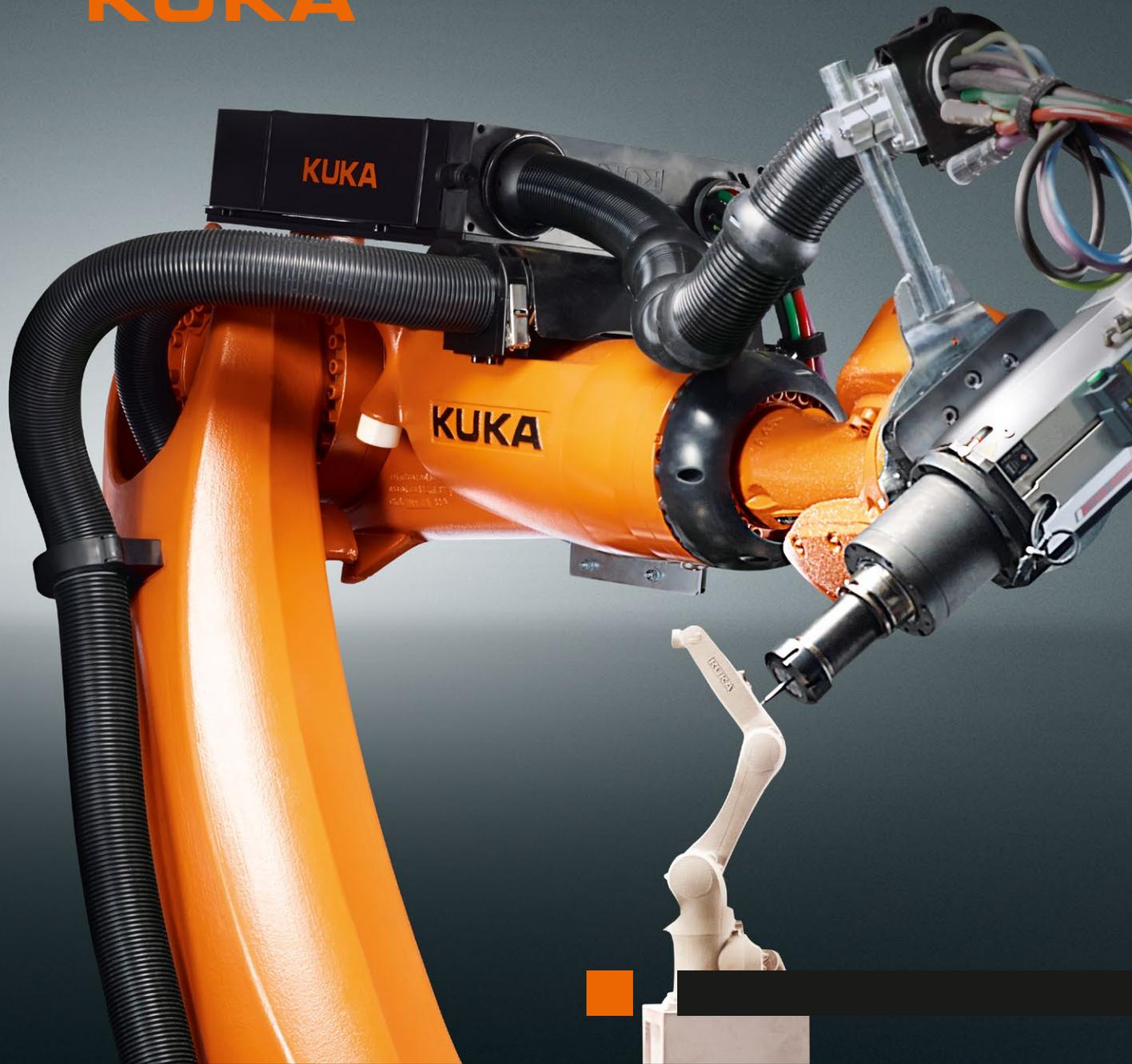


KUKA



KUKA.CNC for maximum
robot performance
in machining processes.

CNC and robots expertly connected:

KUKA.CNC.

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".

Robots and systems combine to form a process-oriented integrated system operated from one terminal.

KUKA.CNC

KUKA.CNC Sinumerik



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.

- 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 _____

KUKA.CNC. The machine tool and robot talk the same language.



Cleaning



Loading and unloading



Labeling



Deburring



Tool change



Sorting

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.

