



# Screen and Pad Printing – Industrial High-Tech Printing Processes

Dr. Andreas Sohns  
Vice Manager R&D – Pröll

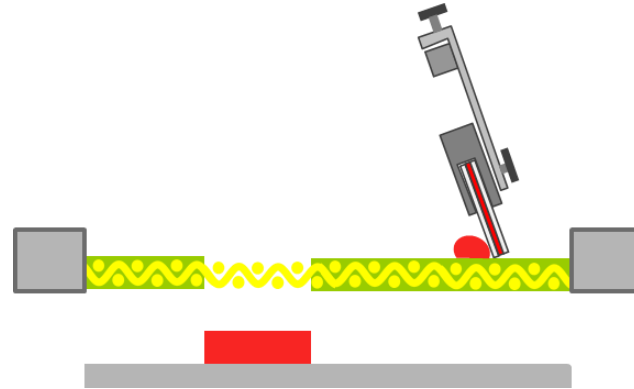
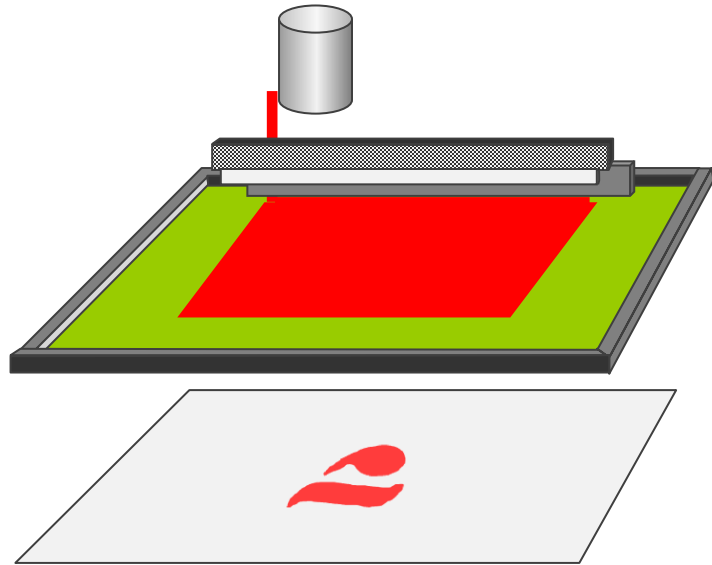
Co-Authors:  
Dr. Wolfgang Schäfer – Marabu  
Michael Simon – Ruco  
Jean-Paul Muller – Coates Screen Inks

German Paint and  
Printing Ink Association (VdL)



# Screen Printing Process

Screen printing → „Print-through“ process



- **Wide chemical basis:**
  - Solvent-based / UV curing / UV LED / water-based / Dual Cure
- **Wide range of printing substrates:**
  - Thermoplastics such as PVC, PP, PE, PA, PC, PET, etc.
  - Glass & metal
  - Thermosetting plastics
  - Textiles
  - Paper & cardboard

- Opacity → > 50 % pigment content
- Ink film thickness → 5 to > 30  $\mu\text{m}$  (Braille > 200  $\mu\text{m}$ )
- Line width → 30  $\mu\text{m}$  up to full area print
- High optical density → > 5 (black)
- Particle size of pigments → 5 – 200  $\mu\text{m}$  for effects
- Rheological properties → shear thinning to flowable (1 Pas)

## Flat glass:

- Touch panel
- Data input systems (nautic controls, coffee dispensers, gambling machines...)
- LSG glass / partition walls (entrance halls, sanitary areas)
- 3C Markets = computer, communication, consumer electronics
- Glass elements for furniture (kitchen panels, splash guard walls, doors)



## Glass (direct printing)

- *Organic screen printing inks:*  
solvent-based (1C/2C, stoving 140 – 250 °C)  
UV curing inks (2 C, with / without stoving 140 – 180 °C)
- *Ceramic screen printing inks:*  
(Heavy metals, high firing temperatures 500 – 600 °C,  
limited range of colour shades)
- *Thermoplastic screen printing inks:*  
(Chips → heating of the printing screen up to 80 °C, CMYK print,  
Pantone colour shades)

