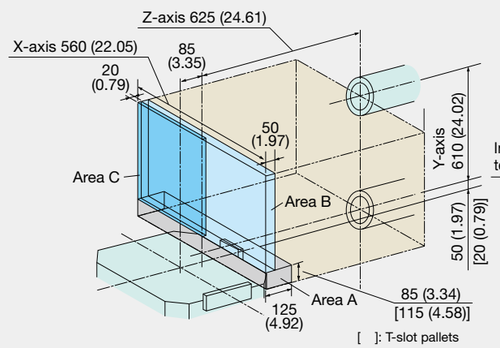
Optional Specifications & Accessories

Spindles available	15,000 min^{-1} (26/18.5 kW) No. 40, HSK-A63 20,000 min^{-1} (30/22 kW) HSK-A63 25,000 min^{-1} (15/11 kW) HSK-A63 35,000 min^{-1} (15 kW) *1 HSK-F63
Dual contact spindle	HSK, BIG-PLUS®, SuperBT
ATC magazine capacity (tools)	40, 60 (chain) 110, 146, 182, 218, 326 (matrix)
AbsoScale linear encoder	X-Y-Z axes, X-Y axes
Auto 0.001° indexing table	Built-in NC table
Multi-pallet APC	6-, 10-, 12-pallet, FMS
Pallet top face special	T-slot specifications
Spare pallets	
Edge locators	
Oil-hole coolant system	1.5 MPa
Thru-spindle coolant *2	1.5, 7.0 MPa, Flood 1.5, 7.0 MPa
Shower coolant	10 nozzles
Work wash gun	
Oil mist lubricator	
Chip air blower (blast)	Adapter
Chip pan	
Off machine chip discharge	See recommended chip conveyors on p. 8.
Chip bucket for above	Height 700 mm (27.56 in), 1,000 mm (39.37 in)
Hydraulic unit cooler	
Coolant heater/cooler	
Tool breakage detection	Including auto tool length compensation (touch sensor)
Auto zero offset	Including auto gauging (touch probe)
Tool life management	By hour meter
Overload monitoring	Including feed rate adaptive control
Pull stud special	MAS-1, CAT, DIN, JIS
Pull stud bolt	MAS-1, MAS-2, CAT, DIN, JIS *3
Standard 2-pallet block	Height: 640 mm, T-slot pitch: 80 mm
Standard 4-pallet block	Height: 640 mm, T-slot pitch: 80 mm
Ball screw cooler	X-Y-Z axes
Recommended die/mold machining specifications	• AbsoScale (X-Y-Z axes) • Super-NURBS • DNC-DT • 0.1 μm control
TAS-S	Thermo Active Stabilizer—Spindle
TAS-C	Thermo Active Stabilizer—Construction

*1. X-axis travel, ATC unit/magazine will change.
*2. Okuma pull studs required.
*3. Thru-spindle specifications with No. 40 are JIS.

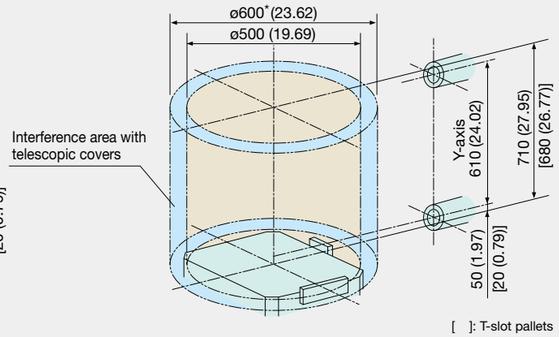
Working ranges Note: Edge locators are optional

Working ranges



Note the following interference areas:
Area A: Spindlehead
Area B: When max workpiece dia is ø500 to 600 mm (ø19.69 to 23.62 in)
Area C: Cover interference with optional touch sensor

Max work dimensions

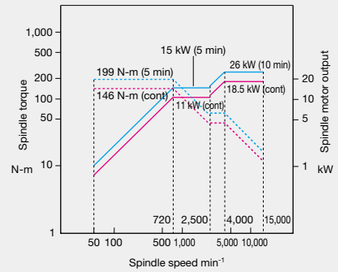


* Workpiece diameter should be within ø500 mm (ø19.68 in) or interference with telescopic covers will occur at the negative limit of the Z-axis.
Note: The minus Z and Y-axis limit area is a spindle / pallet interference zone.

