OKUMA

5-Axis Vertical Machining Center

UNIVERSAL CENTER **MU-4000V**

5-Axis Vertical Machining Center

UNIVERSAL CENTER
MU-4000V

| Intelligent Technology | Thermo-Friendly Concept | Collision Avoidance System | Machining Navi | 5-Axis Auto Tuning System | SERVONAVI |

A next generation machine that opens new possibilities in "Monozukuri"*¹ with "M-E-I-K"*² merging technologies

The MU-4000V is a 5-axis machining center that opens new "Monozukuri" possibilities with superior basic functions for 5-axis machining, a large machining range, and ease of use. It can perform jobs from high quality 5-axis machining to process-intensive machining that exceeds conventional multitasking machines, including turning, cutting, grinding and gear cutting.
It is equipped with the OSP suite, a next-generation intelligent CNC with all the information needed for 5-axis machining—cutting information, tool information, fixture information, simulations and more to increase productivity more than ever.

*1 *Monozukuri* (manufacturing)—
   the art of "making things" better than ever.
*2 The merging of
   Mechanics - Electronics – Information (IT) - Knowledge (Creation)
   technologies, only Okuma can provide, as
   Your Single Source for Machine & Control.

Photographs used in this brochure may show optional equipment.

OKUMA

MU-4000V-L
UNIVERSAL CENTER

High-accuracy 5-axis machining

A next generation machine that surpasses the normal

A high-performance machine with the ease of use, work envelope, high accuracy, and high quality demanded in 5-axis machining, all in a compact space.
The MU-4000V merges M-E-I-K technologies to open new areas to multitasking operations—turning, grinding, gear cutting—and expand the possibilities of "Monozukuri" manufacturing.

Highly accurate 5-axis machining

Superior dimensional stability is achieved over many hours with a highly rigid trunnion table that supports accurate 5-axis machining, the 5-Axis Auto Tuning System that automatically measures and compensates for geometric error, and the Thermo-Friendly Concept that minimizes dimensional changes due to changing temperature or heat.

Artificial joint	Satellite parts	Blisk

Operator-friendly

Good access to the table and spindle, a table structure for good visibility of the tool tip, a large window to visually check the machining chamber, and brighter, reduced-flicker LED lamps for all make it easier for operators to perform their work.

Large machining area and tool travel

The machining area is large and tool changes can be done even with the trunnion table swung over.

Shorter machining times with high cutting capability

High torque motors are used for the spindle and turning spindle to handle heavy-duty cutting, difficult-to-cut material and many other types of machining. The result is highly efficient machining.

Flexible expandability to automated systems

In addition to a large capacity ATC magazine, it is easy to install an automatic pallet changer (APC), robots and loaders. The best automated system for the purpose can be built.

Spindle speed	15,000 min^{-1}
Table top to spindle nose	120 to 580 mm
Table dimensions	ø400 mm
Max workpiece dimensions	ø500 × H400 mm
Max load capacity	300 kg
Rapid traverse	X-Y-Z: 50 m/min
Tool magazine capacity	32-tool (chain magazine)

(19-in. operation panel screen)

3

4

High accuracy 5-axis machining with "M-E-I-K" merging technologies

A trunnion table for high accuracy, ease of use, and compactness

The MU-4000V has a very rigid roller gear cam suited to high-speed drive on the trunnion table B-axis, and a direct drive motor that produces high torque even at low speeds on the C-axis. This makes it possible to achieve both high-speed and high-accuracy machining.

■ High-speed
- ● B axis: 50 min^{-1}
- ● C axis: 120 min^{-1} (Standard)
  1,200 min^{-1} (Optional) [turning mode]

■ Indexing accuracy *
- ● B-axis indexing accuracy/repeatability: ±1.78 sec / ±0.50 sec
- ● C-axis indexing accuracy/repeatability: ±2.26 sec / ±0.12 sec

* [Actual data]

Note: The data mentioned in this brochure are "actual data" and do not represent guaranteed accuracies.

Y axis
Z axis
Spindle
Table
Trunnion
X axis
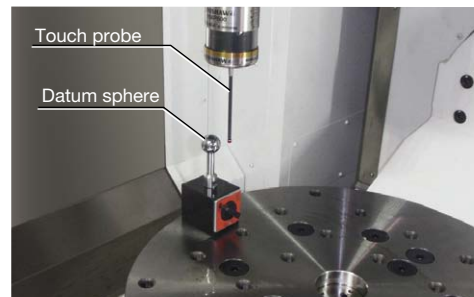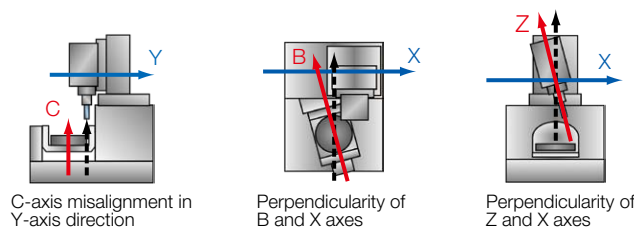C axis
B axis
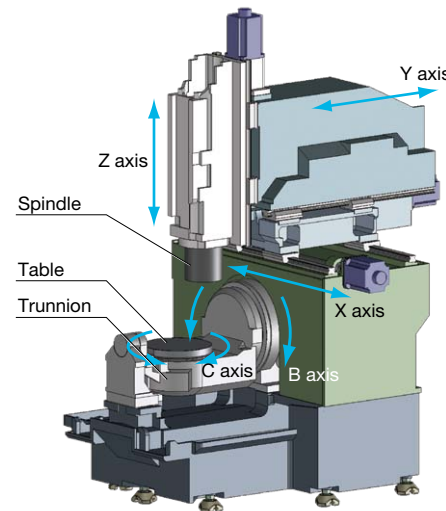
Maximized machining accuracies

Gauging and compensation of geometric error
5-Axis Auto Tuning System (Optional)

■ Automatic tuning for geometric error is quick, easy, and can be done by anyone

Automatic tuning of a total of 11 different kinds of geometric error, including spindle misalignment and tilt. The accuracy of 5-axis machines is measured in less than 10 minutes to draw out maximum performance.

[Examples of geometric error]

Y   C
B   X
Z   X

C-axis misalignment in Y-axis direction
Perpendicularity of B and X axes
Perpendicularity of Z and X axes

Touch probe
Datum sphere

With just a touch probe and datum sphere —auto tuning completed.

High accuracy maintained over long times in 5-axis machining

The unique approach of "accepting temperature changes"
Thermo-Friendly Concept

■ 5-Axis Auto Tuning System accuracy maintained

Accuracy changes due to changes in ambient temperature or spindle heat are minimized. When the 5-Axis Auto Tuning System is also used, a synergistic effect is achieved with the two Intelligent Technologies and high accuracy is maintained in 5-axis machining even when the environmental temperature changes.
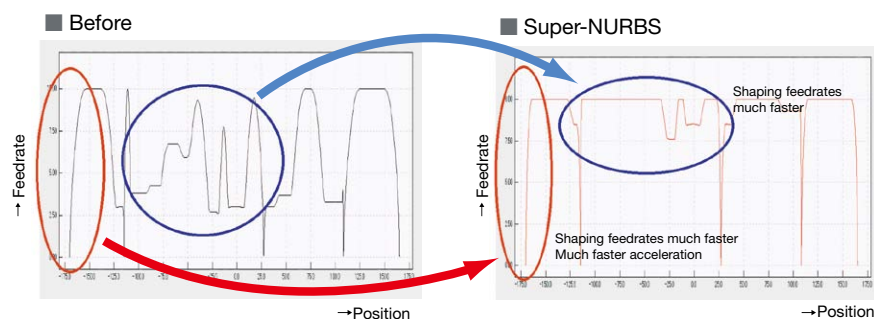
With simultaneous 5-axis control that produces excellent machined surface quality

Simultaneous 5-axis kit makes it even easier Because "Machine & Control" OSP provides advanced features

■ High Speed Contouring Super-NURBS (5-axis specs) (Optional)

High speed NC function for high accuracy, high quality, and high speed marching of curved surfaces of any shape with newly-developed "sculptured-surface adaptive acceleration control."

