

PALCLEAR™

Transparent PVC Sheet



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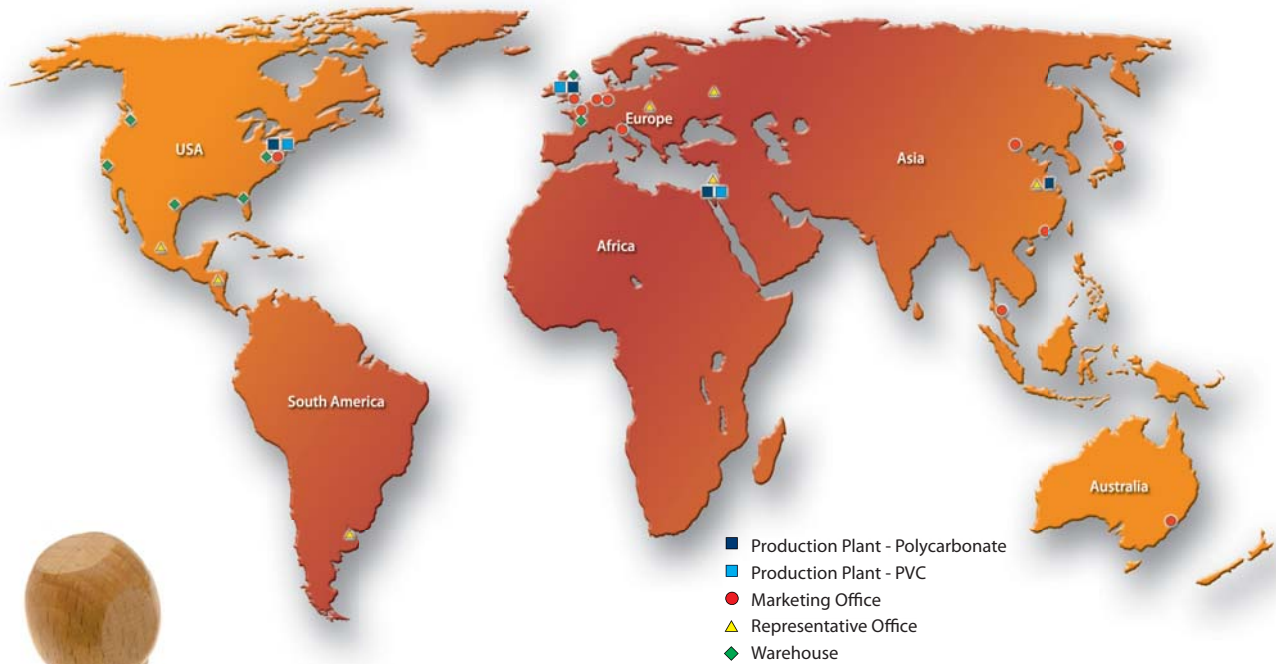
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PALRAM - Creating Solutions Worldwide

PALRAM is a multi-national, market leading manufacturer and distributor of extruded thermoplastic sheets made of polycarbonate, PVC and other materials. PALRAM has 750 employees around the world and operates from production, warehousing and distribution bases spread over 3 continents. PALRAM specializes in extruded thermoplastic sheets and adapting them to provide solutions for agricultural, construction, advertising and DIY applications.



Logistics and Quality Commitment

- PALRAM utilizes the potential of the SAP ERP system to strengthen coordination and to improve control of operations and quality control.
- PALRAM maintains its dedication to the highest internationally recognized quality standards.
- All PALRAM plants have achieved accreditation to ISO 9001:2000 Quality Assurance.



Close Customer Attention

- Many PALRAM advancements have come as a result of the close, working relationship with its customers.
- As it has grown larger, PALRAM maintains its ability to respond to the demands of its worldwide customers.
- PALRAM customers benefit from the developments that emanate from PALRAM's continuous R&D efforts.
- PALRAM provides continuous, comprehensive and reliable technical support.

Environmental Safety and Health

- PALRAM is committed to working within progressive criteria on the issue of health & safety and to take part in the national and global effort to conserve the environment.
- PALRAM strives to function in all its pursuits in a way that remove or minimize safety and environmental hazards for its employees, contractors, customers and the general public.



PALCLEAR™ - Clarity, Durability & Flammability

PALCLEAR brings high fire ratings 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, and makes PALCLEAR one of the best thermoplastic materials for indoor applications in public areas. PALCLEAR offers high mechanical properties and impact strength while allowing easy fabrication. PALCLEAR also has “water-clear” clarity and excellent chemical resistance, making it ideal for machine guards in industrial and chemical environments. Special PALCLEAR grades offers optional high clarity, anti-reflective surface and increased impact and UV resistance.

Main Features

- ✓ High fire rating - Self extinguishing
- ✓ Impact resistant and durable
- ✓ High light transmission
- ✓ “Water-Clear” Clarity
- ✓ Excellent chemical resistance
- ✓ Optional UV resistance coating on one side
- ✓ Optional high-impact to limit fragility
- ✓ Easily thermoformed and fabricated
- ✓ Optional anti-glare finish on one side to eliminate disturbing glare

Typical Applications

- ✓ Transparent advertising items
- ✓ Indoor signage in populated areas
- ✓ High impact glazing
- ✓ Machine guards
- ✓ Chemically resistant safety glazing
- ✓ Fabrication and forming applications
- ✓ Anti-glare glazing & frame covers

Typical Applications

Glazing - Ideal for public buildings, industrial structures, sports halls, youth centers and schools.

