

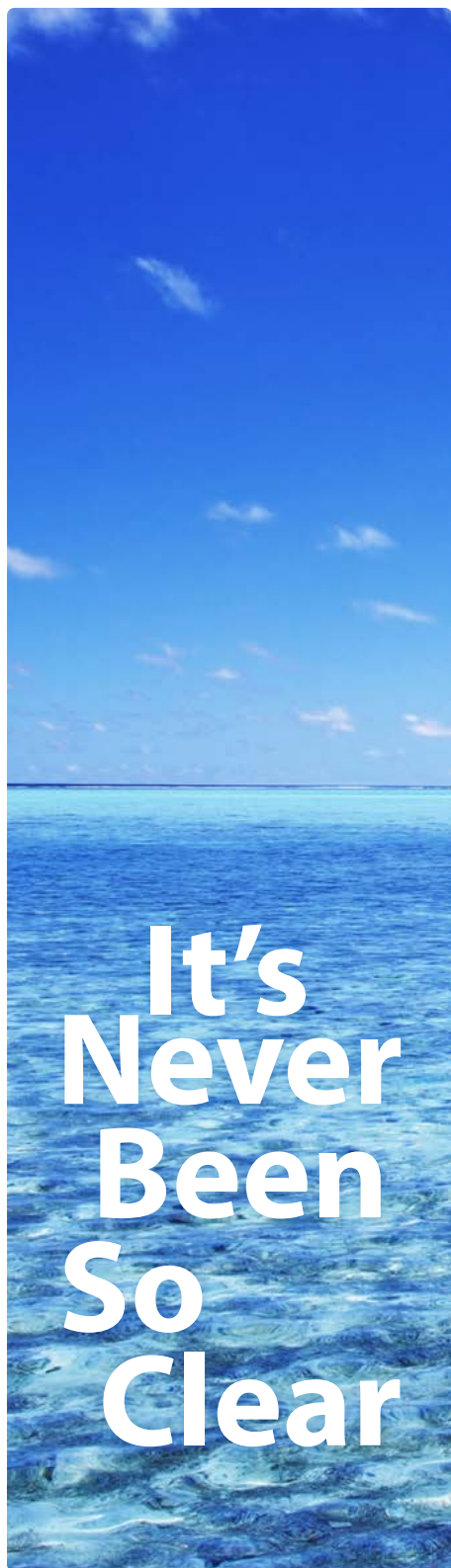


PALCLEAR[®]

Flat Transparent PVC Sheet



PALCLEAR® Flat Transparent PVC Sheet



Content

About Palram	2
PALCLEAR® - Clarity, Durability & Fire Resistance	3
Colors	4
Standard Dimensions	4
PALCLEAR® Product Range	4
Typical Applications	6
PALCLEAR® Diffuser - Indoor Light Box Screens	9
Flammability	10
Light Transmission	10
Impact Resistance	10
Radiation Filtering	11
Chemical Resistance	11
Weather Resistance	11
Physical Properties	12
Working with PALCLEAR®	13

About Palram

A Global Leader in Thermoplastic Panels

Palram Industries Ltd is a leading multinational manufacturer of thermoplastic panels, mainly from polycarbonate, PVC and acrylic. The products are used in a wide variety of applications and projects around the world, including the following market sectors: building and construction, architectural projects, advertising and printing, agriculture, fabrication and DIY. Palram's global presence and advanced technological abilities allow us to provide our customers with competitive products, while maintaining a high level of service. Palram delivers excellence to a global marketplace, backed by professional support and service on both local and regional levels. Palram is proud of its unique corporate culture that makes us agile, creative and committed to all our customers.

