

AUTOMOTIVE



## Ensolite® IR41

- UL 94 HF-1 listed for flame
- UL 50E (periodic and continuous compression) listed for gaskets and seals (recent upgrade)
- Manufactured in a variety of thicknesses
- Widely used skin 2 sides closed cell material
- ASTM D 1056-07 2A1 / 2C1 / 2B1 grade product

### General Information

**Armacell Ensolite® IR41:** Armacell LLC (Conover, NC Plant) manufactures a black, continuous, (rolls / sheets) closed cell, 4.0 - 7.0 lb./ft<sup>3</sup> (64 - 112 kg/m<sup>3</sup>) density, PVC/NBR/CR rubber product IR41, that meets all the physical property requirements of ASTM D 1056-07 2A1, 2C1 & 2B1 and SAE J-18 APR2002 2A1, 2C1 & 2B1. IR41 has excellent resistance to oil and fuel. IR41 meets the requirements of FMVSS-302 at most thicknesses and is listed to UL 94 HF-1 at 3.0 - 3.3 mm (0.118" - 0.130") (UL file # QMFZ2.E55798). IR41 is listed with UL to UL 50E (periodic and continuous compression) (UL file # JMST2.HM30018). Standard roll width(s): 48", 54" and 60".

### Automotive and Industrial Specifications

The following is a list of automotive and industrial specifications that Armacell Ensolite® IR41 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	Armacell Ensolite® IR41	Comments
ASTM	ASTM D 1056-07	2A1 / 2C1 / 2B1	Additional (optional) suffixes can be added
ASTM	ASTM G 21-09	Pass, Rating 0	Fungus resistance test method
ASTM	ASTM E 84	Meets Class A; Rating 10/250	Twenty-five foot tunnel furnace test method
ASTM	ASTM D 6576-07	Type II, Grades A & B, Condition Soft	Formerly MILR6130-C
ASTM	ASTM E 662	Test report available	Smoke density
Chrysler	Chrysler MSZ-75 J18	2A1 / 2C1 / 2B1	Additional (optional) suffixes can be added
Chrysler	Chrysler MS JP9-4	Meets at thicknesses of 0.125" (1/8") (3.1mm) and higher	Flame resistance (horizontal burn rate). Request additional information about thinner thicknesses
Chrysler	Chrysler MSAY 516	Type 1	Exception to 25% compression deflection
Federal	FMVSS-302	Meets at thicknesses of 0.125" (1/8") (3.1mm) and higher	Flame resistance (horizontal burn rate). Request additional information about thinner thicknesses. See note 3
Federal	FAR 25.853	Pass at 1/8" and 1/4"	12 second vertical burn test. (Test report available upon request)
Federal	FAR 25.856(a)	Pass at 3/16"	Test report available upon request
FORD	FORD WSK M2D 419-A	Type 2	See note 2

## Automotive and Industrial Specifications (continued)

Source	Specification	Armacell Ensolite® IR41	Comments
GM	GM 6086-M	Type II	CD tested at 50% deflection. See note 1
GM	GM 6090-M	(B4A) Meets at most thicknesses	Flame resistance tested per GM 9070-P (horizontal burn rate)
GM	GMN11106	Type II	CD tested at 50% deflection. See note 1
GM	GMW15473	Class I Type IV	CD tested at 50% deflection. See note 1
ISO	ISO 6916	2A1 / 2B1 / 2C1	No exceptions
Military	ASTM D 6576-07	Type II, Grades A & B, Condition Soft	Formerly MILR6130-C
Military	MIL-P-15280J	Pass	No exceptions
SAE	SAE J18 APR2002	2A1 / 2C1 / 2B1	Additional (optional) suffixes can be added
SAE	SAE J369	Meets at thicknesses of 0.125" (1/8") (3.1mm) and higher	Flame resistance (horizontal burn rate). Request additional information about thinner thicknesses
SAE	SAE J 1351	Pass, rating 2	Odor specification
Toyota	TSM 1501G	2A1 / 2B1 / 2C1	No exceptions
Toyota	TSM 0500G	Meets at thicknesses of 0.125" (1/8") (3.1mm) and higher	Flame resistance (horizontal burn rate). Request additional information about thinner thicknesses
UL	UL 94 HF-1	HF-1 listed at 3.0mm-3.3mm (0.118" - 0.130")	Flame Resistance specification. (UL file # QMFZ2.E55798)
UL	UL 94 HBF	HBF listed at 3.0mm-3.3mm (0.118" - 0.130")	Flame Resistance specification. (UL file # QMFZ2.E55798)
UL	UL 50E	Suitable as gasket material for UL 50E (periodic and continuous compression) enclosures	Request additional information about UL enclosure types. (UL file # JMST2.HM30018)

Note 1: 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.

