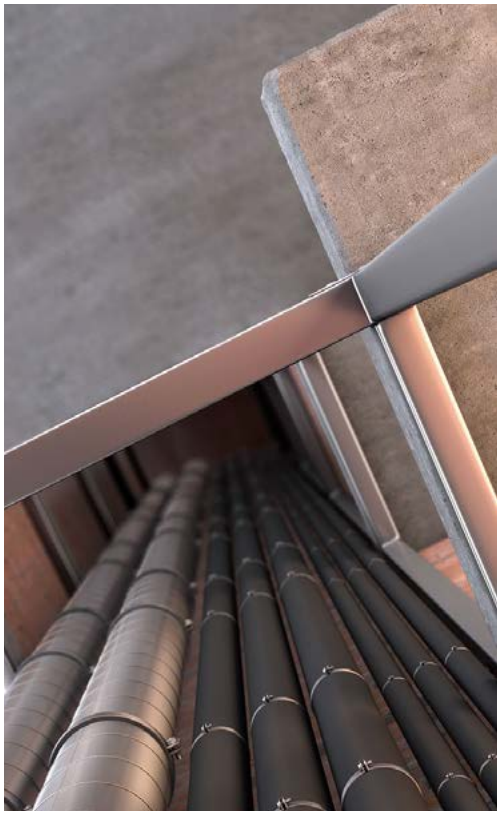
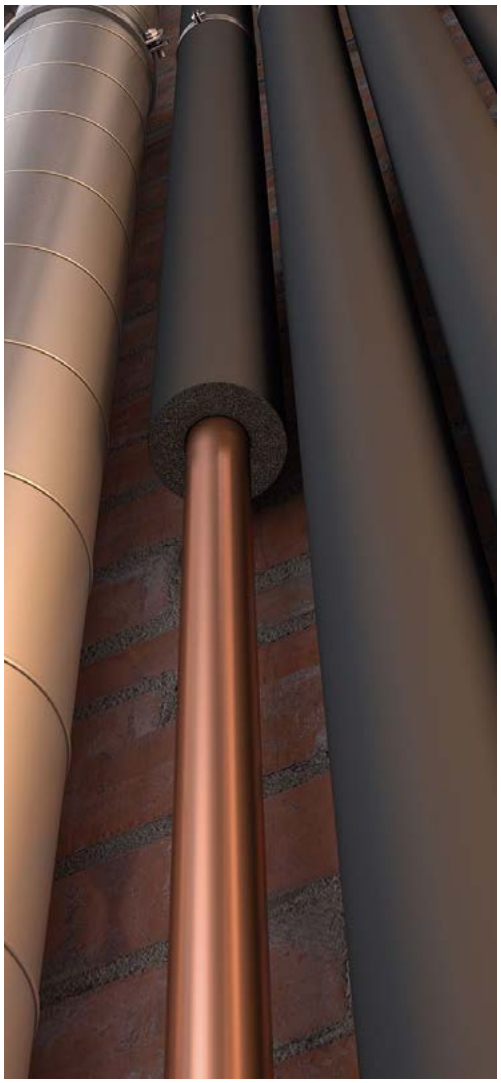


ENHANCED PERFORMANCE AND INDOOR AIR QUALITY

ArmaFlex® FRV



High-performance insulation for air-conditioning, heating and refrigeration

// Fire-tested for vertical pipe chases to NFPA 274
// Complies with AS/NZS 4859.1
// Reduces mould and bacteria growth through Microban® antimicrobial product protection, unique to Armacell
// Type III Environmental Product Declaration (EPD)
// FM-Approved

www.armacell.com.au

armacell®
ArmaFlex®

ENHANCED PERFORMANCE
AND INDOOR AIR QUALITY

ArmaFlex FRV

ArmaFlex FRV fulfils NFPA 274 requirements, a full-scale test simulating one of the most stringent fire environments in high-rise buildings. Infused with Microban antimicrobial product protection and provided with an independently verified Environmental Product Declaration (EPD) to support green building certification schemes, this FM-approved product is the preferred insulation for air-conditioning, heating and refrigeration applications.

Excellent performance

Good indoor air quality

Sustainability focus

// Excellent performance
Passes a full-scale fire test simulating how insulated pipes behave in confined spaces when a small, growing fire escalates in the vertical pipe chase of a high-rise building.