Panel Extrusion Pioneering

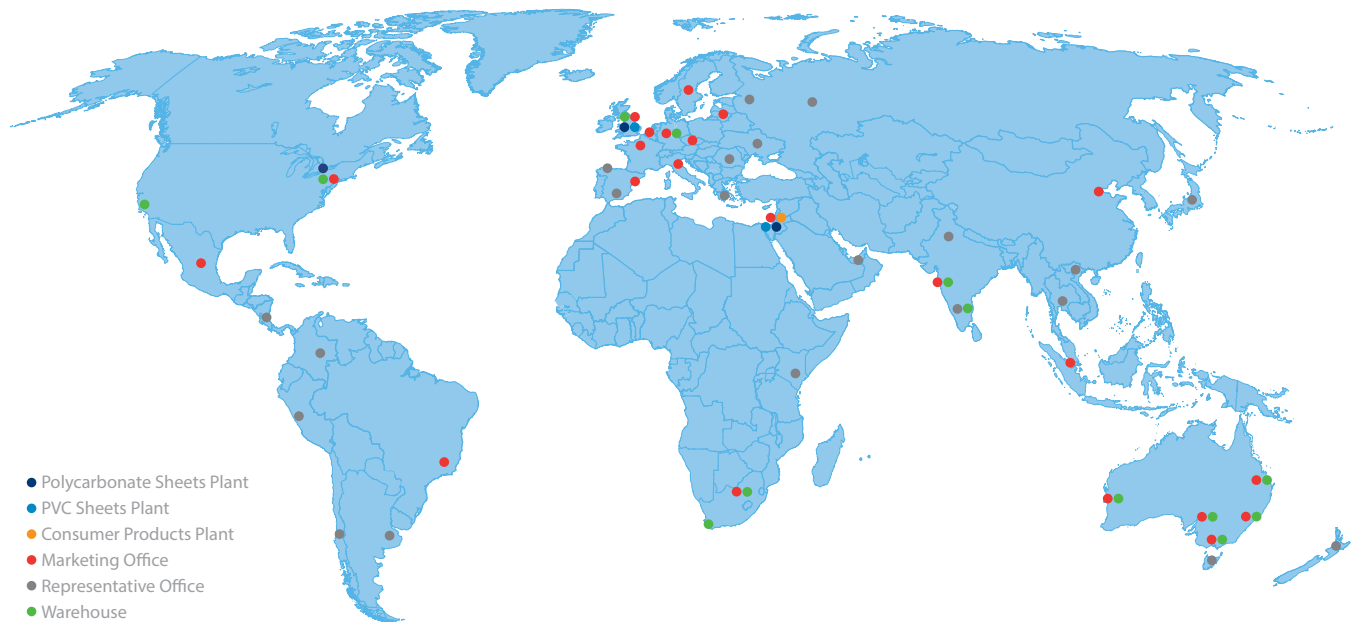
Palram has pioneered the production of extruded PVC panels in 1963 and has relied on innovative product culture ever since. New technologies have been continuously adapted to refine the existing manufacturing methods. Palram also keeps track with market demands in order to create the most suitable panel for each application.

Research & Development

As part of the tradition of producing high quality panels, Palram is constantly adapting new technologies to refine its manufacturing methods. The accumulated knowledge and production technology expands our product range and allows us to match our products more specifically to every project and application.

Global Presence

Palram operates production plants in Europe, the Americas and on the shores of the Mediterranean, allowing constant logistic support.