Spindle torque/output diagram (Optional)

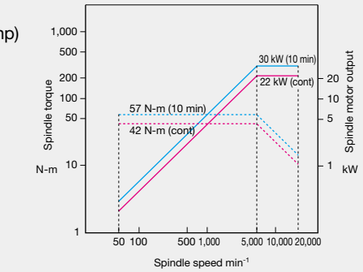
Wide-range efficient machining from light alloys (Al) to steel

- 15,000 min^{-1}
- 26/18.5 kW (35/25 hp) (10 min/cont)
  199 N-m (147 ft-lbf)
- HSK-A63
  7/24 taper No. 40



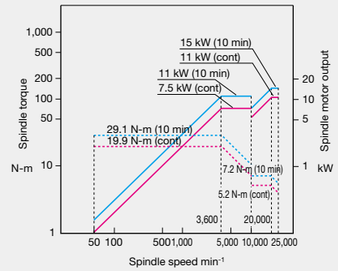
For high speed machining of aluminum

- 20,000 min^{-1}
- 30/22 kW (40/30 hp) (10 min/cont)
  57 N-m (42 ft-lbf)
- HSK-A63



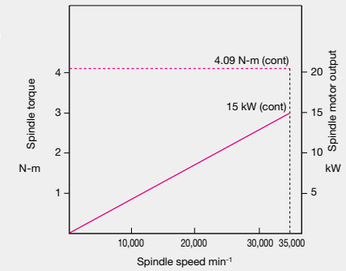
High speed/quality die/mold machining

- 25,000 min^{-1}
- 15/11 kW (20/15 hp) (10 min/cont)
  29.1 N-m (21ft-lbf)
- HSK-A63

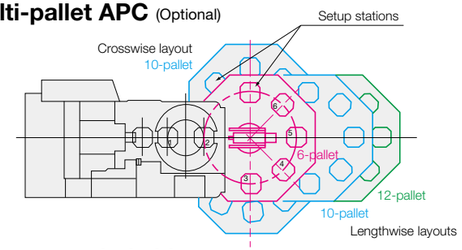


High speed/quality die/mold finishing

- 35,000 min^{-1}
- 15 kW (20 hp) (cont)
  4.09 N-m (3 ft-lbf)
- HSK-F63



Multi-pallet APC (Optional)



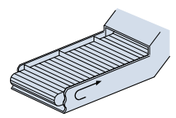
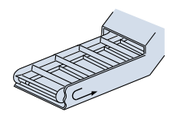
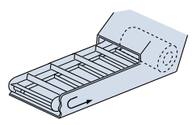
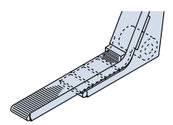
Recommended chip conveyors

Please contact an Okuma sales representative for details. ○: Recommended △: Conditional

Material		Steel	Cast iron	AL / Nonferrous metal	Mixed (general use)
Chip shape					
In-machine chip discharge	Hinge type (Std)	○	○	○	○
Off-machine chip discharge (Optional)	Hinge type	○	—	—	△ *4
	Scraper type	—	○ (Dry)	—	—
	Scraper type (w/ drum filter)	—	○ (Wet) with magnet	△ *3	—
	Hinge + scraper (w/ drum filter)	△ *1	△ (Wet) *2	○	○

*1. When there are many fine chips *2. When chips are longer than 100 mm *3. When chips are shorter than 100 mm *4. When there are few fine chips

Off-machine lift-up chip conveyors

Type	Hinge	Scraper	Scraper (with drum filter)	Hinge + scraper (with drum filter)
Shape				

OSP suite OSP-P300MA

The Next-Generation Intelligent CNC

With revamped operation and responsiveness—ease of use for machine shops first!

Smart factories implement advanced digitization and networking (IoT) in manufacturing to achieve enhanced productivity and added value. The OSP has evolved tremendously as a CNC suited to advanced intelligent technology. Okuma's new control uses the latest CPUs for a tremendous boost in operability, rendering performance, and processing speed. The OSP suite also features a full range of useful apps that could only come from a machine tool manufacturer, making smart manufacturing a reality.

