» Application Story «

COM Express™ in Medical

From the dentist's chair to a multimedia cockpit

Embedded module with carrier board from Kontron in medical engineering

ERGOcom 4 is an innovative communication system used in dental surgeries, providing a practical way of delivering important information to both dentist and patient. During development, KaVo's engineers were looking for flexibility and sustainability — and found them in a Kontron COM Express™ solution. In addition to performance, scalability, and leading-edge technology, the company's embedded specialists were impressed by the first-class consulting services they received throughout the design-in phase.

KaVo, based in Biberach in the south of Germany, is a major operator in dental technology market. More than 3000 people worldwide are responsible for generating high- quality products and ensuring customer satisfaction. Since 2004, the company has been part of the US Danaher Corporation. Through its continuous innovations intended for daily use in dental practices, KaVo has made a significant contribution to advances in dentistry. This is highlighted by more than 2200 patents and utility models that are in domestically and abroad.

ERGOcom 4 – Highlights

» Link to systems in the dental practice office, such as computers, cameras, x-ray, and microscopes

» Flexible media catalog, enables push of marketing information to a patient during treatment at the press of a button

» Terminals for USB devices such as a digital camera and KaVo x-ray sensors

» Multiple options for imaging

» Automatic system check and display of ultimediabased instructions

» Display of device and instrument status, e.g., motor speed

» Software updates via the Internet

» Remote maintenance online with video support and hotline

Dentist's cockpit

One of the most innovative products designed by KaVo is the ERGOcom 4 communication system - a novel solution that turns the classic dentist's chair into a virtual cockpit for the dentist and the patient.

ERGOcom 4 is linked to the network of a dental practice, enabling it to provide dentists with all the information available on a patient and their treatment on a rotatable monitor, straight from the network to the treatment room. Prior to this, the dentist usually had to move away from a patient to a monitor stationed elsewhere and possibly interrupt the procedure for a short interval. The use of the ERGOcom 4 means that dentists have constant access to x-ray images, treatment records, and various other kinds of patient information right in front of them that is accessible without interrupting the treatment. There is also the possibility of connecting an interoral camera and producing real-time images of regions that are difficult to access directly on the monitor, thus improving the level of care that the dentist can provide while minimizing patient discomfort.

Further to that, ERGOcom 4 generates useful services for patients too. If their treatment proves to be a lengthy procedure, they have a multimedia program at their disposal to distract and entertain them. That puts a patient more at ease, and can make for better results.

Another practical benefit of the product is its Internet access. ERGOcom 4 can simply download new functions or firmware upgrades, enabling a dentist to easily keep the system up to date.

Open-ended for the future

Implementing this revolutionary system called for an embedded computer concept that satisfied a number of complex requirements.

For Tobias Bauer, software development manager at KaVo, flexibility and long-term scalability were the two key criteria for choosing the embedded computer system. "KaVo emphasizes sustainability and flexibility of its solutions, because both are of major importance in medical engineering. Dentists want to invest in technology that's reliable and pays back in the long term. Plus, a system must be open-ended and allow new techniques to be adopted that keep open way to faster and better forms of treatment," says Bauer.

These are basic principles for KaVo when it comes to choosing its partners, including embedded technology vendors. "An embedded technology should be powerful enough to serve the full functionality of a product and at the same time adaptable enough to allow for any innovations that appear with future developments," Bauer continues. "We also look for partners who can offer us considerable support in the concept phase, not just later."

In search of the right system, the development team attended the Embedded World show in Nuremberg. The first impression after the KaVo team's meeting and initial consulting discussions with embedded computer technology producer Kontron was a positive one — Kontron's products and its competence matched KaVo's expectations.

Modular solution preferred

"What we found especially interesting was Kontron's modular approach, because modular generally means more flexibility and few if any constraints. These are particularly important features in our medical products, given the fast pace of developments. And we naturally want to offer our customers excellent technology," adds the manager of KaVo software development.

A computer-on-module solution also looked to be a sound and economical compromise between single-board computers with add-ons and full custom design. The engineers did consider a motherboard or SBC solution, but these proved to be too

inflexible and repeatedly demonstrated limitations when evaluated. A full custom solution, on the other hand, would have been too costly in addition to requiring that long-term flexibility and scalability be forfeited.

What also made Kontron's modular solution attractive was the support available with the COM Express™ industry standard. COM Express™ not only made an impressive start on the strength of its mechanical and electronic concept; current developments show that the standard can be adapted without difficulty to new demands in terms of form factor and energy efficiency. COM Express™ consequently matches two of KaVo's basic requirements: flexibility and sustainability.