■ Before
↑ Feedrate
→Position

■ Super-NURBS
Shaping feedrates much faster
Shaping feedrates much faster
Much faster acceleration
↑ Feedrate
→Position

■ Tool center point control manual feed (Optional)

This feature will provide rotary operation with a tool point as the center when operating the rotary axes manually. When the table is swiveled, axis movement will occur with no change in the tool position on the workpiece.
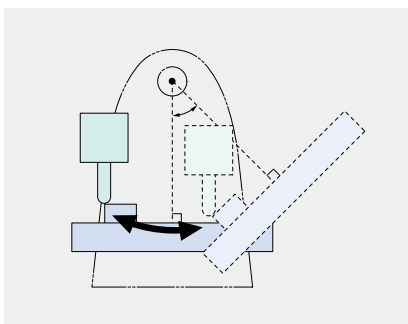
■ Table origin coordinate manual feed (Optional)

A feature to perform X-Y-Z-axis manual feed (rapid traverse, cutting feed, pulse handle) when origin coordinate systems shift on a swiveling table.

Y
X
X axis
Work coordinate origin
Table reference coordinate
X
C-axis rotation center
Y
Y axis
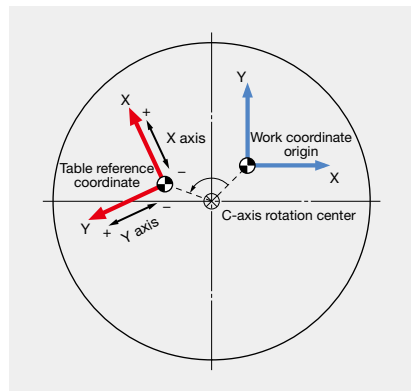
■ Tool center point control II (Optional)

Function controls the path of the tool tip with respect to the workpiece on each axis so that the tool tip trajectory is linear with the axis travel command including the A, B, and C axes.
- ● In the case of simultaneous X-axis and B-axis commands with the linear command (G01), the tool path is a straight line when viewed from the workpiece.

Command
X axis
B axis
Z
X
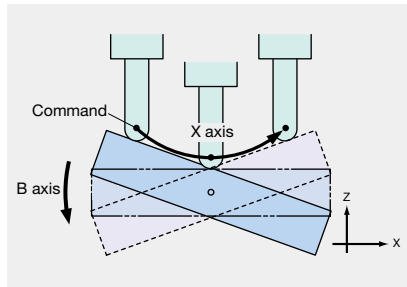
■ Tool tilt compensation
(Included in Tool Center Point Control II)

The tool angle on a workpiece (tool tilt) in 5-axis machining will change on a waving surface. CAM processing errors will cause the tool to stagger with unnecessary accel/decel and reverse angles during axis feed. Simul 5-Axis TTC will keep feedrates steady with a smooth sequence of commands to automatically correct tool tilt angles—resulting in shorter cycle times and smoother surface finishes

Staggered tool angles

With TTC

No change in tool tilt   Gradual change in tool tilt
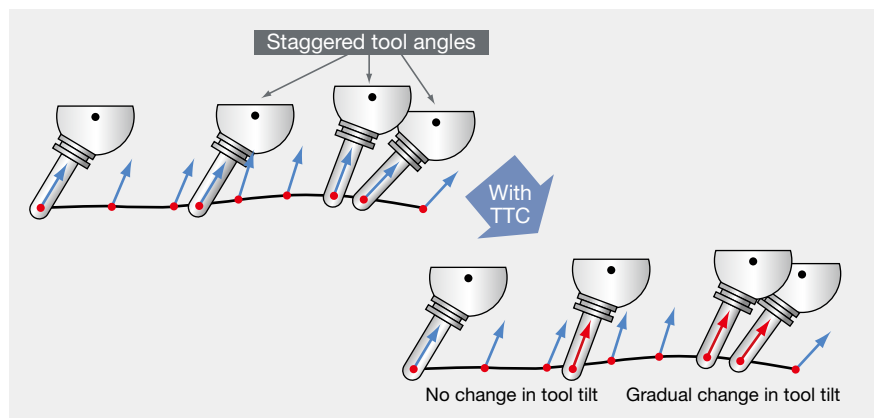
Easy-to-use 5-axis machine from well-considered design

Good access reduces operator burden

Good access of 515 mm to the center of the table is achieved by approaching from the trunnion axial direction. Access to the spindle is also good, reducing operator burden during machining preparation and increasing work efficiency.

Full enclosure shielding

Y-axis column feed

Z axis

285

515

900
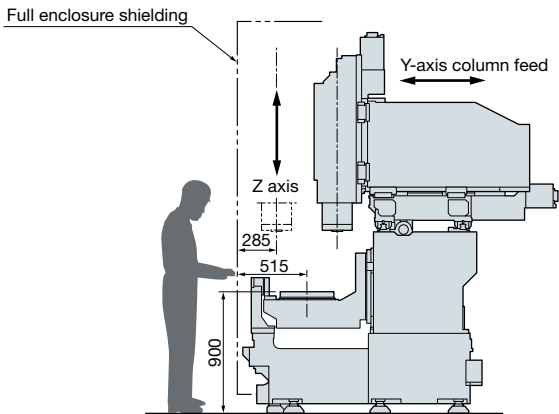
Large working range for applicable workpieces

The machining area is large enough to handle workpieces with a maximum diameter of ø500 mm and maximum height of 400 mm. Tools can also reach the end of workpieces even with the table inclined at various angles, making 5-axis machining possible over a wide range.

Tools can be changed even with the trunnion in a swung position, contributing to reduced cycle times and improved machining accuracies.

■ Even the largest workpieces are machined with capacity to spare

X axis: 740 mm

ø500 mm

Z

X
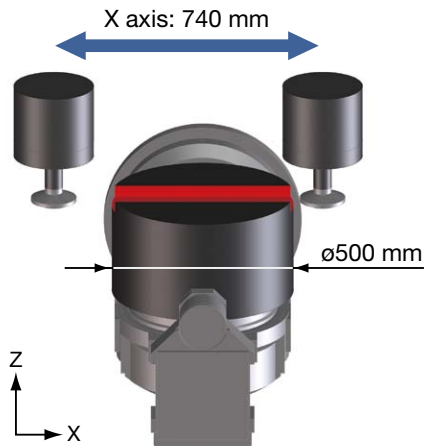
Better visibility of machining status

The BC table structure allows confirmation of the workpiece status at an angle of 120° and the front door has a large window. LED lamps are used for bright, reduced-flicker lighting within the machining compartment, improving visibility of machining status.
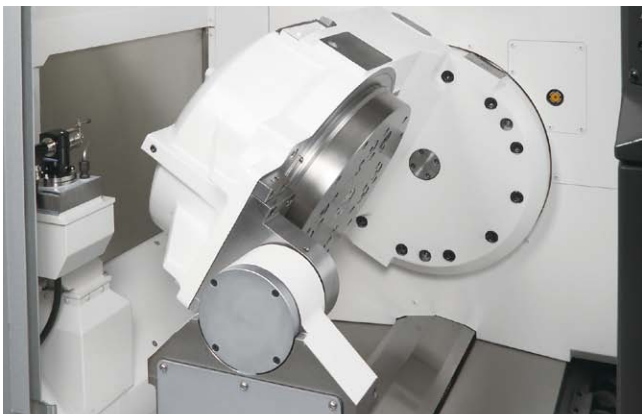
■ Large machining area

● Swing range
  B axis: +90º to −120°
  C-axis: 360°
      (infinite rotation)
● Max workpiece weight:
  300 kg

● Max workpiece size:
  ø500 × 400 mm height
● Max workpiece diameter with
  large X-axis travel
  (ø500) peripheral cutting is
  possible

■ Visibility of the cutting edge at the time of cutting also excellent

X axis: +330 mm

Z

X
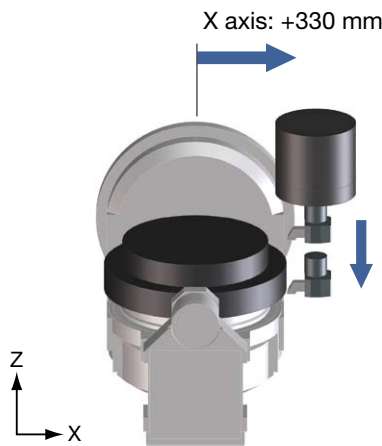
High-spec basic performance delivers high-efficiency machining

High cutting capability with high output motors

A motor with maximum torque of 199 N-m is used on the spindle. Machining time can be shortened with high-efficiency machining. The use of a high torque motor on the turning spindle also gives high turning capacity.

