

multiple dimensions

Introduction Multiple Dimensions & 3D-MID

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**WE MAKE
INNOVATION PRODUCTIVE**

3D – MID



Company Represented By : ESSETI SRL

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Content

- Who is Multiple Dimensions?
- What is 3D-MID?
- Why a 3D-MID?
- 3D-MID Technology at Multiple Dimensions AG
- Application Examples and Advantages of 3D-MID Solutions

Multiple Dimensions AG – The 3D-MID Company

- Headquarters:

Bruegg/Biel, Switzerland

- Global presence:

Europe, America, Asia

- Customer base:

MNEs (Multi-National-Enterprises), SMES (Small-Medium-Enterprises),
globally leading companies in telecommunication,
automotive, watch, consumer and medical industry



Multiple Dimensions AG

- Multiple Dimensions is focused on 3D-MID-technology
- Multiple Dimensions is a pacemaker for miniaturization
- Multiple Dimensions is an independent company
- Multiple Dimensions transfers innovation into a cost-effective series production



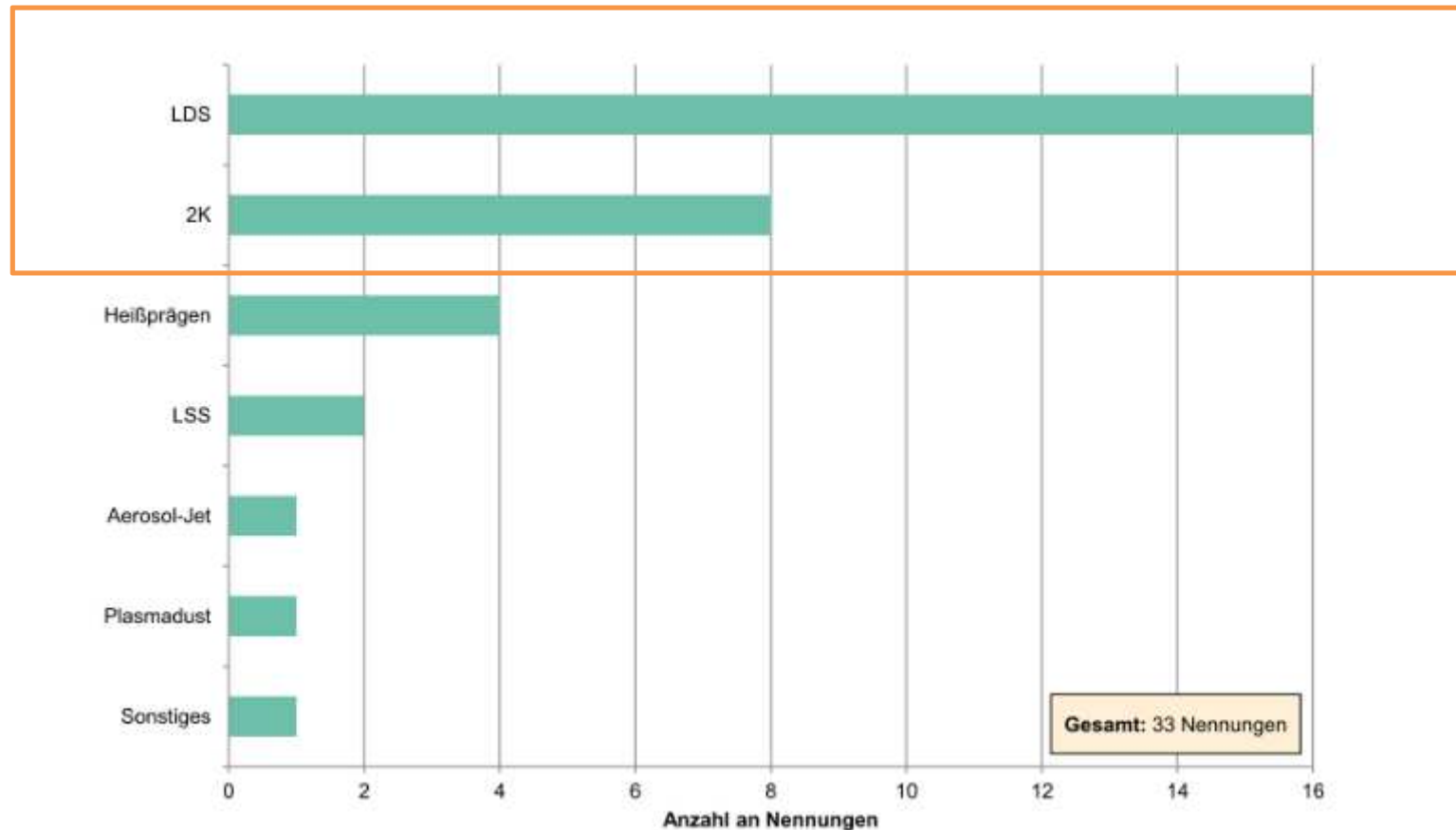
What is 3D-MID?

