

**ACRYLITE®  
FOR  
AVIATION**

**DISCOVER  
INFINITE  
SPACE**



**ACRYLITE®** 

Aircraft glazing  
was one  
of the first  
applications  
for cast  
acrylic sheet.

**REACH FOR  
THE SKY  
WITH EVONIK!**

**EVONIK CYRO LLC, AN EVONIK INDUSTRIES AG  
GROUP COMPANY,**

is a leading manufacturer of acrylic sheet, acrylic molding compounds, bulk and performance monomers. Having spearheaded the development and expansion of continuously manufactured and specialty cell cast sheet products we have earned a reputation as a leader in innovative technology in the plastics industry. Our strengths are creativity, specialization, continuous self-renewal, and reliability.

Aircraft glazing was one of the first applications for cast acrylic sheet. Acrylic is lightweight, resistant to thermal shock, has excellent optical clarity and mechanical properties. In the 1960's, the German Röhm GmbH, now Evonik, introduced its aircraft grade acrylic sheet. Evonik Cyro has successfully marketed these products for both military and commercial aircraft applications for many years.

## ACRYLITE® LIGHTWEIGHT MATERIALS FOR A CLEAR VIEW

### PROPERTIES AND APPLICATIONS

Cast aviation grade sheets are used for glazing, edge-lit panels, wing tip lenses, and other transparent applications in the aviation industry. ACRYLITE® aviation grade sheet possesses the following properties:

- Excellent light transmission and brilliance
- Outstanding weather resistance
- 100% recycling ability
- Easy to fabricate
- High surface hardness
- Light weight – half the weight of glass
- 11 times more break resistant than glass

## SALES RANGE SPECIALIZED MATERIALS THAT ARE RELIABLE AND DURABLE

### ACRYLITE® GMU

ACRYLITE® GMU sheet is a cell cast acrylic sheet designed for general aviation and helicopter window applications and is superior to standard cell cast acrylics in both optical quality and thickness tolerance. The material is used for applications that do not specify material certified to any particular aviation standard. It is manufactured and certified to meet the requirements of AMS-LP-391, Type I, Grade C.

### APPLICATION

ACRYLITE® GMU sheet is used for aviation applications where military specifications are not required at an economical cost.

