

G 160 · G 250

G 400

Generating and profile grinding machines



G 160 – MAKING GEAR WHEELS QUICKLY

The G 160 generating and profile grinding machine features a unique machine structure, which improves its dynamic rigidity compared to other current machine designs.

The G 160 generating grinding machine from EMAG SU has a new, innovative axis concept. The tangential axis is generated by the interpolation of the Z- and Y-axes on the main stand. This enables the grinding head to be significantly shorter, which in turn increases its dynamic rigidity and also has a positive influence on the gearing quality.

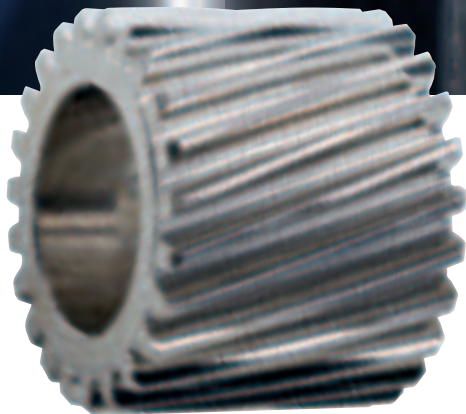
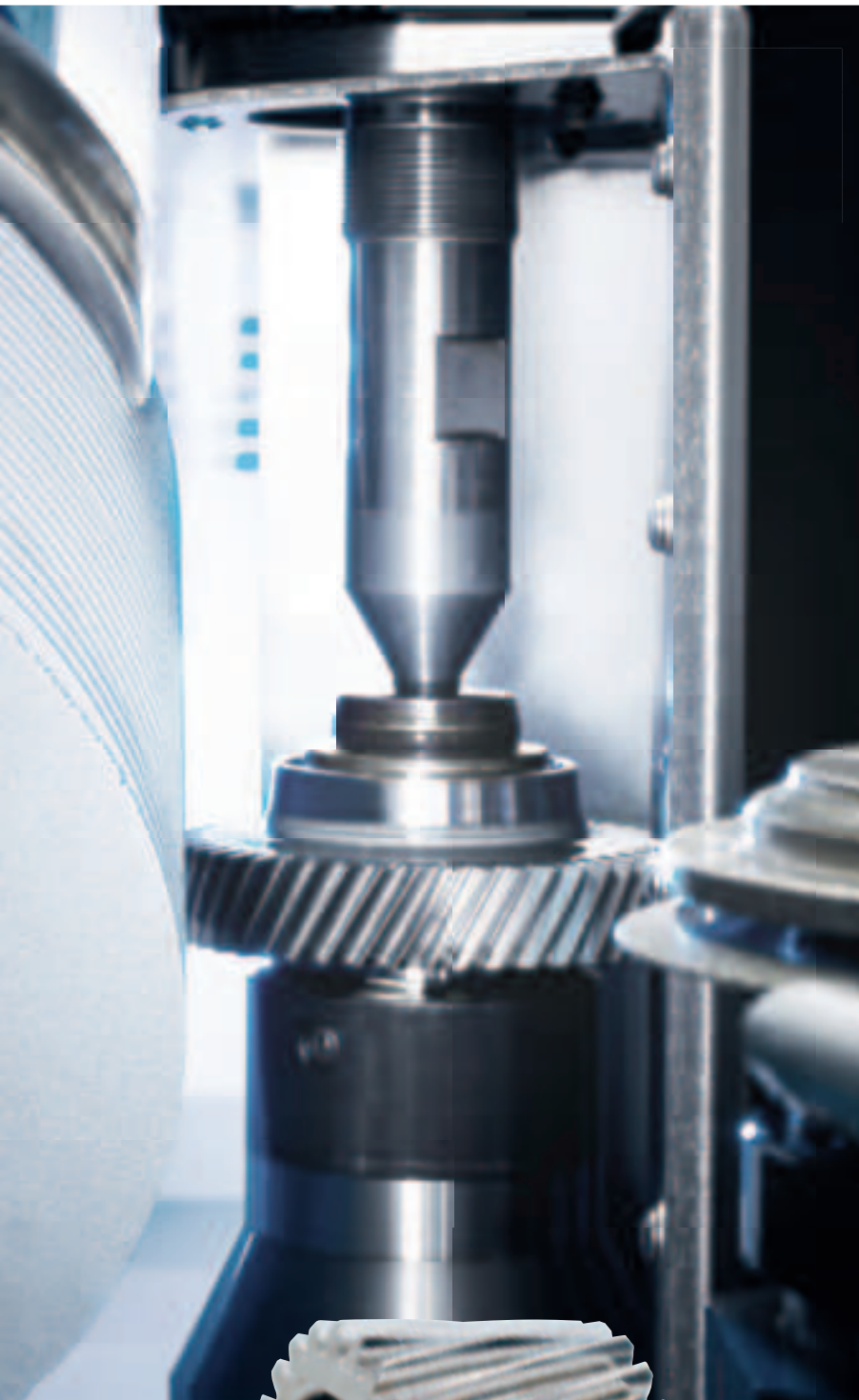
Instead of a turret, two parallel table slides are used, each with a table spindle featuring a direct drive unit. They are powered by two linear motors and are responsible for supplying the workpiece to the tool. These highly dynamic linear motors can move the workpiece from the loading position to the machining position very quickly, which significantly reduces the cycle time of small planet and gear wheels.