3D-MID

3 Dimensional
Molded Interconnect Device

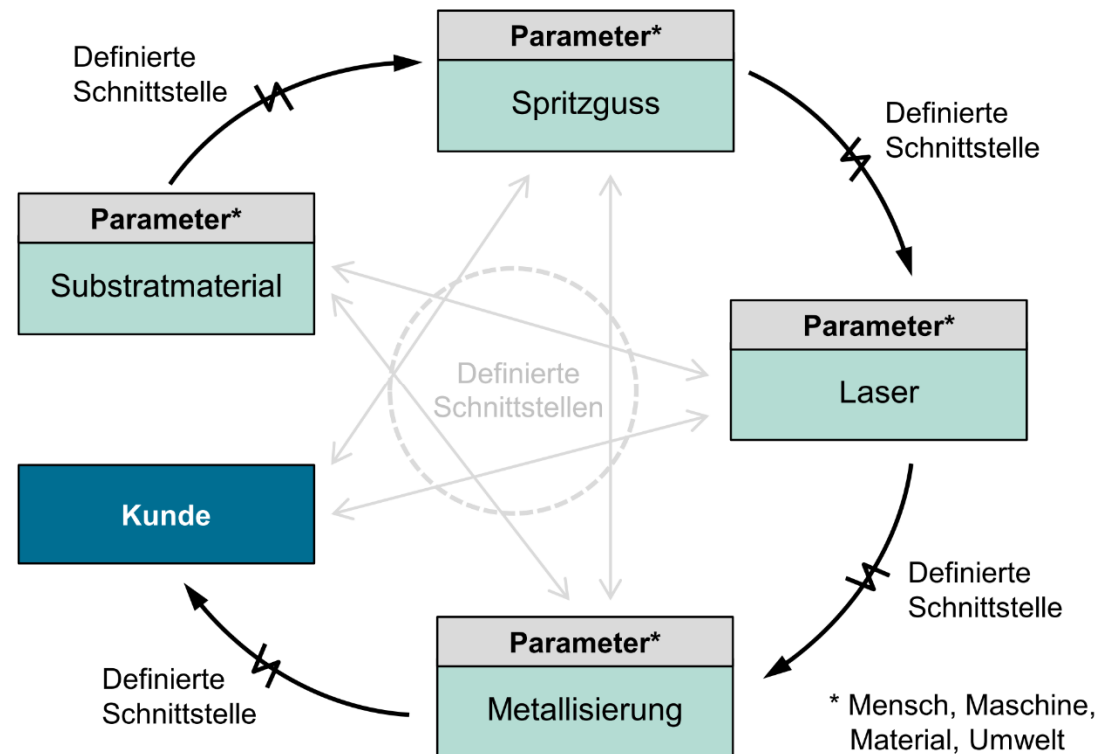
3 Dimensional
Mechatronic Integrated Device

