



KUKA Roboter builds a secure future

Intel's technology, with embedded lifecycle support, gives KUKA the ability to bring a new PC-controller product to market

Case Highlights

Profiled Organisation	KUKA Roboter GmbH, the world's third largest robot manufacturer.
The Challenge	KUKA Roboter, a globally operating Original Equipment Manufacturer (OEM) with a large established installed customer base, required a highly stable platform for its next-generation PC-based controller. KUKA needed guaranteed component availability to support a product lifespan of up to seven years, even in demanding operating environments.
The Solution	Using Intel's technology, Fujitsu Siemens Computers created a customer-specific industrial motherboard solution for the KUKA PC-based controller. Capable of highly durable performance and providing optimal system integration, the solution meets lifecycle product guarantee requirements and is future-proofed against the anticipated needs of KUKA's customer base.

Summary

KUKA Roboter is one of the world's largest robot manufacturers. Since building its first industrial robot in 1977, KUKA has earned an international reputation for plant automation and robotic excellence. Providing solutions for the automotive and metal-working industries as well as their sub-suppliers, its customers include the likes of manufacturers such as BMW, DaimlerChrysler, the Volkswagen Group and Ford.

With the introduction of its KR C1* controller in 1996, KUKA Roboter became the world's first robot manufacturer to move away from a proprietary controller to a PC-based controller using a Windows* interface. Providing a unified, PC-based, standard concept for the entire KUKA robot range meant its global customers enjoyed the benefits of high reliability and ease of maintenance. Today, virtually the whole of KUKA Roboter's field-installed base of 60,000 robots utilises its own PC-based control technologies.

Evolving the next generation PC-based controller involves significant and critical business and engineering decisions for KUKA. Alongside specific performance requirements, KUKA Roboter has to consider long-term platform and image stability, so as to enable customer-wide alignment in addition to customer manufacturing productivity and continuity. Furthermore, the high-performance platform has to be available for an unusually long and clearly defined timeframe of between five and seven years, without re-engineering, re-qualification or modification. As an OEM that assembles and produces its own systems, failure on any of these points has significant impact on customer relationships, and ultimately on KUKA's reputation and business.

For the motherboard, the main component of the PC-based controller, KUKA selected the Intel based D1688-K* from Fujitsu Siemens Computers to make provision for the innate reliability and quality demands of the product. KUKA's specifications were clear: alongside outstanding durability, the board's individual components had to be available for the lifetime of the board. To give KUKA an effective product-lifecycle guarantee, Fujitsu Siemens Computers selected an Intel-based component platform that would meet KUKA's performance definitions and provide a long-term technology roadmap to assure both platform stability and longevity.

Challenge: ultimate performance and reliability under unrelenting pressure

For Klaus Brosche, Vice President Competence Centre Systemboard, Test & Compliances and Keyboards at Fujitsu Siemens Computers, evolving an embedded solution for KUKA involved responding to an unusual and highly demanding application challenge.

"This was a distinctive and highly specialised customer requirement. Because of the nature of the manufacturing marketplace and of KUKA's own customer operating environments, the need was for a high-quality motherboard capable of performing with zero downtime in extended lifetime operations, while offering full compatibility with a variety of end-customer systems."

A key goal was ensuring that KUKA Roboter could satisfy market requirements by providing technology with unparalleled reliability. Dependable and highly stable systems are essential in hostile and exacting manufacturing situations, as Martin Pleyer, Graduate Engineer Quality Assurance at KUKA Roboter explains: "Downtime is simply unacceptable to our customers. For this reason we seek out premium, standardised, high-quality motherboards capable of operating within an industrial product that's exposed to intense 24x7 work situations and tough environmental conditions; our control systems have to operate in temperatures of around 55 degrees centigrade, and be capable of sustaining a seven-year working life."