The simultaneous movement of all axes results in a chip-to-chip time of less than 2 seconds. The raw parts are also centered on the actual workpiece tables at the same time as another part is being machined.

This ensures that the tools can be reset and the workpiece clamped quickly. To change the grinding worm, it moves into an ergonomic changing position, so that it can be changed easily by the operator. The grinding worm is overhung and is clamped on the spindle by grinding wheel flanges. There is an automatic balancing system in the grinding spindle. In addition, the coolant jets are adjusted by the CNC axis once the grinding worm has been dressed.

The G 160 generating grinding machine is significantly faster than comparable machines on the market simply because of its extremely short chip-to-chip time and idle times. Gear wheels can be produced very quickly without increasing the risk of grinding burn. It is the best technical solution with its high dynamic rigidity and up-to-date processes such as polishing and fine grinding, topological grinding and a software package for noise-reduced gear wheels and is also one of the fastest machines on the market.





AT A GLANCE

- + Fastest machine on the market with two parallel spindles
- + Chip-to-chip time 1.6 sec.
- + Innovative axis concept with linear motors in the two X-axes
- + Good vibration properties of the machine due to the short distance between the contact point of the grinding wheel and the swivel plate, fewer "ghost frequencies" on the gear wheel
- + No cables in the machining area
- + Generating grinding only
- + Fine grinding
- + Polish grinding
- + Topological grinding
- + Grinding noise-reduced surfaces

AXES OF G 160

- X** Tool stand radial movement
- Y** Grinding head tangential movement
- Z** Grinding head vertical movement
- A** Tool head swiveling
- B1** Tool spindle rotation
- B2** Dressing spindle rotary movement
- B7** Coolant jet swiveling
- C1** Tool spindle 1 rotation
- C2** Tool spindle 2 rotation
- C3** Work table rotation
- C4** Probe swinging in
- W** Vertical movement for positioning retainer

G 250 – PROFILE AND GENERATING GRINDING

The EMAG SU G 250 is a very modern, extremely flexible generating and profile grinding machine, which is available in two versions – the standard G 250 and G 250 HS with high-speed grinding head.

The EMAG SU G 250 has been specially developed for extremely short cycle times and the efficient, very high quality large-scale production of wheels with outer diameters up to 250 mm and shafts up to 550 mm in length.

The G 250 features double workpiece spindles that are mounted on a turret. The centering sensor can be installed either on the NC coolant jet (moved using the NC axes for lots of workpiece changes) or in the form of a swing-in sensor on the loading and unloading position, resulting in the elimination of almost all unproductive idle times. Special attention was given to state-of-the-art solutions, which enable fast tool changing and feature a quick clamping device.

Generating and profile grinding wheels as well as dressable ceramic and galvanically coated CBN grinding worms can be used.

The G 250 generating and profile grinding machine is very flexible as it can be used to machine both shafts and gear wheels. In addition, workpieces with collision points can also be ground using small generating grinding worms and profile grinding wheels.

The G 250 HS, with a high-speed grinding spindle (HS), is particularly well designed for small workpieces as, in addition to small generating grinding worms, very small profile grinding wheels can be used on it due to its high spindle speed. Dressable ceramic, dressable CBN and galvanically coated CBN wheels can be used. The retooling time from profile to generating grinding is very short as both processes take place on the main spindle.

