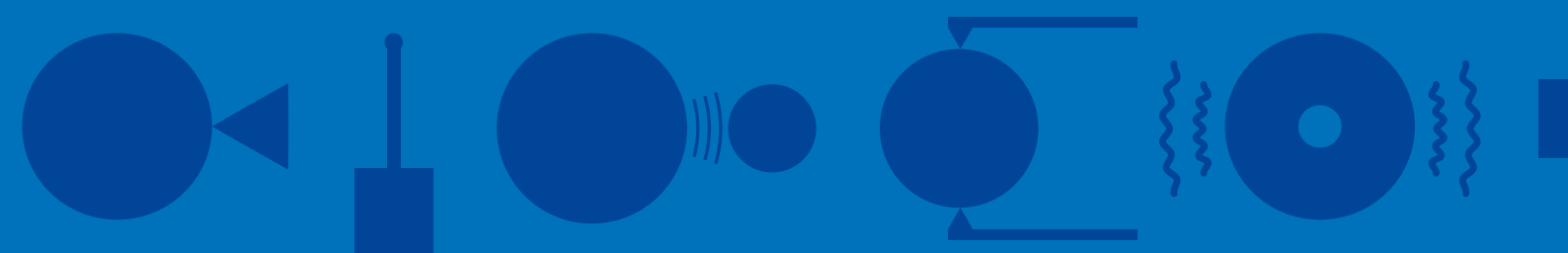
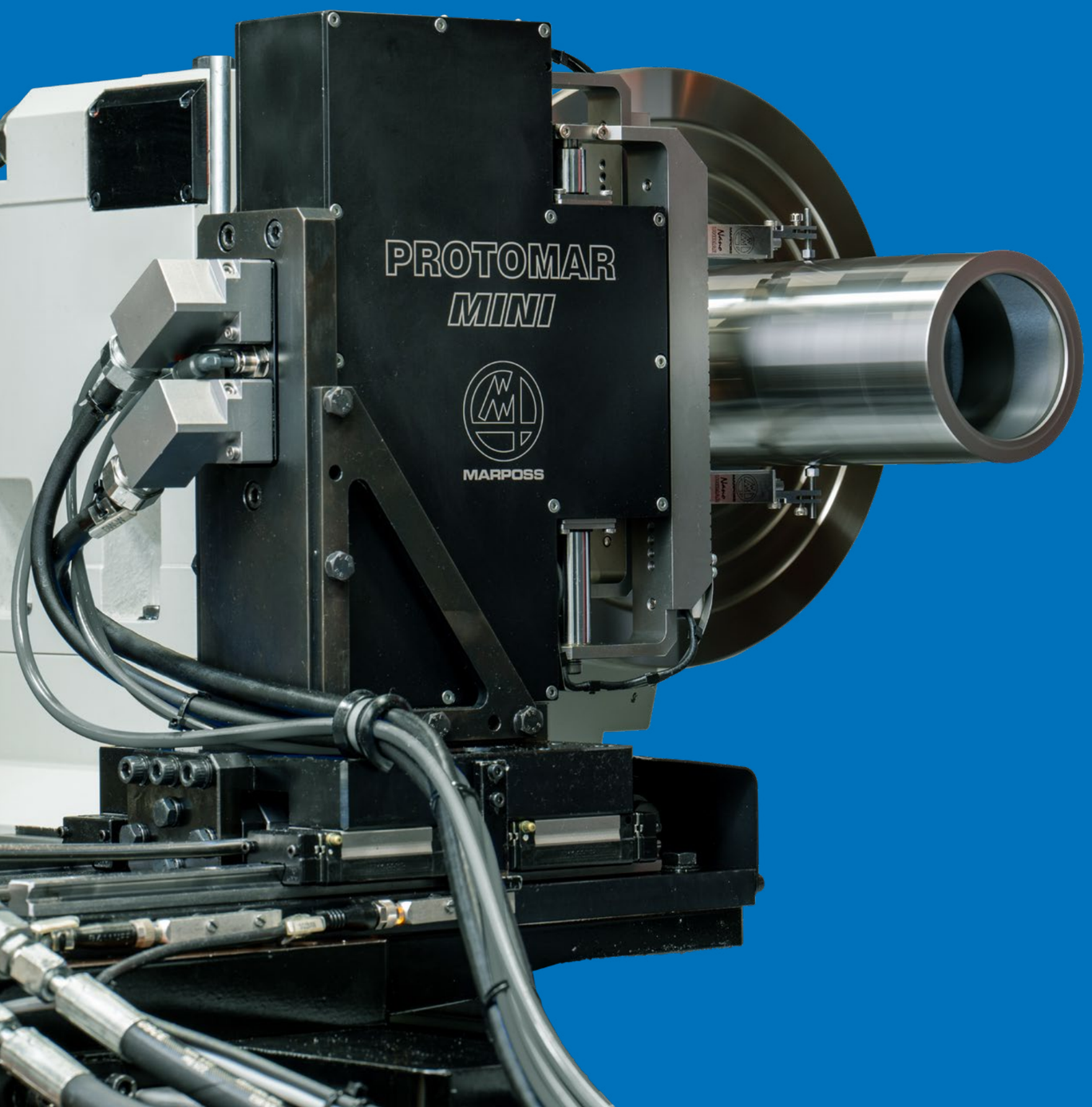
MARPOSS

