

#### Advanced Materials & Security Features in Identity Documents

#### Agenda

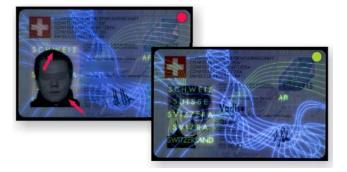
- General Identity Document Requirements
- Types of Materials for Identity Card Documents
- Polycarbonate Card Security Features
- Polycarbonate Data Pages in Passports
- Bringing Color photo to Polycarbonate documents
- × Summary



## Threats to document security

- X Counterfeiting a complete document
- Photo substitution
- Manipulation/alteration of bio-data
- Theft of genuine document blanks
- Impostors (assumed identity; altered appearance)







# Security levels

#### Level 1 (overt)

Verification without aids

Basic security with central and complementary **Level 1** Security Features

#### Level 2 (covert)

Simple equipment such as UV lamp or a magnifying glass

#### Level 3 (forensic)

X Specific laboratory equipment or knowledge

#### Level 4 (forensic)

Verification only by the document manufacturer

Additional security with a set of **Level 2**Security Features

Enhanced security with a few **Level 3** features

Proof with one Level 4
SF



## Document security is subject to four key aspects

#### Document material

maintain document integrity

#### Security features

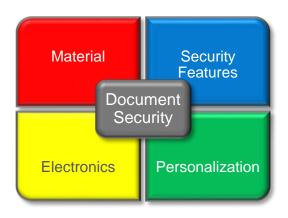
x safeguard optical information and protect from document manipulation

#### Personalization technology

secure and durable integration of card holder data

### Integrated electronics

biometric data on microprocessor



## Range of Card Bodies in Identity Documents

#### Premium PC



- Polycarbonate card
- X Highest security
- × 10 year durability
- Greyscale laser engraving with highest contrast

#### Color in PC



- Polycarbonate card
- X Highest security
- × 10 year durability
- X High resolution color laser photo inside card

#### PET



- × PET-F/PVC card
- X High security
- ★ 5-10 year durability
- Color photo on card surface

#### **PVC**



- × PVC card
- X Basic security
- ★ 3 year durability
- Color photo on card surface



## Global Approach to Security Threats

- Identity protection in today's world cannot be accomplished with software alone.
- It requires a holistic approach that adopts both digital and analog solutions for the physical world.
- Technological advances, like polycarbonate for secure documents cards, are helping prevent identity attacks and are better preparing law enforcement to catch fraudsters.
- Polycarbonate card bodies for ID documents and passports are providing a layered security approach to physical documents making them more complex to counterfeit.





## What is Polycarbonate?

- Thermoplastic polymers containing carbonate groups in their chemical structures
- × Excellent molding and thermoforming properties
- X Some grades are optically transparent
- X Used in many applications
  - X Motorbike Helmets
  - ★ Bullet-resistant glass
  - X Eye protection equipment
  - X Mobile phones and computers
  - Jetfighter canopy

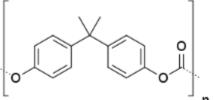






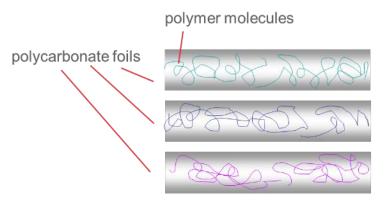


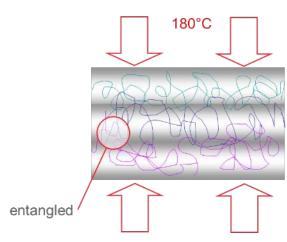




# Security & Durability

- Polycarbonate documents are made up of layers of plastic that overlap and intertwine
  - It is impossible to separate the layers of polycarbonate, which are fused together using temperature and pressure.
- This layering process is one of the reasons that polycarbonate is so secure
  - The intertwined layers of plastic make it nearly impossible to swap out document information or photos without completely destroying the document and rendering it useless.
- This makes the document body much more secure than other available materials.





