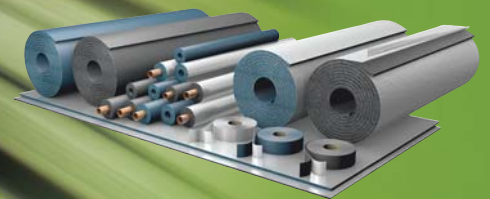


**Armaflex®**  
Rail

THE WORLD'S FIRST CLOSED CELL  
INSULATION TO MEET EN 45545-2 FIRE  
PROTECTION REQUIREMENTS.



- The leading and most innovative closed-cell thermal insulation available to the railway industry worldwide
- High-tech insulation with advanced fire protection for railway vehicles
- Closed cell insulation with built-in water vapour barrier reduces risk of corrosion under insulation (CUI)
- Developed to produce extremely low smoke density, no burning droplets
- Reduced risk of mold and mildew contributes to an improved indoor air quality
- First flexible closed cell insulation to meet hazard level 2 & 3 according to EN 45545

## 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 case of a fire
- Low smoke density, superior fire behaviour
- Low thermal conductivity, high-tech insulation with built-in fire protection for railway vehicles

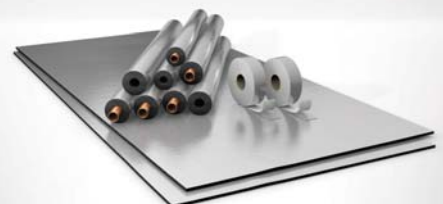
- EN 45545 – HL2,R1



## ARMAFLEX RAIL ZH-C

- Halogen-free insulation reduces toxicity and corrosive effects on people and equipment in case of fire
- Resistant to UV, salt water and chemicals
- Wash down waterproof and easy to clean
- Factory applied reinforced coating with silver finish for hygiene area requirements

- EN 45545 – HL3,R1



# EN 45545

## ROLLING STOCK HAZARD LEVELS

Fire safety requirements are part of the European Directive on the interoperability of the trans-European high-speed rail system. The seven part standard EN 45545 'Railway applications - Fire protection on railway vehicles' has been developed to harmonise 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 include 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 the requirement set R1 they are all based on radiant panels with heat fluxes 50 kW/m<sup>2</sup>.

### REQUIREMENTS FOLLOW 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 <sup>-2</sup>	Minimum	20	20	20
	Heat release, smoke production and mass loss rate ISO 5660-1	MAHRE kWm <sup>-2</sup>	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 for railway vehicles, with improved fire retardant properties, low smoke generation and in-built Microban® antimicrobial protection.				
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 protective paper/foil used on the self-adhesive closures.				
Applications	Insulation / protection for air-conditioning and refrigeration air ducts and pipes (incl. elbows, fittings, flanges etc.) to prevent condensation				
Remarks	Armaflex Rail SD is not UV stable material and should not be exposed to direct sunlight.				
Property	Value/Assessment			Test <sup>*1</sup>	Special Remarks
<b>Temperature Range</b>					
Temperature Range	Max. service temperature	+ 110 °C	(+ 85 °C If sheet or tape is glued to flat objects with its whole surface)	EU 5315	Tested acc. to EN 14706, EN 14707 and EN 14304
	Min. service temperature	-50 °C			
<b>Thermal Conductivity</b>					
Thermal Conductivity	$\vartheta_m$	+/-0	°C	EU 5315	Declared acc. to EN ISO 13787 Tested acc. to EN 12667 EN ISO 8497
	$\lambda$	≤ 0.040	W/(m · K)		
<b>Water vapour diffusion resistance</b>					
Water vapour diffusion resistance	$\mu$	≥	5,000	EU 5315	Tested acc. to EN 12086 and EN 13469
<b>Fire performance</b>					
Reaction to fire	Hazard level	HL2, R1 (3 mm sheets & tape: HL3, R1)		EU 5327 D 5347 D 6219 D 5578 D 5623	Declared acc. to EN 45545-2 DIN 5510-2 GOST 12.1.044-89 ECE R-118 p. 6-8 NFPA 130
	Fire behaviour	S4, ST2, SR2, FED 0,43			
	Russian Federation Certificate of conformity	G1, V2, D2, T2, I1,8			
	Burning behaviour for use in motor vehicles	Passed			
	American fire test to railway components ≤ 13 mm	ASTM E 162 I <sub>s</sub> ≤ 25; ASTM E 662 D <sub>s(4,0)</sub> ≤ 100			
<b>Other fire class</b>					
Practical fire behaviour	Self-extinguishing, does not drip, does not spread flames				
<b>Other technical features</b>					
Dimensions and tolerances	In accordance with EN 14304, table 1			EU 5315	Tested acc. to EN 822, EN 823, EN 13467
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 and approvals can be requested using the registration number given.

