

AUTOMOTIVE



Ensolite® IV1

- UL 94 V-0, V-1, HF-1 and HBF listed for flame
- UL 50E (periodic and continuous compression) listed for gaskets and seals (recent upgrade)
- ASTM D 1056-07 2A1 / 2C1 grade product
- ASTM D 6576-07 Type II, Grades A & B, Condition Soft material
- PVC / NBR / CR closed cell rubber material manufactured in continuous rolls

Ensolite®

General Information

Armacell Ensolite® IV1: Armacell LLC (Conover, NC Plant) manufactures a black, continuous, (rolls / sheets) closed cell, 3.0 - 5.5 lb./ft³ (48 - 88 kg/m³) density, PVC/NBR/CR rubber product IV1, that meets all the physical property requirements of ASTM D 1056-07 2A1 / 2C1 and SAE J-18 APR2002 2A1 / 2C1. IV1 has good resistance to oil and fuel. IV1 is manufactured with non-staining oils and anti-oxidants. IV1 meets the requirements of FMVSS-302 at most thicknesses and is listed to UL 94 HF-1 at 1.1 mm (0.043") and UL 94 V-0 at 1/2" and higher (UL File# QMFZ2.E55798). IV1 meets the flame resistance requirements of CAL 117 (tested at 0.500") and FAR 25.853 a(2003) 12 second vertical burn at 1/8" & 1/4". IV1 is listed with UL to UL 50E (periodic and continuous compression) (UL File# JMST2.MH10189). IV1 is listed on the approved source list for Chrysler MSAY 516 Type 1. Standard roll widths: 54" or 60".

Automotive and Industrial Specifications

The following is a list of automotive and industrial specifications that Armacell Ensolite® IV1 has been tested to or can meet. Additional specifications are listed that have a few exceptions. Feel free to suggest other automotive, military or industrial specifications, and a full review will be made.

Source	Specification	IV1	Comments
ASTM	ASTM D1056-07	2A1 / 2C1	Additional (optional) suffixes can be added
ASTM	ASTM G21-96 (2002)	Pass, Rating 0	Fungus resistance test method
ASTM	ASTM D 1171	Pass	Ozone resistance test method
ASTM	ASTM D 6576-07	Type II, Grades A & B, Condition Soft	Formerly MILR6130-C
CAL	CAL 117	Pass	Flame resistance
Caterpillar	1E0720	1E0720D Grade 1	No exceptions
Chrysler	Chrysler MSZ-75 J18	2A1/2C1	Additional (optional) suffixes can be added

Automotive and Industrial Specifications (continued)

Chrysler	Chrysler MS JP9-4	Meets at most thicknesses	Flame resistance (horizontal burn rate)
Chrysler	Chrysler MSAY 516	Type 1	Approved source list
Federal	FMVSS-302	Meets at most thicknesses	Flame resistance (horizontal burn rate). See note 1
Federal	FAR 25.853	Pass at 1/8" and 1/4"	12 Second Vertical Burn Test. (Test report available upon request)
FORD	FORD WSK M2D 419-A	Type 2	See note 2
GM	GM 6086-M	Type II	CD tested at 50% deflection. See note 3
GM	GM 6090-M	Type II	CD tested at 50% deflection. See note 3
GM	GMN11106	Type II	CD tested at 50% deflection. See note 3
GM	GME 6090-M	(B4A) Meets at most thicknesses	Flame resistance tested per GM 9070-P (horizontal burn rate)
GM	GMW15473	Class I Type IV	CD tested at 50% deflection. See note 3
Gulfstream	GAP105K Rev C	Part Numbers GAP105K14-18	Approved source list
ISO	ISO 6916	2A1 / 2C1	Exception to compression set
Military	ASTM D 6576-07	Type II, Grades A & B, Condition Soft	Formerly MILR6130-C
SAE	SAE J18 APR2002	2A1 / 2C1	Additional (optional) suffixes can be added
SAE	SAE J369	Meets at most thicknesses	Flame resistance (horizontal burn rate)
SAE	SAE J 1351	Pass, rating 2	Odor specification
Toyota	TSM 1501G	2A1 / 2C1	Exception to compression set
Toyota	TSM 0500G	Meets at most thicknesses	Flame resistance (horizontal burn rate)
UL	UL94 V-0	V-0 UL Listed at 11.7 mm and higher	Flame resistance specification. (UL file# QMFZ2.E55798)
UL	UL94 V-1	V-1 UL Listed at 11.7 mm and higher	Flame resistance specification. (UL file# QMFZ2.E55798)
UL	UL94 HF-1	HF-1 UL Listed at 1.3 mm	Flame resistance specification. (UL file# QMFZ2.E55798)
UL	UL94 HBF	HBF UL Listed at 1.3 mm	Flame resistance specification. (UL file# QMFZ2.E55798)
UL	UL 50E	Suitable as gasket material for UL 50 and UL 50E (continuous and periodic compression) enclosures	Request additional information about UL enclosure types. (UL file# JMST2.MH10189)