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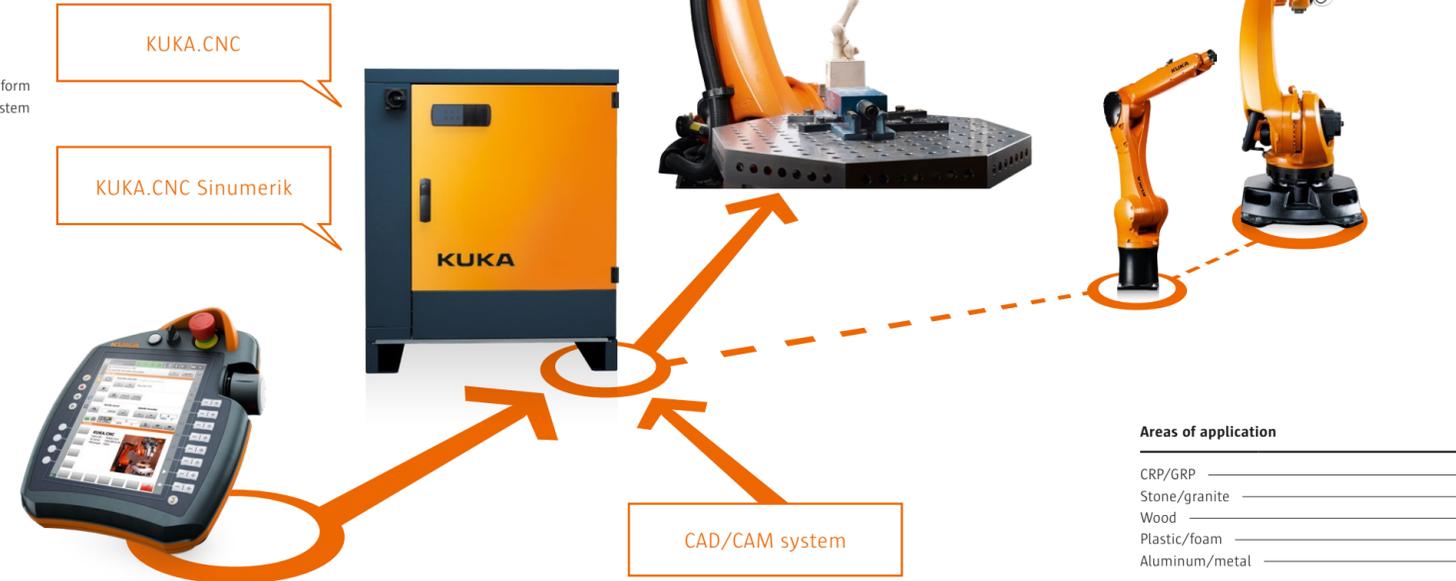
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CNC-specific functions

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Areas of application

CRP/GRP _____
 Stone/granite _____
 Wood _____
 Plastic/foam _____
 Aluminum/metal _____

The Milling application module for KR C4.

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) the electrically-driven spindle and the safety equipment are integrated into the milling controller. All installed modules are preconfigured and thus offer an operational, complete process solution 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 _____
 smartPAD teach pendant _____
 Milling technology cabinet _____
 Electrically-driven spindle (8, 12, 16 kW power) _____
 Milling controller (frequency converter, safety module ...) _____
 Recooling system (spindle cooling) _____
 Tool rack (option) _____
 Tool cover (option) _____
 Gate lock (option) _____
 EMERGENCY STOP device (option) _____
 Positioner, linear axis (option) _____

KUKA.CNC Sinumerik.

KUKA.CNC Sinumerik offers the unique means to connect a KUKA KR C4 robot controller to an upstream Siemens 840D sl controller and to perform complete robot operation and programming with standard Siemens functions. An interface based on PROFINET IRT allows the Siemens controller to be used to realize path planning for the robot motion to be executed and to send motion information to the robot controller at the KR C4 controller’s interpolation cycle rate. This control architecture makes it possible to use advanced functions of the 840 D sl and to operate the robot in a common CNC format for machine tools. Operator control and online programming of the robot machining system can be carried out via a standard Siemens control panel or a mobile HT8 terminal. The KUKA control system continues to use all control and drive functions which move the industrial robot on its programmed path as accurately as possible. To this end, the robot path interpreter uses a dynamic robot model which allows the robot to be optimally moved in its current pose. KUKA path and safety algorithms enable the safe operation of the robot, now in connection with a Siemens 840D sl controller.

CAD/CAM/KUKA process integration.

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-controlled machine tools. A wide range of users in work preparation departments with extensive previous knowledge 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 and verified path programming of industrial robots. These software tools often provide a direct connection to higher-level PLM systems which are used in companies for the complete process data flow.

Testing facilities and options at the KUKA TechCenter.

The KUKA Robotics TechCenter now provides a large range of options for machining and application testing with KUKA robots. Testing is flexible, uses various robot test systems and is tailored to customer requirements. 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 plastic materials (flexible foam, rigid foam, PU, PP, wood, aluminum, CRP, GRP, cast steel ...) to special materials such as wax, pattern making clay or ice.

Engineering and programming for CNC projects.

With the Robotic Consulting department, KUKA Roboter GmbH offers its customers and system integrators an extensive range of services. Individualized programming solutions, specially designed for the requirements of the machining sector, are created here by experts on a project-specific basis. This provides the customer with a solution tailored exactly to the particular needs of his machining project. Robotics knowledge and process expertise are combined to achieve the best possible machining solutions featuring cutting-edge technologies and assuring the customer maximum economic benefit.

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.

UTMOST ACCURACY DUE TO CNC PATH PLANNING. Supplemented with various tool compensation functions, the CNC path planning ensures high surface precision.

OPERATOR CONTROL OF THE ROBOT FROM A TYPICAL CNC ENVIRONMENT. Upstream CAD/CAM software enables the robot to be used directly for programming and machining workpieces. And 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 guarantee a uniform process chain.



Free-form surface machining on a wooden model with the capability of processing extremely large CNC programs.



Robotic finishing work at a machine tool. The robot carries out machining jobs in addition to the automation task.



Machine hammer peening with a KR QUANTEC and KUKA.CNC.



KUKA – YOUR STRONG PARTNER.

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.



www.contact.kuka-robotics.com



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