Consistent Surface Finishing with **AksIM Encoders**

CASE STUDY

Customer:
AMTOS Solutions, Croatia

Industry:
Robotics

Challenge:
Maintaining precise force control in surface finishing applications.

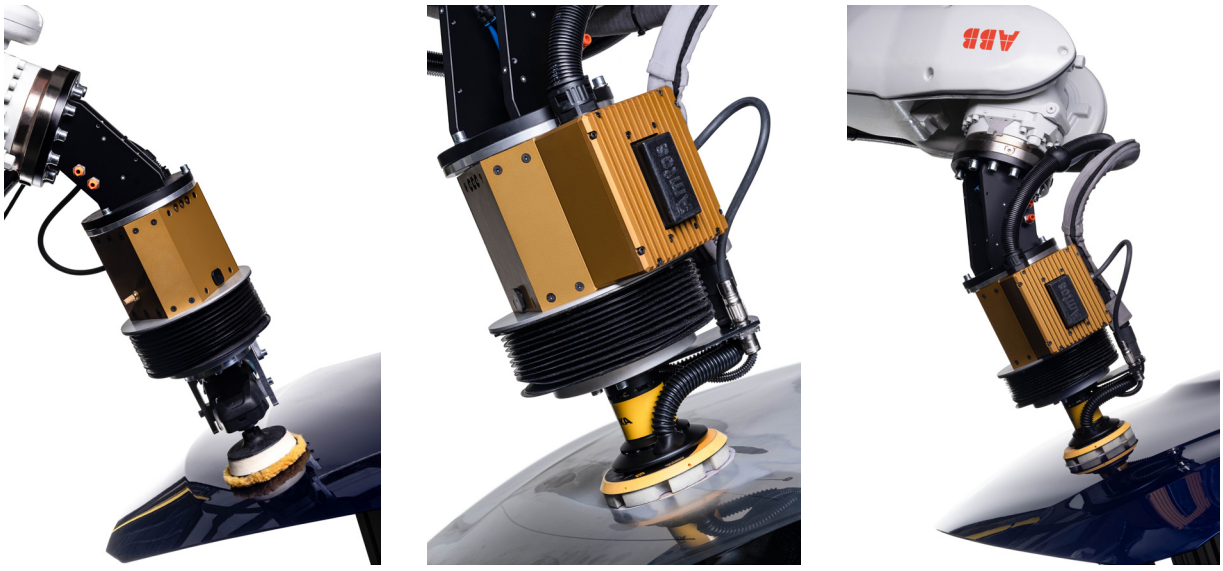
Solution:
AksIM-2™ off-axis absolute magnetic encoder

BACKGROUND

Manufacturers increasingly rely on automated grinding, sanding and polishing systems to improve productivity while delivering consistent, high-quality surface finishes. These applications require precise control of the contact force as the tool moves across surfaces with varying geometries and tolerances. Even small deviations can affect the quality of the finished part.

AMTOS Solutions, a Croatian technology company, developed the patented **AMTOS Force Control Unit (FCU)**, a fully electric device for adaptive force control in surface finishing applications. Designed for use on industrial robots and machine tools, particularly for sanding and polishing parts with complex geometries, the FCU helps maintain controlled contact with the workpiece throughout the process, providing a precise electric alternative to conventional pneumatic force control systems.

AMTOS Force Control Unit



The Force Control Unit in polishing, sanding and grinding applications

CHALLENGE

To achieve reliable force control, the FCU needed a servo system capable of responding rapidly to changing surface conditions while maintaining stable, repeatable motion. The system had to deliver accurate control across a wide force range while minimising overshoot, ensuring both high-quality surface finishes and protection of the tool and workpiece.

The application also presented demanding mechanical constraints. The encoder had to fit inside a custom hollow-shaft axial servo motor while operating reliably in an environment exposed to dust, abrasive particles and vibration. This ruled out many conventional feedback technologies and required a solution that combined compact dimensions, high accuracy and long-term durability.

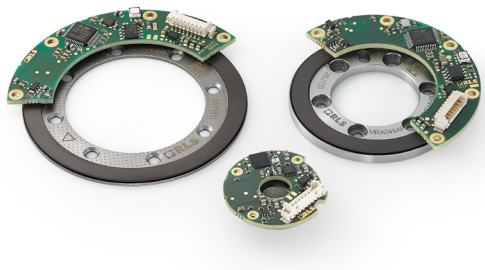
SOLUTION

AMTOS integrated the **RLS AksIM-2™ off-axis absolute magnetic encoder** directly into the custom hollow-shaft axial servo motor. There, it provides continuous position and velocity feedback for the FCU's closed-loop control system.

The encoder's hollow-ring, compact and non-contact design enabled straightforward integration into the motor while preserving the available installation space. Its magnetic operating principle also ensured reliable performance in grinding and polishing environments, where contamination and vibration can limit the effectiveness of other sensors.

Continuous high-resolution feedback allows the control system to regulate motor movement with great precision, enabling smooth force transitions, rapid response to changing contact conditions and accurate tool positioning. Absolute position information is available immediately after start-up, simplifying system initialisation and operation.

During development, AMTOS evaluated alternative feedback technologies, including resolvers. However, the AksIM-2 encoder proved to offer the best combination of compact integration, robustness and performance for the application.



AksIM-2 magnetic encoders

RESULTS

The integration of the AksIM-2 encoder helped AMTOS successfully bring its fully electric Force Control Unit to market, offering manufacturers a high-performance alternative to traditional systems.

The FCU delivers consistent force regulation across a wide operating range, allowing automated surface finishing processes to achieve improved surface quality, greater process stability and more repeatable results.

The encoder's reliable operation in harsh industrial environments also contributes to long-term system performance while reducing maintenance concerns associated with conventional sensing technologies.

Building on the success of the original design, AMTOS has already introduced a smaller version of the Force Control Unit using another RLS encoder, demonstrating the scalability of the solution for future product developments.

FUTURE GOALS

AMTOS is currently optimising the Force Control Unit for large-scale production while continuing to expand its portfolio of surface finishing and force-control solutions. The company also plans to further develop smaller FCU variants, with advanced RLS encoder technology remaining a key component of future products.

> *The RLS encoder is not a peripheral component but a foundational element without which the FCU's force control precision, response speed, surface quality outcomes and operational reliability would not be achievable.*
>
> *– AMTOS Solutions*

ABOUT AMTOS SOLUTIONS

AMTOS Solutions is a Croatian technology company developing fully electric force-control solutions for industrial applications. Its patented AMTOS Force Control Unit (FCU) is designed for surface finishing processes such as grinding, sanding and polishing and can be integrated with industrial robots and machine tools. Through advanced force-control technology, AMTOS helps manufacturers improve surface quality, process consistency and automation.

For more information visit **amtos-solutions.hr.**

ABOUT RLS

RLS is a Renishaw associate company. RLS produces a range of robust magnetic rotary and linear motion sensors for applications such as industrial automation, metalworking, textiles, packaging, electronic chip/board production, robotics and more.

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