All statements and technical information are based on results obtained under typical conditions. It is the responsibility of the recipient to verify with us that the information is appropriate for the specific use intended. Installation instructions are given in our Armaflex installation manual. Please consult our Technical Department before insulating stainless steel.

## 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 pending for coating technology.
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 paper/foil used to protect the self-adhesive closures.
Applications	Insulation / protection for air-conditioning and refrigeration ducts and pipes (incl. elbows, fittings, flanges etc.) to prevent condensation
Special Features	The covering offers excellent durability, even under UV exposure when used for outdoor applications. 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 <sup>*1</sup>	Special Remarks
<b>Temperature Range</b>			
Temperature Range	Max. service temperature + 110 °C (+ 85 °C If sheet or tape is glued to a flat object with its whole surface)	EU 5315	Tested acc.to EN 14706, EN 14707 and EN 14304
	Min. service temperature -50 °C		
<b>Thermal Conductivity</b>			
Thermal Conductivity	$\vartheta_m$ +/-0 °C $\lambda \leq 0.040$ W/(m · K)	$\lambda =$ [40 + 0,1 · $\vartheta_m$ + 0,0009 · $\vartheta_m^2$ ]/1000	
<b>Water vapour diffusion resistance</b>			
Water vapour diffusion resistance	$\mu \geq$	10,000	
<b>Fire performance</b>			
Reaction to fire	Hazard level HL3, R1		EN 45545-2
Practical fire behaviour	Self-extinguishing, does not drip, does not spread flames		
<b>Other technical features</b>			
Tolerances	In accordance with EN 14304, table 1		
Storage & Shelf life	Self-adhesive tapes, self-adhesive sheets: 1 year		

\*1 Further documents such as test certificates and approvals 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 paper/foil used to protect the self-adhesive closures.				
Applications	Insulation / protection for air-conditioning and refrigeration air ducts and pipes (incl. elbows, fittings, flanges etc.) 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 a UV stable material and should not be exposed to direct sunlight.				
<b>Property</b>	<b>Value/Assessment</b>			<b>Test*1</b>	<b>Special Remarks</b>
Temperature Range					
Temperature Range	Max. service temperature	+ 110 °C	(+ 85 °C If sheet or tape is glued to a flat object with its whole surface)	EU 5315	Tested acc.to EN 14706, EN 14707 and EN 14304
	Min. service temperature	-50 °C			
Thermal Conductivity					
Thermal Conductivity	$\vartheta_m$ +/-0	°C	$\lambda =$		
	$\lambda \leq 0.040$	W/(m · K)	$[40 + 0,1 \cdot \vartheta_m + 0,0009 \cdot \vartheta_m^2]/1000$		
Water vapour diffusion resistance					
Water vapour diffusion resistance	$\mu$	$\geq$	1,000	EU 5315	Tested acc. to EN 12086 and EN 13469
Fire performance					
Reaction to fire	Hazard level	HL2, R1			Declared acc. to EN 45545-2
Practical fire behaviour	Self-extinguishing, does not drip, does not spread flames				
Other technical features					
Storage & Shelf life	Self-adhesive tapes, self-adhesive sheets: 1 year				

\*1 Further documents such as test certificates and approvals 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 high-tech coating			
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 paper/foil used to protect the self-adhesive closures.			
Applications	Insulation / protection for air-conditioning and refrigeration air ducts and pipes (incl. elbows, fittings, flanges etc.) to prevent condensation			
Special Features	Without halogens (chloride, bromide) acc. to DIN / VDE 0472, part 815. Fulfils DIN 1988 Parts 200. The covering offers excellent durability, even under UV exposure when used for outdoor applications. Designed for easy cleaning.			
Remarks	When dimensioning the insulation thickness please calculate with an external surface coefficient of 8 W/(m <sup>2</sup> ·K).			
<b>Property</b>	<b>Value/Assessment</b>	<b>Test*1</b>	<b>Special Remarks</b>	
<b>Temperature Range</b>				
Temperature Range	Max. service temperature	+ 110 °C (+ 85 °C If sheet or tape is glued to a flat object with its whole surface)	EU 5315 Tested acc.to EN 14706, EN 14707 and EN 14304	
	Min. service temperature	-50 °C		
<b>Thermal Conductivity</b>				
Thermal Conductivity	$\vartheta_m$	+/-0	°C	$\lambda =$
	$\lambda$	$\leq 0.040$	W/(m · K)	$[40 + 0,1 \cdot \vartheta_m + 0,0009 \cdot \vartheta_m^2]/1000$
<b>Water vapour diffusion resistance</b>				
Water vapour diffusion resistance	$\mu$	$\geq$	10,000	
<b>Fire performance</b>				
Reaction to fire	Hazard level	HL3, R1	EN 45545-2	
Practical fire behaviour	Self-extinguishing, does not drip, does not spread flames			