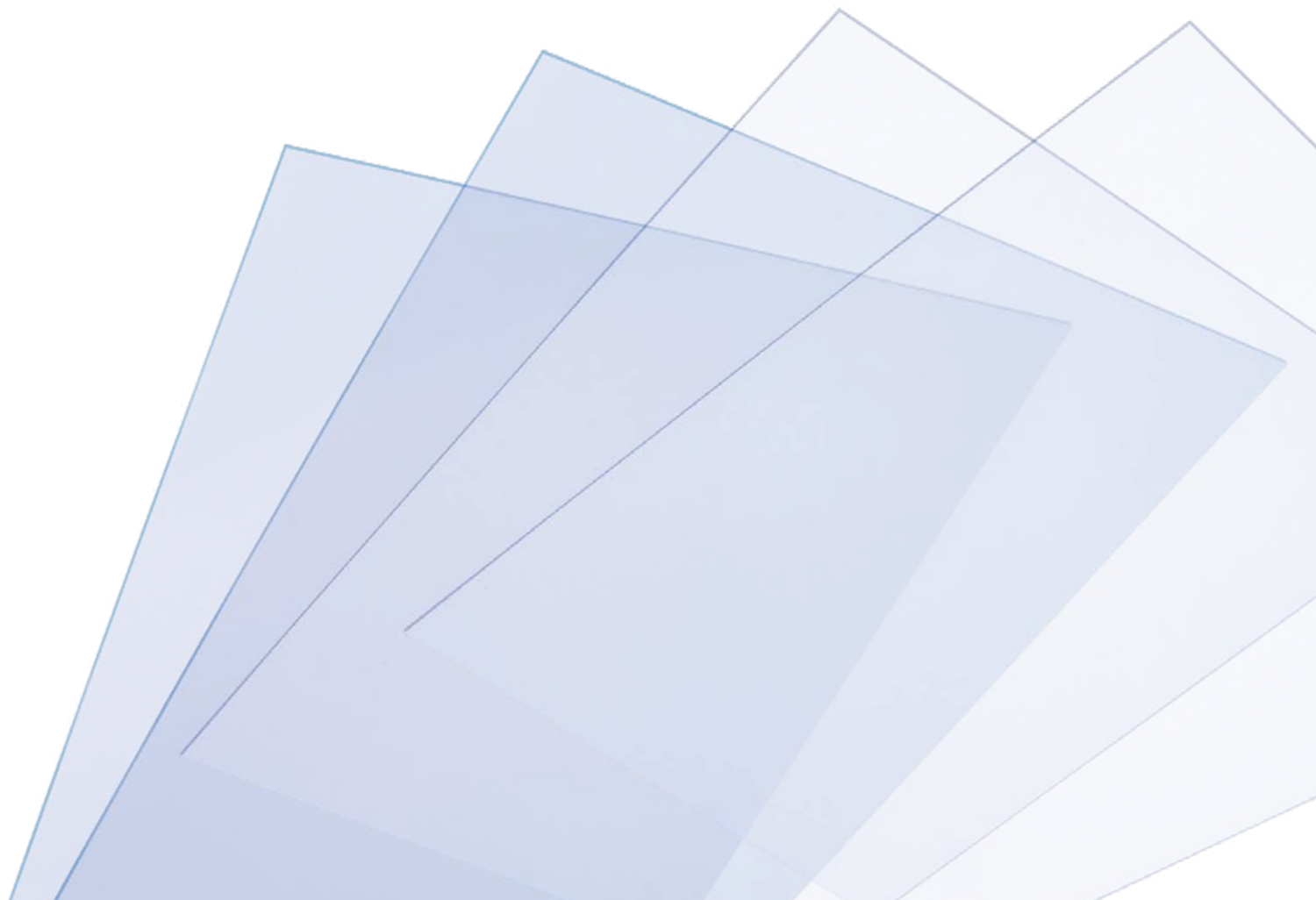


PALCLEAR® - Clarity, Durability & Excellent Fire Ratings

PALCLEAR offers unsurpassed clarity, a testimony of Palram's long and proven production experience that dates back to 1964. The sheet offers excellent fire ratings and excellent chemical resistance to the world of clear, durable and easy-to-use thermoplastic sheets. This unique combination opens various application options where other materials fail to qualify, making PALCLEAR one of the best thermoplastic materials for indoor applications in public areas and machine guards in industrial and chemical environments. PALCLEAR offers high mechanical properties and impact strength while allowing easy fabrication. Special PALCLEAR grades offer anti-reflective surface, increased impact and UV resistance and more.

Main Benefits

- ✓ Excellent fire rating
- ✓ Impact resistant and durable
- ✓ Good light transmission
- ✓ "Water-Clear" Clarity
- ✓ Excellent chemical resistance
- ✓ Easily thermoformed and fabricated
- ✓ Optional UV resistance coating on one side
- ✓ Optional high-impact grade
- ✓ Optional matte (anti-glare) finish on one side
- ✓ Optional diffuser for light box applications

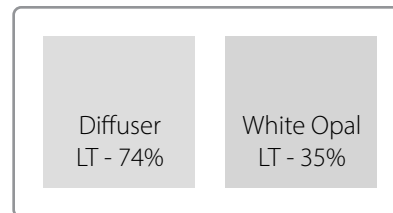


Colors

Transparent



Translucent*



* Light transmission values refer to sheets with 3mm thickness.

