» Application Story «

ThinkIO in Automation

Getting there faster with more precise positioning and less wear

Bosch relies on PSI Technics' intelligent positioning systems with the Kontron DIN Rail PC ThinkIO

To enable faster and more precise positioning with less wear and tear of transfer carriages in automatic warehouses, the Automotive Aftermarket Business Unit of Robert Bosch GmbH chose the intelligent Positioning Solution System from PSI Technics. They are not only a perfect substitute for the Trimble positioning systems which are no longer available, but they are a true retrofit and offer Bosch even faster, more precise storage and retrieval processes.The hardware platform is the compact ThinkIO Industry PC from Kontron, which makes an essential contribution to the flexible integration and high reliability of the system.

For storage and retrieval of car spare parts in their own automatic warehouses, Bosch had used systems from Trimble for positioning transfer carriages and shelf storage and retrieval operating units. When Trimble discontinued production of the ICS5000L, technologically the world's leading positioning systems which boasted over 15,000 installations worldwide, Bosch Automotive Aftermarket had to find an alternative solution. But the solution needed to replace the existing systems without costly and time consuming conversion work and the downtimes that come with that. In addition, the new solution had to offer the same high level of reliability and low maintenance. Due to the experience which Bosch had with the Trimble system, Bosch needed a long-term solution based on open standards to secure the availability of spare parts.

About positioning Systems

Positioning systems are motorized, one or two axis systems which navigate, for example, shelf operating units, transfer carriages and overhead cranes to their destination where they carry out storage or retrieval processes. Especially when larger containers are being transported, factors such as acceleration and braking and the mass inertia and vibration of the machine have to be taken into account to avoid accidents, unnecessary wear and tear or damage to the equipment. Time optimization is a key factor to the value of the system as not only can the response time for orders and requests be shortened but also the equipment's throughput can be increased considerably.

New positioning system from PSI Technics

Bosch found the system it was looking for at PSI Technics, a company situated in Koblenz which specializes in intelligent and effective solutions which increase the productivity and the quality of industrial positioning systems. The company has developed the Positioning Solution System, a system which carries out positioning tasks and which even surpasses the performance of the Trimble system. The system's functions are not just limited to position measurement; the system also regulates and optimizes processing time by calculating the ideal motion profile from the maximum acceleration and the distance to be travelled. By doing this, creeping speeds are avoided and throughput times are radically shortened. On top of all these factors, the Positioning Solution System is the only one available worldwide that can read and convert the parameters of the existing Trimble positioning systems which meant minimal downtimes during the implementation of this retrofit solution.

Extended performance spectrum

However, this is not all the Positioning Solution System has to offer in terms of performance. The Positioning Solution System offers two key differentiators over other positioning systems available on the market which leave behind even the superior standard of the Trimble ICS5000L solution. The first feature is the system's own intelligence. The Positioning Solution System automatically calculates a machine model of the installation where it will be integrated. Unlike traditional systems, the Positioning Solution System captures not only the reference data of the motor but also, via the sensors (i.e. laser distance meters), the driving behaviour of the equipment. The benefit is that the system's performance is continuously analyzed and compared with the model of the machine so that even the smallest vibrations can be compensated. This results in a sharp increase in the system's precision, plus the wear and tear of the equipment is reduced which in turn underlines the sustainability of the PSI system.

Flexible integration into old and new scenarios

The second key feature is the system's high level of flexibility. This is enabled by the fact that the digital control system works independently and is equipped with a wide selection of interfaces. As soon as it is connected with higher-ranking warehouse administration systems or controls (PLCs), the Positioning Solution System carries out the chain of commands automatically. Communication can either take place via standardized field bus systems or, as is the case with Bosch, via serial interfaces. To control drives of any kind the Positioning Solution System dictates to the converters the actual data of the track via analog voltage or analog current. Distance data capturing to the field can be carried out by modern optical distance meters, i.e. laser or infrared-based, or via encoders or barcode systems which can be flexibly connected via digital or analog I/Os.

What delivers the extended performance

The Positioning Solution System is a control unit in the form of a compact industrial PC, which provides numerous interfaces and connecting modules which are conform to industry standards (see picture 1) and a communication interface and

Picture 1: The control unit of the Positioning Solution System offers all the usual interfaces needed for connecting to the company's IT, processing computers or PLC as well as a scalable number of I/O modules for direct connection to distance meters like lasers, incremental encoders or barcode readers.

a distance meter for each axis which has to be measured. The industrial PC gets its intelligence from the PSI Technics software, which is conveniently installed via a web interface. Once installed, the software works independently and also supports next to the automatic reading of the parameter identification an intelligent trouble shooter: If for example one of the distance meters fails, the Positioning Solution System is, if needed (and for a specified period of time), able to switch over to the machine model rather than use the sensor data for the positioning. If this period is overstepped, a ramp function is activated and the machine is brought to a halt and issues a failure signal.

