



Dureflex® Plaitlon®

THERMOPLASTIC POLYURETHANE (TPU) FILM FOR ULTIMATE TRANSPARENT PROTECTION



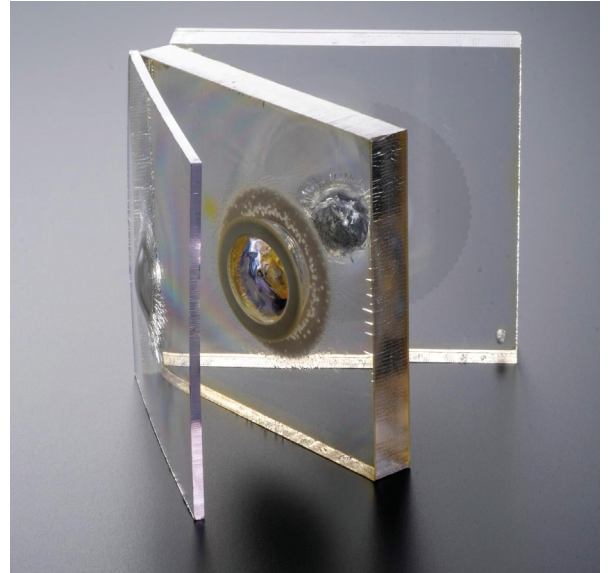
The High-Performance Choice for Safety, Durability, and Clarity

From building facades designed to resist blast and catastrophic weather to bullet resistant windows for vehicles and interior spaces, security glazing provides transparent protection in an increasingly uncertain world.

Comprised of bonded layers of glass and plastic, security glazing protects by dissipating the energy of impact and blast while containing dangerous fragments. These functions depend on interlayer adhesive performance.

Proper interlayer selection and processing are critical to the overall safety and durability of the security glazing system. Additionally, security glazing must withstand many years of exposure to moisture, vibration, UV light and temperature extremes.

Covestro's Dureflex® and Platilon® thermoplastic polyurethane (TPU) films are specifically formulated to meet these challenges⁽¹⁾. Dureflex® TPU is the high-performance choice for safety, durability, and clarity.



Optically Clear TPU Films for Security Glazing

Product ⁽¹⁾	Chemistry	Application
Dureflex® A4500	Aliphatic polyether urethane	Lower modulus mitigates thermal stress when bonding dissimilar materials such as glass and PC
Dureflex® A4700	Aliphatic polyether urethane	High durability general purpose interlayer for glass and plastic lamination
Dureflex® X2260	Aliphatic polyether urethane	High modulus, high strength bonding for ballistic laminates that must perform at elevated temperatures
Dureflex® ES2592 ⁽²⁾	Dual-layer aromatic/aliphatic urethane	All-purpose laminate edge sealing for enhanced environment durability and aesthetics, compatible with all types of transparent interlayer adhesives

(1) Covestro's Dureflex® products are sold in Europe and other world-wide regions under the Platilon® brand. Information in this brochure applies equally to Dureflex® and Platilon® branded products.

(2) Outside (aromatic) layer of edge seal is black with embossed finish.

The TPU Advantage

Superior Environmental Durability

Compared with materials like PVB and EVA, the aliphatic polyether TPU formulations of the Dureflex® TPU family offer superior hydrolytic stability and are significantly more resistant to bonding loss in hot/wet conditions. Additionally, the inherent UV stability and low glass transition temperatures of Dureflex® TPU, together with integrated adhesion promoters delivers a primerless bonding system that outperforms other interlayer adhesives.

Excellent Adhesion to Plastic

TPU offers excellent bonding to common transparent security plastics including polycarbonate and polymethyl methacrylate (acrylic). The absence of plasticizers and solvents in TPU allow safe use with plastics whereas interlayer materials such as PVB contain incompatible elements that can cause stress cracking (crazing). TPU also provides outstanding adhesion to glass.

No Special Storage Requirements

PVB and EVA rolls must be dry-stored or refrigerated and sealed to prolong useful life. Notable yellowing and loss of bonding strength can result from exposure to moisture or light. TPU, due to its aliphatic structure, is naturally UV resistant and requires no special storage.

Reduced Energy Costs

TPU lamination temperatures are typically more than 30° C less than ionoplast, EVA and PVB. This translates into direct energy and time savings and allows co-lamination with temperature sensitive plastics such as abrasion coated polycarbonate that will be damaged by higher temperatures (distortion and cracking of the abrasion coating).

Design Versatility

TPU offers a wide range of mechanical properties to meet unique application requirements. For example, Dureflex® X2260 provides higher hardness and stiffness to enhance structurally demanding applications. Softer materials, such as Dureflex® A4500 are well suited to manage high bond strain that may be found in flexible systems or in plastic-glass hybrid systems where thermal stress is prevalent.

Easy Processing

TPU processing can accommodate a wide range of cooling rates without risk of haze formation. This is especially valuable in the production of thick laminates that cannot be quickly cooled without development of residual stress that contributes to distortion and early delamination failure. TPU also bonds equally well to both the air and tin side of glass, thus simplifying laminate construction.