# Polycarbonate - A Stronger Document Material

- 100% polycarbonate layers
- Fused under heat and pressure
- No adhesives used
- Highest resistance against mechanical, chemical, and thermal stress
- Highest robustness against delamination or splitting
- Highest resistance against chemical or mechanical attacks
- Highest resistance against other counterfeit attacks (e.g. substitution of data page, microcontroller replacement, etc.)
- Long life-span of document body, 10 years under normal use





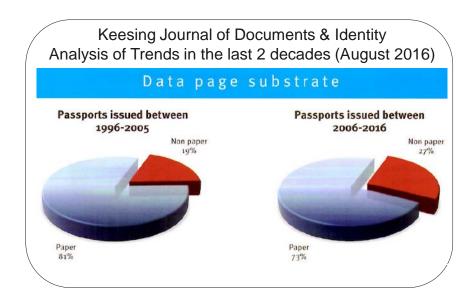
# Polycarbonate has won the trust of governments

- Introduced over twenty five years ago, polycarbonate is an increasingly popular choice in many countries across the world
  - × 1989 first identity document (Finland Driving License)
  - × 1997 first passport (Finland Passport)
- Over 40 countries have chosen it for their national identity or residence permit programs
  - X Mandatory for driving license in the European Union
- Over 40 countries have chosen it for their passport datapage
- X PC is unique in supporting highly fraud-resistant security features



## Migration to Polycarbonate

- Migration to Polycarbonate decided for
  - X Australia (2019)
  - ★ Germany (2017)
  - × Japan (2023)
  - × UK (2019)
  - × USA (2017)
- Strong signals pointing to migration to Polycarbonate
  - × Bangladesh
  - × Pakistan
  - South Korea
  - × Taiwan





## Polycarbonate has a large selection of security features

- DOVID Diffractive Optically Variable Image Device
- CLI/MLI Changeable/Multiple Laser Image
- Dynaprint
- OVI Optically Variable Ink
- **LFI** Latent Filter Image (not shown)
- UV and IR Printing
- True Vision
- Security background (guilloche/rainbow)
- Secure Surface elements
- Tactile laser engraving
- Window / Window Lock
- Micro lettering
- Serial number
- Edge Sealer
- MR7 Machine Readable Zone





# DOVID - Diffractive Optically Variable Image Device

- X Different technologies and designs available (transparent and metallic)
- Protection of personalized data against manipulation or substitution.
- × Protection of document body against copying or duplication



Transparent DOVID's (e.g. Kinegram®)



Zero-order DOVID's (e.g. DID®)

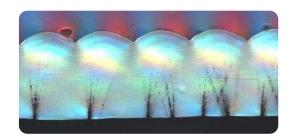


Metallic DOVID's (e.g. Kinegram®)



# CLI/MLI – Changeable/Multiple Laser Image

- X Lenticular lens structure
- Laser engraving of different holder data (e.g. date of birth, ghost image)
- Image flipping effect when tilting the card
- Strong protection of personalized data
- X Enhanced security in combination with Sealys Secure Surface
- X Easy to verify









# Dynaprint – Optically variable printed image

- X High resolution fine line printing of different images
- Combination with CLI/MLI lens.
- Image flipping effect under different viewing angles
- Strong protection against document reproduction or duplication
- X Easy to verify





## Latent Filter Image (LFI)

- Multiple fine line patterns printed on different card layers creates a latent image
- Optically variable effect thanks to integrated printed filter
- Image changing effect when tilting the card (light to dark and vice versa)
- X Strong protection against document reproduction or duplication
- X Easy to verify





#### True Vision

Attractive security and design feature for polycarbonate documents

- X High resolution true-color images visible under 365nm UV exposure
- Excellent color reproduction and high brilliance

X Enhanced document security due to underlying image processing

algorithms

Protection against duplication or reproduction

X Hard to copy or imitate





## Window – Eye-catching document protection

- X Visually attractive first line security element
- Easy to understand and verify
- Safeguards against grinding attacks, copying or reproduction
- Integrated with the document in combination with other security features:
  - tactile surface features
  - × security printing elements
  - personalization features





