

Rail automation system speaks CANopen

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Key milestone

On 2nd November 2011, the 500th Coradia Lint was leaving the Alstom factory. This is a key milestone for the rail vehicle manufacturer. This vehicle is part of an order for 28 Coradia Lint rail vehicles for the Lower Saxony rail company (Germany), who ordered their first Coradia Lint from Alstom in 1997. Since the first vehicles were delivered in 2000, the company has sold a total of 621 Coradia Lint trains in Germany, the Netherlands, Denmark and Canada to private and state-run transport companies and providers. The 500th vehicle reaches speeds of up to 120 km/h, has 129 seats and is equipped with accessories for people with limited mobility (e.g. a wheelchair ramp) and for visually impaired passengers (guide bars on the external doors).



Figure 1: The MTU Powerpacks for Alstom's Coradia Lint 54 and 81 railcars

Tognum is to supply a total of 206 MTU Powerpack Automation systems (drive units) to railcar manufacturer Alstom (Germany) from 2012. The drive units are interconnected with the central train control system via CANopen. Alstom will install the under-floor diesel units in 56 regional trains, which will go into service with Deutsche Bahn (German national railway company) in the Greater Cologne and Eifel region, known as the Cologne Diesel Network, from December 2013. The drive units meet EU Stage IIIB emis-

sions regulations, which come into force in 2012. The new Coradia Lint 54 and 81-type trains are Deutsche Bahn's first diesel multiple units to be fitted with SCR catalyzers for exhaust gas cleaning and nitrogen oxide emissions reduction. In addition, in-engine technology will reduce particulate emissions by around 90%. In conjunction with an engine management system, the introduced technology reduces diesel fuel consumption and therefore CO₂ emissions by up to 5%.

The Powerpacks with 390 kW diesel engines of

the type 6H 1800 R85L are scheduled for delivery between March 2012 and September 2013. The two-car Coradia Lint 54 vehicles will each be fitted with three Powerpacks whilst the three-car Coradia Lint 81 versions will get four Powerpacks each. On each vehicle, one of the three (or four) Powerpacks may be shut down to achieve savings on fuel and operating costs depending on the route involved. The units, also known as "Traction Powerpacks", will be supplied in a configuration without assemblies such as on-board power gensets or aircon compressors. As an operator, Deutsche Bahn also benefits from the opportunity to tailor the package supplied to the service operated. Consistent savings on diesel fuel mean increased cost-efficiency over the entire life of the vehicles.

Powerpack system

The Powerpack modular automation system allows controlling, regulation and monitoring of the entire drive system. It can be deployed for diesel-mechanical drives, as well as for diesel-electric drives. Automatic power adjustment or engine shutdown by the integrated safety system is supported. Traction optimization is achieved by the integrated load management (torque control) feature depending on the consumers connected (e.g. generator, compressor, etc.).

The automation system includes the SAM (ser- ▶



Figure 2: Three MTU Powerpacks will power Alstom's Coradia Lint 54 diesel railcars operating in the Cologne Diesel Network

Universal Gateway Solution for CAN

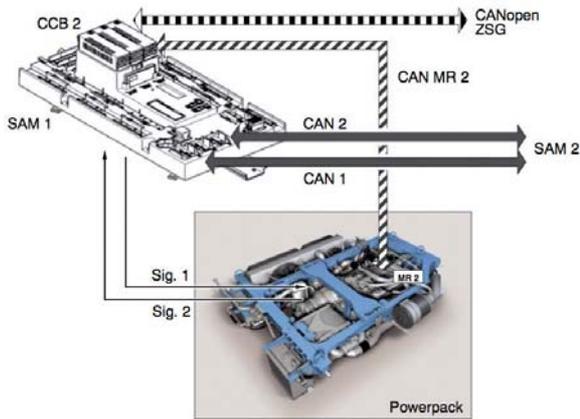


Figure 3: Typical configuration of the Powerpack and its electronic devices

vice and application module) interface module. It is used to exchange control signals and status information with the central controller of the vehicle. The interface module provides three CAN interfaces each realized by a CAN communication board (CCB) with a separate processor handling the CANopen protocol. Ethernet interface and various I/O functionality are also available. Supported CANopen specifications include CiA 301 (basic application layer functions; version 4.1), CiA 302 (additional application layer functions e.g. NMT master) and CiA 307 (Framework for maritime electronics). The CiA application profiles for train vehicle control networks (CiA 421) and for rail vehicle power drive systems (CiA 423) are supported as well. Programming is possible using the IEC 61131-3 languages. Software update may be done using a CF card. Diagnosis may be realized via the integrated web server and the mini display. The IP40-rated device is designed for continuous operation at environment temperatures from -40 °C to +60 °C.

CANopen communication

The automation system communicates with a fixed bit-rate of 125 kbit/s and acts in its standard configuration as an NMT (network management) slave. This means,

that the device requires an NMT master to be started. The node-ID varying from 1 to 127 is configurable. As no SDO (service data object) communication is supported, the device does not really comply with the CiA 301 specification, which mandates to provide at least one SDO client on a CANopen device. Thus, the device transfers its status data and receives commands via PDOs (process data objects). Static PDO mapping is supported, which means that the content of the messages may not be changed while the device is running (NMT state "Pre-operational" or "Operational"). The PDO 1 to PDO 4 use the CAN-IDs from the pre-defined connection set as given by the CiA 301. If more than four PDOs in transmit or receive direction are required, a CAN-ID allocation scheme is pre-defined by the manufacturer. The PDOs are sent cyclically every 5 s. The device produces a Heartbeat message (signals that it is alive and works in a required state) every 500 ms. As an option, the drive unit may be provided as a self-starting device, which may go from the NMT state "Pre-operational" to "Operational" without a command from the NMT master. ◀

Worldwide, more than 40,000 units in use



CANbridge

Easy expansion of the bus length and implementation of tree and star topologies

Connection of systems using different baud rates

Powerful filter functionality

Transparent operation, can be used with customer-specific protocols as well as with CANopen, DeviceNet, and SAE J1939

Easy adaptation of the functionality and protocol conversion via optional Application Development Kit

NEW!

Easy and fast setup using the included Windows configuration tool.