Smooth, comfortable operation with the feeling of using a smart phone

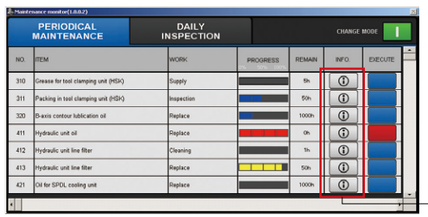
Improved rendering performance and use of a multi-touch panel achieve intuitive graphical operation. Moving, enlarging, reducing, and rotating 3D models, as well as list views of tool data, programs, and other information can be accomplished through smooth, speedy operations with the same feel as using a smart phone. The screen display layout on the operation screen can also be changed to suit operator preferences and customized for the novice and/or veteran machinists.

"Just what we wanted."—Refreshed OSP suite apps

This became possible through the addition of Okuma's machining expertise based on requests we heard from real, machine-shop customers. The brain power packed into the CNC, built by a machine tool manufacturer, will "empower shop floor" management.

Routine inspection support
Maintenance Monitor

The Maintenance Monitor displays items for inspections before starting daily operation and regular inspections and the rough estimate of inspection timing. Touching the [INFO] button displays the PDF instruction manual file of relevant maintenance items.



[INFO] button

Increased productivity through visualization of motor power reserve
Spindle Output Monitor

Making new machining technology simpler and easier to use
Turn-Cut Guide (Optional)

Monitoring operating status even when away from the machine
E-mail Notification

Automatic saving of recorded alarms
Screen Capture

Easy programing without keying in code
Scheduled Program Editor

Standard Specifications

Basic Specs	Control	X, Y, Z, simultaneous 3 axis, spindle control (1 axis)
	Position feedback	OSP full range absolute position feedback (zero point return not required)
	Coordinate functions	Machine coordinate system (1 set), work coordinate system (20 sets)
	Min / Max command	±99999.999 mm, ±9999.9999˚, 8-digit decimal, command unit: 0.001 mm, 0.01 mm, 1mm, 0.0001˚, 0.001˚, 1˚
	Feed	Cutting feed override 0 to 200%, rapid traverse override 0 to 100%
	Spindle control	Direct spindle speed commands, override 30 to 300%, multi-point indexing
	Tool compensation	No. of registered tools: Max 999 sets, tool length/radius compensation: 3 sets per tool
	Display	15-inch color LCD + multi touch panel operations
	Self-diagnostics	Automatic diagnostics and display of program, operation, machine, and NC system faults
Programming	Program capacity	Program storage capacity: 4 GB; operation backup capacity: 2 MB
	Program operations	Program management, editing, multitasking, scheduled program, fixed cycle, G-/M-code macros, arithmetic, logic statements, math functions, variables, branch commands, coordinate calculate, area calculate, coordinate convert, programming help
Operations	"suite apps"	Applications to graphically visualize and digitize information needed on the shop floor
	"suite operation"	Highly reliable touch panel suited to shop floors. One-touch access to suite apps.
	Easy Operation	"Single-mode operation" to complete a series of operations; advanced operation panel/graphics facilitate smooth machine control
	Machine operations	MDI, manual (rapid traverse, manual cutting feed, pulse handle), load meter, operation help, alarm help, sequence return, manual interrupt/auto return, pulse handle overlap, parameter I/O, PLC monitor
	MacMan	Machining management: machining results, machine utilization, fault data compile & report, external output
Communications / Networking		USB (2 ports), Ethernet
High speed/accuracy specs		Hi-G Control, Hi-Cut Pro, pitch error compensation, Machining Time Shortening Function
Energy-saving	ECO suite	ECO Idling Stop*1, ECO Power Monitor*2

*1. Spindle cooler Idling Stop is used on TAS-S machines.
*2. The power display shows estimated values. When precise electrical values are needed, select the wattmeter option.

