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The meaning of KroMID®

KroMID® is a combination of our brand name Kromberg and MID (Molded Interconnect Devices).

KroMID® describes the development and production-process of real 3D- PCB, made of laser-structured thermoplastic carriers.

KroMID® products are representing the first 3D-MID in serial production of a premium OEM.

KroMID® products offers an increased number of features without increasing the space.

KroMID® products are produced on automated production lines with a secured quality.

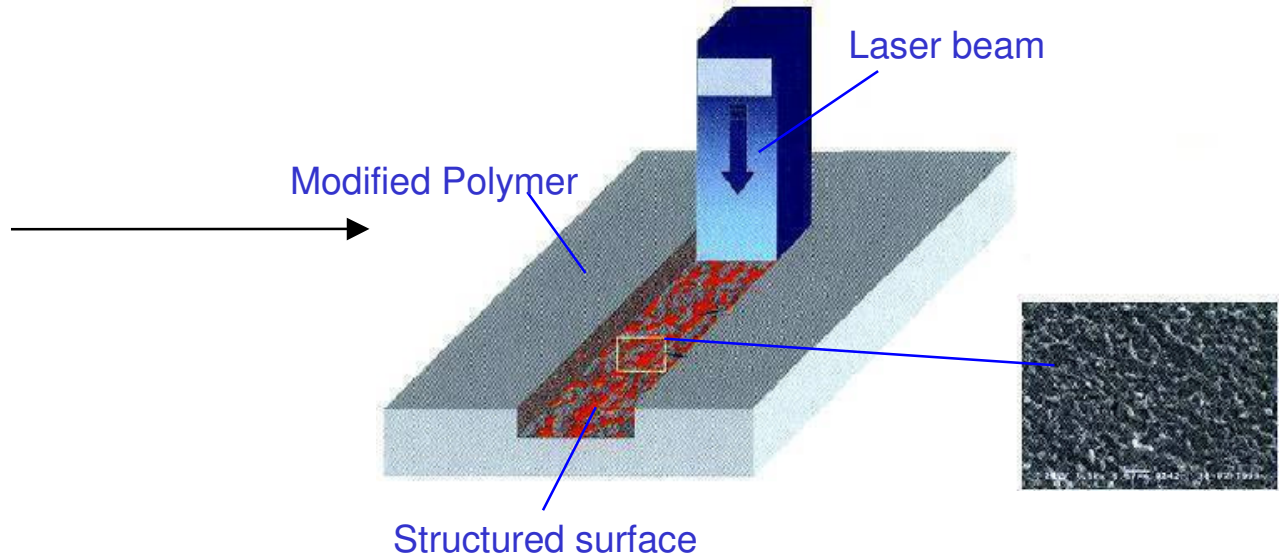
KroMID® is 100% „Made in Germany“.



PCB goes three-dimensional

How does it work?

- 1. Plastic moulded part
- 2. Laser structuring of tracks



- 3. Chemical plating (electroless)

Cu- Tracks

Optional: Au, Ni, Sn, ...





PCB goes three-dimensional




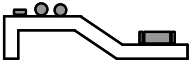
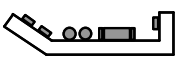


Laser Direct Structuring

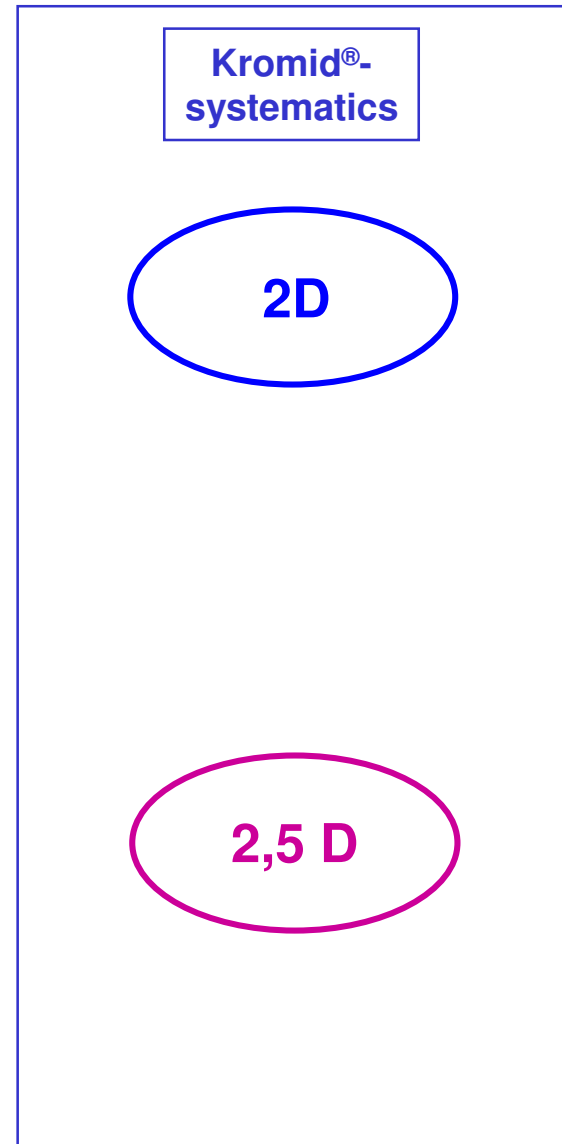
- + thin structures possible (<100 µm)
- + layout is not tool depended
- + „real“ 3D applications
- + superb for signal applications





