

BORDER MANAGEMENT TODAY

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Films, Covestro, APAC

Future ID document concepts today leveraging Specialty Films

INDUSTRY MARKET TRENDS

The identification document segment continues to evolve at a rapid pace. The market is witnessing sustained growth in smartcard penetration, drawing on the complementary strengths of physical and digital identity to produce highly secure citizen identity documents, including e-Passports and e-ID cards. Given that core citizen identity programs typically carry a validity period of ten years or longer, polycarbonate films are distinctively positioned to underpin the durability and security requirements of such documents.

As of September 2026, 109 countries are members of the ICAO Public Key Directory (PKD) for e-Passports, a development that is accelerating adoption and cross-border interoperability. Approximately 90% of passports shipped annually incorporate electronic chips, while approximately 70% of national identity cards are smartcards, with a pronounced trend towards multi-purpose electronic identity cards. Many citizen identification programs rely on polycarbonate films to safeguard both the physical and digital elements of these documents.



SOPHISTICATION IN CLEAR WINDOW POLYCARBONATE (PC) DOCUMENTS

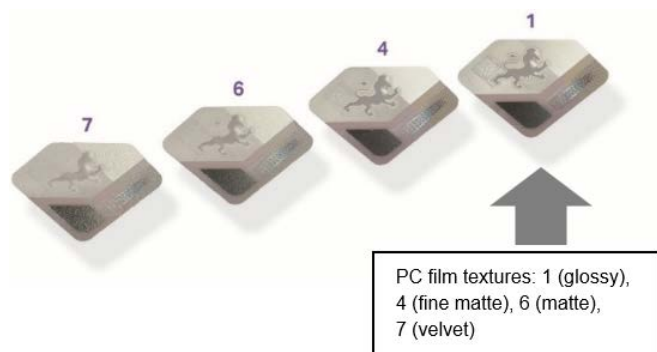
Industry discourse has shifted from whether a given identity document program incorporates clear windows to the degree of sophistication those windows offer — including the number of windows, the presence of overlapping apertures, and whether the window incorporates color, exhibits color-shifting properties, or reveals concealed colors under ultraviolet illumination.

The availability of thin, high-opacity white polycarbonate films down to 30 microns enables the creation of highly intricate window shapes. The transparent polycarbonate layers above, below, and between the white opaque layers naturally fill the punched window cavities during the lamination process. This simplifies production, expands the range of achievable window shapes, and creates additional space for supplementary polycarbonate film layers, each of which may carry its own inherent security features.



BRIGHTER HOLOGRAMS FOR EASE OF VERIFICATION

Identity documents can incorporate a clear polycarbonate film that causes the hologram to appear visibly brighter to the naked eye following data page lamination with the surrounding polycarbonate film layers. The hologram on the polycarbonate data page can further accommodate laser engraving of both variable and static characters, providing an additional layer of security. The glossy surface on one side of this particular clear polycarbonate film — in contact with the hologram-bearing layer — contributes to a noticeably brighter hologram appearance at arm's length.



