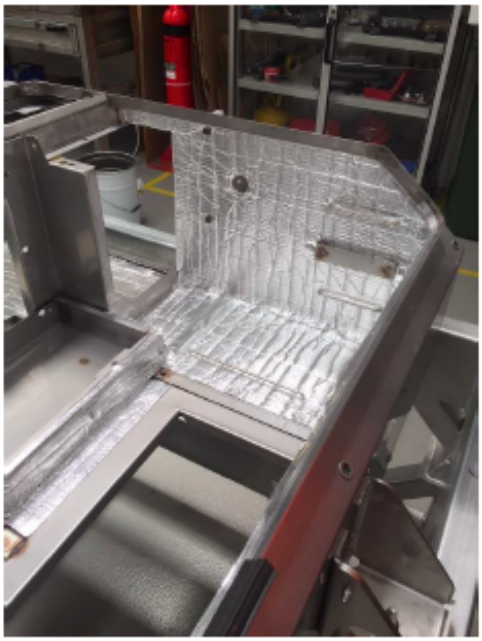
THERMOBREAK INSULATION IN HVAC OEM APPLICATIONS

Closed cell foam insulation offers significant advantages in AC units due to their fibre-free, closed cell structure and high insulation efficiency, even in lower thicknesses.

Thermobreak insulation is widely used both for thermal and acoustic insulation by leading AC manufacturers. Thermobreak offers unique advantages:

- **Market leading thermal performance** (k value 0.032 W/mK or 0.22 BTU.in/h.sqft) therefore excellent insulation at lower thickness.
- **Completely closed cell structure**
- **Almost zero vapour permeability**
- **Meets all major International Fire standards** and Building code regulations.
- **Superior weather performance**
- Inertness against chemicals and solvents
- **Wide operating temperature**
- **Lightweight and flexible**.(25 kg/m3 or 1.5 lb/sqft)
- Comparatively low cost
- Manufacturing flexibility (supplied with factory applied adhesive backing. Can be easily die cut)



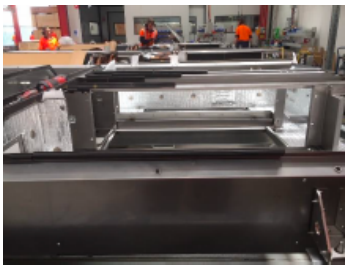
Why closed cell foams are better than open cell and fibrous insulation?

In any AC unit, there is a lot of moisture/vapour available. This is due to the mechanical function of the AC unit- it is basically a condensing unit.

The function of the insulation is to ensure that a) thermal efficiency is maintained, and b) prevent condensation, which in turn can damage the unit itself or leak into the surroundings thus causing damage. Often confused with water permeability, Vapour permeability is the major cause of condensation and malfunction of insulation systems.

Between any cold and hot surface, a differential vapour pressure system is created. Vapour pressure can penetrate even solid surfaces such as aluminium. On the "hot side", the pressure exerted by vapour is higher than the corresponding "cold side". As such vapour will permeate from the hot side to the cold side. Once the vapour comes into contact with the "cold side", the temperature is below its due point, and the result is condensation of the vapor into a liquid.

For fibrous insulation, the slow progression of vapour into the insulation affect the thermal performance ultimately leading to condensation and equipment damage.



Material:	Physically (irradiation) crosslinked closed cell polyolefin foam with factory applied reinforced aluminium foil and optional pressure sensitive adhesive backing
Density:	1.5 pcf (foam core only)
Thermal Conductivity: (ASTM C518)	0.22 BTU.in/h.ft².°F (@ 73°F mean temperature)
Water Vapour Permeability: (ASTM E96)	0.002 perm-inch
Water Vapour Permeance:	0.0034 perms (½" thickness)
Permeability Resistance Factor:	μ > 80,000
Water Absorption by Volume: (ASTM C1763, Procedure B, 24h)	< 0.2% v/v
Resistance to Fungi: (ASTM G21)	Zero Growth
Leachable Chlorides: (ASTM C871)	< 12 ppm (< 0.0012% w/w)
Ozone Resistance:	Excellent
UV Resistance:	Excellent
VOC Emission Rate: (ASTM D5116)	Low VOC emitting ("Green Star")
Operating Temperature Range:	-112 °F ~ +212 °F (no adhesive)
Physical Property Requirements:	COMPLIES (ASTM C1427)