GRINDING LINE

REFERENCE GUIDE





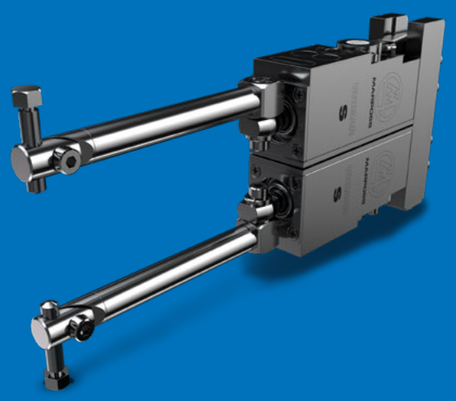
GRINDING LINE

REFERENCE GUIDE

In modern manufacturing, the ability to maintain efficient, reliable, and cost-effective production is a strategic priority.
In grinding operations, product quality, defined by surface finish and dimensional accuracy, depends heavily on the stability of the process. Even minor deviations can result in non-conformities, rework, or costly downtime.
Ensuring process stability is not only a matter of part quality: it also impacts overall equipment effectiveness and production planning.
Machine monitoring systems play a key role in this context. By providing continuous feedback on process conditions, they allow for early detection of anomalies, enable corrective actions to be taken in real time, and reduce reliance on manual checks or operator intervention.

In addition to supporting product quality, monitoring systems help optimize machine performance by adjusting process parameters dynamically. This leads to shorter cycle times, better utilization of grinding wheels and machine components, and ultimately a more stable and cost-efficient operation. Moreover, by monitoring the machine through the installed sensors and improving working conditions through actuators, we can extend its lifetime. As a result, monitoring is increasingly seen not just as a quality control tool, but as a core element of modern process management.
The ability to export and analyze process data allows manufacturers to monitor and correlate key parameters across different operations, leading to deeper insight and a more comprehensive understanding of their production processes.

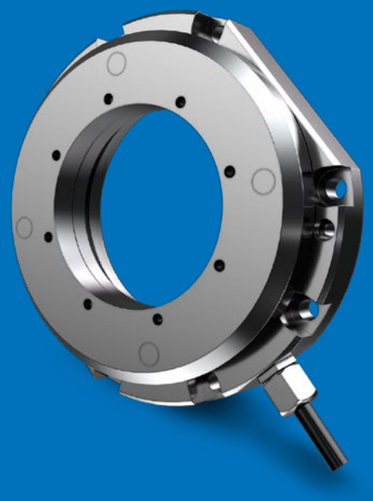
- DRESSING CYCLE
- WHEEL IMBALANCE COMPENSATION
- PART POSITIONING / PHASING
- GAP ELIMINATOR CYCLE
- IN-PROCESS / POST-PROCESS MEASUREMENT
- DATA EXPORTING



MEASUREMENT SENSORS - DIMENSION MONITORING

In-process measurement plays a fundamental role in optimizing the grinding cycle. Monitoring the actual size of the workpiece, as it is ground, allows for precise control of the wheel infeed, ensuring that stock removal is efficient without compromising accuracy. As the workpiece approaches its final dimensions, the system automatically reduces the grinding wheel infeed to maintain the workpiece dimension, achieving a superior surface finish, while shortening the overall cycle time. Measurement systems are not limited to in-process applications.

Post-process measurement provides valuable data on both the dimensions and geometry of the finished part. By detecting any deviation from target specifications, it enables early corrective actions, helping to reduce scrap, avoid rework, and maintain consistent production quality. This added layer of control supports better process stability and lowers overall production costs.