** Custom colors and light transmissions are available upon special request, subject to minimum quantity.

Standard Dimensions

Thickness (mm)	Dimensions (mm)	PALCLEAR®	PALCLEAR® UV	PALCLEAR® HI
1-2	1000x2000			Standard
	1220x2440			Standard
	1300x2500			Standard
	1500x3000			Standard
	2000x3050			Standard
3-4	1000x2000	Standard	Standard	
	1220x2440	Standard	Standard	
	1300x2500	Standard	Standard	
	1500x3000	Standard	Standard	
	2000x3050	Standard	Standard	
5-6	1000x2000	Standard	Standard	
	1220x2440	Standard	Standard	
	1300x2500	Standard	Standard	
	1300x2500	Standard	Standard	
8-15	1000x2000	Standard		
	1220x2440	Standard		
	1300x2500	Standard		

*Other dimensions are available, subject to minimum quantity.

PALCLEAR® Product Range

Type	Description
PALCLEAR® Water Clear*	Clear UV stabilized general purpose for interior use.
PALCLEAR® Bluish	Bluish tint
PALCLEAR® UV	UV protected on one side
PALCLEAR® HI (High Impact)	Increased impact resistance
PALCLEAR® Embossed	Prismatic embossed finish on one side
PALCLEAR® Matte	Matte finish on one side
PALCLEAR® Diffuser	High light diffusion for indoor light-box applications

* Water-Clear is PALCLEAR's standard color. Bluish tint is available upon request.



It's
Never
Been
So
Clear

PALCLEAR® Applications

Safety Glazing

PALCLEAR HI is an effective protector in chemically corrosive environments. Its impact resistance also makes it ideal for instrument and observation windows. It is also Ideal for public buildings, industrial structures, sports halls, youth centers and schools.

School Safety Windows



Electrical Junction Box Porthole



Mail Cart Side Shields (French Postal Service)



Partitions - Digitally printed on PALCLEAR



Fabrication

Thermoforming, bending and other fabrications where clarity and chemical resistance are required.

Thermoformed Dome



Indoor Light Fixtures

Printed PALCLEAR Diffuser for back light application



Advertising & Signage

PALCLEAR is ideal for advertising applications in public areas that require high fire ratings. It can be used for regular signage, light-boxes, Point-Of-Purchase stands (P.O.P), displays, dispensers and poster glazing. PALCLEAR is widely used in light fixtures due to its mechanical strength and clarity. PALCLEAR HI (High-Impact), which offers high impact resistance and clarity down to the lowest thicknesses, is an ideal solution for thin, clear and durable items.

Cosmetics P.O.P (Diffused Illumination)



PALCLEAR is one of the most compatible clear sheets for direct digital printing: it absorbs digital printer inks very easily due to its remarkable adhesion capability. This quality precedes that of all other clear thermoplastic sheets, and is supported by tests and approvals from the world's major large-format digital printer manufacturers.

Exit Signs



Advertising Signage



PALCLEAR® Diffuser Ideal Indoor Light Box Screens

High Light Transmission

- ✓ Requires less illumination - saves energy
- ✓ Higher visibility for a stronger visual impact

100% Haze

- ✓ Uniform light spread
- ✓ Light source is concealed
- ✓ Allows thinner light box

Best Physical Properties

- ✓ Long term service with best UV protection
- ✓ High fire rating
- ✓ Formable: can be thermoformed, vacuum formed, bent hot or cold and fabricated
- ✓ Excellent chemical resistance
- ✓ Optional high impact to better resist breakage and vandalism

Light Box

High light diffusion enables thinner and more cost-efficient light box.



PALCLEAR® Diffuser

Back light is concealed by even dispersion of light throughout the sheet.



