Committed to crafting exceptional passports

We help our customers deliver unique travel documents that become works of art and symbols of pride in the hands of millions. We're proud to have succeeded in designing some of the most secure and attractive passports to appear in recent years.
Passport forgery is constantly evolving and techniques now include grinding to access the core of the document or adding laser engraved personalization to an existing document.

The main kinds of document fraud are:
- Copying or imitating the visual appearance of a document, i.e. counterfeiting an entire ID document, sometimes using materials from legitimate documents.
- Changing the data on a legitimate document by substituting the displayed photo and altering or deleting information.
- Stealing a blank genuine document and personalizing it with fake data.

This guide aims to set out our thinking process when we design a secure document and to explain, step by step, how some of the features used in the Gemalto Utopia passport make the process of verifying documents easier in the field.

Gemalto has a background of secure government printing dating back to 1886 with the acquisition of Setec, formerly Finland’s National Printing House in 2005.

Printing expertise includes banknotes, stamps and identity documents with a long track-record in innovation.

Today, Gemalto is contributing to more than 40 Passport programs with specific expertise in border and visa management projects. Our expert teams are working closely with national polices and printers on aspects of security features and document design.
Security features: Raising the bar

The selected combination of features must provide protection against all types of attacks – from copying, reproducing, data manipulation or attempts to personalize a blank document. Some essential security safeguards include:

- Using feature technologies that are difficult to copy (clear window, rainbow printing or CLI/MLI: Multiple Laser Image/Changeable Laser Image)
- Combining several security features to make it highly problematic for a counterfeiter to master all the various techniques (printing, lamination, laser engraving)
- Using materials and technologies that are difficult to source
- Employing specific inks and components that are only sold to secure printers

When designing secure documents like e-Passports, it’s critical to make it extremely difficult to either create the document or change the data on the document.

Here tactile details and the new generation of CLI/MLI lens of Secure Surface.

The perceived quality and security of documents also send strong messages to citizens and form a tangible element of trust.

- 2005: First electronic polycarbonate datapage
- 2007: A transparent window in the polycarbonate datapage
- 2013: High resolution UV images on polycarbonate datapage
- 2013: Laser ablation personalization process creating ghost image
- 2014: Color photo with laser personalization in the polycarbonate datapage
- 2015: Laser engraving on the edge of polycarbonate datapage
- 2017: High resolution UV images on paper
- 2018: Laser engraved “floating” personalized data
- 2019: Encoded Guilloches for visual and machine inspection
- 2019: Multiple Translucent areas in the datapage
A holistic approach to security design

Our goal is to design a document so that its authenticity can be indisputably trusted.

We implement each technology at its highest quality and level, and use means and materials with limited availability. In a nutshell, we use technologies and materials that are extremely difficult to copy, to use, and to come by.

When designing a high secure Passport, the primary task is to identify potential threats. Then the necessary security measures are selected to counter these potential threats.

The selection of a security feature is based on its ability to protect a specific part of the document (datapage, personalized data) and to increase or reinforce other security features.

Polycarbonate enables optimum use of each security feature: datapage security features can be used to protect personalization and personalized features can protect datapages.

All design motives and security features we integrate in documents are fully compliant with the ICAO doc 9303 specifications and supplements. They also integrate the best practices to secure and protect the document from forgery and counterfeit.

Our design approach is based on years of experience of documents in the field, feedback received from professionals and end users using the documents, from the cooperation with security experts and forensic laboratories, as well as the expertise of our dedicated engineers.
Verification of documents

Security features can help in verification by providing intuitive and easy to verify elements that are visible with the naked eye or by touch (tactile effects) and which protect both the document structure and personal data.

The objective is to help an Immigration or Border Control Officer to answer two main questions. A third one can be answered by fingerprint matching or facial recognition.

- Is the document genuine?
- Is the citizen’s personal data authentic?
- Is the person present the true owner of this document?