FIRE AND SMOKE PERFORMANCE

AS 1530 Part 3	**Ignitability Index:**	**0**
	Spread of Flame Index:	**0**
	Heat Evolved Index:	**0**
	Smoke Developed Index:	**0 – 1**
ASTM E84 (UL 723):		**COMPLIES (NFPA 90A & B)**
	Flame Spread Index:	**≤25**
	Smoke Developed Index:	**≤50**
BS 476 Parts 6 & 7:		**CLASS 0**
EN 13823 (Sheet)	**Single Burning Item:**	**COMPLIES (EUROCLASS B – s2, d0 RATING)**
ISO 11925 Part 2 (Sheet)	**Ignitability:**	**COMPLIES (EUROCLASS B – s2, d0 RATING)**
FM 4924 (Sheet)	**Up to 1" thickness**	**FM APPROVED**

ISO 5659 Part 2	**Smoke Density**	**COMPLIES (EN 45545:2 R1, HL3 RATING)**
	Smoke Toxicity	**COMPLIES (EN 45545:2 R1, HL3 RATING)**

TOLERANCES

The following tables list tolerances for thickness, density and width of standard Thermobreak® LS products:

Thickness	
Nominal Thickness	**Tolerance (based on SI nominal value and converted from SI units)**
3/8" (10mm)	0.35" – 0.45"
1/2" (12mm)	0.43" – 0.53"
5/8" (15mm)	0.55" – 0.67"
3/4" (20mm)	0.75" – 0.87"
1" (25mm)	0.95" – 1.10"
1 1/2" (40mm)	1.50" – 1.70"
2" (50mm)	1.90" – 2.10"
Other thicknesses and tolerances subject to confirmation.	

Density* (foam only)	
Nominal Density	**Tolerance (based on SI nominal value and converted from SI units)**
1.5 pcf (25 kg/m³)	± 10%
*Applies to the foam core. The density of Thermobreak with reinforced aluminium foil will be higher.	

Width (Sheet)	
Nominal Width	**Tolerance (based on SI nominal value and converted from SI units)**
48" (1200mm)	47.2" – 48.0"
Other widths and/or tolerances subject to confirmation.	

FIRE AND SMOKE PERFORMANCE

AS 1530 Part 3		COMPLIES (AS 4254)
	Ignitability Index:	0
	Spread of Flame Index:	0
	Heat Evolved Index:	0
	Smoke Developed Index:	0 – 1
ASTM E84 (UL 723):		COMPLIES (NFPA 90A & B)
	Flame Spread Index:	≤25
	Smoke Developed Index:	≤50
DIN 54837	Burning Test	COMPLIES (DIN 5510:2) Classification S4, SR2, ST2
ISO 5658 Part 2	Flame Spread	COMPLIES (EN 45545:2 R1, HL3 RATING, 1/5" – 1")
ISO 5659 Part 2	Smoke Density	COMPLIES (EN 45545:2 R1, HL3 RATING, 1/5" – 1")
	Smoke Toxicity	COMPLIES (EN 45545:2 R1, HL3 RATING, 1/5" – 1") COMPLIES (DIN 5510:2) FED < 1
ISO 5660 Part 1	Heat Release Rate	COMPLIES (EN 45545-2 R1, HL3 RATING, 5 – 24mm)
ASTM E162	Surface Flammability	COMPLIES (PRIIA/NFPA 130)
ASTM E662	Smoke Density	COMPLIES (PRIIA/NFPA 130)
ASTM E1354	Heat Release Rate	COMPLIES (PRIIA)
BSS 7239 (Boeing)	Smoke Toxicity	COMPLIES (PRIIA)
BS 476 Parts 6 & 7		CLASS 0
UL 181 Part 11	Burning Test	COMPLIES (AS 4254)