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

## Armaflex Rail SD tubes



Length 2.0 m, Colour Blue

Pipe max. Outside-Ø [mm]	Inner Ø min/ max mm (tube)	9,0 mm	
		Code	m/carton
12	13.0 - 14.5	RA-09X012	192
15	16.0 - 17.5	RA-09X015	164
18	19.0 - 20.5	RA-09X018	150
22	23.0 - 24.5	RA-09X022	122
28	29.0 - 30.5	RA-09X028	90
35	36.0 - 38.0	RA-09X035	68
42	43.5 - 44.5	RA-09X042	56

Length tolerance for tubes:	± 1,5 %
Thickness tolerance	9 mm ± 1,5 mm
Reaction to fire	Hazard level 2, R1 according to EN 45545-2

## Armaflex Rail SD continuous sheets (rolls)



Colour Blue

Code	Thickness [mm]	Roll length [m]	m <sup>2</sup> /carton
RA-03-99/E	3.0	30	30
RA-06-99/E	6.0	15	15
RA-09-99/E	9.0	10	10
RA-13-99/E	13.0	8	8
RA-19-99/E	19.0	5	5

Length tolerance for sheets	+/- 1,5 %
Thickness tolerance	3 - 6 mm ± 1,0 mm 9 - 19 mm ± 1,5 mm
Reaction to fire	Hazard level 2, R1 according to EN 45545-2 3 mm sheets: HL3, R1

## Armaflex Rail SD continuous sheets self-adhesive (rolls)



Code	Thickness [mm]	Roll length [m]	m <sup>2</sup> /carton
RA-03-99/EA	3.0	30	30
RA-06-99/EA	6.0	15	15
RA-09-99/EA	9.0	10	10
RA-13-99/EA	13.0	8	8
RA-19-99/EA	19.0	5	5

Length tolerance for sheets	+/- 1,5 %
Thickness tolerance for sheets	3 - 6 mm ± 1,0 mm 9 - 19 mm ± 1,5 mm
Reaction to fire	Hazard level 2, R1 according to EN 45545-2 3 mm sheets: HL3, R1

## Armaflex Rail SD self-adhesive tapes



Colour Blue

Code	Width [mm]	Length [m]	Thickness [mm]	Rolls/carton
RA-TAPE	50.0	15	3	12

Thickness tolerance	- 0,1 / + 1,5 mm
Length tolerance	- 1,5 / + 5 %
Reaction to fire	Hazard level 3, R1 according to EN 45545-2



## Armaflex Rail SD adhesive



Code	Description	pieces/carton
AHU-700/1,0 •	Armaflex Ultima Adhesive 700, blue one component adhesive, 1 litre cans	12
AHU-RS850/0,7 •	Armaflex Ultima Adhesive RS850, reduced solvent, non-drip blue gel form adhesive, 0.75 litre cans	6

• Not a stock item. Delivery on request.

## Armaflex Rail SD-C pre-covered tubes



Pipe max. Outside-Ø [mm]	Inner Ø min/ max mm (tube)	9,0 mm	
		Code	m/carton
12	13.0 - 14.5	SDC-09X012	96
15	16.0 - 17.5	SDC-09X015	82
18	19.0 - 20.5	SDC-09X018	75
22	23.0 - 24.5	SDC-09X022	61
28	29.0 - 30.5	SDC-09X028	45
35	36.0 - 38.0	SDC-09X035	34
42	43.5 - 45.5	SDC-09X042	28

Length tolerance for tubes:	± 1,5 %
Thickness tolerance	9 mm ± 1,5 mm
Reaction to fire	Hazard level 3, R1 according to EN 45545-2

## Armaflex Rail SD-C pre-covered self-adhesive sheet



Length 2.0 m, Width 1.0 m, Colour Blue, Covering Colour Silver

Code	Thickness [mm]	m <sup>2</sup> /carton
SDC-06MM/A	6.0	50
SDC-09MM/A	9.0	34
SDC-13MM/A	13.0	24
SDC-19MM/A	19.0	16
SDC-25MM/A	25.0	12

Length tolerance for sheets	± 1,5 %
Thickness tolerance for sheets	6 mm ± 1,0 mm 9-19 mm ± 1,5 mm 25 mm ± 2,0 mm
Reaction to fire	Hazard level 3, R1 according to EN 45545-2