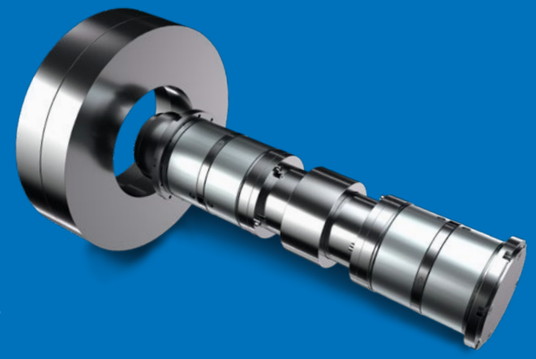
ACOUSTIC EMISSION SENSORS

During grinding and dressing operations, machine components generate high-frequency acoustic signals, often in the ultrasonic range, that can be measured and reveal valuable information about the process. Acoustic Emission sensors, installed at strategic points on the machine, capture these signals in real time and transmit them to an amplifier for continuous monitoring and analysis.

Monitoring acoustic emissions helps maintain the process in optimal working conditions. Changes in the signal can be related to variations in grinding wheel contact, wear, or the first signal of collision events. Detecting these changes promptly, allows for immediate corrective action, minimizing the risk of damage, reducing tool wear, and preserving workpiece quality.

AE sensors are fundamental for cycle-time optimization. One key application is the detection of the initial contact between the grinding wheel and the workpiece, commonly referred to as the “air grinding” phase. By precisely identifying the first point of contact, the system can reduce unnecessary non-cutting time, streamlining the process without compromising the process.

WHEEL IMBALANCE COMPENSATION



Grinding wheel performance is a critical factor in achieving consistent part quality and preserving machine integrity. As the spindle accelerates and the wheel rotates, even minor imbalances, whether in the wheel itself or the clamping system, can generate significant forces. At high rotational speeds, these forces translate into vibrations that negatively impact surface finish, accelerate wheel wear, and shorten spindle bearing life.

Automatic wheel balancing systems detect and correct imbalance conditions in real time. By actively compensating for imbalance, these systems help eliminate vibration at the source, ensuring smoother operation and preventing workpiece chatter marks.

Maintaining optimal balance throughout the process, extends machine and wheel lifespan, contributes to long-term process stability and reduces the risk of unplanned downtime.

PROBING SENSORS

Probing devices are essential tools for automating setup within the grinding process. Integrated directlyin the machine, on dedicated linear or rotating actuators, they allow for accurate detection of part position, orientation, and reference surfaces before grinding begins.
This ensures that each cycle starts from a known and repeatable condition, reducing setup time and minimizing the risk of positioning errors.
By integrating probing systems, manufacturers benefit from more stable processes, reduced manual intervention, and improved part-to-part consistency, especially in high-mix or precision-critical production environments.
Probing can also be used to verify the condition of critical tooling elements, such as the grinding wheel, the dresser, or a tool, supporting automated compensation routines when wear or deviations are detected.
Scanning probes can also be used as an effective solution for pre- and post-process part analysis, providing detailed dimensional verification and acting as an integrated certification tool directly within the machine.

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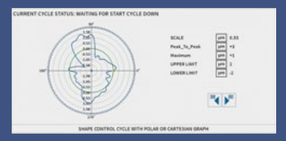
OD GRINDING

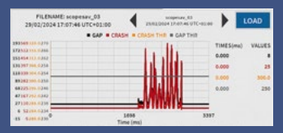
PART POSITIONING

Touch probes are used for precise part positioning. Repeatability and isotropy performance can be optimized based on the application needs.



POST-PROCESS MEASUREMENT SHAPE CONTROL

Software for pre- and post-process workpiece geometry checks. It helps define new cutting programs before grinding and ensures that geometric tolerances are met after the grinding cycle.

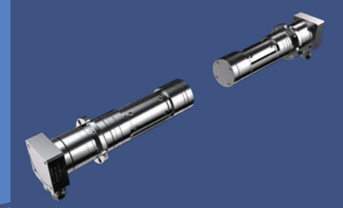


DATA EXPORTING

The BLÚ recording channel enables the acquisition of data from all connected Marposs sensors and devices within the system. Access to this information allows users to analyze and correlate process variables, gaining deeper insight into machine performance and helping to identify potentially critical conditions. Data export is also available through OPC UA. The goal is always the integration with higher-level monitoring and control systems.