TOLERANCES

The following tables list tolerances for thickness, density and width of standard Thermobreak® Acoustiplus™ products:

Thickness	
Nominal Thickness	**Tolerance (based on SI nominal value and converted from SI units)**
3/8" (10mm)	0.35" – 0.45"
5/8" (15mm)	0.55" – 0.67"
1" (24mm)	0.90" – 1.05"
2" (54mm)	2.05" – 2.25"
Other thicknesses and tolerances subject to confirmation.	

Density* (foam only)	
Nominal Density	**Tolerance (based on SI nominal value and converted from SI units)**
1.5 pcf (25 kg/m³)	± 10%
*Applies to the foam core. The density of Thermobreak with reinforced aluminium foil will be higher.	

Width (Sheet)	
Nominal Width	**Tolerance (based on SI nominal value and converted from SI units)**
48" (1200mm)	47.2" – 48.0"
Other widths and/or tolerances subject to confirmation.	

Material:	Physically (irradiation) crosslinked closed cell polyolefin foam with factory applied, heavy duty multilayer composite with a specially developed UV and weather durable coating
Density:	1.5 pcf (foam core only)
Thermal Conductivity: (ASTM C518)	0.22 BTU.in/h.ft².°F (@ 73°F mean temperature)
Water Vapour Permeability: (ASTM E96)	< 0.003 perm-inch (basis 1" thickness)
Water Vapour Permeance:	< 0.003 perms (basis 1" thickness)
Permeability Resistance Factor:	μ > 40,000 (basis 1" thickness)
Water Absorption by Volume: (ASTM C1763, Procedure B, 24h)	< 0.2% v/v
Resistance to Fungi: (ASTM G21)	Zero Growth
Leachable Chlorides: (ASTM C871)	< 12 ppm (< 0.0012% w/w)
Ozone Resistance:	Excellent
UV Resistance: (ISO 4892-3) (3000 hour QUV exposure)	No change in performance or appearance
Salt Resistance: (Internal Method) (2 week immersion in 5% salt solution)	No visible change in appearance
Tensile Strength: (ASTM D751)	> 225 lbf MD > 200 lbf CD
Tear Strength: (ASTM D751)	> 13 lbf MD > 11 lbf CD
Puncture Resistance: (ASTM D4833)	> 90 lbf
Operating Temperature Range:	-112 °F ~ +212 °F (no adhesive)
Physical Property Requirements:	COMPLIES (ASTM C1427)

FIRE AND SMOKE PERFORMANCE

AS 1530 Part 3	**Ignitability Index:**	**0**
	Spread of Flame Index:	**0**
	Heat Evolved Index:	**0**
	Smoke Developed Index:	**0 – 1**

ASTM E84 (UL 723):		**COMPLIES (NFPA 90A & B)**
	Flame Spread Index:	**≤25**
	Smoke Developed Index:	**≤50**
BS 476 Parts 6 & 7:		**CLASS 0**
FM 4924 (Tube)	**Up to 8" IPS** **Up to 2" wall thickness**	**FM APPROVED**

TOLERANCES

The following tables list tolerances for thickness, density and width of standard Thermobreak® No-Clad products:

Thickness	
Nominal Thickness	**Tolerance (based on SI nominal value and converted from SI units)**
3/8" (10mm)	0.35" – 0.45"
5/8" (15mm)	0.55" – 0.67"
3/4" (20mm)	0.75" – 0.87"
1" (25mm)	0.95" – 1.10"
1 1/8" (30mm)	1.14" – 1.28"
1 1/2" (40mm)	1.50" – 1.70"
2" (50mm)	1.90" – 2.10"
Other thicknesses and tolerances subject to confirmation.	

Density* (foam only)	
Nominal Density	**Tolerance (based on SI nominal value and converted from SI units)**
1.5 pcf (25 kg/m³)	± 10%
*Applies to the foam core. The density of Thermobreak with reinforced aluminium foil will be higher.	