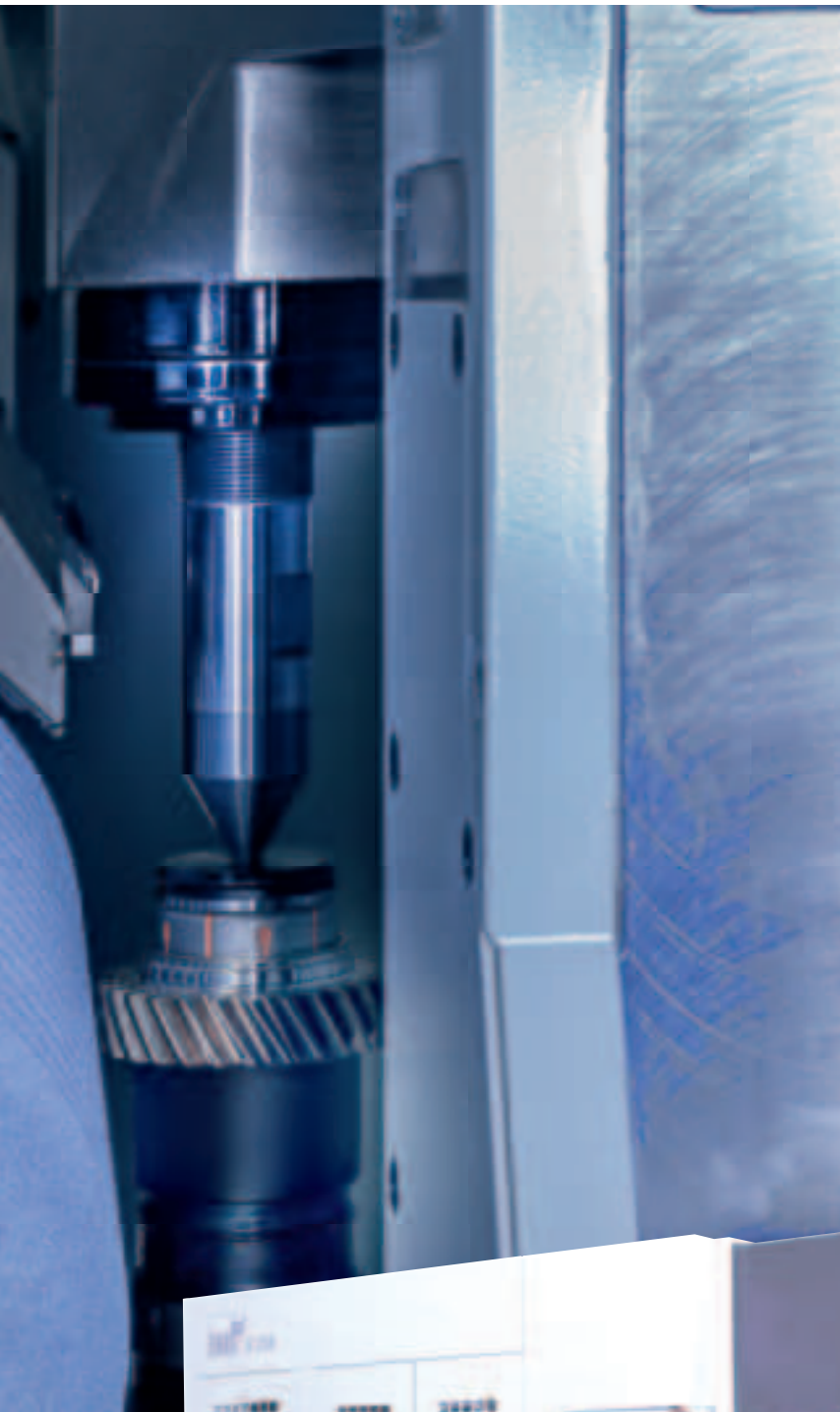
The strengths of this unique machine include automation and extreme ease-of-use.



GEAR GRINDING: MAXIMUM EFFICIENCY FOR A SECURE INVESTMENT

The grinding spindle can hold very wide generating grinding worms, which significantly increases the tool service life. This means that both fine grinding and polish grinding worms can be used. Furthermore, generating grinding wheels with very small outer diameters can be used for workpieces with collision points. This means you can use the most suitable production process or the most efficient combination to complete your grinding work.

