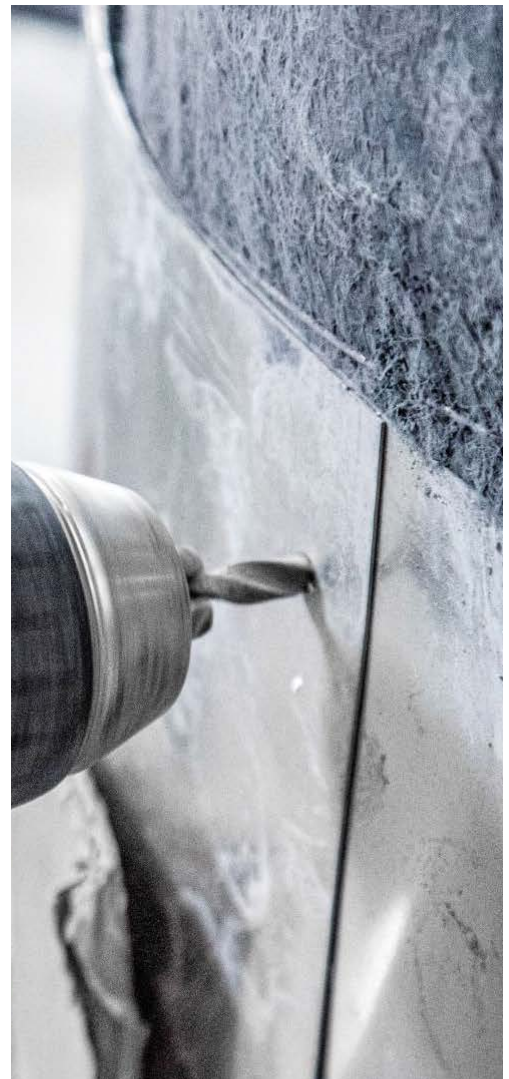


FIRE PROTECTION JUST GOT SMARTER

ArmaGel[®] HTF

Application Guide

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ArmaGel[®] HTF

Consumption Guide



The sections of insulation shall include a minimum 100 mm overlap around the circumference, applicable to all insulation layers.

Cut ArmaGel blanket into sections with the sizing dimensions that are equal to the length of the steel pipe specimens considering an 100 mm overlap plus an additional compensation factor (50 mm for 1st layer, 60 mm layer for 2nd layer, 70 mm for 3rd layer,...)



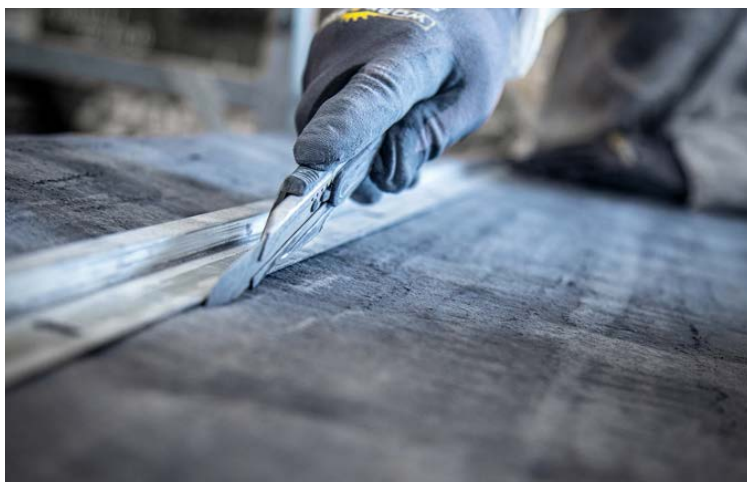
Required circumference length of ArmaGel HTF =

- circumference based on outside diameter
- + compensation factor for overlapping (see table below)
- + overlap (100 mm)

Example for steel pipe with outside diameter of 219.1 mm

Layer	Outside diameter w/o considering overlapping (mm)	Circumference based on outside diameter (mm)	Compensation factor for overlapping (mm)	Overlap (mm)	Required circumference length of ArmaGel HTF (mm)
1	219,1	688	50	100	838
2	239,1	751	60	100	911
3	259,1	814	70	100	984
4	279,1	877	80	100	1057
5	299,1	939	90	100	1129
6	319,1	1002	100	100	1202
7	339,1	1065	110	100	1275

Note: the above table is only an example. On jobsite deviations from the calculation model above could be possible. Therefore, for every layer the needed circumference length of ArmaGel HTF needs to be determined before cutting.



