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ASPA®

Authentication Solution Providers' Association
Diverse technologies, common goal.

SUPPLIER
DIRECTORY

Authentication & Traceability

FOR PRIVATE
CIRCULATION ONLY

Contents

Executive Summary

About the Document

ASPA is building up innovative tools to help policymakers on the need for action and legislation in fighting counterfeiting. One such initiative is the Authentication & Traceability Supplier Directory.

The document is first of its kind document prepared by ASPA in Indian scenario to assist the stakeholders with key technologies available across the globe within authentication industry in order to fight against counterfeit. The document provides knowledge on Overview of technologies, definitions and meaning, advisory for selection of authentication vendor along-with technology provider listing available in India.

Purpose of the Document

Counterfeiting activities are impacting socio-economic development across the globe and becoming one of the critical hindrances to achieving sustainability goals target set by UNO, including removal of poverty, education to all, etc. A global menace, the problem of this magnitude cannot be solved overnight; perhaps, a preventive step is what all we need. The problem is the increasing lack of awareness amongst stakeholders and requires an integrated Anti-Counterfeiting proactive approach from all agencies.

We strongly believe Authentication & Traceability technologies/solutions/systems is a critical and useful tool in the fight against counterfeits and illicit trade. Every industry and product have their needs, not only regarding the levels of security the solution offered but also their economic viability.

With this, we hope that this first edition will help brands, governments and institutions understand how products can be protected and how these solutions can best be integrated to allow a wide range of stakeholders to disrupt illicit networks actively. We hope it will become a valuable source for those considering the adoption of authentication & traceability technologies, solution & systems.

How to Read this document

Today many authentication technologies are available across the globe and most of them are listed in this document. To understand them according to your requirement, we suggest you to first consult the chapter on Overview of Authentication & Traceability Technologies, Solutions and Systems for through understanding of the document.

Next edition

We intend to update this report on a Bi-annual basis and add case studies by those profiled as they become available. Although, we have listed most of the technologies and definitions, perhaps, in case if you would like to add or suggest any one, please do write to us. All suggestions for improvements and observations on errors are welcome at info@aspaglobal.com

Puneet Maithani

(Associate Director - Industry Affairs)
ASPA

Overview of Authentication Technologies, Solutions & Systems

Authentication

Counterfeiting activities are impacting socio-economic development across the globe and becoming one of the critical hindrances to achieving sustainability goals target set by UNO. Including removal of poverty, education to all, etc. A global menace, the problem of this magnitude cannot be solved overnight; perhaps, a preventive step is what we need.

With the advancement of desktop publication & smart scanning technologies, it is becoming easy for counterfeiters to replicate product labeling. The problem is the further aggrecated in absence of awareness amongst stakeholders and requires an integrated Anti-Counterfeiting proactive approach from all agencies. Even an expert cannot identify the difference between fake vs. genuine products.

In this scenario, authentication technologies have played an essential role in combating counterfeiting. Every industry and product have their needs, not only regarding the levels of security the solution offered but also their economic viability.

Today, there are various number of authentication technologies available in the market, although all these technologies are applicable and provide protection in the three main areas;

- Anti-Counterfeiting
- Anti-Tampering, and
- Track and Trace

Anti-Counterfeiting

The common feature of anticounterfeiting technologies is that they are extremely difficult to counterfeit. Consequently, they help in identifying a genuine product. Based on the authentication requirements, such technologies may consist of overt, covert and forensic features, or a mix thereof.

Anti-Tampering

Such solutions are found more in the food and pharmaceutical industry where there is a need to protect a product from adulteration or replacement. An intact anti-tampering feature is the consumers' assurance that the contents are genuine and not tampered or adulterated.

Track and Trace

Track and trace technologies use mass serialisation to provide a unique identity to each SKU. The IT technology then allows tracking on each SKU through customised software that allows an authorised user to track the movement of this SKU across the entire supply chain. As authorised, each user may also be able to access additional information about the product such as manufacturing date and factory, expiry date, the market such SKU is for etc.

According to inspection level (human / tools), these technologies fall into categories, either overt, covert, forensic or digital.

Overt

Overt technologies are authentication devices built into labels, documents and packaging which are visible to the user and show dynamic visual effects. Their main advantage is the fast and easy, on the spot, visual authentication where no additional devices are needed.

Overt features fulfill three main criteria;
• Communicate with the verifier
• Be easy to identify
• Be hard to copy and imitate

Physical secure solutions offering overt features include Fineline design, security guilloches, holograms, optically variable devices (OVDs), watermarks, colour-shift and thermochromic inks, threads, foils and laminates, embossable and laser markable films and security papers.
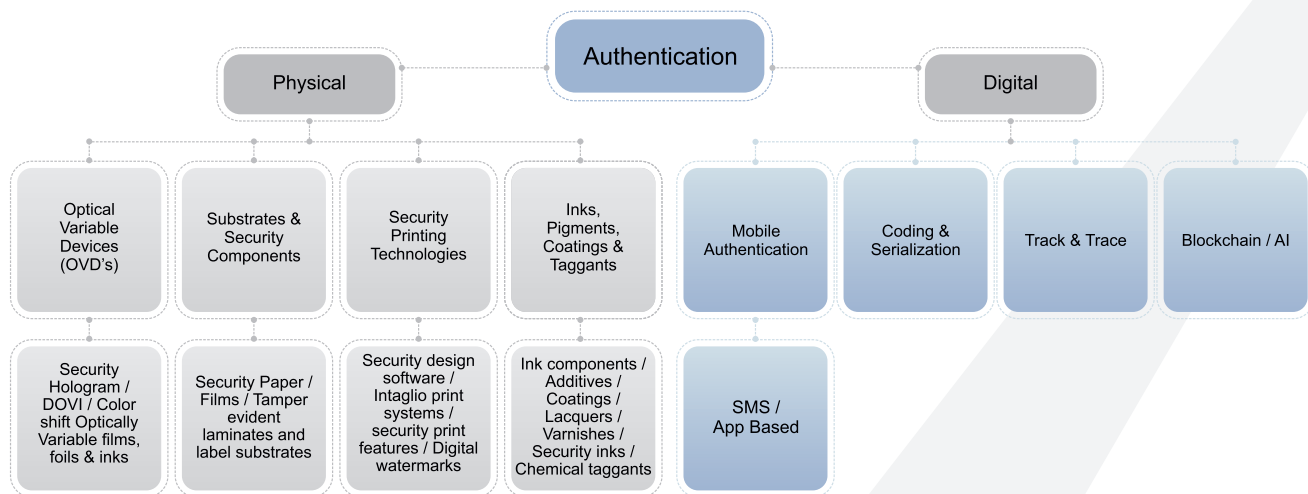
Figure: Authentication technologies

Overt features can be made secure by combining them with more covert, forensic and digital features. As Overt are used for identification verification by the consumer, and (Verification by a predetermined Covert device or a tool) can be used by manufacturer or their channel the partner for an advanced level of authentication and verification. The third level is highly sophisticated and can be used forensic experts and can be useful by to law enforcement and for evidence in case of litigation.

Covert

Covert technologies are not instantly recognisable. They require a reader or detector to be able to special their presence and validity, and verify people using covert technologies will normally require training. Covert technologies include ultraviolet and infrared micro text, unique synthetic tagging inks, etc.

Forensic

Forensic technologies, being covert, are not readily recognisable and special tools for detection and require validation. Whereas covert technologies can be detected and validated in the forensic technologies must often field, taken to a laboratory with specialisedbe equipment.

Digital

Digital technologies may be either overt or covert, but all require an electronic means for detection and Digital technologies are most validation. associated with RFID tags or with numbers that can be compared serialised to a remote database.

Authentication and Traceability Definitions & Meaning

A

Active Security Feature: Characteristic used to identify an original document by sight or touch. See also Passive Security Feature.

Alphanumeric: A character set that contains letters and numbers.

Algorithm: An iterative mathematical procedure used to combine information to create a cipher or secret code. The basis of many proprietary coding systems.

Alphanumeric code: Human - readable code format that may contain both letters (A-Z) and numbers (0-9). The increased number of permutations therefore allows data to be encoded with fewer characters than if only numbers are used.

Antibody detection: Authentication technology based on the affinity (binding) between small molecules (marker) added to the product or its packaging during production, and a protein (the antibody) added during the test.

Anti-counterfeiting technologies: Technical measures designed to prevent or detect counterfeiting. Not synonyms with "track and trace technologies," which may be for purely supply chain and logistic purposes.

Anti-Scan/Anti-Copy pattern: Images or patterns formed by regular parallel multidirectional strokes or raster elements. When copying or reproducing such images, more appears on prints as a colourful tangle of lines, bright and dark stripes and spots, etc.

Anti-Stokes Ink: An ink which contains crystals of rare-earth metals (ytterbium, thulium, etc.) and glows when exposed to IR light of high intensity. Luminophores which glow green are the most used.

Artificial Watermark: Printed simulated watermark applied by the paper manufacturer or by the form manufacturer as opposed to a true Fourdrinier watermark produced during paper manufacturing. An artificial watermark visually simulates a true watermark but is only visible on the side where the artificial mark is applied. See also Digital Watermark and Fourdrinier Watermark.

Authentic: Real, genuine, valid of undisputed origin. Authentication is the process of confirming that a product, document or even person is authentic.

Authenticity: Validating in the sense of being unmodified or "genuine".

Authentication: The process of providing that packaging, product, or other item is (or is not) genuine. Generally divided into digital authentication (codes, databases, transaction history, etc.) and sensory authentication {holograms, inks, taggants, etc.).

> " The barcode was invented by Normal Joseph Woodland and Bernard Silver and patented in the US in 1951 "

B

Barcode: A series of vertical printed bars of controlled thickness and separation representing variable data information in a linear format. A 2D barcodes consists of a representation of solid and clear images (usually squares) in a matrix format over a specific twodimensional structure.

Biometric Identification Data: Individual identification information such as fingerprints, facial geometry, and/or geometry of the iris of the eye contained in a chip in the product (for example, in a passport.)

Bi-fluorescent ink: An ink that fluoresces at two different wavelengths.

