

## G 35 – DUAL-SPINDLE MACHINE WITH VERTICAL CONCEPT

Ready for take-off with a new machine design for the 5-cut method: With the Oerlikon G 35 bevel gear grinding machine, manufacturing gearings for the aviation industry has never been easier – or more efficient. The machine is the culmination of tried and tested technology combined with new ideas.



The bevel gears used in the aviation industry are manufactured by the 5-cut method in a fixed setting. This method requires consecutive machining of convex and concave pinion flanks, with different tools and different machine settings. Due to the complex certification procedures for aviation applications, it is not an option to change an existing gear geometry over to duplex gearing, for example, which is processed in a single step with only one tool.

## Optimal for Requirements in the Aviation Industry

Specifically tailored to the requirements of the aviation industry, the newly developed Oerlikon G 35 bevel gear grinding machine (see Fig. 1) takes aviation gear manufacturing to a new level with its two vertical grinding spindles. Tried and tested concepts and components are used to ensure optimal functionality and the best possible availability of spare parts for this special-purpose machine. The technology has been enhanced to include new features that allow for efficient work practices on the machine.

## Optimized Dual-Spindle System ...

The machine concept is based on the current Oerlikon G 30 single-spindle machine. Owing to its high rigidity and thermal stability, this machine achieves optimal machining results in the automotive industry, even in high productive grinding processes. The G 35 is equipped with two grinding heads that can be positioned independently (see Fig. 2). As a result – unlike older dual-spindle concepts with grinding spindles that are positioned in a fixed offset in relation to one another – the second grinding head in this machine presents no additional collision contours that limit the operation of the machine. To ensure rapid positioning of the grinding heads, they are equipped in the main direction of motion (Y1 and Y2) with highly dynamic linear motors, whose design has already been proven in the larger G series machines (G 60 and G 80).

## ... and an Improved Vertical Concept

The advanced vertical concept with concealed door guides and active tray cleaning completely eliminates grinding sludge



