2-spindle turning and milling center with 8 axes

HK CON MASCHINENBAU

Fully automated production cell

- Complete machining on one machine bed in 2 set-ups
- Cycle time 240 sec.
- 20 driven tools
- Quality assurance via measuring probe in OP10

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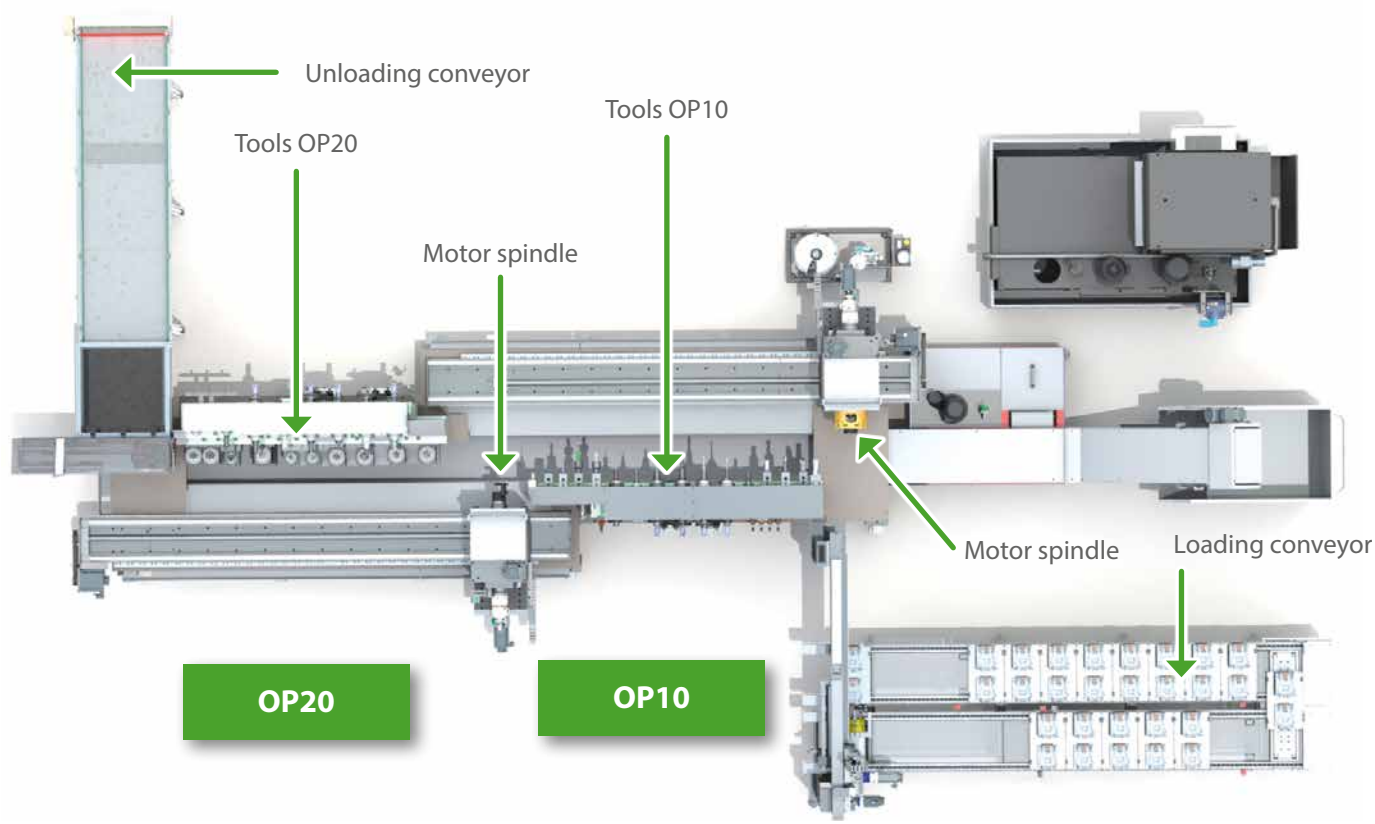
Powerful chipping via robust tool drives



Cycle time: one component in 240 seconds

The cast blank of the brake caliper is machined on the front and rear sides using the opposing horizontal work spindles.

The machine is loaded via a feed belt which is designed as an accumulation belt. The housing blanks do not lie directly on the belt. In order to feed them into the machine in a defined position, two blanks are placed on a pallet; the two blanks to be processed have a slight height difference within the pallet. This double loading of the pallet shortens the accumulation belt and still allows the machine to be self-sufficient for a good 2 hours.

The loading portal with pneumatic gripper picks up the casting blank from the pallet and places it directly into the special chuck.

Centering pins on the chuck ensure that the brake calliper housing is positioned correctly. In addition, the jaw stroke of the chuck is controlled by the clamping travel monitor mounted on the spindle.

This type of transfer enables error-free positioning and centering within the chuck, so that machining of the raw part on OP10 according to the the defined reference surfaces and holes is guaranteed.

The balanced chuck in combination with the spindle speed of 1600 rpm leads to excellent machining results.

A **special feature** of the **machine concept** described here are the Y-axes of the main spindle units. These axes make it possible to design the tool block very compactly on both the OP10 and the OP20, as the tools are arranged one above the other.