Bi-metallic foil stripe: A security foil element that can be distinguished by having two different metals (e.g. aluminum and gold) placed next to one another

Blister pack: In the pharmaceutical context, almost always a plastic or laminate tray with separate wells for each pill or capsule, sealed with blister foil.

Background Image: An image or an ornamental pattern printed on the background. It is used as a background for other images, serial numbers, text or notes. The image prevents both full and partial forgery because it is damaged during mechanical or chemical erasure.

Bleeding Ink: A black security ink containing component which penetrates a printing substrate - pores. It colours the paper red or blue in the form of a colourful halo from both front and reverse sides. A bleeding ink is used for applying numbers in passports and travel documents by the letterpress technique.

Blind Embossing: A colorless relief image applied to the substrate by deforming the material under pressure and heat. The image is palpable and used both for paper and polymer materials. It is visible under oblique light.

Figure: Silver aluminum foil blister pack packaging

C

Casting: A method of embossing whereby a film of soft resin is applied to a nickel shim then exposed to ultraviolet light causing the resin to harden by cross linking. The resin film can now be removed and retains a faithful copy of the surface relief image that was present on the shim.

Chromium Hologram: Means any such hologram, which is a chromiumbased foil with diffractive optical variable devices incorporated

Cipher: An encrypted message representing a range of characters

Clear Window: A non-printed area of a substrate which is transparent, when viewed against the light. Clear window is used for applying additional holder's image used as a verification filter or for visualization of latent scrambled information.

Cliche printing: Transfer of ink by a pad or stamp directly onto the packaging.

Colour Shift: An optically variable effect whereby the material - usually a thin film or ink shifts from one color to another or from one colour to clear when the viewing angle is altered. See also OVD &OVI

Counterfeit: An imitation of a document, product or its packaging that is made with the intent to deceptively represent the item as the genuine article.

Covert: A concealed or hidden feature that is not apparent and can only be viewed via with special reading or lighting equipment

Closure Seal: A means of sealing a pack to prevent accidental opening. For anti-counterfeiting purposes, closure seals need to be tamper-evident and secure, or they can easily be replaced.

Coin-reactive ink: An ink that changes colour when scraped with a coin or similar metallic object.

Figure:
Color Shift Ink in
Microsoft Genuine
Windows Label
(Source: Microsoft)

Colour shift ink: An ink that reflects at two different wavelengths depending on the angle of view, with a characteristic "flip-flop" effect when the substrate is titled. Not to be confused with iridescent inks.

Cover: An outer document coating, a decoration element in the form of a sheet of a heavy paper or a board covered with a synthetic material.

Covert Laser Readable Image (CLR): A security mark (an image, symbols or text) which is invisible to the unaided eye and under a microscope. The image is visualized in laser beams with the help of special devices. It is formed when recording a hologram image using the method of the electron-beam lithography. A covert laser readable image is an area on the hologram surface which has specific microrelief of 1 micron in size and less than a micron in depth. A laser beam which is perpendicular to the surface of this area reflects from microrelief elements and forms an image on the device screen.

Cryptography: The science of encrypting information.

> In 2002, ICAO (International Civil Aviation Organisation) specified that passports should feature optically variable devices like holograms to combat counterfeiters, particularly in the wake of 9/11

D

Data matrix: A barcode consisting of many lines of linear barcodes arranged into a rectangular or square format. Its advantage is that it can carry much more information than a single, linear barcode. It is also known as a 2D barcode.

Decryption: The process of converting encrypted data back into its original form (see encryption)

Diffractive Optically Variable Device (DOVDs): The collective term for images that display complex visual effects that change according to the viewing angle, based on the phenomenon of diffraction.

Diffractive Optically Variable Image Device (DOVIDs): DOVID is a collective that describes the family of feature that includes holograms and other decices exhibiting a variety of complex iridescent images and patterns according to the viewing angle. Holograms are types of DOVID, but not all DOVIDs are hologram.

Digifeiting: The reproduction (as in counterfeiting) of documents and packaging using digital reprographic technology.

Digital watermark: A machine readable covert pattern in a digital image in either the digital or printed format. Often used to identify the copyright holder of a photograph. See also Fourdrinier Watermark

Figure:
Different types of
Barcodes
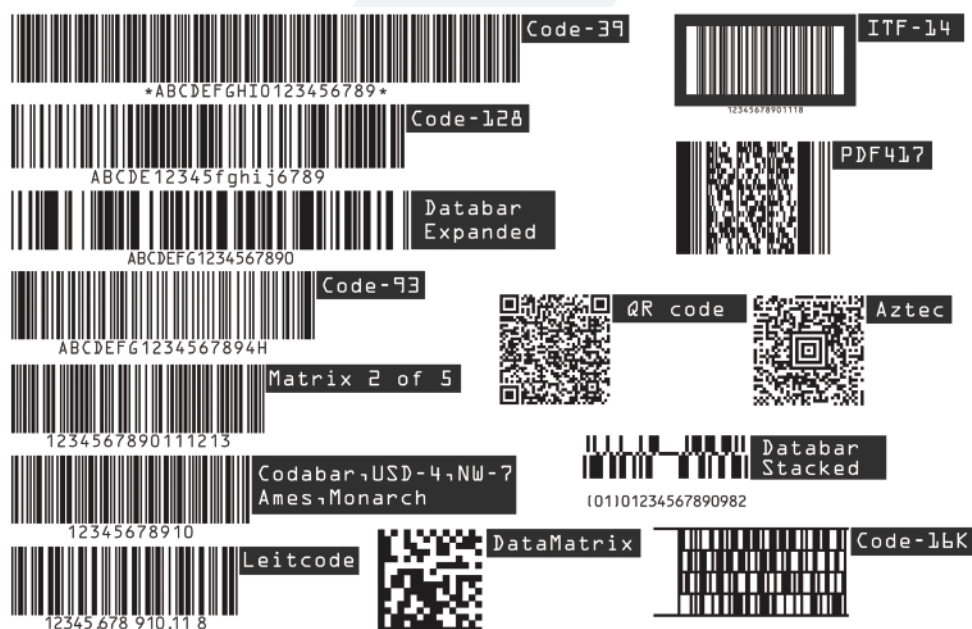
Diversion: Genuine goods distributed outside of and often in violation of authorized distribution channels (also known as parallel trading)

Debossing: Creating an image (such as expiry and batch data), which is sunk below the level of the surrounding substrate, using a die, plate, o punch.

DNA markers: Short, specific strands of DNA incorporated covertly into ink or onto a packaging substrate as taggants. The DNA can then be detected by portable kits.

Date Page: A page of a passport or a travel document on which the issuing state applies holder's personal data and the issue and expiry dates. The main holder's portrait is located on data page.

A data page of a machine-readable document contains a visual inspection zone and a machine-readable zone. A data page is filled according to certain standards to make a reading process in different countries easier.

Demetallization: Production process in which text or design elements are removed from a metallic layer so that they are legible in transmitted light. Used for security threads and security stripes (LEAD) in banknotes.

DID - Diffractive Identification Device: An optically variable image which contains elements changing the colour at different angles of illumination and observation. See also OVD / DOVID

Document Personalization: The process whereby a variable data incorporated into a document. The data allows identifying the document and its holder and verifying whether the document belongs to the holder.

According to the way of personalization the data can be read and proceeded both manually and automatically with the help of special scanners, card-readers, etc. The personal data is applied by laser perforation, laser engraving, or with the help of a printer.

Dot matrix: A surface relief hologram built up from an array of tiny diffractive gratings arranged at certain angles, is called a dot matrix hologram. The 'dots' are a point at which two microscopic beams of laser light meet at an angle

> " In India, the first Excise Adhesive Label (Tax Stamp) was used by Tamilandu State Excise Department in1998-99. "

E

E-beam (Electron Beam Lithography): A method of creating a holographic image is to dispense with the traditional method of creating an interference pattern by interfering two laser beams and 'write' the individual interference fringes using a fine beam of electrons in a vacuum chamber.

ECC200: A format for two-dimensional codes. The most used, GSl-compliant, two-dimensional matrix code type in pharmaceuticals.

EDX (or EDS): Energy-dispersive X-ray spectroscopy

Ejection system: A method of removing non-compliant packs as they move down the production line. An ejection system used on production lines, and is places downstream of the printer and vision system. In serialization systems, any mis-coded or uncoded product must be removed before the units are packed for shipping since they will be subsequently untraceable.

E-ID Document: Electronic ID documents such as passports, ID cards, driver's licenses, visa etc.

Electronic Product Code (EPC): A data standard for the unique identification of any item around the world.

Electronic Product Code Information Service (EPCIS): A data standard used to track the progress of coded objects as they move through the supply chain.

EPCIS provides the standards necessary for the storage, communication, and dissemination of serialization data between stakeholders using different software and hardware systems.

Figure: Excise Adhesive Label DYK: In India first, EAL were used by Tamilnadu State Excise Department in 1998-99.

Electronic Document (E-Passport): A document in the form of a book or a card with an electronic chip and an antenna. In an e-passport, the microchip contains scrambled holder's personal data: digital photo, name, data from a machine readable zone, fingerprints and iris, etc.

Electrotype Watermark: A filigree visible when held up against the light. Created during the paper making process using a filament which takes the form of numbers or different types of characters. See also Artificial Watermark, Digital Watermark, Watermark.

Embedded Security Features: Security elements embedded in the paper during the paper production process. See also Security thread

Embossing: The transfer of raised pattern from a hard plate to a softer material. This mechanical transfer is usually facilitated by means of heat and always with pressure. See also Hologram embossing.

Encoding: The recording of information onto a receptive medium.

Encryption: The adaptation of information using ciphers so that unauthorized access is restricted.

E-pedigree: An electronic statement of a products history and passage through the supply chain, with each movement and trade recorded so that, at any point in the chain and at its end, the lineage of the product can be obtained.

EPC Global: The organisation, which administers the Electronic Product Code systems and coordinates the development of the associated data standards.

Excise Adhesive Label (EAL): EAL is a stamp affixed to certain products (mainly used in sin products) to indicate that required tax has been paid. According to its usages, it is known by a variety of names for example excise stamps, tax stamps, banderols, etc. See also Tax Stamp.

