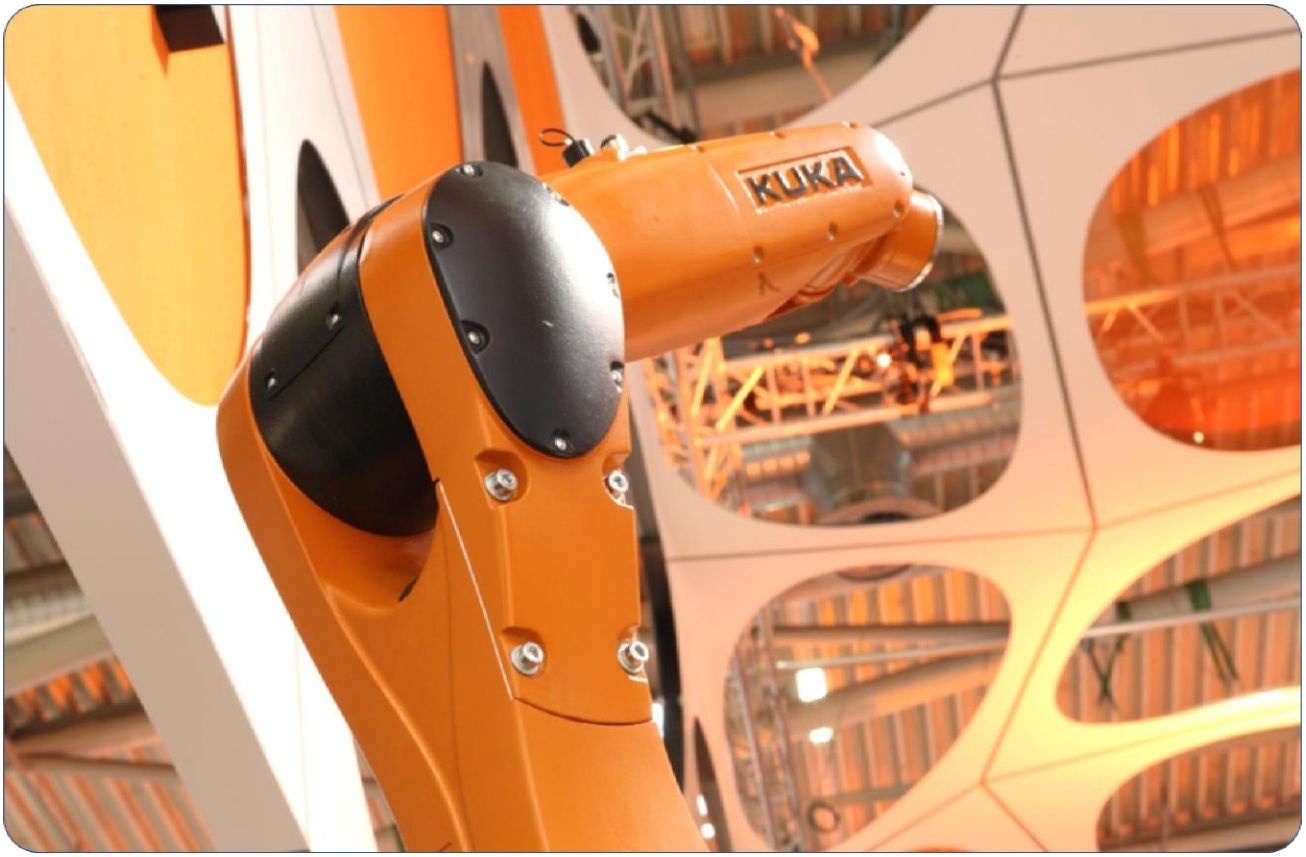
Even higher power density

KUKA and KOLLMORGEN: Co-engineer optimised motors for compact robots



The performance of the KR Agilus series within its rated load range sets new standards for speed, cycle times and energy supply. They can even handle unusual tasks in base and cover installation positions. KOLLMORGEN developed the custom motors by adapting motors from the standard AKM servo motor series without compromising performance or quality chain.

KUKA's compact robots in the KR Agilus series are precise, agile and fast. As agile systems these five-axis 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. Using collaborative co-engineering, the two companies were able to reduce the installation volume of the motors compared to standard models, implement robot-specific applications and optimise the entire supply chain.

