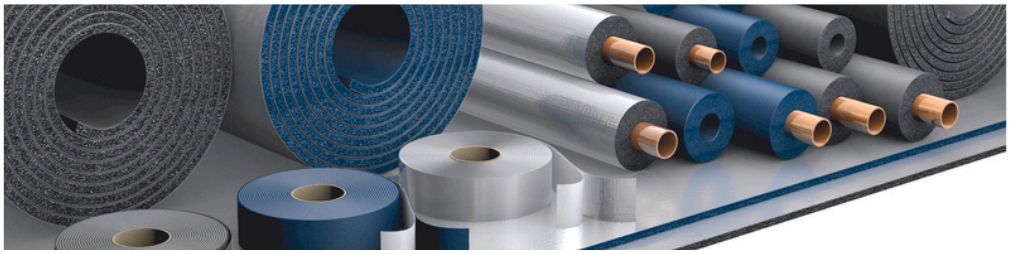
INSTALL IT. TRAVEL SAFELY.

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

www.armacell.com.sg



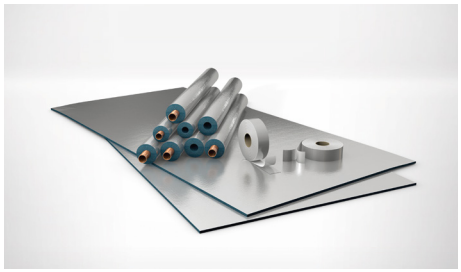
armacell®
ArmaFlex®

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 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.

	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
4: Regular use of underground sections and tunnels (incl. Euro-Tunnel). No evacuation possible.	HL3	HL3	HL3	HL3

HL1
e.g. tramway

HL2
e.g. TGV, TER, RER, subway

HL3
e.g. subway, metro, couchette wagon

NATIONAL STANDARDS REPLACED BY EN 45545-2

Country	Standard
Great Britain	BS 476-6/7
France	NF 16 101 NF 16 102
Germany	DIN 5510
Italy	UNI CEI 11170
Poland	PN-K-02511

European Standard	Testing Standard
EN 45545-2	Spread of flame ISO 5658-2
Railway application	Heat release, smoke production and mass loss rate ISO 5660
Fire protection on railway vehicles	
Requirements for fire behaviour of materials and components	Smoke optical density and toxicity EN ISO 5659-2

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
Temperature range			
Service temperature	Min. °C	Max. °C[1]	EN 14304, EN 14706, EN 14707
	-50	110	
Thermal conductivity			
Declared thermal conductivity	ϑm	0°C	EN 12667, EN ISO 8497, EN ISO 13787
	λd ≤ [W/(m·K)]	0.04	
	Formula	[40 + 0,1· ϑm + 0,0009 · ϑm²]/1000	
Transportation			
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 ls≤ 25 Ds(4,0) ≤100		ASTM E162, ASTM E662
Fire performance			
Practical fire behaviour	Self-extinguishing, does not drip, does not spread flames		
Resistance to water vapour			
Water vapour diffusion resistance factor	μ ≥ 5000		EN 13469, EN 12086
Physical attributes			
Dimensions and tolerances	In accordance with EN 14304, table 1;		EN 13467, EN 822, EN 823
Weather and UV resistance			
UV resistance	Protection against UV-radiation is necessary, see TB 142		
Health and environment			
Fungal growth	No fungal growth according to tests		ASTM G21
Additional features	SCCP, MCCP-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.

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 m²
RA-06-99/E	6	1,000	15	15 m²
RA-09-99/E	9	1,000	10	10 m²
RA-13-99/E	13	1,000	8	8 m²
RA-19-99/E	19	1,000	5	5 m²
RA-25-99/E	25	1,000	4	4 m²

Other information

Roll - standard. Blue

Item	Thickness [mm]	Width [mm]	Length [m]	Content [metric]
Thickness tolerance	3 - 6 mm ± 1.0 mm 9 - 19 mm ± 1.5 mm 25 mm ± 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 m²
RA-06-99/EA	6	1,000	15	15 m²
RA-09-99/EA	9	1,000	10	10 m²
RA-13-99/EA	13	1,000	8	8 m²
RA-19-99/EA	19	1,000	5	5 m²
RA-25-99/EA	25	1,000	4	4 m²
Other information				
Thickness tolerance	3 - 6 mm ± 1.0 mm 9 - 19 mm ± 1.5 mm 25 mm ± 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

ArmaFlex | ArmaFlex Rail SD | Brochure | 062024 | en-SG

ABOUT ARMACELL

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.

armacell®
ArmaFlex®

For more information, please visit:
www.armacell.com