Eyelets/Rivets: A fixing method which is applied for connection of flat details, for example, a holder's portrait and a passport page by using a tube section with the flared head.

> **Ernst Oeser, a master bookbinder in Berlin, is credited as a pioneer in the development of hot-stamping foils as early as 1880**

F

FDA: United States Food and Drug Administration.

FDAAA: The United States Food and Drug ADMIONISTRATION Amendments Act of 2007.

Fine Intaglio Technology (FIT®): Digital engraving method developed by G&D to produce intaglio printing plates.

Fingerprint: A visible graphic reproduction of a holder's fingerprint uppermost layer. It is a relief line (papillary pictures). Their structure is determined by a few friction ridges divided by grooves. These friction ridges form a complex skin pattern which has the following characteristics.

Floating Image: Optically variable element visually perceived as an image hovering or floating in space above or below the surface. See also OVD

Fluorescence: The ability of some molecules or materials to absorb light of one wavelength (color) and re-emit it at a different wavelength. The emitted light ceases to be emitted as soon as the excitation light is extinguished . There is no persistence of emitted light as in the case of phosphorescence.

Fluorescence Fibres: Visible or invisible paper fibers that glow under UV light.

Fluorescence Ink: Visible or invisible ink that glows under UV light.

Foil: A material comprising a polyester carrier with one or more coatings, a release layer and an adhesive layer. The foil is transferred - generally by heat-onto paper, labelstock, textiles etc and the carrier is stripped away, leaving the coating which is bonded to the substrate by the adhesive. This coating can be colour shift, iridescent, metallised, holographic etc. Also known as hot stamping or transfer foil. See also Hologram, Hot Stamping, Metallisation.

Forensic markers: See Taggants

Foil Stamping: An image is applied to a paper, carton or polymer material by stamping a foil by means of heat. Due to high pressure, parts of the foil get into the paper making its mechanical separation practically impossible.

Figure: Example of Floating Images

Fourdrinier Watermark: A translucent image created in paper on the paper making machine, with the use of a dandy roller. The image is generally the name of the paper or a company logo and can be viewed from both sides of the paper when it is held up to the light. A.k.a. a genuine watermark. See also Artificial Watermark.

Fugitive Ink: Ink that runs and stains the document when water or any aqueous type of solution is used to alter the document.

VINSAK

CONNECTED PACKAGING & BRAND PROTECTION SOLUTIONS

Track & Trace

Track the individual product which are geotagged

Track the product movement through suppy chain for transparency

Scan history to track counterfiets

Create parent-child relationship & track individual product within consingment

Scan products & trace journey across the suppy chain

CONNECTED SMART PACKAGING

> " The name, as guilloche, is French, dating back at least to the 1770s, and is often said to be called after a French engineer named Guillot, who invented a tool or turning machine

G

Ghost Watermark: An artificial watermark printed on the back of a sheet that will not appear on a scanned or copied document.

Guilloche: Over the past 200 years, they have been used in the field of anti counterfeiting. A graphic element in the form of a complex geometrical pattern of repeated thin curved lines formed according to certain mathematical rules. Guilloche elements form rosettes, frames, borders, vignettes and elements of a security pattern. Guilloche lines can be both positive and negative.Also known as Geometric Lathe Work / Rose Engine.

GPRS: GPRS is the short term for General Packet Radio Service. This technology is used in the Mobile phone for the data service on the 3G and 4G

GPS: Global Positioning System, used for satellite tracking of suitably equipped items.

GRAS: An abbreviation used by the US FDA meaning "Generally Regarded as Safe" and which refers to substances that have an accepted safety profile.

GS1: An international, not-for-profit organisation, dedicated to the development and worldwide adoption of supply chain data standards.

GTIN: Global Trade Item Number. A GSI standard number unique to each stock keeping unit (SKU) or specific product type but not unique to the individual pack itself

Glossy Laminate Overprint: An image formed during the manufacturing process of the matte laminating film (heated roll lamination) by means of temperature and pressure. Visible under oblique light and has glossy effect.

Glossy laminate overprint is invisible in normal light at a right angle.

Figure: Guil/oche pattern in visa sticker

> Hungarian scientist Dennis Gabor won the Nobel Prize for Physics in 1971 for his invention of holography.

H

High Residue Labels: Labels that when removed, leave a gummy surface behind to indicate that a seal has been removed

High Resolution Image: Fine line work too thin to reproduce by copier or scanner. When copied, detailed lines blend together and spaces fill in.

High Refractive Index (HRI): In situations where a transparent hologram is required, e.g, for use as a laminate to cover the variable data of a passport or other ID document, instead of coating the holographic image with a metallic film, a transparent coating is made using a material with High Refractive Index.

High Security Registration Plate (HSRP): An aluminum-made number plate which is fixed on a vehicle using two non-reusable locks and carries anti counterfeiting features such as chromium hologram.

Hologram: Optically variable image that is created through the interference of two laser beams. Holograms are the most common type of diffractive optically variable device and the term hologram is frequently used as a generic one in place of this. The two most common types of hologram are surface relief and volume. See also, DOVID's, OFF, DOVDs and OVDs,.

Figure: Hologram on obverse side of 500 euro banknote

Holographic Microparticles OVDot: Faceted metallic particles with the size of 100-600 mcm which are randomly embedded in a substrate all over a document page. Holograms are applied over the surface of microparticles by the electron-beam lithography method and contain a nano image or a nano text.

Magnification mode shows how elements of a holographic image change their colour at different angles of illumination and observation (fig.1).

Hot stamping foil: A process for applying the hologram as a very thin film, only a few nanometres thick so that it does not add appreciable thickness to the item it is on; almost always metallised which gives a silver or similar metallic appearance.

Hologram Embossing: The holographic structure is embossed in a suitable layer of varnish applied previously by means of an appropriate tool.

Holographic Stripe: Security stripe with a holographic surface, normally available in widths of 8 to 15 mm, for application on a security substrate. See also Security Susbtrate.

Holographic Thread: Security thread with a holographic surface, normally available in widths of 2.5 to 5 mm, for embedding in a security substrate. See also Security thread

Human Feature (Overt Feature): See overt features

Hybrid™: Banknote substrates combining cotton paper and polymer materials.

Few Holographic Features (Overt, Covert & Forensic)

Overt	2 or 3 - Channel (Switch) Effect	Two or more distinct images can occupy the same area of a hologram, shifting from one to the other when viewed at different angles. This highly valued feature enables the viewer to authenticate the image by observing the switching images in a defined area.
	20/30 Multi-Plane Effect	20/30 multi-plane images, lines, and text are composed of elements that exist on different planes (surface plane, above the surface plane, and below the surface plane), exhibiting a sense of depth and parallax. Used in combination with dot matrix elements, this feature provides a powerful barrier to counterfeiting because the ability to combine these two types of images requires a very high level of skill.
	30 Stereogram	The 30 stereogram is an optical illusion of depth and movement created from one or more flat, two-dimensional images or three-dimensional models.
	Achrograms	Achrograms are colorless images with positive and negative components that swap when viewed at a 90 degree angle.
	Achromatic Image	Composed of neutral grays, white, or black, achromatic images, lines, and text have no color refraction.
	Embossed effect	A highly diffractive, surface-oriented grating can be applied to images, text or lines in a hologram, generating the optical illusion of relief or embossing.
	Latent Effect	Latent images, lines and characters are designed to refract light at a very acute angle.
Covert	Animated CLR	Multiple images are slightly and sequentially rotated, giving the appearance of animation when holding an Hologram Label stationary and moving a laser across the CLR.
	Dual Axis CLR	While similar to the Single Axis Covert Laser Retrievable (CLR), the Dual Axis CLR projects two different images at 90° angles from one another. Because it's more complex and difficult to create than the Single Axis CLR, the Dual Axis CLR is considered more secure. Yet, with both images occupying the same space within the hologram, the projected images may appear a little less bright in the Dual Axis CLR.
	Micro Imagery	True color micro images or photographs, as small as three square millimeters, require the use of a loupe or magnifying glass to authenticate.
	Micro Text	Diffractive or non-diffractive micro text, that can be as small as 175 microns high, is clearly viewed only with an eye loupe or magnifying glass with 10x to 20x magnification.
Forensic	Brick Matrix Manipulation	Brick Matrix is a holographic origination technique. Deliberately manipulate the brick optical structures in predefined and undisclosed areas of a hologram, generating unique fingerprints that can be used to positively verify a document's authenticity.
	Nano Imagery	Nano imagery provides excellent clarity and definition when viewed under a highly sophisticated, high-powered microscope.
	Nano Text	Viewable only through a high-powered microscope, 40 to 175 micron nano text can be diffractive or non-diffractive.

Ink Stamp: Liquid ink is transferred to the substrate by means of a stamp, e.g. for the authentication of a document or of a conventionally fixed (e.g. glued) image of the holder

Iridescent: The ability of some materials to create rainbow effects when they reflect white light. Pearls, oil films on water and bubbles all show iridescence. The effect can be created with foils and inks to create optically variable devices.

Iridescent Ink: A semi-transparent ink with a pearl luster determined by an interference structure of a thin film. The ink contains mica scaled pigments covered by TiO_2, Fe_2O_3 or other metal oxides placed in the transparent binding medium of the ink.

Iridescent Fluorescent Inks: Inks containing fluorescent pigments which glow when exposed to blue-green light of 400-530 nm. Luminescence is visible under IR-light of 850-950 nm as bright light images on a dark background. IR fluorescent inks are not perceived with the naked eye in white light. Inks are used for applying design elements, texts or for coloring security fibres, a security thread, a stitching thread, etc.

Iridescent Metameric Inks: Inks which have similar spectral features in visible light (perceived like of the same color) but different under IR-illumination (some inks absorb IR-light others reflect). As a result, when examining an image with IR-metameric inks only IR-visible parts of the image can be seen on the monitor.

Iridescent Laminate: A thin-film coating in the form of a stripe, a text or an image with color changing effect. The effect appears when the angle of observation or illumination changes. The iridescent laminate doesn't contain ink pigments. It is transparent when viewed at a right angle in diffuse white light. The coating is red under direct incident light at a right angle and becomes green when viewed under oblique light at an acute angle.