// Closed-cell structure
Minimises moisture penetration to ensure long-term protection against corrosion under insulation. Makes an additional water vapour barrier unnecessary.

// Energy efficient
Low thermal conductivity minimises energy losses to deliver long-term energy savings.

// Microban protection
When microbes come into contact with the insulation surface, Microban penetrates the cell wall of the microorganism, disabling its ability to function, grow and reproduce.

// Focused on sustainability
From the point of manufacturing to its end of life, ArmaFlex FRV saves more energy over the product life cycle than is required to manufacture it.

// Safer indoor air quality
Free of fibre and formaldehyde, and GREENGUARD® Gold certified for low emissions of volatile organic compounds.

// Easy-to-install
Highly flexible elastomeric foam that can be installed quickly on irregular shapes and installations in tight spaces.

BETTER PERFORMANCE IN HIGH-RISE BUILDINGS

Insulation materials are among the few industrially made products that save more energy over their product lifetime than is needed in their manufacturing process. For example, **ArmaFlex saves 140 times more energy** than is required for its production, transportation and disposal[1]. Amortisation calculations for typical applications also exhibit that the cost of ArmaFlex is recovered after just one or two years.

While the benefits of installing quality insulation are clear, the drive to limit any increase in construction costs has resulted in a proliferation of different materials that claim to meet various local regulations. With several major fires breaking out in tall buildings around the world in recent years, there is an increased awareness that existing test methods may not be adequately assessing fire hazard properties. Hence, the intention to regulate the fire performance of building materials is being insufficiently met.

The key to ensuring the robustness of any building design lies in selecting and installing products that are "fit for purpose", not merely tested and approved. As buildings get taller, specifiers should look beyond minimum requirements to ensure higher safety standards. This challenges material manufacturers to improve their technology to offer solutions that provide enhanced overall safety for building occupants.

NFPA 274 STANDARD TEST METHOD

The National Fire Protection Association (NFPA) is an international non-profit organisation that develops, publishes and disseminates fire risk consensus codes and standards. The NFPA 274 Standard Test Method is a full-scale test that uses large samples to simulate how insulated pipes in a **confined vertical configuration** may behave during a growing fire situation. It may be a more realistic assessment as it reflects the actual installation configuration.

BY USING PRODUCTS THAT PASS NFPA 274, SPECIFIERS AND MANUFACTURERS HELP TO ENCOURAGE THE USE OF PRODUCTS WITH BETTER PERFORMANCE.

Insulated pipes are first inserted into a vertical pipe chase test chamber which mimics the actual pipe installation.

A small, growing fire which escalates is placed directly underneath the pipes and the fire performance is observed.

The test runs for 10 minutes and materials must pass the recommended performance criteria.

// Test results

Three materials were tested: ArmaFlex FRV, foil-faced polyethylene (PE) and PE. To pass the test, the material must meet all the recommended performance criteria and **only ArmaFlex FRV was able to achieve this.**

Material / Performance criteria	Peak heat release rate	Total heat release	Total smoke release	Extent of flame above pipe chase	Result
	[kW]	[MJ]	[m²]	[m]	[Pass/Fail]
Pass criteria	⩽ 300	⩽ 83	⩽ 500	⩽ 0.3	-
ArmaFlex FRV	✓	✓	✓	✓	✓
Foil-faced PE	✗	✓	✓	✗	✗
PE	✗	✗	✓	✗	✗

[1] Assuming a service life of 20 years for cold applications and/or 30 years for hot applications, this ratio was calculated based on very conservative assumptions.

IN 2009, WE BECAME THE WORLD'S FIRST MANUFACTURER OF FLEXIBLE TECHNICAL INSULATION MATERIALS TO CARRY OUT LIFE CYCLE ASSESSMENTS (LCA) AND PUBLISH ENVIRONMENTAL PRODUCT DECLARATIONS (EPDS).

PROTECTING THE ENVIRONMENT

A key aspect of our corporate philosophy and business strategy is our commitment to environmental protection, which ties in with our corporate value - Sustainability. In all this, we measure our success by the added value our innovative solutions deliver to a wide range of industries - benefits of societal and ecological significance.

