

Electrified monorail system: Up to 1500 carts in different CAN segments



Franz Ott



Jürgen Wanner

Established 1966, Berghof comprises different departments. The automation and testing division has chosen CAN as a strategic network technology in the beginning of the 90ties. As founding CiA member, the company had used first the CAN Application Layer (CAL) protocol and migrated to CANopen a few years later.

“One of our first CAN customers was Fico (now BESI) manufacturing some semiconductor production machines,” remembered Franz Ott, formerly head of the development and now managing the automation and testing division. “Other early CANrol users were Gieseke & Devrient

for chip-card personalizing equipment and SEG for gas, diesel, and wind-power systems (now Woodward).” In the 90ties, the company cooperated closely with Moog and PMA in the development of CAN products. One of the most important customers is Eisenmann using CAN-based control system for its electrified monorail systems (EMS). A new physical CAN layer has been developed by Berghof especially for these EMS applications. EMS are installed for example in the car-manufacturing plant. In the Ford factory in Cologne (Germany) the entire monorail system with embedded CAN communication has a length of 13 km comprising

several segments. In each segment, up to 100 carts coordinate themselves via the CAN communication integrated in the monorail. The segments have a maximum length of 300 m. In total, up to 1500 vehicles populate the rail network. The carts transport the car components (e.g. doors, seats, gear, and engine) to the assembly workplaces. This is one of the largest CAN applications.

Other applications of the EMS include conveying of beer bottles and furnitures. Another system has been installed in the flower auction hall in Aalsmeer (Netherlands).

“We produce about 20000 modules, including- ▶

“25 mm was a challenge.”

The modular CANrol EC1000 PLC control system uses as an embedded backbone network Ethercat. The host controller module has just a width of 25 mm. “This was a real challenge,” said Franz Ott from Berghof. The 400-MHz PowerPC runs the Codesys PLC software (version 2.3 or 3.4) and provides a CANopen interface supporting data-rates up to 1 Mbit/s. Local extension I/O modules are connect-



ed via the backbone network. The Ethercat backbone can communicate also to external devices, for example high-speed drives from third parties. The host controller pro-

vides an Ethernet interface for display units directly supported by the Codesys Visu software. The CANopen interface is also integrated into the PLC software.

PLC controllers, display-controllers and industrial PC's with CAN interfaces per year," said Jürgen Wanner from Berghof. He was already in the Esprit research project, which pre-developed the CANopen protocol. Most of the display-controllers are application-specific. "Machine builders are increasingly interested in these products, because they are less expensive than industrial PCs," stated Franz Ott. "We also have introduced recently the EC1000 controller (see info-box) featuring the Codesys PLC software compliant with IEC 61131-3." This DIN-rail mountable controller with an Ethercat backbone network provides CANopen connectivity for price-critical devices. "The first user is not using the Ethercat backbone, but the CANopen interface," said Ott. "The system will be installed in car garages, more details I can't give yet." This compact PLC system will complete the existing control units of the CANtrol product family. "But the CANopen interface will remain for connecting low-cost devices," promised Ott.

The CANtrol family of modular CANopen devices is also in duty in test and automatic calibration systems developed for automotive suppliers. One application example is the calibration of car seats for luxury class cars. The CAN-LIN connectable seats embed weighing sensors, which needs to be calibrated end-of-line.

In operation of the car, the seats adjust air-bag ignition depending on the weight of the passenger. This adjustment is performed by means of a complex communication. The AMS (audit measurement system) by Berghof also controlled by a CANopen-based system evaluates the different functions of car seats and records the results of the measurements.

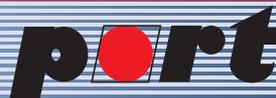
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The company headquartered in Eningen (Germany) was a founding member of the CAN in Automation users' and manufacturers' group. Since mid of the 90ties, the company's automation and testing department with a branch office in Mühlhausen/Thuringia (Germany) provides in most of its products CAN interfaces, and will do it in the future, too. The 100-employees firm offers off-the-shelf control devices as well as application-specific control units optionally including application software. In 2011, the automation and testing division achieved a turnover of about 18 million euro.

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