3D-MID Manufacturing methodes



Quelle: MID Studie 2011

Interdisciplinary Know-How



Quelle: MID Studie 2011

Interdisciplinary Know-How



Quelle: MID Studie 2011

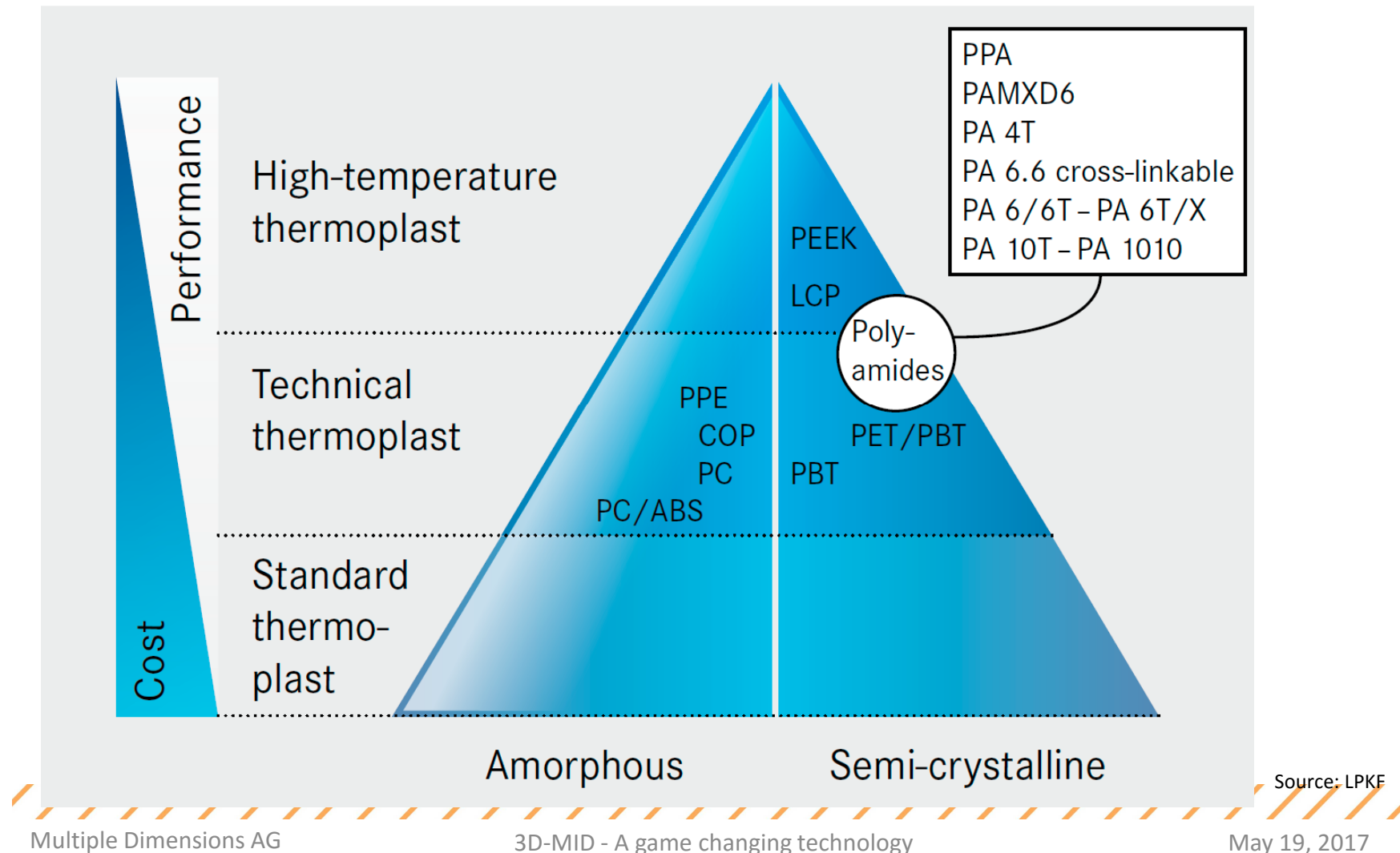
What is 3D-MID?

- Injection molding:

Injected molded parts with special LDS (Laser Direct Structuring) additive; molded part accuracy down to +/- 20 μm .



