Eckelmann Group

Electrical Design, Control Cabinet Construction and Software Development for Wafer Production Grinding Machine

For the high-precision grinding machine SiC OD GRINDER Q2, our Erfurt subsidiary REX Automatisierungstechnik took over the complete machine automation. This system is unique for processing hard and brittle materials — such as SiC boules, blanks for silicon carbide wafers.

"In the development of precision machines, our engineering teams are reliable sparring partners for all areas of software development!"

Uwe Schulz | Sales Manager REX AT

logomatic GmbH | Case Study Semiconductors, SMT

Objective

Silicon carbide is the material of the future: The composite semiconductor material, whose properties offer enormous efficiency improvements over silicon, is a central component of innovative and growing applications in power electronics, such as in electromobility or servo drives. The technology enables enormous cost savings due to its lightweight, compact design. However, the demanding production of wafers is complex and critical. They are especially difficult to process due to their mechanical properties.
logomatic GmbH has taken on this challenge to meet the increased requirements and developed the machine SiC Boule Grinder Q2. This system is unique for processing hard and brittle materials — including SiC boules, blanks for silicon carbide wafers. Due to its proven software know-how, REX Automatisierungstechnik GmbH has taken on the complete software development of the production grinding machine for logomatic, in addition to electrical design and control cabinet construction. A "typical customer project," says Sales Manager Uwe Schulz.

The Customer

As part of the Könnemann Group, logomatic GmbH, based in Mainaschaff, designs and builds external cylindrical grinding machines for hard and brittle materials such as silicon, sapphire, and silicon carbide (SiC) to the highest technological standards. Company owner Ronny Könnemann has consistently oriented logomatic towards the growth-intensive global semiconductor market, focusing on processing silicon carbide blanks, known as boules.

Performance by Eckelmann

As a partner of logomatic, the Erfurt subsidiary REX Automatisierungstechnik took over the electrical design, control cabinet construction, software development, and commissioning in the development and production of the system.

- Hardware for the control panel, including Eckelmann CNC control technology and I/O system
- Industrial PC
- Machine wiring
- Software development for PLC and HMI
- Integration of sensor technology
- Digitalization package for visualization
- Optimization of service and support with the help of the digital twin

In addition to drive technology, products from the Eckelmann Group (CNC control E°EXC 89, I/O modules, and the IPC) were delivered.

In the machine, the SiC boules are first ground from the uneven outer diameter to the target size. In a subsequent second processing step, the flat is ground according to a predefined angular alignment without reclamping.

REX AT is the partner for the software development of the machine as well as the integration of the relevant measurement technology: measuring probes, AE sensors (acoustic emission sensors), and spindle sense (sensor for grinding pressure monitoring).

› REX Automatisierungstechnik GmbH took on the complete software development of the production grinding machine for logomatic, in addition to electrical design and control cabinet construction. In the machine, the SiC boules are first ground from the uneven outer diameter to the target size, and then the flat is ground according to a predefined angular alignment without reclamping.

Application

The outer diameter of the workpiece is ground to the desired size with the Q2. In addition, orientation markers such as flat and notch are ground according to the previously measured orientation without reclamping.

The machine impresses with absolute process stability. For this, the grinding spindle is mounted on a high-precision and hermetically sealed transverse and feed slide.

Operation is semi-automatic (manual workpiece clamping remains), and the program sequences are fully automatic: grinding, workpiece measurement, grinding wheel compensation, and dressing. The workpiece spindle is directly driven.

The REX AT application continuously monitors the grinding process. The workspace is completely enclosed. The machine is equipped with an AE sensor for collision monitoring and innovative sensors for grinding pressure monitoring.

A separate centrifuge was connected to the machine and linked via an interface in the software. To ensure smooth operation, warnings from the centrifuge are displayed on the machine's HMI.

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Processing incl. Flat **6 Inches**	Processing incl. Notch **8 Inches**	Max. Workpiece Length **60 mm**
Grinding Process / Workpiece Spindle Speed **200 U/min**	CNC Axes **3**	Development Time for Electronics and Software **6 Months**

Special Features

› The HMI is user-friendly and can be operated via a touch monitor. REX AT relies on a self-developed software framework consisting of HMI, PLC, and digitization tools. Machine processes can be configured in a sequence editor.

› Additionally, we use a digital twin of the machine to test program sequences in advance on the virtual model. This makes development more efficient and shortens the commissioning time on the real machine.

› The recipe-specific adjustment of program parameters takes place via the user-friendly HMI. These are automatically transferred to the DIN program.

Do you have any questions?

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