## Round glass

- Single-use beverage bottles, drinking glasses
- Baby drinking / feeding bottles, cosmetic flacons



## Hot stamping combined with screen printing

- *Embossing stamp*, high pressure, slow
- *Rotary hot stamping*, higher pressure, faster



## Cold stamping (INLINE FOILING®)

- Decoration of glass containers and plastic tubes
- Principle: print of adhesive with screen printing process
- Foil is applied into the adhesive, UV-LED curing
- Application of a topcoat to improve resistances
- Colouring of the topcoat by tinting with pigment pastes

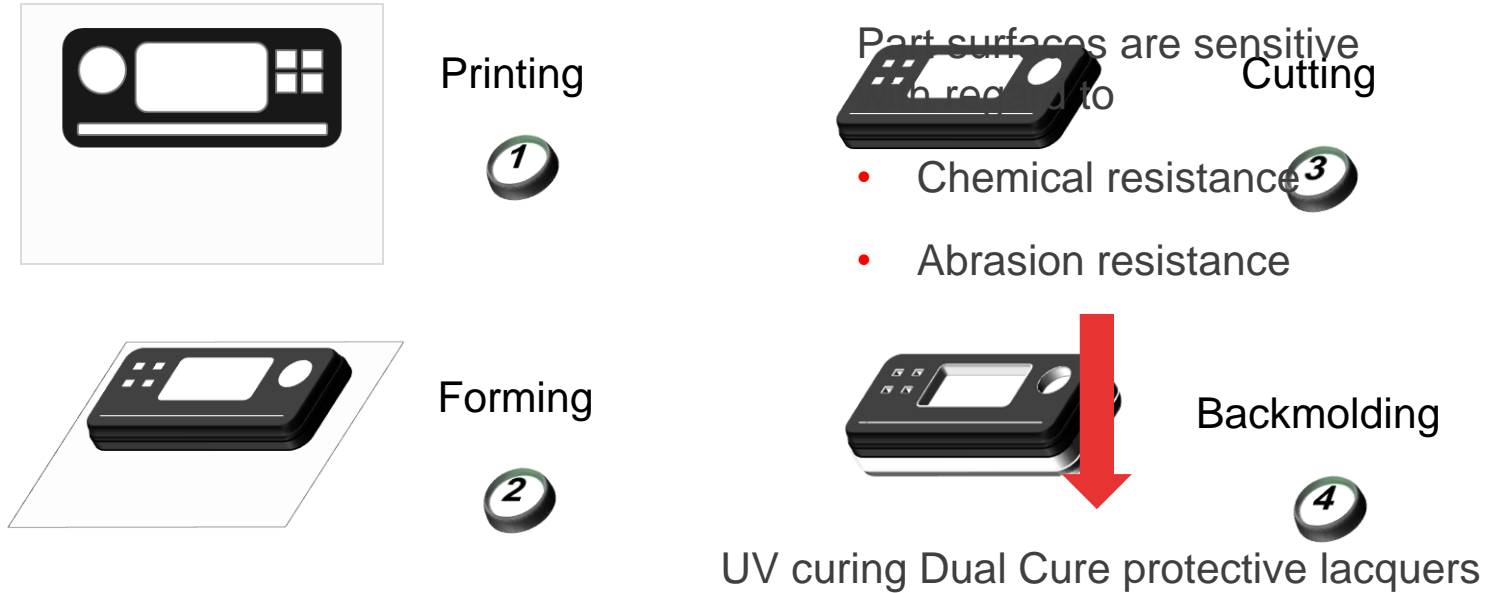


## Plastics (direct printing):

- Mainly UV curing printing inks (conventional / UV-LED)
- Food packaging with inks which are compliant for food packaging decoration (ketchup, mustard...)
- Cosmetic articles (tubes, jars, eyeliner pencils...)
- Industrial containers (silicone sealants...)



