Flexible 5-axis machining with a CNC-controlled articulated robot

When specified, MAKA supplies its machines with a robot interface for production automation and integration into production lines. With SINUMERIK “Run my Robot”, users now have an open, standard system that makes it especially simple to integrate Kuka robots: Only CNC know-how is needed when operating, commissioning, and carrying out service & maintenance and diagnostics. The solution includes the complete safety-relevant integration of the robot using Safety Integrated.

New ways of boosting productivity

Fully integrating a robot into a CNC system offers perspectives that go far beyond production automation and integration into production lines. While the main spindle finishes a workpiece, a robot equipped with a spindle can carry out machining work at the face and edges of a workpiece (e.g. drilling holes) – even with the workpiece moving. An additional option is production control using the robot itself. Equipped with workpiece identification system (camera, RFID, matrix code reader), based on the blank located at the infeed to the machine it can automatically call part programs, machine settings and tools and initiate the appropriate machining operations. The workpiece that is fed into the machine controls its machining itself – maximum flexibility for order-controlled production of individual workpieces.

SINUMERIK “Run my Robot” – the highlights

- CNC know-how alone is sufficient: complete CNC integration of the robot control
- Robots move in the coordinate system of the machine (e.g. workpiece coordinates including active transformations) → simple programming, simple traversing in jog along the workpiece axes
- Operation, programming, commissioning, diagnostics and maintenance of the robot via the CNC
- Override settings at the machine are also applicable for the robots (synchronous operation)
- Extremely simple switchover between synchronous operation and independent operation (manual and/or program controlled)
- Free selection of the coordinate system in independent operation
- Safety functionality of the robot integrated in Safety Integrated (including automatic brake test)
- Interface coordinated between Kuka and Siemens
- Channel principle: one CNC can control several robots
Perspectives for extended robot use

- Simple way of achieving completely automated machining of various blanks entered in any sequence (robot-supported workpiece identification)
- Batch size of 1 and different materials can be machined extremely quickly in sequence
- Time is reduced by actively incorporating the robot in the machining process
- The tool magazine on the robot is equipped during the main machining time and/or tools are replaced on-the-fly (eliminating the time-consuming movement of the spindle to the magazine).
- (Automated) part-specific robot programming already in the CAD-CAM loop – including the definition of disturbing machine and workpiece contours

Identical operation, identical programming, identical coordinate system

Configuration example:

- MK7 axis machining center
- KR 60-3 Kuka robot
- Control technology from Siemens:
  – SINUMERIK 840D sl
  – SINUMERIK Operate, also including options
- MDynamics
- “Run my Robot”

Rationalization potential for production

Klaus Kern - CEO of MAKA-Systems: “The consequential CNC integration with “Run my Robot” opens up extensive rationalization potential for users. The CAD-CAM process can now be expanded so that as standard a control program for the robot can be generated in parallel to the NC program. Expanding the process in this way means that robots are not just limited to part handling, machine-related material flow or integration into the production line, but now they can be directly integrated into the production landscape. As a consequence, SINUMERIK ‘Run My Robot’ has the potential, over the medium term, to expand our own system for linking robots.”

Efficiency and flexibility in production: Articulated robots play an important role. As CNC-controlled machine component, they can be seamlessly integrated into an operating and programming environment that is known and well established.

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Whether manually in jog or in the programmed automatic mode: Without the operator or programmer having to do anything, the robot travels along the machine or workpiece axes. The NC program for the robot – standard DIN/ISO code or standard NC cycles – runs in its own CNC channel. This means that one CNC can also control several robots.

Simple, high performance, fit for the future:
SINUMERIK “Run my Robot” is the result of a long-term strategic cooperation between KUKA and Siemens.

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