DRESSING CYCLE | FIXED AE SENSOR

Acoustic Emission monitoring analyzes the high-frequency signals generated when the grinding wheel comes into contact with the dresser. The sensor can be installed in different positions on the machine: on the spindle, inside the spindle, on the grinding wheel support flange, or on the dresser.



DUAL PLANE WHEEL BALANCING

The system detects and compensates dynamic spindle imbalance on two planes using high-precision acceleration sensors, together with two balancing heads. By automatically shifting compensation masses, the system neutralizes the imbalance and reduces vibration during operation. The design also allows the integration of an Acoustic Emission sensor, enabling simultaneous monitoring of grinding process conditions.

GAP ELIMINATION CYCLE | INTEGRATED AE SENSOR

By detecting the exact moment of contact between the grinding wheel and the workpiece, the integrated Acoustic Emission sensor allows the machine to optimize the approach feed rate. This minimizes unnecessary “air grinding” time, improving cycle efficiency while maintaining full process control.

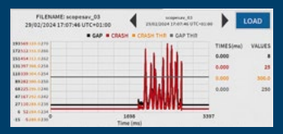
IN-PROCESS GAUGING

Unimar is the most flexible solution for process control on grinding machines, combining the functions of in-process, pre-process, and post-process measurement in a single system. This makes it ideal for a wide range of precision measurement applications, enhancing both accuracy and efficiency.

ID GRINDING

THRU-SPINDLE IN-PROCESS GAUGING

Thruvar gauges are designed to be installed inside the machine spindle and allow for the measurement of internal diameters directly during the grinding process. Available in different sizes and measurement ranges, they provide high accuracy and reliability while maximizing process efficiency, also for reciprocating cycles. Continuous in-process control helps reduce cycle time and ensures consistent part quality.



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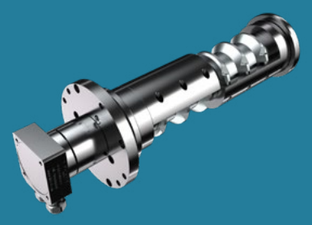
GAP/CRASH CYCLE | FIXED AE SENSOR

By detecting the exact moment of contact between the grinding wheel and the workpiece, the Acoustic Emission sensor allows optimization of the approach feed rate, reducing unnecessary “air grinding” time.

Adaptive acoustic cycles can be implemented to optimize the process both for large production batches and for single-part machining. In the event of abnormal contact or crash conditions, the system can immediately stop the machine, helping to prevent damage to the workpiece and the machine components.

ROLL GRINDING



SINGLE PLANE WHEEL BALANCING

The system compensates for grinding wheel spindle imbalance by combining a high precision acceleration sensor with an integrated balancing head.

Imbalance is detected in real time and corrected by automatically repositioning compensation masses within the head, neutralizing vibration at the source.

The design allows for the integration of an Acoustic Emission sensor, enabling simultaneous monitoring of process conditions and wheel balance from a single unit.

GAP ELIMINATION CYCLE | INTEGRATED AE SENSOR

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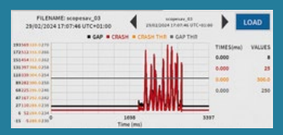

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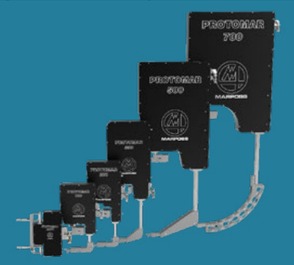


IN PROCESS AND POST PROCESS MEASUREMENT

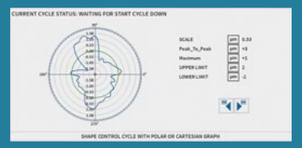
PROTOMAR is a high-precision, wide-range absolute measurement gauge designed for flexibility and performance. It can measure any diameter within its range without the need for manual retooling or recalibration when switching between different diameters, making it ideal for high mix production environments.

The gauge delivers excellent accuracy and repeatability, on both smooth and interrupted

surfaces, and it is suitable for both in-process measurement and post-process shape verification.

Its versatility supports continuous quality monitoring throughout the grinding cycle and ensures compliance with strict tolerance requirements.

PROTOMAR can also be integrated with non-destructive (ND) inspection systems to provide a comprehensive view of part quality



SURFACE GRINDING

IN-PROCESS MEASUREMENT

On surface grinding machines, the gaging system can measure the workpiece while the table is in motion, providing real-time feedback to the machine control. This enables immediate dimensional corrections during the grinding cycle, ensuring that the final size remains within the specified tolerances.