Inkjet printing: Non-contact, digital printing method that forms an image from fine droplets sprayed at the substrate. May be continuous inkjet or drop-on-demand.

Iridescent Materials: That reflect visible light at multiple wavelengths simultaneously to give multi-colour or rainbow effects. Iridescent inks are sometimes used as low-grade security features. They are not the same as Colo shift inks.

Isotope: One or more atoms with the same atomic number but a different number of neutrons.

Induction seal: An aluminium foil or paper seal bonded over the opening of usually bottles after they have been filled with pills or capsules. Provides tamper evidence but can potentially be illegally replaced if plain foils with no security features are used on the original product.

Figure: INK

Isotopic analysis: The measurement of the isotope composition of innate components of the product (or its packaging) or of substances added as markers. The comparison of suspect samples with reference material can provide evidence of counterfeiting.

Isotopic tags: A forensic marker technology that involves adding isotopic variants of one or more components of the formulation or packaging, to allow the identification of genuine products.

Isotopic analysis: The measurement of the isotope composition of innate components of the product (or its packaging) or of substances added as markers. The comparison of suspect samples with reference material can provide evidence of counterfeiting.

Isotopic tags: A forensic marker technology that involves adding isotopic variants of one or more components of the formulation or packaging, to allow the identification of genuine products.

Intaglio Printing: Intaglio printing also known as copperplate or in jargon, "DP" (short for direct plate), is an ancient printing process that dates back to the earliest period of printing. It is based on the use of an engraved plate, where the image is carried as a recess in the plate. It is a printing technique whereby the image to be printed is etched or engraved in the surface of a printing plate. First, a thick and highly pigmented ink is applied to the printing plate, then the non-printing (non-recessed) areas of the surface are wiped clear of ink.

Finally, the ink that remains in the engraved parts of the printing plate (the image to be printed) is transferred to the substrate under high pressure. The pressure forces the substrate into the recessed areas of the printing plate.

Not to be confused with gravure printing-204

Not to be confused with **PEA,<ID** - a technology combining offset and intaglio printing: colour (or other) changes are visible depending on the angle of view and the angle of incidence of light.

Not to be confused with **raised (tactile) laser engraving** in plastic laminates or cards

Intaglio printing without using ink leads to paper deformation and can thus be used to produce an embossing effect produced by the lithographic process. It is also possible to produce inkless latent image effects using **blind intaglio (intaglio embossing)**.

Figure:
Vintage engraved
illustration of intaglio
printing workshop

GENUINE OR COUNTERFEIT?

SICPA Product & Brand Protection your dedicated partner against fraud. Building lasting brand partnerships with proven security solutions and cutting-edge technologies.

SICPA

Enabling trust

K

Kinegram®: The Kinegram®is a computer-generated hologram (DOV/DJ capable of producing multiple high resolution images. It contains special types of computer-generated diffractive optical elements. These can be designed in different ways to exhibit kinematic, colour changing, contrast reversal and other special effects.

See also: Hologram I OVD

Kinetic: An adjective whose roots in the Greek word 'kinesis' indicate motion. A holographic image which displays excessive movement of form or color is said to be kinetic. Often, such images are patterns rather than objects. The patterns can be made up of fine lines or graphic elements and appear to scintillate when moved. The Swiss company Landis & Gyr found a particularly effective way of producing such designs and called them 'kinegrams'. The term is now trademarked, owned by the German company Leonard Kurz and used only for high security application such as banknotes, passports and other identity documents.

Figure:
New 20 England Pound
with Kinegram stripe
over window
Source: OVD Kinegram

L

Laminate: A transparent polymer film applied on the substrate over the whole data page or only over its part in order to protect the document against its damage or forgery.

Laminate Embossing: Laminate embossing are tactile features such as intricate designs of fine-line patterns or microprint which are incorporated into security laminates by embossing.

Laminate Overprint: An image which is applied on the laminate coating to protect it against forgery. Screen printing and gravure printing are the most frequent printing methods used for the laminate overprint.

Laser Originated Optical Key (LOOK): A banknote printing method from that uses laser technology to individually adapt security features on banknotes.

Laser Ablation: A marketing technique used to add small amounts of variable.

Laser Engraving: Applying an image or a text on a paper or a polymer substrate using the energy of a laser beam. A laser beam heats the surface of a substrate (for example, polycarbonate). As a result carbon deposition occurs in the upper transparent layers. Deposing carbon is visualized in the form of black dots of different tones which form an image. When the laser beam affects a paper surface its discoloration occurs, and the ink layer is removed.

Laser Perforation: The ID document serial number is perforated through the substrate with a laser.

Figure:
Laser perforation used
for numbering passport
page

Typical distinguishing marks are produced:

- traces of burning round the edges of the holes
- no raised edges round the holes in the substrate (paper) on the back of the perforations
- conical decrease in size of the perforated holes in the booklet document when viewed from front to back
- can have different shapes:

Not to be confused with needle perforation. See also: Numbering I See also: Secondary (ghost) image

Latent Filter Image (LFI): An image which is applied by the slit raster technology. The scene of the image changes when changing the angle of observation. A latent filter image consists of a slit raster printed inside a transparent polycarbonate which serves as an optical filter and a scrambled image stripped from two initial images. Lightness of the image changes regarding to the background when changing the angle of observation. Latent (second) image is visualized at an acute angle of observation and printed by offset.

Latent Image KIPP (from German kippen - overturn, rotate): An image formed by parallel straight relief strokes perpendicular to background strokes. The image is almost invisible in incidental white light at a right angle. It is visualized as an achromatic image in sliding white light at an acute angle of observation due to the shadow casted by relief strokes. A background and an image are applied by means of intaglio and are not differ in colour and stroke density. An image becomes lighter or darker regarding the background when rotated around the vertical axis without changing the angle of observation.

Latent Image Mask: An image in the form a number of lines or strokes of a certain geometrical shape or raster elements. A latent image makes a whole with the background image in technique, color and printing method. Its contours are slightly visible by the naked eye.

Figure: PEAK®three dimensional security feature. source: G+D

Zoomed image is visualized as an alphabet symbol, figure or geometrical figure in white light. Latent image MASK is printed by offset.

Latent Image Peak (PEAK - Printed and Embossed Anti-Copy): An image is formed by lines of blind embossing in the foreground and parallel straight strokes of the background. The image is almost invisible in incidental white light. When sliding light is perpendicular to relief lines a shadow is formed and a latent image is visualized on the ridges of these lines. When rotating a document around vertical and horizontal axes its different areas become lighter or darker regarding to the background.

Latent Multicolour Image: An image which is formed by parallel multicolor background strokes or relief lines of blind embossing. A latent multicolor image is slightly visible in white light. It is visualized as a chromatic image under oblique light. Every chromatic element of the image changes its color when rotating the document around the vertical axe without changing the angle of observation. Background strokes are applied by offset, relief lines are printed by intaglio.

Latent Scrambled Image: Strokes or raster elements of latent scrambled image are embedded in the background or a photo the way that the image is not visible when viewed by the naked eye. The image is previously fragmented and encoded according to special algorithms. A latent scrambled image is visualized by means of the lenticular decoding devices. It is applied by the printer or offset.

Lenticular Technology: A method of printing and visualization of an image using lenticular lens. It allows getting an image changing effect depending on the angle of observation. A lenticular is a sheet of a transparent plastic material. The front side of a sheet has a relief surface and composed of parallel cylindrical lenses. The back side is smooth. Scrambled interlaced images are printed under the lenticular. The principle of encoding is that initial images are stripped and joint together the way that at list two stripes (one from one image and the second from the other one) are placed under every lens.

Level 1,2 and 3 security features: A commonly used means of grading security features.

Level 1 refers to features that can be verified by the public and untrained examiners with the naked eye.

Level 2 refers to covert feature that require some form of reading device or tool, and typically deployed for use by, for example, cashiers in banks, product distributors and retailers, inspectors or customs officials.

Level 3 refers to feature that can only be identified under forensic examination in laboratories and used by the IP owner or manufacture to provide forensic authentication of a product or document that could, for example, be used as proof in a court of law

Lock and key: A system of encryption whereby something (the 'key') is required to decode the message. The 'key 'is usually a handheld device which renders meaningful that which was previously unintelligible. Possession of the key is restricted to certain individuals thereby limiting access to the encrypted information.

Lippman Holograms: Lippmann holograms present a three-dimensional image when shifted left and right and up and down, generating a more lifelike image than embossed holograms. They are manufactured by coating films with a special polymeric material and altering the density of the interior of this material to form interference patterns due to changes in refractive index

M

Machine Readable Travel Document (MRTD): The specifications of Machine Readable Travel Documents (MRTD) - passports, visas and ID cards - are set out in document 9303 of the International Civil Aviation Organisation (ICAO).

Machine verifiable features (machine assisted document security verification features) are security features that can be read and verified by machines (document readers).

Magic-ID: Optically variable 3D effect based on micro lens technology.

Magnetic Ink: An ink containing ferromagnetic components, which have a specific reaction to the external magnetic field. The magnetic ink can be applied on security threads, fibres and used for printing images, serial numbers, bar-codes.

Magnetic Stripe: A medium in the form of a stripe with the limited storage space. A magnetic stripe is usually placed at the reverse side of a card. The data which has previously been coded recorded on magnetic stripes.

Metamerism: The effect generated when using a pair of similarly shaded inks, the colour and contrast of which appear virtually identical in normal light, but which have different spectral responses so that , when viewed with a filter or under special illumination , one always different effects or colours to the other .

Metallic Ink: An ink containing a fine dispersed powder of bronze (fig. 1b) and aluminum (fig. 2b). It has a specific metallic gloss. Only a gloss intensity changes when changing the angle of observation and illumination of the image applied by the metallic ink.

Metameric Inks Pair: Special security inks (usually the pair of inks) which look similar in one type of illumination (for example, IR-light, UV light, oblique white light) but show a noticeable difference in another type of light.