Applications across multiple industries:

Dureflex® TPU formulations are designed to meet the specific demands of security glazing applications. Tailored properties that include high adhesive strength for glass and plastic, toughness, good melt flow, outstanding chemical and moisture resistance and crystal clarity are combined to deliver a premium lamination interlayer capable of meeting the most stringent performance requirements including ASTM F1233, F3561, EN 356, UL 972, and ATPD 2352, among others.



Vehicle Armoring



Military vehicles, police cruisers, and civilian VIP transport demand the highest level of protection without added weight or reduced visibility



Our Dureflex® TPU solutions enable multi-hit ballistic resistance while maintaining optical clarity essential for driver and passenger safety



Aerospace and Transportation



The wide temperature range, elasticity and excellent tear resistance of Dureflex® TPU make it an ideal interlayer choice for large span windshields of trains, buses, and aircraft



Whenever the utmost in clarity and impact safety are required, Dureflex® TPU is the right choice



Architectural Safety



From residential high-rises to government facilities, Dureflex® TPU provides protection against severe weather, forced entry, and ballistic or blast threats



The exceptional clarity and UV stability of Dureflex® TPU ensure lasting aesthetics while meeting increasingly stringent building codes for safety and security



Retail and Public Safety



Banks, stores, and schools face unique security challenges



Dureflex® TPU creates secure barriers providing invisible protection that surveillance needs and promotes natural human interactions

TPU Films for Security Glazing

Dureflex® TPU Films for Security Glazing*

Film Grade		A4500	A4700	X2260	ES2592 Edge Seal
	Film Type	Polyether Aliphatic	Polyether Aliphatic	Polyether Aliphatic	Aromatic/Aliphatic dual layer
	Self-Priming	Yes	Yes	Yes	Yes
Hardness	Shore A	68	78	95	
Tensile Strength	psi MPa	3,500 24.1	5,500 37.9	9,000 62.1	9,000 62.1
Tear Resistance	pli kN/m	225 39.4	250 43.8	440 77.1	350 61.3
Elongation (Ult.)	%	750	500	375	550
TMA Onset Softening Temp	F° C°	153 67	169 76	194 90	176 80
Lamination Temperature	F° C°	200-240 95-115	200-250 95-120	210-250 100-120	200-250 95-120
Available Gauges	mil	25,50	15, 25, 50	15, 25	50
Available Roll Widths	in	40, 50, 60	40, 50, 60	60	43

* The Product data listed is provided as general information only. They are approximate values and not considered part of the product specifications.



Key Properties

Dureflex® A4500

- Self-priming, polyether-based, aliphatic TPU film
- Engineered for low modulus and high elongation
- Ideal for laminating challenging PC-to-Glass and asymmetric laminates
- Typically used at 50 mils thickness (customizable from 25 to 50 mils)
- Matte finish for efficient air evacuation during press or autoclave bonding

Dureflex® A4700

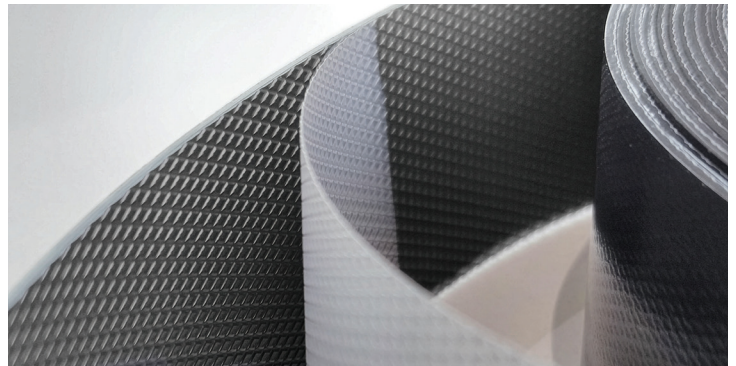
- Self-priming, polyether-based, aliphatic TPU film
- Excellent impact and puncture resistance, optical properties, and adhesion
- Formulated for bonding PC-to-PC, PC-to-glass, and acrylic-to-glass security laminates
- High elasticity for bridging different materials and compensating for temperature-related expansions

Dureflex® X2260

- Enhanced self-priming, polyether-based aliphatic TPU film
- High ballistic efficiency allows for thinner glass and lighter overall construction
- Used in military and high-security applications
- Withstands heat of embedded heating wires used in military de-ice systems
- Wider application temperature range (withstands both colder and hotter temperatures)
- Resists delamination at extreme temperatures
- Compatible with A4700 and A4500 in the same laminate

Dureflex® ES2592

- Multilayer TPU film for edge protection of glass-clad laminates



- Compatible with all common interlayers (TPU, PVB, EVA, Ionoplast)
- Seals laminate to resist moisture, chemicals, and liquid penetration
- Minimizes edge chipping
- Provides visually appealing product



Scan to learn more about our TPU films
for security glazing

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