5-Axis Horizontal Machining Center

Large horizontal machining center for beautiful finishing of large, complex parts with 5-axis, multi-sided machining

Thermo-Friendly Concept
Collision Avoidance System
Machining Navi

Premium Designing—has begun
Harmonious human-machine interaction produces new forms. Add to that, reliably cultivated and sustainable innovation from a comfortable work place found in a pleasing factory environment. With superior quality and value, Premium Designing has begun.

Photos shown in this brochure may also show optional equipment.
Experience the power of process-intensive machining with 5-axis multitasking

- Simultaneous 5-axis machining (linear and rotary), for single chucking applications with less fixturing.
- Resulting in shorter lead-times with improved productivity.

Highly efficient machining with outstanding machining capacity

**Machining capacity** (material S45C)

<table>
<thead>
<tr>
<th>Gear spindle: 4,500 min⁻¹, VAC 40/30 kW (15 min/cont) (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ø250 face mill, 10 blade (cermet)</td>
</tr>
<tr>
<td>Stock removal: 1,000 cm³/min</td>
</tr>
<tr>
<td>Spindle speed: 293 min⁻¹</td>
</tr>
<tr>
<td>Cutting speed: 230 m/min</td>
</tr>
<tr>
<td>Width × depth: 175 × 6 mm</td>
</tr>
<tr>
<td>Feedrate: 953 mm/min</td>
</tr>
</tbody>
</table>

| ø63 end mill radial facing, 4 blade (carbide) |
| Stock removal: 602 cm³/min |
| Spindle speed: 1,415 min⁻¹ |
| Cutting speed: 280 m/min |
| Width × depth: 10 × 35 mm |
| Feedrate: 1,720 mm/min |

| ø50 end mill radial facing, 3 blade (carbide) |
| Stock removal: 700 cm³/min |
| Spindle speed: 1,780 min⁻¹ |
| Cutting speed: 280 m/min |
| Width × depth: 50 × 10 mm |
| Feedrate: 1,400 mm/min |

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

**High-torque spindle: 1,071 N-m (integral motor/spindle), 1,920 N-m (gear spindle)**

<table>
<thead>
<tr>
<th>Integral motor/spindle (Standard)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed: 6,000 min⁻¹</td>
</tr>
<tr>
<td>Max output: VAC 45/37 kW (20 min/cont)</td>
</tr>
<tr>
<td>Max torque: 1,071/637 N-m (3 min/cont)</td>
</tr>
</tbody>
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</tr>
</thead>
<tbody>
<tr>
<td>Speed: 4,500 min⁻¹</td>
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<tr>
<td>Max output: VAC 40/30 kW (15 min/cont)</td>
</tr>
<tr>
<td>Max torque: 1,920/1,440 N-m (15 min/cont)</td>
</tr>
</tbody>
</table>

**Highly rigid machine structure**

- Bed and column to achieve heavy-duty cutting
- Ideal rib layout to resist bending and torsion
- Accurate, powerful, and highly accurate axis drive system
- High accuracy double ball screws are used on X, Y, and Z axes
- Double motor drive system on A, B axes
- Thermal deformation controlled for high-accuracy machining
- Ball screw and motor base cooling on X, Y, Z axes
- A, B axis drive unit cooling

**Beefy torque makes easy work even of difficult-to-machine material**

- Integral motor/spindle: 1,071 N-m
- Gear spindle (low speed): 1,920 N-m (optional)

**Large working range to handle large parts**

- Maximum working range: ø1,500 × 1,125 mm
- Pallet size: 1,000 × 1,000 mm
- Axis travel: X: 1,550 mm, Y: 1,600 mm, Z: 1,650 mm
Trunnion table that supports high speed, high accuracy machining of large parts

High speed trunnion table
- A and B axis have double motor drive for good responsiveness and rapid movements
- High accuracy indexing with highly accurate Okuma rotary encoder directly linked to table and trunnion
- A-axis swing speed: 12 min⁻¹
- B-axis swing speed: 20 min⁻¹

Working range suited to large part machining

- Swing ranges
  - A-axis: ±25 to −115° (table swing)
  - B-axis: 360° (pallet swing)

- Max workpiece
  - Max workpiece swing diameter: ø1,500 mm
  - Max workpiece height: 1,125 mm
  - Max workpiece weight: 2,500 kg

Ease of operation improves productivity

- Cleaner and simpler spindle shape for less interference with workpiece in 5-axis machining.
- Reduced clutter around columns for smooth entry from operation panel to machining chamber.
- Easy accessibility to tool and workpiece.
- Step installed in APC for easy workpiece mounting and chip cleaning.

High accuracy 5-axis machining is achieved with advanced technology

Thermo-friendly structure gives outstanding thermal stability

The unique approach of “accepting temperature changes”

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

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 (Optional) [Thermo Active Stabilizer—Spindle]

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.

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. In addition, the results of tuning are applied regardless of whether the operation is 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.

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.

High dimensional stability
Chip discharge

- A hinged conveyor beneath the center trough and X-axis telescopic cover facilitate smooth transfer of chips.
- Clean, simple covering prevents chips from accumulating in the machining chamber.

