



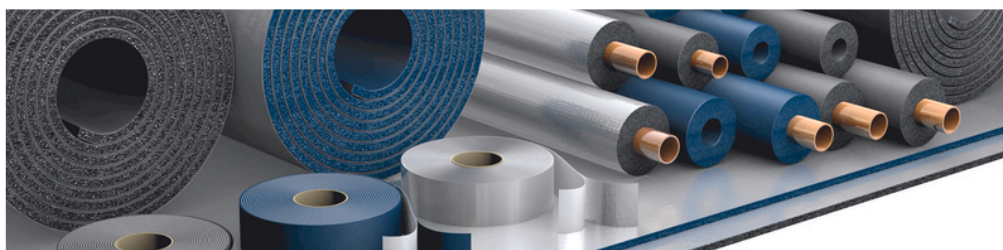
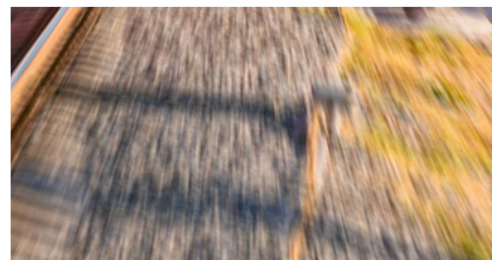
INSTALL IT. TRAVEL SAFELY.

ArmaFlex Rail ZH

First halogen free FEF insulation that meets HL2 according EN45545-2

- // Protect assets and people
- // Halogen-free
- // Free of dust and fibres
- // Easy to install

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MAKING A DIFFERENCE AROUND THE WORLD

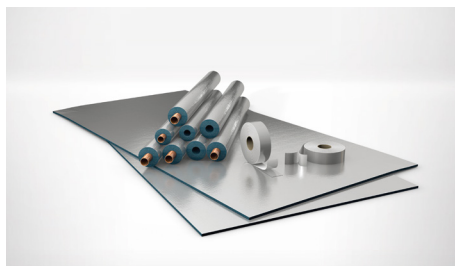
ArmaFlex Rail

// ArmaFlex Rail SD



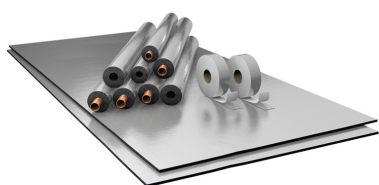
- Extremely low smoke density and superior fire behaviour
- Built-in Microban® antimicrobial protection reduces mould and bacteria growth
- Complies with most international railway standards for insulation materials
 - EN 45545 – HL2, R1
 - NFPA 130
 - DIN 5510-2
 - GOST 12.1.044-89
 - United Nations ECE R-118 p. 6-8

// ArmaFlex Rail SD-C



- With Microban® antimicrobial product protection
- Excellent mechanical protection and high degree of stability under exposure to ultraviolet light
- Wash-down waterproof and easy to clean
- Meets highest hazard level requirements
 - EN 45545 – HL3,R1

// ArmaFlex Rail ZH-C



- Halogen-free insulation reduces toxicity and corrosive effects on people and equipment
- Resistant to UV, salt water and chemicals
- Wash-down waterproof and easy to clean
- The revolutionary insulation product has a factory-applied, silver-metallic look, reinforced coating for increased hygienic requirements
 - EN 45545 – HL3,R1

// ArmaFlex Rail ZH



- The protective halogen-free insulation to reduce corrosive effects and smoke toxicity in a fire
- Low smoke density, superior fire behaviour
- Fibre- and dust-free material provides low thermal conductivity
- High-tech insulation with built-in fire protection for railway vehicles
 - EN 45545 – HL2,R1



EN 45545

HAZARD LEVEL OF A VEHICLE

Fire safety requirements are part of the European Directive on the interoperability of the trans-European high-speed rail system. The seven-parts standard EN 45545 'Railway applications - Fire protection on railway vehicles' has been developed to harmonize classifications and fire testing.

EN 45545 introduces a new concept – the hazard level of a vehicle (HL). This is obtained by combining the operation and design categories of the vehicle.

EN 45545-2 classifies all material on board in groups which have to fulfil specific requirements which often includes several test methods. The most important fire tests used in EN 45545-2 are the flame propagation, the cone calorimeter and the smoke and toxicity tests. For requirement set R1 they are all based on radiant panels with heat fluxes 50 kW/m².

| | N: Standard vehicles | A: Vehicles of automatic train, no emergency trained staff on board | D: Double decked vehicles | S: Sleeping / couchette vehicles | |
|---|----------------------------|--|------------------------------------|---|--|
| 1: No underground lines. | HL1 | HL1 | HL1 | HL2 | |
| 2: Regular use of underground sections and tunnels. Fast evacuation possible. | HL2 | HL2 | HL2 | HL2 | |
| 3: Regular use of underground sections and tunnels. Slow evacuation possible. | HL2 | HL2 | HL2 | HL3 | HL1 e.g. tramway |
| 4: Regular use of underground sections and tunnels (incl. Euro-Tunnel). No evacuation possible. | HL3 | HL3 | HL3 | HL3 | HL2 e.g. TGV, TER, RER, subway |
| | | | | | HL3 e.g. subway, metro, couchette wagon |

