MCS Credential Components

In association with our Malaysian manufacturing partner, MCS Microsystems offers a complete line of semi-finished, ready-to-use credential components to meet your custom National security needs

About us

MCS MICROSYSTEMS SDN BHD

- Malaysian incorporated technology company.
- Developed the chip operating system for the first e-passport and multi-application national ID card in the world.
- Obtained Multimedia Super Corridor (MSC) status in September 1999
- Our mission is to provide emerging and adaptive technologies to meet challenges in the current environment.
- We collaborate with technology partners who are best-in-class to deliver leading edge designs.

Flexible Platforms

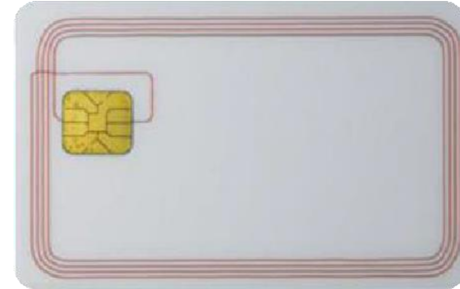
Technologies

Contactless

Contact

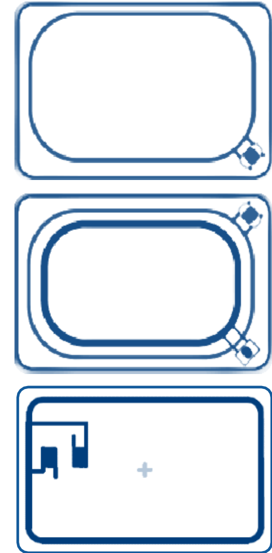
Hybrid

Dual Interface



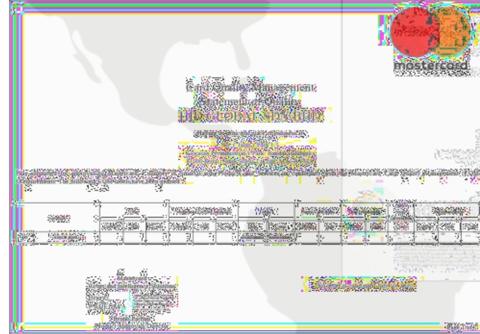
Terminology

- Single Technology: 1 chip/module + 1 antenna
- Combo: 2 chips/modules + 1 or 2 antennas
- Dual Interface Inlays:
  Antenna only for later placement of dual interface chip e.g. used for Visa, MC, Amex… cards



Global Quality

ISO 9001-2015, ISO 14001-2015 and CQM certified facilities



- Product design, development, manufacturing, delivery and service processes meet strict international standards for quality
- Validated systems for continuous improvement ensuring consistent quality and delivery performance

Channels to Market

Products

Prelaminate

Overlay

E-unit

Partners

Card Manufacturer

Applications

Access

Transport

Loyalty

Payment

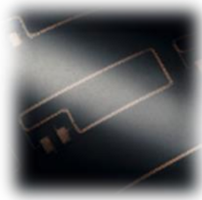
Banking

Prelaminates

- Diversity of Materials : PVC, PETG, PC, Teslin®, synthetic paper,

  Development in progress of "ecofriendly" alternatives such as 100% recycled PVC, recycled PET-G…
- Frequency and chip supplier agnostic
- Combinations of up to the 3 frequencies on the same position
- Customized to your format from A4 to king size; 6up to 80up, custom cards sizes: ID1, CR100, XXL, mini card…
- Various thicknesses from 150µm for DI antenna, 175µm for HF DBond™
- Colors options available with volume | upon demand
- Technology advantages:
  - Fully automated process
  - Wire embedding
  - Coil winding
  - DBond™ Technology