Relevant illustrations shown:
- In-machine chip conveyor (hinged)
- Off-machine chip conveyor

Recommended Chip Conveyors

<table>
<thead>
<tr>
<th>Workpiece material</th>
<th>Steel</th>
<th>FC</th>
<th>Aluminum/Spotless</th>
<th>Mixed (general use)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chip shape</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-machine</td>
<td>Hinge type</td>
<td>[Std]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-machine</td>
<td>Scraper type (with drum filter)</td>
<td>[Opt]</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hinge + scraper (with drum filter)</td>
<td>[Opt]</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

* Scraper type is available as an option.
1. When there are many fine chips
2. When chips are longer than 100 mm
3. When chips are shorter than 100 mm
Note: In the case of dry chips, clean out chips that have accumulated under the pallet or elsewhere in the machine as needed.

Off-machine lift-up chip conveyors

<table>
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<th>Name</th>
<th>Scraper type (with drum filter)</th>
<th>Hinge + scraper (with drum filter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shape</td>
<td>[Std]</td>
<td>[Opt]</td>
</tr>
</tbody>
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* Regular cleaning of coolant tank is necessary even for conveyors with drum filters.

Tool changer (ATC), matrix magazine type

- Fast, space-saving matrix magazine system with low energy use drive is standard
- Open-ceiling magazine door for storage of heavy tools with crane
- Shorter tool preparation times: minimum 18 seconds
- Reduced machine width
- Simplified specification change (accommodates changes in tool number from increased/decreased racks)

Recommended specifications
- [Std]: Recommended specifications
- [Opt]: Recommended specifications with conditions

Matrix magazine

- Tool magazine capacity: 81 tools (Standard)
  - 129 tools, 177 tools (Optional)
- Tool dimensions: Max diameter (w/ adjacent tool) ø130 mm (81 tool capacity)
  - ø315 mm (8 tool capacity)*

  * With eight ø135-mm (and ø130-mm or smaller) tools, storage capacity becomes 67 tools.

Flexible pallet change

- 2-pallet parallel shuttle APC (Standard)
- 6 pallet APC (Optional)

Chip discharge (cont.)

- In-machine chip discharge Chip conveyor below X-axis telescopic cover
- Center trough conveyor
- Chip transport direction
- Coolant tank
- Off-machine chip discharge Lift-up chip conveyor

Flexible pallet change (cont.)

- High speed ATC
- Open ceiling magazine door

Chip transport direction

- Manual tool insert
- NG tool stations
- NG tool station
  - NG2 – NG4
  - * Tool waiting to be replaced
- Tool waiting to be replaced

Chip discharge

- A hinged conveyor beneath the center trough and X-axis telescopic cover facilitate smooth transfer of chips.
- Clean, simple covering prevents chips from accumulating in the machining chamber.
## Machine Specifications

### Standard Specifications

- **Spindle speed**: 6,000 min⁻¹ / 45/37 kW [20 min/cont]
- **Turret table**: 45/37 kW [20 min/cont]
- **ATC tool magazine capacity**: 81 tools (matrix magazine)
- **Spindle/Spindlehead coolant**: Oil controlled
- **Ball screw coolant**: Oil controller
- **Centralized tube auto unit**: Oil controller
- **In-machine chip discharge**: Oil controller
- **Center trough chip conveyor**: Status indicator
- **In-machine chip washer**: 3-color C type
- **ATC air blower (Blade)**: Nozzle
- **Chip air blower (Blade)**: Foundation blocks, jack bolts
- **Table washer**: Tapered boring
- **Tool box**: Tool box

### Optional Specifications

- **Spindle speed (gear box)**: 4,000 min⁻¹ / 40/37 kW, No. 50
- **Dual contact spindle**: HSK, BIG Plus®, SuperBT
- **ATC tool magazine capacity**: 129, 177 (matrix magazine system)
- **Automatic tool length compensation/breakage detection**: 1, 2 axes
- **Automatic pallet changer**: Multi-pallet APC, 6 pallets
- **Oil-inlet coolant system**: Coolant system
- **Thru-spindle coolant**: Coolant system
- **Workpiece washing gun**: 1.5 MPa
- **Coolant system**: 1.5, 7.0 MPa, large flow 1.0, 7.0 MPa
- **Chip bucket for above**: Chip bucket for above

### Machine dimensions

- **X axis travel**: +25° to −115°
- **Y, Z, A axes**: ±360°
- **Y, Z, A axes**: ±360°

### Working range

- **X axis, B axis**: 0°
- **Y, Z, A axes**: ±90°
- **A-axis travel**: −25° to +115°
- **B-axis travel**: ±360°
- **Maximum workpiece size**: ø1,500 × 1,125

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**Note:**

- HSK-A125 is not available with 6,000-min⁻¹ spindle.
- Chemica anchors, foundation bolts
- Chemical anchors, foundation bolts

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**Optional Specifications**

- **Pull stud**: Adapter type
- **Coolant system**: Tank: 1,200 l, effective 1,000 l
- **Pump**: 555/885 W (50/60 Hz)