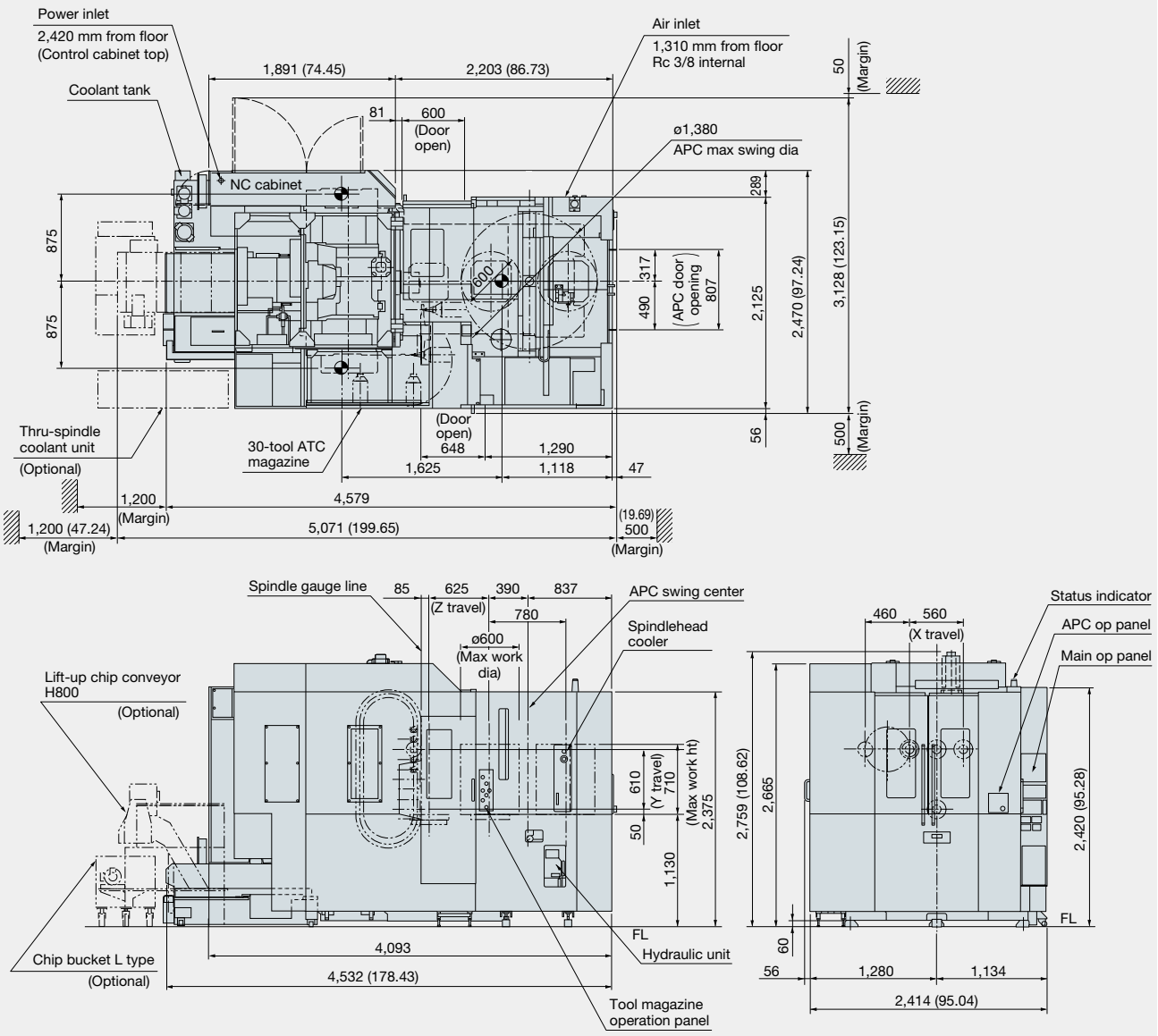
Optional Specifications

Item	Kit Specs*1	NML E	NML D	3D E	3D D	AOT E	AOT D
Interactive functions							
Advanced One-Touch IGF-M (Real 3D simulation included)						●	●
Interactive MAP (I-MAP)				●	●		
Programming							
Auto scheduled program update		●	●	●	●	●	●
G/M-code macros							
Common variables (Std: 200 sets)	1,000 sets						
	2,000 sets						
Program branch; 2 sets							
Program notes (MSG)			●		●		●
Coordinate system selection (Std: 20 sets)	100 sets	●		●		●	
	200 sets		●		●		●
	400 sets						
Helical cutting (within 360˚)		●	●	●	●	●	●
3-D circular interpolation							
Synchronized Tapping II		●	●	●	●	●	●
Arbitrary angle chamfering		●	●	●	●	●	●
Cylindrical side facing							
Slope machining							
Tool grooving (flat-tool free-shaped grooving)							
Turn-Cut							
Tool max rotational speed setting							
F1-digit feed	4 sets, 8 sets, parameter						
Programmable travel limits (G22, G23)		●	●	●	●	●	●
Skip (G31)							
Axis naming (G14)							
3D tool compensation							
Tool wear compensation			●		●		●
Drawing conversion	Programmable mirror image (G62)		●		●		●
	Enlarge/reduce (G50, G51)		●		●		●
User task 2	I/O variables (16 each)						
Tape conversion*2							
Monitoring							
Real 3D simulation				●	●	●	●
Simple load monitor	Spindle overload monitor	●	●	●	●	●	●
NC operation monitor	Hour meter, work counter	●	●	●	●	●	●
Hour meters	Power, spindle, NC, cutting						
Operation end buzzer	With M02, M30, and END commands						
Work counter	With M02 and M30 commands						
MOP-TOOL	Adaptive control, overload monitor						
Machine Status Logger							
Cutting Status Monitor							
Tool life management	Hour meter, No. of workpieces	●	●	●	●	●	●
Gauging							
Auto gauging	Touch probe (G31)	Included in machine specs					
Auto zero offset	Includes auto gauging	Included in machine specs					
Tool breakage detection	(touch sensor) (G31) Includes auto tool offset	Included in machine specs					
Gauging data printout	File output						
Manual gauging (w/o sensor)		●	●	●	●	●	●
Interactive gauging (touch sensor, touch probe required)							

Item	Kit Specs*1	NML E	NML D	3D E	3D D	AOT E	AOT D