The extremely high acceleration rates and absolute top speeds of the rotary and linear axes guarantee excellent production times, and also enable you to benefit from future developments in the grinding tool sector. With universal quick clamping systems for mass production, even changing the tool does not take up any more valuable time than is absolutely necessary.



AT A GLANCE

- + Optimized direct drives for tool spindles and workpiece spindles with independent cooling circuits
- + No cables in the machining area
- + Axial travel 400 mm
- + Grinding worms of different sizes with root diameters from 250 to 68 mm
- + New enlarged working range
- + Use of small generating grinding wheels with a usable root diameter of at least 68 mm
- + Generating grinding worm wheels and profile grinding wheels on the main spindle
- + Standard tool and workpiece clamping systems
- + Custom-designed solutions for every application
- + Grinding any type of workpiece and complex geometries
- + Power and speed reserves for future developments in the tool sector
- + Quick clamping device for workpiece clamping
- + Fine grinding
- + Polish grinding
- + Topological grinding
- + Grinding noise-reduced surfaces



G 250 WITH HIGH-SPEED GRINDING HEAD (G 250 HS WITH COLLISION POINTS USING PROFILE AND GEN

The G 250 HS differs from the standard G 250 due to its high-speed grinding head and lower axis spacing between the table axis and grinding head axis, so that small profile grinding wheels can be used.

Compared to the standard machine, this machine is also suitable for the production of large quantities of profile-ground components. Gear motors, in particular, feature a large number of components, such as push-in pinions in electric motors, with collision points and small numbers of teeth. These can only be produced using profile grinding. It is also possible to produce components with generating grinding. The centering process can be carried out on either the loading or unloading side using a swing-in centering sensor during the machining process or it can also be installed on the coolant jet and positioned using a NC axis. This does not take place during the machining process, but delivers benefits for retooling if a large range of different parts has to be machined.

Retooling from generating to profile grinding can be completed in a minimum of time and takes place on the main spindle.



G 250 HS – FLEXIBLE, EFFICIENT DRESSING USING STANDARD PROFILE DRESSING ROLLERS

The dressing unit is in the 90° position on the turret. It can hold both dressing wheels for generating grinding and for profile grinding. All conventional dressing operations can be used on EMAG SU generating grinding machines.

The possibility of using conventional profile dressing rollers in the machine will save you costs and guarantee the rapid availability of the dressing tool. Double sheaves, set profile rollers or multi-rib dressing rollers can be used depending on requirements.

S) FOR MACHINING SMALL GEAR WHEELS GENERATING GRINDING



AT A GLANCE

- + The workpiece can be loaded/unloaded during machining.
- + Optional automatic loading and unloading of the workpiece
- + Optional tool changing
- + Workpieces with collision points can be ground by using small grinding wheels.
- + High speeds in the grinding spindle mean that high cutting speeds are possible even with very small profile grinding wheels.
- + Fine grinding
- + Polish grinding
- + Topological grinding
- + Grinding noise-reduced surfaces
- + No cables in the machining area

DIFFERENCES BETWEEN G 250 AND G 250 HS

The G 250 HS differs from the standard G 250 in two respects:

- + Lower axis spacing than on the standard version
- + The grinding head can be operated at higher speeds and is more suitable for grinding using small profile grinding wheels.

Profile and generating grinding takes place on the main spindle, which delivers benefits in the heat management of the grinding spindle compared to the attachment spindle and requires fewer corrections for the first components. In addition, retooling from profile to generating grinding is possible in a very short time. This means, in particular, that workpieces such as gear wheels with collision points can be ground without any additional equipment.

Ceramic generating grinding wheels can be used for generating grinding. Ceramic, galvanic CBN or dressable CBN grinding wheels can be used for profile grinding.

