Put through its paces

MULTIGRIND® CA Machine Check in fertigung magazine

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The Multigrind CA grinding machine from Haas
MULTITALENTED WITH A KICK

The Multigrind CA grinding machine from Haas: at Haas, grinding technology is defined by the interaction of system components whose functions are finely tuned to one another and that together form a “grinding cube” with an optimized design. The CA machine, as a smaller offshoot of the CB machine, exhibits the same rigidity, precision, and dynamics as its predecessor. And when it comes to the machine’s level of automation, functionality, and accessibility, it in fact offers additional benefits.

Regardless of whether the user is grinding tools or using functional parts from the fields of medical engineering and automotive manufacturing, with the CA machine from Haas the user can adjust the machine’s design to perfectly match their specific needs.

Machine Design
The machine’s components are assembled for the customer in the “Haas Machine Configuration Program,” and the data generated is then used throughout the rest of the workflow to check on the availability of parts, to order parts, to provide information about delivery times, for parts lists, and to calculate prices. This dataset forms the basis for the scope of all further work. The machine’s design, the various components, all supply lines, and the electrical appliances are all available as a CAD dataset. When it comes to the CA machine’s design, the base of the machine is “completely seamless.” This means that the middle section of the base and the support assembly for the Y and Z axes are cast from a mineral composite with an epoxy content of about five percent into one cube. The machine’s rigidity and precision are achieved through the central placement of the axes, the minimization of protrusions, and calculation of the dimensions of the cast composite cube using FEM (fi-
The Multigrind CA is a compact machine with an attractive design. The operator pendant is swivel-mounted, and the height of the keyboard can be adjusted for the perfect viewing and ergonomics.
The CA machine comes standard with a 12 kW spindle that rotates at 8,000 rpm (or 18,000 rpm) and two grinding wheel ends. A high-frequency spindle that rotates at 70,000 rpm can also be attached to the front flange.

The heart of the grinding machine is the grinding spindle: it is symmetrically fitted in the grinding cube. The vibration-cushioned mineral-composite base, the embedded guides, and the machine’s well-engineered kinematics lend the machine precision and process reliability.

### Facts and Figures: Machine Data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Workspace (mm)</strong></td>
<td>630 × 345 × 430</td>
</tr>
<tr>
<td><strong>Machine table (mm)</strong></td>
<td>1,000 × 440</td>
</tr>
<tr>
<td><strong>C axis, angle of rotation</strong></td>
<td>300°</td>
</tr>
<tr>
<td><strong>A axis</strong></td>
<td>1,000 rpm; optional: 2,600 rpm</td>
</tr>
<tr>
<td><strong>Height of centers</strong></td>
<td>175 mm</td>
</tr>
<tr>
<td><strong>Tool holder for working spindle</strong></td>
<td>HSK 50E</td>
</tr>
<tr>
<td><strong>Spindle option: 1 spindle end</strong></td>
<td>8,000 rpm; 11.5 kW (100%); 14.4 kW (40%)</td>
</tr>
<tr>
<td><strong>Spindle option: 1 spindle end</strong></td>
<td>18,000 rpm; 11 kW (100%); 12 kW (40%)</td>
</tr>
<tr>
<td><strong>2 spindle ends mounted</strong></td>
<td>taper 31.75 mm; 8,000 rpm; 11.5 kW (100%); 14 kW (40%)</td>
</tr>
<tr>
<td><strong>A axis tool holder</strong></td>
<td>SK 50; HSK 50/63/80 optional</td>
</tr>
<tr>
<td><strong>Tool changer (number of tools)</strong></td>
<td>8 up to Ø 250; 16 up to Ø 100; 13 up to Ø 250; 27 up to Ø 100</td>
</tr>
<tr>
<td><strong>Time to change tools without grinding wheel guard</strong></td>
<td>10 seconds</td>
</tr>
<tr>
<td><strong>Controller</strong></td>
<td>Siemens 840 D sl (Haas software for grinding cycles)</td>
</tr>
<tr>
<td><strong>Footprint (mm)</strong></td>
<td>2,621 × 2,400 × 2,300</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>8.5 metric tons</td>
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<tr>
<td><strong>Base price:</strong></td>
<td>About 210,000 euros without optional equipment</td>
</tr>
</tbody>
</table>

### At a glance

**Multigrind CA Grinding Machine from Haas**

**Strengths:**
- A rigid machine
- High-precision basic geometry
- Numerous available modules (2,500 total)
- Flexible tool changer
- Structurally well-designed and flexible coolant unit
- Intelligently designed mineral-composite machine body
- Expertise in spindle manufacturing

**Weaknesses:**
- The implementation of a database for service analyses is missing

**Multifunctional X axis**
- Attractive overall design
- Good accessibility
- Own software for NC and PLC
- Numerous preprogrammed grinding cycles
- Dedicated service team

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The A axis can rotate at 2,600 rpm and as such can be used for cylindrical grinding in conjunction with measurement control.