Definition of 3D-MID systematics

Dim.	type	attribute	sketch
2D	0	planar component side	
2 ^{1/2} D	1A	planar component side, 3D-snaps, beams,... on the opposite side	
	1B	planar component side with 3D-snaps, beams,...	
	1C	different plan parallel component sides	
n x 2D	2	different angled planar component sides	
3D	3A	Standard forms (cylinder, cube,...)	
	3B	Free-form surfaces	

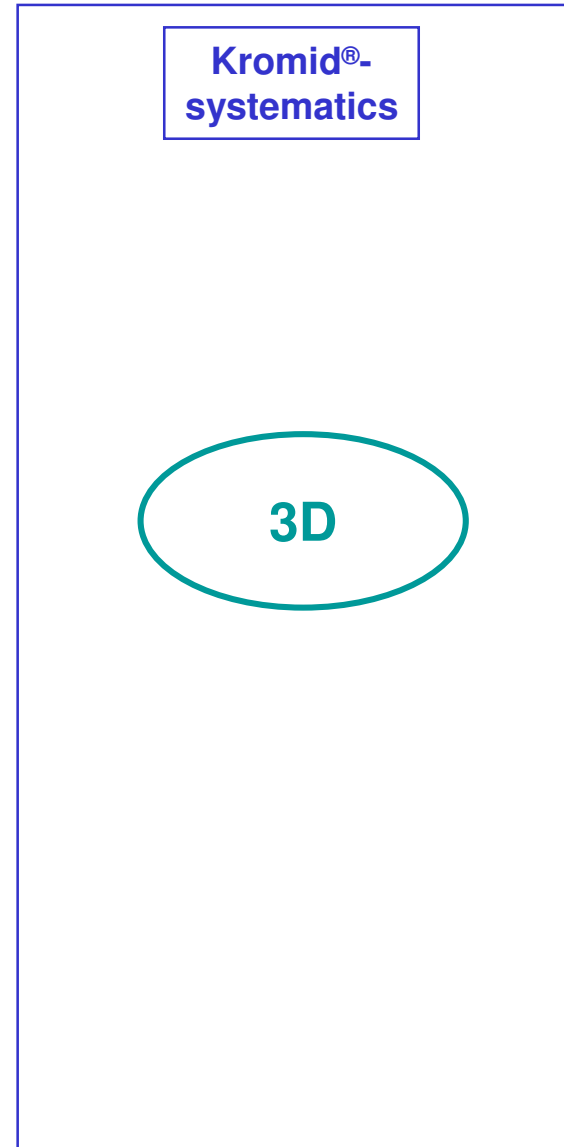


source: Dissertation J.Franke, FAPS, 1995



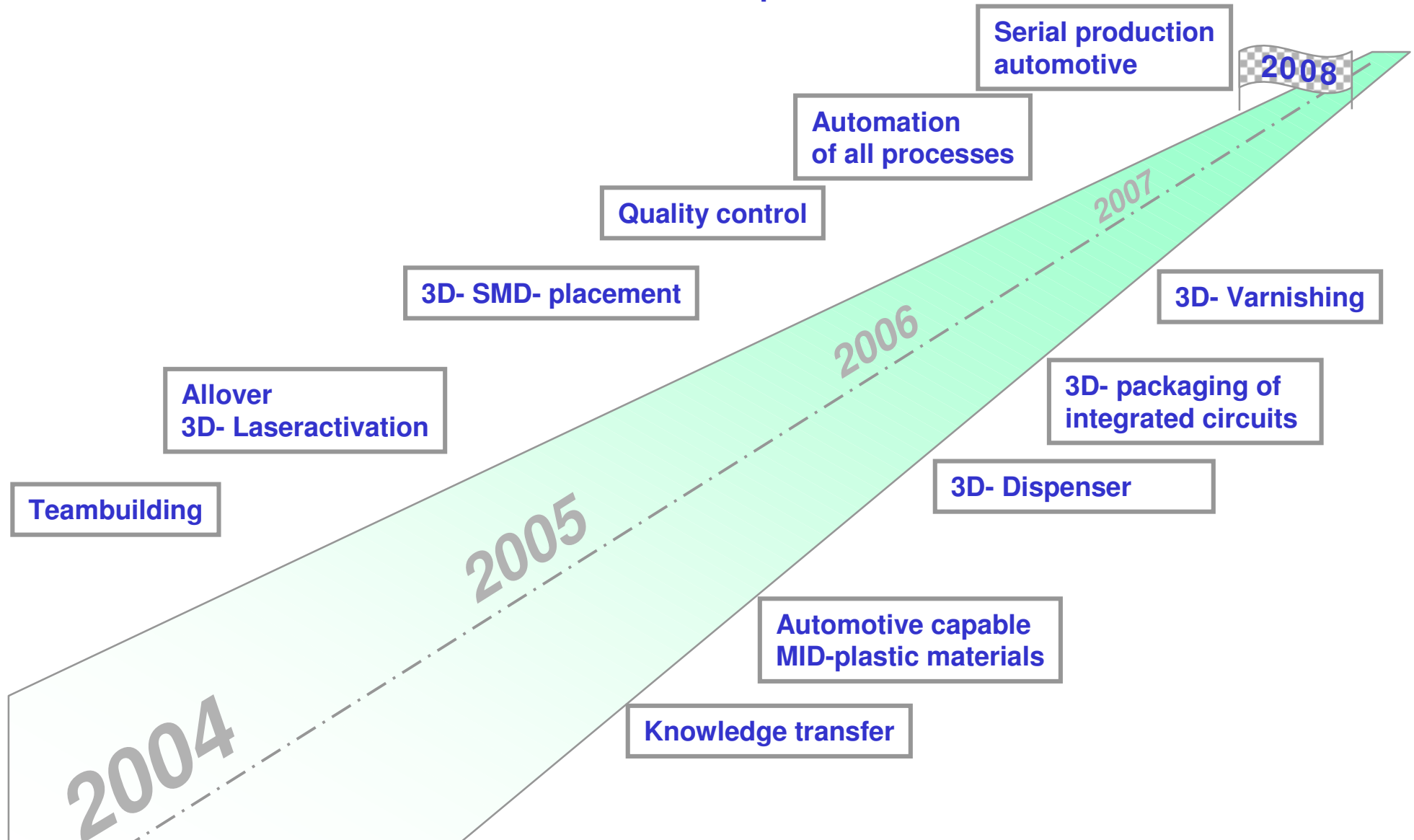
Definition of 3D-MID systematics

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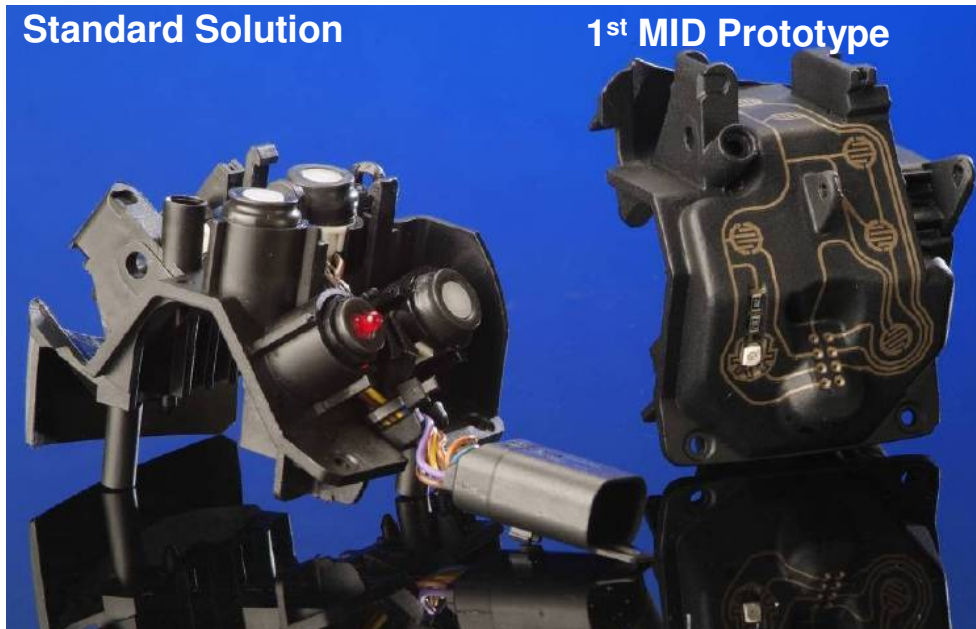
Roadmap für KroMID®





Advantages of KroMID® hand control units

