Even after 25 years, always up-to-date with VMEbus control

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In the 25 years since its introduction in 1981, VMEbus has proven its worth as an open industry standard for 3U and 6U boards and systems. Some VME solutions from Kontron have been in continuous use for 15...20 years and replacement parts can still be supplied for them today.

Figure 1. TruDisk 6002 laser machine by Trumpf with VMEbus control system by Kontron

The Metro in Warsaw still uses basically the same control concept that was first installed 12 years ago. A fundamental advantage of VME is that individual components can have a long service life, despite increases in both performance and the scale of integration of an overall system. Technically, this is made possible by the asynchronous architecture, in which old cards cannot slow down new cards. For this reason, VME is still the first choice for many designs because upgrades are comparatively cost-effective to obtain. If you need greater performance because of extensions, for instance, in many cases it is enough simply to change the CPU. A reference customer for the successful history and future of VME at Kontron is Trumpf Laser, Schramberg/Germany, a company of the Trumpf Group.

The company laid the foundations for the laser devices produced today back in 1988. At that time, it was decided that the control technology should be made up of two parts: the first part was a controller developed in-house to handle power supply and the control of the mechanical components. For the second part – collecting all the data generated via the controller and transferring it to the customer's applications – Trumpf used a VMEbus control from Kontron. With the controller units they developed themselves, Trumpf Laser's main objective was to generate as much sensor data as possible from the laser itself, the optics, the cooling system, the power supply and from the interfaces of the devices. Today, with the help of integrated sensors, more than 500 absolute measurement values are continuously recorded. Trumpf has broken away from recording and analyzing digital values: Using analog values, a problem can not only be localized, but can also be much better assessed in terms of its extent than with simple yes/no responses.

The generated values play an important role when the devices are brought into service in the plant in Schramberg. Using a special software tool (MinTol – minimum tolerance), the technicians restrict the tolerance field of the 500 measurement values by 30%. Every laser device must function optimally under these conditions – and must do so without warnings or error messages. Prior to delivery, the tolerance field is reset to 100%, which means that when they are dispatched, every device has a 30% safety zone. The Trumpf technicians also use the software tool for remote diagnosis at customers' premises in the event a machine has a fault. Right around the clock the specialists can use telepresence in a matter of seconds via modem, ISDN or the internet, to examine the laser system closely, even while it is in operation at a customer's site. The VMEbus controller with VMP1 by Kontron plays an important role in rapid and smooth data transfer. This single-board computer in 3U format with PowerPC 8240, 250 MHz continuously collects, manages and filters the data that the company's own controllers generate via the sensors and therefore, as an interface, is used both for the customers' applications and for remote diagnosis. A customer-specific 3U VMEbus carrier card for the laser control and field bus module allows a flexible connection of the control to Profibus, INTERBUS and DeviceNET.

The high level of performance of the VMEbus processor is mainly required for the connection to the customers' applications. The VME-CPU has to react in a quick and reproducible way on the start signal of CNC and/or PLC via parallel or field bus interfaces. The customer will not accept it if on a start signal the laser reacts after 5 ms one time and after 50 ms another time. We need the guaranteed real time capability that the VME system in connection with the real time/multi-tasking operating system OS-9 has provided to date, and that real-time Linux will

Figure 2. The VME CPU VMP3 with PowerPC processor

OSADL follows the concept of an institution organized on a cooperative basis for the development of a Linux-based operating system environment for the automation industry. Trumpf is a founding member of this institution.

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guarantee in future. In the meantime, the migration to real-time Linux has been completed and the hardware has been abstracted. The Linux-based operating system environment of the OSADL (open source automation development lab) consortium is used.

The decision to use a VMEbus control was made in 1988 for many different reasons. On the one hand, Trumpf was looking for an open, commercial platform that incorporated different standard components – these include networking components such as field bus or Ethernet connections. Scalability also played a crucial role: When Trumpf began 18 years ago, the most innovative product was the VSBC-1 (then made by PEP Modular Computers, today by Kontron Modular Computers) with a MC68HC000 (12 MHz). Since then, the throughput of the applications has come ahead in leaps and bounds.

When Trumpf went in series, they already needed the VSBC-4 (68302 processor, 10 MHz), and then switched to the VSBC-32 with 68360 CPU (33 MHz) and modern flash drive technology and today Trumpf uses the VMP1 with the PowerPC8240 and 250 MHz. They were able to implement all performance leaps without having to modify the software because Kontron had provided them with a board support package and the drivers. The special qualities of the VMEbus controller include: high reliability; scalable throughput; safeguarding investments in software through seamless HW/SW upgrades; fast interrupt processing unit; robust and compact technology as well as the ability to supply over the long term. For more than 15 years the VMEbus controller has helped Trumpf to have a stable and reliable controller architecture for their series of laser devices. The changeover to Linux was very easy without having to make significant modifications to the application software. The switch to RoHS also went without any problems. When Trumpf changed the VMEbus over to RoHS, 80% of the products they had listed could be successfully switched to RoHS.

A few products had to be discontinued such as an old serial interface card with 2x RS232. Nevertheless, 100% of all functional requirements could be switched over to the new RoHS-compliant solutions because, for example, many of the interfaces that used to be located on external expansion boards are now integrated on the new CPU boards or on more closely integrated expansion boards that are comparable in terms of price.

Kontron even still supplies the 68040/68060-based 3U and 6U VME CPUs in accordance with the new RoHS guidelines so that customers can continue to safeguard their investments in the coming years. In places where, for instance, the DRAM memory was not available with RoHS-compatibility, a new layout of the memory sub-module was implemented so that form-fit-function compatibility is guaranteed. Kontron therefore continues to offer its customers the entire range of VMEbus-based solutions. ■