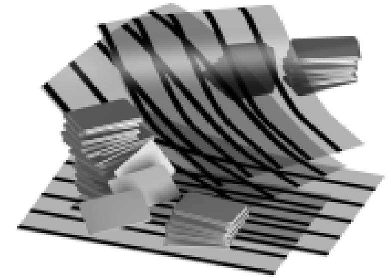
Dual Interface prelaminate variant



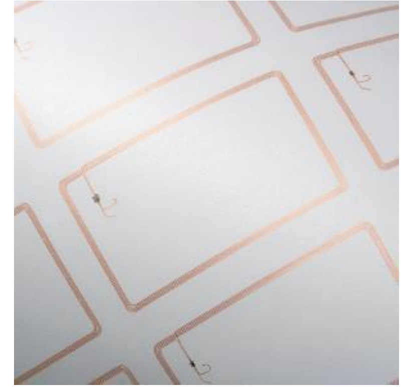
- Cu pads for physical connections thanks to:
  - ACF (anisotropic conductive film)
  - Mühlbauer flex bump or T-Connect
- Meanders pads for physical connections thanks to:
  - Mühlbauer flex bump or T-Connect
  - Conductive adhesive (NBS / Delo …)
  - ACF
- Soldering wire connection:
  - Pulling of wires during milling process which are then soldered to module
- Coupling (SPS, IFX CoM)
  - Modules must have their own antenna

Overlays

- Diversity of Materials : PVC, PETG, PC, laserable or not, with or without coating
- Up to 10 stripes
  - HiCo, Loco magnetic stripes, several stripes per row possible
  - Width of stripes from 1.3mm to 21.5mm width
- Stamped hologram to your format
  - 2D, 3D, holographic effects…
  - Design support with our partners
  - On surface for smooth card's touch after lamination or embedded hologram within card body's structure for higher security



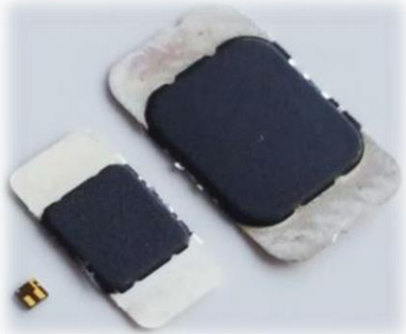
MCS
MiCroSystems Group

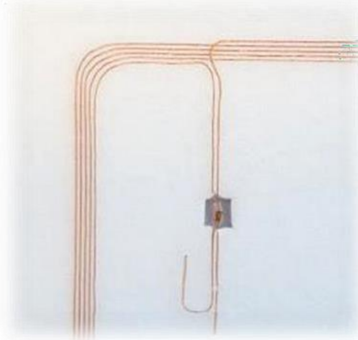


Direct Bonding Technology™

DBond™ Technology

- DBond™ (Direct Bonding) is a means to directly connect an RFID wire antenna to a micro-sized chip without the need for bulky module housing and without additional soldering material





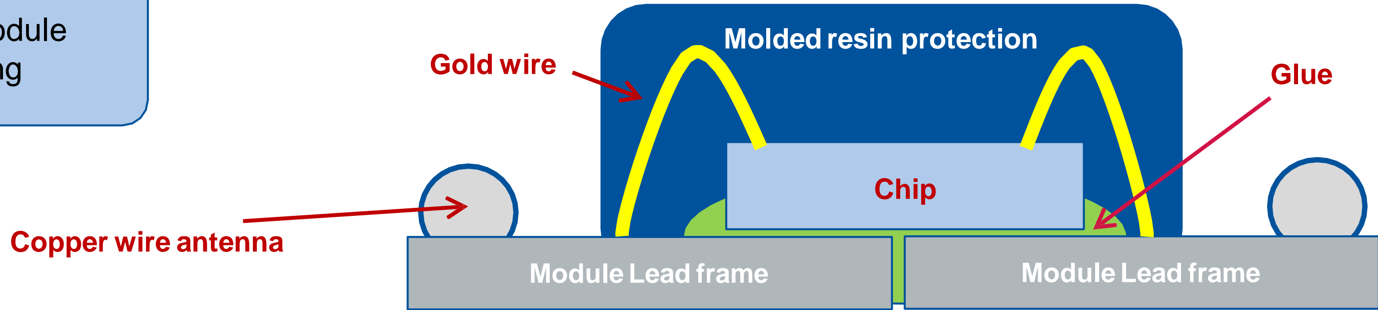
Advantages of DBond™ Technology

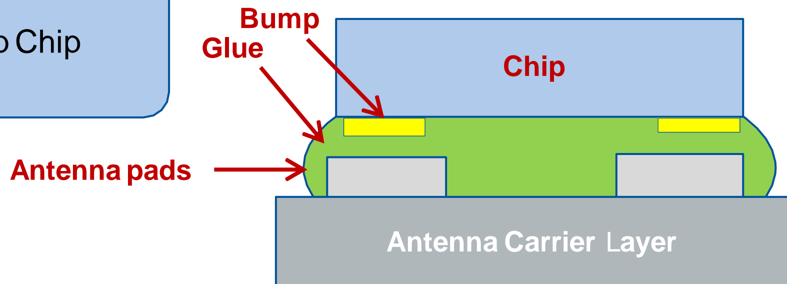
- Thinner inlays for ISO Cards and Passports
  - Inlay thickness down to 170µm (100µm or less chip thickness) compared to ~260µm with modules (200µm module thickness, MOX10)
  - Ultra-thin prelaminates allow adding more security features
  - Possibility to use same structures for DI & HF cards (raw material standardization)
- Excellent printability of ISO cards even with DTC printers

