

Polycarbonate Physical Properties



**Suntuf® /
Dynaglas® /
Sunsky®**

Material: Corrugated Polycarbonate

Updated: 9/29/11 (MDW).

Notes: The table depicting the typical properties of SUNTUF / SUNSKY / DYNAGLAS sheets appears below.

Conditions, units and values in U.S. Customary units are presented in the table within parentheses. All the results depicted in this table were obtained by following the indicated ASTM method except where another method is indicated by the appearance of this symbol (b).

Property	Conditions (U.S. Customary)	ASTM Method	Units - SI (U.S. Customary)	Value (U.S. Customary)
Physical				
Density		D-1505	g/cm ³ (lb/ft ³)	1.2 (75)
Water Absorption	24 hr. @ 23°C	D-570	%	0.15
Mechanical				
Tensile strength at yield	10 mm/min (0.4 in./min)	D-638	MPa (psi)	62 (9,000)
Tensile strength at break	10 mm/min (0.4 in./min)	D-638	MPa (psi)	65 (9,500)
Elongation at yield	10 mm/min (0.4 in./min)	D-638	%	6
Elongation at break	10 mm/min (0.4 in./min)	D-638	%	110
Tensile Modulus of Elasticity	10 mm/min (0.4 in./min)	D-638	MPa (psi)	2,378 (345,000)
Flexural Modulus	1.3 mm/min (0.05 in./min)	D-790	MPa (psi)	2,378 (345,000)
Flexural Strength at Yield	1.3 mm/min (0.05 in./min)	D-790	MPa (psi)	93 (13,500)
Notch Impact Strength Izod	23°C (73°F)	D-256	J/m (ft-lbf/in.)	800 (15)
Notch Impact Strength Charpy	23°C (73°F)	D-256	J/m (ft-lbf/in)	800 (15)
Impact Falling Weight	3 mm (0.12 in.) Sheet	ISO-6603/1b	J (ft-lbf)	158 (117)
Rockwell Hardness		D-785	R scale / M scale	125 / 70
Thermal				
Long Term Service Temperature			°C (°F)	-75 to +100 (-175 to +212)
Short Term Service Temperature			°C (°F)	-75 to +120 (-175 to +250)
Heat Deflection Temperature	Load: 1.82 Mpa (264 psi)	D-648	°C (°F)	132 (270)
Vicat Softening Temperature	Load: 1 kg (2.2 lb)	D-1525	°C (°F)	150 (300)
Coefficient of Linear Thermal Expansion		D-696	10 ⁻⁵ /°C (10 ⁻⁵ /°F)	6.5 (3.6)
Thermal Conductivity		C-177	W/m ² K (Btu-in./hr-ft ² -°F)	0.21 (1.46)
Specific Heat Capacity		C-351	kJ/kg°K (Btu/lb°F)	1.26 (0.31)
Optical				
Haze	.8 mm (0.03 in.) Clear Sheet	D-1003	%	<1
Light Transmission	.8 mm (0.03 in.) Clear Sheet	D-1003	%	90
Refractive Index	Clear Sheet	D-542		1.59
Yellowness Index	.8 mm (0.03 in.) Clear Sheet	D-1925		<1
Electrical				
Dielectric Constant	50 Hz	D-150		3
	1 MHz	D-150		2.9
Dissipation Factor	50 Hz	D-150		0.9
	1 MHz	D-150		11
Dielectric Strength Short Time	500 V/s	D-149	kV/mm (V/mil)	>30 (>770)
Surface Resistance	Ketley	D-257	Ohm	5.1x10 ¹⁵
Volume Resistance	Ketley	D-257	Ohm-cm	1.3x10 ¹⁷

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Polycarbonate General Care



General Polycarbonate Cleaning Guidelines

- Never use abrasive or high alkaline cleaners on any Palram polycarbonate products
- Do not leave cleaners on Palram polycarbonate for extended periods of time. Rinse immediately with cold, clean water.
- Do not apply cleaners in direct sunlight.
- Never use sharp objects, squeegees or razors on polycarbonate.
- Do not clean with gasoline.
- Always practice safety first and never step directly on a polycarbonate panel.
- Always test cleaners in a small inconspicuous area prior to cleaning entire panel to insure against adverse results.
- Avoid allowing the pressure washer spray tip to come too close to the panel. Pressure washers often have enough pressure at the spray tip to penetrate or tear the panel.
- Avoid dry cleaning, as sand and dust particles clinging to the exterior of the panels may scratch the surface.
- Avoid cleaning the interior surface of DYNAGLAS and THERMAGLAS, as the effectiveness of the anti-condensate coating can potentially be diminished, depending on cleaning method or material used.