Width[1]	
Nominal Width	**Tolerance (based on SI nominal value and converted from SI units)**
48" (1200mm)	47.2" – 48.0"
[1]Other widths and/or tolerances subject to confirmation.	

Length[2]	
Nominal Length	**Tolerance**
Sheets (90.5", 2300mm length)	90.6" – 93.3"
Rolls (all lengths)	-0% / +5%
[2]Other lengths and/or tolerances subject to confirmation.	

TECHNICAL COMPARISON

Thermobreak® LS

PROPERTY	TEST	Thermobreak® LS	PRODUCT A
Material Construction		Physically crosslinked , Closed cell polyolefin foam with factory applied reinforced aluminium foil and acrylic tissue adhesive (repositionable)	Elastomeric foam based on Nitrile Butadiene Rubber (NBR).
Foam Structure		Very fine, even cell engineered foam with completely closed cell structure.	Larger cells , closed cell foam
Manufacturing Specification	ASTM C1427	Complies	Complies (ASTM C534 Elastomeric)
Density		1.5 PCF (foam core only)	3-6 pcf
Thermal Conductivity (k) btu-in/hr-ft2 .F	ASTM C518	73°F - 0.22	75°F - 0.245
Vapour Permeability	ASTM E96	0.002 perm-inch	< 0.01 perm-inch
Permeability Resistance Factor	DIN 52615	μ > 80,000	μ > 7,000
Water absorption by volume	ASTM C1427	< 0.15 % vv	Not tested / no data
Influence of humidity on dimensional Stability		No change	Not tested / no data
Operating temperature		-112 F to 212 F (no adhesive)	-40 F to 200 F
Compressive Strength	JIS K6767	29 kPa @ 25% deflection 83 kPa @ 50% deflection	Not tested / no data
Anti Microbial	ASTM G21	Zero growth	Pass
UV resistance		Excellent	Requires coverings
Leachable Chlorides		<12ppm (< 0.0012%)	<0.05%
Hot surface Performance	ASTM C411	No cracking or delamination	No cracking or delamination
Noise Reduction Coeffcient (NRC)	ISO 354	0.20 (12mm foam thickness) 0.30 (25mm foam thickness	Not tested / no data
Smoke Density & Toxicity	ISO 5658 Part 2	Complies (EN 45545-2 R1, HL3 RATING)	Not tested / no data
	ISO 5659 Part 2	Meets standard's threshold limits. Smoke density Dm < 200 Gases concentration below threshold limits CO, HCl, HF, NOx, HBr, HCN, SO2 Toxicity Index R = 0.35	Not tested / no data
	BS 6853 Annex B	Complies	Not tested / no data
	IMO MSC 61(67) Part 2	Complies	Not tested / no data
Fire Ratings	BS 476 Parts 6 & 7	Class O (up to 25mm)	Class 0
	ASTM E84	Complies to Spread of Flame/Smoke Index max of 25/50 (up to 2")	Complies to Spread of Flame/Smoke Index max of 25/50 (up to 2")
	Australian /NZ Standard AS1530.3 (1998)	Spread of Flame index : 0 Smoke Developed index : 0-1 Heat Evolved index : 0 Ignitability index : 0	Not tested / no data
	UL 94 (electronic devices)	HF-1 (UL Listed Product)	Not tested / no data
	EN 13823	Complies (EUROCLASS B - s2, d0 RATING)	Not tested / no data
	FM 4924	FM approved	FM Approved
	ASTM E84 & ASTM C411	Meets requirements - NFPA 90A & 90B (up to 50mm)	Meets requirements - NFPA 90A & 90B (up to 50mm)
Energy Code Requirements		Meets ASHRAE 90.1	Meets ASHRAE 90.1
REACH Compliance	197/2006/EC	Complies	No data
RoHS Compliance		Complies	Complies
Green Building	ASTM D5116	Low VOC Emitting ("Green Star")	Not tested / no data
PVC Free		Yes	No

NOTES

* Permeability values should only be compared if the Test Methods used are the same. Different procedures will give different results depending upon conditions of test.