## Armaflex Rail SD-C self-adhesive tapes



Code	Colour	Width [mm]	Length [m]	Thickness [mm]	Rolls/carton
ACH-PSATAPES-30	Silver	30.0	25	0.08	10
ACH-PSATAPES-50	Silver	50.0	50	0.08	6

## Armaflex Rail ZH tubes



Length 2.0 m, Colour Dark grey

Pipe max. Outside-Ø [mm]	Inner Ø min/ max mm (tube)	9,0 mm	
		Code	m/carton
12	13.0 - 14.5	ZH-09X012	192
15	16.0 - 17.5	ZH-09X015	164
18	19.0 - 20.5	ZH-09X018	150
22	23.0 - 24.5	ZH-09X022	122
28	29.0 - 30.5	ZH-09X028	90
35	36.0 - 38.0	ZH-09X035	68
42	43.5 - 45.5	ZH-09X042	56

Length tolerance for tubes:	± 1,5 %
Thickness tolerance	9 mm ± 1,5 mm
Reaction to fire	Hazard level 2, R1 according to EN 45545-2

## Armaflex Rail ZH continuous sheets (rolls)



Code	Thickness [mm]	Roll length [m]	m <sup>2</sup> /carton
ZH-03-99/E	3.0	30	30
ZH-06-99/E	6.0	15	15
ZH-10-99/E	10.0	10	10
ZH-13-99/E	13.0	8	8

Length tolerance for sheets	+/- 1,5 %
Thickness tolerance for sheets	3 - 6 mm ± 1,0 mm 9 - 13 mm ± 1,5 mm
Reaction to fire	Hazard level 2, R1 according to EN 45545-2

## Armaflex Rail ZH continuous sheets self-adhesive (rolls)



Colour Dark grey

Code	Thickness [mm]	Roll length [m]	m <sup>2</sup> /carton
ZH-03-99/EA	3.0	30	30
ZH-06-99/EA	6.0	15	15
ZH-10-99/EA	10.0	10	10
ZH-13-99/EA	13.0	8	8

Length tolerance for sheets	+/- 1,5 %
Thickness tolerance for sheets	3 - 6 mm ± 1,0 mm 9 - 13 mm ± 1,5 mm
Reaction to fire	Hazard level 2, R1 according to EN 45545-2

## Armaflex Rail ZH self-adhesive tapes



Colour Dark grey

Code	Width [mm]	Length [m]	Thickness [mm]	Rolls/carton
ZH-TAPE	50.0	15	3	12

Thickness tolerance	- 0,1 / + 1,5 mm
Length tolerance	- 1,5 / + 5 %

## Armaflex Rail ZH-C pre-covered tubes



Pipe max. Outside-Ø [mm]	Inner Ø min/ max mm (tube)	9,0 mm	
		Code	m/carton
12	13.0 - 14.5	ZHC-09X012	96
15	16.0 - 17.5	ZHC-09X015	82
18	19.0 - 20.5	ZHC-09X018	75
22	23.0 - 24.5	ZHC-09X022	61
28	29.0 - 30.5	ZHC-09X028	45
35	36.0 - 38.0	ZHC-09X035	34
42	43.5 - 45.5	ZHC-09X042	28

<b>Length tolerance for tubes:</b>	± 1,5 %
<b>Thickness tolerance</b>	9 mm ± 1,5 mm
<b>Reaction to fire</b>	Hazard level 3, R1 according to EN 45545-2

## Armaflex Rail ZH-C pre-covered self-adhesive sheet



Length 2.0 m, Width 1.0 m, Colour Dark grey, Covering Colour Silver

Code	Thickness [mm]	m <sup>2</sup> /carton
ZHC-06MM/A	6.0	50
ZHC-10MM/A	10.0	30
ZHC-13MM/A	13.0	24
ZHC-19MM/A	19.0	16
ZHC-25MM/A	25.0	12

<b>Length tolerance for sheets</b>	± 1,5 %
<b>Thickness tolerance for sheets</b>	6 mm ± 1,0 mm 9-19 mm ± 1,5 mm 25 mm ± 2,0 mm
<b>Reaction to fire</b>	Hazard level 3, R1 according to EN 45545-2

## Armaflex Rail ZH-C self-adhesive tapes



Code	Colour	Width [mm]	Length [m]	Thickness [mm]	Rolls/carton
ACH-PSATAPES-30	Silver	30.0	25	0.08	10
ACH-PSATAPES-50	Silver	50.0	50	0.08	6

## Notes

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