- reduced weight with 50%
- reduced number of components
- 14 functions instead of 7
- reduced volume with 50%
- electronics fully integrated in „true 3D“
- absolutely no maintenance required
- connectors fully integrated
- no „mini“ wire harness needed



KroMID® Solution



PCB goes three-dimensional

Up to 256 variants possible with just one carrier

Examples





3D- Laser- activation

Requirements

- All over 3D- Laser- activation
- high- precision conductor tracks
- definable performance of the laser
- 100% reproducibility



subsequently galvanization



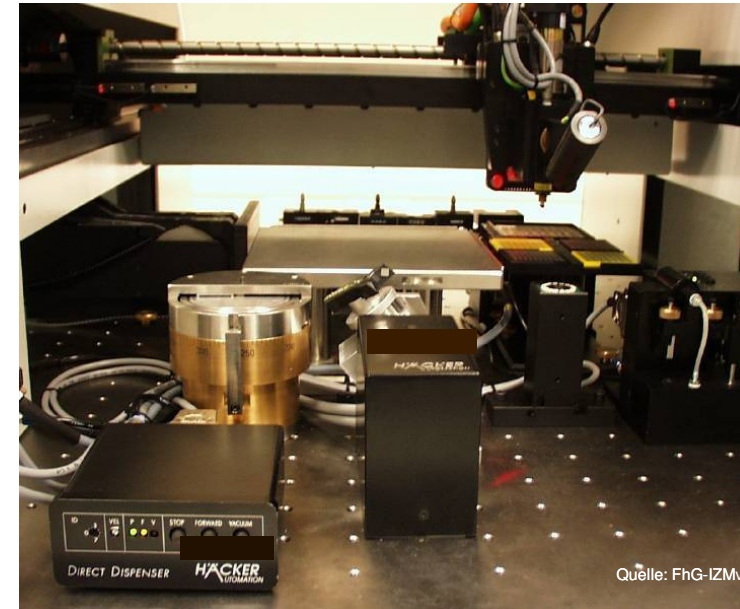
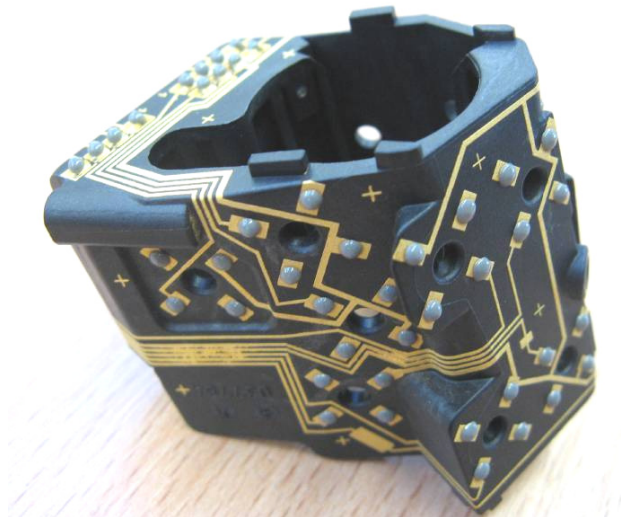
Quelle: LPKF



