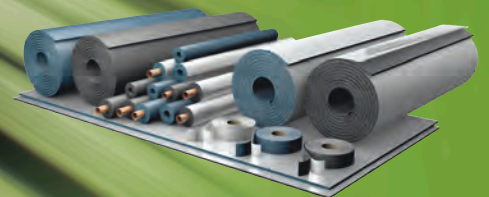




ARMAFLEX RAIL

FIRST-CLASS IN TRAINS



- 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

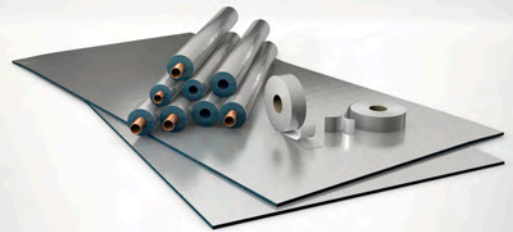
- EN 45545 – HL2, R1
- NFPA 130
- DIN 5510-2
- GOST 12.1.044-89
- United Nations ECE R-118 p. 6-8



## 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

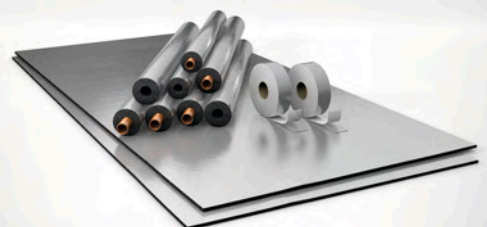
- EN 45545 – HL2,R1



## 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/m<sup>2</sup>.

### 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 <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 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* <sup>1</sup>	Special Remark
<b>Temperature Range</b>			
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	
<b>Thermal Conductivity</b>			
Thermal Conductivity	$\vartheta_m$ +/-0	°C	EU 5654 Declared acc. to EN ISO 13787 Tested acc. to EN 12667 EN ISO 8497
	$\lambda \leq 0,040$	W/(m · K)	
<b>Water vapour diffusion resistance</b>			
Water vapour diffusion resistance	$\mu$	$\geq 5.000$	EU 5654 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 6963 EU 6964 EU 6965 EU 6966 Declared acc. to EN 45545-2
	Fire behaviour and fire side effects	S4,ST2, SR2, FED < 1	D 5882 Classified acc to DIN 5510-2 Tested acc to DIN 54837
	Russian Federation Certificate of conformity	G1, V2, D2, T2, I1,8	RUS 6866 Declared acc to: GOST 12.1.044-89
	Burning behaviour for the use in motor vehicles (ECE Regulations)	Passed Annex 6,7,8,9	D 5842 ECE R-118
	NFPA 130 American fire test to railway components	$I_s \leq 25$ $D_s(4,0) \leq 100$	EU 5955 EU 5956 Classified acc to NFPA 130:2014 Tested acc to ASTM E 162:20 ASTM E 662:2012
<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; Tested acc. to EN 822, EN 823, EN 13467		EU 5654
Biological / chemical behaviour	Fungal Resistance, no fungal growth according to tests 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).		

\*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/(m <sup>2</sup> ·K).