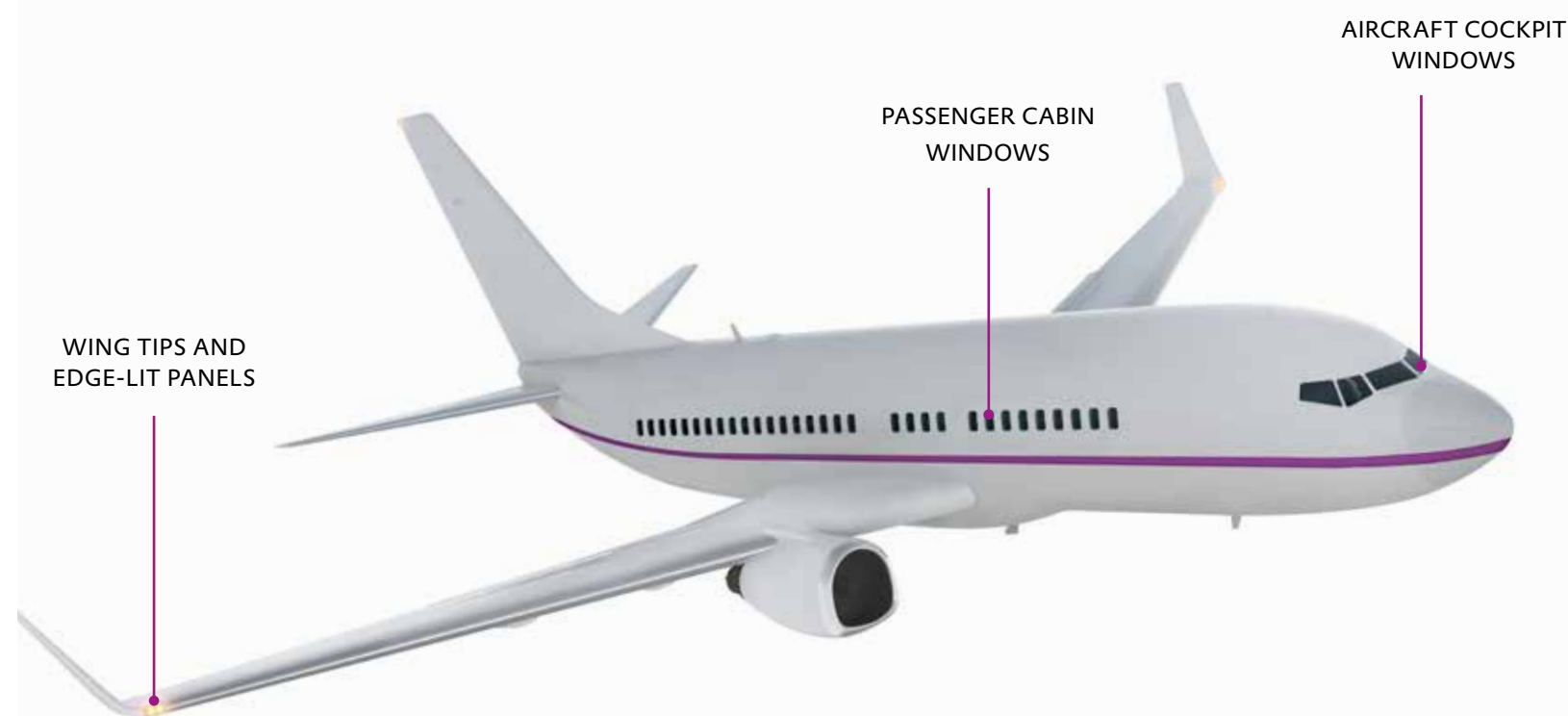
### FABRICATION

Fabrication techniques used on standard cell cast acrylic sheet will be appropriate for ACRYLITE® GMU sheet. When drape forming this sheet, excellent results can be achieved if the sheet is heated evenly between 300 °F and 320 °F. For pressure forming or vacuum forming operations temperature of 340 °F to 380 °F are recommended.

### PROPERTIES

- UV transmittance < 1 % (UV range of 290 nm - 330 nm)
- ACRYLITE® GMU sheet is tested to high optical standards for glazing that does not specify require a specification. We do certify it to AMS-LP-391, Item A, Type I, Grade C

### Applications of ACRYLITE® in Aviation Transparency



### GRADES

The aviation acrylic sheet products include: ACRYLITE® GS 249 aviation grade, which is a cross-linked acrylic sheet. ACRYLITE® GS 249 meets prEN 4365. Furthermore it is qualified by the US Navy to meet Military Specification MIL-PRF-8184 as a Type I, Class 2 material. As such, it is also suitable for Type II and Class 1 applications. ACRYLITE® GMS aviation acrylic sheet meets prEN 4364 and is qualified by the US Navy to meet the requirements of Military Specification MIL-PRF-5425. Furthermore, ACRYLITE® Stretched Acrylic is qualified to prEN 4366 as well as MIL-PRF-25690. Together with our products we offer our customers competent application-oriented advice, custom-tailored solutions and compliance with all relevant standards and specifications.



## ACRYLITE® GMS

ACRYLITE® GMS acrylic sheet meets and is qualified to prEN 4364 and MIL-PRF-5425 for use in the aviation industry in applications where exacting standards are established for aircraft applications. It has premium optical quality, dimensional stability, and extraordinary flatness and tolerance control.

### APPLICATION

Current applications include instrument panels, wingtip lenses, dust covers, helicopter bubbles, and aircraft canopies. ACRYLITE® GMS sheet is used in aerospace transparent enclosures in monolithic or laminated form.