## InMold Decoration (IMD) / Film Insert Molding (FIM)



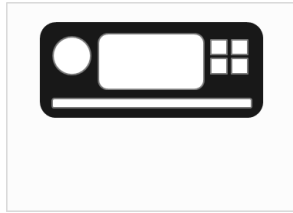
- Screen printing  
→ Standard process in IMD/FIM technology
- Decoration and production of automotive interior parts, front panels of IT and household appliances
- Excellent adhesion to different film materials, e.g. PC, PET, PMMA, PA, PP
- Highly flexible and formable via thermal, mechanical, vacuum and high pressure forming



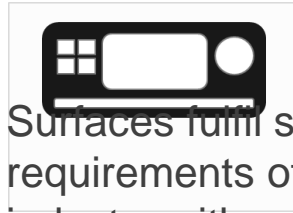
- Resistance to thermal stress and shear caused by melt of injection molding material
- Long-term adhesion between film / ink / injection moulding material
- Compatibility with conductive metallic and polymeric inks
- Secret until lit / dead front design



## Dual Cure protective lacquers for IMD/FIM applications



1 Decorative print, second surface

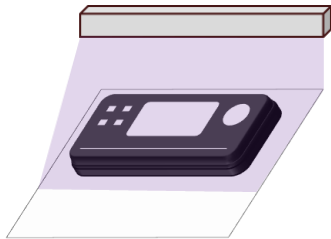


Surfaces fulfil stringent requirements of automotive industry with regard to chemical and abrasion resistance

2 Print of Dual Cure lacquer, first surface



3 Forming



4 UV curing



5 Cutting



6 Backmolding

- Solvent-based UV systems, additionally cross-linked via isocyanate reaction
- Improvement of surface resistances of thermoplastic standard films such as PC, PMMA, ABS, PA or PP
- Printing onto pre-coated, non-cured hard coat films for realisation of matt / glossy design combinations on one part



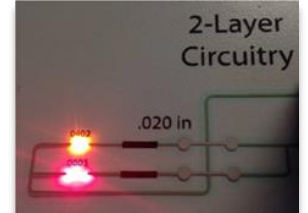
## Printed circuit boards, solar cells, electronics

- Solder resists & marking inks
- Etch & plating resists
- Conductive inks (carbon, polymer, silver pastes)
- Dielectrics, solder masking lacquers, peelable lacquers
- Silver & aluminium metallization pastes for PV



## Applications in electronic devices

- Smart packaging solutions
- Printed antennas
- Membrane switches / touch panels
- ID plastic cards / security labels
- Automotive & industrial electronics

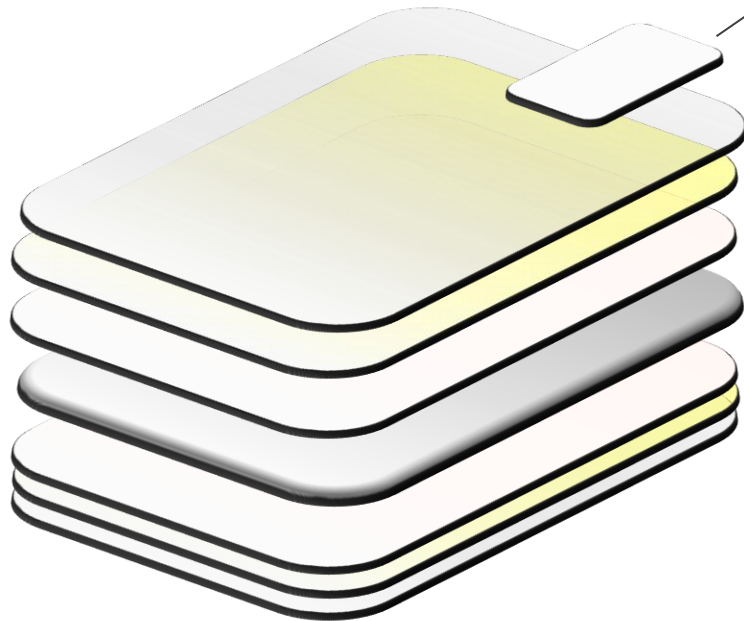




- Credit and ID cards made of PVC and PC films
- Solvent and water-based, but also UV curing screen printing inks
- Screen printing for decoration and functionalization
- Screen printing inks are offset overprintable and suitable for lamination
- Metallic colour shades and special effects are feasible
- Firm bond in the multi-layer structure of inks and films

