



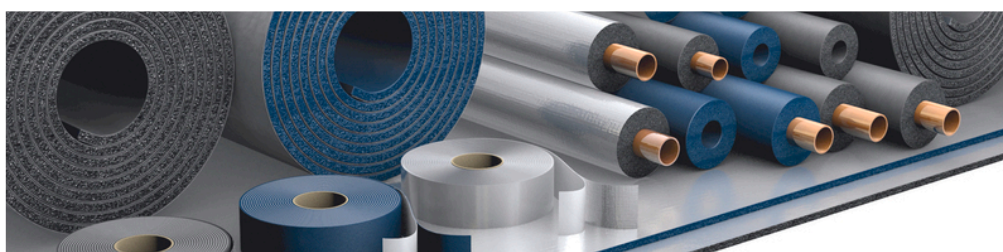
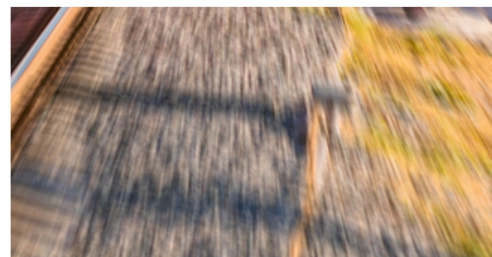
INSTALL IT. TRAVEL SAFELY.

# ArmaFlex Rail SD

First FEF insulation that meets HL2  
according EN45545-2

- // High performance insulation meeting the highest standards in rail applications
- // Easy to apply
- // Stops water vapour transmission
- // Build-in with Microban technology
- // Fibre and dust free

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 **armacell**<sup>®</sup>  
ArmaFlex<sup>®</sup>

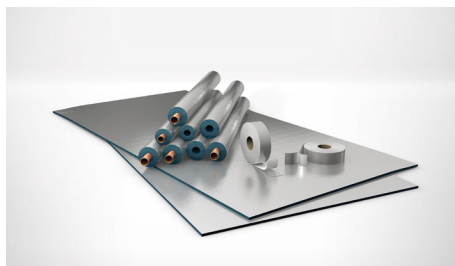
# ArmaFlex Rail

## // ArmaFlex Rail SD



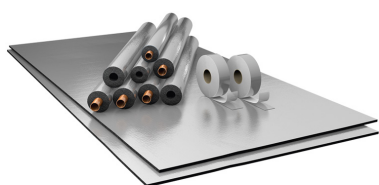
- Extremely low smoke density and superior fire behaviour
- Built-in Microban® antimicrobial protection reduces mould and bacteria growth
- Complies with most international railway standards for insulation materials
  - EN 45545 – HL2, R1
  - NFPA 130
  - DIN 5510-2
  - GOST 12.1.044-89
  - United Nations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

	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	Requirements for fire behaviour of materials and components	
Poland	PN-K-02511		

## 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.
Additional material 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.
Product colour range	Dark blue
Applications	Insulation/protection for air ducts, pipes, vessels, equipments (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 SD 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 SD-C.

Property	Value / Assessment	Standard / Test method
<b>Temperature range</b>		
Service temperature	Min. °C	Max. °C <sup>1</sup>
	-50	110
<b>Thermal conductivity</b>		
Declared thermal conductivity	Øm	0°C
	$\lambda_d \leq [W/(m \cdot K)]$	0.04
	Formula	$[40 + 0,1 \cdot \vartheta_m + 0,0009 \cdot \vartheta_m^2]/1000$
<b>Transportation</b>		
Reaction to fire - hazard level	Tape and sheets 3 mm: HL 1,2,3 acc. R1, R7 Sheets and tubes 6-25 mm: HL 1,2 acc. R1; HL 1,2,3 acc. R7	EN 45545-2
Burning behaviour of materials for use in motor vehicles	Burning behaviour for the use in motor vehicles (ECE Regulations) Passed Annex 6,7,8,9	ECE R-118
NFPA 130 American fire test to railway components	3-13 mm $l_s \leq 25$ Ds(4,0) $\leq 100$	ASTM E162, ASTM E662
<b>Fire performance</b>		
Practical fire behaviour	Self-extinguishing, does not drip, does not spread flames	
<b>Resistance to water vapour</b>		
Water vapour diffusion resistance factor	$\mu \geq 5000$	EN 13469, EN 12086
<b>Physical attributes</b>		
Dimensions and tolerances	In accordance with EN 14304, table 1;	EN 13467, EN 822, EN 823
<b>Weather and UV resistance</b>		
UV resistance	Protection against UV-radiation is necessary, see TB 142	
<b>Health and environment</b>		
Fungal growth	No fungal growth according to tests	ASTM G21
Additional features	SCCP, MCCP-free	
<b>Other technical features</b>		
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).	

