

Drive & Control profile

Full drive and control package speeds linear transfer system



The linear CNC machining center, Mikron Multistep XS, is especially suited for flexible production runs.

Better is the enemy of good. With this motto the Swiss company Mikron Machining Technologies has once again succeeded in improving its already successful multi-step concept of a linear CNC transfer machining system for use in precision manufacturing. In this latest version, the modular system achieves up to 20 percent higher productivity than before. To do this Mikron makes use of the complete control and drive package from Rexroth with the high-speed control system, IndraMotion MTX.

“The movements are simply faster and follow each other in a more fluid progression than before,” is how Rolf Held, design manager of Mikron GmbH in Rottweil, Germany, describes the increase in speed of the new Multistep XS. “Although it’s always only a matter of a few fractions of a second, overall we are managing more workpieces per unit of time – according to initial experiences, productivity is up to 20 percent higher than with the previous model.”

Challenge

Improve functionality and productivity of high-precision linear CNC transfer machining system.

Bosch Rexroth Solution

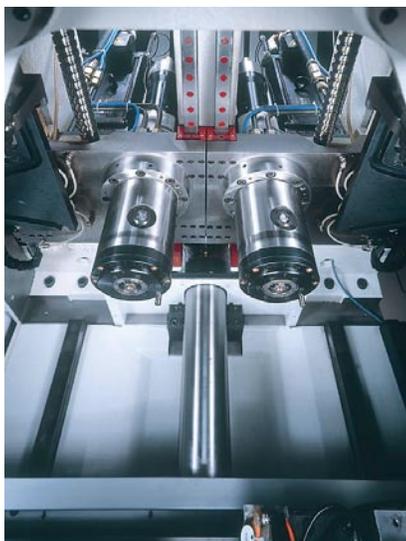
- High-speed CNC IndraMotion MTX control system
- Integrated IEC 61131-3 PLC IndraLogic with multi-tasking capability
- Intelligent Rexroth IndraDrive servo-drives with integrated safety functions

Benefits

- Increased productivity by 20 percent
- Modular construction combines transfer line benefits with machining center flexibility
- Operates up to 64 axes on one control with 12 mutually independent CNC channels

The Multistep systems built up to date (and there are more than 150 of them) were harbingers of these fast systems, which, due to their modular construction, combine the productivity of a transfer line with the flexibility of a machining center. In the Multistep XS, Mikron retained the tried-and-tested concept while, first and foremost, renewing the drive and control package.

Within the Multistep concept, Mikron combines extendable, individual modules that are firmly linked to one another in a linear mode. At the same time the user can, depending on the production task, combine one to three standard machining modules with a five-axis and side machining facility for each. Right from the first module the machine is fully operational and features all the CNC functionalities. The control is designed for up to three standard



By alternately transferring in pairs between neighboring modules, the system has a constant flow of production. In addition, the line works in forward and backward flow.



Mikron uses the full drive and control package from Rexroth, with the high-speed IndraMotion MTX control.

modules, one special module for special machining operations as well as the automatic load and unload station. “Fully extended, the CNC can operate up to 30 axes simultaneously in closed loop control,” calculates Held.

Linear extension by means of further modules gives a considerable increase in productivity because complex machining operations for workpieces of up to 10x10x10cm capacity can be processed in parallel. “This makes our concept outstandingly suitable for series launches or series run-outs because, as a result of the modular construction, the user has just the right amount of machine he needs for the quantity required,” emphasizes Held.

1,000 instructions in only 60µs

In the redesign the development personnel from Mikron opted for the new high speed CNC Rexroth IndraMotion MTX.

With this it is possible to operate up to 64 axes on one control with twelve mutually independent CNC channels. Connection with the integrated IEC 61131-3 PLC Indra-Logic with multitasking capability on powerful hardware guarantees a close link between the CNC and the PLC and, at the same time, makes extraordinary performance data possible. Thus, for example, the PLC will process 1,000 instructions in only 60µs and the CNC offers, where eight axes are controlled, an interpolation cycle time of maximum 1 ms.

When it comes to the machining of complex parts in standard Multistep XS mode, IndraMotion MTX incorporates functions, which make for particular time benefits. Comprehensive CNC programs do not first have to be fully loaded into the main memory, instead they are processed continuously following activation by means of “CNC-Streaming.” The machining process can be

commenced while the code is still being generated or loaded in the background. Part programs are organized in a file system with flexibility of allocation to the main memory or the mass storage unit. This means that there are no restrictions on the program size.

The dynamic preliminary processing of NC sub-programs as well as jerk limited speed management increase the machining speed while at the same time ensuring improved machining quality. Mikron also makes use of special functionalities in order to increase productivity: "With the Indra-Motion MTX we can precisely specify automatic clamping adjustments down to 0.1 degrees," Held says emphatically. This means that, in practical terms, long-winded maneuvers to adjust gripping tools are not required.

More productive solutions

The system transports the workpieces from one module to the next without re-tooling. The circulation concept specially developed by Mikron reduces the



The workpiece change time for the Multistep XS is about 5.5 seconds; the chip-to-chip time in the modules is about 1 second.

number of encodable work carriers required to a minimum. By means of alternate transfers by pairs between neighboring modules, the system guarantees a constant flow of production. Furthermore, the line features forwards as well as backwards flow operation. The workpiece change time is around 5.5sec, the chip-to-chip time in the modules is around 1sec. Further keys to higher productivity are

the intelligent Rexroth IndraDrive servo-drives with their extensive range of rotary motors and direct drive technology. In addition, the IndraDrive servo-drives feature integrated safety functions for safe stopping and safe movements, which are certified in accordance with the standard EN 954-1, Category 3. "Overall we have reduced non-productive time by up to 40 percent," confirms Held.

In regard to control communication, Mikron has, in the case of the Multistep XS, opted for PROFIBUS by way of field bus and SERCOS interface for real-time communication with the drives. The universally open IndraMotion MTX supports all current field bus systems and can be connected via Ethernet to superordinated company software – important pre-requisites for worldwide application in the automotive industry. "We initially took to the IndraMotion MTX due to its universally open interfaces," recalls Held. "But, due to the high speed, we are now also able to offer a considerably more productive solution."

Rexroth
Bosch Group