ArmaGel[®] HTF

Application Steps



Installation Method of ArmaGel[®] HTF insulation blankets on steel pipes

Cut and fabricate sections of ArmaGel HTF blanket to the required number of layers requirement (see approval). The sections of insulation shall include a minimum 100 mm overlap around the circumference and an additional compensation factor, applicable to all insulation layers (see consumption guide).

Each section is cut so that there is an excess of approximately 25 mm of mat length for each section in the longitudinal direction on the pipe.



All insulation sections when installed shall have no visible gaps showing the bare steel specimen surface.

The ArmaGel insulation is tightly wrapped around the length and contour of the specimen in one full length of blanket (to avoid gaps and voids) - applicable for all insulation layers.

The ArmaGel insulation shall be secured tightly around the steel specimen circumference with industry standard stainless steel insulation binding wire of minimum 0.8 mm in diameter at maximum 200 mm on center for inner layers and 100 mm for the outmost layer.

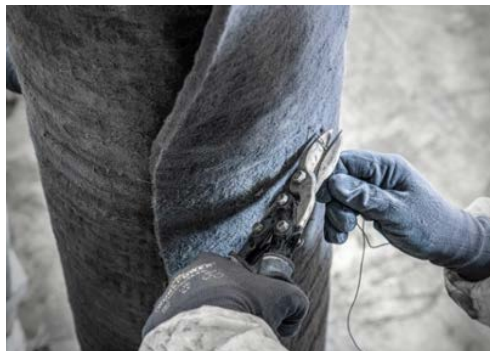
Install ArmaGel insulation on the same layer using a butt joint.

Stagger the butt joint between layers by a minimum of 200 mm.

All overlapping seams contained within the insulation layers shall be staggered by a minimum of 90° to 120° throughout for each consecutive layer.

Consult the approval and UL listing to determine the amount of insulation layers for the required fire rating relative to the steel member dimensions.

For applications with jet fire requirements, the penultimate layer of ArmaGel HTF need to be fixed additionally with metal straps (16 mm wide industry standard, with thickness of minimum 0.75 mm, tightened with stainless steel tension clips). For details please refer to relevant third party listings or contact Technical Services.



Fixing and Securing of Stainless-Steel Metal Cladding

Fabrication / design & installation of metal cladding

The insulated pipe has to be covered with metal cladding casing installed around the final insulation: use pre-rolled manufactured minimum 0.6 mm thick stainless-steel.

The cladding shall be installed in sections. Metal jacketing should be staggered. The longitudinal overlapping of jacketing should be ≥ 250 mm. Overlaps around the circumference of the cladding sections shall be a minimum of 200 mm.

For vertical applications, the 1st metal cladding section shall be installed at the bottom of the insulated specimen first, the following metal sections where applicable shall be overlapped facing in a downwards direction as per industry standard (roof tile effect).

Use of blind stainless-steel rivets

All metal cladding shall be fixed and secured with 4.8 mm diameter – stainless steel countersunk type pop rivets in pre-drilled 5 mm diameter holes.

Install ≥ 6 rivets/m¹ along the edge of the jacketing. Distance of the first rivet to the edge of the jacketing is ≤ 30 mm. Distance of the rivets to the long edge of the jacketing is 10 to 20 mm.

In addition to the rivets installed on the leading edge, six additional rivets shall be installed around the circumference of the jacketing (two additional rivets at every 90°), at each horizontal overlap at approximately 30 mm and 200 mm from the horizontal edges of the cladding segments.



Use of stainless-steel restraining bands and tension clips

All metal cladding shall also be additionally secured with 16 mm wide industry standard stainless-steel bands (with thickness of minimum 0.75 mm) and tension clips. Excess length of the band needs to be cut off.

Distance between the bands should be ≤ 250 mm, the distance of the first band to the edge of the jacketing is 50 to 70 mm.

4.8 mm diameter rivets are installed in pre-drilled 5 mm diameter holes, at a distance of 80 to 100 mm left and right from the clip.

For applications with jet fire requirements for the outer jacketing the distance between the metal straps (16 mm wide industry standard, with thickness of minimum 0.75 mm, tightened with stainless steel tension clips) should be max. 200 mm.

In the case of vertical pipe configurations, four 90° stainless-steel angle brackets, side length 2 times 60x18x1mm, installed around the circumference of the top segment of metal jacketing (at every 90°) to fix the top segment only to the upper supporting construction. Fixing with rivets to the jacketing and bolted to the upper supporting construction.