Tough demands on the hardware

The right choice of hardware was for PSI Technics' technical management as important as the quality of their own software:

Kontron ThinkIO fulfills all requirements

All the requirements which PSI Technics stipulates in its specification sheet are addressed by the Kontron ThinkIO ex works. Next to the compact design in the robust and fanless aluminium housing it also has a very high Mean Time Between Failures (MTBF), which depending on the individual I/O configuration, can reach up to 195,000 hours. With the combination of x86 industrial PC with a scalable, modular interface selection via clamp modules, the ThinkIO also allows direct and flexible integration regardless of location, in the field application or in the company's IT system. Even the real-time Linux OS with the RT pre-empt kernel invented by the OSADL consortium is part and parcel of the Kontron ThinkIO. The ThinkIO does not just provide the right processor performance but in the configuration PSI chose, even leaves room for scaling up the performance.

A strong partner ensures long-term design security

Another major issue for PSI and Bosch, aside from the technical demands, was to have an industry PC manufacturer with a solid position in the market in order to be able to make long-term plans. The manufacturer also needed to be in a position to guarantee that the hardware platform or a compatible successor for the next ten years. For PSI Technics Kontron, as one of the world's largest manufacturers of Embedded Computer Technology (ECT), was the best fit for a reliable partner for long-term planning. These factors were of the utmost importance for Positioning Solution System customers who need to update their existing systems which have gone out of production and are searching for a long-term replacement solution.

Already up and running

"The Positioning Solution System has now been up and running at Bosch since 2010: thanks to the flexible integration of the Positioning Solution System, within the shortest space of time we were in a position to modernize three of our transfer carriages without even having to exchange the system components and motors. The whole process lasted no longer than two hours per transfer carriage. It was a very simple procedure and our technicians were able to carry this out on their own", Thomas Knebel, Maintenance Planner at Robert Bosch GmbH in the Automotive Aftermarket business unit comments. *"Apart from the simple installation, we were also convinced by the increase in efficiency, so much so that we have already ordered ten further Positioning Solution Systems with which we will not only replace further old systems but also realize new systems with. Last but not least, we were also very impressed by the commitment and support of the PSI Technics team."*

"The top priority on our specification sheet, which determined our hardware choice, was the high level of flexibility required in terms of configurable I/Os which would grant easy integration into different application scenarios", Michael Niecknig, Technical Manager of PSI Technics Ltd, explains. *"Further to that we required a compact and fanless design for installation onto hat rails in switch cabinets, realtime OSADL Linux OS support and lon gtermavailability and reliability of the complete platform. Amongst all the hardware platforms we looked at with reference to this spec sheet, very soon the ThinkIO f romKontron materialized as our ideal choice."*

Mario Anich
Product Manager ThinkIO
at Kontron

Technical Information

Processor	2x 1.2 GHz Intel® Core™ Duo processor, 2MB L2 Cache
Memory	1 Gbyte DDR-SDRAM, 2Gbyte CF onboard, soldered
Ethernet	2x 10/100/1000 Base-TX
USB	2x USB
Serial	1x RS232 with all handshake lines
Onboard	Opto-isolated, separate I/Os Watchdog, relay output
DVI-I	Digital and analog (CRT/VGA adapter)
RTC	Gold Cap Backup
Field bus	Modbus RTU, Modbus TCP, DF 1
Optional	Profibus DP Master/Slave, CANopen Master/Slave, DeviceNet Master/Slave
Modular I/Os	Clamp module with 1, 2, 4 or 8 channels Digital and analog I/Os, SSI, special clamps, i. e. RS232, RS485
Operating system	Embedded Realtime Linux (OSADL)
Supply voltage	24V DC (-25%/ +30%)
Environmental temperature	0°C to +55°C degrees Celsius
Dimensions (LxBxH)	236 x 100 x 70 mm (with an I/O interface module)
MTBF	139,000 to 195,000 hours depending on configuration
Certifications	For example, shockproof according to EN60068-2-27 (15 g), vibration: EN60068-2-6 (4 g)

In the automatic warehouses, transfer carriages are responsible for automatic storage and retrieval of car spare parts. With the new positioning system from PSI Technics the availability of the system and the positioning precision are further secured.

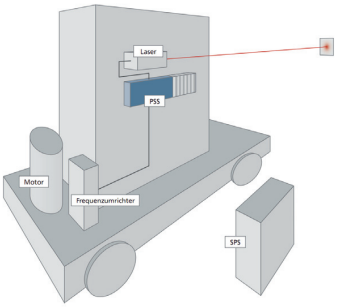

Diagram of the system construction with an example of a transfer carriage. The number of axes to be controlled can be scaled up to three and, as well as a laser, rotary encoders of barcode readers can also be connected.

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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