LDS - plastics



What is 3D-MID?

- **Injection molding:**

Injected molded parts with special LDS (Laser Direct Structuring) additive; molded part accuracy down to $\pm 20 \mu\text{m}$.



- **Laser activation:**

The line/space structure modulated by the laser beam; laser spot minimum $80 \mu\text{m}$ with an accuracy of $\pm 25 \mu\text{m}$.



- **Chemical plating:**

Cu layer ($8 \pm 3 \mu\text{m}$) on the modulated structure, **Ni** layer on top of the Cu layer ($8 \pm 3 \mu\text{m}$) and a flash **Au** layer ($0.1 \pm 0.05 \mu\text{m}$) as a final layer; Line/space ratio down to $80/80 \mu\text{m}$.



- **Electronic assembly:**

Assembly of electronic components by soldering, bonding, conductive gluing, or another technology; placement accuracy $\pm 30 \mu\text{m}$.



Industrial trends – Miniaturization



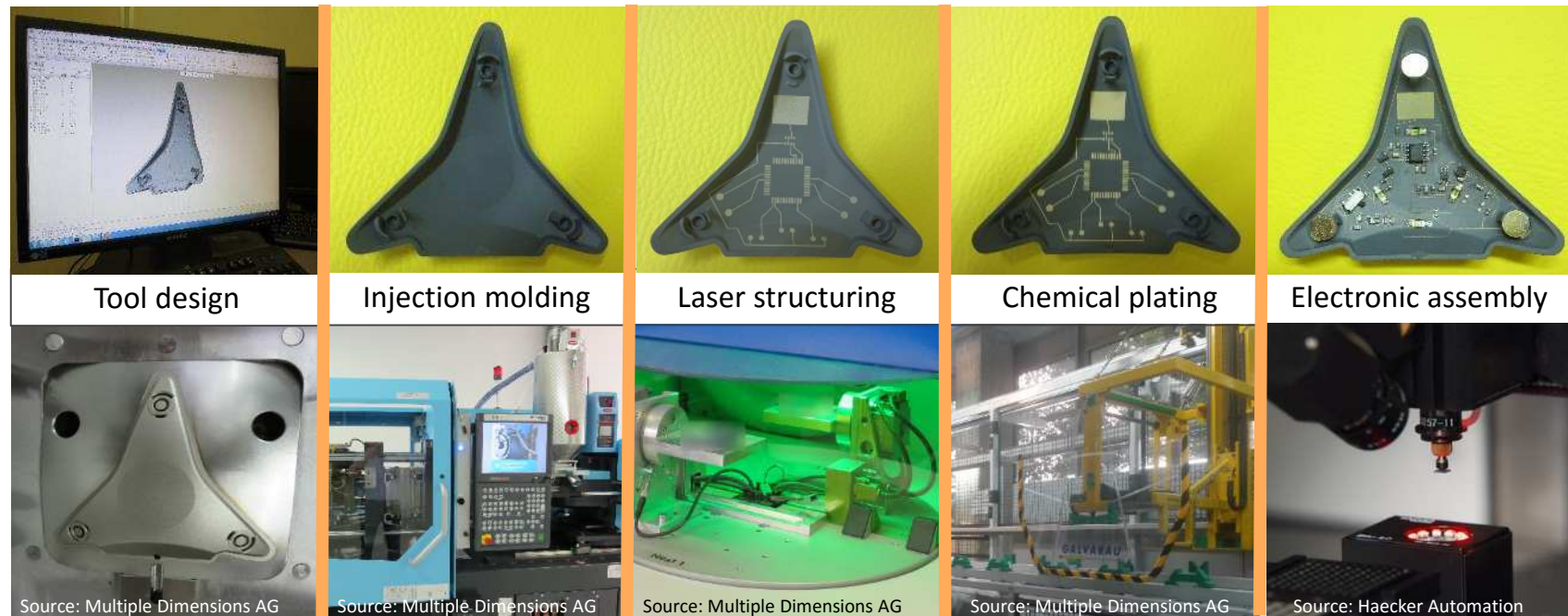
Industrial trends – Autonomous systems



Why a 3D-MID?