■ Standard spindle

● Speed: 15,000 min⁻¹
  (With turning specs: 12,000 min⁻¹)
● Max output: 22/18.5 kW (10 min/cont)
● Max torque: 199/146 N-m (5 min/cont)

15 kW (5 min)
11 kW (cont)
199 N-m (5 min)
146 N-m (cont)
22 kW (10 min)
18.5 kW (cont)

Spindle torque — N-m
Motor output — kW

720 2,500 4,000 15,000 12,000
50 100 500 1,000 5,000 10,000
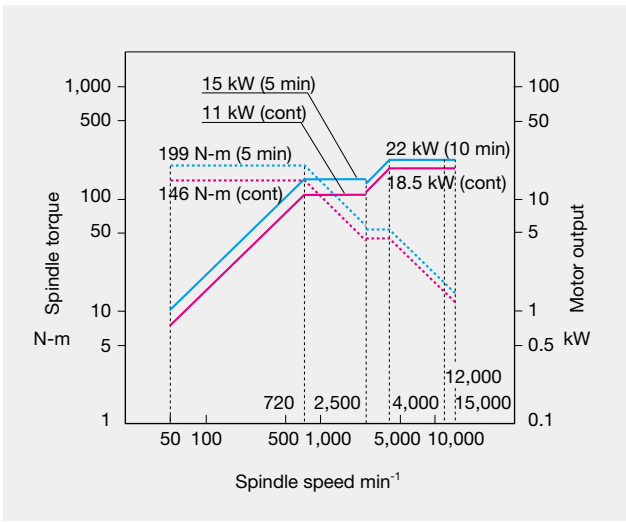
Spindle speed min⁻¹

■ Turning spindle (Optional)

● Table (turning spindle) spindle speed:
      1,200 min⁻¹
● Max output: 15/10 kW (15 min/cont)
● Max torque: 477/318 N-m (15 min/cont)

447 N-m (15 min)
318 N-m (cont)
239 N-m (15 min)
159 N-m (cont)
15 kW (15 min)
10 kW (cont)
15 kW (15 min)
10 kW (cont)

Spindle torque — N-m
Motor output — kW

300 600 1,200
50 100 500 1,000

Spindle speed min⁻¹
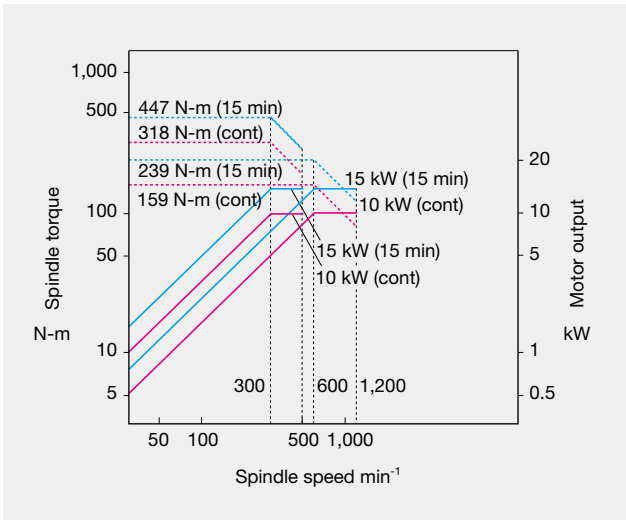
■ Machining Time Shortening Function

This shortens machining time in operations with repeated rapid traverse (G00) and cutting feed (G01) movements, such as for parts with many drilled holes.

(The amount by which machining time is reduced will differ depending on machine setup, machined part shape, and part program.)

High-specced basic performance capacity delivers highly efficient machining

Flexible automation options

■ ATC magazine systems
- Chain magazine: 48, 64 tools
- Matrix magazine: 64, 98, 132, 166, 200, 234, 268 tools

Matrix magazine
(Photographed without front covers)

64 to166-tool
matrix magazines
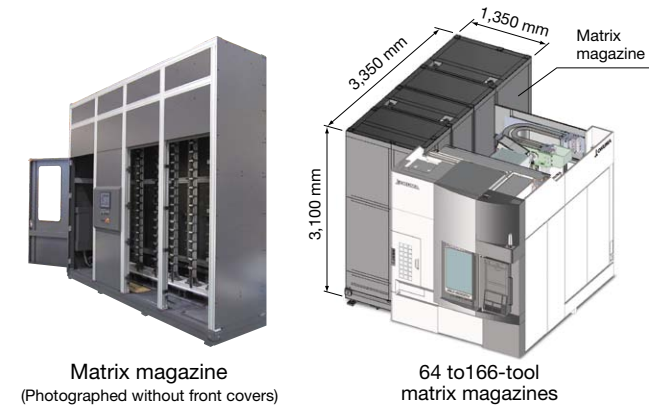
■ Extra ports for complex hydraulic or pneumatic fixture arrangements
- Max ports: 8 ports* (Optional)

Table center supply

8 ports
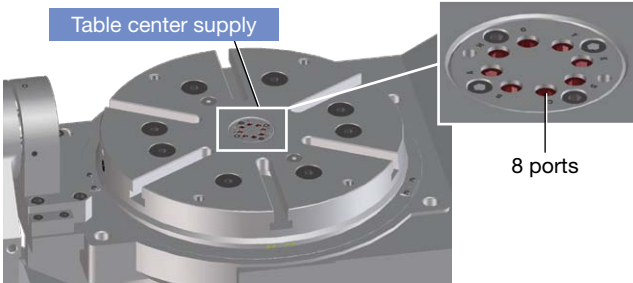
* Different for turning and APC specifications.

■ Auto tool gauging with workpiece mounted

Touch sensor

Tool breakage detection/Automatic tool compensation

■ Auto pallet changer (APC)
- External setup of workpiece preparations improve machine utilization
- The good approach from the machine front is not compromised thanks to a structure in which pallet changes with an APC are done on the right side.
- Turning specs can also be selected

Pallet travel

Table center

2-pallet APC

APC setup station

■ Automatically measures workpiece alignment and dimensions

Touch probe

Receiver
(Sends and receives touch probe signals)

Auto zero offset, auto gauging (radio-controlled touch probe)
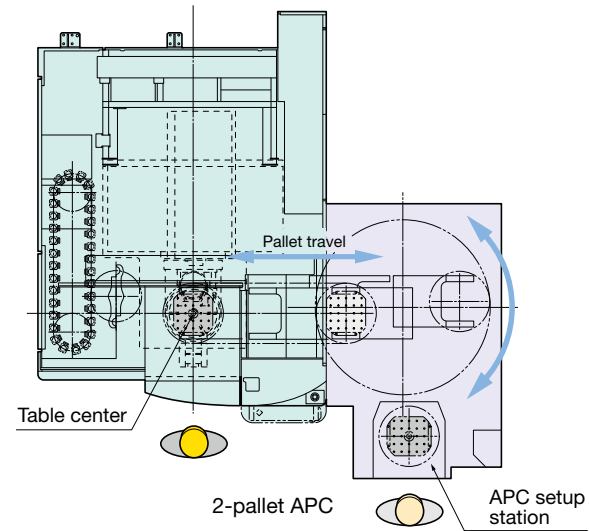
Safe, reliable chip discharge

Excellent chip discharge

Washer on saddle (Standard)

In-machine chip discharge (coil) (Optional)

Shower coolant system (Optional)

Off-machine chip discharge (lift-up chip conveyor) (Optional)

■ Recommended Chip Conveyors
(Please contact an Okuma sales representative for details.)