An Environment Product Declaration (EPD) is a neutral, independently verified document that provides information about the impact a product has throughout its life cycle - and in particular its impact on the environment. The fact that one EPD can be compared with another facilitates product evaluation, especially when designing green buildings in line with certification schemes such as Leadership in Energy and Environmental Design (LEED®).

A Life Cycle Assessment (LCA) quantifies the direct and indirect environmental impact associated with the life cycle of a product from the raw material extraction, materials' processing and manufacturing through distribution and use to its ultimate disposal. As an LCA provides specific information on an individual manufacturer's products, the results serve as a valuable benchmark.

INDOOR AIR QUALITY

In 2011, the Empire State Building in New York City was extensively renovated and LEED GOLD certified. ArmaFlex was installed on the air ducts to ensure a high indoor air quality.

ENERGY CONSERVATION

Sathorn Square in Bangkok, Thailand, is a Grade A office building and a LEED-certified project that achieved GOLD level certification in 2013. ArmaFlex was installed on the chilled water system to prevent condensation and minimise energy losses.

HOW ARE THESE DOCUMENTS USED?

EPDs and LCAs provide objective and transparent information about a product's environmental impact and facilitate understanding about a building's environmental footprint. EPDs also allow for a like-for-like comparison of similar products for specification and procurement purposes.

Architects, specifiers and those inviting tenders

EPDs are used as the basis for calculating eco-balance, a prerequisite for green building certification. Some of the key criteria considered when selecting construction products include technical performance, costs, environmental aspects and aesthetics.

Real-estate companies and building owners

When EPDs and green building certifications are presented, the value of the building increases and it is easier to market properties that are certified as sustainable. Long-term cost savings can also be enjoyed as the building is designed to make efficient use of its resources.

End-users and governments

As awareness of sustainability and healthy working environments for increased productivity increases, governments are keen to develop green building initiatives. Individuals are also driven to engage in energy consumption behavioural change and place higher emphasis on occupant well-being. **EPDs can provide assurance that the manufacturers' claims are substantiated.**

The U.S. Green Building Council's LEED® green building programme is the preeminent programme for the design, construction, maintenance and operations of high-performance green buildings. Learn more at usgbc.org/LEED.

HEALTHIER INDOOR AIR QUALITY

GREENGUARD is a certification programme created by UL to certify products that have been scientifically proven to meet some of the world's most rigorous third-party chemical emissions standards. GREENGUARD Certified products help to reduce indoor air pollution and the risk of chemical exposure, contributing to healthier indoor environments. GREENGUARD Certified products are recognised by many green building rating schemes around the world, giving these products a clear advantage in the marketplace.

GREENGUARD GOLD CERTIFICATION

This certification programme offers a much stricter certification criteria than the GREENGUARD Certification programme as it takes into account the safety of sensitive individuals (such as children and the elderly) who spend an extended amount of time indoors. Products that have achieved GREENGUARD Gold certification are acceptable for use in schools and healthcare facilities as they emit even fewer volatile organic compounds and total chemical emissions than products without this certification.

With more of our time being spent indoors, installing materials that emit low volatile organic compounds and total chemical emissions will help to mitigate health risks.

THANKS TO GREENGUARD GOLD CERTIFICATION, USING ARMAFLEX FRV MEANS YOU COULD EARN CREDITS TOWARDS GREEN BUILDING CERTIFICATION (SUCH AS LEED) WITHOUT ADDITIONAL TESTING OR LOCAL CERTIFICATION.

ANTIMICROBIAL PRODUCT PROTECTION

Bacteria are among the fastest reproducing organisms in the world, and research has shown that some can double every four to twenty minutes. This means they could be a potential health hazard to anyone coming in contact with them, even before they are visible to the naked eye.

ArmaFlex FRV is infused with Microban product protection during the manufacturing process. Hence, the protective ingredient becomes part of the insulation molecular structure and helps to provide long-term antimicrobial protection that does not deplete or get washed off. This state-of-the-art technology works to penetrate the cell wall of the micro-organism coming into contact with the insulation surface to disable its ability to function, grow and reproduce.

