

# ➤ Kontron Solutions@Work

We create digital brains for a more intelligent world

Control system for document printing in book wholesale

## ➤ Decentralized intelligence in a compact package

Delivery of goods, correctly and as quickly as possible, always poses an immense challenge to internal logistics. From planning the optimal flow of goods to efficient control of the entire logistics facility, a great deal of know-how as well as suitable software tools and automation components are essential factors for achieving the intended goals. Straightforward integration and expansion of automated subprocesses, for example, are supported by compact and flexible controls.



Order it today at the bookstore – and receive it as early as the next morning. Timely arrival of your book is ensured by, among others, KNV Koch, Neff & Volckmar GmbH. With locations in Stuttgart and Cologne, KNV is the largest book wholesaler in Germany with a market share of about 50%. At each of its locations, KNV has some 400,000 book titles in store, supplying

not only regular bookstores, but also Amazon and other Internet bookstores.

Modernization of decentralized control  
The automated in-house flow of goods had been handled through de-centralized controls for ten years, initially using LON technology (Local Operating Network). When, in the middle of 2004, the bottleneck between the printing of the delivery and order documents and the actual starting point of the transport of goods for commissioning was to be remedied, the system house Fraenz & Jaeger took over the planning and implementation of the desired run-time optimization in connection with a decrease in cost.



'ThinkIO' from Kontron was introduced as the new intelligent, decentralized control. The main requirement for the new solution was that it should optimize routes, delivery and time schedules, at a very high data throughput. 9,000 deliveries each day mean that a minimum of 1,400 containers per hour must be taken to the warehouse together with the appropriate documents. The new printing station consists of 16 standard office printers in all; two printers facing each other are set up to print the documents for one commissioning container. Naturally, the printing processes of the 16 printers must not interfere with each other. Even if one printer is temporarily out of order, due to a paper jam, maintenance or paper replacement etc., the remaining printers must keep going.



*Just-in-time-printing at eight printing stations with two printers each, perfectly controlled*

#### Printing "just in time"

The solution: all delivery and order documents, such as bill of lading, packing slip, as well as book and shipping labels, are not printed for each order until the corresponding commissioning container starts its journey through the book warehouse. The ThinkIO is not limited to controlling the printers, but also handles the container transport around the printing stations. The container transport must occur simultaneously with the printing of the documents. This requires, for example,

verification of whether all documents were printed correctly, whether printing has finished before the commissioning container starts moving, checking the printer status, whether there is an interruption, whether a container is waiting in the buffer space, etc. All this information is transmitted to the ThinkIO via sensors, scanners and adjacent controls. Therefore, the essential requirements of the Linux-based Kontron control consisted of easy expandability with additional interfaces (e. g., for scanners), availability of USB ports in order to connect the printers, networkability (Ethernet) for communication with the main computer and with adjacent controls, as well as easy programmability.

Naturally, selection criteria also included sufficient computing performance and a favorable cost/performance ratio.

The selected compact Kontron control system consists of the ThinkIO DIN rail PC as a central fanless computing unit, the modular Wago I/O system, and an IEC 61131-3-compliant soft SPS from Codesys Automation Alliance.

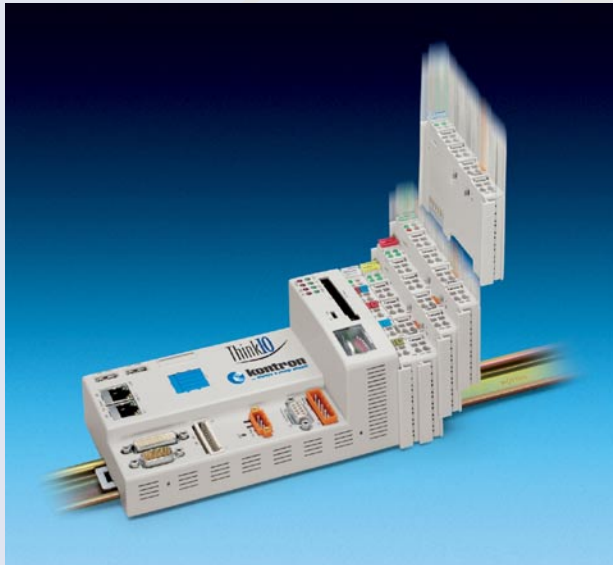


*The switch cabinets are divided into a production part (right) and a control part (left), where the compact control system takes up a minimum of space.*