○: Recommended specifications
△: Recommended specifications with conditions

Workpiece material		Steel	FC	Aluminum / Nonferrous	Mixed (general use)
Chip shape					
In-machine	Chip flusher (Standard)	—	○ (Wet)	○	—
	Coil (Optional)	○	○ (Dry-Wet)	—	○
Off-machine (Optional)	Hinge	○	—	—	△(*4)
	Scraper	—	○ (Dry)	—	—
	Scraper (with drum filter)	—	○ (Wet) with magnet	△ (*3)	—
	Hinge + scraper (with 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				

High-accuracy 5-axis machining with Intelligent Technology

The unique approach of "accepting temperature changes"
Thermo-Friendly Concept

■ Thermo-friendly structure gives outstanding thermal stability

Forced cooling and restraining of thermal deformation

1. Minimal thermal deformation
2. Manageable thermal deformation
3. Accurate compensation

Thermo Active Stabilizer—Construction (TAS-C)
Thermo Active Stabilizer—Spindle (TAS-S)

Thermo Active Stabilizer - Construction (TAS-C)
Thermo Active Stabilizer - Spindle (TAS-S)

Highly Accurate Control Technology

Thermo-Friendly Concept

Simple machine construction

Symmetrically built
Thick walls

Machine designs that equalize ambient temperatures

Machine covers
Peripheral equipment placement
Machine "hot spots" diffused

Machining dimensional change over time minimized with outstanding dimensional stability

■ Eliminate waste with the Thermo-Friendly Concept

In addition to maintaining high dimensional accuracy when room temperature changes, Okuma's Thermo-Friendly Concept provides high dimensional accuracy during machine startup and machining restart.
To stabilize thermal deformation, warming-up time is shortened and the burden of dimensional correction during machining restart is reduced.

Machine startup

Machining restart

Room temp change

High dimensional stability

■ TAS-C (Thermo Active Stabilizer—Construction)
[Optional]

The TAS-C environmental thermal deformation control accurately controls the machine's structural thermal deformation; by taking into consideration the machine's thermal deformation characteristics, temperature data from properly placed sensors, and feed axis positioning information.

■ TAS-S (Thermo Active Stabilizer—Spindle)
[Optional]

The TAS-S spindle thermal deformation control takes into account various conditional changes such as the spindle's temperature data, modification of the spindle rotation and speed, as well as spindle stoppage. The spindle's thermal deformation will be accurately controlled, even when the rotating speed changes frequently.

Machine tool idling stop
ECO Idling Stop

ECO suite

Only the necessary units run

Accuracy ensured, cooler off
ECO Idling Stop

Intelligent energy-saving function with the Thermo-Friendly Concept.
The machine itself determines whether or not cooling is needed and cooler idling is stopped with no loss to accuracy. (Standard application on machines with Thermo-Active Stabilizer—Spindle)

On-the-spot check of energy savings
ECO Power Monitor

Power is shown individually for spindle, feed axes, and auxiliaries on the OSP operation screen. The energy-saving benefits from auxiliary equipment stopped with ECO Idling Stop can be confirmed on the spot.

■ ECO suite benefits

Electricity consumption during non-machining time greatly reduced with "ECO Idling Stop", which shuts down each piece of auxiliary equipment not in use.

■ ECO suite provides a suite of energy-saving functions that can be used on machines
- **"ECO Idling Stop"** for operation of necessary units only
- **"ECO Power Monitor"** for visual graphics of power
- Intermittent/continuous operation of chip conveyor and mist collector during operation — **"ECO Operation"** (Optional)
- Energy-saving hydraulic unit using servo control technology — **"ECO Hydraulics"** (Optional)

Gauging and compensation of geometric error
5-Axis Auto Tuning System (Optional)

■ Higher accuracies in 5-axis machining
5-axis machining accuracy is greatly affected by misalignment and other "geometric errors" on the rotary axis. The 5-Axis Auto Tuning System measures geometric error using a touch probe and datum sphere, and performs compensation using measurement results to tune the movement accuracy on 5-axis machines. In this way 5-axis machining accuracy on a higher level is achieved.

■ Quick and easy tuning by anyone
Previously, manual measurements of the indexing center were bothersome and time-consuming, but with the 5-Axis Auto Tuning System the measurements are made automatically by the machine. Measurements can therefore be done with stable accuracy in a short time by anyone. (Up to 11 geometric errors tuned automatically.) In addition, the results of tuning are applied regardless of whether the operation in auto, manual, or MDI and whether Tool Center Point Control is on or off. Setup and machining can therefore be done with the same operations as before.

Work efficiency

Time reduction

General auto compensation

With 5-Axis Auto Tuning System

11 types

Manual

4 types

Accuracy improvement

Accuracy

Cutting condition search for milling
Machining Navi M-*i*, M-*g*Ⅱ+ (Optional)

■ Adjust cutting conditions while monitoring the data (M-*i*)
Built-in sensors measure chatter vibration and the machine automatically changes to the best spindle speed.

■ Machining Navi (M-*g*Ⅱ+)
Navigates effective measures by detecting and analyzing machining chatter with a microphone attached to the machine.

Machining Navi (OSP) provides the answer!

This sign indicates a change to the optimum spindle speed.

This sign indicates that spindle speed is being changed.

This sign indicates that the cutting load needs to be reduced.

Collision prevention
Collision Avoidance System (Optional)

■ World's first "Collision-Free Machine"
NC controller (OSP) with 3D model data of machine components—workpiece, tool, chuck, fixture, headstock, turret, tailstock—performs real time simulation just ahead of actual machine movements. It checks for interference or collisions, and stops the machine movement immediately before collision. Machinists (novice or pro) will benefit from reduced setup and trial cycle times, and the confidence to focus on making parts.

Optimized Servo Control
SERVONAVI

Achieves long term accuracy and surface quality

SERVONAVI AI (Automatic Identification)
Optimum settings automatically identified

Automatically estimates the workpiece weight on the table and optimizes the table rotation axis acceleration for the weight. Stable machining of heavy workpieces and faster machining of light workpieces.

SERVONAVI SF (Surface Fine-tuning)
Enables longer machine use

When decreased machining accuracy is recognized to have occurred with many years of use, ServoNavi restores machined surface accuracy. It can improve crease marks in machined surfaces that occur where the feed axis reverses with worn ball-screws or guideways.
Even noise or vibration that occurs when there are large changes in the machine state can be immediately eliminated.

■ Machine specifications

	Item	Unit	MU-4000V	MU-4000V-L Turning Specs
Travels	X axis (spindle ram)	mm (in.)	740 (29.13) (+20 (0.79) ATC movements)	
	Y axis (spindle ram)	mm (in.)	460 (18.11)	
	Z axis (spindle ram)	mm (in.)	460 (18.11)	
	B axis (trunnion rotation)	deg	+90 to -120	
	C axis (table rotation)	deg	360 (infinite)	
	Table surface to spindle nose	mm (in.)	120 to 580 (4.72 to 22.83)	
Table	Table size	mm (in.)	ø400 (15.75)	
	Max work size	mm (in.)	ø500 × H400 (ø19.69 × H15.75)	
	Floor to table top	mm (in.)	900 (35.43)	
	Max load capacity	kg (lb)	300 (660)	
	Turning spindle speed	min⁻¹	—	C axis: 1,200
Spindle	Spindle speed	min⁻¹	15,000 [20,000, 25,000]	12,000
	No. of spindle ranges		Infinitely variable	
	Tapered bore		7/24 taper No.40 [HSK-A63]	HSK-A63
	Bearing dia	mm (in.)	ø70 (2.76)	
Feed	Rapid traverse	m/min (ipm)	X-Y-Z: 50 (1,969)	
	Rapid traverse	deg/min	B: 18,000 (50 min⁻¹) C: 43,200 (120 min⁻¹)	
	Cutting feedrate	mm/min	X-Y-Z: 1 to 50,000	
Motors	Spindle (10 min/cont)	kW (hp)	22/18.5 [30/22, 15/11] (30/25 [40/30, 20/15])	22/18.5 (30/25)
	Feed axes	kW (hp)	X-Y-Z: 3.5, B: 4.6, C: 6.7 (X-Y-Z: 5, B: 6, C: 9)	
ATC	Tool shank		MAS BT40 [HSK-A63]	HSK-A63
	Pull stud		MAS 2 [—]	—
	Tool capacity (magazine)		32-tool (chain) [48-tool, 64-tool: chain, Over 64-tool: matrix]	
	Max tool dia (w/adjacent / w/o adjacent)	mm (in.)	ø90/ø125 (ø3.54/ø4.92)	
	Max tool length	mm (in.)	300 (11.81)	
	Max tool weight	kg (lb)	8 (18)	
	Maximum tool mass moment	N-m	7.8	
	Tool selection		Memory random (matrix magazine is fixed address system)	
Machine size	Height	mm (in.)	2,950 (116.14)	
	Floor space W x D	mm (in.)	2,399 × 3,248 (94.49 × 127.87)	
	Weight	kg (lb)	9,700 (21,340)	
CNC			OSP-P300MA	OSP-P300SA