Fig. 1: Oerlikon G 35 bevel gear grinding machine with dual spindle

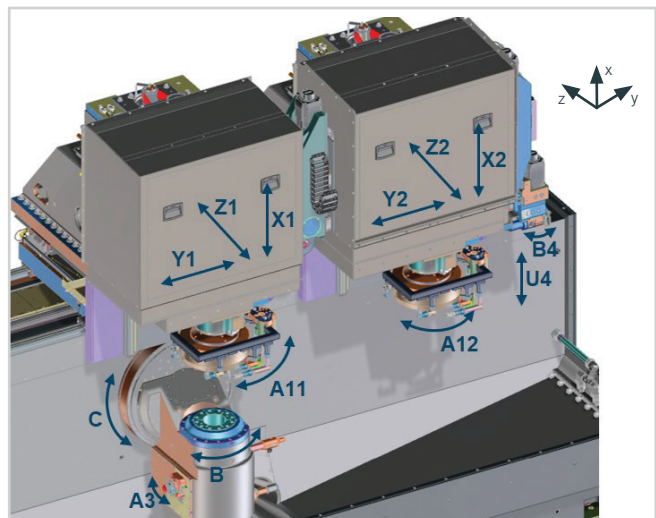


Fig. 2: Axis arrangement of the G 35

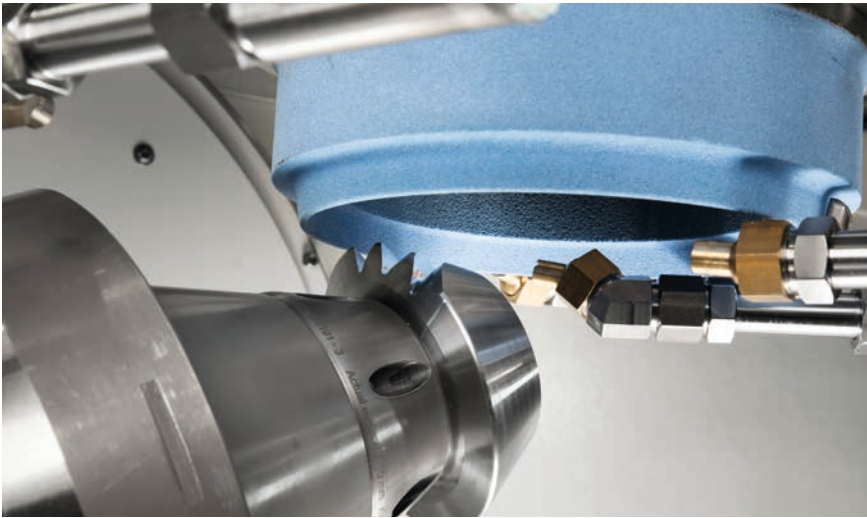


Fig. 3: Vertical machine design for reliable process sequences



Fig. 4: Flexible deburring in the machine

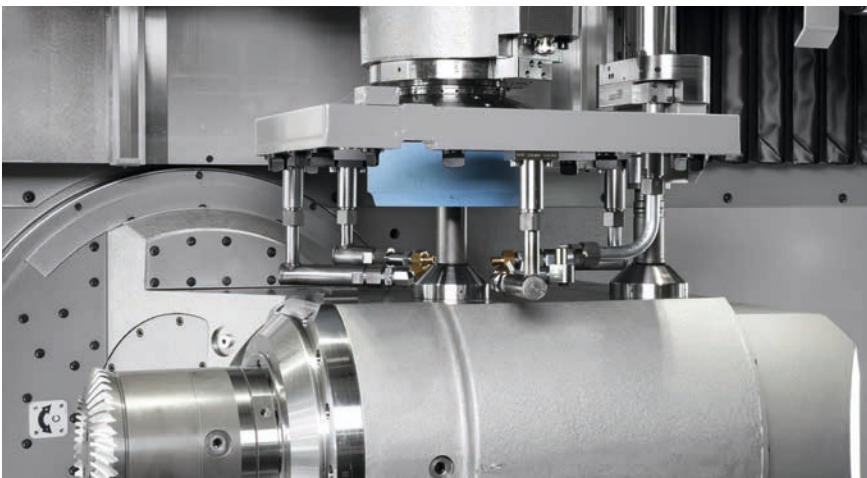


Fig. 5: Automatic pick-up of the grinding wheel and grinding oil supply

deposits in the working chamber. The advantages of this “Clean Cabin Concept” are particularly apparent in deep grinding of gearings. Current tool concepts today enable grinding processes with tremendously high material removal rates – and correspondingly high volumes of grinding sludge. With a power output of 22 kW each, the two grinding spindles (A11 and A12) have ample power reserves to handle even machining jobs of this nature.

The two grinding wheels are profiled with a single dressing device (A3), which is side-mounted on the workpiece axis (C) – as it is in the G 30. For soft machining on the G 35, an integrated deburring spindle (B4) provides the option of precise deburring of the gearings on the abutting face. A tried and tested concept at Klingelnberg – the one used in the C 30 bevel gear cutting machine – was used here as well (see Fig. 4).

## Intuitive Operation and Simplified Setup

The machine’s operating concept is based on the forward-looking KOP-G software interface, which is operated intuitively via a high-resolution touch display. Function keys on the control panel provide direct access to frequently used setup functions. The generous traversing paths of the G 35 make it possible to fully relieve the workpiece spindle (B) for setup work. The clamping device and component can be changed both with horizontally positioned workpiece spindle as well as with gravity-assistance in the vertical direction.

As in the G 30, the coolant supply for the grinding process is provided through a single-piece adapter (oil ring). From there, the individual cooling nozzles can be precisely positioned by means of slip ducts. A high-pressure cleaning nozzle is also put into place from here. For the first time in the G 35, the oil ring and grinding

wheel can be picked up together from a provisioning station on the C axis and connected in a fully automatic manner, significantly simplifying the machine set-up (see Fig. 5).

The G 35 allows dressing of the grinding wheels in two different positions each, in order to shift the unavoidable collision contour of the dressing unit. This provides significantly greater flexibility for optimal adjustment of the cooling nozzles. Thanks to the optional SmartTooling functionality, the current geometry of all available grinding wheels is available as a digital twin. The intelligent dressing program makes it possible for the G 35 to profile grinding wheels starting from an existing profile – whether the as-delivered condition or a previously used geometry – within a very short time for the current machining task.

## Quality Assurance Made Easy

Quality assurance is an important topic in the aviation industry. Contact detection during dressing ensures that the grinding wheel features the fully dressed profile during the entire machining sequence. For quality inspection performed directly on the machine and documentation of the locally ground allowance, the G 35 can be equipped with the KOMPASS measuring functionality (see the article titled “KOMPASS – Measuring Directly on the Machine” on page 20). ◆

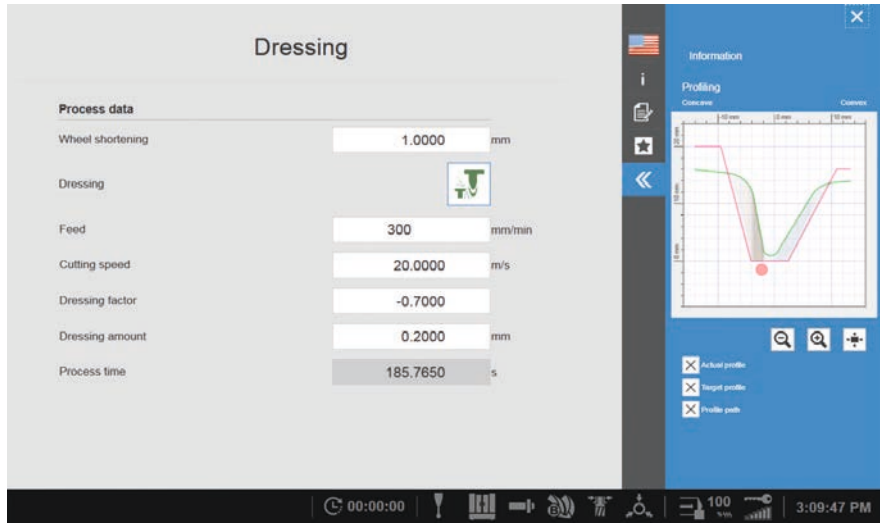


Fig. 6: Dialog window of the intelligent dressing process

## HIGHLIGHTS OF THE G 35

- Two independently positionable grinding heads enable easy setup and maximum flexibility.
- Extremely rigid design and thermal stability for optimal machining results.
- The “Clean Cabin Concept” eliminates grinding sludge deposits in the working chamber.
- Deburring spindle allows precise deburring of the abutting face in deep ground gears.
- Advanced software enables intuitive touch operation.



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