Note 1: A number of horizontal burn tests can also be listed (GM 6090, BMW, Volvo, etc.). Request additional information.

Note 2: For all FORD WSK M2D 419-A callouts, request full information for each product due to some exceptions with non tested staining requirements.

Note 3: For all GM 6086-M, GMN11106 & GMW15473 callouts, Armacell (Ensolite®) certifies to the "basic" requirements only. Request additional information for each product. Providing application (interior, exterior or under-hood) and part thickness is helpful.

Roll Size Information

Gauge (in)	Gauge (fraction of an inch)	Gauge (mm)	Tolerance (inches)	Tolerance (mm)	Roll Size W (in)	Roll Size L (ft)	Roll Size W (m)	Roll Size L (m)	Comments
0.375	3/8	9.53	0.328 - 0.422	8.33 - 10.72	33	180	0.84	54.86	S1S
0.375	3/8	9.53	0.328 - 0.422	8.33 - 10.72	45	180	1.15	54.86	S1S
0.75	3/4	19.05	0.670 - 0.830	17.02 - 21.09	72	90	1.83	27.43	S2S
1.00	1	25.40	1.000 - 1.200	25.40 - 30.48	54	75	1.27	22.86	S2S
1.25	1-1/4	31.75	1.250 - 1.450	31.75 - 36.83	54	50	1.27	15.24	S2S, NS
1.25	1-1/4	31.75	1.250 - 1.450	31.75 - 36.83	54	50	1.37	15.24	S2S, L
1.25	1-1/4	31.75	1.250 - 1.450	31.75 - 36.83	60	50	1.52	15.24	S2S
1.50	1-1/2	38.10	1.500 - 1.700	38.10 - 43.18	54	100	1.37	30.48	S2S

S1S = skin 1 side

S2S = skin 2 sides

NS = no splice

L = additional lengths available



IV1 Continuous Rolls/Sheets (Black)

Physical Properties	Unit	Test Method	Typical Results
Density	kg/m ³	ASTM D 1056	48 - 80
	lb/ft ³	ASTM D 1056	3.0 - 5.0
Hardness, Durometer Shore 00		ASTM D 2240	30 - 45
Compression Deflection (25%)	kPa	ASTM D 1056	13 - 34
	psi	ASTM D 1056	2.0 - 5.0
50% Compression Set (Room temp)	%	ASTM D 1056	≤ 40%
Tensile Strength	kPa	ASTM D 412 (Die A)	345 minimum
	psi	ASTM D 412 (Die A)	50 minimum
Tear Strength	kN/m	ASTM D 624 (Die C)	1.6
	lb/in	ASTM D 624 (Die C)	9
Elongation	%	ASTM D 412 (Die A)	100 minimum
Service Temperature (1)			
Low	°F (°C)	ASTM D 1056 (Cold crack)	-40°F (-40°C)
High Continuous	°F (°C)	ASTM D 746	---
High Intermittent (2)	°F (°C)	ASTM D 746	200 °F (93.3°C)
Water Absorption			
Maximum Weight Change	%	ASTM D 1056	< 10%
Fluid Immersion (7 days at 23°C [73.4°F])			
ASTM Ref. Fuel B, Weight Change (%)	%	ASTM D 1056	< 250%
Accelerated Aging (7 days at 70°C [158°F])			
Flexibility (180° bend without cracking)		ASTM D 1056	Pass
Appearance change		ASTM D 1056	None
Change in Compression Deflection	%	ASTM D 1056	± 30%
Combustion Characteristics (3)		Thicknesses	Comments
FMVSS-302			Pass at most thicknesses
FAR 25.853		1/8" (3.18 mm) & 1/4" (6.35 mm)	Pass
UL94			
V-0 / V-1		0.461" (11.7 mm) & higher	Listed, UL file# QMFZ2.E55798
HF-1 / HBF		0.051" (1.3 mm) & higher	Listed, UL file# QMFZ2.E55798