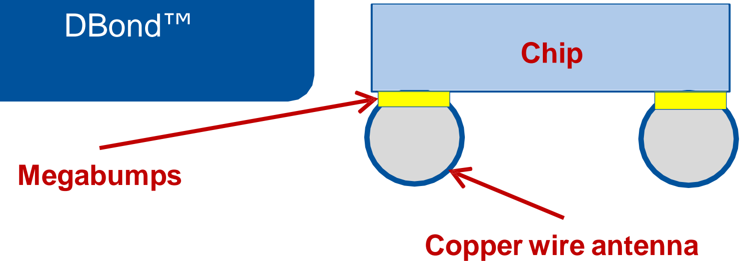
Modules can cause a slight deformation on card surface impacting print quality

- High durability due to fewer connections, increased robustness against bending
- Excellent RF performance thanks to copper wire antenna

Bonding Technologies



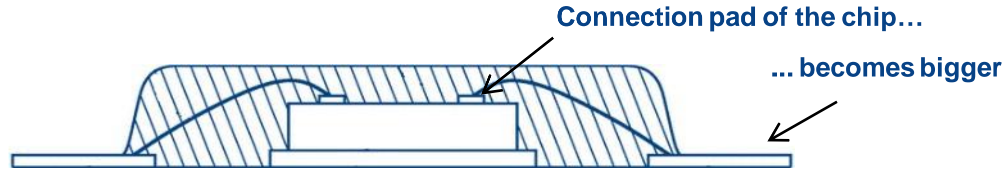




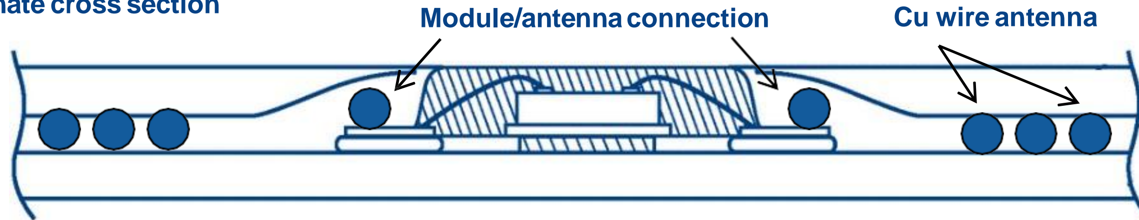
How to Reduce Inlay Thickness (1 of 2)

- Inlay thickness is driven by module thickness
- Big module enlarges the connection pads of the chip, allowing an easier connection with the antenna

Module cross section

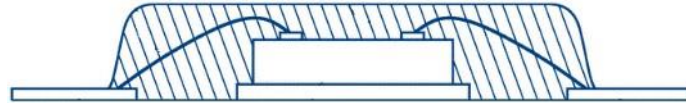


Module inside prelaminate cross section

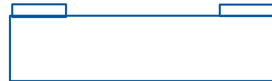


How to Reduce Inlay Thickness (2 of 2)

- Chip manufacturers are making thinner module:
  MOA2, NOA3… (400µm) ⇒ MOA4, NOA3T, HOA4 (330µm)
  ⇒ MOB6, MOA8, MCS8, MOB6 (250µm)
  ⇒ MOB10 (200µm)



- The simplest way to reduce thickness is to remove the module from the equation and make a direct connection between the chip and the antenna