As a result, KaVo's developers elected to begin the evaluation of a Kontron ETXexpress® module. The carrier board development also was contracted to Kontron. KaVo was very satisfied with the support it received from the Kontron. "Parallel to this, we were trialing other solutions and concepts, so the evaluation phase obviously took its time. Kontron's support during this period was very good, even on questions connected with other projects," says Bauer of the selection process.
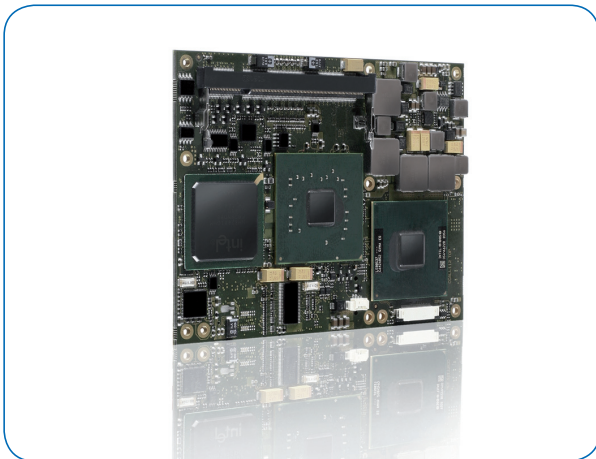

Photo 1: ETXexpress®-CD Modul mit Intel® Core™ Duo Prozessor

Setting the bits and bytes to work

The evaluation phase showed that the envisaged solution was right in all its details. The CPU powers the multimedia functions of ERGOcom 4 with adequate performance. The layout, such as the arrangement of the connectors, could be configured to match the needs of external design, governed by marketing principles, of course. High-speed Ethernet and a frame grabber for digitizing video signals were implemented by the expansion card standard PCI Express.

For flexibility and simple addition of functionality to ERGOcom 4, the developers were able to use the USB interfaces of the system. Peripherals such as KaVo's x-ray sensors, devices for simple transmission of diagnostic data, or digital cameras could be connected to the four external interfaces in a plug & play mode. The internal USB interface supports KaVo's wlink

for wireless communication. The screen is integrated a high-definition multimedia interface, audio functions by audio I/O, and the signals are digitized by Codec97.

The panel PC can be cooled over the standard heatsink of the module. Given the relatively high power consumption of the monitor and power supply, an extra fan was added as active cooling in the metal casing to ensure that the operating temperature would not exceed.

The system is powered on 12 Vdc. An integrated real-time clock and the CMOS RAM buffer are fed from a vanadium-pentoxide lithium battery (VL2320). LEDs on the front indicate the supply voltage. In operation, the consumption of the module is less than 20 VA, while that of the carrier board is less than 15 VA.

The BIOS was matched to custom KaVo requirements — display of the corporate logo, suppression of system log-on, password protection, plus start-up by the foot trigger.

Kontron COM Express™ Solution

Applikationsbeschreibung
Panel-PC für zahnärztliche Behandlungseinheit zur Visualisierung

Projektbezeichnung
Kundenspezifisches Baseboard Design mit ETXexpress-CD Modul 1GHz

Abmessungen
» 175 mm x 175 mm x 40 mm

Die wichtigsten Funktionen
» 1x 10/100/1000 MBit Ethernet
» 1x Video Frame Grabber Conexant
» 2x S-Video Ein- und Ausgänge
» 1x DVI / HDMI Ausgang
» 1x VGA Ausgang
» 1x Audio In/Out Line
» 4x USB 2.0, plus 2x integriert
» 2x Serielle Schnittstellen RS232

Uninterruptible duty

KaVo put special emphasis on reliability in operation. "An ERGOcom 4 will be in service for at least ten years — running 200 workdays a year at eight hours a day means the system must have adequate operating reserves," outlines Bauer. Consequently it was important that Kontron's PC panel supported the intended secure operating system solution. The developers opted for Windows Embedded. This software ranks as being extremely reliable and efficient, in addition to which it offers a flexible assortment of tools and programs.

ERGOcom 4 runs under Windows XP Embedded that is installed on an integrated 40 GB hard disk. Booting takes less than a minute. In the evening, a dentist can simply put the system on cold standby, without shutting it down entirely. To make sure no patient data is lost; data is immediately saved to a server whenever it is changed.

KaVo's technicians also wanted to design the patient's chair to be as user-friendly as possible. The actual customer should never have anything to do with the apparatus at operating system level. To this end, they developed software based on Microsoft Net 3.5 that not only controls the foot trigger, but also conveniently guides a dentist through programs. Remote maintenance of the system is possible over the Internet, and software updates — likewise over the Internet — help to sustain the long-term value of an investment.