### FABRICATION

Fabrication techniques used on standard cell cast acrylic sheet will be appropriate for ACRYLITE® GMS sheet. When drape forming this sheet, excellent results can be achieved if the sheet is heated evenly between 300 °F and 320 °F. For pressure forming or vacuum forming operations temperature of 340 °F to 380 °F are recommended.

### PROPERTIES

- UV transmittance < 1 % (UV range of 290 nm - 330 nm)
- Certified to aviation standard prEN 4364 and MIL-PRF-5425 and listed on the US Navy's QPL
- Is a cell-cast acrylic with excellent weather resistance specially developed to meet the high optical requirements of the aviation industry



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## ACRYLITE® GS 249

ACRYLITE® GS 249 acrylic sheet meets and is qualified to prEN 4365 and MIL-PRF-8184 (Type I, Class 2). ACRYLITE® GS 249 is a cross-linked cast acrylic sheet with increased resistance to crazing and solvent attack, as well as improved dimensional stability after heating.

### APPLICATION

ACRYLITE® GS 249 sheet is used in a wide variety of commercial, military and rotary wing transparencies in monolithic or laminated form.

### FABRICATION

Most fabrication techniques used with other acrylic sheet materials can also be followed when fabricating ACRYLITE® GS 249 sheet. Forming techniques may vary slightly.

### PROPERTIES

- UV transmittance < 1 % (UV range of 290 nm - 330 nm)
- Certified to aviation prEN 4365 and Mil-PRF-8184
- Cross-linked acrylic sheet developed to withstand craze and weathering
- Offers higher resistance to media that cause stress cracking and a higher heat deflection temperature
- Excellent suited for stretching, which makes it possible to improve its properties even further over the unstretched state
- As MIL-PRF-8184 Type I, Class 2 material, it is also suitable for use in Type II and / or Class 1 applications

## ACRYLITE® STRETCHED

ACRYLITE® Stretched acrylic sheet meets and is certified to prEN 4366 and MIL-PRF-25690. ACRYLITE® Stretched is produced from Evonik's ACRYLITE® GS 249 cross-linked material. The stretched acrylic increases the resistance to crazing and solvent attack, as well as improves mechanical behavior.

### APPLICATION

ACRYLITE® Stretched is used in a wide variety of commercial, military and rotary wing applications in monolithic or laminated form.

### FABRICATION

Most fabrication techniques used with conventional acrylic sheet materials can also be followed when fabricating ACRYLITE® Stretched sheet. Forming of stretched acrylic sheet requires unique and more sophisticated processing parameters. Forming temperatures should not exceed 230 °F and forming times are much longer than with unstretched acrylic.

### PROPERTIES

- UV transmittance < 1 % (UV range of 290 nm - 330 nm)
- Certified to aviation prEN 4366 and MIL-PRF-25690
- Offers higher resistance to environmental conditions
- Is produced from ACRYLITE® GS 249, prEN 4365 and Mil-PRF-8184
- Superior optical quality as well as thickness tolerances due to grinding and polishing of the material
- MIL-PRF-25690 Class 2 material, it is also suitable for Class 1 applications



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# ADDITIONAL FEATURES

## Colors

ACRYLITE® aircraft-grade acrylic sheet is available in a variety of transparent, translucent, and opaque colors. Please contact our sales department for further information.

Evonik Cast	Evonik Cast UV IR	Industry Standard	Color	Light Transmission* in %
2422			Green	74
2585			Grey	23
2830			Grey	52
2928			Blue	76
2929	7YS15	2515	Grey	74
2930			Grey	48
5Y23		5527	Blue	46
5Y48		2069	Blue	58
5Y50		2454	Blue	78
655			Blue	76
6Y24		2019	Green	83
6Y32	6YS11	2111	Green	76
6Y86		2082	Green	65
7X03			Grey	24
7X05			Grey	51
7Y00			Grey	27
7Y08			Grey	62
7Y12			Grey	67
7Y17	7YS17	2074	Grey	14
7Y18	7YS18	2094	Grey	46
7Y25	7YS25	2256	Grey	67
7Y35		2539	Grey	58
7Y38		2537	Grey	33
7Y43	7YS64	2064	Grey	27
7Y52		2412	Grey	26
7Y70			Grey	74

\* The light transmission is independent of the nominal sheet thickness. Every color can be matched as UV IR version.