Advertising - PALCLEAR HI (High-Impact) offers high impact resistance and clarity down to the lowest thicknesses, an ideal solution for thin, clear and durable items. It can be used for Point-Of-Purchase stands, displays, poster glazing, silk-screen printing and painting. PALCLEAR is widely used in light fixtures due to its mechanical strength and clarity.

Shields - PALCLEAR HI is an effective protector in chemically corrosive environments. Its impact resistance also makes it ideal for instrument and observation windows.

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

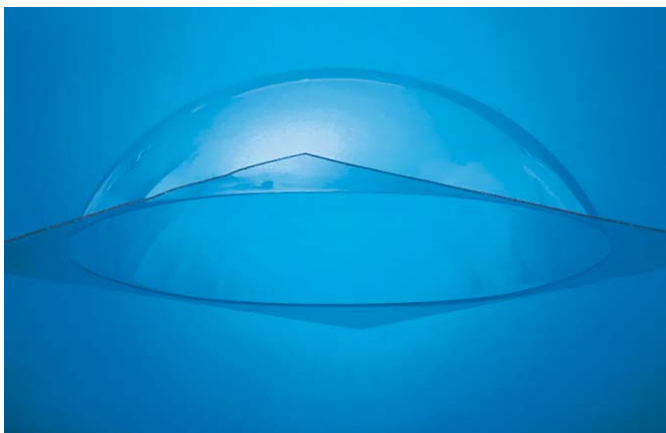
Electrical Junction Box Porthole



Mail Cart Side Shields (French Postal Service)



Thermoformed Dome



PALCLEAR™ Matte For Glare-Free Applications

Standard Clear PVC



PALCLEAR™ Matte



Exit Signs



Advertising Signage



PALCLEAR™ Product Range

Product	Description
PALCLEAR™ Water Clear	Clear UV stabilized general purpose PVC sheet for interior use. <i>NEW: PALCLEAR Water-Clear's renowned clarity is now improved with higher LT and lower haze</i>
PALCLEAR™ Bluish	Traditional bluish tint
PALCLEAR™ UV	UV protected on one side, suitable for outdoor use.
PALCLEAR™ HI (High Impact)	Increased impact resistance
PALCLEAR™ Embossed	Prismatic embossed finish on one side
PALCLEAR™ Matte	Matte finish on one side

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

Colors

Transparent	Translucent
Water-Clear, Bronze, Bluish	White Opal, White Diffuser

*Other dimensions are available, 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.



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)	1.35-1.4 (84-87)
	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
		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%.

Flammability

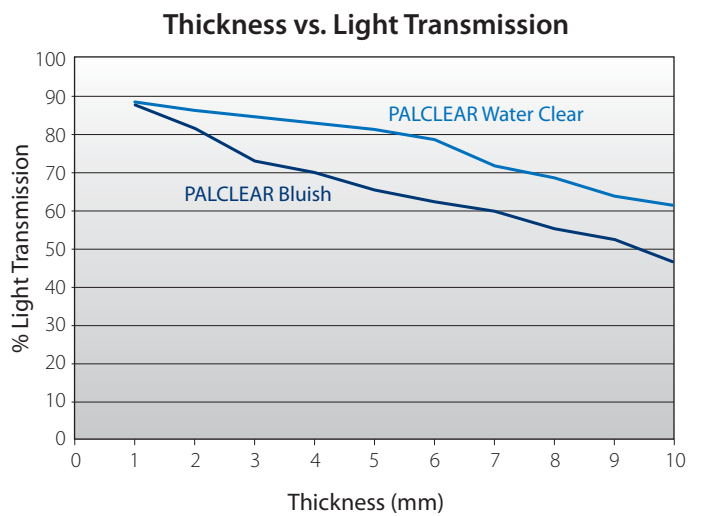
PALCLEAR sheets are self-extinguishing and comply with international fire resistance standards, as indicated by the representative table attached.

Method	Classification*
DIN 4102	B-1
BS 476/7	Class 1
NSP 92501,5	M-1, M-2
UL 94	V-0
ASTM D-635	Self Extinguishing

*Depends on thickness, color and type.