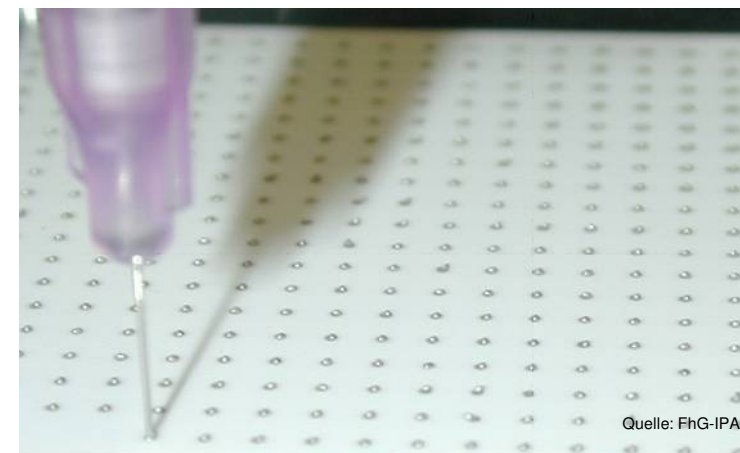
3D-dispensing

Requirements

- All-over 3D- dispensing
- combined vertical- and horizontal dispensing
- definable and reproducible dispensing
- adaptation of soldering paste



Quelle: FhG-IZMv



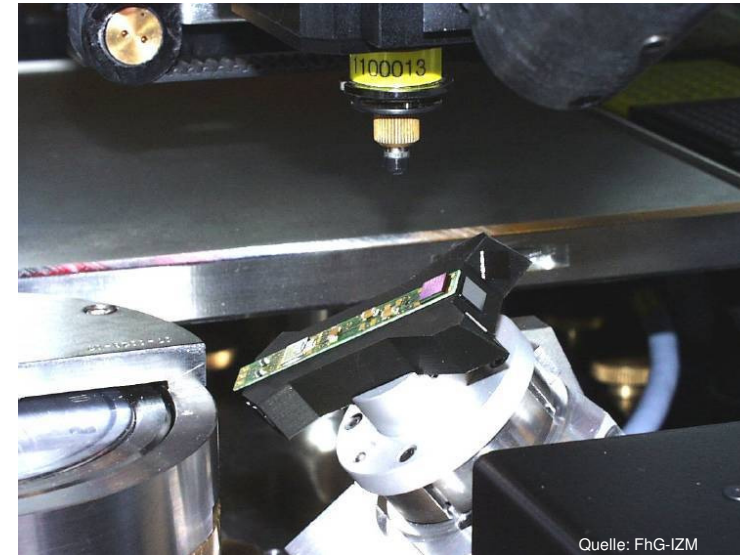
Quelle: FhG-IPA



3D- SMD placement

Requirements

- Allover 3D- placement
- proper referencing onto the product
- controlled placement
- new contacting technologies
- High-speed assembly adapted to (automotive) high volume production



Quelle: FhG-IZM



Quelle: 3-D MID e.V.



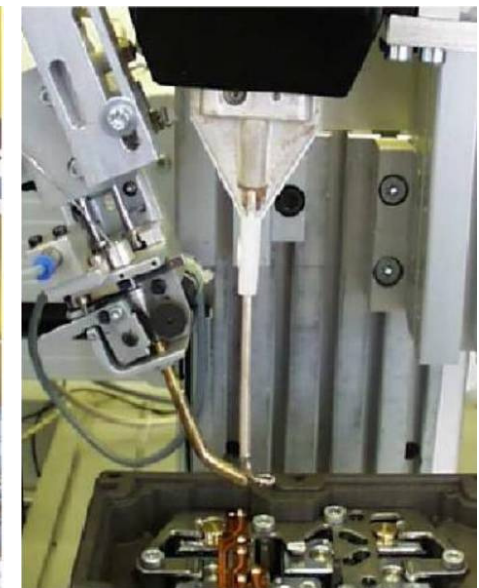
3D- soldering

Requirements

- lead- free soldering
- product-specific soldering
 - selective
 - induction
 - vapor phase
 - combinations
- integrated in automated production line