The supply units, such as oil for lubrication, semiliquid grease for the spindle, the cooling unit, and the machine’s pneumatic and hydraulic systems, are all installed in a separate enclosure in an extremely orderly fashion. The systematic design of these units, as well as of the entire machine, can be seen quite clearly here. CAD datasets exist for every part of the machine. This can also be easily understood examining the way the electrical cabinet is set up. And one point of interest is the fact that the machine’s electrical wiring is fed through conduits cast as part of the machine’s mineral-composite body. This minimizes the effort needed to wire up the machine and also ensures that the machine’s interior remains free of wire clutter.

**Tool Changer**
The full flexibility of the Multigrind CA machine is encompassed in the design and configuration of the tool changer. It is designed as a pick-up changer with two segmented wheels that operate independently of one another and can hold a maximum of up to 27 grinding wheels with a diameter of 100 mm. The mounting device for the grinding wheels’ HSK flanges is supported by the base frame using spring-steel packages. These absorb the shock when the grinding spindle latches on, and this increases the useful life of the main spindle as a result. If the operator’s grinding duties require fewer grinding wheels, then a segment of the changer can also be used to store workpieces.

The highlight of the tool changer is the Haas-patented cooling unit. Since the position of the cooling nozzles in relation to the grinding wheel has a significant effect on quality and grinding performance during the grinding process, the design and use of this unit both take on important functions. The coolant unit and corresponding grinding wheel guard can be removed from and mounted to the changer with the main spindle.

When wheels are changed that have different contours, the motor-driven coolant nozzles automatically adjust their height to match the current wheel’s contour. As a result of intelligent wiring within the unit and the unit’s controller, the nozzles for the front and back chambers can be operated independently. This feature is a world’s first, and it ensures that the grinding wheel is always supplied with the ideal amount of coolant.

**Controls**

When it comes to the machine’s control unit, Haas uses the Siemens 840D solution line as its hardware platform. The NC and PLC software and the layout of the user interface were all developed internally by Haas and contain all the necessary features. DLLs (direct library links) are used to program the wide variety of different grinding cycles and to ensure that the structure of the workflow is designed in the optimum manner. Special grinding cycles are programmed by Haas – even 3-D tracks that can be inserted into the grinding wheel using the dresser unit.

**Automation**

Out of all the CA and CB machines Haas has delivered, about 90 percent are equipped with an automatic tool changer and about 70 percent with automated workpiece loading. For loading, robotic solutions are used that are controlled independently from the machine and only communicate with it through interfaces. On the CA machine, these are located on the right side, and they are on the left side of the CB machine.

**Service / TCO**

The service department is comprised of a small, dedicated team of four that is always available; after-hours calls are forwarded to an emergency hotline. If necessary, personnel from the final assembly department can also be called upon. On-site service is offered within 24 hours. If the customer has a maintenance agreement, service can be provided even faster. Technical personnel are always available in the service department; this means customers are provided troubleshooting support over the phone or by modem from the very first step.

All service operations are recorded in a PP system, which makes it possible to conduct life cycle and cost analyses. These are carried out manually; fixed, preprogrammed assessment algorithms have not been defined, however. The daily quality meeting directly covers malfunctions experienced by actual customers, and this backs up the statement: “Two or three malfunctions cannot be allowed to happen one after the other.”

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Edwin Neugebauer
At heart, we have always been inquisitive and love to experiment. And, our world has now been revolving around the wheel for more than 75 years. To be more precise, around grinding wheels – the grinding wheels that are used in our precision grinding machines.

Our company is based in a country whose engineers are noted for their innate drive for perfection and we happen to employ a fair number of them. It comes as little surprise then that our products are always ahead of the times.