KUKA's exhaustive eight-month testing process validated that the D1688-K board provided both the durability and reliability required. With both R&D and motherboard production close to the customer in Augsburg/Germany, together with long-term engineering expertise, extensive system competence and very high quality, Fujitsu Siemens Computers has been established as KUKA Roboter's motherboard partner for the new PC-based controller. With this in place, the focus now turned to defining the embedded components that would determine board functionality, compatibility and lifecycle expectations.

Process: selecting for today's demands and ensuring a future-proofed product

A fully integrated solution was a primary goal for all parties, as Martin Pleyer from KUKA clarifies: "For us, the whole system, from board quality through to the chipset and PCB, is integral. To ensure we are able to assemble a standardised product, we need a high-volume premium board, customised to our exact requirements. Achieving component consistency is essential to the delivery of an optimised product and to ensuring that we can effectively manage post-sales support to our customers."

Klaus Brosche, Fujitsu Siemens Computers continues: "Our next task was to develop a specific embedded solution, populated with on-board technologies, which would satisfy KUKA's unique stipulations and requirements as an OEM. Working with Intel would enable us to provide a high quality and innately stable platform with reliable, standardised components, all of which was essential in delivering this solution."

"KUKA wanted support for embedded Windows XP* and the VXWorks* operating system, to provide a familiar and easy-to-use environment to program and interact with the Robot," says Klaus Brosche. "As an industrial customer, revision changes can be costly to incorporate and validate—and a stable NIC solution was key for KUKA. The ideal was to incorporate the networking chip on the FSC mother board, giving a 1Gbit bandwidth that was more than capable of supporting KUKA's future customer requirements. Ensuring that any selected CPU and chipsets are compatible with its customer systems represents a huge R&D investment for KUKA, and changing anything during the lifecycle would compromise its business and reputation."

Durability and lifecycle-duration demands mean that long-life capacitors and highly reliable semi-conductors are of paramount importance to KUKA. The embedded solution utilises an Intel® 875P chipset to deliver inherent scalability, the ICH5 controller hub, together with the GbE 825471EI controller which provides full-duplex Gigabit Ethernet performance, providing enough bandwidth headroom for future applications. The current configuration utilises 2Ghz Intel® Pentium®4 and Celeron® processor.

A consistent platform, guaranteed over five years with zero component revisions or modifications, was central in Fujitsu Siemens Computer's selection of Intel as a solution partner, as Klaus Brosche explains: "Serial production for an industrial model is dependent on a guaranteed and standardised platform over an extended timeframe," he says. "The ability to track component parts is essential to KUKA's customer support and maintenance process. Even more important is the ability to deliver consistent functionality over the entire product lifetime."

"For KUKA, on-board power and the latest technologies were not the most salient priority; lifetime reliability and long-term component availability were highly critical," he continues. "Even the smallest changes in chipset can lead to disrupted production, or costly modification and re-qualification issues."

Intel's commitment to a five-year roadmap for its products made it the partner of first choice for Fujitsu Siemens Computers in its development of an embedded solution for KUKA, as Klaus Brosche explains: "If demand for a standard component falls off, most other manufacturers cease production, putting OEM-based solutions at risk. Intel provides a clear embedded product roadmap — and its chipset specifications are more detailed than any other manufacturer, making the R&D process far more open and collaborative across all parties."

Intel's guarantee of product continuity ensures support throughout the projected lifespan of the controller. In addition, it enables KUKA to make a minimal spares investment and gives Fujitsu Siemens Computers just one partner to call if fast response is required to any technical changes at KUKA. As Martin Pleyer at KUKA Roboter states: "Intel's product roadmap was absolutely key for us, as an industrial customer," he says.

Future: stable and planned evolution

The latest generation of KUKA controllers offers lifetime reliability together with enhanced functionality and features. Over the next two-and-a-half years, KUKA aims to maintain a stable platform before planning the next iteration of its controller technology. For the team at Fujitsu Siemens Computers, being able to review Intel's embedded roadmap enables detailed planning to support embedded-solution customers such as KUKA Roboter. "As our first-choice partner in the development of bespoke solutions, Intel's platforms enable us to pass on inherent performance and business advantages that no other component vendor can provide."

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