This also has the advantage that the travel distances from tool to tool are minimal.

The process-integrated measuring probe is used to measure quality-relevant parameters (length, diameter) of OP10. This data is used for tool correction; it is also used to to ensure the process quality for further processing of the component on OP20.

Direct workpiece transfer from spindle to spindle

OP10

13 tools, 5 of which are driven, machine the brake sliding caliper from the cylinder side in OP10. In this set-up with the brake cylinder centered in relation to the work spindle, the internal turning tools, boring bars and back boring bars create the contour of the brake cylinder inner surface. Cylinder surfaces with different diameters, annular grooves and flat surfaces are produced. In contrast, the driven face milling cutters, step drills, reamers and deburring cutters machine the eccentric flat surfaces, bores and fits for the two sliding bolts.

30 parts self-sufficiency – infeed conveyor as pallet accumulation conveyor

5 driven tools in OP10

The fit of the brake cylinder inner wall produced on OP10 is used as a clamping surface in OP20.

After completion of the machining process in OP10, the housing is transferred directly from the main spindle OP10 to the main spindle OP20, which is equipped with a mandrel holder including air system control.

The OP20 motor spindle is equipped with an additional spindle brake to stabilize the C-axis. It is used to absorb the high torques during machining.

Special chuck OP 10

green = processed areas

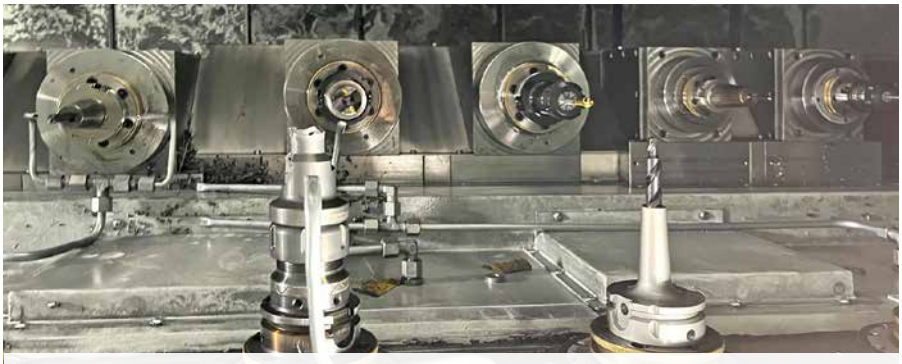
OP20

The rear side of the brake calliper is machined using 15 driven tools. The end mills, ball cutters, disc cutters, drills, taps and deburring tools are used to produce the mounting stop and brake pad sliding surfaces, the retaining bracket lock and the bleed and hydraulic connection.

In order to absorb the large forces generated during machining, the guides of the X and Z axes are reinforced on both sides. A particularly powerful bearing of the main spindle optimally absorbs the machining forces.

Once the machining process is complete, a pneumatic unloading portal removes the finished housing from the mandrel and places it on a 2-track unloading conveyor.

The two-lane design was chosen due to the limited space available at the final location.



15 driven tools in OP20

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Highlights

- **Complete machining of the cast housing in two set-ups on one machine bed**
- **Direct workpiece transfer from main spindle OP10 to OP20**
- **5 driven tools in OP10**
- **Clamping path monitoring in OP10**
- **15 driven tools in OP20**
- **Air system control in OP20**
- **Work spindles with X, Y, Z and C axes**
- **Travel/cycle time-optimized tool arrangement in X and Y direction**
- **Driven tools with HK-CON motor spindles for maximum cutting performance, vibration reduction and internal tool cooling**
- **Optimized, strong guides in X and Z axes with robust bearing package for maximum machining forces**
- **Cycle time 240 seconds**
- **Two-track unloading conveyor**
- **Loading: raw parts aligned via pallet accumulation belt and 2-axis loading gantry, 30 workpieces**
- **Measuring probe in the work area for quality assurance of the inner radius, coupled with tool correction and measurement of the fit for OP20**

Workpiece on OP20 mandrel for rear machining

Probes for quality assurance

Technical data/equipment

- 2 work spindles 23 kW, 130 Nm, maximum 7100 min^{-1}
- Travel per work spindle: X: 2940 mm
  Y: 220 mm
  Z: 340 mm
- 1 special chuck with stop, 1 mandrel
- 20 stationary, driven tools
- Tool holders for the driven tools
  7 HSK-C 40
  13 HSK-C 63
- Performance data of the driven tools:
  14.6 kW / 35 Nm
  8.9 kW / 16 Nm
- 8 fixed tools, Capto C5
- Sinumerik 840 D SL
- Central lubrication
- Cooling lubricant system with compact belt filter and immersion cooler
- Chip conveyor
- Exhaust air unit
- Hydraulic system
- Dust belt with pallets
- Unloading conveyor

Options

- Visualization tool management
- User interface
- Tool breakage monitoring

Machine dimensions

- Dimensions of the main machine (L/W/H):
  7084 mm / 3480 mm / 2870 mm
- Machine dimensions incl. peripherals (L/W/H):
  10960 mm / 6740 mm / 3740 mm

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