Pyramid of security levels

- **Level 4**
  - Laboratory
  - Taggant
- **Level 3**
  - Specific, sophisticated equipment
  - Digital Watermarking
- **Level 2**
  - Simple equipment
  - Microprint
  - UV
  - Micro-controller (BAC)
- **Level 1**
  - Bare eye
  - DOVID
  - Guilloche
  - Rainbow printing
  - Tactile
  - CLI/MLI
Cover

The cover features an embossing in the shape of butterfly on the front side. This means that just by holding the passport handed over by the traveller, an officer can verify the authenticity of the document with a first tactile level of security.

Electronic cover

The cover can include a secure micro-controller and is known as an e-cover.
The physical security of a passport booklet relies strongly on the technology of its paper – its core component. Paper pages make up the bulk of the booklet: in the cover and end pages (glued to the inside of cover), as well as the pages that hold the visa and entry and exit stamps. And for those that have not yet migrated to polycarbonate, paper forms the basis of the datapage, which includes the holder’s personal details and portrait.

Gemalto has acquired in-depth know-how on paper technologies as it has been delivering passports and ePassports since 1987. The company has an even longer history of security printing activities including banknotes, stamps and bonds.

Effective paper design includes burning the document number through every single page, using laser technology. This means going through all the visa pages, as well as the back cover. These numbers comprise small conical holes, the size of which varies according to the page number, making it even harder for counterfeiters to swap pages.

What is Intaglio printing?
A technique known as Intaglio printing provides another powerful security tool. At Gemalto, it typically incorporates latent images that can only be seen when viewed at particular angles. Furthermore, Intaglio printing has a distinctive feel to it. This is immediately recognizable not just to those responsible for checking the document’s authenticity, but the wider public too.
Inside Cover

The inside cover paper includes many security printing features. The inside cover paper is usually thicker than the visa paper sheets. We use solvent reactive inks in the background design.

**Intaglio negative micro text:**
Similar negative microtext as with offset, where characters are openings in a solid background

**Intaglio:**
Provides a thick printed pattern that can be detected with fingertips

**Colorless Intaglio on top of offset print:**
Create a unique color shift effect, which can show slight animation

**Relief printing**

**Intaglio + OVI:**
Optical variable ink whose color changes when the document is tilted or rotated

**Positive micro text:**
Standard positive microtext as of any text

**Two color Intaglio with latent Image:**
A latent image is an intaglio printed element that may even be invisible when looked at directly from on top of the image but that reveals an image when tilting the document
**Perforated document number:**
laser perforation of passport number through booklet

**Blind Embossing**
on top of UV offset print

**UV Rainbow**

**Colorless Intaglio on top of offset print:**
create a unique color shift effect, which can show slight animation

**Micro text**

**UV Rainbow color**
with visible paint

**Blind Embossing on top of UV offset print**
Visa Pages

Visa pages certainly offer the opportunity to create unique travel documents that become works of art and symbols of pride in the hands of millions. We’re proud to have succeeded in designing some of the most secure and attractive passports to appear in recent years.

**Guilloche page number in background:**
Guilloche printing is a part of secure background printing where continuous thin lines and compact areas are formed using multiple colors, which makes them impossible to copy with common copy machines.

**Special raster:**
detailed dot structures are very difficult to scan and are impossible to reproduce using any normal printers. The appropriate software and algorithm generating the initial image are difficult to come by.

**Butterfly movement frame animation:**
The movement of the butterfly is visible when turning pages.

**Rainbow color micro text background:**
invisible rainbow UV print has one guilloche line with microtext included.

**Negative micro text with deliberated error:**
a deliberate error (level 3 feature) is included in the microtext.
We offer extensive experience and support enabling our customers to meet their design expectations for distinctive passports as secure as they are attractive.

When designing visa pages, we advise to create a different design for each page in such a way that it allows for visual detection in case of page substitution. We also suggest to use a different background printing for inside cover pages, the data page and the visa page with a minimum of 4 colors.

**See-through:** See-through registration is a printing method that consists in synchronizing the printing of an artwork for each side of a same paper page (recto and verso) in such a way that unprinted geometric patterns of the artwork are perfectly aligned.

**Guilloche UTO letters in background:**
This is a design feature, “UTO” letters have been embedded in the guilloche background artwork by changing the linewidth and distances between guilloche lines.

**Edge text effect:**
High accuracy when collation of visa pages enables edge text effect. This is a proof of high quality booklet manufacturing process.