Quelle: IBL





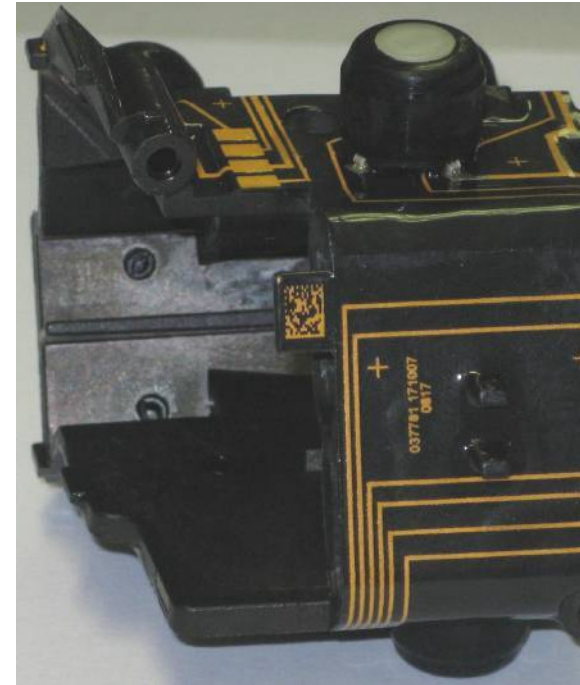
Traceability

Requirements

- 100% traceability
- registration of all product- related process data

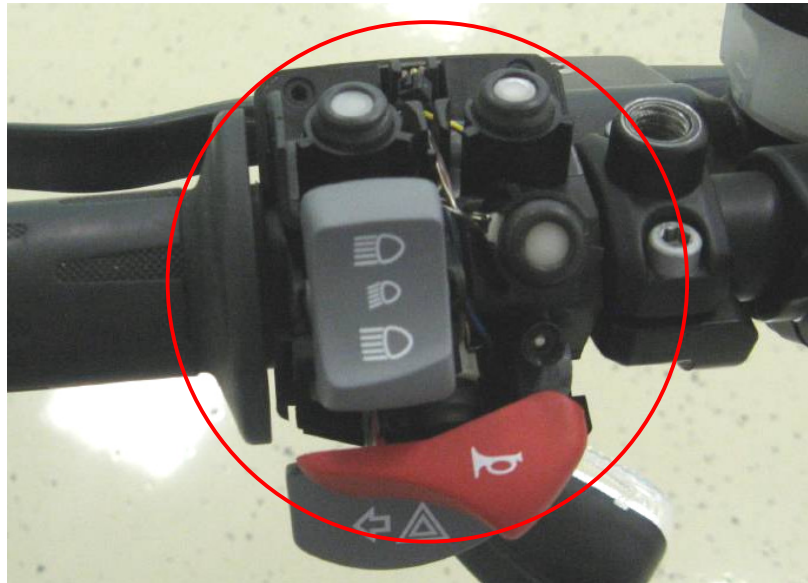
DMC Data Matrix Code

- version
- material data
- parameter
 - Laser
 - Galvanic
 - Process
- QS-Data
- end-of-line Testresults
- worker
- ...