## Window Lock – New dimension in photo protection

- X Metallic substrate integrated into transparent window
- Metal ablation by laser of secondary "negative" portrait
- Protection of card body and holder portrait
- Not possible to add additional dark image information by subsequent laser marking
- Prevents similar alteration of primary and secondary card holder portrait
- X Easy to verify

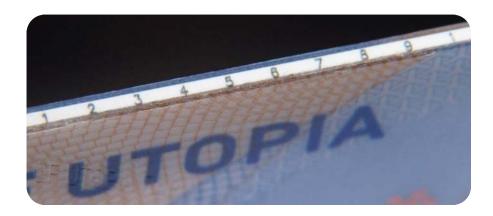


metal ablation laser engraving negative

halftone

## Edge Sealer – Cutting edge document security

- Laser engraving on document edge
- Pre-personalized feature made in manufacturing with generic or document specific data, e.g. serial number
- X Ensures complete integrity of document structure
- Difficult to forge and copy
- Offers level 1 and 2 security

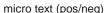




#### Secure Surface

- Tactile elements on document surface: positive and negative embossing, microtext, 3D features, braille...
- X Enhanced security with brand-new effects: movement, light reflection
- X Flexible design options
- Simple verification by touching, looking and tilting



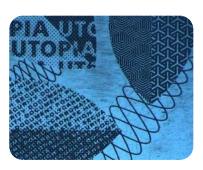




halftone images



3D Relief



various designs

















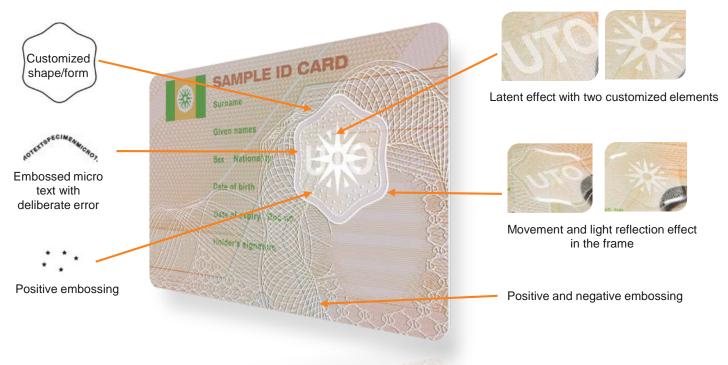






#### Surface Sealer

#### Combined Secure Surface effects for advanced portrait protection





#### Surface Sealer

- Combines different Secure Surface effects: movement, latent effect, light reflection
- Contains level 1-3 features
- High positive embossing prevents adding a foil with a modified photo
- Tamper-proof against attacks from front and reverse side
- X Easy to verify thanks to eye-catching effects
- Enhanced security for documents without DOVID







# High security document design and printing

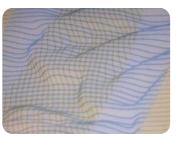
- Guilloches
- X Rainbow printing (A-B-A)
- Micro lettering (positive/negative)
- × Relief printing
- Special raster printing
- Variable line width



Micro lettering



Special raster printing



Relief printing



Variable line raster



# High security inks and printing

- X UV fluorescent inks / UV bi-fluorescent inks
- X IR visible and invisible inks
- X IR up-converting inks / anti-stokes inks
- ★ OVI Optically Variable Ink
- × Pearlescent ink



UV fluorescent inks with bi-fluorescence



IR visible and invisible inks



OVI



Pearlescent ink



#### Personalization features

#### Safeguarding personalized card holder portrait and data

- X Tactile laser engraving
- × ImagePerf
- × PhotoLock
- X IPI Invisible Personalized Information