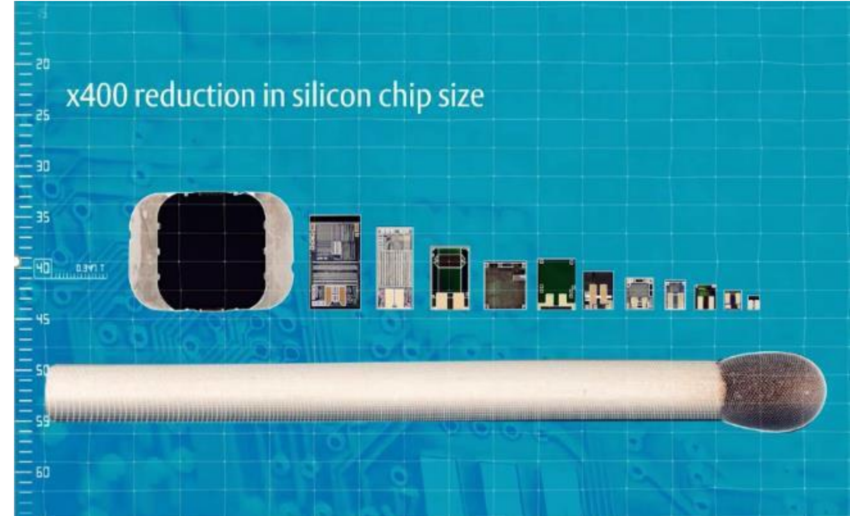


DBond™ Chips

- High Frequency
  - ✓ Vigo™
  - ✓ Fujitsu MB89R119
  - ✓ Seos®
  - ✓ iCLASS®
  - ✓ EM NF4 8K
  - ✓ MIFARE® EV1 1K
  - ✓ P60D080
  - ✓ SLE78CLX1600
  - ✓ EM4233

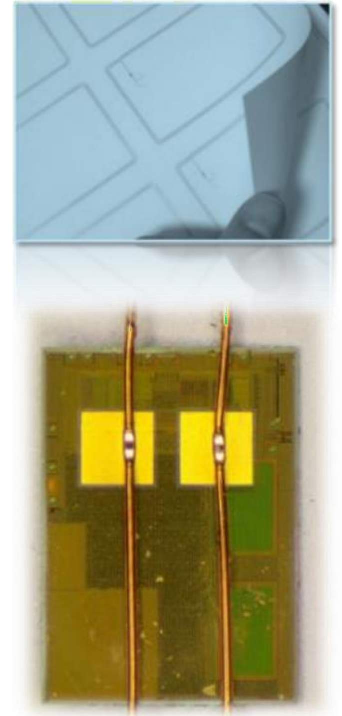
  - ➢ New platforms coming…

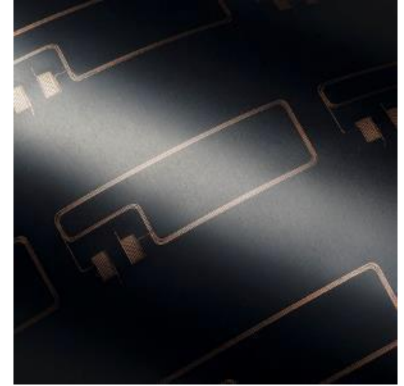
- Low Frequency
  - ✓ EM4102/4200
  - ✓ EM4305
  - ✓ Q5
  - ✓ ATA5577
  - ✓ HITAG S
  - ✓ EM4166
  - ✓ EM4450
  - ✓ Prox



Summary on DBond™ Technology

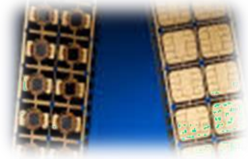
- DBond™ is the best way to connect RFID chips to copper wire antennas
- Allows miniaturized or special form factors
- Enables manufacturing of extra thin inlays for trouble-free „direct to card" printing or additional security layers
- High reliability due to:
  - Smallest possible number of connections
  - Robust heat/pressure welding process
  - Immune against bending (small chip size)
- Optimal RF performance due to Cu wire antenna
- Proven technology for LF and HF





Dual Interface

Dual Interface cards vs smart card

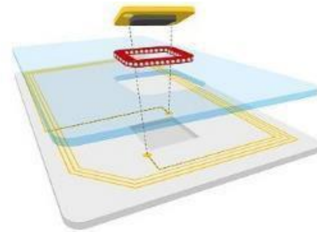


- Card's body: need to have integrated inside of it an antenna which will allow RFID communication of the chip
- Module: need to be able to be connected to the antenna inside the card body:
  - Physically thanks to connection pads on the back side of the module or
  - By RF thanks it's own antenna which will resonate with the booster which will be in the card body
- Then you need to connect both
  - Physically
  - By coupling
- Pictures of some of the existing modules from front & back:

Technologies of connections:

Without any specific equipment's vs contact cards:

- ACF:
  - Use of Anisotropic Conductive Films instead of standard adhesive to stick the module to the card body
  - This film have particle within its structure which will do the connection between the antenna and the module
  - Need to have the antenna close to the top of the cards as it needs to be revealed during P1 milling
  - Can use all DI modules from the market
  - *Known suppliers of tape: Dexterials, Tesa*
  - *Antenna technology used: Cu Pads (making milling easier) or wire pads*



Source: Tesa website

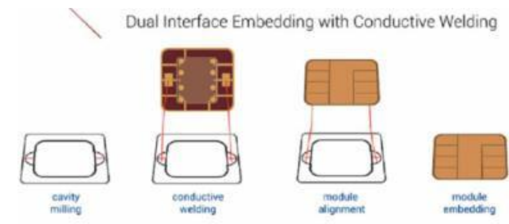
- Coupling technology
  - No physical contact between the module & the antenna
  - Need to use special modules which have their own antenna
  - Antenna can be Cu wire embedded or etched (in case of etched usually substrate is PET which then require special attention on adhesion between the layers of the card body)
  - Require accuracy of module / antenna positioning which can be challenging bigger the format is
  - *Known suppliers of modules: IFX with CoM, SPS*

Source: Infineon website

Technologies of connections:

With additional specific equipment's vs contact cards:

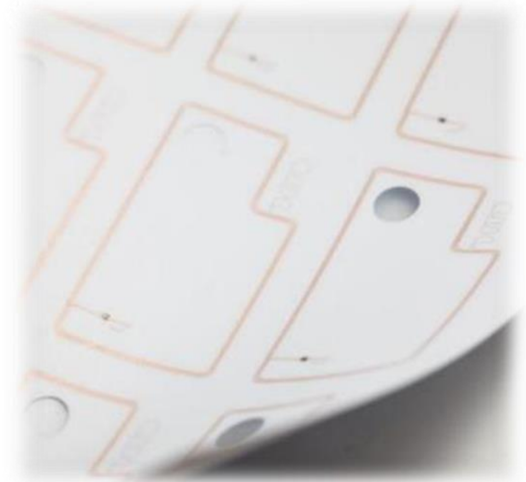
- Need to have a special cavity made during milling with 3 levels:
  - Std P1 for adhesion of the module to the card body & P2 to give space to the chip & it's globe top
  - Small additional holes on sides of P2 with deepness in between P1 and P2 are made, milling the copper allowing to make a physical connection between the module & the antenna.
  - Conductive material is added on the back side of the module and/or in those 2 small cavities
  - Adhesive is stick on the back side of the module – letting free the connections area on the back side of the module
  - *Antenna technology: commonly used: wire pads technology, possible also to use Cu pads technology*
  - *This process allow to use any standard DI modules available in the market*
- Suppliers & technology available:
  - TeConnect Mühlbauer using Flex Bump technology
  - Conductive glues from Delo
  - DMEX from NBS
  - …
- Others process such as soldering is possible, but so far only used in far east factories



Prelaminate Details

Prelaminate Specification Details

- Material: PVC, PETG, PC – others and mix upon request, development in progress for towards material with neutral impact to the environment
- Color: White, Clear – your specific pantone possible with volume
- Packaging:
  - HF: DBond™ technology or all standard modules
  - LF: exclusively DBond™ technology
  - UHF: Single smart loop | Flip chip on etched antenna
  - Dual Interface: Not applicable – supply of antenna only (*Designed for your own Ics|OS & application requirements)*
- Dimensions:
  - Maximum Length: 770 mm
  - Maximum Width: 630 mm
- Single antenna size as per application needs (*From the mini cards to XXL card's size)*



Prelaminate Specification Details Cont.