Micron: A unit of measurement commonly used in authentication when referring to the thickness or gauge of physical substrates and features. One micron is equal to one millionth of the meter.

Microprint: Print that is so small that it cannot be reproduced by photocopying or scanning, and which can only be read under magnification.

Microprinting: Micro images (figures, symbols, texts) of 0,15-0,3 mm height. Micro printing is visible only when zooming.

Moire pattern: Images formed by the superimposition of two patterns with different periodicities, so that they display different visual effects according to the viewing angle.

MultiCode TM: Magnetic feature for security threads in banknotes.

Moire Variable Color (MVC): An image formed by parallel straight color strokes of the background and parallel lines of blind embossing located at an acute angle to one another. A background image is printed by offset. Blind embossing is applied by intaglio

Multiple Laser Image I Changeable Laser Image (MLI / CU): An image applied with the help of the lenticular technology, and changes depending on the angle of observation (flip-effect).

Multitone Watermark: Visible Image incorporated into the paper which is visible when the document is held against the light.

Figure: Enlarge view of Micro-printing
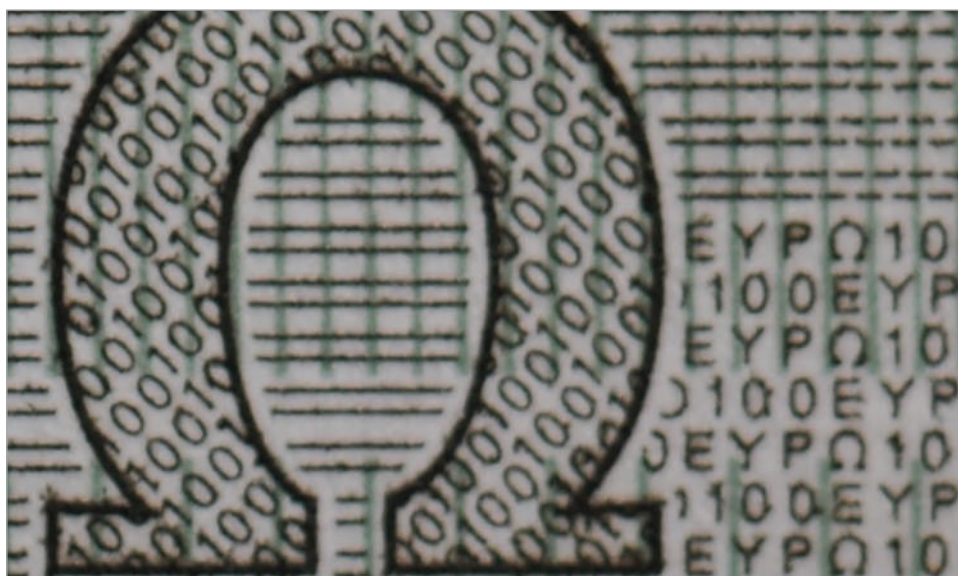
N

Nanotechnology: The science and technology of precisely manipulating the structure of matter at the atomic and molecular level (one nanometer is one billionth of meter) and which in the authentication arena is becing used to explore and develop unique optical phenomena for use in new material and security features.

Needle Perforation: Process of Making holes mechanically (by piercing or punching) in order to incorporate a number or motif into a document. Serial numbers are perforated in a regular, matrix-type arrangement of circular, equal-sized holes always pierced in the same direction. Needle perforation is recognisable by the ridges ("burr") that can be felt on the back of the substrate.

Needle Printing: A needle printer or traditional dot-matrix printer is a type of computer printer which prints by impact, striking an ink-soaked cloth ribbon against the substrate, much like a typewriter, but, unlike a typewriter, letters are drawn out of a dot matrix.

NFCs: It is a set of communication protocols for communication between two electronic devices over a distance of 4 cm (11;2 in) or less. NFC offers a low speed connection with simple setup that can be used to bootstrap more-capable wireless connections.

Numbering: The serial or document number is a unique number that is printed and / or perforated in a document (or in parts of it); its uniqueness allows a document to be traced, e.g. during the production process and if it is lost or stolen. The following alphanumeric characters are used to indicate the composition of the serial number within the descriptive text:

A: any letter

N: any digit

R: any digit or letter (in a random sequence)

e.g. AA-NNNNN, AAA NNN, AANNNN,

or A RRRRRRRR.

See also Temple Numbering

Figure: Numbering in India Banknote
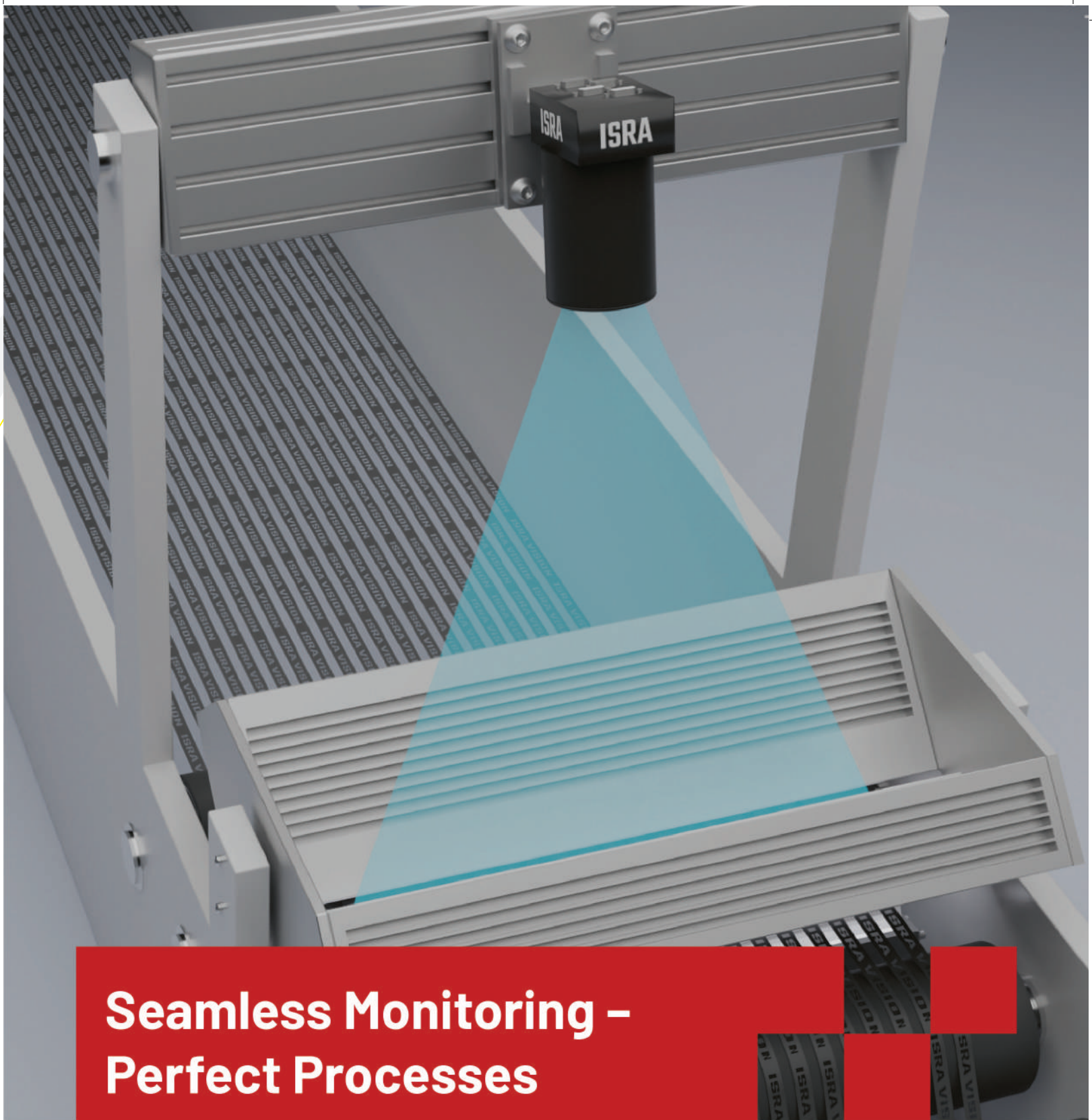
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Leverage the full productivity potential of your production processes with in-line inspection and advanced analytics by ISRA VISION. Contact us to learn more about our specialized solutions for printing, coating, embossing, and cutting/slitting processes.

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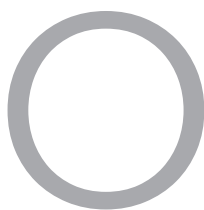
OCR Line: A line of machine readable copy printed in a special OCR (Optical Character Recognition) font.

Optical Stripe: An optic stripe is a laser readable memory device with a storage capacity up to 4 MB. Multiple data files including images can be stored; also visual features, like a micro image, security patterns and an OVD (Optically Variable Device) can be viewed for rapid card authentication.

Optically Variable Devices (OVD's): Visible features with dynamic characteristics that change according to the viewing angle -for example from one colour to another or from one image to another.

Overt: A feature on product, document for human verification without using technical equipment.

Optically Variable Identification Element Feel-ID: A composite security feature based on colour changing and thermochromic effect. It was developed by G&D company. FEEL-ID has a multilayer structure: 1) The top layer is made using STEP security feature with liquid crystal pigments; 2) The middle layer is made of thermochromic ink; 3) The bottom layer contains laser engraved identification information (holder's portrait, etc.).

Optically Variable Identification Fuse ID: A composite security feature with identification information about the document holder. FUSE-ID was developed by G&D company. It is printed with optically variable ink (OVI) and laser engraved afterwards. The element is produced by a laser beam which moves sequentially over the image background area and leaves the image outline untouched. The laser energy discolours optically variable ink by changing its surface nano relief and optical features. The image contrasts with the brightened background and looks darker. The image colour is determined by interference effect which appears on the layered structure of ink pigments.

Optically Variable Ink (OVI): An ink which changes its colour unevenly due to the angle of observation and illumination. A colour changing effect is determined by a thin film interference of pigments placed in a transparent bounding ink medium. Pigments structure is based on so called

Figure:
OVD (hologram) in
Banknote

Fabry-Perot filter principle. Selective absorption of white light beams occurs as a result of interference and multiple reflection of beams by two reflective surfaces (AL, Cr) The waves which have not been absorbed determine the ink colour that we may observe.