General Cleaning Instructions for all Products Listed at Left

All of the Palram polycarbonate products listed at left can be easily cleaned utilizing a soft sponge or cloth made from 100% cotton using lukewarm water and a mild dishwashing detergent. All surfaces should then be rinsed with cold water and dried with soft cotton cloth to reduce water spotting. In some instances this procedure may be inadequate and will require the use of additional cleaning agents. The agents listed below have all been approved for use at room temperature:

- | | | |
|----------------------------|-----------------|-----------------|
| • Methyl alcohol | • Ethyl alcohol | • Butyl alcohol |
| • Isopropyl alcohol | • Heptane | • Hexane |
| • Petroleum ether (BP 65°) | • VM&P Naphtha | |

As is the case with all thermoplastic materials, certain chemicals can cause structural as well as surface damage and precautions need to be taken to avoid any aggressive cleaning agents. Should you desire to use a cleaning agent not on the approved list, please contact a Palram representative to inquire about our in-house chemical compatibility testing capabilities.

Specific cleaning instructions for large roofing and wall applications

Palram polycarbonate products used for large commercial roofing and wall applications (SUNTUF, DYNAGLAS, SUNSKY, SUNTOP, SUNLITE, THERMAGLAS) can be cleaned in the same fashion as mentioned previously; sometimes, due to the sheets physical installation location, different cleaning apparatus need to be utilized. When polycarbonate products are installed in such applications, utilization of a pressure

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Polycarbonate Chemical Resistance



The mechanism of chemical attack on thermoplastic sheets differs significantly from the mechanism of corrosion of metals. Corrosion of metals results in a gradual loss of surface material as a result of electrolytic action by the relevant chemicals. In the cases where chemical attack on polycarbonate sheet occurs, all or a portion of a range of effects can be observed. Ethylene chloride, chloroform, tetrachloroethane, m-cresol, pyridine and other chemicals can cause partial dissolution of polycarbonate. Swelling agents include benzene, chlorobenzene, tetralin, acetone, ethyl acetate, acetonitrile and carbon tetrachloride. Additional effects include color change and/or whitening. These effects may not always lead to product failure, especially for non-loaded sheets. Nevertheless, the level of measured mechanical properties will be reduced. The most critical effect of chemical attack is stress cracking or crazing, which may range in size from being visible to the naked eye to being only observable under a microscope. Stress cracks will always result in sheet failure, which will develop from areas of greatest stress (screws, fixings, bends, etc.)

Polycarbonate sheets are generally not recommended for use with acetone, ketones, ethers, and aromatic and chlorinated hydrocarbons in addition to aqueous or alcoholic alkaline solutions, ammonia gas and its solutions and amines.

Polycarbonate is resistant to mineral acids, many organic acids, oxidizing and reducing agents, neutral and acid salt solutions, many greases, waxes and oils, saturated, aliphatic and cycloaliphatic hydrocarbons and alcohols, with the exception of methyl alcohol. The resistance of polycarbonate to water may be described as good up to approximately 60 °C. At higher temperatures, degradation occurs, the extent of which depends on time and temperature. Polycarbonate should therefore not be exposed for long periods of time to hot water. However, brief contact with hot water has no effect. For example, polycarbonate tableware can be washed over 1000 times in a dishwashing machine with no adverse effects being observed.

The table that appears in the following pages lists the resistance of polycarbonate sheets to a number of commonly encountered chemicals and other corrosive media at room temperature. (Information on chemical resistance at higher temperatures will be supplied upon request). Where the chemical resistance varies with concentration, the results of tests at different concentrations is presented. (Note that information on compatible adhesives and sealants can be found in a separate leaflet which will be supplied upon request) It serves as a basis for recommendation. PALRAM does not guarantee chemical resistance, unless specific tests are carried and separate documentation is supplied.

For chemicals and corrosive media not mentioned in the list, please contact your PALRAM representative. He will place you in contact with the PALRAM R&D & Technology Department.

