

Thermoplastic polyurethane (TPU) film enables high safety standards for bullet-resistant applications.

Reliable material for security glazing protection.

**Dureflex®**



## Enhanced protection with specialty films for security glazing

**Dureflex® A4700** thermoplastic polyurethane (TPU) film has **good optical properties** and **excellent adhesion to glass, PC and PMMA sheets**, making it a versatile interlayer to use between the various materials that make up bullet-resistant glass. TPU film also imparts toughness to the laminate, **increasing the impact resistance** due to the excellent puncture strength and elongational properties of the film. When lightweighting is needed, a layer of glass can be substituted with polycarbonate and still offer enhanced protection because of the excellent mechanical properties of TPU. Unlike other interlayer films, TPU film does not have plasticizers or require special handling or storage of the material. Our Dureflex® TPU film further **enables the integration of electronics or additional functionality into glass-clad systems** such as those needed for laminated smart glass or PV solutions.

## Processing

Dureflex® A4700 can be laminated via autoclave processing to achieve excellent adhesion to glass and plastics with a recommended temperature range of 100 – 130°C. Pressure for this process can vary from as little as 25 psi (1,5 bar) to as much as 200 psi (15 bar). Laminating can be done using vacuum bag or vacuum ring de-airing, or nip-roll / calender laminating for symmetrical glass-clad configurations.

## Security glazing structures

Bullet-resistant glass is constructed with stacked layers of glass and plastic sheets with interlayers of film to bond the sheets. The stacked construction is de-aired and heated to seal all layers together and then fully bonded in an autoclave. Dureflex® A4700 can effectively bond all layers of glass, polycarbonate (PC) film/sheet or PMMA film/sheet. The level of protection can be tuned by the number, type and thickness of the layers. A final layer of PC film/sheet may be placed on the safe side, or inside, to protect occupants against spalling, i.e. ejected shards of glass, in the event of an impact.

## Benefits of Dureflex® A4700 TPU film

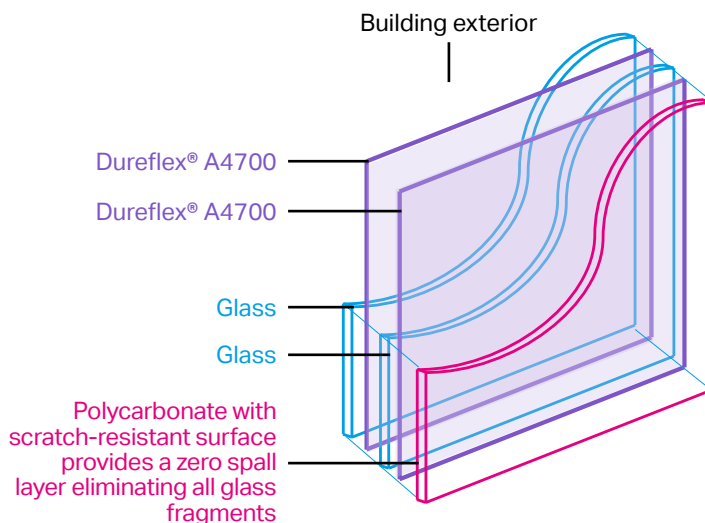
- Excellent bondability to glass, acrylic and polycarbonate
- Elasticity for bridging CTE of differing materials
- Absence of plasticizers
- Excellent energy dispersive characteristics
- Excellent UV resistance and fatigue strength
- Highly durable
- Low haze and good optical clarity after processing



Covestro Deutschland AG  
Kaiser-Wilhelm-Allee 60  
51373 Leverkusen  
Germany

[solutions.covestro.com](https://solutions.covestro.com)  
[films@covestro.com](mailto:films@covestro.com)

## Bullet-resistance, zero-spall glazing



The manner in which you use our products, technical assistance and information (whether verbal, written or by way of production evaluations), including any suggested formulations and recommendations, is beyond our control. Therefore, it is imperative that you test our products to determine suitability for your processing and intended uses. Your analysis must at least include testing to determine suitability from a technical, health, safety, and environmental and regulatory standpoint. Such testing has not necessarily been done by Covestro, and Covestro has not obtained any approvals or licenses for a particular use or application of the product, unless explicitly stated otherwise. [EMEA only: If the intended use of the product is for the manufacture of a pharmaceutical/medicinal product, medical device<sup>1</sup> or of pre-cursor products for medical devices or for other specifically regulated applications which lead or may lead to a regulatory obligation of Covestro, Covestro must explicitly agree to such application before the sale.] Any samples provided by Covestro are for testing purposes only and not for commercial use. Unless we otherwise agree in writing, all products are sold strictly pursuant to the terms of our standard conditions of sale which are available upon request. All information, including technical assistance is given without warranty or guarantee and is subject to change without notice. It is expressly understood and agreed by you that you assume and hereby expressly release and indemnify us and hold us harmless from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance, and information. Any statement or recommendation not contained herein is unauthorized and shall not bind us. Nothing herein shall be construed as a recommendation to use any product in conflict with any claim of any patent relative to any material or its use. No license is implied or in fact granted under the claims of any patent. These values are typical values only. Unless explicitly agreed in written form, they do not constitute a binding material specification or warranted values. <sup>1</sup>Please see the "Guidance on Use of Covestro Products in a Medical Application" document.  
Edition: 2022 · Printed in Germany