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**Standard Specifications**

- **Max tool dimensions**: 129, 177 (matrix magazine system)
- **Max tool mass moment**: Multi-pallet APC, 6 pallets
- **Pallet upper surface shape**: T groove spec
- **Spare pallet**: Pallet upper surface shape
- **Operation panel**: Link, arm type
- **Multi-pallet APC**: 6 pallets
- **Machine anchoring systems**: Chemical anchors, foundation bolts
- **Chip bucket for above**: Chip bucket for above

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**Max tool dimensions (MAS BT50)**

- **Workpiece clamp tapped hole detail**: 2-pallet parallel shuttle
- **Machine Link**: T groove spec
- **Floor space**: 1,000 x 1,000
- **Weight**: 57,000 (35,400)

---

**Normal tools**

- Can be stored in all areas
- **Big bore tool**: Can be stored in big bore tool storage area.
- **Tools cannot be placed on either side.**

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MU-10000H
Dimensional and Installation Drawings
81-tool magazine specifications
[ ] for 177-tool magazine specifications

Satisfaction from complete control of a machine tool

As a "machine & control" builder, Okuma makes further strides in machine tool manufacturing with this superb Control featuring "Easy Operation." Okuma took a close look at the way machinists actually operate machine tools, to help them create smoother and more effective ways of producing parts. Novice operators as well as professional machinists get complete control—and satisfaction.

Moreover, what you want to see and do conveniently come together in a "single-mode operation."

First, select one of three operation screens. Then simply touch the screen or press a function key to see and do your job.

With spreadsheet simplicity—tool offsets, tilt, shape, life, etc.—all the tool data required to cut a part can be registered here.

Since the registered tool data is also used by Okuma auto programming (Advanced One-Touch IGF) and a collision check function (Collision Avoidance System), this screen will complete the entire registering process.

The touch sensor screen pops up from the tool registration screen.

Easy tool registration

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The touch sensor screen pops up from the tool registration screen.

Tool compensation values are set while looking at a guidance message.
OSP-P300M advanced technologies

Collision prevention
Collision Avoidance System (optional)

Finding the best cutting conditions quickly
Sensors built in to the machine detect and analyze machining chatter. Machining Navi then navigates to the effective measures in a wide range of spindle speeds, from low to high.

Cutting condition search for milling
Machining Navi M+ (Optional)

Adjust cutting conditions while monitoring the data
Based on the chatter noise captured by the microphone, Machining Navi displays a number of optimal spindle speed possibilities on the screen. The operator can change to the indicated spindle speed with a single touch and immediately confirm the result.

Simultaneous 5-Axis Tool Tilt Compensation (Optional)
The tool angle on a workpiece (tool tilt) in 5-axis machining will change on a wavering surface. CAM processing errors will cause the tool to stagger with unnecessary accel/decel and reverse angles during axis feed. Simultaneous 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.

OSP-P300M advanced technologies

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Cutting condition search for milling/maching
Machining Navi M+i (Optional)

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**Fire Safety Precautions**

To protect your factory and equipment from fire and assure continued safe operation, observe the following fire safety precautions whenever you operate machinery.

Whenever possible, avoid the use of oil-based coolants for cutting operations. Sparks caused by hot chips, tool friction, and grinding can cause fires.

Always observe the following safety measures to ensure safe operation when machining flammable materials or when performing dry machining.

1. **Oil-based coolant**
   - (1) Use nonflammable cutting fluid coolant.
   - (2) When the use of an oil-based coolant is unavoidable:
     - Before you begin machining, check cutting tools to make sure of their service life and the condition of the tool edge, and choose cutting conditions that will not cause a fire.
     - Periodically clean the coolant filter to maintain sufficient coolant discharge, and frequently verify that coolant is discharging normally.
     - Take measures to control the outbreak of fire: Place a fire extinguisher near the machine, have an operator constantly monitor operation, and install an automatic fire extinguishing system.
     - Do not place flammable materials near the machine.
     - Do not allow chips to over accumulate.
     - Periodically clean the inside of the machine and the area surrounding it.
     - Check that the machine is operating normally.
     - Never run the machine unattended.
     - Since an automatic fire extinguishing system and other peripherals are needed for grinding operations, please let us know as soon as possible if you plan to perform such operations.

2. **Precautions regarding machining of potentially flammable materials**
   Before machining any material designated by law as a flammable substance, e.g., plastic, rubber, wood, acquaint yourself with the special characteristics of the material in terms of fire prevention, and observe the precautions given in (2) above to ensure safe operation.
   Example: When machining magnesium, there is a danger that magnesium chips and water-soluble coolants will react to produce hydrogen gas, resulting in an explosive fire if any chip should ignite.

3. **Dry machining**
   Dry machining is a fire hazard because workpieces, tools, and chips are not cooled. To ensure safe operation, do not place any flammable objects near the machine and do not allow chips to over accumulate.
   In addition, be sure to check cutting tools to make sure of their service life and the condition of the tool edge, and observe the precautions regarding oil-based coolants given in (2) above.