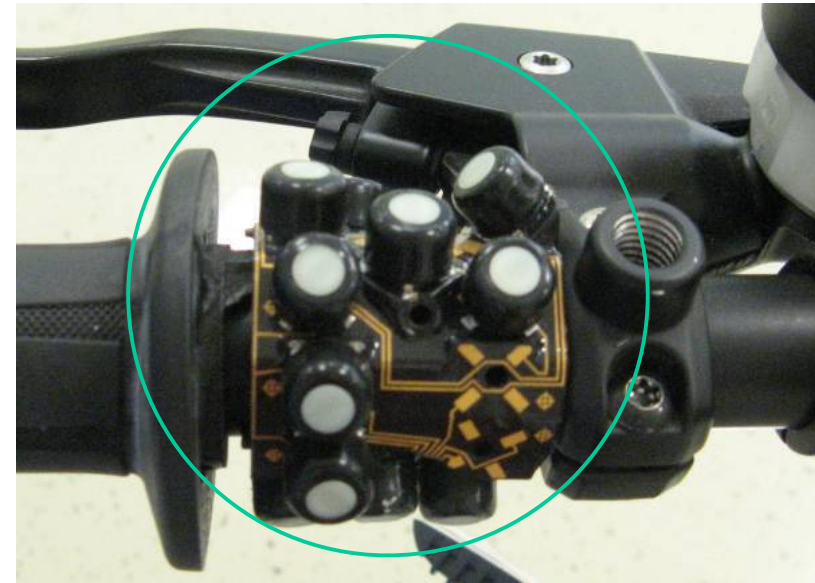




Comparison of conventional and KroMID® hand controls



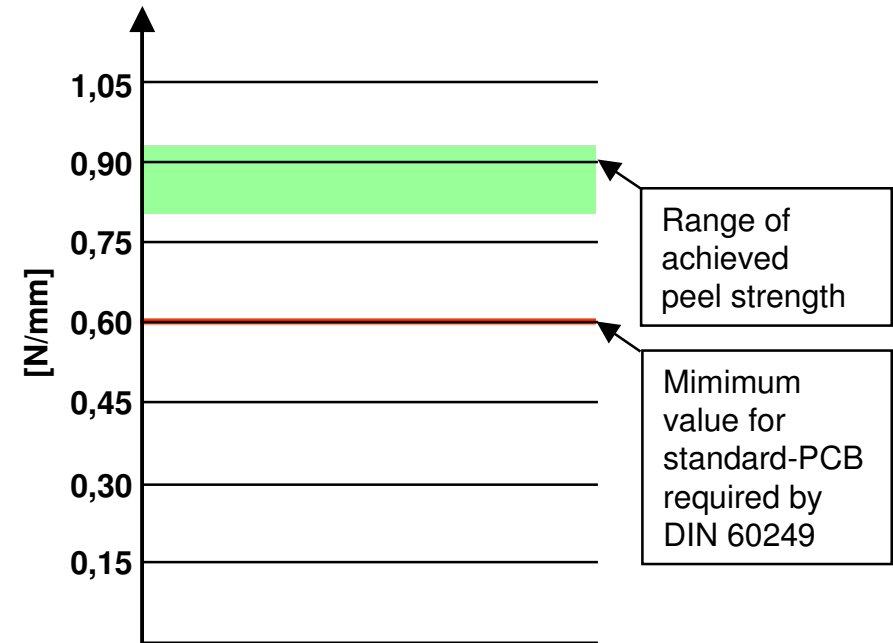
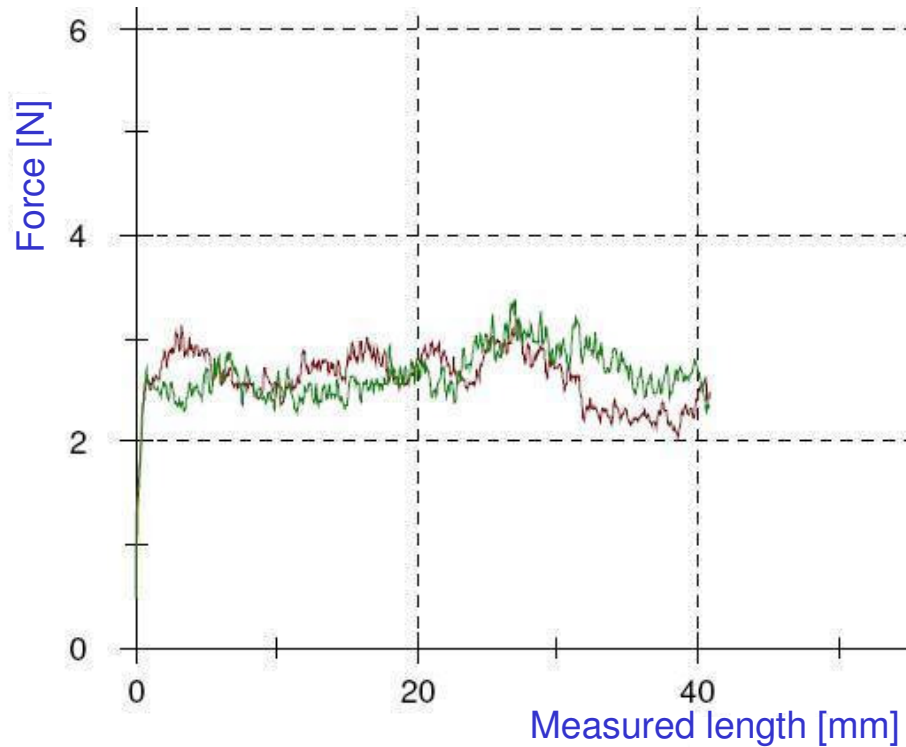
- conventional hand control
- wiring harness needed
- maximum 7 switches on a carrier
- handmade production
- every version needs a new carrier
- limited installation space
- integration of additional features means additional control units on the handle bar
- wiring harness needed



- new KroMID® hand control
- fine pitch integration (no wiring harness)
- 14 switches possible
- up to 256 variants possible with just one carrier
- integrated button night illumination
- IP 67 water proof (german quality standard)