Property	Value/Assessment	Test* <sup>1</sup>	Special Remark
<b>Temperature Range</b>			
Temperature Range	max. service temperature	+ 110 °C	(+ 85 °C If sheet or tape is glued to the object with its whole surface)
	min. service temperature	-50 °C	
<b>Thermal Conductivity</b>			
Thermal Conductivity	$\vartheta_m$	+/-0 °C	λ =
	$\lambda \leq 0,040$	W/(m · K)	
<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	EU 6253 EU 7034
	NFPA 130 American fire test to railway components	$I_s \leq 25$ $D_s(4,0) \leq 100$	EU 6905 EU 6906 EU 6907 EU 6908
	Russian Federation Certificate of conformity	G1, V2, D2, T2, I1,8	RUS 6866
			Declared acc. to: GOST 12.1.044-89  Tested acc to BSS 7239:1988, BSS 7242:1989
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		
			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 <sup>*1</sup>	Special Remark
<b>Temperature Range</b>			
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	
<b>Thermal Conductivity</b>			
Thermal Conductivity	$\vartheta_m$ +/-0	°C	λ = [40 + 0,1 · $\vartheta_m$ + 0,0009 · $\vartheta_m^2$ ]/1000
	λ ≤ 0,040	W/(m · K)	
<b>Water vapour diffusion resistance</b>			
Water vapour diffusion resistance	μ	≥	1.000
<b>Fire performance</b>			
Reaction to fire	Hazard level	HL2, R1	EU 5816 EU 5857 EU5896 EU6665
Practical Fire Behaviour	Self-extinguishing, does not drip, does not spread flames		
<b>Other technical features</b>			
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/(m <sup>2</sup> ·K).

Property	Value/Assessment	Test <sup>*1</sup>	Special Remark
<b>Temperature Range</b>			
Temperature Range	max. service temperature	+ 110 °C	(+ 85 °C if sheet or tape is glued to the object with its whole surface)
	min. service temperature	-50 °C	
<b>Thermal Conductivity</b>			
Thermal Conductivity	$\vartheta_m$ +/-0	°C	λ =
	$\lambda \leq 0,040$	W/(m · K)	
<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	EU 6997 EU 5818
Practical Fire Behaviour	Self-extinguishing, does not drip, does not spread flames		
<b>Other technical features</b>			
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.

## Armaflex Rail SD tubes



Length 2,0 m, Color blue

Pipe max. Outside-Ø [mm]	9,0 mm		13,0 mm	
	Code	m/carton	Code	m/carton
12	RA-09X012	192	RA-13X012	130
15	RA-09X015	164	RA-13X015	112
18	RA-09X018	150	RA-13X018	98
22	RA-09X022	122	RA-13X022	88
28	RA-09X028	90	RA-13X028	64
35	RA-09X035	68	RA-13X035	56
42	RA-09X042	56	RA-13X042	48

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

## Armaflex Rail SD sheets endless



Color blue

Code	Insulation 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
RA-25-99/E	25,0	4	4

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 sheets endless self-adhesive



Color blue

Code	Insulation 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
RA-25-99/EA	25,0	4	4

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 tapes self-adhesive



Color 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	Article description	Pieces/carton
AHU-700/1,0	Armaflex Ultima Adhesive 700, 1 liter cans	12
AHU-SF990/0,8	Armaflex Ultima Adhesive SF990, 0,8 liter cans	12

## Armaflex Rail SD-C tubes pre-covered



Length 1,0 m, Color blue, Covering Color silver

Pipe max. Outside-Ø [mm]	Inner Ø min/ max mm	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 sheets self-adhesive pre-covered



Length 2,0 m, Width 1,0 m, Color blue, Covering Color silver

Code	Insulation 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 tapes self-adhesive



Color silver

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, Color dark grey

Pipe max. Outside-Ø [mm]	Inner Ø min/ max mm	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

● Item not in stock. Delivery on request. [MTO]

## Armaflex Rail ZH sheets endless



Color dark grey

Code	Insulation 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  
3 mm sheets: HL3, R1

● Item not in stock. Delivery on request. [MTO]

## Armaflex Rail ZH sheets endless self-adhesive



Color dark grey

Code	Insulation 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  
3 mm sheets: HL3, R1

## Armaflex Rail ZH tapes self-adhesive



Color 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 %

**Reaction to fire**

Hazard level 3, R1 according to EN 45545-2

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



Length 2,0 m, Width 1,0 m, Color dark grey, Covering Color silver

Code	Insulation thickness [mm]	m <sup>2</sup> /carton
ZHC-06MM/A	6,0	50
ZHC-10MM/A	10,0	34
ZHC-13MM/A	13,0	24
ZHC-19MM/A	19,0	16
ZHC-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 ZH-C tapes self-adhesive



Color silver

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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