Optically Variable Ink with Embossing: A complex optically variable security element. It contains an image printed by an optically variable ink OVI which plays a role of the background for the second image applied by blind embossing.

Optically Variable Ink with Polarizing Effect Step (OVIPES): An optically variable iridescent ink which changes its colour at different angles of illumination and observation. It contains liquid crystal pigments with periodic spiral molecular structure. Ink colour depends on the lead of the spiral and angle of illumination.

Colour changing effect is achieved due to interference. Incident light reflected from the ink interacts with the spiral of a liquid crystal molecule and becomes polarized.

Optically Variable Magnetic Ink (SPARK, OVMI): Optically variable ink OVI with the dynamic effect. Ink pigments are oriented with the help of magnetic field - image colour changes after changing the angle of illumination and observation. The effect of a bright light stripe movement occurs. The ink is usually applied by the screen-printing method and contains ferromagnetic pigments.

Optically Variable Printed Image Dynaprint: An image applied by the lenticular technology. Dynaprint consists of an array of cylindrical lenses (lenticular) and two scrambled images printed by offset (fig. 1). Colour, brightness and contrast change relatively to the background depending on the angle of observation.

Orlov Printing: A method of a single-run multi-colour printing invented by Ivan Orlov in 1890 in Russia. The Orlov printing is the formation of separate ink layers on colour-separated plates and the transfer of the inks to the common plate and then to the receiving surface.

In an Orlov printing machine a print is transferred from a plate directly to a paper sheet. In modern devices, an intermediate rubber cylinder (like the offset one) is used.

Origination: The implementation of a design in a tool for the production of security elements

Figure: Example of Optical Variable Ink in Euro Banknnote
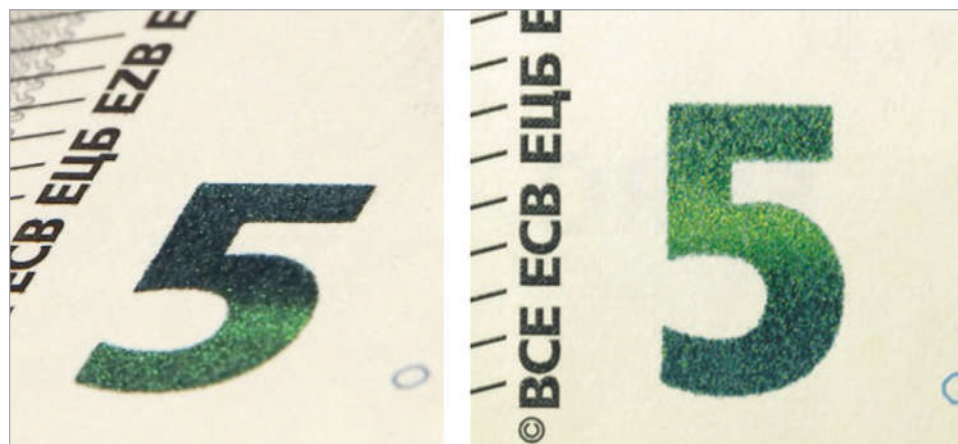
> **Modern polymer banknotes were first developed by the Reserve Bank of Australia**

P

Perforation: Holes in the substrate, which are in a certain order. They can form a pattern (a holder's portrait, a document number, etc.).

Photochromic Ink: An ink containing photochromic pigments which change their color from transparent to red, yellow, blue, purple when exposed to UV light. When the UV light source is removed the image becomes pale and reverts to its original state. This process can be repeated an endless number of times.

Phosphorescence: A fluorescence that continues for a period after the stimulus that produced the emission has stopped.

Planchettes: Thin round or many-sided pieces (scales) of 1-4 mm size which are made of polymer material and embedded into the substrate surface during the paper manufacturing process. They are placed randomly or located in a certain place of a sheet. Planchettes can be colourless, colourful, metallic, transparent, luminescent under UV light or have the holographic effect.

See also:

- Fluorescent planchettes
- Coloured security fibres
- Fluorescent fibres
- Substrate without optical brightener

Polarisation: The orientation of light waves into a predominating angle.

Figure: Trinidad & Tobago $50 Safeguard (Specimen) banknote. Clear window with image of bird: the Red-capped Cardinal.

Do You Know:
Modern polymer banknotes were first developed by the Reserve Bank of Australia

Polarizing Filter: An optical device which transforms unpolarized light passing through it into polarized light. It is used as an analyser for examination of light reflected from ink or thin-film coating. It blocks light rays of a specific polarization direction and at the same time it lets light rays of other polarization directions pass.

Polycarbonate: As substrate is often preferred for security printing and for documents requiring high durability (long validity periods).

Polymer banknote: The banknote substrate is made of plastic foil (polymer), unlike traditional banknotes made of cotton.

R

RFID (Radio Frequency Identification Device): A technology for automatic, contactless identification and object localization, as well as automated data capture and storage.

Rainbow Colouring: Also called split duct printing. This colouring process used in offset printing is used to protect security documents against colour separation or copying by subtly merging colours into each other, resulting in a gradual colour change.

Rainbow Printing: A special security printing method using a technique in which two or more inks are applied on one printing plate. The printing is carried out with several inks from one color box divided by plates. Special rollers with fixed axial displacement in horizontal and vertical directions are used for printing.

Rasterising (screening): Screening (originally named from a patterned glass screen inserted between the illustration and the light source on a camera), or rasterising, transforms the shades of colours of graphics / images into tiny dots into a raster format in order to print them. As the dots are small enough, the human eye cannot distinguish between.

Relief Embossing: Also called blind embossing: A colourless embossing of images or text. It involves high-pressure embossing of letters, motifs or other designs.

See also:

Hot Foil Stamping

Laminate Embossing

Authentication see also:

Embossing Stamp

Ink Stamp

Retroreflective Coating: An optical device with the retroreflective effect. It consists of several layers retroreflective layer with microlenses (microspheres); graphic image layer; reflecting layer.

Retroreflective Laminate: An invisible image is incorporated into the laminate, only rendered visible by the use of co axial light using a special viewer or technical equipment.

RIP Cuts: A partial cutting of a substrate upper layer or a laminate coating which prevents a structural damage of a document made with the purpose of its forgery.

Figure: Example RFID tag used by Russia to check identification mark with natural fur

> **By 2021, serialization is expected to cover 80% of the globaldrug supply.**

S

Serialisation: The application of a unique identifier to each unit in a lot or batch. The identifiers are a number but might be printed as alphanumeric or barcodes or might be embedded in a chip activated by radio frequency (RFID). The numbers may be sequential or randomly generated; what is important is the same number should not be used twice.

Secondary Ghost Image: A Second (ghost or shadow) facial image of the document holder can be included on the biodata page or on a second page containing biographical information in the identity document. It can be applied by the same printing process as the primary facial image, or by different processes, e.g. using: fluorescent overprint, laser perforation, a transparent window, or an Identigram®.

Security Threads: A narrow polymer based stripe embedded in a paper web during the paper manufacturing process. There is embedded security thread, window thread and thread with floating images.

Security Fibres: Fine visible or invisible fibres located randomly in the paper substrate. Fibres are embedded in the paper during its manufacturing process and distributed among other fibres of the paper pulp.

Synthetic Fibres: Synthetic fibres are used as a main component in several special traditional security papers; they make the substrate highly durable and resistant.

Examples of synthetic printing media:

NeoboncfID (e.g. old pink, folded German driving licence).

Tes/in® (as it is commercially available, Teslin®is also often used for counterfeiting ID cards.)

Synthetic fibres are not to be confused with coloured security fibres which do not contribute to the mechanical properties of a substrate.

See Through Register: An image, a part of which is printed on one side of a sheet and the other part on the other side. When the sheet is viewed against the light, both parts match up and create a complete image without overlapping and gaps.

Self-Verifying Filter: A transparent part of a multipage document which allows visualizing latent images, texts or codes located on an adjacent page of the document. During the verification process the filter is placed closely to the image area and scrambled data becomes clearly visible.

Figure: Example: Serialization on medicine packaging, Source: PharmaSecure
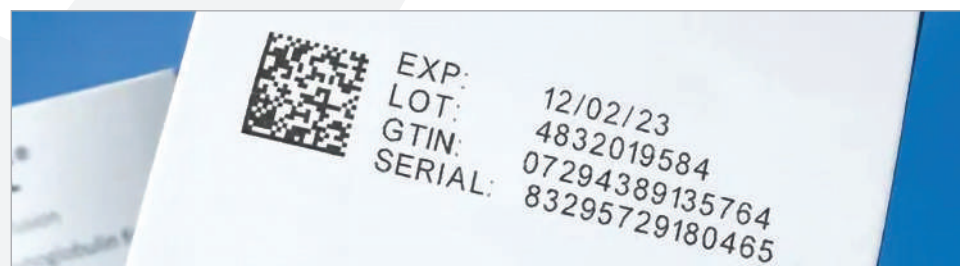
> " Russia is the only country in world using security thread on their tax stamps. "

Shim: A 'shim' is a thin plate of metal, usually nickel, which is attached to a cylinder in preparation for the embossing process. The shim is produced by an electrodeposition process whereby the plate with the recombined images is immersed into a galvanic tank and metallic nickel is caused to accumulate on its surface.

Simulation: Packaging or products which do not use the exact same trademark as the original, but which look very substantially similar.

Spectroscopy: The analysis of the wavelength and intensity of a specific area of the electromagnetic spectrum in order to undertake a qualitative or quantitative analysis.

Slit Raster Technology: A method of printing and visualization of images using a slit raster which allows getting an image changing effect depending on the angle of observation. A slit raster (optical analog of a lenticular) is a transparent film on which a pattern is printed. The pattern consists of parallel transparent and non-transparent stripes. A scrambled interlaced image is printed under the slit raster (principle of coding is the same as in lenticular technology).

Spine: The edge of a book block where all elements of a passport book are stitched.