- **Miniaturization / Weight reduction**
3D-MID allows reducing the size and overall weight of a component by eliminating wires, PCB and interconnects.
- **Function integration / Simplification**
Mechanical, optical and electrical functions can be integrated into smaller designs.
- **Reliability**
The lower number of parts means higher reliability
- **Flexibility**
New degree of freedom due to the third dimension

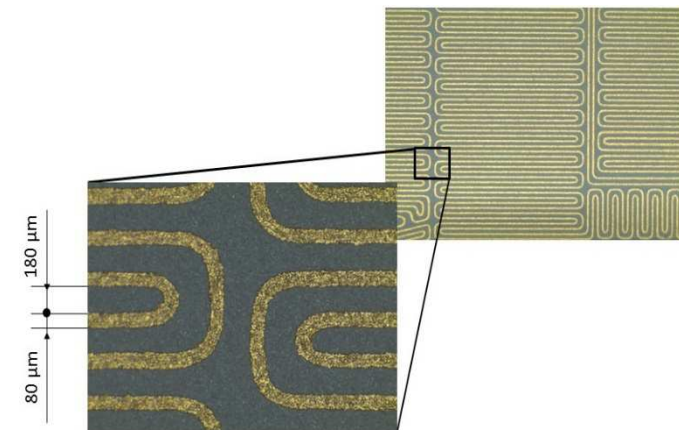
From design to electronic assembly



- Product and process development in Switzerland
- Production facilities in Switzerland (and China)

Competencies

- Miniaturization capabilities through fine line/spacing structures down to $80\text{ }\mu\text{m}/80\text{ }\mu\text{m}$ (smaller upon request) and vias $< 200\text{ }\mu\text{m}$ at a wall thickness of up to 2mm
- Cost saving through
 - State of the art production equipment
 - Elimination of the laser debris cleaning
 - High deposition rate of chemical copper
 - Highest yield rate
- Product reliability with high cohesion/adhesion of the metallic layer into the plastic substrate
- Profound experience in the entire process chain combined with application know how



Markets and Applications for 3D-MID

Industrial electronics



Consumers



Applications

- Sensors
- Connectors
- Switches
- Antennas
- Shielding
- LED lighting
- Hearing aids

Main drivers

- System simplification
- Miniaturization
- System costs
- Variability/Flexibility