**Floating pagination:**
the page number is sequentially placed in variable locations.

**Modulated lines image:**
This design feature is an image which is embedded in the guilloche background pattern by changing linewidth and distances between single guilloche lines.

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The security industry is constantly engaged in research and development activities aimed at developing new and innovative security features using polycarbonate. Recent innovations, such as color laser personalization as well as enhanced visual and tactile effects, are giving additional opportunities to government authorities and national printers to seriously consider this enhanced polycarbonate environment for their document projects.

Gemalto offers polycarbonate datapages for the highest level of security and the use of innovative security measures combining electronic, optical and visual features. Made of 100% polycarbonate, Gemalto Datapage offers a long lifespan ensured by fused polycarbonate material with an integrated hinge and tamper-resistant laser engraving personalization.

Built-in, leading-edge security features further reduce the risk of falsification.

Data page hinge - superior passport handling
Gemalto Hinge is durable and made of woven fabric, securely integrated into the polycarbonate body. It is irreversibly and securely attached to the datapage and booklet. Gemalto Hinge is highly robust and flexible; the booklet stays open and closes completely.

We manufacture polycarbonate datapages for several customers, including the governments of Azerbaijan, Czech Republic, Denmark, Finland, Hong Kong, Latvia, Malaysia, Norway, Luxembourg, Singapore, South Africa and Sweden. High durability and resistance to fraud are the chief reasons why authorities have placed their trust in our technology.
**Edge sealer:**
laser marking on data page edge

**IR visible printing:**
infrared inks

**Dynaprint:**
Gemalto Dynaprint is a printed element combined with a CLI/MLI lens. The image changing effect becomes apparent when tilting the document from one angle to another

**Tactile laser engraving:**
Tactile laser is a relief effect created with laser during laser engraving personalization

**Embedded transparent DOVID:**
Diffractive Optically Variable Image Device embedded inside the polycarbonate document

**Window Lock:**
secondary image personalized into metallic substrate in transparent window by laser ablation personalization process

**LFI Latent Filter Image:**
The element is integrated into the polycarbonate document and changes its appearance under different viewing angle. This effect is generated by a filter which is integrated into the document body

**OVI:**
Optically Variable Ink

**Security background printing:**
incl. rainbow printing, guilloches, micro lettering and special rasters

**Number perforation:**
laser perforation of passport number through data page and booklet
Polycarbonate data page (other example)

UV printing

True Vision:
True color UV image
Gemalto Color Laser Shield

Built-in photo security

Gemalto Color Laser Shield is a unique solution for securing a color photo within a polycarbonate ID document. Powered by four color lasers hitting a special ink in the document’s inner structure, this new issuance solution achieves the highest levels of resolution and counterfeit protection.

Fitting seamlessly with governments’ issuance workflows, it uses blank documents uniquely protected against fraudulent personalization.

The unrivalled security performance delivered sets a new benchmark in laser personalization solutions.

Gemalto Color Laser Shield documents offer numerous benefits:

- Reduced fraud due to technology barriers
- Simple verification
- Seamless integration
- Compliance with best practices
- Gemalto Color Laser Shield is available for cards and passports, as well as high security printers.
Exciting innovations from Gemalto

3D Surface

Embedded into the polycarbonate document’s surface, 3D Surface offers perceptible features such as surface embossing or braille, with unmatched accuracy.

It is designed to counter new methods of forgery on existing security features such as adding an additional overlay on top of the data page.

Window Lock - A new dimension in photo protection

Window Lock prevents the bearer’s portrait from being tampered with after issuance. This patented feature comprises a secondary portrait image known as a ghost image. It is personalized using a metallic foil by means of laser ablation, whereby the metallic foil is integrated into a window inside the polycarbonate card body.

Window Lock benefits

- Delivers unique inverse personalized ghost image stamped into metal foil and integrated into a transparent window
- It is not possible to add further dark image information through subsequent laser personalization after it has been issued
- Prevents simultaneous tampering of primary and secondary image
- Generates high-resolution metal ablation personalization with standard laser engraving equipment
- Creates an easy-to-verify first-line security feature
Edge Sealer - At the cutting edge of document security

Edge Sealer provides strong protection against delamination, tampering and cutting attempts. Laser-engraved marking on the polycarbonate datapage edge is performed using a specially designed machine. It is impossible to copy (using a photocopier or scanner) and very difficult to mimic or reproduce due to the special expertise and technology required. The markings are visible to the naked eye (Level 1 security feature) and details can be verified with a magnifying glass (Level 2 security feature).