[   ]: Optional

■ Standard specifications / accessories

No. 40 spindle speed 50 to 15,000 min⁻¹	22/18.5 kW (30/25 hp) [10 min/cont]	ATC air blower (blast)	
Rapid feedrate	X-Y-Z: 50 m/min	Chip air blower (blast)	Nozzle type
Spindle/Spindlehead cooling system	Oil controller	Work lamp	LED (installed on right sides)
Air cleaner (filter)	Including regulator	In-machine chip discharge*3	Chip flusher system table L/R 2 tools
Operation panel with color LCD		Chip pan	Effective capacity 60 L
Pulse handle		Foundation washers (with jack bolts)	7 pcs
Tapered bore cleaning bar		3-lamp status indicator	Type C (LED signal tower) Red (alarm), Yellow (end) Green (running)
B/C axis rotary table	0.0001 deg		
C axis table*1	ø400, 6 18H7 T grooves	32-tool ATC	
Hand tools		ATC magazine shutter	
Tool box		Full enclosure shielding	With ceiling (full enclosure)
Washing device on saddle		Chemical anchors	
Coolant supply system*2	Tank: 315 L (Effective: 170 L), pump: 250 W		

*1. Turning specs have ø400, M12 tapped holes in 28 locations
*2. Do not use oil-based coolants. In cases when use of such coolants is unavoidable, the pump capacity must be increased to 800 W.
*3. When oil-based coolants are used, select an in-machine chip conveyor (coil).
Note: Oil-based coolants are highly flammable, so fire prevention measures must always be taken when using these coolants. Do not operate unattended.

■ Optional specifications / accessories

Name	Remark	Name	Remark
High-speed spindle 50 to 20,000 min⁻¹	△ 30/22 kW (40/30 hp) [10 min/cont] *1	Workpiece wash gun	
		In-machine chip converyor (coil)	
High-speed spindle 50 to 25,000 min⁻¹	△ 15/11 kW (20/15 hp) [10 min/cont] *1	Off-machine chip discharge △	Lift-up chip conveyors: floor type, drum filter type
Dual contact spindle	△ HSK, BIG-PLUS®, Super BT	Chip bucket for above △	
Ball-screw cooling	X-Y-Z axes	Super-NURBS	High speed contouring
AbsoScale	X-Y-Z axes	Tool breakage detection/Auto tool length compensation	Touch sensor (Renishaw)
Auto pallet changers	2P-APC, 6P-APC, FMS		
ATC magazines	△ Chain: 48, 64 tools Matrix: 64, 98, 132, 166, 200, 234, 268 tools	Auto zero offset/auto gauging	Touch probe (Renishaw)
Pull stud specs	△ MAS 1, JIS, CAT, DIN	5-Axis Auto Tuning System	By touch probe, sphere (Renishaw)
Table surface	△ Tapped table top	Tool life management (time counter, etc)	
Thru-spindle coolant *2	Specify 1.5 MPa or 7.0 MPa. 25,000 min⁻¹ specs available for HSK-A63 only.	Overload monitor (w/ feed adaptive control)	
Chip air blower (adapter) (blast)	Unavailable with thru-spindle specifications	TAS-S *3	Thermo Active Stabilizer—Spindle
Oil mist coolant		TAS-C	Thermo Active Stabilizer—Construction
Shower coolant	5 nozzles on the right side in the machine	Automatic door	

△: Corresponding standard specification deleted.
*1. Spindle accepts 7/24 No. 40 (BIG-PLUS®, Super BT), or HSK-A63 tapers.
*2. Okuma pull stud required (End-face grinding, O-ring, and through-hole diameter differ from those of commercial pull studs.)
*3. Required for high-speed spindles

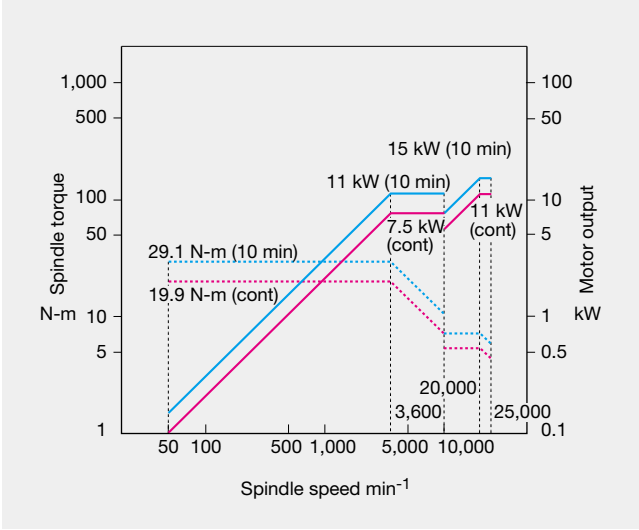## ■ Spindle torques, power graphs (Optional)

■ High-speed spindle

● Speed: 20,000 min⁻¹
● Max output: 30/22 kW (10 min/cont)
● Max torque: 57/42 N-m (10 min/cont)
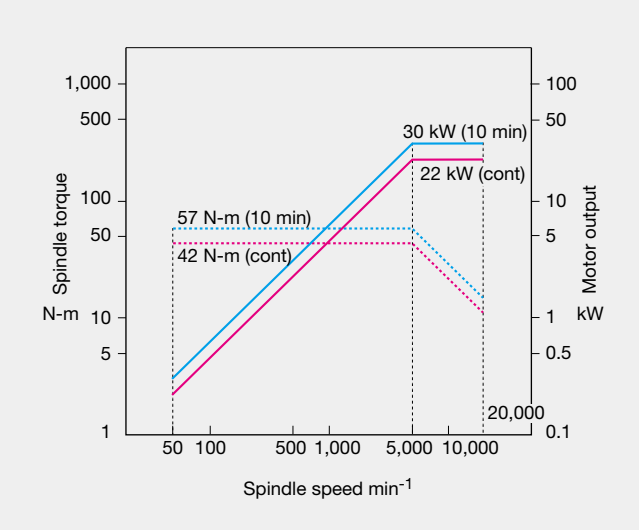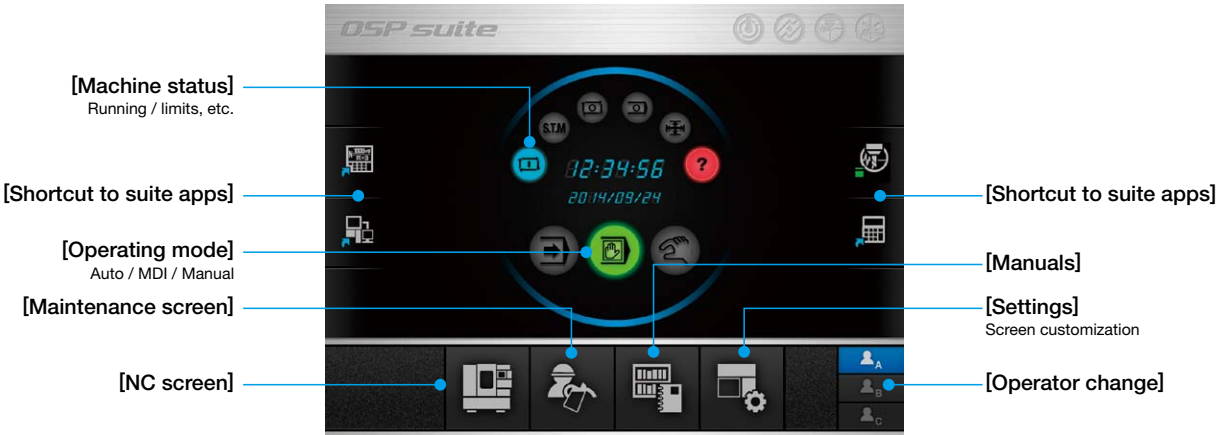

■ High-speed spindle

● Speed: 25,000 min⁻¹
● Max output: 15/11 kW (10 min/cont)
● Max torque: 29.1/19.9 N-m (10 min/cont)

# The Next-Generation Intelligent CNC OSP suite OSP-P300MA/SA

Meet Okuma's control package of "visual and digital" shop floor production instructions, setup data, cutting and utilization status, machine maintenance information, and more.