TACTILE LASER ENGRAVING ON POLYCARBONATE DATA PAGES

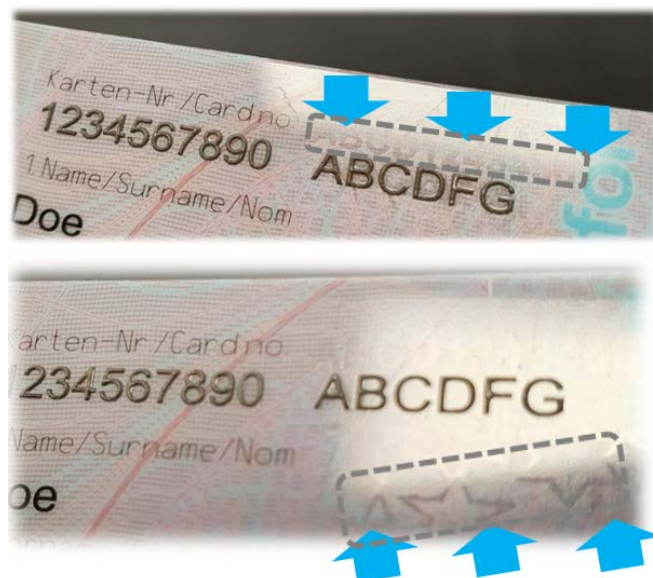
Tactile characters on PC ID documents have become common place in core ID document programs. A concept which can take tactile engraving a step further is by laser marking white tactile characters or images together with standard black laser engraving. The raised white laser tactile elements can also be used as a secondary portrait photo for added level 1 security at border crossing points such as airports, seaports and guarded land points.

At the micro level, characters and imagery can be



laser engraved such that they are only visible when the data page is tilted to a specific angle, revealing the concealed elements. This constitutes a robust security

feature: it occupies minimal space on the data page, remains imperceptible unless the examiner is aware of its presence, and can be rendered variable — producing a unique result for each individual document holder.



HIGH LASER RESOLUTION AND REACTIVITY ON POLYCARBONATE DATA PAGES

Currently available in the industry, Makrofol® ID superlaser polycarbonate film enables very high-contrast laser personalization while requiring significantly less laser engraving energy compared to standard laser-reactive polycarbonate ID films, when producing equivalent imagery and text under identical equipment settings and parameters. Furthermore, the Makrofol® ID superlaser polycarbonate film can achieve a Level 3 forensic security feature following laser personalization, as the single film comprises a three-layer structure, each layer possessing its own distinct laser reactivity.



PUTTING IT ALL TOGETHER - INTEGRATED ID DOCUMENT SOLUTION

In summary, the industry offers a range of specialty film solutions that can be combined within a single identity document — a concept referred to as the all-in-one passport. This begins with the data page construction using polycarbonate films incorporating specialized features. The passport hinge utilizes thermoplastic polyurethane (TPU) films to securely attach the polycarbonate data page to the passport cover, with the TPU foam providing additional cushioning and protection for the chip and antenna within electronic covers (e-Covers).

The most effective approach to mitigating identity document counterfeiting and alteration is to embed security features at every stage of the document creation process — commencing with the substrate material itself, which can help enable Level 1, Level 2, and Level 3 security features for the citizen ID documents.



For more information on how Covestro specialty films can help enable secure identification documents, please visit our ID landing page: Covestro.com/IDdocuments
Email: films@covestro.com

ABOUT COVESTRO

Leveraging four decades of unparalleled expertise in security materials science, Covestro stands as the trusted innovation partner for the world's most demanding identification document and security printing applications. Our sophisticated Makrofol® polycarbonate (PC) and Plaiton® thermoplastic polyurethane (TPU) films represent the pinnacle of security technology, engineered to exceed the most rigorous international standards. These premium materials enable seamless integration of advanced security features—from holograms to biometrics—into identity credentials, government documents, and currency.

Through continuous innovation and deep market understanding, Covestro consistently advances the boundaries of document protection and authentication. With a fiscal performance of EUR 12.9 billion in 2025, a global network of 46 production centers, and 17,600 employees, we remain committed to developing materials that safeguard critical documents while protecting our shared environmental future.

Henry Leung is the Regional Segment Manager for Covestro, leading the company's identification segment initiatives in APAC with responsibilities including market penetration, strategic development, ecosystem support and best positioning the company's world-renowned specialty films to enable secure identification solutions.

Prior to joining Covestro, Henry was the senior marketing manager for Entrust Datacard, where he was responsible for driving its government vertical marketing initiatives in Asia Pacific for the company's physical and digital identification solutions.

He was also a senior business development manager at NEC Corporation, where he helped the company to best position its government identity, border control, public safety and biometrics technologies worldwide.



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