Safe Electronics for Railways

Housings and Enclosures in Rail Technology

As part of its complete package for the rail technology sector, as well as offering special housing and enclosure solutions Rittal also provides support in the form of technical clarification, FEM and CFD, design service in 2D and 3D, complete documentation for the train manufacturer and operator as well as comprehensive consultation for enclosures, housings and climate control technology.

Hermann Becker

1 Built for the city: Electronic train set Coradia Lirex X 60

The requirements of the operators and OEM are clearly defined with regard to safe installation of electronic and electric components in rail vehicles. Only systems that work flawlessly guarantee functionality, protection and safety every day for decades under permanent dynamic demands.
This requires individual and safe packaging solutions that withstand a busy railway schedule and provide the necessary protective framework for sensitive electronics.
Rittal, a successful partner in rail technology for many years, is introducing new solutions. Different rail vehicles in very different operational areas require specially designed system technology.
City railways operate in congested areas and connect suburbs and districts within large cities. The trains reach speeds of up to around 160 km/h. Alstom LHB in Salzgitter, Germany is currently manufacturing 55 six-part Coradia Lirex X 60 electronic train sets (Figure 1) for Stockholm Transport (SL), which serves Storstockholm.
The new train sets, which have been developed with the harsh winters and the proximity to the Baltic Sea in mind, are 107 m in length and are characterized by high starting acceleration as well as high passenger capacity. Like the additional components in the driver's cab and the passenger area, the Rittal manufactured enclosures used have been developed in accordance with customer specifications. Thanks to the possibility of using standard materials in conjunction with serial measurements, components from the entire range of accessories could also be integrated. The integrated 19 inch technology is protected by an EMC-compliant enclosure design.

2 For cross-border operation: Siemens universal locomotive for the Austrian National Railways

Multisystem locomotives in cross-border traffic are designed for transporting passenger trains or freight trains with speeds of more than 160 km/h in places. Siemens TS is currently manufacturing a total of 70 three-system rotary current universal locomotives for Austria and Slovenia. Based on the Siemens Euro Sprin-

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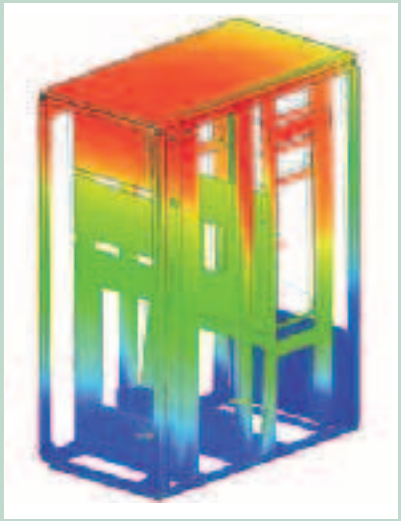
ter type family ES 64 U4, 50 "Rh 1216" are being produced for the ÖBB (Austrian National Railways), and 20 "Rh 541" for Slovene Railways (SZ) (Figure 2).
The locomotives have a continuous power of 6,000 kW and can reach a maximum speed of 200 km/h. They are designed for use with three current systems: 15 kV/16.7, 25 kV/50 Hz AC and 3 kV DC. Complex systems and the related enclosure technology also require a competent supplier in this area. For each high-power locomotive, Rittal manufactures housing for auxiliary systems (a tiered enclosure system with 16 mounting plates and 2 large swing frames), an electronic enclosure (EMC, with three consecutive 482.6 mm (19") levels) and a 3 kV rack for the 3000 V system (tiered enclosure system) (Figure 3).
High-speed trains have maximum speeds of up to 250 km/h, 350 km/h and in excess of 400 km/h. The Spanish railway company RENFE Grandes Líneas commissioned Bombardier Transportation and Talgo in April 2004 to produce 22 trains. Each train has two high-speed traction units designed for 250 km/h. The 44 "TRAXX S 250 MS" locomotives are equipped for two voltages, 3 kV DC and 25 kV AC, as well as for variable gauges, and are being manufactured in 20 months, from March 2006 until October 2007. Together with the project collaborators from the different Bombardier Transportation sites, Rittal gathered suggestions and solutions in just ten months. In the machine room of each locomotive, five PS 400 enclosure systems – some of them multi-part – as well as the corresponding climate control technology from Rittal are used.
The standards EN 61373 and EN 12663 outline the basic mechanical requirements of subsystems. While the standard EN 61373 mainly represents dynamic conditions, the EN 12663 refers to static requirements, which are more easily accessible for the purpose of FEM evaluations.



Images: Rittal

3 Everything fits into here: enclosure systems from Rittal

4 Insights: FEM of an electronic enclosure

FEM Systems Help the Design Process

What they have in common is that this only applies to the entire system, whether impacts caused by shunting or braking are forwarded to the body of the rail vehicle via bumpers and coupling, or driving vibrations of wheel tracks via the bogie. The mechanical demands require the whole system to be accurately constructed, in order to avoid resonances. A high packing density of components and cable management in the enclosures and housings results in different weights, which need to be viewed and solved differently, depending on the country-specific complex system design.
FEM evaluations (Figure 4) during the construction and planning stage are not only helpful but also necessary. This results in indications of the constructive design of the entire enclosure with regard to material selection, design of the weld seams, adjustment of the material thickness as well as component geometry. The partial observation of strains in the area of metrical connections is also important, in order to determine the number of tightening torques according to the standard DIN 25201.
The standard EN 50121 prescribes EMC planning for the whole system, whereby the individual components are to be designed according to the actual requirements. Exclusion of third-party systems, as well as fault properties of sensitive components require special materials for radio communication, data transmission, signal technology, sensor technology and auxiliary systems. On the one hand, this safeguards the continuous rotary contact, and on the other, the required degree of IP protection as well as the heat loss in the closed system is not neglected.

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COMPACT INFO

Supplied and Currently Running Projects

with Rittal components for mobile rail vehicle operation: Transrapid TR07, TR08 and Shanghai; G 1700 and G 2000; BR 424-426; EL 2; VT 612; VT 642; Rh 1016, 1116, 2016; BR 145, BR 146; BR 185.1; BR 185.2; BR 189; Coradia LINT: Re 484; EG 3100 DSB; Blue Tiger; Duplex X 40 ; Coradia Lirex X60 ; Re 474 ; ES 64 U4 ; SZ 541; Talgo 350; HSP 250.1; Regio Citadis.

Housings (KL, AE, Special), enclosures (PS 4000, ES 5000, racks PS 4000, individual design) in sheet steel, aluminum/zinc and stainless steel are used. Furthermore, Rittal supplies climate control components like special "train resistant" air/air heat exchangers, for example with special dimensions, with special voltages like 110 V DC and pre-designed, HF-screened. Rack-mounted fans and heaters, fan-and-filter units and outlet filters. Information such as the brochure "Rittal Railway Solutions" and an illustrated project overview can be requested at rail@rittal.de.

www.konstruktionspraxis.de

Interesting information on enclosure systems can be found at Rittal

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