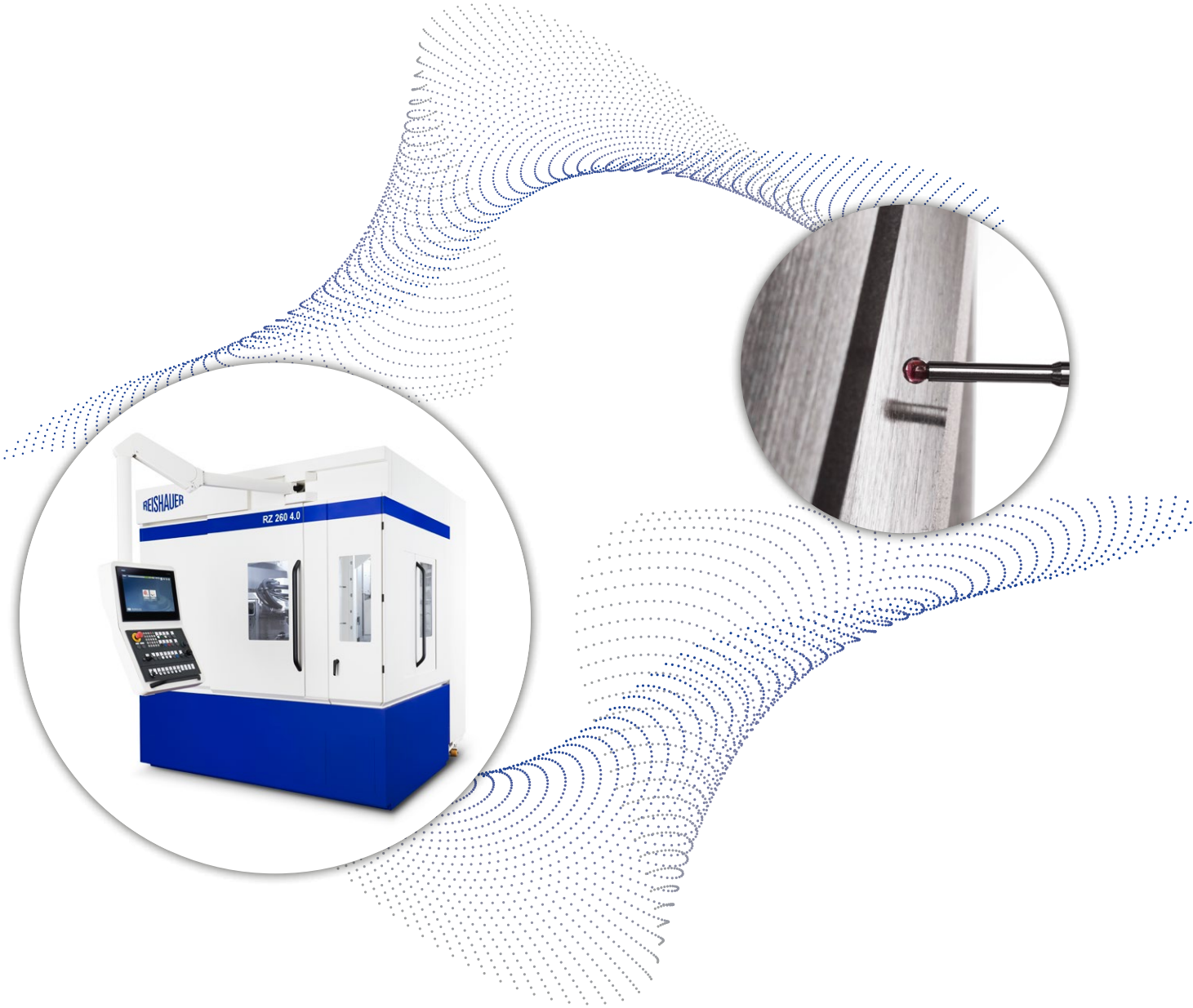
REISHAUER

Gear Grinding Technology

Closed Loop Process



Grinding and measuring closely geared

Swiss Precision.
Made by Reishauer.

As far back as the development of the world's first generating grinding machine, Reishauer has had a huge impact on modern transmission production through its continuous drive for innovation. Our high-tech gear grinding machines, pioneering digital applications, efficient tools and state-of-the-art clamping fixtures enable the production of durable, efficient and quiet transmissions.