Tactile laser engraving



ImagePerf®



Photol ock™



 $IPI^{TM}$ 

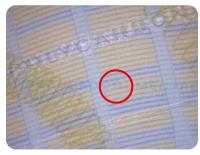


### Level 3 security features

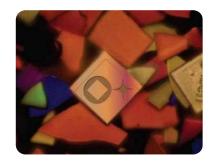
- ★ Deliberate errors in design
- × Microparticles



Pattern error



Character substitution in micro lettering



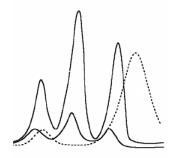
Charms microparticles



### Level 4 security features

- ★ Chemical marker / spectrometric taggants
- X Only verifiable by document manufacturer







## The various components of a Passport

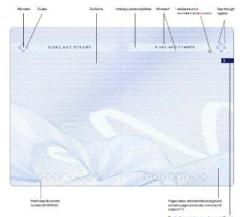
Covers with customer specific gold foiling



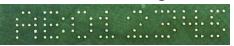
Paper (watermark, security thread)



Customized thread: Several single threads with UV reactive properties Inner cover paper/end paper

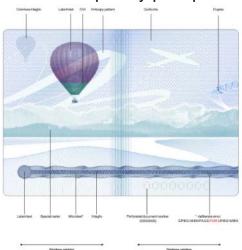


Numbering





Microcontroller either in the cover or in the data page Visa pages: Number of pages is typically 32. As little as 8 in temporary passports



Data page (paper or polycarbonate)



#### What is a Booklet?

- All passports are consisting of these parts:
  - X Covers with customer specific gold foiling
  - × Paper for security printing

  - Inner cover paper / end paper
    Title page (the backside of the data page)
    Data page (paper or polycarbonate)
    Visa pages (number of pages is typically 32, but in temporary passports it can be 8)
  - X Customized book binding thread (several single threads with UV reactive properties)
- Passport book physical dimensions are defined in the ICAO doc 9303:  $88mm \pm 0.75mm \times 125mm \pm 0.75mm$
- × In contactless passports there is also a contactless inlay included in the passport
  - X Embedded in the cover
  - Or embedded inside the plastic data page





#### What is a Datapage?

- × Datapage
  - X Holds the biographical data of the holder
  - × 2 materials: paper



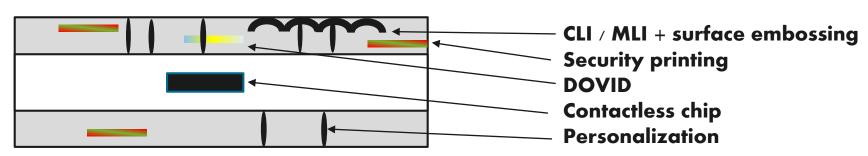
#### or polycarbonate





#### Multi-layered structure of the datapage

- Personalized layers separated by a non-laserable transparent layer in between.
- Part of the printing is between the laser layers and visible printing deeper from the surface and closer to the white core.
- X Any attempt to manipulate such personalized information would evidently destroy the printing.



#### What are eCover and Inlay?

- × Inlay
  - Module and antenna housed in synthetic paper inlay for gluing onto cover before book binding
  - × 2 materials: Teslin or paper



- × eCover
  - Microcontroller and antenna housed in inlay and attached to cover
  - × 2 materials: textile or paper



#### What is the Hinge?

- X Attaches the datapage to the booklet
- X The Hinge is durable and made of woven fabric, securely integrated into the polycarbonate body





### Hinge partially integrated inside the datapage

- X Hinge is inserted in the data page but does not go across the full length, so that it does not create weakness in the structure and facilitate slicing.
- In theory, you may have an attack angle with integrated hinge Vs external hinge, but when fused properly, it does not weaken the structure, opening the door to easier slicing. Some feature holes in the hinge material for better adhesion of PC layers during lamination.
- X Tamper evidence is most visible when the hinge has a visible area between the databage and the stitching.
- Many of the hinges include tamper evident features
  - UV printing and/or UV threads in the fabric
  - × Precisely aligned pattern,
  - Combination with offset printing which will be destroyed when removing the datapage
- 21 countries are using such a product



