The All-Around Solution in Metal Machining

Everything is turning: AKM servomotors from KOLLMORGEN in CNC multi-spindle machines from INDEX

The steel rods are machined in eight different work steps.

MS40C-8: is the name given to an eight-spindle metal processing machine from INDEX for fully-automated production of complex components. Yet with double 4-spindle machining, the same machine is also available for cost-effective production of simple parts with double the output quantity. There are a number of good reasons why the CNC multi-spindle machine, made in Deizisau near Esslingen, southern Germany and driven by KOLLMORGEN servo technology, is seen as a true all-around solution in machining technology.

The solution from INDEX is used both in the production of high quantities of precision parts and - due to their shorter set-up times - for smaller batches. “We are pioneers in CNC multi-spindle machines,” says Karl-Heinz Schumacher, head of development and design of multi-spindle machines at INDEX. There are currently several thousand of these machines in use around the world.

Demand for dimensional accuracy

INDEX specializes in both selling standard machines and also supplying fully equipped machinery with all tools assembled. Multi-spindle machines are mostly used for parts that will be on the road at some point in the future. These include injection pump components, valve needles, small gears or injector nozzles – all featuring accuracy levels within tolerance grade IT5

Typical products that are produced with a CNC multi-spindle machine include components for the automobile industry

The AKM servo motors have been co-engineered for use at INDEX with a lasered nameplate and special cable duct

The centerpiece of the INDEX MS40C-8 multi-spindle automatic lathe is the compact spindle drum with eight fluid-cooled motor spindles using synchronized technology. These can reach speeds of up to 7,000 rpm with 24 kW of power and torques of up to 57 Nm. They feature infinitely variable speed control, high torques, and a compact design; and they require no maintenance. As a result of the increased number of main spindles and tool carriers, the MS40C-8 is also completely capable of machining highly complex components in a single operation. There are also two pivoting synchronous spindles available, each able to work on up to seven rear-end machining tools, with four of these capable of being powered. The capacity for two rear-end machining tools to work on the workpiece at the same time is a new feature.

Perfect workflows for perfect parts

In all cases, the optimum speed and feed rate can be programmed for each spindle location and each cutting edge, and these can even be modified during the cutting process. The eight fluid-cooled motor spindles integrated in the spindle drum are infinitely variable, require no maintenance, and are driven with synchronous motors. The KOLLMORGEN AKM permanent magnet servomotors are installed in the cross slides. The synchronous machines in the INDEX systems also include the added benefit of high-quality control mechanisms and high torque density. The optimum power-to-volume ratio allows INDEX to work with smaller drives during the design process. Careful use of space is a particular benefit in confined work areas.

High torque density

Plenty of power with minimum space: INDEX uses the KOLLMORGEN motors in part as positioning axes for the tools. The high-power density enables compact designs that take up less space when installed in the work area. The very good torque density of the AKM synchronous servomotors allows INDEX to convert the rotation movement of the motors into a linear motion without gears. The ball bearing spindles are connected directly to the motor shaft for this. “The lack of gears means there are fewer moving parts, and improves the zero backlash and the overall stiffness of the drive,” says Metin Han from KOLLMORGEN. As Key Account Manager he took INDEX’s requirements on board and translated these into a suitable design solution. “We need zero backlash and stiffness, especially with multi-stage thread cutting, so that the tool always completes the next machining step precisely on the threaded attachment,” explains Karl-Heinz Schumacher.

The MS40C-8 from Index is designed as a CNC multi-spindle machine for large and small production batches.

Drives directly in the work area

INDEX uses these features without having to clad the AKM synchronous servomotors in the work area beforehand--a time-consuming process. The AKM servomotors are specially designed to meet the requirements provided by INDEX and undergo extensive IP67 testing in the aim of keeping the work area as orderly as possible. The motors can be installed directly with the cross slides thanks to their special washdown exterior paint. This allows the units to be introduced directly into the machining process without impairing their service life. “That’s a good argument for the AKM servomotors from KOLLMORGEN”, says Karl-Heinz Schumacher. This just leaves the connecting cables. These are also exposed to constant bombardment from metal chips. As a result KOLLMORGEN placed these in a metal cable duct specifically designed to meet INDEX’s needs. Today, this co-engineering initiative securely protects the servo drive, together with its wiring, from the metal chips that fly around and from the cutting oil that gets into the work area at pressures up to 80 bar.

Integration standards are maintained even though the AKM synchronous servo motors from KOLLMOREN are perfectly aligned towards the usage conditions in the INDEX CNC multi-spindle machines as a result of the co-engineering project. Background: the motors need to fit seamlessly into the machine's overall automation mechanism without time-consuming adjustments. The connection via DRIVE-CLiQ is an example of this. This allows the performance benefits of the AKM synchronous servo motors to be used for CNC applications directly with Sinumerik control units in metal machining, without needing to compromise on the connection technology. Until now, anyone who wanted to use motors from other manufacturers outside these Siemens world proprietary motors had to rely on special and costly DRIVE-CLiQ sensor modules. "DRIVE-CLiQ is available for the AKM motors, allowing us to continue processing the position signals 1:1 without requiring any SMC modules. They cost space and money," notes Metin Han. "This leaves us free to exploit the performance benefits of the AKM motors in full in this application."

The Bottom Line

Fitting with DRIVE-CLiQ is an example of how the synchronous servo motors from KOLLMORGEN can adapt to the diversity of CNC and automation technology – particularly for metal machining. This lets machine constructors use drives outside of closed systems, without losing any of the convenience or performance benefits. Very simple adjustments can also be carried out outside of mass production, opening up whole new avenues for INDEX – from gearless use of the AKM servo motors to protection for the connecting cable using a specially developed cable duct.

The AKM servo motors are simply compact": Karl-Heinz Schumacher, head of development and design of these machines at INDEX.

Author: Sandra Becker, Kollmorgen Marketing Communications EMEA & India

ABOUT KOLLMORGEN

Since Kollmorgen was founded in 1916 its innovative drive solutions have turned great ideas into reality, made the world a little safer and improved people's quality of life. Kollmorgen enables continuous development of pioneering solutions that are unsurpassed in terms of performance, reliability, and user-friendliness. Crucial to these are first-class knowledge and experience in drive systems and components, industry-leading quality and extensive expertise in connecting, and integrating standard and custom-made products. This gives machinery constructors all over the world an important competitive advantage, and gives their end-customers the reassurance that they can rely on the finished application at all times. – Further information: www.kollmorgen.com | THINK@kollmorgen.com.