## UV IR ABSORBING FEATURE

ACRYLITE® aviation products are now available with UV and IR radiation absorbing features. The special color technology provides design flexibility to aircraft cockpits and cabin interiors by filtering out unwanted ultraviolet (UV) and infrared (IR) radiation. This feature works in both ends of the solar spectrum outside the visible range. The reduction of UV and IR radiation exposure, helps minimize the weathering of interior fabrics and components, and prevents heat build-up in the aircraft enclosure. The UV and IR absorbing technology is available in all standard and custom colors. Additionally, these colors are available across our range of aviation glazing products: **ACRYLITE® GMU** (AMS-LP-391), **ACRYLITE® GMS** (prEN 4364 / MIL-PRF-5425) and **ACRYLITE® GS 249** (prEN 4365 / MIL-PRF-8184) and in **ACRYLITE® Stretched** (prEN 4366 / MIL-PRF-25690).

## FABRICATION

Our products with UV and IR radiation absorbing features form, cut and process the same as our **ACRYLITE® GMU, GMS** and **GS 249** products. In addition, Evonik's sheet sizes (up to and including 80" x 120" as cast) allow for greater yields and larger formed parts.

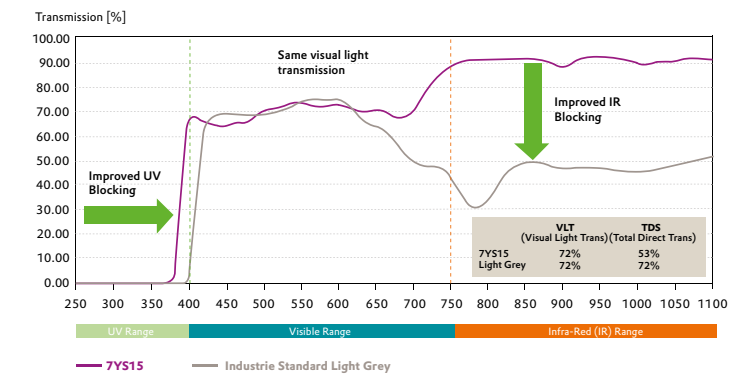
## PROPERTIES

The UV and IR radiation absorbing material has the same physical properties as the corresponding **ACRYLITE®** product into which the features are included. The UV filtering is improved and the IR radiation is blocked even though the color impression in the visible range is maintained. The UV IR absorbing feature improves UV blocking up to 99.9%.

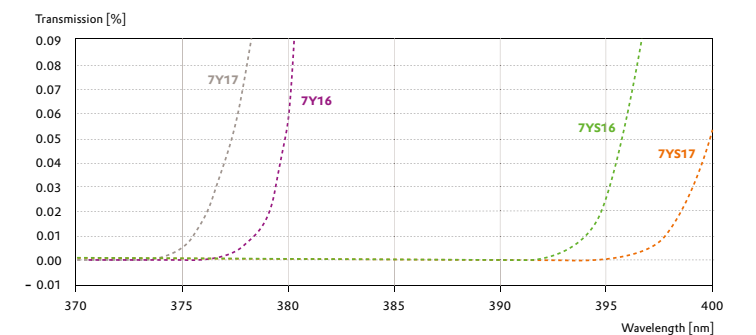


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ACRYLITE® Grey 7YS15 Solar vs Industry Standard Light Grey



Comparison UV Block Colors with and without UV IR Absorbing Feature





# TECHNICAL DATA

## Certification

Evonik Cast	AECMA	Germany	UK	France	US	Russia
ACRYLITE® GMU					AMS-LP-391, ASTM-D-4802	
ACRYLITE® GMS	prEN 4364	WL 5.1412	DTD 5592 A	AIR9106/A Type I	MIL-PRF-5425	GOST 10667-90
ACRYLITE® GS 249	prEN 4365	WL 5.1415	DTD 5592 A	AIR9106/A Type II	MIL-PRF-8184 Type I, Class 2	GOST 10667-90
ACRYLITE® Stretched	prEN 4366	WL 5.1416		AIR9106/ Type III	MIL-PRF-25690 Class 2*	

