

High Performance in a Small Package

Compact Servo Systems Offer 100% Flexibility and Performance While Requiring 50% Less Space

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Machine builders need to increase productivity and are looking for more reliable and powerful systems with greater throughput and flexibility. At the same time, they are faced with increasing competition to implement these demands with smaller, more compact machines. Compact, high-performance servo systems meet these demands by providing high torque with minimum energy consumption, in a smaller footprint. For example, Kollmorgen's [AKM™ servomotor](#) paired with the new [AKD™ servo drive](#) make an ideal servo system. With the advanced tuning algorithms and robust Performance Servo Tuner (PST), the AKD helps accommodate compliant loads, making it possible to reach performance requirements with optimized motor solutions. This offers some significant advantages including greater stability, lower power requirements, and higher efficiencies. Plus, since the units are extremely compact they fit into some really tight spaces.



These capabilities, allow for the development of lower cost machines that are more compact and more powerful. Conventional solutions struggle with compliant loads, or take significant expertise to tune systems with inertia mismatches of even just 5:1. Utilizing advanced tuning algorithms, even the most challenging mechanical application has a chance at being tamed. With the bode tool feature, you can understand better if any mechanical issues are present that may be hindering performance. The AKD/AKM system has been successful in belt driven applications (similar to CT Scanners) with inertia mismatches of greater than 500:1.

The AKM series of motors is rated for IE4 - the highest energy efficiency class. The broad range of applications the AKM series can accommodate is the result of the wide variety of frame size, stack length, and winding variations, providing numerous speed and torque combinations. A total of eight sizes of different motor types with supply voltages from 75 to 480 volts are available. The overall lengths of AKM motors, ranging from 79 to 424 mm, are 30 to 50% shorter than other competitive offerings. Designed with flexibility in mind, Kollmorgen can produce this variety of sizes while including all of the usual mounting flanges (IEC-NEMA-JIS), various feedback options, and alternate connector technologies. [MOTIONEERING®](#) is an efficient sizing tool at the disposal of the design engineer for selecting the right system for their application. The AKM1 to AKM8 series of motors offers a continuous range of torques from 0.19 Nm to 180 Nm.

Servomotors with High Power Density and Overload Capacity

The best power transfer is achieved when motor inertia matches load inertia. However, this ideal situation rarely exists, which means the machine designer must make choices between higher inertia, or a more compact solution based on torque and acceleration requirements. By overlapping the static torques and nominal speeds between frame sizes and stack lengths, the user can optimize the performance of his individual applications. For example, a user can increase stability in his application by using a larger motor rather than a smaller one with the same torque, resulting in a greater mass moment of inertia. In cases where very high acceleration is a must, a longer, thinner motor can be considered reducing the mass moment of inertia, thus reducing the power needed to accelerate the motor itself. The high efficiency, low power loss, and high power density of AKM motors are the result of Kollmorgen's engineering expertise in designing this type of motor.

A number of technical measures combine to allow AKM motors to achieve the same output, even though the structure is 30 to 50% smaller than other conventional synchronous motor technologies. The weight reduction achieved means the AKM motors are 10 to 30% lighter than earlier generation comparable motors.

Extremely compact dimensions, paired with high [servo system](#) performance, are particularly significant for medical equipment technology. The challenge here is to produce stable, vibration-free and uniform motion sequences with high positional stability in tightly confined spaces. The highest demands on coordinated and synchronized movements are made by medical scanning systems for imaging diagnostics such as CT scanners, in order to provide a high quality image for analysis. Another example is a cardio scanner for examining cardiovascular problems, which has up to seven motion axes and an additional four to five axes in the patient table – all of which must be synchronized simultaneously. This example application may not be representative of all sectors, but many design engineers and operators want more and more compact systems while still getting the maximum possible drive power from the servo systems.

AKM, a Compact, Robust Solution

Features such as a single front flange/housing casting, plus unique electromagnetic design featuring a magnetically balanced configuration improve the robustness of the AKM motors providing extended life. AKM motors lead the marketplace when it comes to package size – typically shorter; with less rotor inertia than comparable motors with the same torque ratings.

Innovative Digital Servo Drives Increase Performance

The AKD, with its innovative high-performance control electronics and fast regulation of current, speed, and position, offers maximum performance and bandwidth. Very rapid and precise control allows shorter working cycles driving potentially significant productivity increases. The power density makes the AKD a market leader in the implementation of high performance servo loops. Contributing to this are update rates of just 0.67 microseconds in the current control loop, and the rapidly regulating speed control (62.5 μ s) and position regulation (125 μ s).

Space-Saving Servo Systems Lead to the Optimum Solution

Kollmorgen has achieved a further increase in terms of extremely compact dimensions and top performance with the AKD. The smallest version, with dimensions of 57x156x168 mm (width, depth, height), generates a continuous output power of 1.1 kW at a continuous current of 3 A_{rms} and a peak current of 9 A_{rms} . Even the most powerful AKD with its continuous output power of 16 kW for a continuous current of 24 A_{rms} and a peak current of 48 A_{rms} has very small dimensions of 102x228x306 mm (width, depth, height).

The following examples summarize Kollmorgen's compact servo solutions:

- **The Most Compact Servo System in the Top Power Range**

The AKM8 with a frame size of 260 mm and an overall length of 424 mm – even shorter if required by the customer – outputs 19.8 kW at a rated speed of 1800 revolutions per minute. It has a constant torque of 180 Nm and a peak torque value of 668 Nm at a mass inertia of 495 kg-cm².

- **Smallest, Most Compact Servo System in the Lower Output Range**

The smallest, most compact, powerful combination is created by the smallest AKD with its output power of 1.1 kW in conjunction with the smallest version of the AKM, the AKM1. The AKM1 with a frame size of 40 mm and an overall length of just 79 mm outputs 80 W at a rated speed of 4000 revolutions per minute. It has a constant torque of 0.18 Nm and a peak torque value of 0.61 Nm at a mass inertia of 0.017 kg-cm².

ABOUT KOLLMORGEN

[Kollmorgen](http://www.kollmorgen.com) is a leading provider of motion systems and components for machine builders around the globe, with over 70 years of [motion control](#) design and application expertise. Through world-class knowledge in motion, industry-leading quality and deep expertise in linking and integrating standard and custom products, Kollmorgen delivers breakthrough solutions unmatched in performance, reliability and ease-of-use, giving machine builders an irrefutable marketplace advantage.

For more information visit www.kollmorgen.com, email support@kollmorgen.com or call 1-540-633-3545.