The control interface itself adds a new dimension to ease of use—the more intelligent and faster way to manufacture high-quality components.

[Machine status]
Running / limits, etc.

[Shortcut to suite apps]

[Operating mode]
Auto / MDI / Manual

[Maintenance screen]

[NC screen]

[Shortcut to suite apps]

[Manuals]

[Settings]
Screen customization

[Operator change]

■ "suite apps"

In addition to Okuma's Intelligent Technology, a rich array of applications is available for visualization and digitization of information needed on shop floors to support high-level "Monozukuri"/manufacturing.
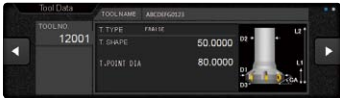
Actual Load

MacMan Monitor
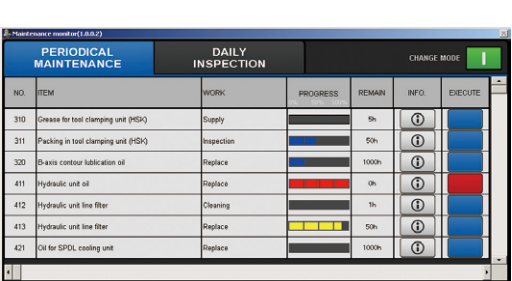
Tool Data

Maintenance Monitor that displays daily and regular check items
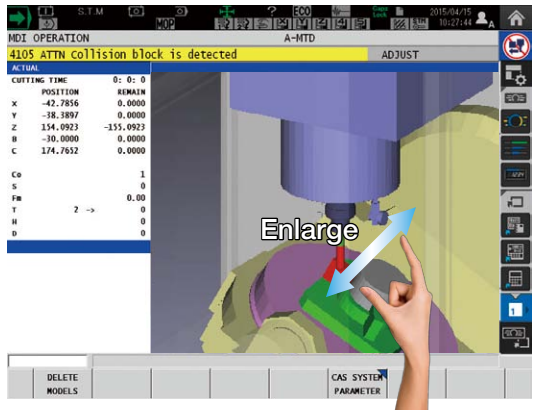
## ■ "suite operation"

Use of a multi-touch panel achieves intuitive graphical operation. Finger moving, enlarging, reducing, and rotating 3D models, as well as scrolling 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.

Enlarge

Scroll

Smooth operations even with wet or work-gloved hands
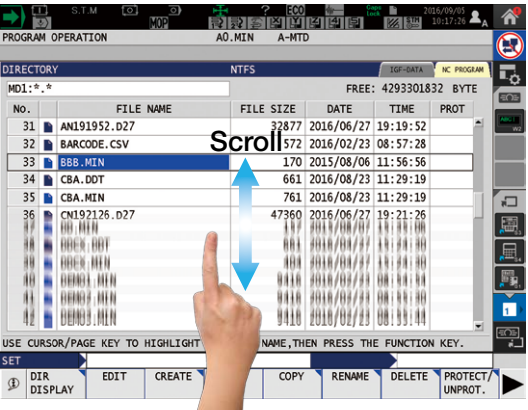
Note: 15-in. operation panel screen shots.
Collision Avoidance System (Optional) shown above.

■ Standard Specifications

Basic Specs	Control	X, Y, Z, B, C simultaneous 5-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 inputs	8-digit decimal, ±99999.999 to 0.001 mm (3937.0078 to 0.0001 in.), 0.001° Decimal:1 μm, 10 μm, 1 mm (0.0001,1 in.) (1°, 0.01°, 0.001°)
	Feed	Override: 0 to 200%
	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, fixture offset II, Turning function (with P300S), Automatic function programming for lathes (M-LAP) (with P300S)
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, alignment compensation
	MacMan	Machining management: machining results, machine utilization, fault data compile & report, external output
Communications / Networking		USB (2 ports), Ethernet, RS-232-C interface (1 channel)
High speed/accuracy specs		Hi-Cut Pro, pitch error compensation, Hi-G Control, SᴇʀᴠᴏNᴀᴠɪ, 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 on-machine wattmeter option.

■ Optional Specifications

Item	Kit Specs*1	NML E	NML D	3D E	3D D	AOT-M E	AOT-M D
Interactive functions							
Advanced One-Touch IGF-M (w/Real 3-D simulation)						●	●
Interactive MAP (I-MAP)				●	●		
Programming							
Auto scheduled program update		●	●	●	●	●	●
Common variables (Std: 200 pts)	1,000 pts						
	2,000 pts						
Program branch; 2 sets							
Program notes (MSG)		●		●		●	
Coordinate system select (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							
Inverse time feed							
Tool grooving (flat-tool free-shaped grooving)							
Tool center point control II (TCP-II) (w/ tool tilt comp)							
Tool tilt command							
Tool max rotational speed setting							
F1-digit feed	4 sets, 8 sets, parameter						
Programmable travel limits (G22, G23)		●	●	●	●	●	●
Skip (G31)							
Axis naming (G14)							
Additional G-/M-code macros							
3-D 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 ★							
Monitoring							
Real 3-D simulation				●	●	●	●
Simple load monitor	Spindle overload monitor	●	●	●	●	●	●
NC operation monitor	Hour meter, work counter	●	●	●	●	●	●
Hour meters	Power, spindle, NC, cutting						
Operation end buzzer	M02, M30, and END commands						
Work counter	With M02 and M30 commands						
MOP-TOOL	Adaptive control, overload 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-M E	AOT-M D
External I/O communication							
Additional RS-232-C channel (Std specs include 1 channel)							
DNC-T3							
DNC-B (232C-Ethernet transducer used on OSP side)							
DNC-DT							
DNC-C/Ethernet							
Additional USB (Additional 2 ports, Std: 2 ports)							
Automation / untended operation							
Auto power shut-off	M02 and END alarms, work preps done	●	●	●	●	●	●
Warm-up (calendar timer)							
External program select	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						
5-Axis Auto Tuning System	Standard, high spec						
Straightness compensation							
0.1 μm control (linear axis commands)							
Super-NURBS							
Simultaneous 5-axis kit	Tool center point control II (w/tool tilt comp) Tool center point control manual feed Table origin coord manual feed Super-NURBS (5-axis spec) Slope machining Inverse time feed Tool tilt command DNC-DT						
TAS-S (Thermo Active Stabilizer—Spindle)							
TAS-C (Thermo Active Stabilizer—Construction)							
ECO suite							
ECO Operation							
ECO Power Monitor	On-machine wattmeter						
Energy-saving hydraulic unit	Inverter system						
	ECO Hydraulic						
Other							
Control cabinet lamp (inside)							
Circuit breaker							
Sequence operation	Sequence stop	●	●	●	●	●	●
Upgraded sequence restart	Mid-block return	●		●		●	
Tool point center manual feed							
Table reference coord manual feed							
Pulse handle	2 pcs, 3 pcs (Std: 1 pc)						
External M signals	4, 8 signals						
Collision Avoidance System (CAS)							
Machining Navi M-ɪ, M-gII+(cutting condition search)							
One-Touch Spreadsheet							
Block skip; 3 sets							
Leading edge offset							
OSP-VPS (Virus Protection System)							
19-inch variable angle operating panel							

