



ARMAFLEX RAIL

INSTALL IT. TRAVEL SAFELY.



- Advanced fire protection for railway vehicles:
hazard level 2 & 3 according to EN 45545
- Effectively prevents moisture penetration
- High flexibility ensures ease of installation

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

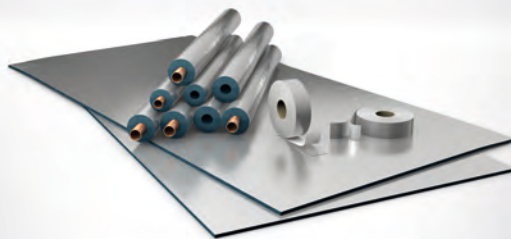
- EN 45545 – HL2, R1
- NFPA 130
- DIN 5510-2
- GOST 12.1.044-89
- United Nations ECE R-118 p. 6-8



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

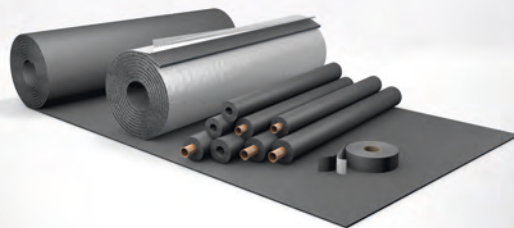
- EN 45545 – HL3,R1



ARMAFLEX RAIL ZH

- 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

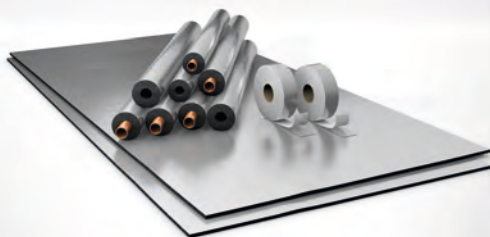
- EN 45545 – HL2,R1



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



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.

Operation category	Design category			
	N: Standard vehicles	A: Automatic vehicles	D: Double de-cked vehicle	S: Sleeping and couchette cars
1. Surface Operation	HL1	HL1	HL1	HL2
2. Metro - Tunnel Operation	HL2	HL2	HL2	HL2
2. Inter-City Tunnel Operation	HL2	HL2	HL2	HL3
4. Metro - Tunnel Operation - Restricted	HL3	HL3	HL3	HL3

EN 45545-2:2013 classifies all material on board in groups which have to fulfil specific requirement sets 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.

REQUIREMENTS FOLLOW THE FIRST PRINCIPLES:

- Flame Spread
- Ignitability
- Heat Release
- Smoke Emissions
- Toxic Gas Emissions

Requirement set	Test method reference	Parameter unit	Requirement definition	HL1	HL2	HL3
R1 (for insulation material)	Spread of flame ISO 5658-2	CFE kWm ⁻²	Minimum	20	20	20
	Heat release, smoke production and mass loss rate ISO 5660-1	MAHRE kWm ⁻²	Maximum	-	90	60
	Smoke optical density and toxicity EN ISO 5659-2	Ds(4) dimensionless	Maximum	600	300	150
		VOF4 Minutes	Maximum	1200	600	300
		CITG dimensionless	Maximum	1.2	0.9	0.75

Technical Data - Armaflex Rail SD

Brief description	Highly-flexible, closed-cell insulation foam with improved fire retardant properties, low smoke generation and in-built Microban® antimicrobial protection for railway vehicles.
Material type	Elastomeric foam based rubber; manufactured with Armaprene® patented technology; US patent no. 8 163 811, EU patent no. 2 261 305
Colour	Blue
Material Special Information	The pressure-sensitive adhesive coating is based on modified acrylate basis with mesh structure and covered with polyethylene foil. Traces of silicon can be found on the protection paper/foil used to protect self-adhesive closures.
Applications	Insulation / protection for air ducts and pipes (incl. elbows, fittings, flanges etc.) of air-conditioning / refrigeration to prevent condensation
Remarks	Armaflex® Rail SD is not designed for transparent insulation applications (exposed to sun light) and is not UV stable.