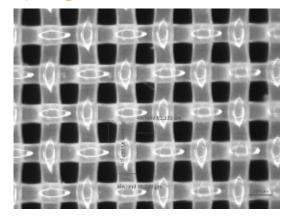
## Hinge partially integrated inside the datapage

Malaysia



Latvia





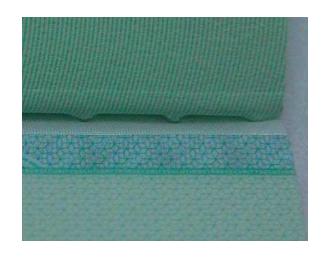
Czech Republic





#### Hinge Attachment

- Hinge strongly attaches through the datapage and booklet
- A focal point for attacks:
  - Remove the datapage and integrate with another booklet
  - Counterfeiters can use hinge to alter document holder data
  - So hinge must be durable and leave visible marks for any tampering attempt
- X Added before lamination process



#### Which security features can be incorporated into a Hinge?

- VisiFab PRINT
  - Printed fabric visible under daylight or 365nm UV
  - × Configuration
    - X UV blue ink
    - X UV red ink
    - Visible ink (customer specific qualification)
- X VisiFab UV
  - Fabric with interwoven fibers visible under UV light
  - Option to either print equidistant lines for balanced design or irregular line spacing for stronger resistance to fraud
- VisiFab PRINT and UV features can be combined









#### **Booklet Serial Numbering**

- X Numbers are burned through all the pages with laser technology
  - Brownish marks are left around the holes as laser is burning the paper, which is also considered as a security feature
- X Numbers are composed of small conical holes
  - The hole size depends on the page number, making it more diffic pages



- X Hole shape can be variable, either circular or specific shapes
- Usually 2 letters + 6 or 7 digits
- Perforation goes through all visa pages and also through the back cover rforation





#### Swedish ePassport: Protection through Duplication

## INFOSECURA

A magazine for the security printing industry worldwide, published four times a year on behalf of the International Security Printers Section by Intergraf, the International Confederation for Printing and Allied Industries, Brussels and mailed to named members of the security printing community, such as security printers, banking and police organisations, suppliers, and customers in 196 countries.

The new Swedish passport is not so much remarkable for its graphic design, which is pleasant and together with the UV features, rather witty, but nevertheless restrained in a Scandinavian way, but for the wide array of security features it contains. The six portraits of the holder will make it exceedingly difficult and expensive to counterfeit and to alter. And the clever and visually pleasing UV features will make it easier for border guards to verify whether the whole book has been counterfeit, because these features are very memorable. Which of the many features will be primarily used and checked on border crossings will only be determined in time in the field.









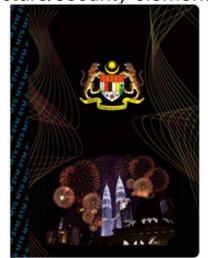
#### **Graphical Artwork**

- Passports combine security and national pride
  - Passport conveys a sense of pride for the holder
  - Passports are usually patriotic-themed and tell the story of the Country
- Graphical experts create unique design

From the real photo....



...To the reproduction in a UV picture/security element





#### Color in PC Datapage

Color in PC Datapage offers high quality color photo personalized by laser inside polycarbonate card



Superior color photo personalization:

- ★ high resolution → outperforming competing technologies
- ★ best protection → integrated,
  - overt. covert and forensic security elements

#### Color laser personalization

YAG laser engraves black components and text
Red laser bleaches cyan pigments
Green laser bleaches magenta pigments
Blue laser bleaches yellow pigments



- Standard architecture for laser personalization
- Enhanced with color lasers
- X No consumables