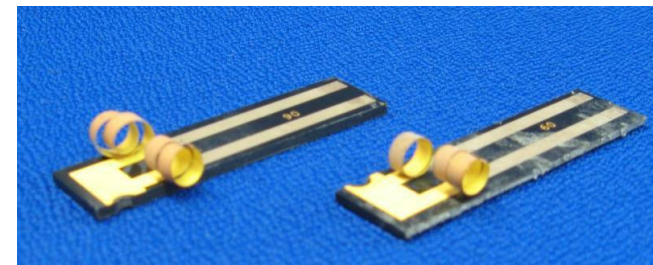


Technical basics, Peeltests MID versus PCB



results

Unterserie	Nr	W N/mm	R-max (Lm) N/mm	Verfahren
	1	0,91	0,25	C
	2	0,84	0,24	C

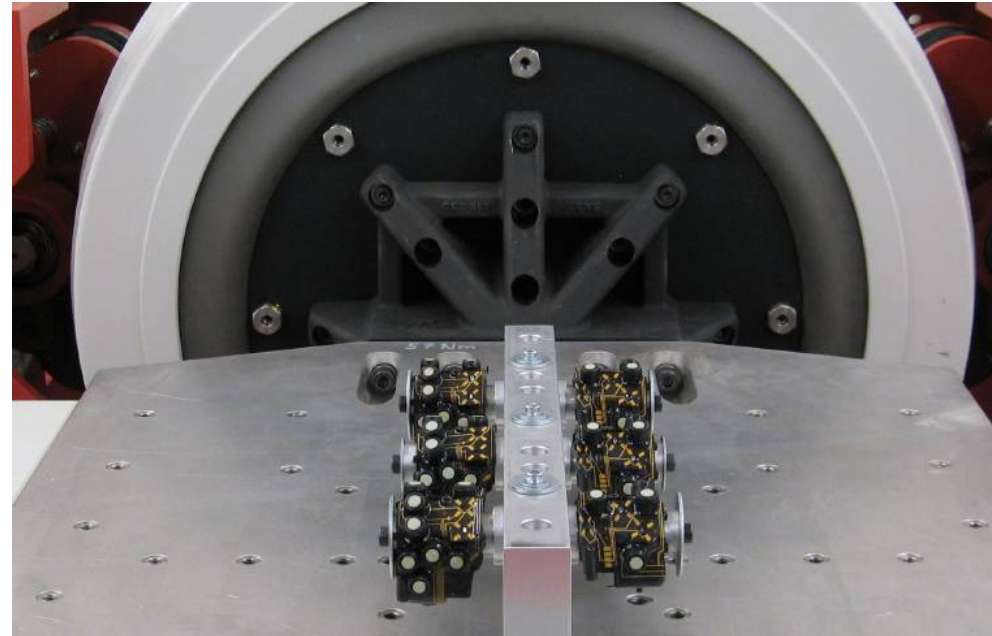




Technical basics, Vibration tests

Requirements

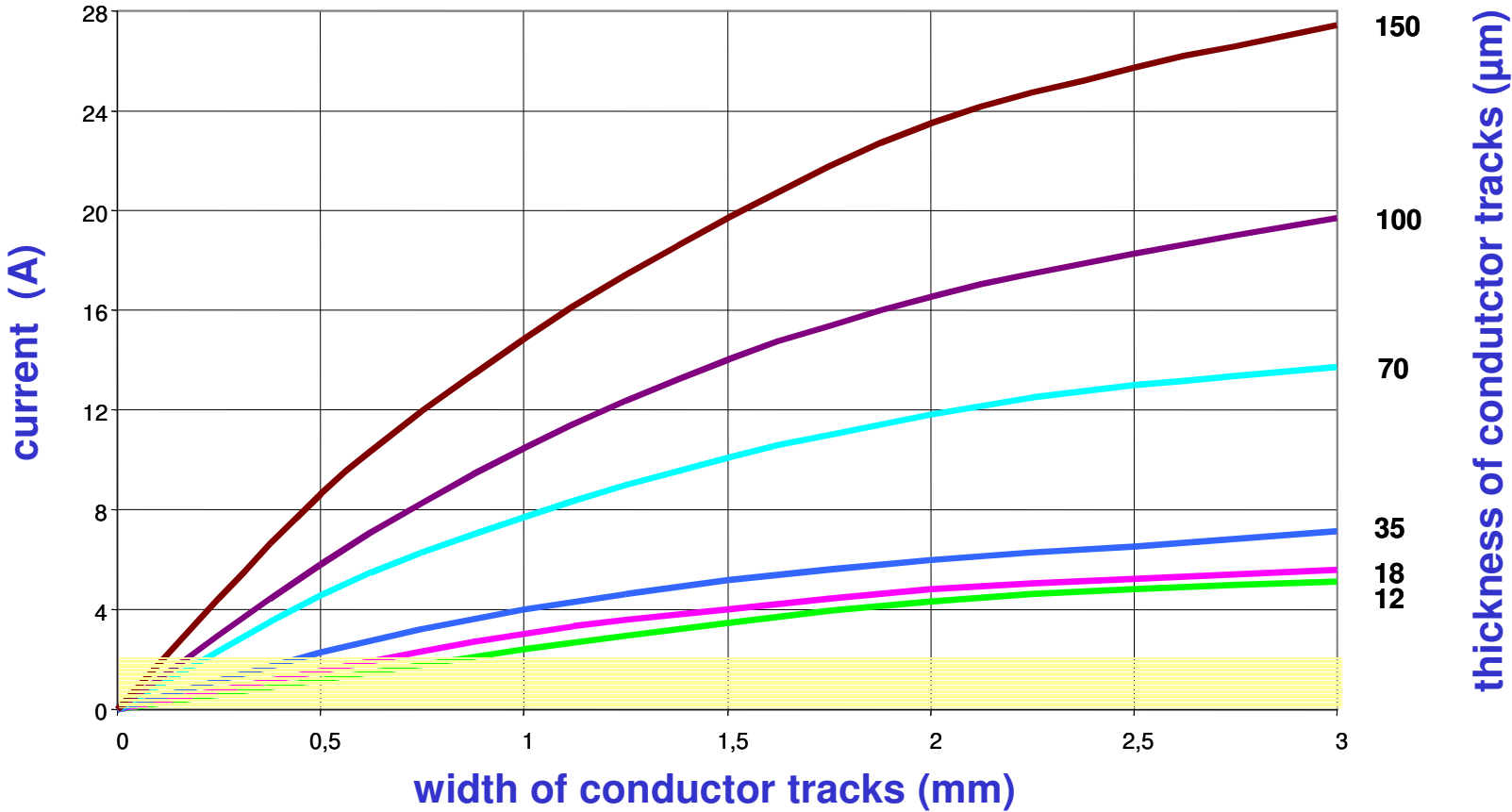
- Shakertests of **KroMID**® products up to 30 g
- three axes
- verification of vibro-resistance according to requirements of the customer;
- in addition overstepping of customer profiles up to technical breakdown





PCB goes three-dimensional

K&S primary focus for new applications is limited, for the moment, to 2A. Later we will increase this range.





Motorbike indicator

- Reduced weight -> 1/3
- Reduced number of components
- Reduced volume
- Electronics fully integrated in 2,5D
- High power LED's and heating problems solved
- Absolutely no maintenance required
- No connection terminals needed
- Automated production
- Guaranteed quality