Top quality and precision thanks to innovation

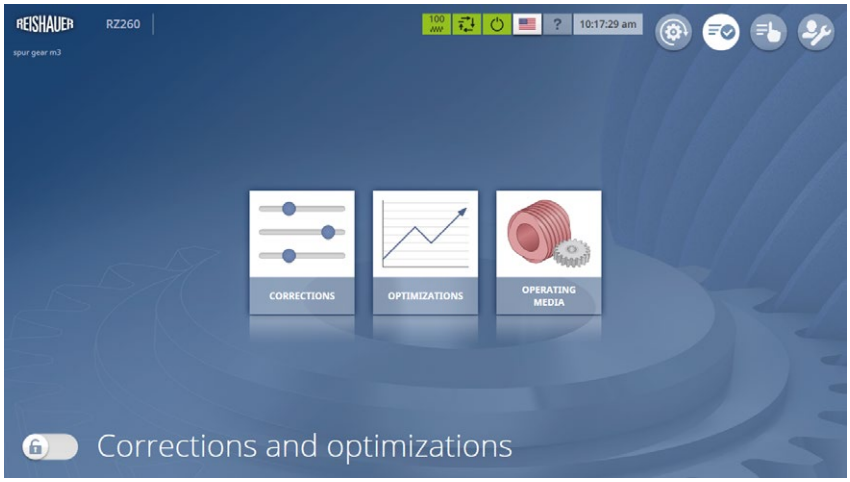
Reishauer is further contributing to the digitalization of gear and transmission production with its closed loop process. This increases productivity when manufacturing efficient, high-performance transmissions and innovative drive trains.

Greater productivity due to digital data synchronization

The closed loop process supports you in making the setup process for grinding machines as efficient as possible and in producing workpieces that are consistently within tolerance during series manufacturing.

Grinding and measuring need to act hand in hand. Every time a grinding process is set up, the desired target features and the actual ground features of the gear need to be aligned. The grinding process is not complete until the gear is within the desired target tolerance.

The closed loop process is optimized in order to prevent misinterpretations, incorrect entries or mismatches (double spindles). This minimizes time spent on the unproductive setup process and allows production to start sooner. Measuring data for SPC parts ejected from ongoing production are also available promptly on the grinding machine. In both cases, it is no longer necessary to manually assign data, thus maximizing the output of OK parts.



The closed loop process...

- ... reduces delays in the evaluation of measuring data
- ... digitizes data synchronization, making the entire process more stable
- ... clearly assigns the actual values to the target values (including for individual spindle values)
- ... initiates the automated suggested corrections from the grinding machine
- ... supports machine operators whatever their level of experience in making uniform corrections

Direct, clear comparison of target and measuring data

Stabilization of processes thanks to digitalization

The digital closed loop process supports operators in speeding up and stabilizing the setup and grinding process. The GDE format (Gear Data Exchange Format according to VDI/VDE 2610) is used as the open interface between machining and measuring systems. This enables the direct and clear comparison of target and measuring data, which in turn reduces errors and eliminates delays.

Measuring protocols cannot get mixed up and the measurement results are interpreted based on data. The physical distance between the grinding machine and the measuring device, which can have an impact in large production facilities, makes no difference to the transmission of measuring data.

What the Gear Data Exchange enables:

- Partially automated corrections during the setup and grinding process
- Digital process control, increase in overall process capability
- Exchange of basic data between the measuring device and the machine
- Measuring protocol for visual inspection at the machine in familiar graphic layout
- Digital measuring protocols can be saved for 100 % traceability
- Automatic, digital data collection for QA and AI

