

Manufacturer's information – Connectors for the Rail Industry

The fast and safe data transmission in transportation presents special challenges for data transmission systems. For this reason, ESCHA has developed a product seal called ‚rail approved‘ comprising the entire rail-specific properties, standards and tests – for connectors and cables.

ESCHA products with this seal are tested according to the following standards:

- **DIN EN 45545-2 (fire behavior)**

According to DIN EN 45545- Part 2 (Requirements for fire behavior of materials and components) and within the scope of requirements R24, the oxygen index of the tested plastics was determined. Requirement R24 regulates the obligation to produce proof for plastic parts >10g. Plastics with a mass <10g are basically free of the pre-mentioned obligation. ESCHA products have been developed further beyond this standard. That is why ESCHA has also introduced the proof for the main plastics in connectors according to requirement R24.

In addition to a high-quality individual product, this technical difference also leads to the fact that in case of a grouping regulation, the entire approval can be set up more easily.

A grouping regulation may arise, when e.g. a large number of connectors are connected to one switch and the plastic masses of the connectors exceed the required limit values of the entire approval and thus have a higher emphasis on fire impact.

Therefore, ESCHA connectors body- and also currently contact-carrier material have an oxygen index $\geq 32\%$. Consequently, ESCHA connectors fulfill Hazard-Level (HL) 1-3 and are adapted for all design types of trains and for the highest operating type 4.

Operating type	Design type			
	N Standard	A Automatic D	D Double-stack car	S Sleeping car
1 Surface vehicles	HL 1	HL 1	HL 1	HL 2
2 Tunnel max. 5km	HL 2	HL 2	HL 2	HL 2
3 Tunnel >5km	HL 2	HL 2	HL 2	HL 3
4 No lateral evacuation	HL 3	HL 3	HL 3	HL 3

The cables used meet DIN EN 45545 HL1-3. Likewise, the national standards of fire protection on rail vehicles according to NF F16- 101; UNI CEI 11170 und BS 6853, GM/RT 2130 are fulfilled.

- **DIN 50155 (Mechanical stresses, Vibrations, Shocks)**

In order to provide the products with the ‚rail approved‘ seal, a statement on the mechanical resilience is necessary. As ESCHA connectors have originally been developed for applications in harsh industrial environments – and thus meeting product standards IEC 61076-2-109 or IEC 61076-2-101 (Type test M12x1 connector) – an extension to the requirements for the train applications according to DIN 50155 is very well-realizable.

Within the ‚rail approved‘ tests, ESCHA products go through a temperature profile of -40°C to +85°C (profile Tx acc. DIN 50155) and have to resist a cyclic load at wet heat up to 55°C. At this temperature load, the products are stocked as well as rated at operation.

Eventually, the tested items are inspected in view of their dielectric strength which has to be passed according to IEC 61076-2-101 or 109.

With further tests, the loads of a year-long of operation in the harsh train environment are simulated through the vibration- and shock test (acc. IEC61373 - category 1 - class B). A safe data transmission at high mechanical load, vibration or shock is guaranteed by the patented ESCHA two-component shielding concept. This provides for the 100% shielding all over the entire 360° of the round connector. The high quality and robustness of the bonding between wires and contacts is also confirmed regarding its adaptability on trains.

The salt spray test (Class ST1-4:4h-96h) confirms that the metal parts used are provided with high-grade corrosion protection.

After completing all these tests, the robustness of the cable is verified within the scope of a protection class test according to IEC 60529. Influences out of loads of previous tests would now be obvious.

- **IEC 60529 (IP –Protection class)**

Particularly, the high IP-protection class of ESCHA connectors characterizes the product quality. So we confirm, that the ‚rail approved‘ M12x1 connectors fulfill protection classes IPX7 up to an operating temperature of -30°C. For applications up to -40°C, our connectors fulfill protection class IPX5. Due to the double-overmolding applied on ESCHA, rail approved‘ connectors, a dust- and waterproof-connection of connector body and irradiated cable is guaranteed.

- **Series associated tests**

All ESCHA in-series connectors are 100% electrically tested on dielectric strength, short circuit and pin configuration. Moreover, the ether cables are batch-wise inspected on their guaranteed transmission properties according to categories Cat6_A or Cat5e as patchcord.

Kind regards
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