<sup>1</sup>+85 °C, for products with a self-adhesive layer.

Tube – standard. Blue. Length: 2.0m

9 mm					13 mm				
Pipe Ø [mm]	Item	Inner diameter (minimum) [mm]	Inner diameter (maximum) [mm]	Content [metric]	Pipe Ø [mm]	Item	Inner diameter (minimum) [mm]	Inner diameter (maximum) [mm]	Content [metric]
12	RA-09X012	13	16	192 m	12	RA-13X012	13	16	130 m
15	RA-09X015	16	19	164 m	15	RA-13X015	16	19	112 m
18	RA-09X018	19	22	150 m	18	RA-13X018	19	22	98 m
22	RA-09X022	23	26	122 m	22	RA-13X022	23	26	88 m
28	RA-09X028	29	32	90 m	28	RA-13X028	29	32	64 m
35	RA-09X035	36	39	68 m	35	RA-13X035	36	39	56 m
42	RA-09X042	43	46	56 m	42	RA-13X042	43	46	48 m

Other information

Thickness tolerance 9 - 13 mm ± 1.5 mm

Length tolerance ± 1.5 %

Reaction to fire Hazard level 2, R1 according to EN 45545-2

Tube – standard. Blue. Length: 2.0m

19 mm				
Pipe Ø [mm]	Item	Inner diameter (minimum) [mm]	Inner diameter (maximum) [mm]	Content [metric]
15	RA-19X015	16	19	64 m
18	RA-19X018	19	22	58 m
22	RA-19X022	23	26	56 m
28	RA-19X028	29	32	40 m
35	RA-19X035	36	39	40 m
42	RA-19X042	43	46	24 m
48	RA-19X048	49	52	24 m
54	RA-19X054	55	58	24 m
60	RA-19X060	61	64	16 m
64	RA-19X064	65	68	16 m

Other information

Thickness tolerance 9 - 13 mm ± 1.5 mm

Length tolerance ± 1.5 %

Reaction to fire Hazard level 2, R1 according to EN 45545-2

Roll - standard. Blue

Item	Thickness [mm]	Width [mm]	Length [m]	Content [metric]
RA-03-99/E	3	1,000	30	30 m <sup>2</sup>
RA-06-99/E	6	1,000	15	15 m <sup>2</sup>
RA-09-99/E	9	1,000	10	10 m <sup>2</sup>
RA-13-99/E	13	1,000	8	8 m <sup>2</sup>
RA-19-99/E	19	1,000	5	5 m <sup>2</sup>
RA-25-99/E	25	1,000	4	4 m <sup>2</sup>

Other information

**Roll - standard. Blue**

Item	Thickness [mm]	Width [mm]	Length [m]	Content [metric]
Thickness tolerance	3 - 6 mm $\pm$ 1.0 mm 9 - 19 mm $\pm$ 1.5 mm 25 mm $\pm$ 2.0 mm			
Length tolerance	+ 5% - 1,5 %			
Reaction to fire	Hazard level 2, R1 according to EN 45545-2 3 mm sheets: HL3, R1			

**Roll - standard self-adhesive. Blue**

Item	Thickness [mm]	Width [mm]	Length [m]	Content [metric]
RA-03-99/EA	3	1,000	30	30 m <sup>2</sup>
RA-06-99/EA	6	1,000	15	15 m <sup>2</sup>
RA-09-99/EA	9	1,000	10	10 m <sup>2</sup>
RA-13-99/EA	13	1,000	8	8 m <sup>2</sup>
RA-19-99/EA	19	1,000	5	5 m <sup>2</sup>
RA-25-99/EA	25	1,000	4	4 m <sup>2</sup>

**Other information**

Thickness tolerance	3 - 6 mm $\pm$ 1.0 mm 9 - 19 mm $\pm$ 1.5 mm 25 mm $\pm$ 2.0 mm			
Length tolerance	+ 5% - 1,5 %			
Reaction to fire	Hazard level 2, R1 according to EN 45545-2 3 mm sheets: HL3, R1			

**Tape - self-adhesive**

Item	Thickness [mm]	Width [mm]	Length [m]	Content [quantity]
RA-TAPE	3	50	15	12 roll

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## ABOUT ARMACELL

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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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