Flammability

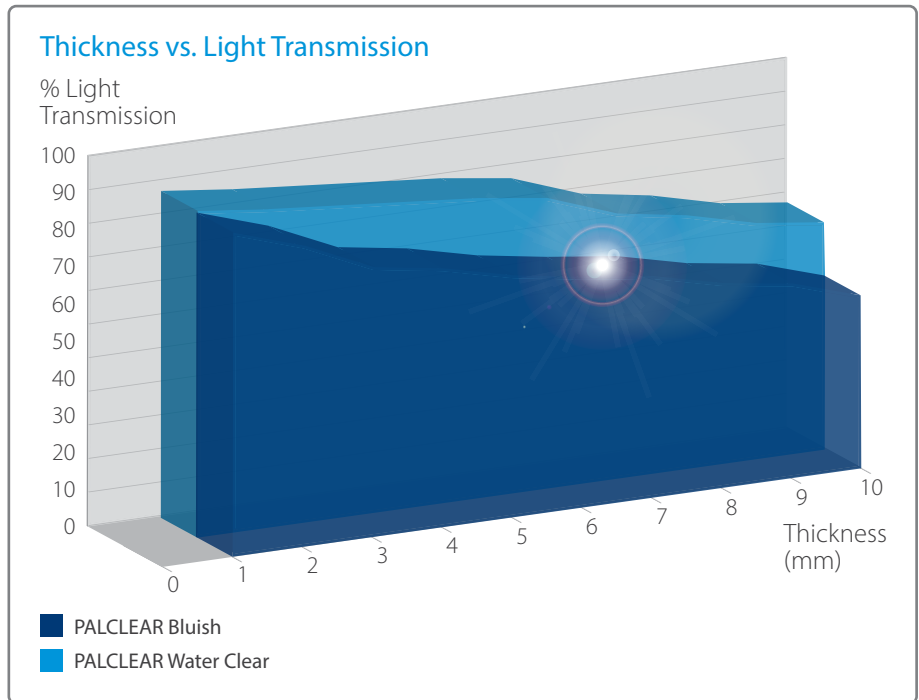
PALCLEAR complies with the most demanding international fire resistance standards in the field of plastics, as indicated in the detailed table herein. The classification is subject to product type, thickness and color.

Standard	Classification*
EN 13501	B, s3, d0
BS 476/7	Class 1
UL 94	V-0

*Depends on thickness, color and type. For more detailed information please contact your Palram distributor.

Light Transmission

PALCLEAR sheets can transmit up to over 90% of incident light in the visible range. This value decreases as a function of sheet thickness, with lower values being measured for opal and light-diffusing sheets. High Impact sheets transmit slightly less light - approximately 2% per mm (0.04in) thickness - than their normal counterparts. The graph below shows the % light transmission of typical normal impact water clear and bluish PALCLEAR sheets.



Impact Resistance

PALCLEAR's resistance to bending and impact allows a wide range of applications and large frame mounting. The results of the ISO 6603/1 Falling Dart Test on PALCLEAR, PALCLEAR HI and PMMA are shown in the graphs below. As can be seen, the impact resistance of PALCLEAR High Impact is about 25% higher than that of PALCLEAR at room temperature with an approximately 2% reduction of light transmission for each mm of thickness. Note that only PALCLEAR HI retains from 40% to 90% (depending on sheet thickness) of its impact resistance at -10°C . Therefore it is suggested that you request PALCLEAR HI when the application will expose the sheet to low temperature combined with impact (e.g. guillotine cutting).

Impact Resistance Comparison - Lab Breakage Test

Conditions: 1mm thickness samples at 23°C

- PALCLEAR HI 1mm 19 J
- PALCLEAR 1mm 12 J
- PALGLAS 1mm 21.43 J*

*[ISO 6301/1 E50 - Energy (J)]



Breakage illustration

Chemical Resistance

PALCLEAR is impervious to a large number of chemicals. It exhibits excellent chemical resistance to the following groups of chemicals: mineral acids, alkalis, plating solutions, paper making chemicals, and most other inorganic solutions in addition to the following classes of organic chemicals: alcohols, aliphatic hydrocarbons, glycols, amines, and phenols.

PALCLEAR is not recommended for use with ketones, aromatic hydrocarbons, chlorinated solvents, some esters and ethers.