- Standard protocol support: ISO 15693, ISO 14443, ISO 10373/7810, CQM
- Manufacturing sites with ISO9001:2015, ISO 14001:2015 & CQM certifications for dual interface & contactless prelaminates.
- Printing marks available upon request (registration, traceability)
- Thickness: See table on next slide
- Card format: See table on following slide

Prelaminate thickness table

Material	PVC	PVC	PVC	PVC	PETG	PETG	PETG	PC	PC	PC
Product type	HF Module 330µm	HF Module 250µm	HF DBond™	Dual Interface antenna	HF Module 330µm	HF Module 250µm	HF DBond™	HF Module 330µm	HF Module 250µm	HF DBond™
Min. Thickness	395+/-25µm [15.6mil]	320+/-30µm [12.6mil]	175+/-20µm* [6.9mil]	150+/-20µm [5.9mil]	380+/-30µm [15.0mil]	320+/-30µm [12.6mil]	195+/-20µm* [7.7mil]	365+/-30µm [14.4mil]	310+/-30µm [12.2mil]	200+/-20µm* [7.9mil]
Thickness over module	Max 450µm	Max 380µm	N.A.	N.A.	Max 430µm	Max 380µm	N.A	Max 430µm	Max 350µm	N.A
Std Color	White Clear	White Clear	White Clear	White Clear	White	White	White	White	White	White
Antenna Technology	Wire embedding	Wire embedding	Wire embedding	Wire embedding	Wire embedding	Wire embedding	Wire embedding	Wire embedding	Wire embedding	Wire embedding

* Depends on chips used

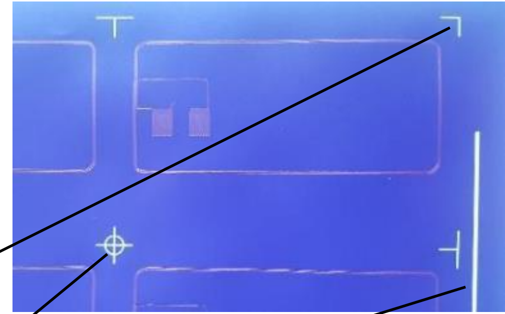
Card format table

(Indicative table – prelaminate made to customized size as requested)

Common names	Specified size (mm)	Specified size (inch)
ID-1 / CR-80	85.6 x 53.98	3.370 x 2.125
ID-2	105.0 x 74.0	4.134 x 2.913
ID-3	125.0 x 88.0	4.921 x 3.465

Common thickness	Specified size (mm)	Specified size (inch)
ISO	0.760	0.030

Prelaminate printing



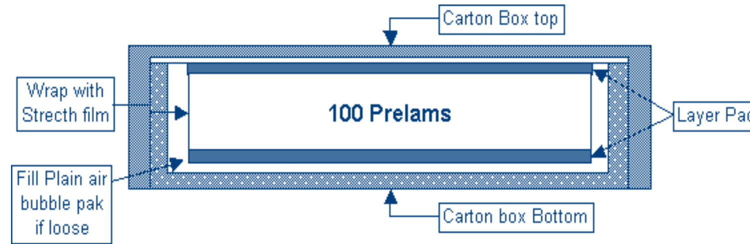
PVC sheet printing for prelaminates is mostly by silk screen or inkjet printing

Standard marking includes:

- Reference marking:
  - Big marks which allow automatic collators sheet's alignment
  - Small crosses for visual alignment references
- Reference corner
- Product description, part number…

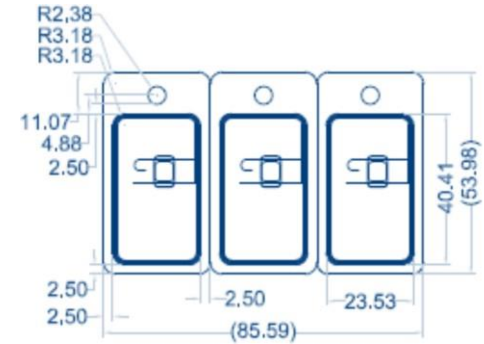
Packaging

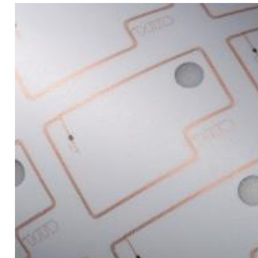
- The prelaminates are packaged in a box, wrapped in stretch film and topped by a layer pad
  - Small size: 100 sheets/box
  - Queen size: 50 sheets/box
  - King size: 50 sheets/box
  - DI small: 200 to 300 sheets/box
  - DI large: 100 to 150 sheets/box

