



Robust High Temperature Connector Meets Fire Safety Requirements in Mass Transportation Systems

As system interoperability continuously progresses in mass transportation systems, European authorities are increasingly defining standards for fire safety. Fire safety is of vital importance in transportation systems, particularly rail systems, and Europe has defined the EC/TCS 45545 standard with which mass transit connectors must fully comply. Connectors meeting these requirements enable safety critical signals, including both low voltage cabinets containing electronic control systems and inter-vehicle connections, such as traction, brake lights, and doors, to be transferred and maintain functionality in the event of a fire, enabling the train to move safely away from the dangerous area.

A train manufacturer required a high temperature connector system that was fully compliant with the fire safety regulations and able to withstand 15 minutes at the heating condition specified by EN 1363-1—at a maximum temperature of 800 degrees Celsius. They approached ITT's VEAM group to design a connector system that would meet all defined European rail system standards, as well as meet this high temperature requirement. One of the major challenges faced by ITT VEAM's design engineers, in addition to meeting the defined rail system standards, was finding a suitable material for the connector insert that would not melt under the extreme temperature.

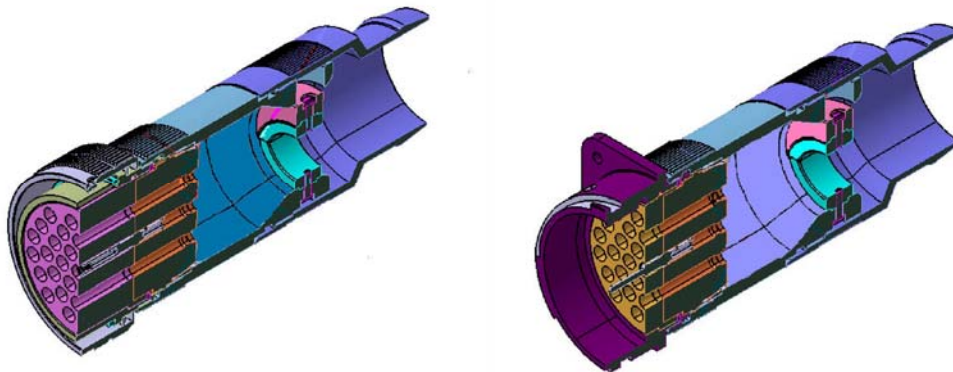
ITT VEAM constructed a connector based on their high reliability CIR Series multipin circular connectors.



ITT VEAM's high temperature connector



The high temperature connector consists of machined copper alloy plated contacts with a metal retention clip, a machined stainless steel shell and ceramic inserts. While conventional connector inserts are constructed with plastic or rubber, these materials melt under the extreme temperatures of a fire. Ceramic, however, is resistant to fire and hardness, and the rigidity of the material makes it less susceptible to vibration and breaking. The ceramic insert is kept in place in the shell by the metal retention ring. As a result, the connector is easy to disassemble, allowing for quick, simple field maintenance and service. The high temperature connector also features a silicon grommet on the back of the connector, sealing the wires against humidity and water penetration, while an anti-vibration cable clamp keeps the wires in place.



The construction of ITT's robust high temperature connector provides easy field installation and maintenance

After the connector was constructed, it was placed in an oven in an external certified lab to test for its temperature capabilities.



High temperature connector in external oven

When the test was complete, the connector was still functioning properly after 30 minutes at 800 degrees Celsius.



High temperature connector after 30 minutes in 800°C oven

As the original requirement was for the connector to withstand 15 minutes at 800 degrees Celsius, the connector performed well above the required length of time, verifying both the electrical continuity of the contacts and the voltage drop on the contacts.

The design parameters of the connector also make it compliant with MIL-DTL-5015 and VG95234 where applicable. The unique positive lock and quick disconnect coupling surpass the environmental requirements of these military specifications, while also contributing to ease-of-use.

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The connector currently meets 23A, 41A, multifunction vehicle bus (MVB) databus and Wire Train Bus (WTB) signal types. Configurations for the connector include high voltage and RFI/EMI, in which grounding fingers on plug connectors provide superior 360° plug-to-receptacle shield integrity. The connector is capable of functioning as an electrical connector, providing design engineers with the ability to simplify receptacle design processes and inventory.

Current specifications for the high temperature connector include 40A signals with 35 size 12 contacts for cable sizes ranging from 0.6mm² to 6mm², and it is rated for 1250VDC and 900VAC. A complete family of high temperature connectors is in development with varying signal types, contacts and cable sizes.

Due to its robust construction and ability to withstand extremely high temperatures, the high temperature connector is ideal for mass transit and other railway applications, meeting specified fire safety regulations. Compliance with the new fire safety requirements along with the ease of installation into firewall systems provides a significant benefit to train manufacturers. While mass transit was the original market, the high temperature connector is also being implemented into industrial ovens, oil exploration

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