G 400 PROFILE AND GENERATING GRINDING MACHINE WITH ONE TABLE SPINDLE

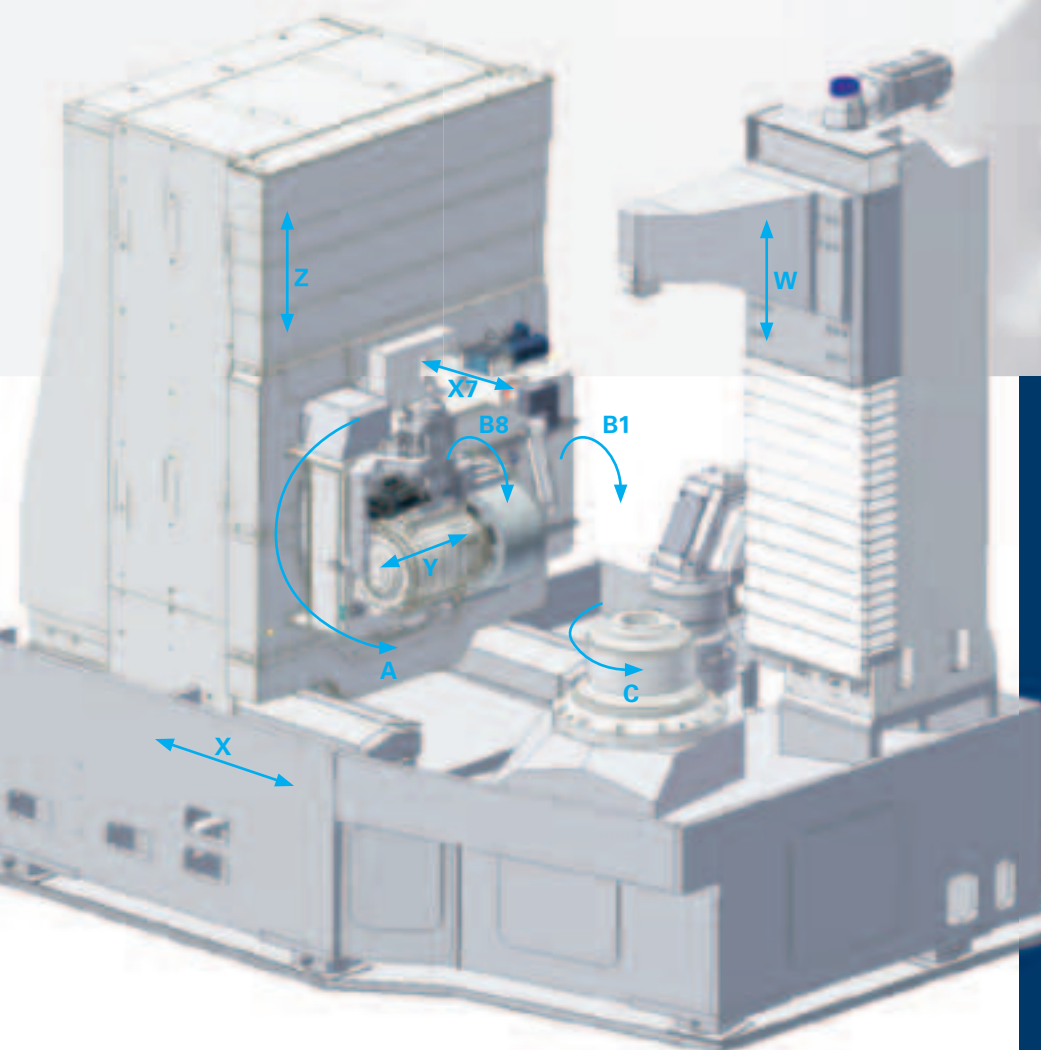
The G 400 stands for maximum flexibility and ergonomics and has been specially developed for the small and medium series production of wheels and shafts with a length of up to 750 mm.

Gear wheels and long shafts can be machined extremely well on the machine as a result of its long axial travel. Profile grinding also enables the operator to produce prototypes and single parts. Small and medium production runs can be produced economically using generating grinding.

The G 400 machine features a stationary work table. The workpiece is loaded/unloaded straight onto and off the workpiece spindle. The machine also has an L-shaped door, so that it can also be loaded using a crane. The machine can also be loaded automatically by a robot through a loading door.

During a workpiece change, the grinding wheel continues to turn while the machine operator changes the workpiece safely. As the machine remains in motion at all times, this results in benefits in terms of the thermal and mechanical stability of the machine components and for changing workpieces in manual mode.

The dressing device is mounted on a swiveling arm, which swings into the machining area to dress the workpiece. The G 400 can also carry out all types of dressing operations.



