

Direct Drive Servomotors maximize dynamics and precision in rotating machinery

**Compact Kollmorgen Cartridge DDR[®]
(Direct Drive Rotary) motors for up to 50% savings**

Written by: Jörg Peters, Product Manager Motors

Direct Drive Servomotors maximize dynamics and precision in rotating

Compact Kollmorgen Cartridge DDR® (Direct Drive Rotary) motors for up to 50% savings

Machine designers are giving close consideration to the use of conventional drives and motor/gearheads in high performance rotating machinery.

The use of gearheads, belts, and pulleys contradicts the objective of achieving optimum performance and many applications using conventional transmission engineering have simply reached their performance limits. As a result, Original Equipment Manufacturers (OEMs) are increasingly deploying direct drive solutions to deliver substantially superior economic results.

The latest generation of the award-winning Cartridge DDR motors from Kollmorgen represents a quantum leap over other rotary direct drive options, and their potential is further maximized when used in conjunction with Kollmorgen's AKD™ servo drive. When compared with conventional mechanical systems, the Cartridge DDR has contributed to 30% higher throughput as a result of 40% reduction in hardware components and 20% greater machine reliability. Plus, machine builders can cut the cost of commissioning and service by up to 20%, and can even cut costs by up to 50% over the life cycle of the machine.

Kollmorgen's success is illustrated by the deployment of the Cartridge DDR motor in the print, metalworking, packaging, and injection molding industries, where they are used on printing rollers, stamping tools, forming tools, web handling, winding, and press and closing processes.

A Cartridge DDR motor recently made a noticeable impact as part of a print roller control. The task for this project was to increase the level of precision using independent Cartridge DDR motors to synchronize the applicator roll and the plate cylinder. Additionally, an axial movement of the rotor by 10 mm was implemented to enable precise adjustment of the inking unit. In the past, when a color register adjustment was required it was very difficult to move the shaft to a precise position with the conventional, mechanical gearhead/motor installation. One of the innovative design features of the Cartridge DDR motor is that it does not have its own bearings; the existing bearing on the machine supports the rotor after installation.

A superior alternative to conventional mechanical solutions

Just like a conventional servomotor, the Cartridge DDR motor is bolted to a flange on a machine with a pilot diameter and bolt circle. A shaft journal projects out of the flange on which the rotor is mounted with an integral

compression coupling. This design ensures a high, torsionally rigid mechanical connection with the load thus eliminating problems that can arise with shaft couplings, belt drives, and gearheads. Furthermore, the rigid connection of the motor to the machine eliminates the need to match the motor and load moments of inertia. DDR motors have been implemented with inertia mismatches for load-to-rotor up to 1000:1. By comparison, a conventional gearhead solution has a maximum inertia mismatch of 10:1.



With just a single component, this approach delivers the following advantages:

Omitted

- toothed belt/pinion
- belt tensioners and their replacement
- lubrication
- gearhead and gearhead backlash
- mounting brackets and associated hardware
- belts and pulleys

Dramatically reduced

- space requirements
- number of components
- system resonances
- down-time
- noise generation (by 20 dB)
- maintenance
- installation and commissioning effort
- engineering and operating expenses

Markedly increased

- acceleration
- positioning accuracy (50 times)
- reliability
- operating stability
- dynamic performance
- servo drive properties and energy efficiency
- machine throughput

Custom configured and a breeze to fit

Cartridge DDR motors are available in five frame sizes (108 to 350 mm), 17 different lengths and 52 standard windings. They provide nominal values ranging from 4 to 510 Nm, and with peak torque of up to 1,090 Nm. Speeds of up to 2500 rpm satisfy most requirements.

Thanks to its smart modular system, Kollmorgen is able to supply an optimized solution refined to the OEMs specific requirements. The customization options are complemented by a wide range of connection options, seals, bearings, feedback systems and hollow shaft design. The machine builder can also call on a broad range of support, including 3D models, installation videos, drawings, and catalogs in various languages. A product configurator is able to help the customer select the optimum Cartridge DDR solution for their specific application.

The machine designer or builder gets an easy-to-deploy Cartridge DDR that he can immediately install, giving a clear competitive advantage. It takes less than 10 minutes to fit a Cartridge DDR unit to the machine, resulting in a reduction in time and cost for commissioning. Machine builders can save several hours per axis just in mounting, testing, and tuning.

Conclusion

With some thought and armed with the knowledge of coupling mechanisms, users can be equipped to effectively minimize EMI issues when best practices are not available.

About Kollmorgen

Kollmorgen 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 informations contact us.

The Cartridge DDR even beats a frameless direct drive for economy. The challenge with frameless direct drives is designing and assembling the many required parts. It is a time and labor-intensive task with relatively long integration time that leads to additional costs.

Increased performance through symbiosis

When the Cartridge DDR is deployed with the AKD™ servo drive, machine performance can be increased even more. Thanks to a preconfigured drive and feedback units, the installation facilitates plug-and-play commissioning. For example, relevant motor data and sophisticated control algorithms are stored in the AKD™ servo drive which permits even greater precision and productivity. In addition, energy usage is optimized to suit the specific need.

Greater machine availability and productivity

Cartridge DDR technology enables machine builders to benefit from greater machine performance at noticeably lower costs. Cartridge DDR technology also dramatically reduces installation, commissioning, service, and maintenance time and expenses. The result is a differentiated machine that delivers real, quantifiable benefits to the end customer too, including:

- 20% more machine availability
- shorter down-times
- less maintenance due to fewer parts and minimized wear
- no need for belt adjustments or filling with oil, as with conventional gearheads

The Cartridge DDR solution enhances product quality, and the greater machine performance leads to production increases of up to 30%.

The initial investment cost of a conventional gearhead/motor combination and the Cartridge DDR motor are similar. With the conventional solution, requisite hardware components will require further expenditures. The installation, commissioning, down-time, maintenance, servicing, replacement part and procurement costs, as well as inefficient energy costs, must be considered as well. Taking all these factors into account, a cost reduction by up to 50% can be achieved by choosing the innovative Cartridge DDR solution. Assuming a life cycle of five years, the Cartridge DDR solution can reduce operating costs by approx. 7000,-- €.