As fast all-rounders, the robots in the KR Agilus series are particularly suitable for general industrial applications. With a dead weight of 51 kg, the basic model can support loads up to 6 kg. The compact robots are therefore ideal for process automation in the packaging, electronics, food and pharmaceutical industries. “We made a significant contribution to short cycle times and high precision by adapting our servo motors from the AKM series to KUKA's specific needs”, says Theo Loy, Sales Manager at KOLLMORGEN. The co-engineering partner adapted the design of the synchronous servo motors to make them fit perfectly in the joints of the KR Agilus robots. “That also enabled us to increase the already high power density.” Looking back on the start of the partnership, Loy comments: “As part of the development project for their new compact robots, KUKA was looking for a motor manufacturer that could supply custom motors with very high power density. The torque to volume ratio turned out to be the decisive factor that got us into the picture. The AKM servo motors are simply unbeatable.” The project quickly evolved in the direction of collaborative co-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, we did not want to launch a full-scale development project with all the associated risks.” Instead, the aim was to optimise standard motors by making controlled modifications. “Standardisation, availability and quality are crucial.” With custom adaptations such as cable strain reliefs, modified bearing shells, KUKA-specific connector configurations or special drilled holes in the out-

Theo Loy: “Standardisation, availability and quality are crucial. That is why we used controlled adaptations to optimise standard motors. We specifically wanted to avoid launching a new development project with all the associated risks.”

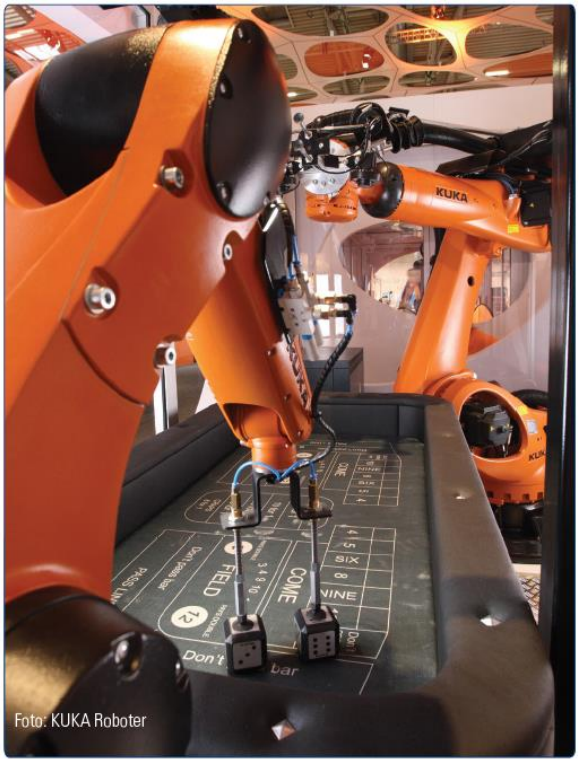


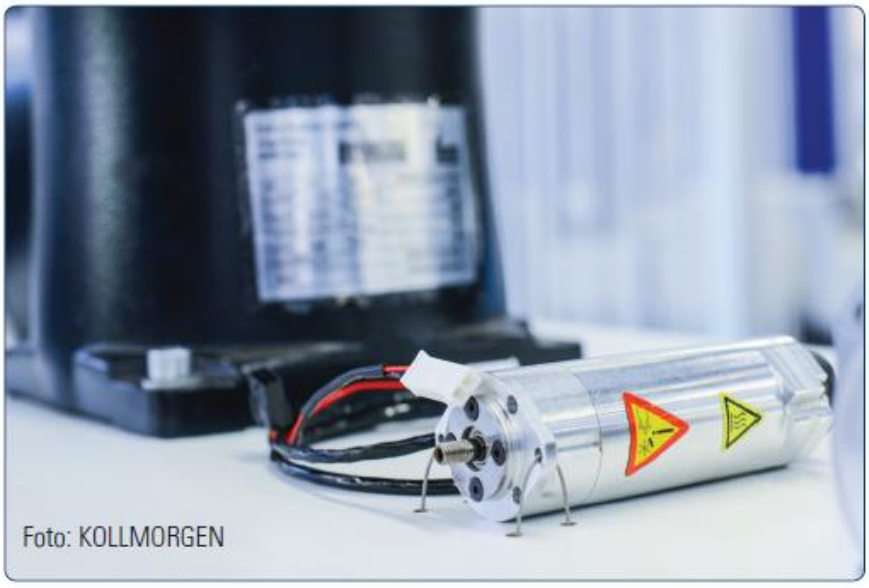
Foto: KUKA Roboter

The compact robots with KOLLMORGEN servo motor drive are especially good at handling tasks, particularly pick-and-place operations.

put shaft, the motor manufacturer could reliably maintain the majority of its standardisation, but is that still possible when the entire design geometry is fundamentally changed?

Tucked away in the wrist joint

That was exactly what happened with the smallest servo motor in KOLLMORGEN's AKM series. Already very small from the start, it had to be made even thinner to fit compactly into the wrist joint of the robot. The co-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 drive systems and motion control specialist manufactures the motors for the Augsburg-based robot foundry in optimised 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 modes and effects analysis (FMEA) for the two coordinated processes.