The table on the following pages uses the following key:

R - Resistant

LR - Limited Resistance (gradual attack over time may occur)

N - Not Resistant (rapid attack or attack over short time period will occur)

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Polycarbonate Chemical Resistance



Chemical	Concentration %*	Resistance	Chemical	Concentration %*	Resistance
Acetaldehyde		N	Butane		R
Acetic Acid	10	R	Butter		R
Acetic Acid	25 (concentrated)	LR (N)	Butyl Acetate		N
Acetone		N	Butyl Alcohol (Butanol)		R
Acetylene		R	Butylene Glycol		R
Acrylonitrile		N	Butyric Acid		N
Ajax Detergent		R	Calcium Chloride	Saturated	R
Allspice		N	Calcium Hypochlorite		R
Allyl Alcohol		LR	Calcium Nitrate		R
Alum (Aluminum Ammonium Sulfate)		R	Calcium Soap Fat		R
Aluminum Chloride	Saturated	R	Camphor Oil		N
Aluminum Oxalate		R	Carbolic Acid		N
Aluminum Sulfate	Saturated	R	Carbon Bisulfite		N
Ammonia (Gas)		N	Carbon Dioxide Gas (Moist)		R
Ammonia (Aqueous)		N	Carbon Disulfide		N
Ammonium Carbonate		LR	Carbon Monoxide		R
Ammonium Chloride		R	Carbon Tetrachloride		N
Ammonium Fluoride		N	Castor Oil		R
Ammonium Hydroxide		N	Catsup (Ketchup)		R
Ammonium Nitrate		R	Caustic Potash (Potassium Hydroxide)		N
Ammonium Sulfate	Saturated	R	Caustic Soda (Sodium Hydroxide)		N
Ammonium Sulfide		N	Chlorine Gas (Dry)		LR
Amyl Acetate		N	Chlorine Gas (Wet)		N
Amyl Alcohol		LR	Chlorobenzene		N
Aniline		N	Chloroform		N
Antimony Trichloride	Saturated	R	Chocolate		R
Aqua Regia (3 parts HCl:1 part HNO ₃)		LR	Chrome Alum	Saturated	R
Arsenic Acid	20	R	Chromic Acid	20	R
Automatic Switch Grease		R	Cinnamon		R
Automotive Waxes		LR	Citric Acid	10	R
Baby Lotion		R	Cloves		N
Bacon Fat		R	Coal Gas		R
Barium Chloride		R	Coca Cola		LR
Battery Acid		R	Cocoa		LR
Beer		R	Cod Liver Oil		R
Beet Syrup		R	Coffee		LR
Benzaldehyde		N	Cooking Oil		R
Benzene		N	Copper Sulfate	Saturated	R
Benzoic Acid		N	Cresol		N
Benzyl Alcohol		N	Cupric Chloride	Saturated	R
Betadine		R	Cuprous Chloride	Saturated	R
Bleach (Clorox)		R	Cyclohexane		R
Blood and Blood Plasma		R	Cyclohexanol		LR
Borax		R	Cyclohexanone		N
Boric Acid		R	DDT		R
Brake Fluid		N	Dekalin		R
Bromine		N	Detergent (most)		LR or R
Bromobenzene		N	Developing Solutions		N or LR

"Entries indicate the following: R - resistant, LR - limited resistance, N - not resistant"
 *concentration of aqueous solution except where noted

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Polycarbonate Chemical Resistance



Chemical	Concentration %	Resistance	Chemical	Concentration %	Resistance
Diamyl Phthalate		N	Kerosene		N
Diesel Fuel		R	Lactic Acid	20	R
Diethyl Ether (Ethyl Ether)		N	Lacquers and Thinners		N
Dimethyl Formaldehyde (DMF)		N	Laundry Detergents (Most)		LR or R
Dimethyl Sulfoxide (DMSO)		N	Ligroin (Hydrocarbon Mixture)		R
Dinonyl Phthalate (plasticizer)		LR	Lime Solution (2%) or paste		R
Doctyl Phthalate (plasticizer)		LR	Liquors or Liqueurs		R
Dioxane		N	Linseed Oil		R
Diphyl 5,3		LR	Loctite		N
Ethanol (Ethyl Alcohol) and Water	96	R	Lubricating Oils (Most)		LR or R
Ethanol (Ethyl Alcohol)	Pure	LR	Machine Oils (Most)		R
Ethyl Amine		N	Magnesium Chloride	Saturated	R
Ethyl Acetate		N	Magnesium Sulfate	Saturated	R
Ethyl Bromide		N	Manganese Sulfate	Saturated	R
Ethylene Chloride		N	Margarine		R
Ethylene Chlorohydrin		N	Mayonnaise		R
Ethylene Dichloride		N	Meat		R
Ethylene Glycol (Antifreeze)		LR	Mercuric Chloride	Saturated	R
Ferric Chloride	Saturated	R	Mercury		R
Ferrous Sulfate		R	Methane		R
Fish and Fish Oils		R	Methanol (Methyl Alcohol)	Pure	LR
Floor Polish		R	Methylamine		N
Formalin	10%	R	Methylcellulose		N
Formic Acid	10% (30%)	R (LR)	Methylene Chloride		N
Freon TF		R	Methyl Ethyl Keton (MEK)		N
Freon (all others)		N	Methylmethacrylate		N
Fruit Juices and Pulp		R	Milk		R
Gasoline		N	Mineral Oil		R
Gear Oil		R	Motor Oils (Most)		LR or R
Glazers Putty		R	Mustard		R
Glucose		R	Naphtha (Stanisol)		N
Glycerine		R	Nickel Sulfate		R
Glycerol		R	Nitric Acid	20	R
Glycols		R	Nitrobenzene		N
Glutaraldehyde	50%	R	Nitropropane		N
Grease, Automotive (Most)		R	Nitrous Oxide		N
Heptane		R	Nutmeg		N
Hexane		R	Oleic Acid		R
Hydrazine		N	Onions		R
Hydrochloric Acid	20 (Concentrated)	R (N)	Oxalic Acid	10	R
Hydrofluoric Acid	20	R	Oxygen		R
Hydrogen Peroxide	30	R	Ozone		N
Hydrogen Sulfide		R	Paprika		R
Iodine (aqueous solution)	5	R	Paraffin		R
Iodine		N	Pentane		R
Inks (Most)		R	Pepper		R
Isoamyl Alcohol		LR	Perchloric Acid	10 (concentrated)	R (LR)
Isopropyl Alcohol		R	Perchloroethylene		N

