KUKA.CNC for maximum robot performance in machining processes.
With KUKA.CNC, an NC controller kernel has been completely integrated on a KR C4 for the first time, making it possible to run NC programs directly on the KUKA KR C4 controller. NC programs, programmed offline using a CAD/CAM system, can be processed without prior conversion to KRL programs (KUKA Robot Language) and executed with the robot.

In addition to the CNC kernel, KUKA.CNC offers a dedicated CNC-specific user interface. The CNC user interface “CNC-HMI” (CNC operator control) is thus available on the smartPAD alongside the KRL user interface “smartHMI” (KRL operator control). This user interface incorporates typical operator control elements of a CNC controller, enabling machine operators with experience of CNC machine tools to start operating the CNC robot quickly and easily. The CNC controller now makes it possible to process even large programs consisting of a large number of program blocks. Programs with up to 1 million path points have been successfully processed. The short distances between the individual CNC path points, together with advance path planning with a range of 150 path points, result in substantial improvements in the path accuracy and path motion characteristics of a “KUKA.CNC robot”.

CNC-specific functions:
- Tool radius correction on the controller
- B-spline/Akima spline path interpolation
- Oriented tool guidance
- Functions for programming a defined velocity profile
- Jerk limitation
- Process/path interpolation

**Ready for immediate use:**
**Familiar interface for fast programming.**
KUKA robots perform machining tasks like machine tools – and can be programmed like them too in G-code (DIN 66025) thanks to the KUKA.CNC interface. Users understand them straight away, can create programs using a CAD/CAM process chain and, after simulation, execute them on the robot without having to compile them into the robot language. Already included: tool radius correction, sister tools and many other familiar CNC functions.

**KUKA.CNC. The machine tool and robot talk the same language.**
Working in conjunction with machine tools, KUKA robots are true all-rounders. They load and unload, clean, mount, change tools, label and deburr. Thanks to KUKA.CNC, taking advantage of this diversity is easier than ever before. The possibility of seamless CNC integration reduces programming times and speeds up sequences. It has never been easier to unite machine tools and robots for greater profitability.
CNC and robots expertly connected: KUKA.CNC.

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In addition to the CNC kernel, KUKA.CNC offers a dedicated CNC-specific user interface. The CNC user interface “CNCFF” (CNC controller) is thus available on the smartPAD alongside the KR user interface “smartHMI” (URL, robot control). This user interface incorporates typical operator control elements of a CNC controller, enabling machine operators with experience of CNC machine tools to start operating the CNC robot quickly and easily. The CNC controller now makes it possible to process even large programs, consisting of a large number of program blocks. Programs with up to 1 million path points have been successfully processed. The short distances between the individual CNC path points, together with advanced path planning with a range of up to 100 path points, result in substantial improvements in the path accuracy and path motion characteristics of a KUKA.CNC robot.

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KUKA.CNC Sinumerik

The Milling application module for KR C4 includes components for creating a robotic machining system. The components for controlling and operating (air and water supply, power electronics, spindle and safety equipment) are integrated into the milling controller. All installed modules are preconfigured and thus offer an operator, complete tool path planning which can be implemented quickly and without start-up work at the customer’s location.

Components of the milling robot system

- Industrial robot
- Robot controller
- Milling controller
- CNC controller
- Milling electronics
- 1 x 4 kW spindle (including motor, speed controls, safety module)
- Milling spindle
- Milling system (cooling system)
- Milling tool compensation
- CNC-Simulation
- FE simulation
- Milling tools
- Milling tool compensation
- Milling tool program (G-code)
- Milling tool paths
- Milling process path information

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KUKA.CNC Sinumerik offers the unique means to connect a KUKA KR C4 robot controller to an upstream Siemens Sinumerik® controller and to perform complete robot operation and programming using standard Sinumerik functions. An interface based on PROFINET RT allows the Siemens controller to be used to realise path planning for the robot motion to be executed and to send motion information to the robot controller at the KR C4 controller’s interpretation cycle rate. This control architecture makes it possible to use advanced functions of the Sinumerik® controller and to operate the robot in a Siemens CNC format for machine tools. Operator control and online programming of the robotic machining system can be carried out via a standard Siemens control panel or a mobile terminal. The KUKA control system continues to use all control and user functions which move the industrial robot on its programmed path as an integral part of the system. In this way, the robot path interpreter uses a dynamic robot model which allows the robot to be manipulated in its current pose. KUKA.path and safety algorithms enable the safe operation of the robot, now in connection with a Siemens Sinumerik® controller.

Testing facilities and options at the KUKA TechCenter

With the two solutions KUKA.CNC and KUKA.CNC Sinumerik, KUKA robots can directly process CNC code. This also facilitates the integration of robots into an offline process chain for robot path programming in CAD/CAM systems. These programming systems have long been used for the complex programming of CNC machine tools. A wide range of users in work preparation departments with extensive previous know-how can now apply this expertise to the programming of robots in machining processes. More and more frequently, CAM systems have been integrating special modules into their software solutions for the simple yet very advanced path programming of industrial robots. These software tools offer a direct connection to higher-level ERP systems which are used in companies for the complete process data flow.

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Feasibility and accuracy studies of KUKA robot systems can be performed on a broad spectrum of customer components using a variety of milling systems. Materials which can be tested range from soft to plastic materials (flexible foam, rigid foam, PU, PP, wood, aluminium, CFRP, GFRP, cast iron) – to special materials such as wax, pattern-making clay or ice.

Features and advantages

ROBOT AS A FLEXIBLE MACHINING CENTER. The direct execution of all standard G and M commands for tool handling and high-speed cutting turns the robot into a highly flexible machining center – especially for large, complex components that have to be machined on all sides.

FURTHER ADVANTAGES WITH KUKA.CNC SINUMERIK. Supplemented with various tool compensation functions, the CNC path planning reduces high surface precision.

OFFERED CONTROL OF THE ROBOT FROM A TYPICAL CNC ENVIRONMENT. The software modules of KUKA.CNC Sinumerik steers the robot to be used directly for programming and machining workpieces. This can be done in the familiar language of your machine tool.

FULLY INTEGRATED CNC CONTROLLER. The direct integration of CAD/CAM systems and the direct processing of G-code with defined CNC functions guarantees a uniform process chain for machine tools. Operator control and online programming of the robotic machining system can be carried out via a standard Siemens control panel or a mobile terminal. The KUKA control system continues to use all control and user functions which move the industrial robot on its programmed path as an integral part of the system. In this way, the robot path interpreter uses a dynamic robot model which allows the robot to be manipulated in its current pose. KUKA.path and safety algorithms enable the safe operation of the robot, now in connection with a Siemens Sinumerik® controller.
Quality made German robots built with the utmost commitment to our customer’s needs. KUKA has been the basis for decades of exceptional technology helping companies to achieve process optimization. We were the pioneers in the world of robotics, and now are global leader in innovation. Our passion is finding future-oriented solutions to make even complex automation tasks simple. Whatever your application no matter the difficulty you can implement it with KUKA. Thanks to experienced KUKA system partners we are able to provide robotic solutions industry-wide. We strive to turn your ideas into reality. Use our experience to drive your success.

KUKA – YOUR STRONG PARTNER.

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