Note 1. NML: Normal, 3D: 3D simulation, E: Economy, D: Deluxe
AOT-M: Advanced One-Touch IGF-M
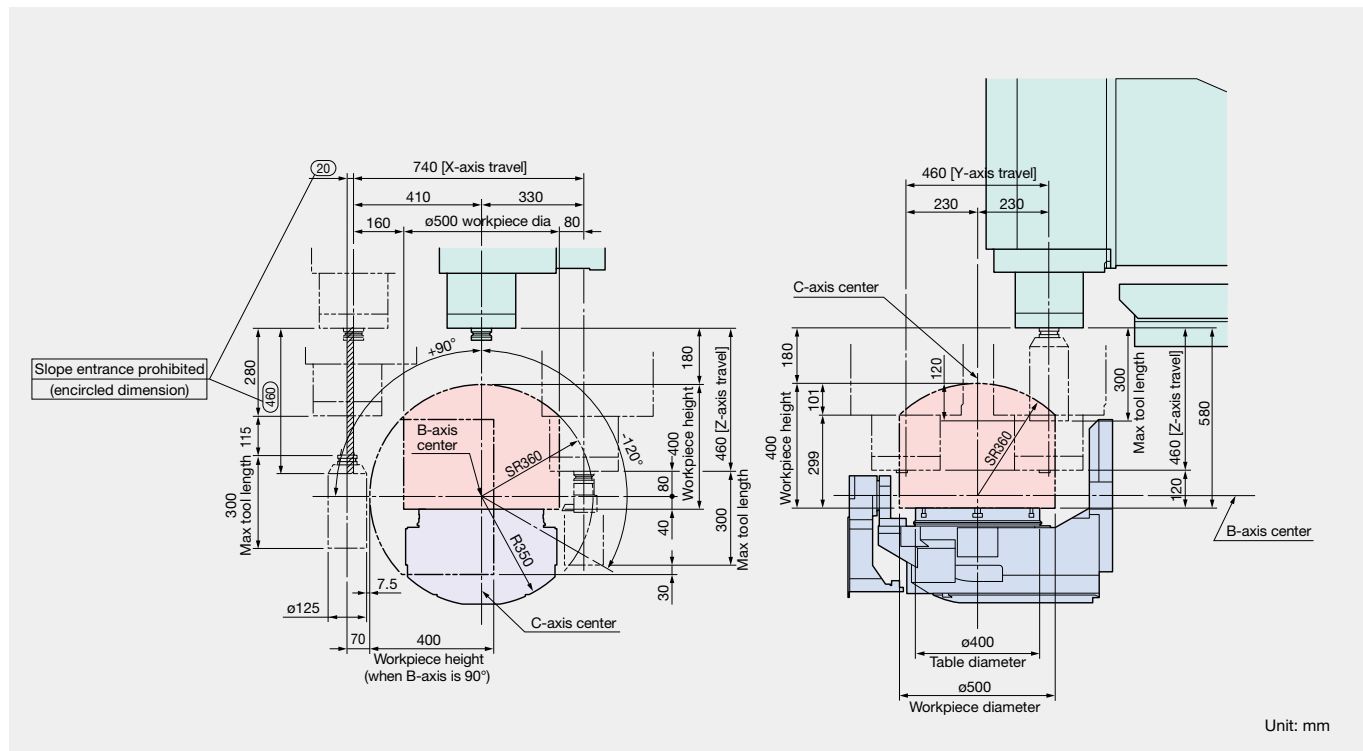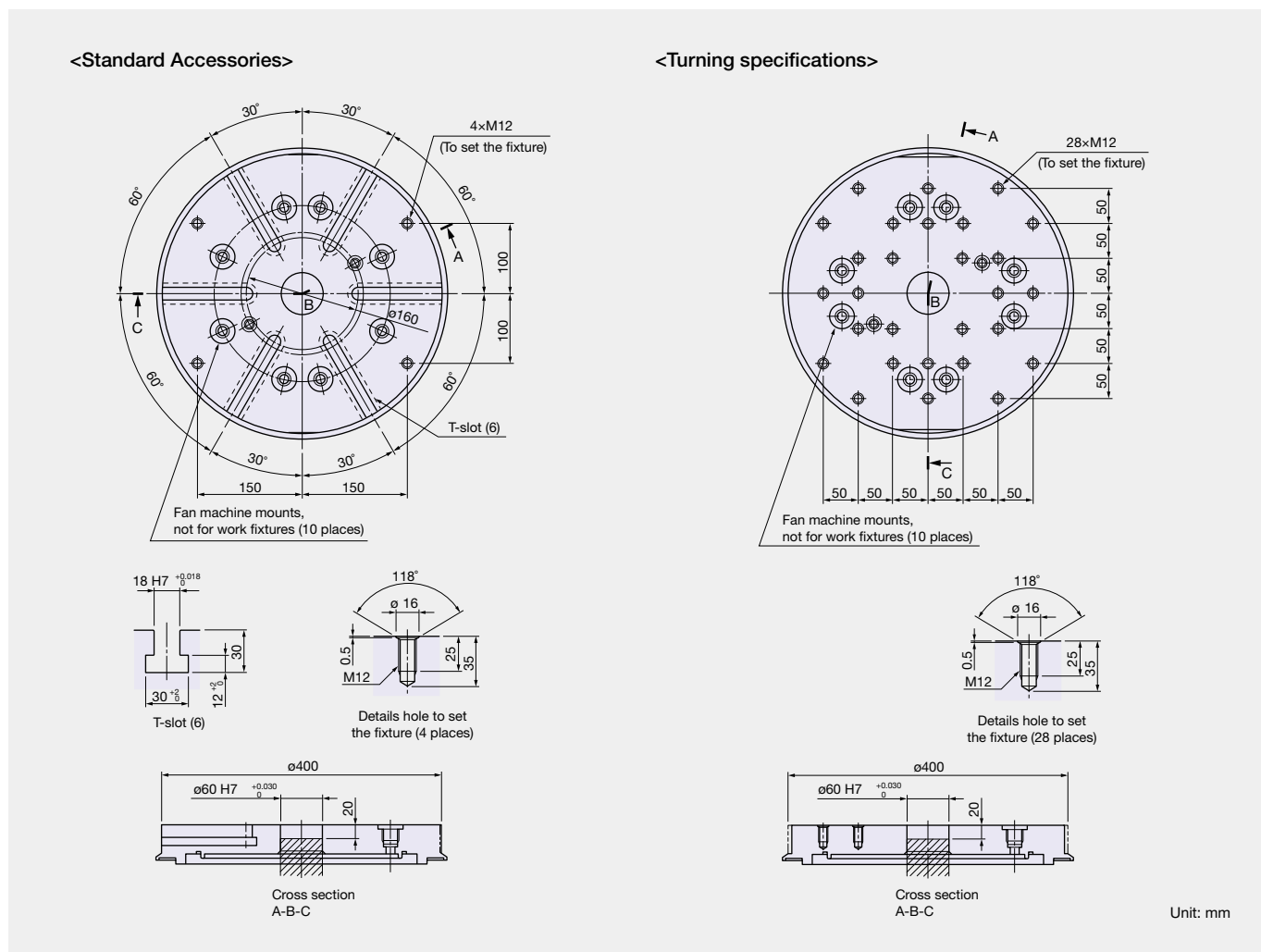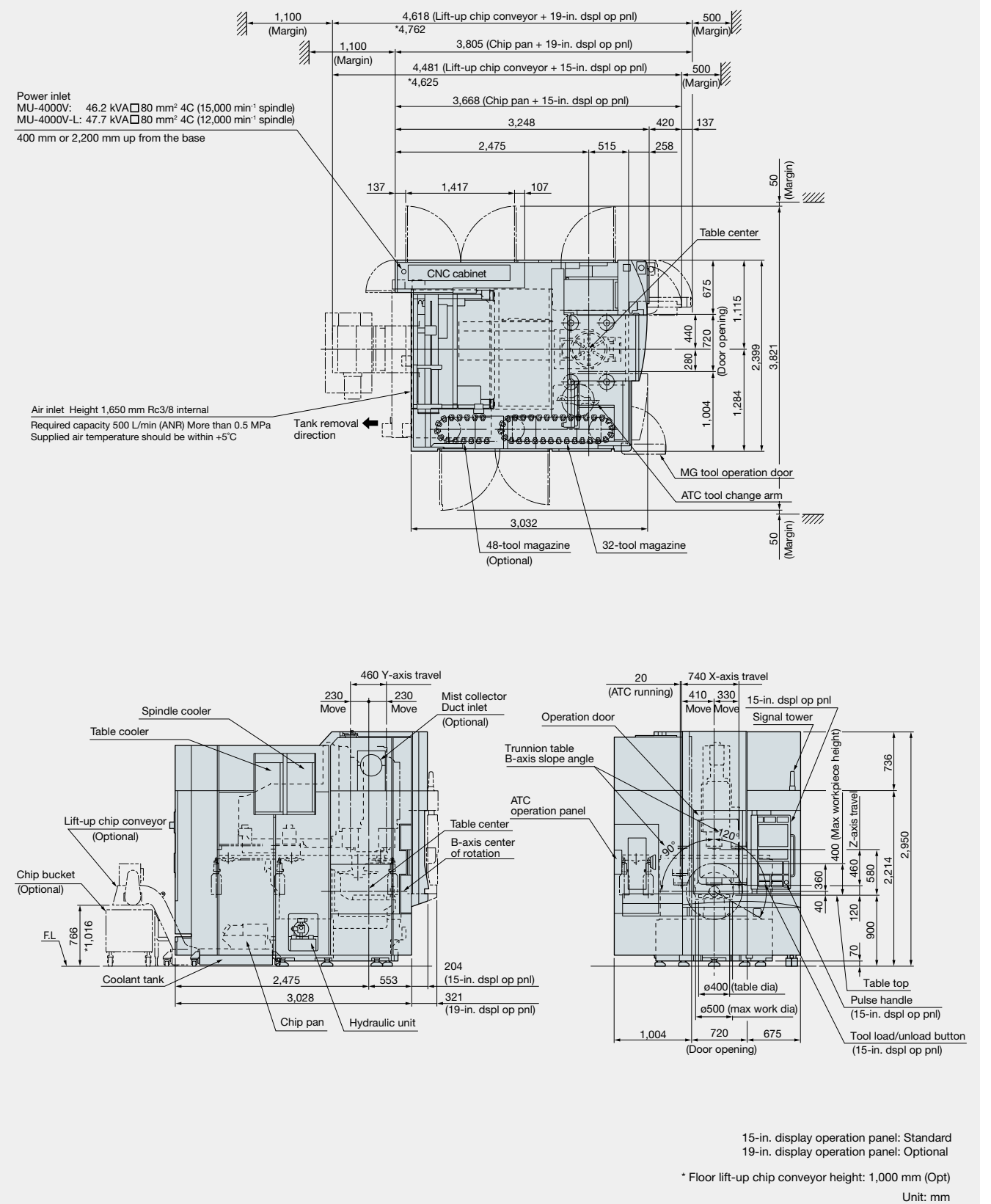Note 2. ★ Technical consultation needed for specifications