Stitching Thread: A material that is used for holding together the pages of a book block (fig. 1-4). A stitching thread consists of single threads, so called filament, twisted or stuck together.

Stitching threads may vary on several threads, colour, formation method and material. Synthetic threads with additional security features (luminescence in UV and IR-light, etc.) are usually used for stitching of passports and travel documents.

Substrate: A material or base - e.g. paper or film - used to produce documents, a background for applying images and embedding of security features.

Symbology: In authentication purposes, genetic term to describe the technology on which a coding or serialization system is based.

Figure: Security thread in the Norwegian 500 kroner banknote

Secure Core Print (SCP): An image (pattern, alphanumeric characters, etc.) located on the inner layer of a multilayer polycarbonate card with holder's data. It is printed with special inks by a printing method. Secure core print is visible in transmitted light.

> As a result of the 1982 TYLENOL®
> tampering incidents, Johnson & Johnson
> produced the first industry-leading tamper-evident
> packaging for TYLENOL® and later, all of its
> over-the counter medications

Tactile Lines: Lines pattern created to help visually impaired people distinguish between different value banknotes.

Tactile lines are also called as cricket legs. One can identified them, because of the noise they make when you rub together.

Tample Numbering: The numerals on the number panels designed ascending in size from left to right.

Taggant: Molecular or microscopic parties that can be organic or inorganic in composition and exhibit specific and unique physical, biological, chemical or spectroscopic properties. Also known as forensic makers.

Tamper-Evident: Devices such as seals and closures that demonstrates that the product or packaging has been opened or otherwise accessed.

Thermal printing: A process which produces a printed image by selectively heating coated thermochromic paper, or thermal paper as it is commonly known. The coating turns black in the areas where it is heated, producing an image. Thermal transfer printing is a related method that uses a heat- sensitive ribbon instead of heat- sensitive paper.

Thermochromic Ink: An ink which changes colour or becomes transparent at a certain transition temperature. It is applied by offset, letterpress or gravure printing on paper or polymer substrate.

Track and Trace: The process of monitoring and recording the past and present whereabouts of a shipment, as it passes through different handlers on its way to its destination, through a distributed network. Tracing refers to where the product has been, while tracking refers to where it is going next.

Transparent Window: The transparent window is incorporated into the substrate during manufacture. When using transmitted light and a magnifying device, e.g. the image of the holder, or a cu®can become visible.

See also Secondary Ghost Image I Polycarbonate

Figure: Example of Tamper Evident Labels on medicine box, Source: Avery Dennison

Thermographic Printing: Thermographic printing (raised printing) is a post-print technology of producing a tactile raised print. The area printed by offset is dusted while wet with low melting powder which sticks to the ink. The excess powder is removed from non-printed areas by shaking off or blowing off. Then the substrate is heated, and, as a result, the powder melts and forms a raised relief (raised ink) on the substrate. The powder that is used in thermography can be transparent, glossy or matte. Besides, transparent powder may be combined with metallized pigments or dyes of different colours.

Thin-Film Interference: Thin-film interference is a phenomenon of two or more light waves superposition which causes their mutual amplification or reduction depending on how the phases of these waves are related to each other.

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U

Up-converter: A material that absorbs energy at a longer wavelength outside the visible and emits in the visible spectrum. The materials that can achieve this effect are rare and therefore used for security marketing.

UV-Fluorescent Hi-Lites: Small colored or colorless particles of a different size randomly embedded in the paper during the manufacturing process. The particles glow when exposed to UV light

UV-Fluorescent Ink: An ink containing color luminophores which transmit UV light into fluorescent light of different colors when exposed to UV light (250- 380 nm). UV-fluorescent ink is not visible in white light by the naked eye. The ink is used for printing texts, images, secondary holder's images or for dyeing security fibres, security threads, stitching threads.

UV Light: UV light belongs to the electromagnetic waves at the lower boundary of visible light (200 - 400 nm) - a source of light that is frequently used in document examination to analyse substrate brightness, fluorescent inks and other security features as well as tampering. Ultraviolet "light" is not visible itself, only its effect, i.e. the visible fluorescence stimulated by UV light can be seen:

*Figure:
Example: UV-visible
symbols, or patterns can
be added to a label to
help authenticate the
product.*

V

Variable laser image is a laser engraved image with tilting effects, incorporated in plastic cards: Images are engraved at different angles through an array of cylindrical lenses embossed into the surface of the card.

Varnish Coating: A transparent 20-40 mcm thick film which is invisible by the naked eye at a right angle. It protects the substrate from getting wet and prevents ink erasure. Varnish coating is visualized as a coating with slight gloss visible at an acute angle. It is applied over a printed image or creates an independent colourless image.

Varifeye®: Optically variable security feature for human authentication and banknotes.

Varifeye®Magic: Window security element in banknotes with micro-optical structures.

Visually Impaired Features: These features are created to help visually impaired people distinguish between different value banknotes. For example, tactline lines, Bleed lines or raised printing features.

Figure:
Example Tactile Lines

Do you know:
These are also called as cricket legs. One can identified them, because of the noise they make when you rub together.

> **"** Watermark are one of the oldest security features in use since13th century. **"**

W

Watermark: A paper security feature which is visible in transmitted light as an image with slightly blurred, indistinct outlines and a smooth gradation of tones appeared due to local differences in paper density. A watermark is formed on a wet paper web in the process of paper production. It is formed by the density of fibres on certain areas of an image.

Darker elements of a watermark are located on the denser areas of paper. Lighter elements are located on the less dense areas.

Do not confuse the traditional watermark with a digital watermark, which is printed, often on computer-printed material and used to identify the ownership, or where an identifying cipher is encoded into digitised music, video or picture files.

Different Type of Watermarks includes;

The single-tone watermark can be light or dark.

The motif of a **duotone watermark** is both light and dark.

Sometimes also called **cylinder mould watermark or shadow watermark**.

Typically only used on banknotes, passports and other high value documents by the high security printing industry.

Multitone watermarks can be combined with much brighter, round shaped, positioned **'Skylight' watermarks** (very thin paper) and, or, with an electrotype watermark.

See also: Artificial Watermark I Simulated Watermark

Watermask: A laser process where the print image is applied in perfect register with a watermark.

Window Thread: A security thread embedded in the banknote and appearing on the paper's surface at defined points on the banknote (windows). When viewed straight on the security thread is partially visible, and appears across the entire length in transmitted light.

Figure:
Watermark with the
face of Europa on
the new 50 euro
banknote

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GUIDELINES

FRAMING BRAND PROTECTION STRATEGY & SELECTION OF AUTHENTICATION VENDOR

Guidelines for
Framing Brand Protection Strategy & Selection of Authentication Vendor

With the current advancements in authentication technologies/ solutions/ systems, Brand Owners and Government Department would like to assess and review the technology/ systems/ solutions in current circumstances. The document will help all stakeholders in reviewing their current systems, finding leakages and plugging them. It may, however, please note that this study report is for general educational purposes.

5.1: Guidelines for framing Anti-Counterfeiting Strategy

	Detection	Prevention	Deterrence
Develop & implement a counterfeit risk assessment tool, Understand the nature of counterfeiting and purpose of brand protection strategy. For example, counterfeiting, tampering, pilferage, or supply chain management issues.	x	x	x
Develop strategy understanding global counterfeit protocol	x	x	x
Create a dedicated group that has expertise in 4 key areas: Law enforcement, supply chain, packaging technology and Legal	x	x	x
Build anti-counterfeit and brand protection into product design process with the goal to employ in-product and on package authentication technology	x	x	x
Identify authentication technologies/solutions and systems. It is always preferable that authentication technology should provide properties such as difficult to copy, tamper resistance, layer of security such as overt, covert and forensic and easy integration with packaging lines. Refer, Table 2		x	
Contract with a single security solution provider. If the solution includes packaging, then purchase packaging and packaging components from a single packaging supplier (For vendor selection, refer table 3).		x	
If manufacturing is outsourced, institute a stringent vetting Process		x	x
Monitor sales practices		x	
Include anti-counterfeiting audits in corporate risk management and audit programs		x	x
Undertake market monitoring measures	x		x
Commit to a program with tactical components	x	x	x
Develop a well-defined process for purchasing from diverters; maintain control at the corporate or regional level		x	
Implement a strong verification and due diligence process for selection of diverters		x	

	Detection	Prevention	Deterrence
Employ security measures for material oversight and reconciliation at warehouses and distribution centers	x	x	
Educate retailers through a product awareness program	x	x	
Develop a question tree specific to counterfeit detection for consumer complaints process	x		
Develop a plan for the disposition of overstock, seasonal and unsaleable products		x	
Create a counterfeit playbook: A counterfeit playbook defines the steps to take if I when counterfeit product is discovered	x	x	x
Involve the brand protection community	x	x	x

5.2: Matrix of available technologies for A&T

Anti-Tampering Technologies		Physical Components			Digital
		Overt	Covert	Forensic	
Tamper Evident Closures	A sealing material for a package or bottle that is typically irreparable once opened, indicating tampering.				
	Shrink sleeves or films	x			
	Induction seals	x			
Tamper Evident Labels	A sealing material for a package or bottle that is typically irreparable once opened, indicating tampering.				
	Tear tapes	x			
	Delaminating films	x			
	Patterned Destruct Films / Labels	x			
Anti-Counterfeiting Technologies/ Authentication Technologies					
Security Inks & Coatings	Security inks are widely used technologies for overt brand protection and covert anti-counterfeiting. They are cost effective, relatively easy to apply, and provide an excellent base for some of the most advanced covert applications such as DNA markers and taggant integration. They are extensively used on labels and containers for primary, secondary and tertiary packaging and they are formulated for almost all substrates				