Medical



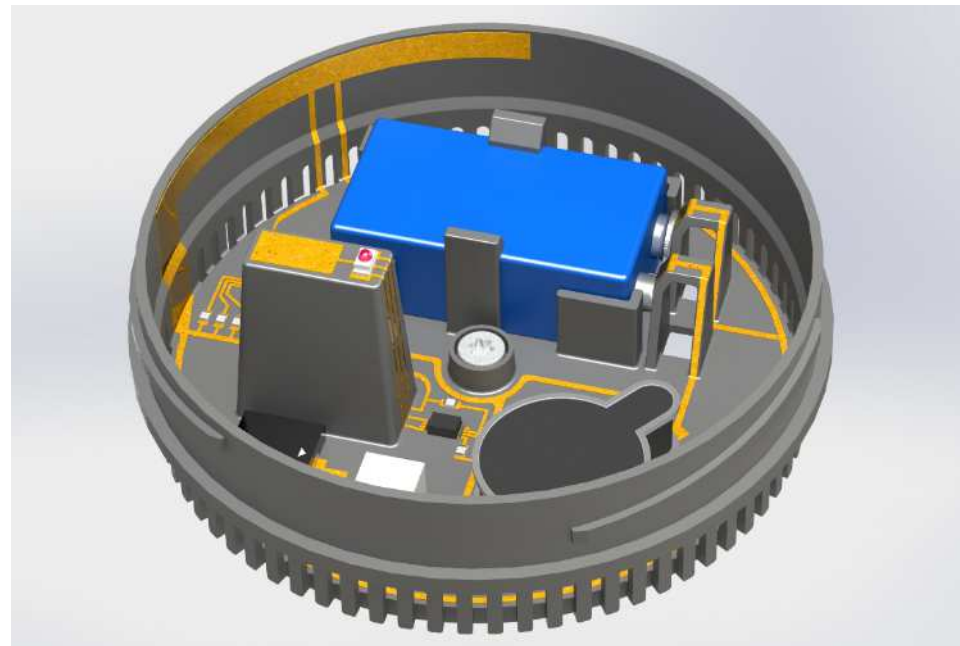
Automotive

3D-MID – A game changing technology for packaging and connectivity solutions!

Application – Smoke detector

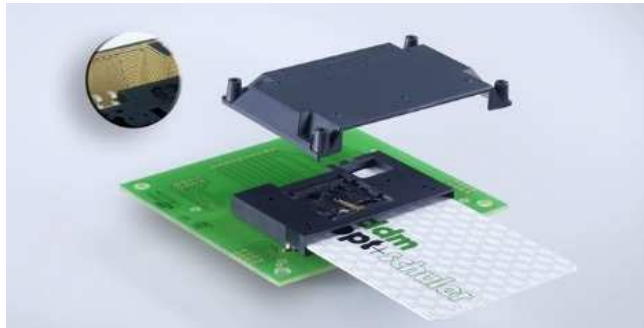


- Function integration
- Simplification
- Highest reliability
- Reduced total costs