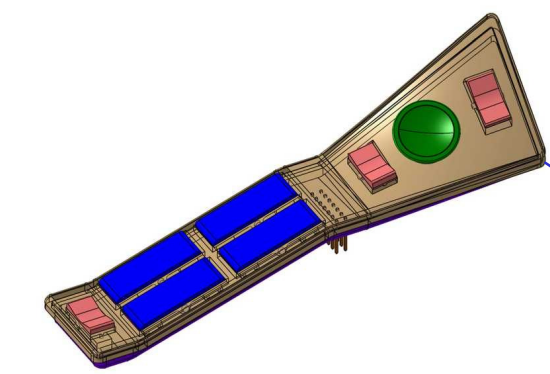


„High Tech - MADE IN GERMANY“



Possible Applications

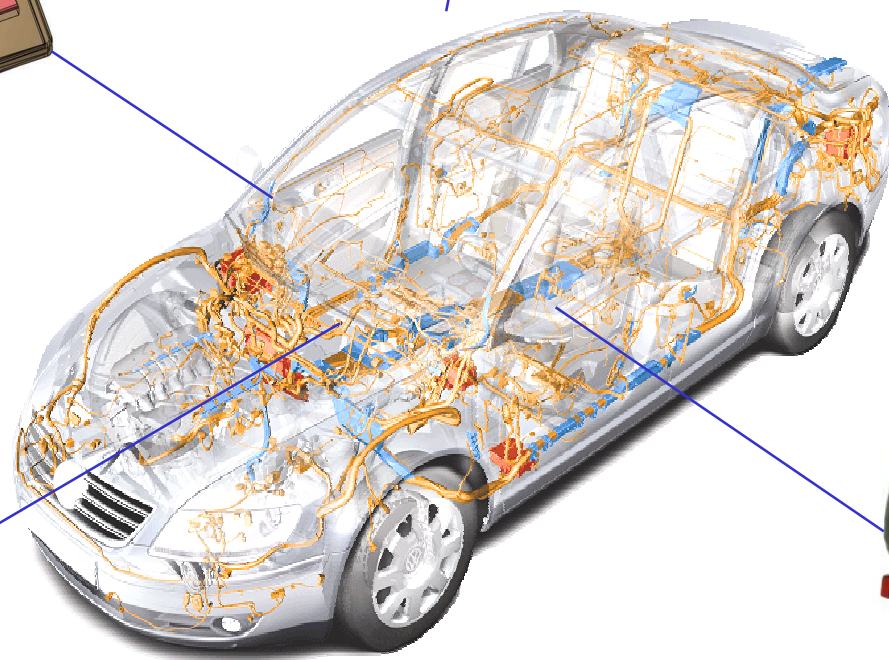
Sensors and Actors



Door switch units



Multifunction-switches



Rear-lights



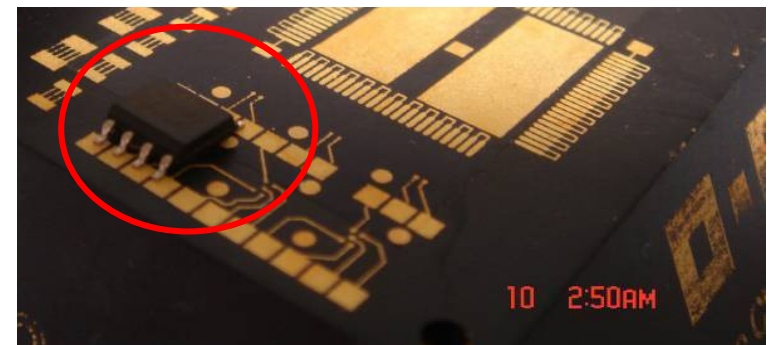
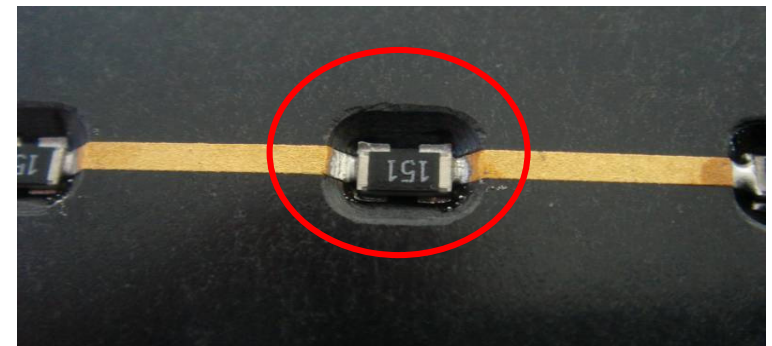
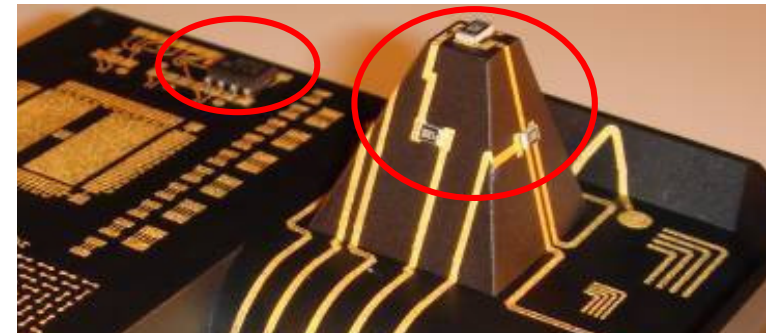
Seats



PCB goes three-dimensional

What is possible?

- 3D- dispensing
- pick-and-place on different levels
- flip-chip mounting possible
- burried smd-parts possible
- vapor phase soldering





What is KroMID® ?

KroMID®

describes the process chain from the development to production of highly complex threedimensional Molded Interconnect Devices (3D-MID).

The goal of *KroMID®* was to overcome all technological gaps which avoided the production of real 3D-MID until now.





PCB goes three-dimensional

...the trademark

Multidimensional thermoplastic „PCB“



Research, development, industrialization of
Threedimensional molded interconnect devices



Thank you for your attention

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