Thanks to the Codesys development environment, the user is not restricted to using components from only one manufacturer when building an application, but is given an open system where components from all 60+ companies which are part of the Codesys Automation Alliance can easily be integrated and programmed. The ThinkIO is equipped with an Intel Pentium MMX-compatible 266 MHz

processor and, besides the direct connection to the Wago I/O system, offers, among other things, Watchdog Timer as well as all standard PC interfaces such as 2x USB, DVI analog and digital, 1x serial and 2x LAN.

The form-fit, industry-grade link-up of the I/O system's various clamps is very convenient, both mechanically and on the software side. I/O modules, simply clipped on, are detected automatically by the software.



*With the Kontron ThinkIO, KNV benefits in particular from the combination of networkability, interfaces and the possibility of connecting Wago clamps.*

Not only the classic analog and digital connectors can be attached, but also variants such as an AS-i (Actuator Sensor Interface) bus. Up to 64 clamps can be lined up per device. Through this high I/O granularity, customized x86-based controls can be realized with just a few easy assembly steps. With 2x Fast Ethernet and an optional field bus interface, the control is optimally suited for integration in industrial networks as a decentralized, modular unit, offering not only the link-up of classic field buses such as Profibus, DPCAN or DeviceNet, but also a field level Ethernet connection besides the Ethernet connection to the main level.

The ThinkIO supports the operating systems Windows CE and real-time Linux; through its default web server, it is able to exchange



data via the web/Ethernet. The entire control system is very compact and, with a maximum installation depth of 70mm, even fits into the smallest industry standard switch cabinet; therefore, at KNV, it could be installed directly in situ, in small switch cabinets above the printing stations. This is important for the USB wiring in particular, since the maximum cable length allowed here is 5m.

The key combination of features The factors that decided in favor of the ThinkIO included, above all, the easy expandability of the interfaces through extension modules, the combination of USB interfaces and Ethernet, as well as the Linux operating system and the programming with higher, or IEC61131-3 based PLC programm. These functions enable the processing of PostScript files or similarly complex file structures and serve all of the network capabilities needed here to synchronize all the processes and realize the requested throughput. Through customer-specific software adaptations by Fraenz & Jaeger, the desired data preparation within the print job controls became possible as well. Eight controls are used for the eight printing stations with two printers apiece; two printers per control can be

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connected via the two available USB ports. In the printer area, container transport is realized via the ThinkIOs in connection with existing (LON) controls. Communication between Ethernet and LON occurs through gateways which provide a connection between the old and new controls.

"Only ThinkIO offered this combination of networkability, interfaces and the possibility of connecting Wago clamps," says Thomas Fraenz, CEO of Fraenz & Jaeger GmbH. "The computing performance is also conveniently high, which could not be said for other providers. They would have required a more elaborate, two-part construction with an IPC and a separate control solution." The storage space on the control has been expanded by 128 MB by means of a CF card. Thus, almost the entire application, as well as many of the necessary log records, could be moved to this memory card.



### Practice Plus

KNV has been working with the new decentralized control solution, based on the Kontron ThinkIO, since October 2004. "75% of the predicted savings and optimizations have been realized already at this point," summarizes Dr. Frank Hinz, authorized signatory and Head of Logistics at KNV in Cologne. KNV has seen progress regarding reliability as well: since the new printers have been running, no irregularities have occurred, with the exception of a few minor disruptions of two or three minutes at most, which a KNV technician was able to remedy in no time at all. Furthermore, the application is designed so intelligently that, when there is a disturbance at one printer, the commissioning container on standby is immediately discharged, and the next container starts the canceled order anew on a different printer right away. On average, for reliability, KNV has achieved an improvement of 60 to 70% over the old solution. Based on these satisfying results, the same concept will now be introduced at the KNV location in Stuttgart as well.

### Info Tip

One advantage of the new KNV control system is its flexibility through the open standard within the Codesys Automation Alliance. For more information regarding this organization, please refer to [www.automation-alliance.com](http://www.automation-alliance.com)

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