*Information given above is given in good faith and to the best of our knowledge. Data for other products are taken from common publications. However, due to the large number of manufacturers, some data may be vary slightly.

*It is recommended that the data are verified by the interested parties before any decisions as to their suitability are made.

TECHNICAL COMPARISON
THERMOBREAK® LS

PROPERTY	TEST	THERMOBREAK® LS	PRODUCT B
Material Construction		Physically crosslinked , Closed cell polyolefin foam with factory applied reinforced aluminium foil and acrylic tissue adhesive	Elastomeric foam based on synethic rubber NBR/PVC
Core Material Structure		Very fine, even cell engineered foam with completely closed cell structure. FIBRE FREE made without use of CFCs, HCFCs, PBDEs and Formaldehyde	Larger cells , closed cell foam FIBRE FREE made without use of CFCs, HCFCs, PBDEs and Formaldehyde
Manufacturing Standard		ASTM C1427	ASTM C 534
Density		1.5 pcf (foam core)	2.5 -3 pcf
Thermal Conductivity (k)	ASTM C518	0.22 BTU.in/h.ft2 @73^{0}F	0.25 BTU.in/h.ft2 @75^{0}F
Vapour Permeability	ASTM E96	0.002 perm-inch	0.05 perm-inch
Permeability Resistance Factor	DIN 52615	μ > 80,000	μ > 7,000
Water absorption by volume	ASTM C1763	< 0.2 % v/v	0.2 % v/v
Influence of humidity on dimensional Stability		No change	Not tested / no data
Operating temperature		-112 °F ~ +212 °F (no adhesive)	-297 °F ~ +220 °F (no adhesive)
Compressive Strength	JIS K6767	29 kPa @ 25% deflection 83 kPa @ 50% deflection	Not tested / no data
Anti Microbial	ASTM G21	Zero growth	Zero growth
Leachable Chlorides	ASTM C871	< 12 ppm (< 0.0012% w/w)	No data
UV resistance		Excellent	Additional covering system required
Smoke Density & Toxicity	ISO 5658 Part 2	Complies (EN 45545-2 R1, HL3 RATING)	Not tested / no data
	ISO 5659 Part 2	Meets standard's threshold limits. Smoke density Dm < 200 Gases concentration below threshold limits CO, HCl, HF, NOx, HBr, HCN, SO2 Toxicity Index R = 0.35	Not tested / no data
	BS 6853 Annex B	Complies	Not tested / no data
	IMO MSC 61(67) Part 2	Complies	Not tested / no data
Fire Ratings	ASTM E84	25/50	25/50
	British Standard BS 476 Prts 6 & 7	Class O (up to 50 mm)	Class O
	European Standard EN 13823	Complies (EUROCLASS B - s2, d0 RATING)	Not tested / no data
	ISO 11925 Part 2 (Ignability)	Complies (EUROCLASS B - s2, d0 RATING)	
	Australian /NZ Standard AS1530.3 (1998)	Spread of Flame index : 0 Smoke Developed index : 0-1 Heat Evolved index : 0 Ignitability index : 0	No data
	UL 94	HF-1	Complies
	European Standard EN 13823	Complies (EUROCLASS B - s2, d0 RATING)	Not tested / no data
	FM 4924	FM approved	FM approved
	NFPA 90A & 90B	Complies	Complies
REACH Compliance	197/2006/EC	Complies	Not tested / no data
RoHS Compliance		Complies	Not tested / no data
Green Building	ASTM D5116	Low VOC Emitting "Green Star Certified" Zero ODP, Low GWP	GreenGuard certified
PVC Free		Yes	No

*Information given above is given in good faith and to the best of our knowledge. Data for other products are taken from common publications. However, due to the large number of manufacturers, some data may be vary slightly.

*It is recommended that the data are verified by the interested parties before any decisions as to their suitability are made.