NATIONAL STANDARDS REPLACED BY EN 45545-2

| Country | Standard | European Standard | Testing Standard |
|---------------|------------------------|---|---|
| Great Britain | BS 476-6/7 | EN 45545-2 | Spread of flame ISO 5658-2 |
| France | NF 16 101 NF 16 102 | Railway application | Heat release, smoke production and mass loss rate ISO 5660 |
| Germany | DIN 5510 | Fire protection on railway vehicles | Smoke optical density and toxicity EN ISO 5659-2 |
| Italy | UNI CEI 11170 | | |
| Poland | PN-K-02511 | Requirements for fire behaviour of materials and components | |

TECHNICAL DATA - ARMAFLEX RAIL ZH

| | |
|----------------------|---|
| Brief description | Halogen free, flexible closed-cell insulation foam with improved fire-retardant properties and low smoke generation for railway vehicles. |
| Material type | Flexible elastomeric foam based on synthetic rubber (NBR). |
| Product colour range | Black grey |
| Special features | The pressure-sensitive adhesive coating is based on modified acrylate basis with mesh structure and covered with polyethylene foil. Traces of silicone can be found on the protection paper / foil used to protect self-adhesive closures. Halogen-free (chloride, bromide) acc. to DIN / VDE 0472, part 815. |
| Applications | Insulation/protection for air ducts, pipes, vessels, equipment (including elbows, fittings, flanges, etc.) of air-conditioning/refrigeration and plumbing systems to prevent condensation and save energy in rail cars. Also, the product can be placed in different areas of the train such as thermal insulation for walls, ceiling, partitions, etc. |
| Remarks | ArmaFlex Rail ZH is not designed for transparent insulation applications (exposed to sun light) and is not UV stable. In this case, we recommend the use of ArmaFlex Rail ZH-C. |

| Property | Value / Assessment | | Standard / Test method |
|--|--|--|-------------------------------------|
| Temperature range | | | |
| Service temperature ¹ | Min. °C | Max. °C (intermittent) | EN 14706, EN 14707, EN 14304 |
| | -50 | 110 | |
| Thermal conductivity | | | |
| Declared thermal conductivity | Øm | 0°C | EN ISO 13787, EN 12667, EN ISO 8497 |
| | $\lambda d \leq [W/(m \cdot K)]$ | 0.04 | |
| | Formula | $[40 + 0,1 \cdot \vartheta m + 0,0009 \cdot \vartheta m^2]/1000$ | |
| Transportation | | | |
| Reaction to fire - hazard level | 3-13 mm: HL 1,2 acc. R1 | | EN 45545-2 |
| Fire performance | | | |
| Practical fire behaviour | Self-extinguishing, does not drip, does not spread flames | | |
| Resistance to water vapour | | | |
| Water vapour diffusion resistance factor | $\mu \geq 1000$ | | EN 12086, EN 13469 |
| Weather and UV resistance | | | |
| UV resistance | Protection against UV-radiation is necessary, see TB 142 | | |
| Health and environment | | | |
| Additional features | SCCP, MCCP, LCCP-free | | |
| Other technical features | | | |
| Shelf life | Self-adhesive tapes, self-adhesive sheets: 1 year | | |
| Storage | Can be stored in dry, clean rooms at normal relative humidity (50% to 70%) and ambient temperature (0 °C – 35 °C). | | |

¹+85 °C, for products with a self-adhesive layer.

All data and technical information are based on results achieved under the specific conditions defined according to the testing standards referenced. Despite taking every precaution to ensure that said data and technical information are up to date, Armacell does not make any representation or warranty, express or implied, as to the accuracy, content or completeness of said data and technical information. Armacell also does not assume any liability towards any person resulting from the use of said data or technical information. Armacell reserves the right to revoke, modify or amend this document at any moment. It is the customer's responsibility to verify if the product is suitable for the intended application. The responsibility for professional and correct installation and compliance with relevant building regulations lies with the customer. This document does not constitute nor is part of a legal offer to sell or to contract.

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As the inventor of flexible foam for equipment insulation and a leading provider of engineered foams, Armacell develops innovative and safe thermal and mechanical solutions that create sustainable value for its customers. Armacell's products significantly contribute to global energy efficiency making a difference around the world every day. With more than 3,300 employees and 25 production plants in 19 countries, the company operates two main businesses, Advanced Insulation and Engineered Foams. Armacell focuses on insulation materials for technical equipment, high-performance foams for acoustic and lightweight applications, recycled PET products, next-generation aerogel technology and passive fire protection systems.

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