Light Transmission

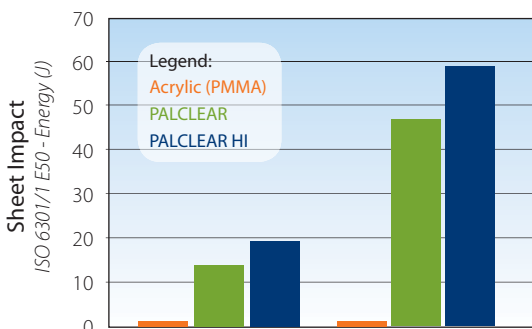
PALCLEAR sheets can transmit up to over 90% of incident light in the visible range. This value decreases as a function of sheet thickness, with lower values being measured for opal and light-diffusing sheets. High Impact sheets transmit slightly less light - approximately 2% per mm (0.04in) thickness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



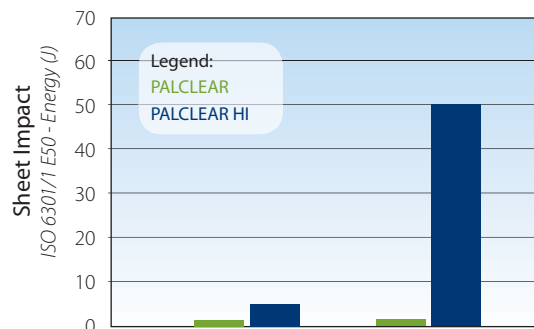
Impact Resistance

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 at 23°C



Impact Resistance Comparison at -10°C



Warranty

A 5 year warranty for PALCLEAR and 10 year warranty for PALCLEAR HI (High-Impact) are available upon request.

Radiation Filtering

PALCLEAR sheets do not transmit UV radiation. This means that anyone under such sheets is protected from solar UV radiation. It is also possible to limit the levels of visible light transmission by selecting certain tints. For more information please consult your local PALRAM representative or distributor.

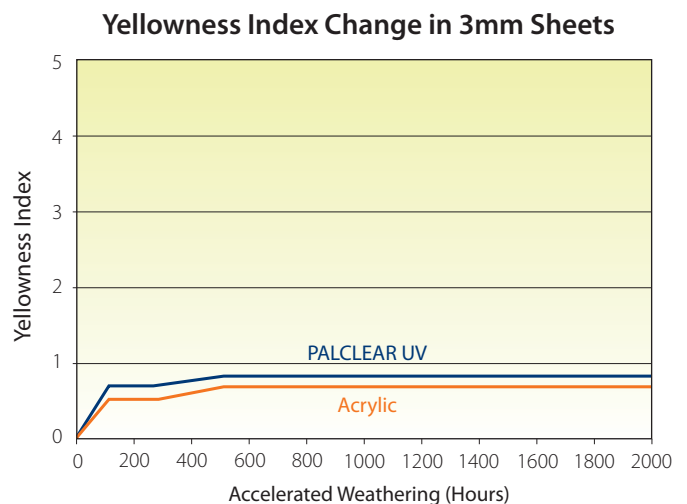
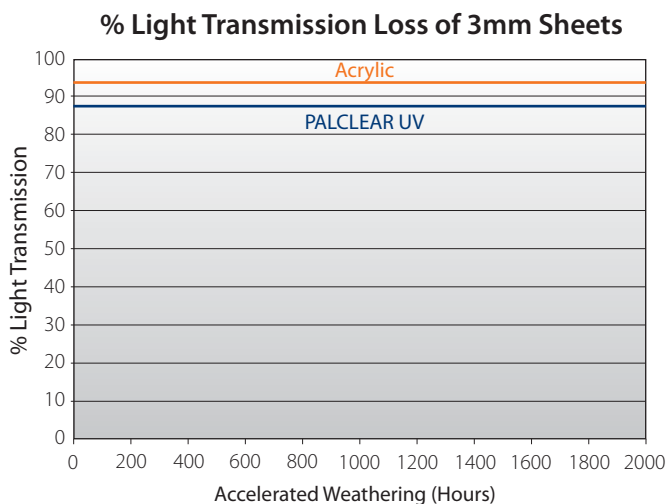
Chemical Resistance

PALCLEAR sheets are impervious to a large number of chemicals. PALCLEAR 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).

Note that PALCLEAR UV sheets are protected by an acrylic coating. The chemical resistance of the UV protected side is the same as that for acrylic, while the unprotected side exposes PVC which has the chemical resistance shown above. When a clear sheet is needed for external use in a chemically corrosive environment, PALRAM suggests that you consult with your local representative or agent to choose the best material for your 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 (3 mm samples) is shown in the graphs below.



*100 hours of exposure to accelerated weathering is roughly equivalent to 1 year of actual outdoor exposure. The changes in optical properties shown above for PALCLEAR UV are not perceptible to the naked eye.

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 sheet may be bent hot or cold and will retain its characteristics when so treated correctly.

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%. For deep thermoforming PALCLEAR UV, a special product, PALCLEAR UV TF, should be ordered.

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.

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.

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.

Masking

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

Inasmuch as PALRAM Industries has no control over the use to which others may put the material, it does not guarantee that the same results as those described herein will be obtained. Each user of the material should make his own tests to determine the material's suitability for his own particular use. Statements concerning possible or suggested uses of the materials described herein are not to be construed as constituting a license under any PALRAM Industries patent covering such use or as recommendations for use of such materials in the infringement of any patent. PALRAM Industries or its distributors cannot be held responsible for any losses incurred through incorrect installation of the material. In accordance with our company policy of continual product development you are advised to check with your local PALRAM Industries supplier to ensure that you have obtained the most up to date information



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