



Kuka and Kollmorgen Collaboratively Engineer Optimized Motors for Compact Robots

Kuka's compact robots in the KR Agilus series are precise, agile and fast. As agile systems, these five- and six-axis handling units feature short cycle times and high repeatability, particularly for pick-and-place tasks. Synchronous servo motors from Kollmorgen's AKM series play a major role in achieving this high dynamic performance and precision. Through collaborative engineering, the two companies were able to reduce the installation volume of the motors compared to standard models, implement robot-specific applications, and optimize the entire supply chain.

As fast all-arounders, the robots in the KR Agilus series are particularly suitable for general industrial applications. With a deadweight of 51 kg, the basic model can support loads up to 6 kg, making these compact robots ideal for process automation in the packaging, electronics, food and pharmaceutical industries.

The success of these robots depends on short cycle times and extreme precision—made possible by Kollmorgen's ability to modify its high-performance servo motors to meet Kuka's specific needs. As a collaborative engineering partner, Kollmorgen adapted the design of its AKM synchronous servo motors to make them fit perfectly in the joints of the KR Agilus robots.

Kuka needed a motor manufacturer that could supply custom motors with very high power density. AKM motors are known for their extremely high torque-to-volume ratio. By adapting this best-in-class technology to Kuka's strict requirements, Kollmorgen was able to further increase the solution's power density and cement a productive partnership.

The project quickly evolved in the direction of collaborative engineering. The objective was to find ways to implement custom performance improvements and structural assembly adaptations without sacrificing the advantages of industrial series production.

Although Kuka's requirements could not be met with off-the-shelf motors, the team wanted to avoid a full-scale development project with all the associated risks. Maintaining standardization, availability and quality would be crucial.

The aim was to optimize standard motors by making controlled modifications. With custom adaptations such as cable strain reliefs, modified bearing shells, Kuka-specific connector configurations or special drilled holes in the output shaft, a motor manufacturer could reliably maintain the majority of its standardization. But is that still possible when the entire design geometry is fundamentally changed?