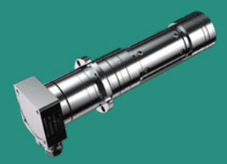
GAP ELIMINATION CYCLE | INTEGRATED AE SENSOR | DRESSING CYCLE | FIXED AE SENSOR

Acoustic Emission sensors can monitor both the gap elimination and dressing cycles. By detecting the exact moment of contact between the wheel and the workpiece or dresser, the system ensures precise timing and control of the operation. This improves process stability, reduces non-cutting time, and helps prevent unnecessary tool wear. Acoustic Emission monitoring also analyzes the high-frequency signals generated when the grinding wheel comes into contact with the dresser. The sensor can be installed in different positions on the machine: on the spindle, inside the spindle, on the grinding wheel support flange, or on the dresser.

SINGLE PLANE | FLANGE TYPE WHEEL BALANCING

The system compensates grinding wheel spindle imbalance by combining a high-precision acceleration sensor with a flange-mounted balancing head. Imbalance is detected in real time and corrected by automatically repositioning compensation masses within the head, compensating vibration at its source.

ORBITAL GRINDING

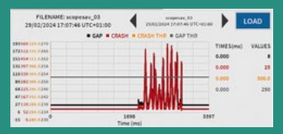


SINGLE PLANE WHEEL BALANCING

The system compensates for grinding wheel spindle imbalance by combining a high precision acceleration sensor with an integrated balancing head.

Imbalance is detected in real time and corrected by automatically repositioning compensation masses within the head, neutralizing vibration at the source.

The design allows for the integration of an Acoustic Emission sensor, enabling simultaneous monitoring of process conditions and wheel balance from a single unit.



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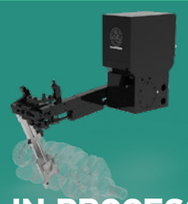


IN PROCESS AND POST PROCESS MEASUREMENT

FenarL and e-Fenar are designed for in-process and post-process measurement on orbital grinding machines. Their design enables accurate gauging of both main and pin journals of eccentric workpieces, without interfering with the grinding wheel.

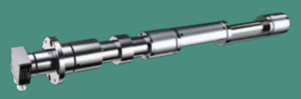
Available with either electromechanical or hydraulic actuation, these systems offer flexible integration depending on the machine configuration and application requirements. Their robust construction and high precision make them a reliable solution for maintaining dimensional control in orbital grinding operations, as well as for post-process shape controls.

GAP ELIMINATION CYCLE | INTEGRATED AE SENSOR | DRESSING CYCLE | FIXED AE SENSOR

Acoustic Emission sensors can monitor both the gap elimination and dressing cycles. By detecting the exact moment of contact between the wheel and the workpiece or dresser, the system ensures precise timing and control of the operation. This improves process stability, reduces non-cutting time, and helps prevent unnecessary tool wear.

Acoustic Emission monitoring also analyzes the high-frequency signals generated when the grinding wheel comes into contact with the dresser. The sensor can be installed in different positions on the machine: on the spindle, inside the spindle, on the grinding wheel support flange, or on the dresser.

CENTERLESS GRINDING



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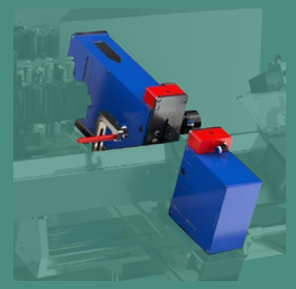


POST PROCESS MEASUREMENT

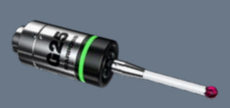
The Grindline system uses a laser gauge installed at the grinder's output to measure the diameter of each workpiece after grinding.

After cleaning, the parts pass through the laser beam, where hundreds of measurements are taken along the axis. An advanced software filters out shape irregularities such as chamfers, threads, or emulsion residues, ensuring accurate diameter readings. The measured values are compared with the nominal tolerances and, if required, the system automatically compensates for wheel wear, maintaining process stability and dimensional consistency.

SCRAP REJECTION

An optional air jet station can be installed downstream of the laser gauge to automatically remove parts that fall outside the defined tolerance limits. This ensures that only compliant components continue along the production line, supporting a fully automated quality control process without the need for manual sorting.

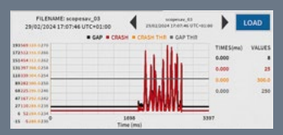
GEAR GRINDING



POSITIONING + POST PROCESS MEASURING CYCLE

Combining touch and scanning capabilities in a single probe, the G25 represents an innovative solution for pre- and post-process gauging on gear grinding machines and machining centers.