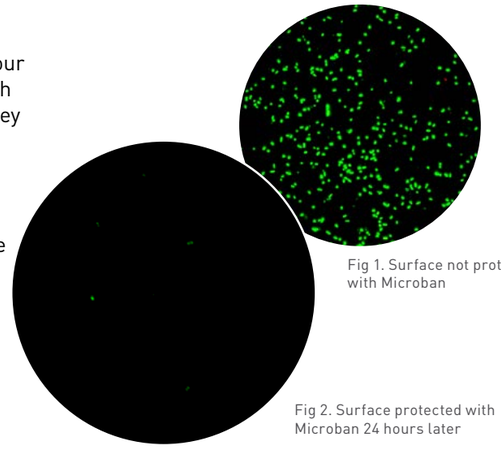


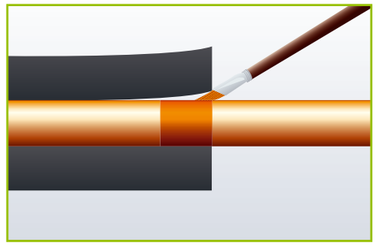
Fig 1. Surface not protected with Microban

Fig 2. Surface protected with Microban 24 hours later

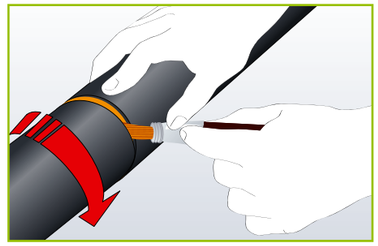
GREENGUARD Certified products are certified to GREENGUARD standards for low chemical emissions into indoor air during product usage. For more information, visit ul.com/gg.

Installation

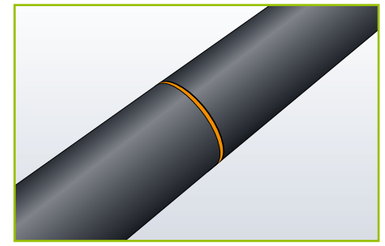
WET SEALING BUTT JOINTS



1. On all cold lines use ArmaFlex adhesive to glue the ends of the ArmaFlex sheets or tubes to the pipe surface. The adhesive should be applied in a width at least equal to the insulation thickness.

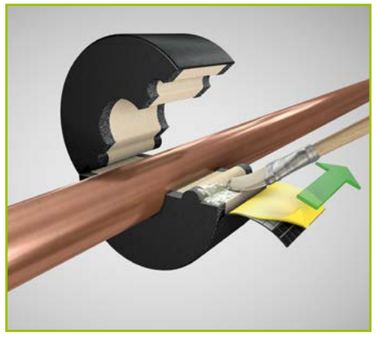


2. For the final wet sealing of the tube or sheet, use fingers to pull the joint apart and apply a thin, even film of adhesive to both butt joint edges with a small brush.



3. Use your fingers and thumbs to apply firm and even pressure to the glued joint to finish.

USING ADHESIVE FOR INSULATED PIPE SUPPORTS



1. Apply ArmaFlex adhesive on the insulated pipe support and remove the self-adhesive tape.

2. Close the seam by applying firm pressure. Glue the edges of the insulated pipe support to the copper pipe with ArmaFlex adhesive.

3. Wet seal butt joints with adhesive and install ArmaFlex FRV tubes on either side of the insulated pipe support.

Learn more

INSTALLATION ADVICE

Visit www.armacell.com to download the latest copy of the ArmaFlex installation manual. Instructional videos are also available on our Armacell - Global YouTube channel.

TECHNICAL DATA - ARMAFLEX FRV

Brief description	ArmaFlex FRV is a highly flexible closed-cell insulation material made from nitrile rubber, with high water vapour diffusion resistance and low thermal conductivity.
Material type	Elastomeric foam based on synthetic rubber.
Colour	Black.
Special features	Sheets and tubes are infused with Microban antimicrobial protection to provide additional assurance against mould and bacteria growth.
Applications	Thermal insulation/protection of pipes, air ducts and vessels (incl. elbows, fittings, flanges etc.) in hot and cold water services, chilled water lines, heating systems, air conditioning ductwork and refrigerated pipework; installed in commercial, industrial, residential and public buildings to control condensation, protect against frost and reduce energy loss.
Installation	Please refer to the ArmaFlex installation manual for advice. ArmaFlex can be used together with ArmaFlex adhesive and ArmaFix® pipehangers for a complete insulation system.