Property	Value/Assessment			Test ¹	Special Remark
Temperature Range					
Temperature Range	max. service temperature	+ 110 °C	(+ 85 °C If sheet or tape is glued to the object with its whole surface)	EU 5654	Tested acc.to EN 14706, EN 14707 and EN 14304
	min. service temperature	-50 °C			
Thermal Conductivity					
Thermal Conductivity	ϑ _m	+/-0	°C	EU 5654	Declared acc. to EN ISO 13787 Tested acc. to EN 12667 EN ISO 8497
	λ	≤ 0,040	W/(m · K)		
Water vapour diffusion resistance					
Water vapour diffusion resistance	μ	≥	5.000	EU 5654	Tested acc. to EN 12086 and EN 13469
Fire performance					
Reaction to fire	insulation thickness 6 mm-25 mm	HL1,2,acc. to R1 ; HL1,2,3, acc.to R 7		EU 7568, 7569, 7570, 7563, 7564, 7565 EU 7366	Declared acc. to EN 45545-2
	3 mm sheets & tape	HL1,2,3 acc.to R1, R7			
	Insulation thickness 3-19 mm	Certificate of Conformity with EN 45545-2			
Other Fire Class	3-13 mm Russian Federation Certificate of conformity	G1, V1, D2, T2		RUS 7872	Declared acc to: GOST 12.1.044-89, Mandatory Certificate
					ECE R-118
	Burning behaviour for the use in motor vehicles (ECE Regulations)	Passed Annex 6,7,8,9		EU 7285, 7286	
	NFPA 130 American fire test to railway components	I _s ≤ 25	D _s (4,0) ≤100	EU 5955 EU 5956	Classified acc to NFPA 130:2014 Tested acc to ASTM E 162:20 ASTM E 662:2012
	Fire behaviour and fire side effects	S3,ST2, SR2, FED < 1 (S4 for 3 mm product)		D 7308, 7309, 7310, 7311, 7312, 7313, 7314, 7369	Classified acc to DIN 5510-2 Tested acc to DIN 54837, ISO 5659-2
Practical Fire Behaviour	Self-extinguishing, does not drip, does not spread flames				
Dimensions and tolerances	In accordance with EN 14304, table 1; Tested acc. to EN 822, EN 823, EN 13467			EU 5654	
Biological / chemical behaviour	Fungal Resistance, no fungal growth according to tets Tested according to ASTM G21			EU 7134	
UV resistance	Protection against UV-radiation is necessary, see TB 142				
Health aspects	Fulfill hygienically requirements of Russian Rail Industry			RUS 6567	
Storage & Shelf life	Self-adhesive tapes, self-adhesive sheets: 1 year Can be stored in dry, clean rooms at normal relative humidity (50% to 70%) and ambient temperature (0 °C – 35 °C).				

Technical Data - Armaflex Rail SD

*1 Further documents such as test certificates, approvals and the like can be requested using the registration number given.

All data and technical information are based on results achieved under typical application conditions. Recipients of this information should, in their own interest and responsibility, clarify with us in due time whether or not the data and information apply to the intended application area. Installation instructions are available in our Armaflex installation manual. Please consult our Customer Service Center before insulating stainless steels.

Technical Data - Armaflex Rail SD-C

Brief description	Highly flexible, closed-cell pre-covered insulation foam with improved fire retardant properties, low smoke generation and in-built Microban® antimicrobial protection for railway vehicles.
Material type	Elastomeric foam based rubber with high-tech coating; manufactured with Armaprene® patented technology; US patent no. 8 163 811, EU patent no. 2 261 305, patent for multi-layer coating technology EP 2 522 502.
Colour	Blue with silver metallic look coating
Material Special Information	The pressure-sensitive adhesive coating is based on modified acrylate basis with mesh structure and covered with polyethylene foil. Traces of silicon can be found on the protection paper/foil used to protect self-adhesive closures.
Applications	Insulation / protection for air ducts and pipes (incl. elbows, fittings, flanges etc.) of air-conditioning / refrigeration to prevent condensation
Special Features	The covering offers an excellent durability even under UV exposure when used for outdoor applications. The insulation system is designed for easy cleaning.
Remarks	When dimensioning the insulation thickness please calculate with an external surface coefficient of 8 W/(m²·K).

Property	Value/Assessment			Test* ¹	Special Remark
Temperature Range					
Temperature Range	max. service temperature	+ 110 °C	(+ 85 °C If sheet or tape is glued to the object with its whole surface)		Tested acc.to EN 14706, EN 14707 and EN 14304
	min. service temperature	-50 °C			
Thermal Conductivity					
Thermal Conductivity	ϑ_m	+/-0	°C	$\lambda=$	Declared acc. to EN ISO 13787 Tested acc. to EN 12667 EN ISO 8497
	λ	$\leq 0,040$	W/(m · K)	$[40 + 0,1 \cdot \vartheta_m + 0,0009 \cdot \vartheta_m^2]/1000$	
Water vapour diffusion resistance					
Water vapour diffusion resistance	μ	\geq	10.000		Tested acc. to EN 12086 and EN 13469
Fire performance					
Reaction to fire	insulation thickness 3 mm - 25 mm	HL3, R1		EU 7880 EU 7572	Declared acc. to EN 45545-2
	Certificate of conformity with hazard levels	product conforms with declared HL		EU7366	
Other Fire Class	NFPA 130 American fire test to railway components	$I_s \leq 25$	$D_s(4,0) \leq 100$	EU 7576 EU 7575 EU 7574 EU 7573	Classified acc to NFPA 130:2014 Tested acc to ASTM E 162:20 ASTM E 662:2012
	6-25 mm Russian Federation Certificate of conformity	G1, V1 D2, T2		RUS 7872	Declared acc to: GOST 12.1.044-89 Mandatory Certificate
Practical Fire Behaviour	Self-extinguishing, does not drip, does not spread flames				
Tolerances	In accordance with EN 14304, table 1				
Storage & Shelf life	Self-adhesive tapes, self-adhesive sheets: 1 year				Can be stored in dry clean rooms at normal relative humidity (50% to 70%) and ambient temperature (0 °C – 35 °C).