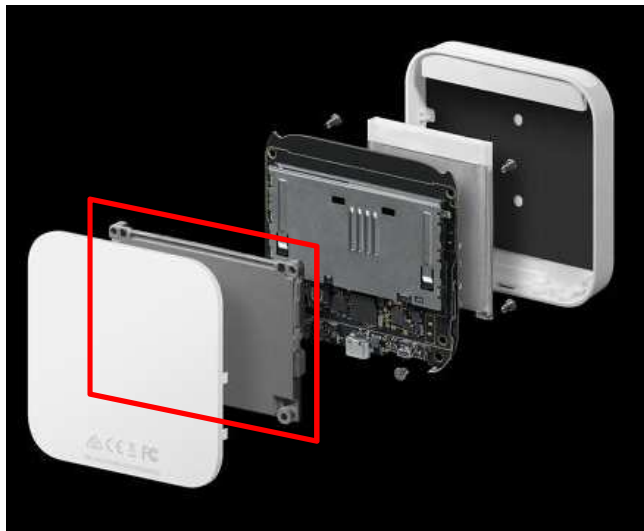
Source: www.grabcad.com

Application – Anti-Tampering

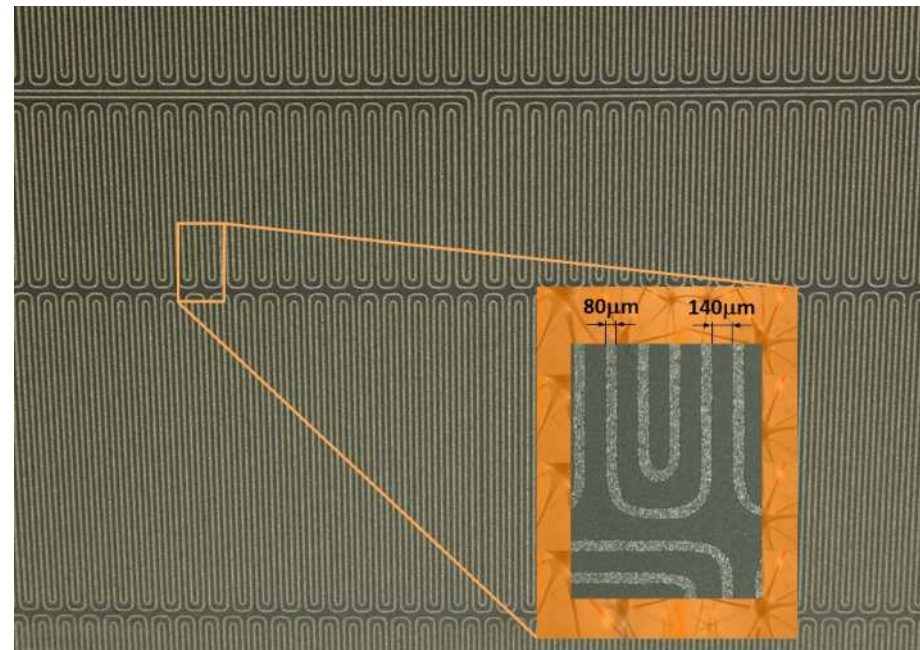


Source: www.dau-components.co.uk

- Point-of-Sale (POS) Device
- Anti – Tampering
- Finest lines
- Highest reliability



Source: www.fastcompany.com



Application Examples and Advantages

Traditional solution	Application	3D-MID solution
		
Source: IEE Security & Privacy	Source: Ingenico	Source: DDM & Multiple Dimensions

Advantages of 3D-MID

- Easy mounting
- Higher reliability
- Cost reduction

Application Examples and Advantages

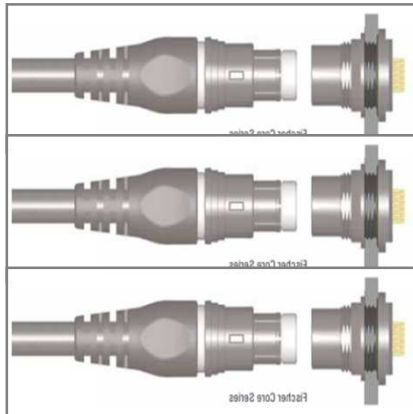
Traditional solution	Application	3D-MID solution
		 Source: Multiple Dimensions

Advantages of 3D-MID

- Plated instead of painted icons
- Higher abrasion resistance
- Better appearance