Property	Value/Assessment					Standard/Test method
Temperature range						
Service temperature	Max. service temperature	+105 °C		+85 °C if sheet or tape is glued to the object with its whole surface.		
	Min. service temperature	-50 °C				
Thermal conductivity						
	θm	+/-0	+15	+23	[°C]	ASTM C518, ASTM C177, ASTM C335, ISO 8497
Thickness ≤ 25mm	λ ≤	0.033	0.034	0.035	[W/(m·K)]	
Thickness > 25mm		0.035	0.036	0.037		
Water vapour diffusion resistance						
Water vapour diffusion resistance factor	μ ≥ 7,000					DIN EN 13469, DIN EN 12086
Water absorption	< 0.2% by volume					ASTM C1763
Fire performance & approvals						
Building Code of Australia (BCA)	Compliant with the requirements for fire hazard properties of insulation materials, as per Specification C1.10 - Clause 7 - of the National Construction Code Volume One (excluding fire control rooms and fire-isolated exits)					AS/NZS 1530.3:1999
New Zealand Building Code (NZBC)	Tested according to the New Zealand Building Code Verification Method C/VM2 Appendix A Group Number Classification: 2					ISO 5660
Surface spread of flame	Class 1					BS 476 Part 7: 1997
Vertical pipe chase	Peak rate of heat release: Total heat release (THR_{10min}) Total smoke release (TSR_{10min}) Extent of flame	≤ 300kW ≤ 83MJ ≤ 500m² ≤ 0.3m (1ft)				NFPA 274
Flammability	V-0 rating					UL 94
	FM-Approved					FM 4924
Practical fire behaviour	Does not generate flaming droplets.					
Other technical features						
UV resistance	For UV protection, an Arma-Chek® covering system is required. For outside use, ArmaFlex should be protected within three days of installation.					
Antimicrobial behaviour	Built-in Microban antimicrobial product protection: No fungal growth is observed.					
Fungal growth	No fungal growth is observed.					ASTM G21
Health aspects	Free of fibre and formaldehyde. Low volatile organic compounds (VOC), low total aldehyde. GREENGUARD Gold for even lower VOC and total chemical emissions.					UL2818-2013
Environmental aspect	Type III Environmental Product Declaration (EPD): Declaration number 4786944121.101.1, UL Environment.					
Storage	Material shall be stored in dry, clean rooms at normal relative humidity (50% to 70%) and ambient temperature (0 °C to 35 °C).					
Shelf (storage life)	Self-adhesive sheets, tubes and tapes: 1 year.					

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 our Technical department in due time whether or not the data and information apply to the intended application area.

// Material R-values for ArmaFlex FRV insulation

The thermal resistance or "R-value" is a measure of a material's ability to retard heat flow. Thermal resistance is used in combination with numerals to designate thermal resistance values. The higher the R-value, the higher the insulation's thermal resistance. The following table provides the material R-values for ArmaFlex FRV pipe insulation, with values calculated in accordance with AS/NZS 4859.1.

Pipe insulation R-values (at 23°C)

Nominal pipe size [mm]	9mm	13mm	19mm	25mm	32mm	38mm	50mm
6	0.45	0.68	1.1				
10	0.40	0.61	0.98	1.5			
12	0.38	0.61	1.0	1.4	1.9	2.3	
15	0.36	0.54	0.86	1.4	1.7	2.2	
20	0.35	0.52	0.82	1.3	1.7		
22	0.34	0.50	0.79	1.2	1.6	2.0	2.8
25	0.33	0.48	0.76	1.2	1.5		
28	0.32	0.48	0.74	1.2	1.5	1.8	2.6
32		0.47	0.73	1.1	1.4		
35	0.31	0.47	0.72	1.1	1.4	1.7	2.5
38		0.46					
40		0.46					
42	0.31	0.45	0.69	1.1	1.4	1.7	2.3
48	0.31	0.44	0.68	1.0	1.3	1.6	2.3
50	0.31	0.44					
54		0.44	0.66	1.0	1.3		
60	0.30	0.43	0.65	0.98	1.2	1.5	2.2
67		0.45	0.64	0.96			
73		0.45	0.68	0.94	1.2	1.5	2.1
76						1.5	
89		0.44	0.66	0.92	1.2	1.4	2.0
114		0.43	0.64	0.89	1.1	1.4	2.0
140				0.86		1.3	2.0

The thermal resistance (material R-value) for ArmaFlex FRV sheet insulation is shown in the table below. These values are calculated in accordance with AS/NZS 4859.1. R-values for flat surfaces and radial surfaces cannot be directly compared.

