



Kollmorgen Motors Drive the Lightweight Helpers of Universal Robots

The UR5 and UR10 are two models from Universal Robots intended to advance the flexibility of articulated-arm robots in industrial production. The focus is on work areas where conventional robots have proven to be too big, too expensive and too loud. Due to their low weight, the UR5 and UR10 can be used wherever they are needed.

A large part of the power density of these six-axis articulated robots comes from specially adapted KBM motors from Kollmorgen. Universal Robots was able to embed the motors directly into the articulation axes without the need for additional housings.

Universal Robots developed the UR5 and UR10 models for small- and medium-sized enterprises in particular. The handling units lift a payload of 5 and 10 kilograms while themselves weighing only 18 and 25 kilograms respectively. This low weight, without complex subcomponents, makes it possible to move the units easily.

These multi-functional, six-axis robots are also flexible in operation given their user-friendly software. They are ready to perform new tasks in no time, with no special knowledge of robotics required for programming.

Modular design

The exceptional ratio of dead weight to loading capacity is achieved through a sophisticated, lightweight design that does not contain anything it does not need.

This minimalist strategy means integrating Kollmorgen's frameless motors directly into the articulation axes. The robot itself takes on the function of the motor housing, while the gear unit simultaneously serves as the primary bearing of the rotor.

Viewed as a whole, the components used by Universal Robots frequently take on multiple functions. This considerably reduces the number of mechanical components such as ball bearings, couplings and shafts, thus decreasing overall system weight and form factor. In addition, with their high power density, Kollmorgen KBM motors increase the lifting capacity of the UR5 and UR10 platforms.

The KBM motor series offers advanced electromagnetic designs for optimized torque and minimal cogging and harmonic distortion. These benefits are offered over a large operating speed range. The electromagnetic technology, with high packing density in the stator, increases torque and keeps thermal losses low.

High-strength rare earth magnets are used in the rotor, enabling a continuous torque range of 1.45 to 3,445 N·m across the KBM series along with a peak torque range of 4.91 to 12,812 N·m. "The high quality of these motors was a reason why we opted for Kollmorgen," explains Esben H. Østergaard, technical business manager of Universal Robots.

With KBM motors embedded in the robot housing and directly driving the load, the robots are able to achieve a high level of precision in movement and force control. Targeted force control is critical in this regard because the robots constantly have to move highly variable workpieces perfectly.

In practice, the robots recognize the size and elasticity of objects and adjust the force to be applied accordingly. This force must be stronger than just 25 N to accomplish this. With a precision of ± 10 N and an accuracy of ± 5 mm, the required force and desired position can be programmed and executed for each of the six joints.



Esben H. Østergaard, technical business manager of Universal Robots

Operation without noise but with high energy efficiency

These robots also offer the advantages of low noise and energy-saving operation. From a total-cost-of-ownership perspective, the economical use of resources directly increases the efficiency of the robots and thus the competitiveness of the technology.

As an additional benefit, high energy efficiency is linked to reduced losses in the motors. Less heat is produced, so the motors stay cooler, operate below their maximum ratings, and consequently achieve a longer service life. This improved thermal behavior also prevents the entire construction from heating up.

“The motors we used in the past became pretty hot when in continuous operation. Because of the lower losses, the KBM motors from Kollmorgen simply stay colder,” Østergaard explains, referring to test procedures with long operation periods and comparatively high loads.” We can therefore run our robots in continuous operation without derating.”

In the KBM series, Kollmorgen provides an innovative direct drive frameless motor technology. These frameless motors offer mechanical and plant engineering a wide range of solutions for creating

applications with a maximum degree of flexibility, power density, dynamics and durability.

In addition to these technical advantages, the KBM platform includes 14 frame designs and many pre-engineered standard options with competitive lead times. “We can basically order as many motors as we want, when and how we want,” emphasizes Østergaard. This aspect is of particular importance because Universal Robots is growing strongly.

“We therefore need a partner in motion technology who is a good fit for us,” he adds. In this regard, Kollmorgen was able to impress the Danish robot specialists with reliable delivery and has since established a Universal Robots-specific production line at the Czech location in Brünn.



Prospects

Ultimately, the quiet operation and high quality control of KBM synchronous servo motors ensure that the robots can be used outside of handling applications, too. Up until now, the focus of Universal Robots has been to use robots as a tool for performing simple tasks.

“We are therefore not competing directly with other robot manufacturers who deal with more complex tasks. Instead we are saving people from having to perform tiring, monotonous manual work,” stresses Østergaard. However, as the company from Odense has developed light constructions without uncontrollable oscillations and vibrations, new application possibilities emerge such as with welding and gluing.

“We can expand our business channels,” says Østergaard. This development is accompanied by the fact that — due to sophisticated safety technology — both robot models are even able to be employed without additional shielding. This opens the path to safe and comfortable cooperation between staff and technology.



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.