*1 Further documents such as test certificates, approvals and the like can be requested using the registration number given.

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	Elastomeric foam based on synthetic rubber.
Colour	Dark grey
Material Special Information	The pressure-sensitive adhesive coating is based on modified acrylate basis with mesh structure and covered with polyethylene foil. Traces of silicon can be found on the protection paper/foil used to protect self-adhesive closures.
Applications	Insulation / protection for air ducts and pipes (incl. elbows, fittings, flanges etc.) of air-conditioning / refrigeration to prevent condensation
Special Features	Without halogens (chloride, bromide) acc. to DIN / VDE 0472, part 815. Fulfils DIN 1988 Parts 200.
Remarks	Armaflex Rail ZH is not designed for transparent insulation applications (exposed to sun light) and is not UV stable.

Property	Value/Assessment		Test ¹	Special Remark
Temperature Range				
Temperature Range	max. service temperature	+ 110 °C	(+ 85 °C If sheet or tape is glued to the object with its whole surface)	Tested acc.to EN 14706, EN 14707 and EN 14304
	min. service temperature	-50 °C		
Thermal Conductivity				
Thermal Conductivity	ϑ _m	+/-0	°C	λ=
	λ	≤ 0,040	W/(m · K)	
Water vapour diffusion resistance				
Water vapour diffusion resistance	μ	≥	1.000	Tested acc. to EN 12086 and EN 13469
Fire performance				
Reaction to fire	insulation thickness 13 mm standard	HL1,2 acc. to R1		EU 7288 EU7525, 7526
	insulation thickness 3 mm standard and self-adh.	HL1,2,3 acc. to R1		
Practical Fire Behaviour	Self-extinguishing, does not drip, does not spread flames			
UV resistance	Protection against UV-radiation is necessary, see TB 142			
Storage & Shelf life	Self-adhesive tapes, self-adhesive sheets: 1 year			Can be stored in dry, clean rooms at normal relative humidity (50% to 70%) and ambient temperature (0 °C – 35 °C).

*1 Further documents such as test certificates, approvals and the like can be requested using the registration number given.

Technical Data - Armaflex Rail ZH-C

Brief description	Halogen free, flexible closed-cell pre-covered insulation foam with improved fire retardant properties and low smoke generation for railway vehicles.
Material type	Elastomeric foam based on synthetic rubber with patented high-tech multi-layer coating; EU patent no. 2 522 502.
Colour	Dark grey with silver metallic look coating
Material Special Information	The pressure-sensitive adhesive coating is based on modified acrylate basis with mesh structure and covered with polyethylene foil. Traces of silicon can be found on the protection paper/foil used to protect self-adhesive closures.
Applications	Insulation / protection for air ducts and pipes (incl. elbows, fittings, flanges etc.) of air-conditioning / refrigeration to prevent condensation
Special Features	Without halogens (chloride, bromide) acc. to DIN / VDE 0472, part 815. Fulfils DIN 1988 Parts 200. The covering offers an excellent durability even under UV exposure when used for outdoor applications. The insulation system is designed for easy cleaning.
Remarks	When dimensioning the insulation thickness please calculate with an external surface coefficient of 8 W/(m²·K).

Property	Value/Assessment		Test ^{*1}	Special Remark	
Temperature Range					
Temperature Range	max. service temperature	+ 110 °C		Tested acc.to EN 14706, EN 14707 and EN 14304	
	min. service temperature	-50 °C			
Thermal Conductivity					
Thermal Conductivity	ϑ _m	+/-0 °C	λ=	Declared acc. to EN ISO 13787 Tested acc. to EN 12667 EN ISO 8497	
	λ ≤ 0,040	W/(m · K)	[40 + 0,1· ϑ _m + 0,0009 · ϑ _m ²]/1000		
Water vapour diffusion resistance					
Water vapour diffusion resistance	μ	≥	10.000	Tested acc. to EN 12086 and EN 13469	
Fire performance					
Reaction to fire	Insulation thickness 6mm- 25 mm	HL1,2,3 acc. to R1		EU 7571	Declared acc. to EN 45545-2
	Certificate of conformity with EN 45545-2		product conform with declared HL	EU 7366	
Practical Fire Behaviour	Self-extinguishing, does not drip, does not spread flames				
Storage & Shelf life	Self-adhesive tapes, self-adhesive sheets: 1 year				Can be stored in dry clean rooms at normal relative humidity (50% to 70%) and ambient temperature (0 °C – 35 °C).

*1 Further documents such as test certificates, approvals and the like can be requested using the registration number given.