



■ Robots for CNC machining

# Making the Most of Robots for CNC Tasks

Only with a combination of Sinumerik CNC control and robotic control is it possible to use robots for demanding machining tasks. With this combination, the integrated CAM/CNC process chain can be used from modeling to the finished NC program. Robot-specific kinematics and safety features are also available.



## Robotic automation plain and simple

A knuckle-boom robot offers many opportunities due to its flexibility. Its kinematics reach points and achieve movements that are far superior to Cartesian robots. However, every knuckle-boom robot has its own operation, programming, and diagnostics – previously a practical obstacle to widespread use with machine tools on many occasions. Robot manufacturer KUKA has a perfect solution for this: The functional module library mxAutomation makes starting out with robot operation considerably easier because it can make the KUKA robot's movement sequence completely programmable in the Sinumerik CNC. According to Tanja Birner-Such, director product management at KUKA, "The worlds of machines and robots are drawing even closer together due to robotic control systems, programming, and diagnostics that are controlled via PLC and CNC. An annual production of 400,000 CNC machines is contrasted with the production of around 100,000 knuckle-boom robots. So our customers speak the language of PLCs and CNCs. We are therefore extending our KRL [KUKA Robot Language] programming language and speaking the customers' language."

Assisted by the openness of the Sinumerik 840D sl, user-oriented cycles are used for programming in the familiar Sinumerik programming environment. At the same time, robot-specific functions such as teaching are available, even in different coordinate systems or with different offsets. And, if on occasion something is not working, the Sinumerik diagnostics provide information via the robot's indications and alarms. So robot-specific knowledge is no longer needed to set up the program, and automation becomes extremely simple.

Using robots in production can significantly increase efficiency and productivity. Thus, machines can be equipped for fully automated around-the-clock operation. Thanks to the combination of CNC and robot control, robots are also perfect for CNC tasks. This gives machine tool builders the opportunity to easily integrate robot kinematics into their machine designs.

Siemens and Augsburg-based KUKA Roboter GmbH, a world-leading supplier of industrial robots, are jointly exhibiting the combination of a Sinumerik CNC and KUKA's robot controller for the first time at AMB 2012. The presentation focuses on the cell for machining composites – material that will gain importance in the fields of automotive construction and also power generation in the future. The robot can take over

the complete root machining of the blade in a wind turbine here. This consists of face milling (trimming) as well as the placement of horizontal and vertical holes. The robot can also assist with the bonding process or lamination of the blade.

### Perfect interaction

With this CNC and robot controller combination, the program required for the CNC is created directly from the NX CAM system by Siemens PLM. Connection of the Sinumerik 840D sl to KUKA's KR C4 controller is effected via a motion control interface that enables the controllers to be integrated consistently into the process chain from CAM to path movement. The tried and tested interface of the mxAutomation handling solution is used for diagnostics, including drive diagnostics, of course. Birner-Such, is very pleased ▶



» **With the integrated solution of CNC and robot controller, we can offer machine builders a perfect solution.** «

Tanja Birner-Such, Director Product Management, KUKA Roboter GmbH

### CNC Machining with Sinumerik Live at AMB

Siemens will demonstrate trends in CNC machining with Sinumerik – live at AMB 2012: five-axis machining, machining of new materials such as composites, as well as the use of robots for machining. Machine builders and users can look forward to seeing new developments for the Sinumerik 840D sl CNC as well as the OP 019 operator panel. Visit the Siemens booth C12 in Hall 4 for live demonstrations.

Other booths featuring interesting information about Sinumerik solutions are the CNC arena in booth B12 in Hall 4, booth E0-100 from VDW Jugend, and booth D32 in Hall 5 hosted by the Technical University of Darmstadt, Institute for Production Management, Technology, and Machine Tools.

► with the integrated solution of the Sinumerik 840D sl CNC and the KR C4 robot controller: “We are convinced that we can now offer machine builders a perfect solution.” Michael Brückner, Director Business Development, Sinumerik High-End at Siemens, adds, “And this, while they continue to rely on Sinumerik for operation and Simatic for cell control.”

### A robot as a flexible six-axis machine

It is possible to perform six-axis machining with the six degrees of freedom afforded by a robot. This provides the user with a high level of flexibility and excellent workpiece accessibility at comparatively low costs. Manufacturers of industrial robots offer their products in modular form matched to the intended use. As a result, there are robots for palleting, welding, assembly and also milling. These robots are specifically strengthened in terms of mechanics and gears so that they can absorb greater machining forces. In addition, robot manufacturers offer special packages for robots to optimize both accuracy and the robot’s dynamics.

Last, but not least, the robot controller also delivers robot-specific safety features such as Cartesian space monitoring or a safe speed of the machine tool. Thus, KUKA’s KR C4 controller combines motion and safety control and replaces passive responses with extremely fast, active interaction. By connecting to the Sinumerik motion control, it is optimally suited for use in demanding machining tasks, paving the way for launching into new markets such as the machining of composites. ■

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