Working range

Slope entrance prohibited (encircled dimension)

740 [X-axis travel] · 410 · 330 · 160 · ø500 workpiece dia · 80 · 20

+90° · -120° · B-axis center · SR350 · R350 · ø125 · 7.5 · 70 · 400

300 Max tool length · 115 · 280 (460) · 300 Max tool length · Workpiece height (when B-axis is 90°) · C-axis center

460 [Y-axis travel] · 230 · 230 · C-axis center · 120 · 180 · 101 · 299 · SR350 · ø400 Table diameter · ø500 Workpiece diameter

180 · 300 Max tool length · 400 Workpiece height · 460 [Z-axis travel] · 580 · 120 · 80 · 40 · 30 · B-axis center

Unit: mm

Table dimensions

<Standard Accessories>

4×M12 (To set the fixture) · 30° · 30° · 60° · 60° · A · B · ø160 · C · T-slot (6) · 100 · 100 · 150 · 150 · Fan machine mounts, not for work fixtures (10 places)

18 H7 +0.018/0 · 118° · ø16 · M12 · 0.5 · 25 · 35 · 30 · 30 +0.2/0 · 12-0.2 · T-slot (6) · Details hole to set the fixture (4 places)

ø400 · ø60 H7 +0.030/0 · 20 · Cross section A-B-C

<Turning specifications>

A · 28×M12 (To set the fixture) · 50 50 50 50 50 50 50 · B · C · 50 50 50 50 50 50 · Fan machine mounts, not for work fixtures (10 places)

118° · ø16 · M12 · 0.5 · 25 · 35 · Details hole to set the fixture (28 places)

ø400 · ø60 H7 +0.030/0 · 20 · Cross section A-B-C

Unit: mm

Dimensional and Installation Drawings

1,100 (Margin) · 4,618 (Lift-up chip conveyor + 19-in. dspl op pnl) *4,762 · 500 (Margin)
1,100 (Margin) · 3,805 (Chip pan + 19-in. dspl op pnl)
4,481 (Lift-up chip conveyor + 15-in. dspl op pnl) *4,625 · 500 (Margin)
3,668 (Chip pan + 15-in. dspl op pnl)
3,248 · 420 · 137 · 2,475 · 515 · 258

Power inlet
MU-4000V: 46.2 kVA☐80 mm² 4C (15,000 min⁻¹ spindle)
MU-4000V-L: 47.7 kVA☐80 mm² 4C (12,000 min⁻¹ spindle)
400 mm or 2,200 mm up from the base

137 · 1,417 · 107 · Table center · CNC cabinet

675 · 1,115 · 2,399 · 3,821 · 50 (Margin) · 280 · 440 · 720 (Door opening) · 1,004 · 1,284

Air inlet Height 1,650 mm Rc3/8 internal
Required capacity 500 L/min (ANR) More than 0.5 MPa
Supplied air temperature should be within +5℃

Tank removal direction · MG tool operation door · ATC tool change arm

3,032 · 48-tool magazine (Optional) · 32-tool magazine · 50 (Margin)

460 Y-axis travel · 230 Move · 230 Move · Mist collector Duct inlet (Optional) · Spindle cooler · Table cooler

20 (ATC running) · 740 X-axis travel · 410 Move · 330 Move · 15-in. dspl op pnl · Operation door · Signal tower · Trunnion table B-axis slope angle · ATC operation panel · Table center · B-axis center of rotation

Lift-up chip conveyor (Optional) · Chip bucket (Optional) · F.L · 766 · 1,016

Coolant tank · 2,475 · 553 · 3,028 · Chip pan · Hydraulic unit · 204 (15-in. dspl op pnl) · 321 (19-in. dspl op pnl)

736 · 400 (Max workpiece height) · 460 [Z-axis travel] · 580 · 2,214 · 2,950 · 120° · 90° · 120 · 900 · 360 · 40 · 70

ø400 (table dia) · ø500 (max work dia) · 1,004 · 720 · 675 (Door opening) · Table top · Pulse handle (15-in. dspl op pnl) · Tool load/unload button (15-in. dspl op pnl)

15-in. display operation panel: Standard
19-in. display operation panel: Optional

* Floor lift-up chip conveyor height: 1,000 mm (Opt)

Unit: mm

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.
Pub No. MU-4000V-E-(2a)-500 (Sep 2016)

This product is subject to the Japanese government Foreign Exchange and Foreign Trade Control Act with regard to security controlled items; whereby Okuma Corporation should be notified prior to its shipment to another country.

OKUMA

OKUMA Corporation

Oguchi-cho, Niwa-gun,
Aichi 480-0193, Japan
TEL: +81-587-95-7825 FAX: +81-587-95-6074