G 400 AXES

- A Tool head swiveling
- B1 Tool spindle rotation
- B8 Coolant jet swiveling
- C Tool spindle rotation
- W Vertical movement for positioning retainer
- X Tool stand radial movement
- X7 Oil jet movement
- Y Grinding head tangential movement
- Z Tool head slide vertical movement

AT A GLANCE

- + Ideal for small and medium gear wheel production runs
- + Easy loading/unloading of the work-piece and tool set-up
- + High thermal and mechanical stability
- + Machine suitable for gear wheels and shafts
- + Fine grinding
- + Polish grinding
- + Topological grinding
- + Grinding noise-reduced surfaces
- + No cables in the machining area

TECHNICAL DATA

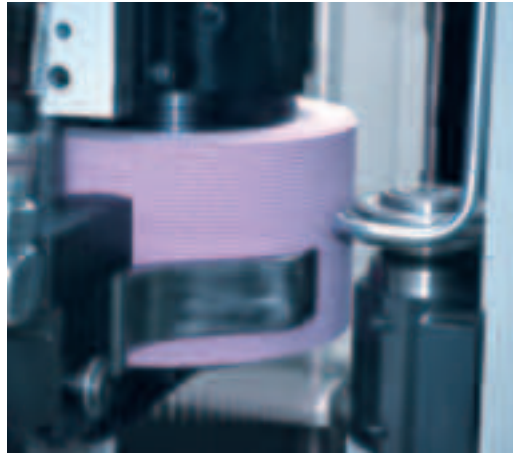
| | | G 160 | G 250 | G 400 |
|---|------|-----------------|-----------------|-----------------|
| Max. workpiece diameter | mm | 160 | 250 | 400 |
| | inch | 6 | 10 | 16 |
| Module range | | 1 – 3 | 0.5 – 7.0 | 0.5 – 8.0 |
| Max. workpiece length | mm | 300 | 550 | 750 |
| | inch | 12 | 21 | 30 |
| Max. face width | mm | 180 | 380 | 380 |
| | inch | 7 | 15 | 15 |
| Max./Min. generating grinding worm diameter | mm | 275/210 | 160/115, 120/70 | 300/220 |
| | inch | 11/8 | 6/4, 5/3 | 12/8 |
| Grinding wheel width | mm | 160 | 180/150/110 | 160 |
| | inch | 6 | 7/6/4 | 6 |
| Dressing tool diameter | mm | 123 | 123 | 123 |
| | inch | 5 | 5 | 5 |
| Control system | | Siemens 840D SL | Siemens 840D SL | Siemens 840D SL |
| Number of workpiece tables | | 2 | 2 | 1 |
| Profile grinding | | x | ✓ | ✓ |

TECHNOLOGIES



Centering

- + Adjustable centering sensor in height and diameter
- + In-process centering on the G 160 and G 250 (HS)



Dressing

- + Multi-rib dressing wheel
- + Solid dressing wheel
- + Double sheave with separate head dressing device



Topological grinding

- + Twists occur on slanted and crowned gears. EMAG SU generating grinding machines can compensate for this:
 - Low-twist
 - Reverse twist
 - Right and left flanks with different twists.
- + This is possible without additional machine axes, using the standard solid dressing roller.
- + Easy entry for corrections and type of compensation by the machine operator

GEARING MEASUREMENT AND AUTOMATION OPTIONS

Automation options: maximum productivity with minimum idle times

Depending on the application, EMAG SU generating grinding machines can easily be fitted with various automation solutions to produce parts in smaller or larger batches with shorter throughput times while still maintaining maximum quality at lower costs.

Generating grinding machines can be automated with a robot or swivel loader, for example, installed near the machine to take care of the workpiece loading and unloading process.

Additional operations can then be integrated in the loading cell, such as oil dippers, measurement operations, NOK and SPC compartments and workpiece storage facilities such as stacking cells or pallet magazines. We have the perfect solution for every application.



Fine and polish grinding

- + Fine grinding: The grinding wheel consists of two ceramic grinding wheels bonded to each other
- + Polish grinding: The grinding wheel consists of a ceramic grinding wheel and a synthetic resin grinding wheel bonded to each other.



Noise-optimized grinding

- + The texture on the surface can be modified using special software.

GEARING MEASUREMENT

A swivel arm moves the probe into the correct position and is then withdrawn from the machining area during the grinding process. The profile, flank line and individual part discrepancies can be measured. The measurement results can be saved to a USB stick or displayed on the control system.

- + Completely integrated process in the EMAG SU dialog program
- + Immediate print-out of the test report
- + Withdrawal of the measuring unit from the machining area during the grinding process



AT A GLANCE

- + Low-noise gears
- + Fine grinding
- + Polish grinding
- + Topological grinding
- + Measuring on the machine

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