\*(automatically qualified for Class 1)



### MIL Tolerance and Dimensions

ACRYLITE® aircraft grade acrylic sheets, blocks and billets are supplied within the tolerance limits of the applicable specification. Custom thicknesses and dimensions are available. Please contact our sales department for further information. Our process allows tight tolerances across a larger sheet size than is shown in the MIL specifications.

Standard Thickness		Tolerance A (Up to 36" x 60" & 40" x 50")		Tolerance B (Up to 53" x 80" & 60" x 72")		Tolerance C	
inch	mm	Specification	We offer in sizes up to	Specification	We offer in sizes up to	Specification	We offer in sizes up to
.060"	1.524	±.012"	64" x 76"	±.020"	64" x 100"		
.080"	2.032	±.012"	70" x 88"	±.020"	72" x 112"		
.100"	2.540	±.012"	70" x 96"	±.020"	72" x 112"		
.125"	3.175	±.015"	64" x 85"	±.020"	72" x 85"	±.030"	
.150"	3.810	±.017"	72" x 112"	±.020"		±.030"	
.187"	4.750	±.020"	80" x 112"	±.023"		±.030"	
.220"	5.588	±.023"		±.025"		±.030"	
.250"	6.350	±.025"		±.030"		±.035"	
.312"	7.925	±.030"		±.035"		±.040"	
.375"	9.525	±.035"		±.040"		±.045"	
.417"	10.592						
.500"	12.700	±.040"	80" x 120"	±.045"	80" x 120"	±.050"	80" x 120"
.625"	15.875	±.050"		±.050"		±.060"	
.750"	19.050	±.050"		±.050"		±.065"	
.875"	22.225	±.050"		±.050"		±.070"	
1.000"	25.400	±.050"		±.050"		±.075"	
1.250"	31.750	±.063"		±.063"		±.094"	
1.500"	38.100	±.075"		±.075"		±.112"	
1.750"	50.800	±.100"		±.100"		±.131"	
2.000"	57.150	±.113"		±.113"		±.168"	
2.500"	76.200	±.126"		±.126"		±.180"	
3.000"	76.200	±.146"		±.146"		±.204"	
3.500"	88.900	±.159"		±.159"		±.219"	

### Product Properties of Cast ACRYLITE® Sheet

Property	Test Method	Unit	Typical Value*		
			ACRYLITE® GMU	ACRYLITE® GMS	ACRYLITE® GS 249
<b>Specific Gravity</b>	ISO 1183; (ASTM D-792)	g/cm <sup>3</sup>	1.19	1.19	1.19
<b>Tensile Strength</b>	ISO 527-2/1B/5; (ASTM D-638)	MPa; (psi)	80; (10,000)	80; (11,000)	80; (11,650)
<b>Tensile Elongation</b>	ISO 527-2/1B/5; (ASTM D-638)	%	4.2	5.5	5
<b>Internal Strain</b>	MIL-P-8184F	%		< 1	< 1
<b>Refractive Index</b>	ISO 489; (ASTM D 542)			1.49	1.49
<b>Light Transmittance</b>					
• Initial	EN 2155-5; (ASTM D-1003)	%		91	91
• After accelerated weathering				89	89
<b>Haze</b>					
• Initial	EN 2155-5; (ASTM D-1003)	%		0.5	1.5
• After accelerated weathering	EN 2155-5; (ASTM D-1003)			1.0	2.2
<b>Ultraviolet Transmittance</b>	(λ= 290 – 330 nm)	%	<1	<1	<1
<b>Angular Deviation</b>	EN 2155-7; (ASTM D-637)	Minutes		< 4	<4
<b>Thermal Expansion</b>	EN 2155-12 ASTM D-696	1/K in./°F		7x10 <sup>5</sup> 3.9x10 <sup>5</sup>	7x10 <sup>5</sup> 3.9x10 <sup>5</sup>
<b>Heat Deflection Temperature</b>	ISO 75-2Ae; (ASTM D-648)	°C °F	105 222	105 222	113 236
<b>Vicat Softening Temperature</b>	ISO 305-B 50	°C		115	118
<b>Flammability</b>	EN 3844-2; (ASTM D-635)	mm/min in./min.		36 1.4	20 0.6
<b>Water Absorption</b>					
• Standard	MIL-P-8184	%			0.2
• Long term	MIL-P-8184				2.1
<b>Craze Resistance</b>					
Dry					
• Isopropyl alcohol	MIL-P-8184F	psi			2880
• Lacquer thinner	MIL-P-8184F	psi			2328
Wet					
• Isopropyl alcohol	MIL-P-8184F	psi			2486
• Lacquer thinner	MIL-P-8184F EN 2155-19	psi MPa			1925 16