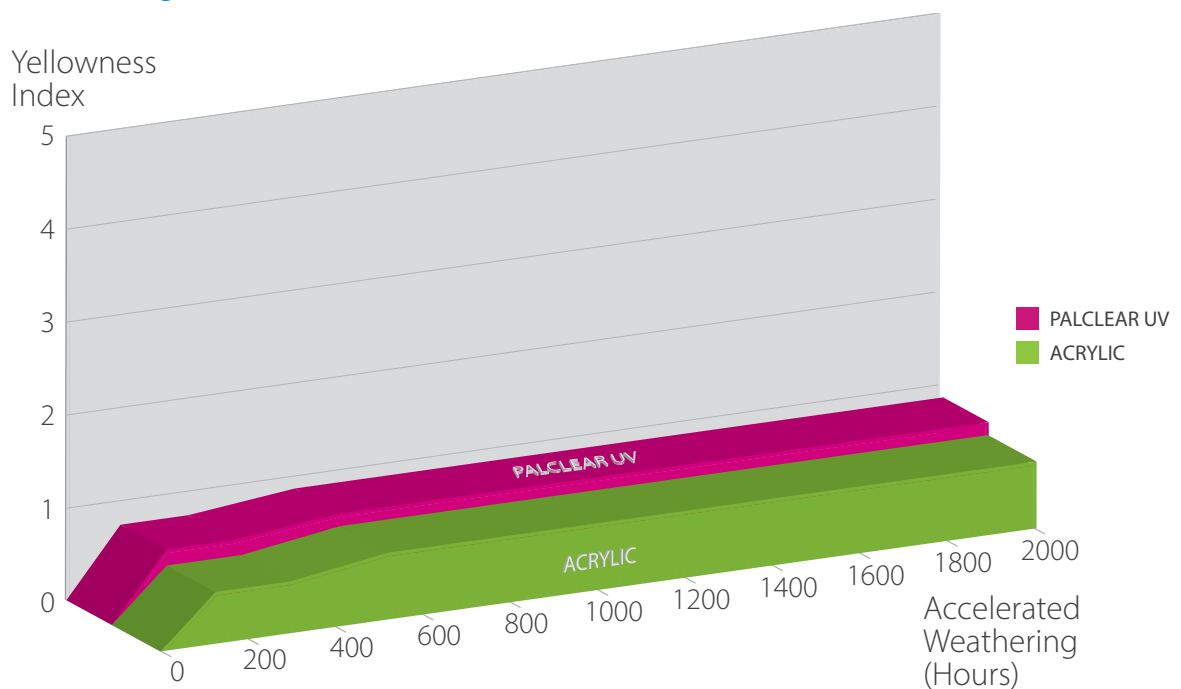
For a more detailed summary consult PALRAM's guide "Chemical Resistance of PVC Products" (lit. #61312).

The chemical resistance of PALCLEAR UV is different, since it is protected by an acrylic coating. The chemical resistance of its UV protected side is the same as that for acrylic, while the other side exhibits the high chemical resistance of standard PALCLEAR. In cases where a clear sheet is needed for external use in a chemically corrosive environment, it is recommended that you consult with your Palram representative in order to choose the most suitable material for the application.

Weather Resistance*

PALCLEAR UV should be selected for outdoor use and can cope with a wide variety of climatic conditions. The service temperature range of both PALCLEAR and PALCLEAR UV is from 0 to 50 °C (32 to 122 °F). The effect of accelerated weathering (QUV exposure) on PALCLEAR UV and acrylic sheet (3mm samples) is shown in the graphs below.

Yellowness Index Change in 3mm Sheets



Accelerated Weathering (QUV)

100 hours of accelerated weathering are roughly equivalent to 1 year of exposure to outdoor conditions. Changes in the optical properties of PALCLEAR UV shown in the graph are not perceptible to the naked eye.

Physical Properties

The table below displays physical properties of PALCLEAR Water-Clear sheet with regular impact properties. For properties differences in other PALCLEAR types please see notes below.