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Chemical	Concentration %*	Resistance	Chemical	Concentration %*	Resistance
Petroleum		LR	Sodium Sulfide		N
Petroleum Ether		LR	Sodium Thiosulfate		R
Petroleum Oil (Refined)		R	Spindle Oil		R
Phenol		N	Stannous Chloride		R
Phosphoric Acid	10	R	Starch		R
Phosphorous Oxychloride		R	Styrene		N
Phosphorous Pentoxide	25	LR	Sugar	Saturated	R
Phosphorous Trichloride		N	Sulfur Dioxide (Gas)		R
Polyethylene		R	Sulfuric Acid	<50 (50<70)	R (LR)
Polyethylene Glycol		R	Sulfurous Acid	10	N
Potassium Acetate		LR	Sulfuryl Chloride		N
Potassium Aluminum Alum (Sulfate)	Saturated	R	Tapping Oil		R
Potassium Bichromate		R	Tartaric Acid	30	R
Potassium Bromate		R	Tear Gas (Chloracetophenone)		LR
Potassium Bromide		R	Terpineol		N
Potassium Chloride	Saturated	R	Tetrahydrofuran		N
Potassium Cyanide		N	Tetralin		N
Potassium Dichromate	Saturated	R	Thiophene		N
Potassium Hydroxide		N	Thyme		R
Potassium Metabisulfite	4	R	Titanium Tetrachloride		R
Potassium Nitrate	Saturated	R	Tobacco		R
Potassium Perchlorate	10	R	Toluene		N
Potassium Permanganate	10	R	Transformer Oils		R
Potassium Persulfate	10	R	Transmission Fluid		R
Potassium Rhodanide	Saturated	R	Trichloroacetic Acid	20	LR
Potassium Sulfate	Saturated	R	Trichloroethylamine		N
Propane		R	Trichloroethylene		N
Propargyl Alcohol		R	Trichloroethylphosphate		LR
Propionic Acid	20	R	Tricresylphosphite		N
Propionic Acid	Concentrated	N	Trisodium Phosphate		R
Propyl Alcohol (1-Propanol)		R	Turpentine		LR
Pyridine		N	Urea		R
Salad Oil		R	Vacuum Pump Oil		R
Salt		R	Vanilla		R
Silicofluoric Acid	30	R	Vanillin		R
Silicone Grease		R	Varnish		N
Silicone Oil		R	Vaseline		R
Silver Nitrate		R	Vegetable Juices		R
Soap (Ivory)		R	Vegetable Oils		R
Sodium Bicarbonate	Saturated	R	Vinegar		R
Sodium Bisulfate	Saturated	R	Water (Demineralized or Sea)		R
Sodium Bisulfite	Saturated	R	White Spirit		N
Sodium Carbonate	Saturated	R	Wine, Whiskey, Vodka, Rum, Cognac		R
Sodium Chlorate		R	Witch Hazel		R
Sodium Chloride	Saturated	R	Worcester Sauce		R
Sodium Chromate		R	Xylene		N
Sodium Hydroxide		N	Zinc Chloride		R
Sodium Hypochlorite	5% Chlorine	R	Zinc Oxide		R
Sodium Nitrate		N	Zinc Stearate		R
Sodium Sulfate	Saturated	R	Zinc Sulfate		R

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