High-tech in the dentist's chair

Evaluation convinced KaVo's technicians that the Kontron solution was right for their application. The feature set is an ideal match for ERGOcom 4; in COM Express™ technology combined with specialist support from Kontron, the product sets up on a reliable, sustainable, and flexible module/carrier board combination. Consequently, KaVo is able to plan long-term, because new trends are also effortlessly integrated into the system.

Bauer speaks positively in his assessment of the application: "KaVo places a great deal of emphasis on both sustainability and flexibility. Being a manufacturer of medical equipment, we must always aim for a balance between quality and long-term availability, the latest technologies, and emerging trends." Kontron was just the right partner. "They were able to satisfy these requirements and support us in developing the concept," the manager explains. "The people working on the project, on both sides, were the same for its entire duration, so they learned to understand one another and created the right kind of relationship to produce the results we were looking for. That way we've succeeded in fusing significant features in the ERGOcom 4, such as having an open-ended system for the future and long-term availability."

KaVo ERGOcom 4
Vernetzungsdiagramm
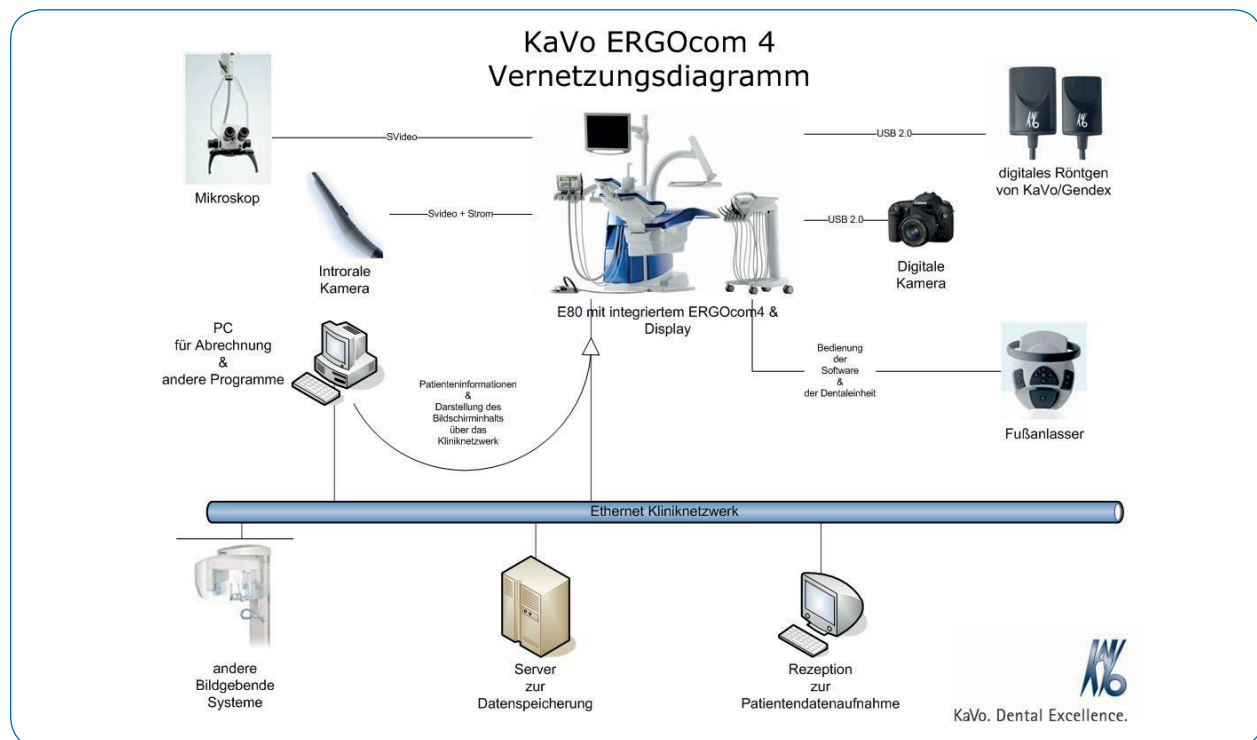
About Kontron

Kontron is a global leader in embedded computing technology. With more than 40% of its employees in research and development, Kontron creates many of the standards that drive the world's embedded computing platforms. Kontron's product longevity, local engineering and support, and value-added services, helps create a sustainable and viable embedded solution for OEMs and system integrators.

Kontron works closely with its customers on their embedded application-ready platforms and custom solutions, enabling them to focus on their core competencies. The result is an accelerated time-to-market, reduced total-cost-of-ownership and an improved overall application with leading-edge, highly-reliable embedded technology.

Kontron is listed on the German TecDAX stock exchanges under the symbol "KBC". For more information, please visit: **www.kontron.com**

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