#### Blank documents with high fraud resistance

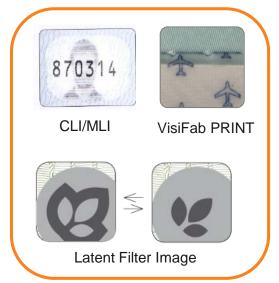




- Black panel protects against thefts during transportation or storage
- High barrier against personalization of genuine stolen documents:
  - Photo cannot be printed on top of a black panel (photo would be blackened)
  - Secure Surface prevents against black panel removal attempts
  - Color lasers not available on commercial market
  - Specific expertise and dedicated software needed to personalize photo



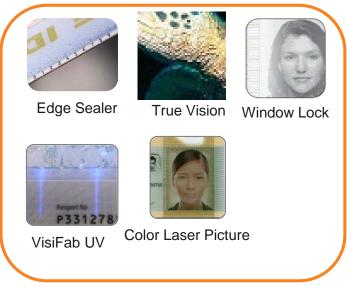
## Packaging coherent features



Minimum recommended set of features



Additional set of features



Advanced set of features

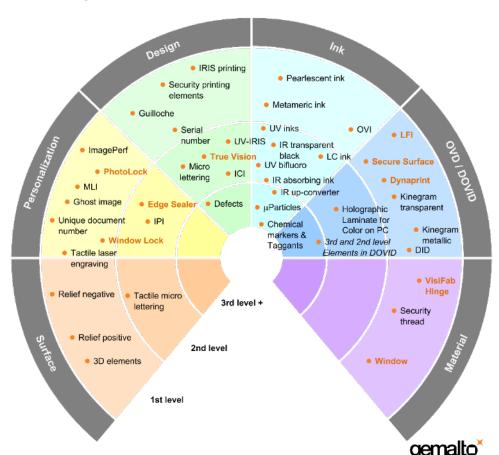
X	On top of the basic features recommended by ICAO,
	we recommend a polycarbonate datapage with a
	minimum set of features and with some features out
	of the additional and advanced sets

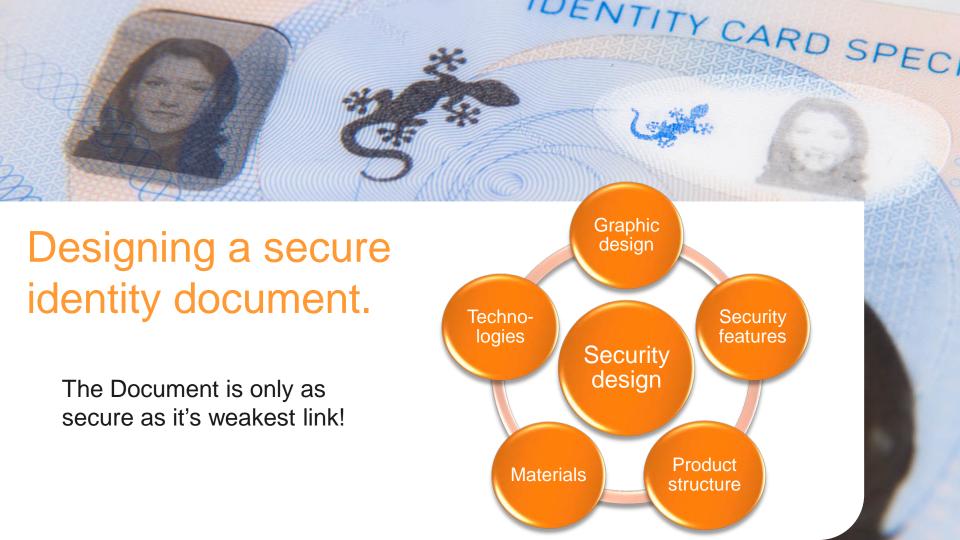
Focus on protecting portrait through secondary image and the hinge

	Minimum set	Additional set	Advanced set
Picture	Secondary image in MLI/CLI	Secondary image in clear window	Secondary image in Window Lock
Hinge	VisiFab PRINT		VisiFab UV

#### Choose the best protection for your document

- Select security features from a wide range
- Ensure a balanced integrated security concept
- Cover all dimensions of document and protect against various threats





# Thank you

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