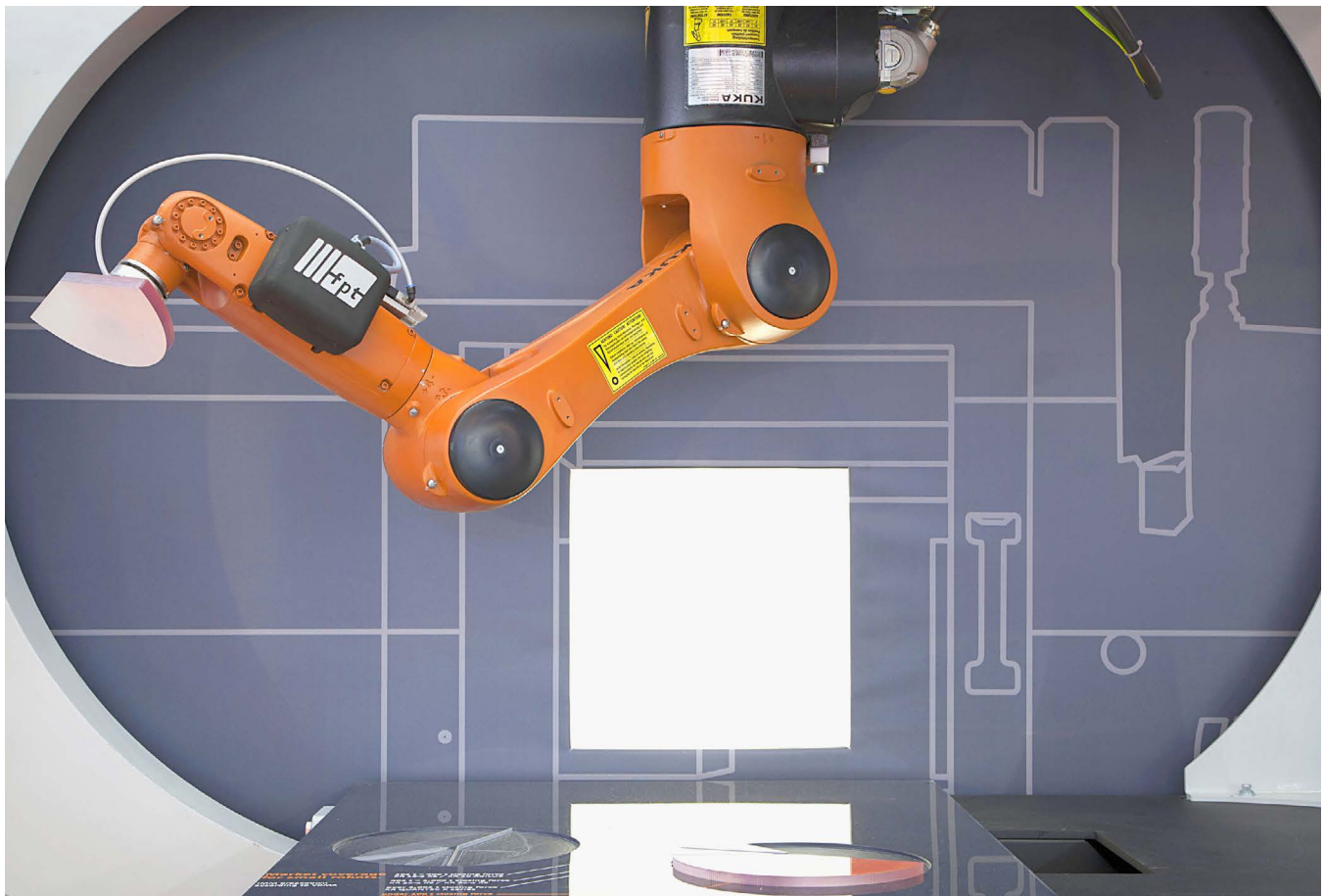
Tucked away in the wrist joint

That is exactly what Kollmorgen achieved with the smallest servo motor in its AKM series. Already very small from the start, the motor had to be made even thinner to fit compactly into the wrist joint of the robot.

The collaborative-engineering process started off with 3D models and outside contours, and in the end it involved working with detailed design data. Now only the internals of the AKM1 motor in the KR Agilus robot are the same as its counterpart in the standard product line.

In addition, the motion-system specialist manufactures motors for the Augsburg-based robot foundry in optimized production cells with custom test processes and quality-control procedures, as well as specific packaging for transporting the motors directly from the assembly line to Kuka.

To round out the quality management picture, Kollmorgen's branch in Bruno, Czech Republic, conducted a failure mode and effects analysis (FMEA) for the two coordinated processes.

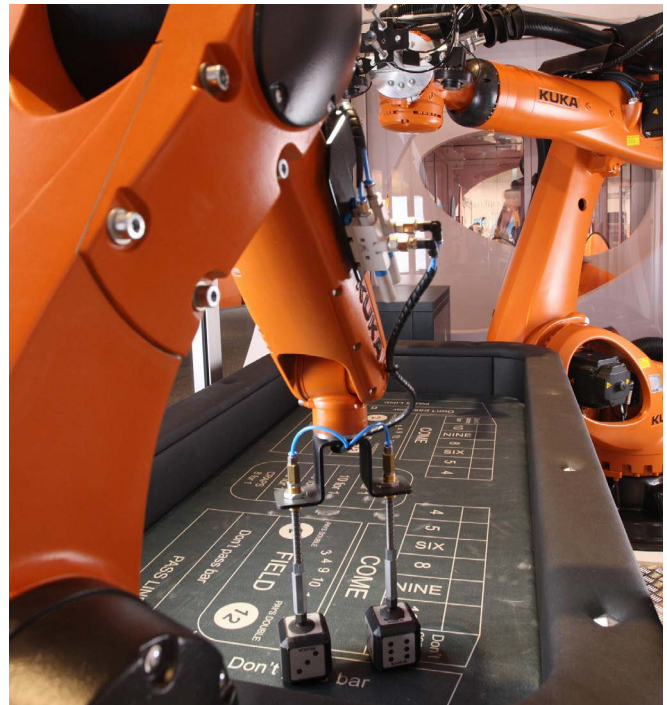


Engineering with a common goal

Kollmorgen sees supply-chain optimization as part of its strategy to design motion solutions that not only deliver the required performance but also fit well into the customer's supply-chain management.

For example, the KR Agilus is the only robot in its class that features Kuka's own Safe Operation functionality, which dramatically simplifies human-robot interaction. To enable this capability, Kollmorgen worked with its brake supplier to offer a specially adapted motor brake that acts as both a holding brake and an emergency brake.

Taking advantage of the engineering expertise of its own supplier, Kollmorgen devised the optimum motion solution for the specific task at hand while also simplifying supply-chain challenges for its customer.



AKM servo motors: High acceleration, control and accuracy

The specially adapted servo motor used in Kuka's AR Agilus robots is based on Kollmorgen's AKM series. These high-acceleration permanent-magnet servo motors are available in 28 standard housing and mounting combinations to facilitate compact machine designs. They also feature reduced energy consumption, extremely high control accuracy and high availability, and they are compatible with all commonly used supply voltages thanks to specifically adapted stator windings.

For truly individual configuration of these synchronous servo motors, Kollmorgen offers a modular range of sizes and power ratings along with other special options. As a result, a vast number of different permanent-magnet motor configurations are possible within the AKM series using proven standard components.



About Kollmorgen

Kollmorgen, a Regal Rexnord Brand, has more than 100 years of motion experience, proven in the industry's highest-performing, most reliable motors, drives, AGV control solutions and automation platforms. We deliver breakthrough solutions that are unmatched in performance, reliability and ease of use, giving machine builders an irrefutable marketplace advantage.