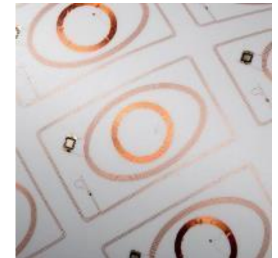


Custom Solution

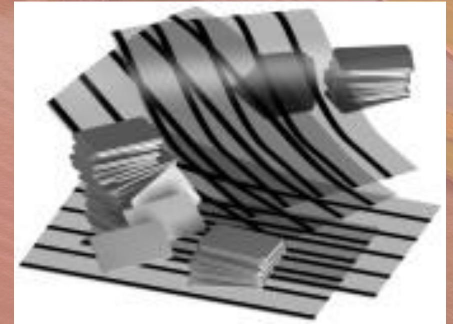
- If we don't have it, we can develop it
  - A culture of innovation custom development
  - Knowledge of emerging technology ensures best solutions
  - Proven processes make it easy to do business
  - Engineering expertise assures results that work
- Customizable product range
  - Non-standard formats, electronics and materials
  - Unique form factors







Overlay Details



Overlays with magnetic stripes

Facility in Rastede (Germany), former "CCD" was the "Inventor" of the Tapelayer Machine

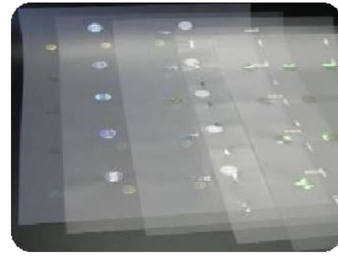
- Flush-On Application of:
  - LoCo or HiCo magnetic stripe
  - Paper and Signature Panels
  - Thermo-Rewritable stripe (TRW)
  - Hologram
  - Any other stripes of hot transferable material (holographic magnetic stripes...)

➔ This means that the stripe layer is transferred without the polyester carrier and still has a non-abrasive connection.

Overlays with stripes

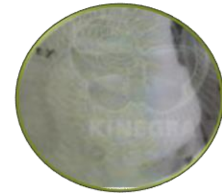
- Materials: PVC, PC, PET-G
  - Thickness from 40µm to 300µm
  - Coated or non-coated
  - Laser engravable or non-laser engravable
- Stripes:
  - Up to 10 stripes
  - As many stripes per row as required (1, 2, 3)
  - Stripe size from min 1.3mm to 21.5mm max
- Delivered in rolls or sheets form.
- Maximum width:
  - 700mm in roll
  - 690mm in sheet

Overlays with holograms



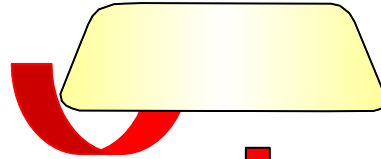
Allow to have the hologram embedded inside the card's body structure insuring highest security

- Materials: PVC, PC
  - Thickness from 50µm to 150µm
  - Non-coated overlays
  - Laser engravable or non-laser engravable
- Hologram:
  - Consigned or provided by us
  - Support on design on demand made with our partners
- Maximum sheet size:
  - 690mm x 540m



Overlays with embedded hologram: card's structure

Application of the hologram on the lower surface of the overlay



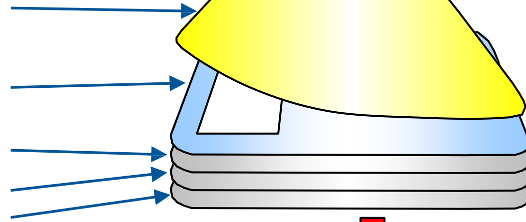
Overlay with hologram top

Printed foil (observe)

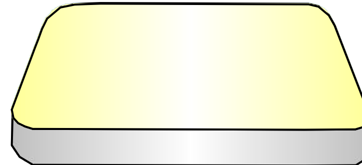
Core / prelaminate

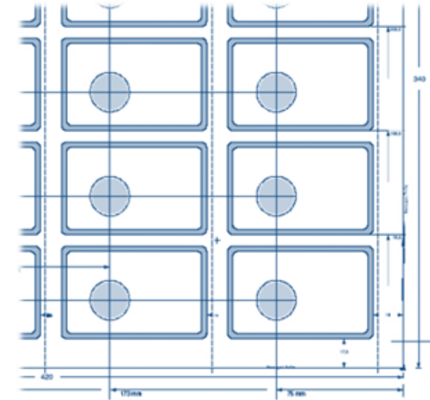
Printed foil (reverse)

Overlay bottom



Finishing of the card by lamination





Details of the various layers of the card made with an embedded hologram on top overlay

Thank you
https://www.mcs-group.com.my

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