Gemalto Datapage 700e - One of the world’s thinnest polycarbonate electronic datapages

With a thickness close to 750 microns and the ability to include all Gemalto innovative security features, Datapage 700e offers improved flexibility over current products in the market, while maintaining mechanical robustness and strong fraud resistance. It enables a better opening and closing of the booklet.

Gemalto Laser Engraved Floating Image (LEFI)

LEFI is a level 1 security feature comprised of personalized images that both float/sink and switch. It shows dynamic movement and clear switch when tilting the document. This eye catching feature protects both document and holder data and is easy to verify.

Unleash design creativity with multiple translucent areas in the datapage

This structure takes a complete 3D approach to design and gives a boost to security features. This new level 1 security feature offers enhanced document security.

Encoded Guilloches for visual and machine inspection

Now offering easy to use machine readable feature. It facilitates the automated verification of the document authenticity therefore facilitating passport verification at borders in a secure way. It’s easily verifiable with a document scanner.
Gemalto True Vision: Now you can see True Vision is a design and security element for polycarbonate datapages as well as paper datapages, and for page 3 or visa pages of booklets. True Vision implements images invisible under normal daylight that turn into brilliant true-color images with excellent color reproduction at under 365 nm UV exposure. The high-resolution images comprise UV fluorescent inks with advanced color separation and half-tone printing. Customer-specified true-color UV images can be integrated into the document design.
Virtual passport

The Growth is not sustainable with existing infrastructure and processes: air traffic is doubling every 15 years. With a virtual passport, a traveller’s identity and biometrics data would be stored in a cloud, so passengers would no longer need to carry their passports and risk having them lost or stolen.

Digital Travel Credentials are rapidly becoming a hot topic worldwide, gaining support from the International Civil Aviation Organization (ICAO).

Let’s consider two examples to understand the power of such initiative and understand why cloud passports or more precisely Digital Travel Credentials can be ideal companions to physical documents.

You lose your passport while on travel

Your consulate or Embassy could activate on your mobile phone a digital copy, retrieved from the Government Passport Agency’s servers, so that you can cross borders.

Data in the mobile phone is signed using the same certificate than the data stored in the chip of the passport booklet that you lost, providing a much better level of security than most emergency travel documents (usually a piece of paper with some basic security features, and manual issuance in a Consulate).

You apply for a visa

You must often visit a Consulate to apply for a visa, since you must give your passport for the visa to be issued in the visa pages of the booklet.

With Digital Travel Credentials, passport data could be transferred directly between the applicant’s passport issuing authority and the visa office. This speeds up the process for both the visa office and the applicant, while allowing for higher level of confidence in the data provided.

With the next version of the ePassport specification (LDS2), it will even make it possible for the applicant to securely download the visa from the visa office in its passport, using a mobile phone, for faster check at point of entry in the country.

Thales is actively involved in the standardization committees of ICAO and the International Organization for Standardization (ISO), which allows us to rapidly integrate all new protocols for the benefits of our customers.

We believe it is our mission to report and share trends and best practices from around the world.
About Gemalto

Gemalto, a Thales company, is a global leader in digital security, bringing trust to an increasingly connected world. We design and deliver a wide range of products, software and services based on two core technologies: digital identification and data protection.

Our solutions are used by more than 30,000 businesses and governments in 180 countries enabling them to deliver secure digital services for billions of individuals and things. Our technology is at the heart of modern life, from payment to enterprise security and the Internet of Things.

We have built a unique portfolio of technology and expertise including physical and digital identity credentials, multiple methods of authentication – including biometrics – and IoT connectivity as well as data encryption and cloud service protection. Together, these technologies help organizations protect the entire digital service lifecycle from sign-up to sign-in and account deletion with data privacy managed throughout.

Gemalto is part of the Thales group, a €19bn international organization with more than 80,000 employees in 68 countries worldwide.