ASTM D 1056 designation: 2A1 / 2C1
 SAE J 18 APR2002 designation: 2A1 / 2C1
 ASTM D 6576: Type II, Grades A & B, Condition Soft
 Additionally UL Listed to UL 50E (UL file# JMST2.MH10189)
 IV1 is on the approved source list for Chrysler MSAY 516 (Type 1)
 Standard Roll Width: 54" (1.37 m)
 Maximum Gauge: 1.50" (38.10 mm)

(1) This recommendation is based on polymer type only. For specific application requirements please contact technical service.

(2) This temperature is the maximum allowable for intermittent exposure only. For continuous use temperature please contact technical service.

(3) Flammability – This item and any corresponding data refer to typical performance in the specific test indicated and should not be construed to imply this material's behavior in other fire conditions.

NBR – Acrylonitrile Butadiene Rubber

PVC – Polyvinyl Chloride

CR – Chloroprene (Neoprene)

UL File Number for Armacell Ensolite® IV1

UL File Number: QMFZ2.E55798

Plastics – Component [UL94]

									H	D	
		Min.		H	H	R T I			V	4	C
		Thk	Flame	W	A	Elec	Mech		T	9	T
Material Dsg	Color	mm	Class	I	I		Imp	Str	R	5	I

Nitrile Rubber/Polyvinylchloride/Neoprene(NBR/PVC/CR), closed-cell foam, “Ensolite”, furnished as profiles, tubes or sheets.

MLC (a)	BK	2.9 - 6.6	HF-1	-	-	50	-	50	-	-	-
		6.6	V-0, 5VA	-	-	50	-	50			

(a) - Density range 0.046 - 0.056 g/cc w/o skin and 0.057 - 0.061 g/cc w/ skin

File Number: JMST2.MH10189

UL Spec	UL Spec	UL Spec
IV1, IV2, IVC	Closed cellular PVC/NBR/CR gasket material	Types “IV1”, “IV2”, “IVC”. Suitable as a gasket material for UL 50 enclosure types 2, 3, 3R, 3S, 4, 4X, 5, 6, 6P, 12, 12K and 13. [UL50E (Continuous and Periodic Compression)]
UL Spec	Test Method	Requirements
UL 50E	Tensile strength and elongation after heat aging 168 h (7 d) at 158°F (70°C)	75% of original for tensile strength 60% of original for elongation
UL 50E	Oil immersion / oil aging (IRM # 903), % volume change after 70 h @ room temperature	Shall not swell more than 25% or shrink more than 1% of original volume
UL 157	Tensile strength and elongation after heat aging 70 h @ 212°F (100°C)	60% of original (For both tensile and elongation)

UL Yellow Card Listing Verification Online

To obtain verification online:

1. www.ul.com
2. Click on "Certifications"
3. Click on "Company Name" in the general search area
4. Type in "Armacell" & click "Search"
5. 8 (Eight) Armacell file numbers come up (2 belong to Armacell Germany)
 - For Armacell *Ensolute*[®] & *Monarch*[®] products (Flame / UL94)
Click on QMFZ2.E55798
 - For Armacell *Ensolute*[®] products listed to JMST2 (Gaskets & Seals)
Click on JMST2.MH30018 and JMST2.MH10189
 - For Armacell *Monarch*[®] products listed to JMLU2 (Gaskets & Seals)
Click on JMLU2.MH25062

Vertical Flame / 12 Second Burn per FAR 25.853

Appendix F — Part I Test Criteria and Procedures for Showing Compliance with Sec. 25.853 or Sec. 25.855

Armacell Ensolute [®] Product #	Min. Thickness	Pass / Fail	Independent Test Lab Report	Test Report ID #	Polymer	ASTM D 1056 Grade	Density lb./ft ³	25% CD (psi)
IV1	1/4"	Pass	2/18/10	0146	PVC/NBR/CR	2C1	3 - 5.5	2 - 5
IV1	1/8"	Pass	2/18/10	0145	PVC/NBR/CR	2C1	3 - 5.5	2 - 5

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