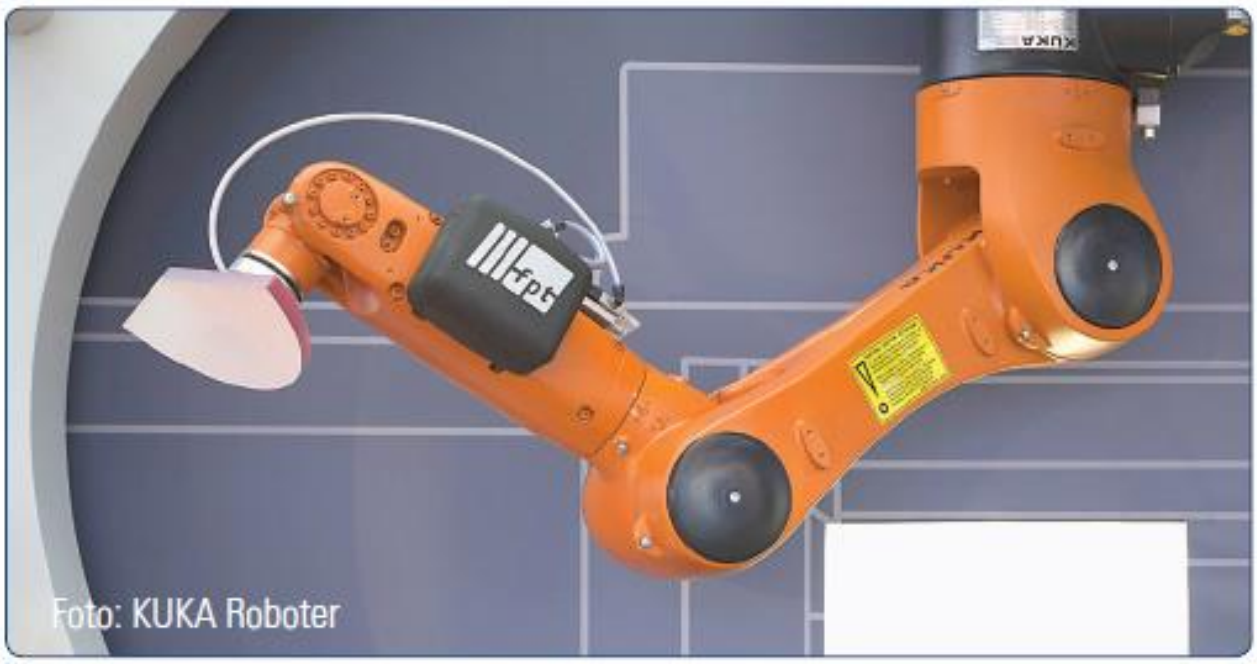
The package size of the AKM motors was reduced significantly for KUKA.

Engineering with a common goal

KOLLMORGEN sees supply chain optimisation as part of its strategy to design drive solutions that not only deliver the required performance but also fit very well into the customer's supply chain management. To make things easier for the customer in the KUKA project, KOLLMORGEN also incorporated the engineering expertise of its own suppliers, such as a specially adapted motor brake. “It acts as both a holding brake and an emergency brake”, notes Loy, with an eye to the fact that the KR Agilus is the only robot in its class that features KUKA's own Safe Operation functionality. That drastically simplifies human-robot interaction. “For this particular application we found a good solution in cooperation with our brake supplier. The optimal solution for the task concerned is what matters in the end”, notes Loy.

AKM servo motors: high acceleration with just one cable

KOLLMORGEN's AKM series of high-acceleration permanent-magnet servo motors are available in 28 housing and mounting combinations to facilitate compact machine designs. They also feature reduced energy consumption, extremely high control accuracy and very



Thanks to special brakes on all axes, the compact KUKA robots deliver outstanding performance in every position. KOLLMORGEN found a good solution in cooperation with its brake supplier.

high availability, and they are compatible with all commonly used supply voltages thanks to specifically adapted stator windings. For truly individual configuration of the synchronous servo motors, KOLLMORGEN offers a modular range of sizes and power ratings along with other special options. As a result, more than 500,000 different permanent magnet motor configurations are possible within the AKM series using proven standard components. This is further enhanced by the connection system with only one cable between the motor and the controller. The advantages of single-cable connection between servo motors and their controllers extend over the entire value chain in the mechanical engineering sector. Physical transmis-

sion of the encoder signal from the AKM motor over the motor cable eliminates an interface. This yields concrete savings by dispensing with a cable and two connectors, which in turn reduces installation time and space requirements for the cabling.

About the author: Thorsten Sienk is a freelance technical journalist for KOLLMORGEN in Ratingen.

About KOLLMORGEN
KOLLMORGEN is a leading provider of integrated automation and drive systems along with corresponding components for machine builders all over the world. With more than 70 years of Motion Control Design and application experience and profound knowledge of constructing standard and special solutions, KOLLMOR-GEN supplies solutions time and again that's stand out in terms of performance, quality, reliability, and ease of use. As a result customers can achieve a market advantage which is beyond question.

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