\* some values may vary with thickness

**Product Properties of ACRYLITE® Stretched sheet**

Property	Test Method	Unit	ACRYLITE® Stretched
<b>Tensile Strength</b>	ISO 527-2/1B/5; (ASTM D-638)	MPa; (psi)	80; (11,600)
<b>Tensile Elongation</b>	ISO 527-2/1B/5; (ASTM D-638)	%	30
<b>Resistance to Crack Propagation</b>			
• At 23 °C	EN 2155-21	N/mm <sup>3/2</sup>	118
• At 73 °F	MIL-P-25690	(lbs./in <sup>3/2</sup> )	(3400)
• At -17,8 °C	EN 2155-21	N/mm <sup>3/2</sup>	56
• At 0 °F	MIL-P-25690	(lbs./in <sup>3/2</sup> )	(1600)
• After Weathering	MIL-P-25690	lbs./in <sup>3/2</sup>	3350
<b>Shear Strength</b>	MIL-P-25690	psi	4500
<b>Thermal Relaxation</b>			
At 110 °C (230 °F)	EN 2155-22; (MIL-P-25690)	%	5
At 145 °C (293 °F)	EN 2155-22; (MIL-P-25690)	%	42
<b>Crazing Resistance</b>			
Dry			
• Isopropyl alcohol	MIL-P-25690	psi	3700
• Lacquer thinner	MIL-P-25690	psi	3350
Wet			
• Isopropyl alcohol	MIL-P-25690	psi	3550
• Lacquer thinner	MIL-P-25690	psi	2850



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**FABRICATION**

ACRYLITE® aviation grade sheet offers excellent optical characteristics, industry leading thickness tolerances, light stability, and low internal stress levels for consistent performance. ACRYLITE® acrylic sheet can be easily cut, sawed, machined, thermoformed and cemented.

ACRYLITE® GS 249 prEN 4365 and Mil-P-8184 requires special two part solvents. Fabrication techniques used on standard cell cast acrylic sheet are appropriate for ACRYLITE® GMS and ACRYLITE® GMU sheet. When drape forming, excellent results can be achieved if the sheet is heated evenly

between 300 °F and 320 °F. For pressure forming or vacuum forming operation, temperatures of 340 °F to 380 °F are recommended. Most fabrication techniques used with conventional acrylic sheet can also be followed when fabricating ACRYLITE® GS 249 sheet. Slight technique modification is required.

**OVERAGES**

All sheets are supplied net trim (no overage). Untrimmed sheets are available. No guarantee is given as to the additional area obtained by ordering untrimmed sheet. For information on custom thicknesses and sizes please contact our sales department.

**EDGE PREPARATION**

Edge preparation billets are available upon request.

**COMPATIBILITY**

Like other plastic materials, ACRYLITE® sheet is subject to crazing, cracking or discoloration if brought into contact with incompatible materials. These materials may include cleaners, polishes, adhesives, sealants, gasketing or packaging materials, cutting emulsions, etc. Contact your ACRYLITE® sheet distributor for information on a specific product.



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