Property	Method*	Conditions**	Units - Metric (US)**	Value - Metric (US)**
Physical				
Density	D-1505		g/cm ³ (lb/ft ³)	1.4 (87)
Water absorption	D-570	24 hr. @ 23°C (73°F)	%	0.03
Mechanical				
Tensile strength at yield	D-638	10 mm/min (0.4 in./min)	MPa (psi)	71 (10,300)
Tensile strength at break	D-638	10 mm/min (0.4 in./min)	MPa (psi)	39 (5,650)
Elongation at yield	D-638	10 mm/min (0.4 in./min)	%	3
Elongation at break	D-638	10 mm/min (0.4 in./min)	%	95
Tensile modulus of elasticity	D-638	1 mm/min (0.052 in./min)	MPa (psi)	3,100 (450,000)
Flexural modulus	D-790	1 mm/min (0.052 in./min)	MPa (psi)	3,200 (464,000)
Flexural strength at yield	D-790	1 mm/min (0.052 in./min)	MPa (psi)	103 (14,900)
Izod impact strength (notched)	D-256	23°C (73°F)	J (ft-lbf)	35 (0.65)
Impact strength charpy (notched)	D-256	23°C (73°F)	J/m (ft-lbf/in.)	25 (0.48)
Impact falling weight	ISO-6603/1d	3mm (0.118 in.) sheet	J (ft-lbf)	95 (70)
Hardness	D-785		Rockwell R Scale Shore	115
	Shore D		D Scale	80
Thermal				
Service temperature - Long term				0 to +50 (32 to 122)
Heat deflection temperature	D-648	Load: 1.82 MPa (264 psi)	°C (°F)	62 to 65 (144 to 150)
Vicat softening temperature	D-1525	Load: 1 kg (2.2 lb)	°C (°F)	86 (185)
Coefficient of linear thermal expansion	D-696		°C (°F)	6.7x10 ⁻⁵ (3.7x10 ⁻⁵)
Thermal conductivity	C-177		W/m ² K	0.15 (1.05)
Optical				
Light transmission	D-1003	3mm (0.118 in.) Water-Clear sheet	%	87
Yellowness index	D-1925	3mm (0.118 in.) Water-Clear sheet		<4
Electrical				
Dielectric constant	D-150	50 Hz		4
Dielectric constant	D-150	1 MHz		3
Dielectric strength	D-149	500 V/s	kV/mm (V/mil)	>50 (1270)
Surface resistance	D-257	Keithley	Ohm	3.7x10 ¹⁴
Volume resistance	D-257	Keithley	Ohm-cm (Ohm-in)	1.2x10 ¹⁵

* ASTM except where noted otherwise.

** Conditions, units and values in U.S. Customary units are presented in the table within parentheses.

Notes:

1. PALCLEAR® with bluish tint differs only in its optical properties.

2. PALCLEAR® High Impact differs only slightly in all properties with the exception of impact resistance and light transmission. Values for impact resistance are: Izod Impact Strength Notched - 80 J (1.5 ft-lb); Impact Strength Charpy Notch - 60 J/m (1.1 ft-lb/in.); Impact Falling Weight ISO 6603/1 - 130 J (95 ft-lb). The light transmission value is 80%.

Working with PALCLEAR®

Low Weight

PALCLEAR's specific gravity is slightly less than 1.4 g/cm³ (87 lb/ft³), meaning that a sheet of PALCLEAR weighs less than 60% of a glass pane of an equal thickness. Lower weight will often result in easier installation and more comfortable use overall.

Formability

Hot and Cold Bending

Palclear can be hot bended. Palclear HI can be also cold bended.

Thermoforming and Vacuum Forming

PALCLEAR may be thermoformed or vacuum formed like any other rigid PVC sheet. When working with standard PALCLEAR UV, the sheet should be drawn or stretched less than 20%.

Machining

1. Cutting: PALCLEAR sheets can be sawn with band-saws, hand saws, disk saws and other cutting tools. Recommended disk saw cutting speed is 3000-6000 rpm.
2. Drilling: Use regular steel drill bits. For drilling, sheets must be laid on a flat, stable platform.

Installation

PALCLEAR and PALCLEAR UV sheets may be installed using suitable frames. For external applications, be sure to choose PALCLEAR UV and install the sheet with the UV protected layer facing out. The UV protected side is indicated on the protective masking, a red polyethylene foil that should face out toward the sun. If by chance this is not indicated, please consult your distributor before installing. The masking foil should be removed immediately after installation.

Masking

PALCLEAR sheets are delivered with protective polyethylene films on both sides. These films must be removed immediately after installation.

Cleaning

PALCLEAR sheets can easily be cleaned with a soft cloth made of 100% cotton using generous amounts of detergent and water. It is best to use mild dish cleaning soap. Commercial spray cleaners are available. Please consult your local PALRAM agent or representative for recommended commercial preparations available locally.



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