	Thermochromic ink		x		
	Photochromic ink	x			
	Intaglio ink	x			
	Luminescent/ Fluorescent ink	x	x		
	Infrared ink		x		
	Magnetic		x		
	Optically variable ink	x			
	Laser activated		x		
	Pearlescent varnishes	x			
	Machine-readable inks		x		x
Security Printing	Specialized types of printing technologies which are difficult to mimic or copy.				
	Microtext	x			
	Nanotext		x		
	Guilloche	x			
	Linework fractals	x			
	Registered images / Relief Images	x			
	Special raster's	x			
	Variable line thickness/ Line modulation	x			
Substrates - Security Papers	Paper designed for tamper resistance or contains security threads, fibers, or other security feature embedded in the paper for covert or overt security. Can also contain special chemicals or treatments that indicate tampering, altering, or determine authenticity.				
	Anti-Copy Paper		x		
	Chemical ingredient Paper		x		
	Paper containing fibres		x		
	Paper with planchettes		x		
	Paper with security threads	x	x		
	Watermark	x			

Optical Security Technologies	A range of visual security technologies widely used in anti- counterfeiting / brand protection applications. Optical technologies are the most employed layer of an authentication / anti-counterfeiting program.				
	Holograms	x	x	x	
	Zero Order Diffraction Devices	x	x	x	
	Floating / sinking image films				
	Color shifting films				
	Retroreflective films				
Chemical and Molecular Taggants & Nanotechnolo-gies	An emerging class of covert and forensic level technologies which utilize unique and highly engineered particles to construct specific signatures which can be detected sometimes in the field, but more often in a laboratory.				
Electronic Track And Trace Technologies					
EAS tags and systems	Tags which utilize a variety of methods to generate an alarm when a product is removed from a specific area or carried through a sensor gate. Usually used as anti-theft devices for retail security but can be used brand security applications as well.				
	Semi-Passive tags				x
Track & Trace Systems	A system where items are uniquely coded, either through an alpha/numeric code or a barcode, and those unique codes are stored in a database and scanned at various points throughout a product's journey through the supply chain. The resulting picture of a product's travels can often provide valuable evidence to the authenticity of the product as well.				
	Sequential numbering				x
	Serial Code				x
	Nano-barcodes			x		x

5.3: Technology selection matrix

Important factors for selecting technology	Tick
Impact on product price	x
Impact on manufacturing - The authentication provider should be sensitive to this issue and plan visits to the manufacturing facility to make certain nothing is jeopardized as a result of a new process or new equipment.	x
Decision on physical & digital combination	x
Usage of technology for target audience	x
Authentication placement - where to put the authentication on the product itself, on the product packaging, or both.	
Appearance considerations - Adding authentication technology to the product or package could change the look. A dramatic change might even lead to concerns about customer perception or acceptance. Marketing and other departments in the company need to be kept informed of technology implementations.	
Environmental factors - what happens to the authentication in various environmental situations (heat, cold, humidity, water, fire, chemical exposure, etc.) needs to be considered.	
Authentication Layers - Combination of overt, covert and forensic technologies is always recommendable.	

5.4 Evaluation parameters of authentication solutions provider (vendor)

		Yes / No
Good corporate practices	Code of Conduct of its industry association	
	Corporate practices	
Innovative	Facilities and solutions	
	Ability to provide combination of technology and solution	
Secure environment	In-house facility to produce authentication solutions under a secure environment	
	CCTV Surveillance	
	Security Guard and deployment	
Standards	ISO 9001 / 270001	
	ISO 12931	
	ASPA-TUV HSSMS	
	Intergraf ISO 14298	
	GS1 Traceability	

		Yes / No
Affiliations	Member of Authentication Solution Providers Association	
	Member of International Hologram Manufacturers Association	
	International Tax Stamp Association	
	Member of GS1	
Copyright & Patent	Copyright authentication solutions under ASPA	
	If the product is hologram, registered this at Hologram Image Registry (HIR) operated by International Hologram Manufacturers Association (IHMA), UK. The registration is complimentary and all ASPA members are approved /entitled for filing HIR with IHMA.	

5.5 Key Industry Associations involved in Authentication and Traceability

Authentication Solution Providers' Association (ASPA): Formed in 1998, a non-profit organization, ASPA has a rich heritage of 25 years and is recognized globally as a regulated and ethical organization. It is working to build up a world-class environment that supports the advancement of authentication ecosystems in India against counterfeiting activity and illicit economy ASPA works on four key areas a) Awareness b) Advocacy (Industry Partnership) c) Research & d) Innovation. Its member companies provide physical and digital authentication technologies, solutions & systems present across the globe. As an industry body of authentication solutions providers, it encourages its members to adopt best practices, standards, and advanced use of technology in providing cost-effective anti-counterfeiting solutions against counterfeiting. ASPA works closely with global authorities such as International Hologram Manufacturers Association (IHMA), GS1 India, CSIR NIEST Kerala, ITSA. Counterfeit Intelligence Bureau (CIB- Interpol), FICCI CASCADE, and other industry bodies in India. For more information visit https://www.aspaglobal.com/

GS1, India: GS1 India is a global Standards body set up in India by the Ministry of Commerce and Industry. Government of India, along with apex trade bodies and institutes. It is an affiliate to the global supply chain standards organisation-GS1 Global, which is headquartered in Brussels, Belgium, and oversee operations in 114 countries For more information visit https://www.gstindia.org/

International Banknote Designers Association (IBDA), Switzerland: Formed in 2010. The IBDA is an association for banknote designers run by banknote designers. It is a non-profit making association registered in Switzerland with a fixed operational structure. For more information visit https://ibd-association.com/

International Currency Association, UK: Founded in 2016, the industry body exists to create a coherent voice for the currency industry covering design, production, manufacturing and distribution. For more information visit https://currencyassociation.org/

International Hologram Manufacturers Association (IHMA), UK: Formed in 1993 to represent the interests of hologram manufacturers and the hologram industry worldwide, IHMA is made up of over 100 of the world's leading hologram companies who actively cooperate to maintain the highest professional, security and quality standards in support of their customers.It is dedicated to promoting the interests of the hologram industry worldwide and to helping users achieve their commercial, aesthetic and authentication objectives through the effective use of holography. For more information visit

International Tax Stamp Association (ITSA), UK: Formed in 2015, The International Tax Stamp Association is a not-for-profit organisation that is working to ensure better understanding of the benefits of tax stamps and tax stamp technology, and to promote high professional standards through education, research and advocacy, and practice. For more information visit https://www.tax-stamps.org/

5.6 Global ISO & other Standards

ASPA propagate the usage of standards and guidelines in fighting fakes. ISO (International Organization for Standardization) & other bodies has many standards for authenticating the origins and supply chain of all products as well as product-specific standards. that ensure they meet internationally recognized safety requirements.

ISO 12931, Performance criteria for authentication solutions used to combat counterfeiting of material goods, specifies performance criteria and evaluation methodology for authentication solutions used to establish good material authenticity throughout the entire material good life cycle. https://www.iso.org/standard/52210.h

ISO 14298: Management of security printing (and security foil production) processes. This standard, published in 2013, will replace CWA 14641. Drafted mainly by Intergraf, NASPO and the IHMA, it specifies the steps that security printers and hologram manufacturers should follow to ensure that their processes are secure. Intergraf and NASPO both have certification auditors for this standard which require that, as a part of their risk reduction processes, hologram producers should use a hologram register to check the availability of proposed designs and to register their holograms. At present this means the IHMA's HIR as there is no other hologram register operating. https://www.iso.org/standard/54594.html

ISO 16678, Guidelines for interoperable object identification and related authentication systems to deter counterfeiting and illicit trade. https://www.iso.org/standard/57391.html

ISO 22382 for tax stamps: Titled: Guidelines for the content, security, Issuance and examination of excise tax stamps. The standard is now published and available from the ISO online store (https://www.iso.org/standard/73859. html) and should also be available from every national standards body (NSB). The purpose of the standard is to assist tax authorities to enhance compliance with excise tax regulations by implementing new, or improving existing, excise tax stamps and associated issuance systems. https://www.iso.org/standard/73859.h

ASPA-TUV Hologram Safety & Security Management System standard (HSSMS): ASPA-TUV HSSMS is an holistic standard which includes Quality Management System, Information Security Management System, Supply Chain Management, Brand Protection Management System, Data Protection requirements, Prototype Protection Management system, Business Continuity Management System and also incorporating best practices for the domain of Hologram manufacturing globally. https://www.aspaglobal.com/standards-and-guidelines

GS1 Global Traceability Standard: The GS1 Global Traceability Standard defines a minimum set of traceability requirements within business processes to achieve full chain traceability, independent of any technology. It outlines a common framework to build a traceability system using other GS1 standards such as barcodes, data carriers, Com and EPCIS. This standard allows an end-to-end traceability system, linking the flow of information to physical products, https://www.gs1.org/standards/tracea bility/traceability/1-3-0

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As a nation, we now face a serious threat and challenge from the illicit economy.

Illegal activities slowed industrial growth, thus affecting producers, and stunted revenue, hitting job growth. Consumers were the ultimate victims of counterfeiting, smuggling, and piracy as they paid excessive prices for substandard products that also increased exposure to health and safety risks.

To fight the crime of the 21st Century, the involvement of all stakeholders is important and therefore, we must maintain all that we can do to prevent it. A hand is what is required to come out of the and this is where we prove our responsibility.

JOIN US IN FIGHT AGAINST FAKES!

ASPA
Authentication Solution Providers' Association
Diverse technologies, common goal.

The Authentication Solution Providers' Association (ASPA) is a self-regulated, non-profit organization of authentication solution providers.

Formed in 1998 with the objective to curb counterfeit products in various sectors, it is the only association of its type in the world primarily focused on the adoption and advancement of authentication technology and solutions for brand, revenue, and document protection. As an industry body of authentication solutions providers, ASPA encourages its members to adopt best practices, standards, and usage of advanced technology in providing cost-effective anti counterfeiting solutions against counterfeiting. ASPA members protect over 15,000 brands worldwide through the identification of genuine products and documents. ASPA works closely with global authorities such as International Hologram Manufacturers Association (IHMA), Counterfeit Intelligence Bureau (CIB), FICCI-CASCADE, CSIR-NIIST, ACMA, CII & other industry bodies in India.

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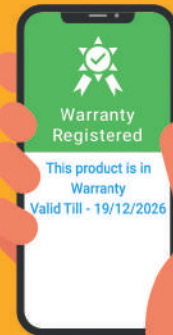Email: info@aspaglobal.com or visit us at www.aspaglobal.com