Note:

All high-temperature insulation materials may release traces of organic residues during initial commissioning and exposure to high temperatures. This process may be accompanied by the emission of gaseous products and their oxidation, and consequently, a short-term exothermic reaction, which may be accompanied by a specific odour, smoke release, and in extreme cases glowing and/or flaming.

1. To ensure that any self-heating and/or exothermic reaction for operating temperatures above 400 °C is kept within an acceptable range, the following application instructions shall be followed:
 - a. All layers of ArmaGel HTF shall be installed and secured tightly to avoid any visible gaps between layers and along all longitudinal and circumferential joints.
 - b. The metallic foil (e.g. aluminium stainless steel foil) shall be installed between the two outmost layers of the ArmaGel HTF construction.
 - c. The cladding system shall be fully installed before operating the pipe equipment.
2. Do not apply ArmaGel HTF on live pipe equipment when operating above 350 °C and ensure that the insulation system is complete before turning the pipe/equipment on.
3. Do not apply ArmaGel HTF with a total thickness of more than 80mm without first contacting Armacell technical support.
4. The service temperature and application temperatures defined above do not reflect the performance under the fire conditions as per UL 1709 and ISO 22899-1.

ArmaGel HTF Application video

Watch the application video for a step-by-step guide on installing ArmaGel HTF and the metal cladding.



ArmaGel[®] HTF

Approved Systems



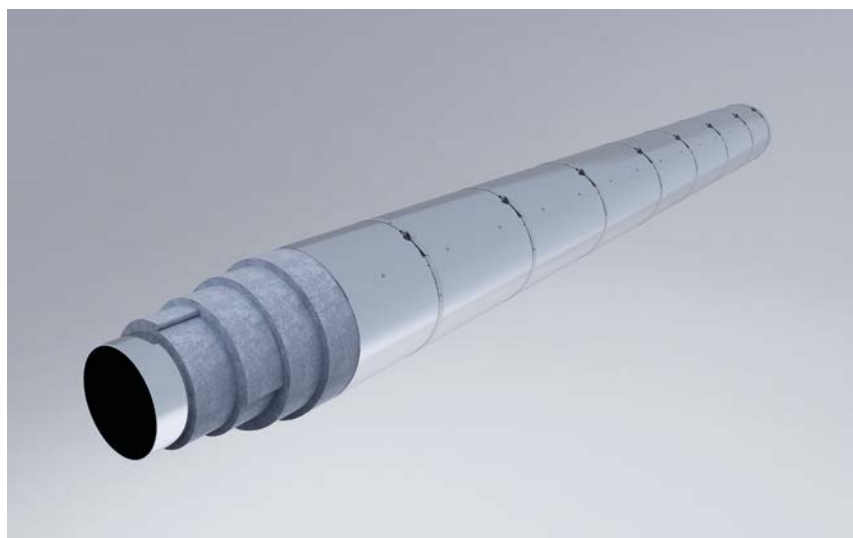
ArmaGel[®] HTF system configuration

The ArmaGel[®] HTF system consists of multiple layers of the blanket, depending on the required fire rating and dimensions of the pipe. As per industry standards, a stainless steel outer jacketing system is being applied to cover the entire surface area of the ArmaGel HTF blankets.

Tested and certified configurations for UL1709 compliance¹

Tested configuration	Fire rating [min.]	Outer diameter [mm]	Wall thickness [mm]	Hp/A Value [m ⁻¹]	ArmaGel [®] HTF
Pipe 8"	120	219.1	3.68	276.4	10 x 10mm
Pipe 8"	120	219.1	6.3	163.4	7 x 10mm
Pipe 8"	120	219.1	14.2	74.8	4 x 10mm
Pipe 8"	90	219.1	6.3	163.4	5 x 10mm
Standard steel beam W10x49 (in x lb/ft)	120	-	-	177.3	3 x 10mm

¹ All fire tests have been officially conducted at a UL laboratory under full witnessing by UL.



Fire performance & approvals						
Surface burning characteristics	≤ 5 flame spread index ≤ 10 smoke development					Tested according to ASTM E84
Fire resistance	Tested configurations for jet fire compliance (ISO 22899-1) ⁶ :					
	Tested configuration	Fire rating	Outer diameter [min.]	Wall thickness [mm]	Hp/A Value [m ⁻¹]	ArmaGel® HTF [mm]
	Pipe 8"	90 (J-90) 180 (integrity)	219.1	6.3	163.4	5 x 10mm

ArmaGel HTF Jet fire test at Efectis/France, officially witnessed by Efectis/France and UL Europe. The below pictures were taken during the test.



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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.

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