Sheet and roll insulation R-values (at 23°C)

Wall thickness [mm]	9mm	13mm	19mm	25mm	32mm	38mm
R-value	0.27	0.39	0.56	0.74	0.89	1.1

Tubes (length: 2.0m)

9mm		13mm		19mm		25mm		Insulation inner diameter	Cu pipe outer diameter	Fe pipe outer diameter	Nominal diameter (DN)
Item	Carton content	Item	Carton content	Item	Carton content	Item	Carton content				
	[m]		[m]		[m]		[m]	[mm]	[inch]	[mm]	
FRVA-09X006	332	FRVA-13X006	198	FRVA-19X006	100			6	1/4		
FRVA-09X010	266	FRVA-13X010	172	FRVA-19X010	92	FRVA-25X010	60	10	3/8		6
FRVA-09X012	200	FRVA-13X012	136	FRVA-19X012	84	FRVA-25X012	54	12	1/2		
FRVA-09X015	192	FRVA-13X015	126	FRVA-19X015	72	FRVA-25X015	48	15	5/8	14	8
FRVA-09X020	140	FRVA-13X020	98	FRVA-19X020	60	FRVA-25X020	40	20	3/4		
FRVA-09X022	136	FRVA-13X022	98	FRVA-19X022	60	FRVA-25X022	40	22	7/8	22	15
FRVA-09X025	112	FRVA-13X025	84	FRVA-19X025	50	FRVA-25X025	34	25	1	25	
FRVA-09X028	98	FRVA-13X028	78	FRVA-19X028	48	FRVA-25X028	32	28	1-1/8	28	20
		FRVA-13X032	64	FRVA-19X032#	40	FRVA-25X032	28	32	1-1/4	32	
FRVA-09X035	82	FRVA-13X035	58	FRVA-19X035	36	FRVA-25X035	28	35	1-3/8		25
		FRVA-13X038#	56					38	1-1/2	38	
		FRVA-13X040#	48					40			
FRVA-09X042	70	FRVA-13X042	48	FRVA-19X042	32	FRVA-25X042	24	42	1-5/8		32
FRVA-09X048	50	FRVA-13X048	40	FRVA-19X048	32	FRVA-25X048	20	48	1-7/8		40
FRVA-09X050#	48	FRVA-13X050	40					50			
		FRVA-13X054	40	FRVA-19X054	24	FRVA-25X054	18	54	2-1/8		
FRVA-09X060	48	FRVA-13X060	34	FRVA-19X060	24	FRVA-25X060	18	60	2-3/8		50
		FRVA-13X067	30	FRVA-19X067	20	FRVA-25X067	16	67	2-5/8		
		FRVA-13X073	24	FRVA-19X073#	18	FRVA-25X073	12	73			
						FRVA-25X076#	12	76	3	76	
		FRVA-13X089	20	FRVA-19X089	16	FRVA-25X089	12	89	3-1/2	89	80
		FRVA-13X114	18	FRVA-19X114	12	FRVA-25X114	8	114	4-1/2	114	100
				FRVA-19X140#	6	FRVA-25X140#	4	140			125
						FRVA-25X168#	4	168			150

#Made to order. Minimum order quantities and different lead times may apply.
Self-adhesive option available upon request. Minimum order quantities and different lead times may apply.