# Application Credit & ID Cards

Credit / ID cards



**Signature field**

**PVC/PC overlay film  
or protective lacquer (UV)**

**Decorative inks (solvent-based/UV)**

Screen printing:

Metallic shades / opaque white

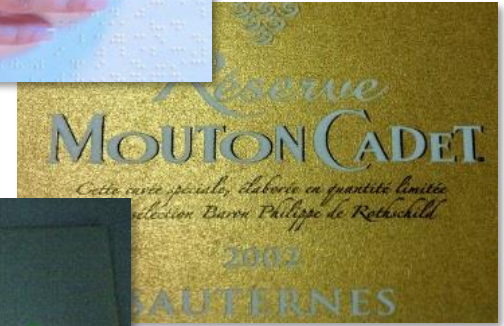
Combinations with offset

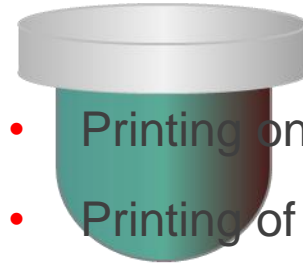
**Offset primer**

**Core film  
PVC / PC**

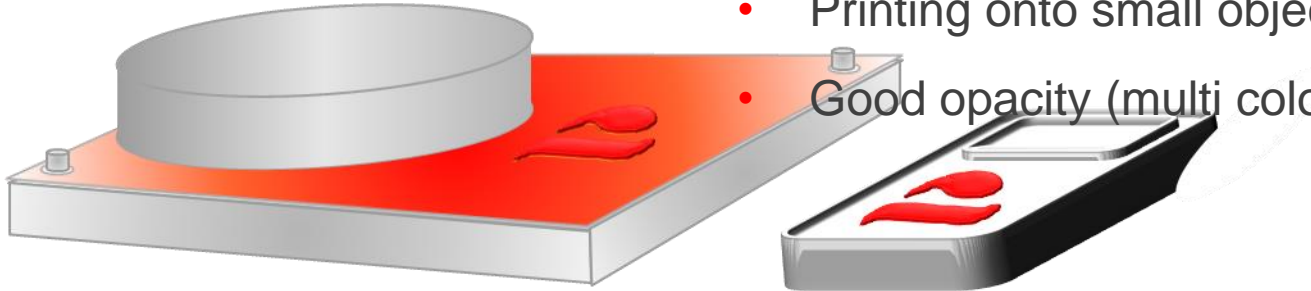


- 3D, haptic effects up to 200  $\mu\text{m}$  (braille lacquers)
- Gloss, matt and textured effects
- Metallics, pearlescent, glittering, flip-flop / chameleon effects, rainbow effects
- Mirror silver, photoluminescence (glow in the dark) effect





- Printing onto plane and 3D surfaces
- Printing of fine details
- Printing onto small objects
- Good opacity (multi colour printing)



- Indirect gravure printing process: transfer of an image by a silicone pad
- Open and closed printing systems
- Different level of automation
- 1 to multiple colour machines and rotary pad printing machines
- Solvent-based ink systems are used in most cases
- UV curing and water-based pad printing inks for special applications

- Various 3D objects
- Household appliances
- Automotive industry
- Medical devices
- Cosmetic parts and packaging
- Glass decoration
- Bottle closures in beverage industry
- Edge bands for furniture
- Promotional items, toys, sporting goods



## „Direct to textile“ printing

- Substitution of labels in t-shirts & underwear
- High washing resistance (30 – 90°C)
- Oekotex conformity (restricted substance list)



**Thank you for your attention!**  
**Any Questions?**



# Thank you for your attention!

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## Sector Group Printing Inks

German Paint and Printing Ink Association (VdL)  
Mainzer Landstraße 55  
60329 Frankfurt am Main  
Germany

Phone: +49 69 2556-1411  
E-Mail: [vdl@vci.de](mailto:vdl@vci.de)  
Web: [www.WirSindFarbe.de](http://www.WirSindFarbe.de)