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

## 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
0.125	1/8	3.18	0.105 - 0.145	2.67 - 3.68	54	250	1.37	76.20	S2S, NS
0.125	1/8	3.18	0.105 - 0.145	2.67 - 3.68	60	250	1.52	76.20	S2S
0.188	3/16	4.76	0.163 - 0.213	4.14 - 5.41	54	165	1.37	50.29	S2S, NS
0.188	3/16	4.76	0.169 - 0.207	4.30 - 5.30	60	200	1.52	60.96	S2S, NS
0.236		6.00	0.196 - 0.276	5.00 - 7.00	39.37	118.11	1	36	S2S
0.250	1/4	6.35	0.220 - 0.280	5.59 - 7.11	54	125	1.37	38.10	S2S, NS
0.250	1/4	6.35	0.220 - 0.280	5.59 - 7.11	60	150	1.52	45.72	S2S, NS
0.313	5/16	7.94	0.227 - 0.347	5.77 - 8.81	60	100	1.52	30.48	S2S, NS
0.374		9.50	0.295 - 0.375	7.50 - 9.50	39.37	118.11	1	36	S2S
0.375	3/8	9.53	0.335 - 0.415	8.51 - 10.54	54	85	1.37	25.91	S2S, NS
0.375	3/8	9.53	0.335 - 0.415	8.51 - 10.54	60	150	1.52	45.72	S2S, NS, L
0.500	1/2	12.70	0.450 - 0.550	11.43 - 13.97	48	60	1.22	18.29	S2S, NS
0.500	1/2	12.70	0.450 - 0.550	11.43 - 13.97	54	60	1.37	18.29	S2S, NS
0.500	1/2	12.70	0.450 - 0.550	11.43 - 13.97	60	100	1.52	30.48	S2S, NS
0.750	3/4	19.05	0.675 - 0.825	17.15 - 20.96	54	40	1.37	12.19	S2S, NS
1.000	1	25.40	0.900 - 1.100	22.86 - 27.94	54	30	1.37	9.14	S2S, NS

S2S = skin 2 sides

NS = no splice

L = additional lengths available



## IR41 Continuous Rolls/Sheets (Black)

Physical Properties	Unit	Test Method	Typical Results
Density (3/8" or 9.53 mm & higher)	kg/m <sup>3</sup>	ASTM D 1056	64 - 112
	lb/ft <sup>3</sup>	ASTM D 1056	4.0 - 7.0
Density (1/4" or 6.35 mm & lower)	kg/m <sup>3</sup>	ASTM D 1056	64 - 160
	lb/ft <sup>3</sup>	ASTM D 1056	4.0 - 10.0
Hardness, Durometer Shore 00		ASTM D 2240	20 - 35
Compression Deflection (25%) (3/8" or 9.53 mm & higher)	kPa	ASTM D 1056	13.8 - 80.1
	psi	ASTM D 1056	2.0 - 5.0
Compression Deflection (25%) (1/4" or 6.35 mm & lower)	kPa	ASTM D 1056	13.8 - 48.3
	psi	ASTM D 1056	2.0 - 7.0
50% Compression Set (Room temp)	%	ASTM D 1056	≤ 25%
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)	2.1 typical
	lb/in	ASTM D 624 (Die C)	12 typical
Elongation	%	ASTM D 412 (Die A)	100 minimum
Service Temperature (1)			
Low	°F (°C)	ASTM D 746	-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	< 100%
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%
<b>Combustion Characteristics (3)</b>		<b>Thicknesses</b>	<b>Comments</b>
FMVSS-302		0.125" (3.18mm) & higher	Pass
FAR 25.853		1/8" (3.18 mm) & 1/4" (6.35 mm)	Pass
FAR 25.856(a)		3/16" (4.76 mm)	Pass
UL 94			
HF-1		0.118" - 0.130" (3.0 mm - 3.1 mm)	Listed, UL file # QMFZ2.E55798

ASTM D 1056 designation: 2A1/2C1/2B1  
 SAE J 18 APR2002 designation: 2A1/2C1/2B1  
 Additionally UL Listed to UL 50E (UL file # JMST2.HM30018)  
 Standard Roll Widths: 48", 54" and 60" (1.22 m, 1.37 m and 1.52 m)  
 Maximum Gauge: 1.0" (25.4 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.  
 (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.  
 For continuous use temperature please contact technical service.  
 NBR – Acrylonitrile Butadiene Rubber  
 PVC – Polyvinyl Chloride  
 CR – Chloroprene (Neoprene)

## UL File Number for Armacell Ensolite® IR41

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 with skin, “Ensolite”, furnished as tubes or sheets.

IR 41(bc)	BK	3.0 - 3.3	HF-1	-	-	50	50	50	-	-	-
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(bc) - Density range 0.149 - 0.164 g/cc

## UL File Number: JMST2.MH30018

UL File Number for JMST2.MH30018

Listed to UL 50E (Gasket materials - component)

Armacell Ensolite® Product Number	Description	Enclosure Types
IR41 & IR42	PVC / Nitrile/ CR	Closed cellular foam PVC/Nitrile/CR. Compound Ensolite IR41 and Ensolite IR42. Suitable as a gasket material for UL 50 and UL 50E (continuous and periodic compression) enclosure types 2, 3, 3R, 3S, 4, 4X, 5, 6 and 6P enclosures.

UL Spec	Test Method	Requirements
UL 50E	Tensile strength and elongation after heat aging 168 h (7 d) @ 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](http://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 Ensolite® & Monarch® products [Flame / UL94].  
**Click on QMFZ2.E55798**
  - For Armacell Monarch® products listed to JMLU2 [Gaskets & Seals].  
**Click on JMLU2.MH25062**
  - For Armacell Ensolite® products listed to JMST2 [Gasket Materials].  
**Click on JMST2.MH10189 or JMST2.MH30018**

### Armacell Ensolite® Products / FAR 25.853 (12 Second Burn)

Vertical Flame / 12 Second Burn per FAR 25.853

Armacell Ensolite® Product #	Min. Thickness	Pass / Fail	Independent Test Lab Report	Test Report ID #	Polymer	ASTM D 1056 Grade	Density lb./ft <sup>3</sup>	25% CD (psi)
IR41	1/4"	Pass	2/18/10	0137	PVC/NBR/CR	2B1	4 - 7	2 - 5
IR41	1/8"	Pass	2/18/10	0136	PVC/NBR/CR	2B1	4 - 7	2 - 5

#### ARMACELL LLC

TEL: 1 800 866-5638

FAX: 919 304-3847

info.us@armacell.com

www.armacell.us

7600 Oakwood Street Extension • Mebane, NC 27302



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