32mm		38mm		50mm		Insulation inner diameter	Cu pipe outer diameter	Fe pipe outer diameter	Nominal diameter (DN)
Item	Carton content	Item	Carton content	Item	Carton content				
	[m]		[m]		[m]	[mm]	[inch]	[mm]	
FRVA-32X012#	32	FRVA-38X012#	24			12	1/2		
FRVA-32X015	32	FRVA-38X015#	20			15	5/8	14	8
FRVA-32X020#	24					20	3/4		
FRVA-32X022	24	FRVA-38X022#	20	FRVA-50X022#	12	22	7/8	22	15
FRVA-32X025#	24					25	1	25	
FRVA-32X028	24	FRVA-38X028	18	FRVA-50X028#	12	28	1-1/8	28	20
FRVA-32X032#	18					32	1-1/4	32	
FRVA-32X035	18	FRVA-38X035	16	FRVA-50X035	10	35	1-3/8		25
FRVA-32X042	16	FRVA-38X042	12	FRVA-50X042	8	42	1-5/8		32
FRVA-32X048	12	FRVA-38X048	12	FRVA-50X048#	8	48	1-7/8		40
FRVA-32X054#	12					54	2-1/8		
FRVA-32X060	12	FRVA-38X060	10	FRVA-50X060	8	60	2-3/8		50
FRVA-32X073	8	FRVA-38X073	8	FRVA-50X073#	8	73			
		FRVA-38X076	8			76	3	76	
FRVA-32X089	8	FRVA-38X089	6	FRVA-50X089	6	89	3-1/2	89	80
FRVA-32X114	8	FRVA-38X114	4	FRVA-50X114	4	114	4-1/2	114	100
		FRVA-38X140	4	FRVA-50X140	4	140			125
		FRVA-38X168#	4	FRVA-50X168#	4	168			150

#Made to order. Minimum order quantities and different lead times may apply.
Self-adhesive option available upon request. Minimum order quantities and different lead times may apply.

Sheets

1.0m width, 1.5m length			
Item	Insulation thickness	Carton content	Carton content
	[mm]	[pcs]	[sqm]
FRV-13MM#	13	15	22.5
FRV-19MM#	19	10	15
FRV-25MM#	25	8	12

#Made to order. Minimum order quantities and different lead times may apply.
Self-adhesive option available upon request. Minimum order quantities and different lead times may apply.

Sheets (rolls)

1.0m width			
Item	Insulation thickness	Length	Carton content
	[mm]	[m]	[sqm]
FRV-13MM/E#	13	8	8
FRV-19MM/E#	19	6	6
FRV-25MM/E#	25	4	4
FRV-32MM/E#	32	3	3
FRV-38MM/E#	38	3	3

#Made to order. Minimum order quantities and different lead times may apply.
Self-adhesive option available upon request. Minimum order quantities and different lead times may apply.

Accessories

Item	Carton content	Article description
FRVA-TAPE	12 rolls	ArmaFlex FRV insulation tape (3mm thickness x 50mm width x 9m length)
AS-AD5201G	4 x 3.78 litre cans	ArmaFlex 520 adhesive (1 gallon)
GLUEM-BRUSH17MM	5 x 4	Gluemaster (17mm diameter) Comes with extra brush points
GLUEMASTER B	12	Gluemaster adhesive pump

//Cover Photo (Top)
Melbourne Grammar School - Bromby Science and Technology Centre
Containing many workshop studios and classrooms to educate the scientists of the future, the Bromby Science and Technology Centre is a five-storey building covering approximately 4,800m² of floor space. Safety is a key concern in this building and ArmaFlex FRV was installed to provide enhanced fire safety as well as condensation control to drive energy efficiency.

//Cover Photo (Bottom)
Rydges Esplanade Resort Cairns, Australia

All data and technical information are based on results achieved under the specific conditions defined according to the testing standards referenced. It is the customer's responsibility to verify if the product is suitable for the intended application. The responsibility for professional and correct installation and compliance with relevant building regulations lies with the customer. Armacell takes every precaution to ensure the accuracy of the data provided in this document and all statements, technical information and recommendations contained within are believed to be correct at the time of publication. By ordering/receiving product you accept the **Armacell General Terms and Conditions of Sale** applicable in the region. Please request a copy if you have not received these.

For distribution in Australia and New Zealand.

00138 | ArmaFlex FRV | ArmaFlex | TDS | 112019 | ANZ | EN

ABOUT ARMACELL

As the inventors of flexible foam for equipment insulation and a leading provider of engineered foams, Armacell develops innovative and safe thermal, acoustic 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 3,100 employees and 24 production plants in 16 countries, the company operates two main businesses, Advanced Insulation and Engineered Foams. Armacell focuses on insulation materials for technical equipment, high-performance foams for high-tech and lightweight applications and next generation aerogel blanket technology.

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