By performing measurement and verification directly inside the machine, the system eliminates the need for external metrology checks, avoiding unloading, transport, and possible reloading operations. High-speed scanning significantly reduces cycle time compared with conventional multi-touch probing cycles, while ensuring reliable measurement and process control.



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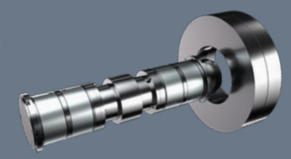

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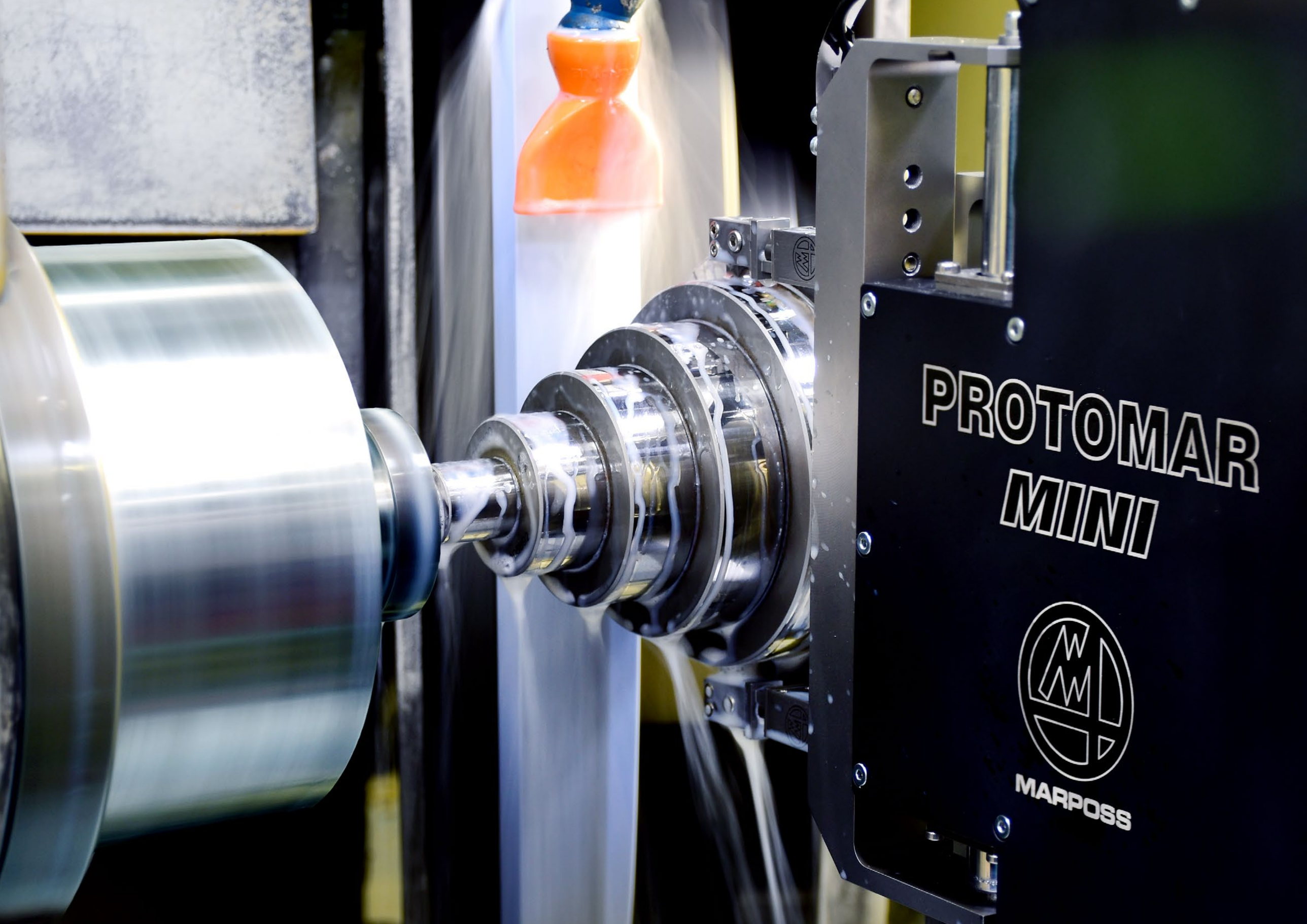
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