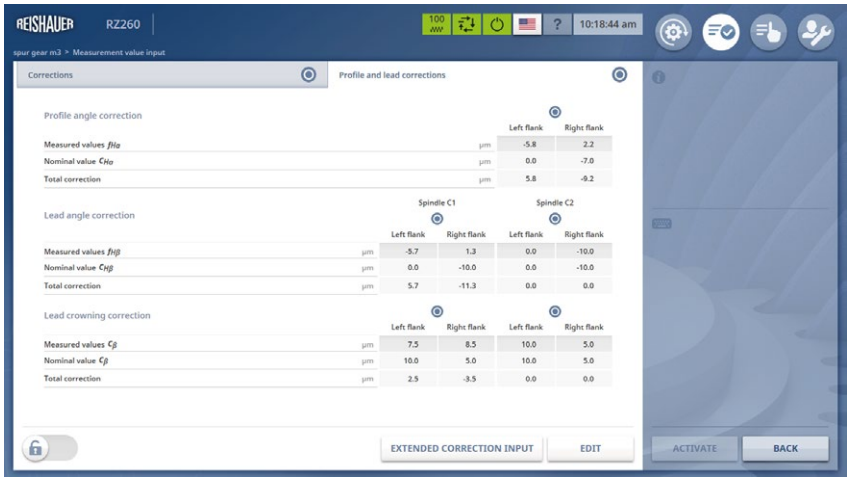
One of the goals of the continuously expanding GDE format is to create an automated control circuit that requires as few manual interventions as possible. Reishauer is directly involved in the further development of the GDE (Gear Data Exchange) format.

Grinding and measuring act hand in hand

The GDE file not only enables the clear transfer of target data between the grinding machine and the measuring device, but also indicates the correct machine, spindle and workpiece assignment. The measuring data transferred to the grinding machine forms the basis for calculating the automatic suggested corrections.

Automatic suggested corrections

Based on the deviations from the target values taken from the GDE file, the grinding program automatically calculates a suggested correction, which must be confirmed by the operator. These can be displayed on the operating panel of the grinding machine in order to visualize the measurement results. This saves having to deal with paper protocols and supports the operator in deciding whether manual adjustments are necessary. The suggested corrections can be implemented unchanged or with manually adjusted values. It is also possible to reject the entire suggestion.



Definitions (depending on GDE version)

- Reference range
- Sign definition
- Measurement instruction

Read-in measurement values

- Amount of profile angle deviation $f_{H\alpha}$
- Amount of lead angle deviation $f_{H\beta}$
- Amount of lengthwise crowning C_{β}
- Diametral dimension over balls M_{dK} or chordal measurement W_k

Possibility of retrofitting existing systems

All Generation 4.0 Reishauer machines can be used in closed loop operation. They are set up in the factory to calculate automatic suggested corrections. Under certain preconditions, predecessor models from machine number 78355 can be retrofitted for the closed loop process.

An increasing number of measuring instrument suppliers support GDE format 3.1, which forms the basis for the closed loop process. We are here to answer any questions you may have, and are happy to put our comprehensive gear teeth expertise at your disposal.

Prerequisites for grinding machines

- Reishauer generating grinding machine with RZControl software

Prerequisites for measuring devices

- Gear measurement device with GDE data connection
- GDE version 3.1 and higher

The infrastructure for networking the grinding machine and the measuring device must be provided by the customer.

The Reishauer Circle of Competence

The Reishauer Circle of Competence describes the entirety of our offering. Reishauer offers products and services around the grinding process completely from one source and thus guarantees a long service life of the machine system at low life cycle costs.

Machine

A broad portfolio, future-oriented controls, and interface concepts, and state-of-the-art grinding technologies – for decades, our machines have guaranteed the highest possible output with maximum precision, consistent quality, and unmatched machine availability.

Automation

Automation "Made by Reishauer". Our automation solutions are perfectly matched to our machines and keep pace with their high output. Modular in design, they can be flexibly tailored to your production needs.

Tooling

Perfectly matched, consistent in quality, and with guaranteed availability: Together with the machine, Reishauer tooling forms the backbone for your successful grinding processes.

Technology

With the development of powerful e-drives, the requirements for quality, surface finishes, and efficient gear geometries have increased significantly. Reishauer grinding technologies enable you to meet your customers´ most demanding requirements and help you remain competitive. Our technology experts are at your side with advice and support.

Digital

System integration, in-depth process analyses, predictive maintenance – the requirements for Industry 4.0 solutions are extremely complex and diverse. Reishauer offers you a constantly growing portfolio of digital services to maximize the potential of your machine.

Services

The reliability of our machines, and thus machine availability, is of central importance for your competitiveness. Shortest reaction time, a worldwide extended network of service engineers, and decentralized spare parts stores guarantee you maximum availability.

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