External I/O communication							
RS-232C connector							
DNC-T3							
DNC-B (RS-232C-Ethernet transducer used on OSP side)							
DNC-DT							
DNC-C/Ethernet							
Additional USB (Additional 2 ports, Std: 2 ports)							
Automation / unattended operation							
Auto power shut-off	M02 and END alarms, work preps done	●	●	●	●	●	●
Warm-up (calendar timer)							
External program selection	Button, rotary switch, digital switch, BCD (2-digit, 4-digit)						
Cycle time reduction (Ignores certain commands)		●	●	●	●	●	●
Pallet pool control (PPC) (Required for multi-pallet APC)							
Robot, loader I/F							
High-speed, high-precision							
AbsoScale detection	X-, Y-, Z-axis, X-, Y-axis						
Inductosyn detection	A-, B-, C-axis						
Super-NURBS							
0.1 μm control (linear axis commands)							
TAS-S (Thermo Active Stabilizer—Spindle)							
TAS-C (Thermo Active Stabilizer—Construction)							
ECO suite (energy saving functions)							
ECO Operation							
ECO Power Monitor	Wattmeter						
Energy-saving hydraulic unit	Inverter						
	ECO Hydraulics						
Other							
Control cabinet lamp (inside)							
Circuit breaker							
Sequence operation	Sequence stop	●	●	●	●	●	●
Upgraded sequence restart	Mid-block return		●		●		●
Pulse handles	2 pcs, 3 pcs (Std: 1 pc)						
External M signals	4, 8 signals						
Collision Avoidance System							
Machining Navi M-*i*, M-gII+ (cutting condition search)							
One-Touch Spreadsheet							
Block skip; 3 sets							
Additional axes	A, C axes [preps, specs]						
Fixture offset							
OSP-VPS (Virus Protection System)							

*1. NML: Normal, 3D: Real 3D simulation, E: Economy, D: Deluxe, AOT: Advanced One-Touch IGF-M
*2. Requires technical consultation.

MA-400HA
Dimensional/Installation Drawings



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SPACE CENTER MA-400HA

When using Okuma products, always read the safety precautions mentioned in the instruction manual and attached to the product.

The specifications, illustrations, and descriptions in this brochure vary in different markets and are subject to change without notice.
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