Application Examples and Advantages

Traditional solution



Source: Fischer Connectors

Application



Source: Fischer Connectors

3D-MID solution



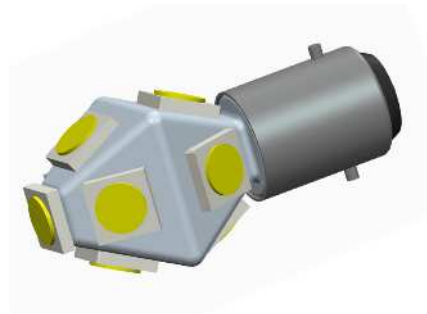


Source: Fischer Connectors

Advantages of 3D-MID

- 3 times more contacts
- 75% weight reduction
- 40% volume reduction

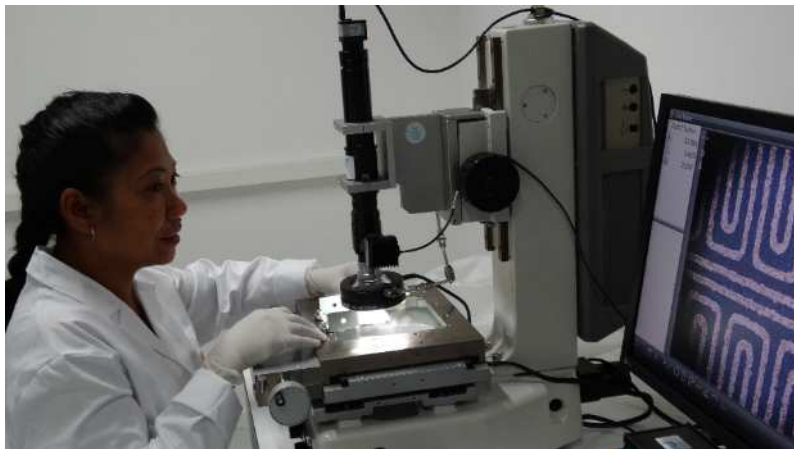
Application Examples and Advantages

Traditional solution	Application	3D-MID solution
		
Source: aliexpress.de	Source: BMW	Source: Multiple Dimensions

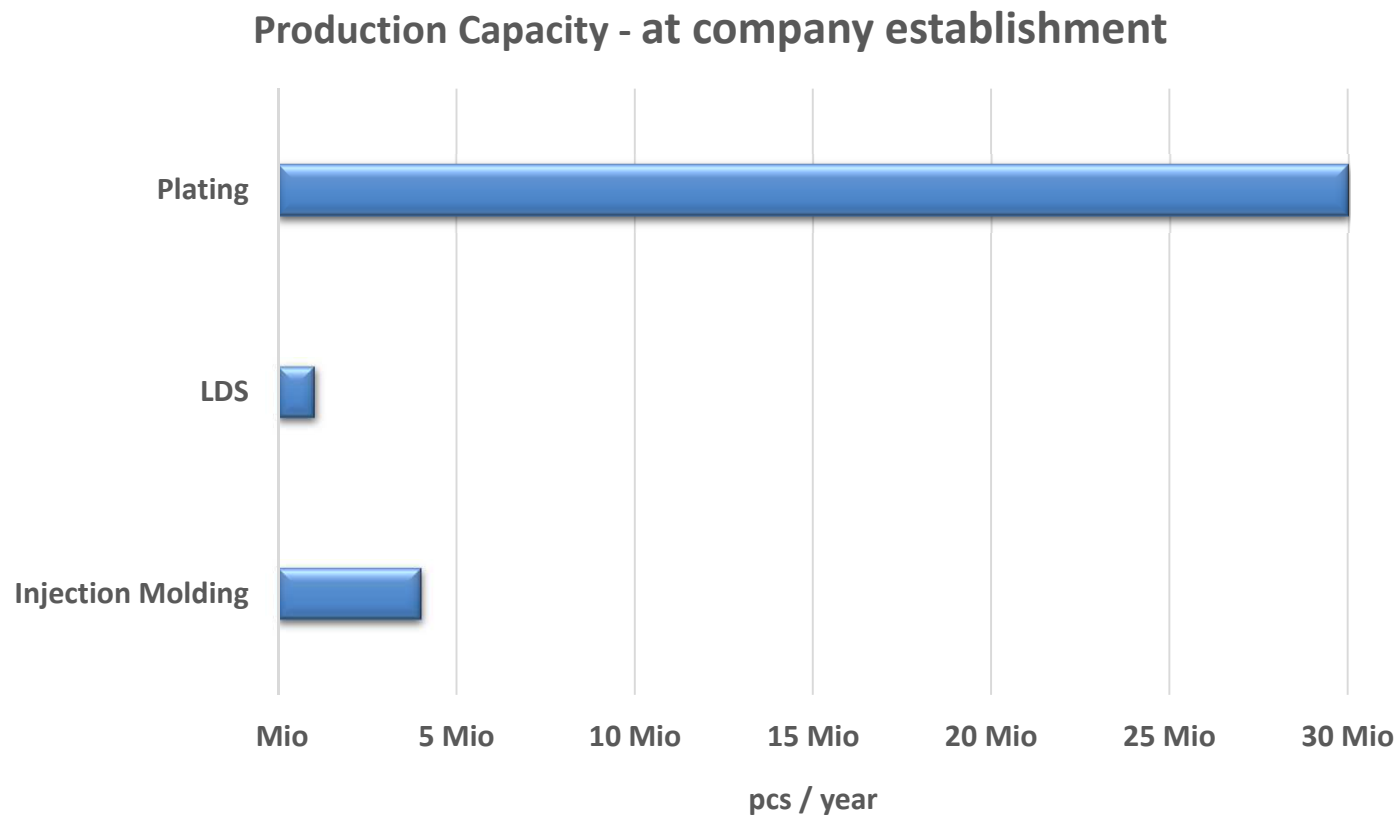
Advantages of 3D-MID

- Integration of the PCB's, heat sinks, reflectors, and connectors onto the 3D-MID substrate
- Improved thermo-management
- Precise positioning of the LEDs
- Significant reduction of assembly work, therefore time, and failure rates

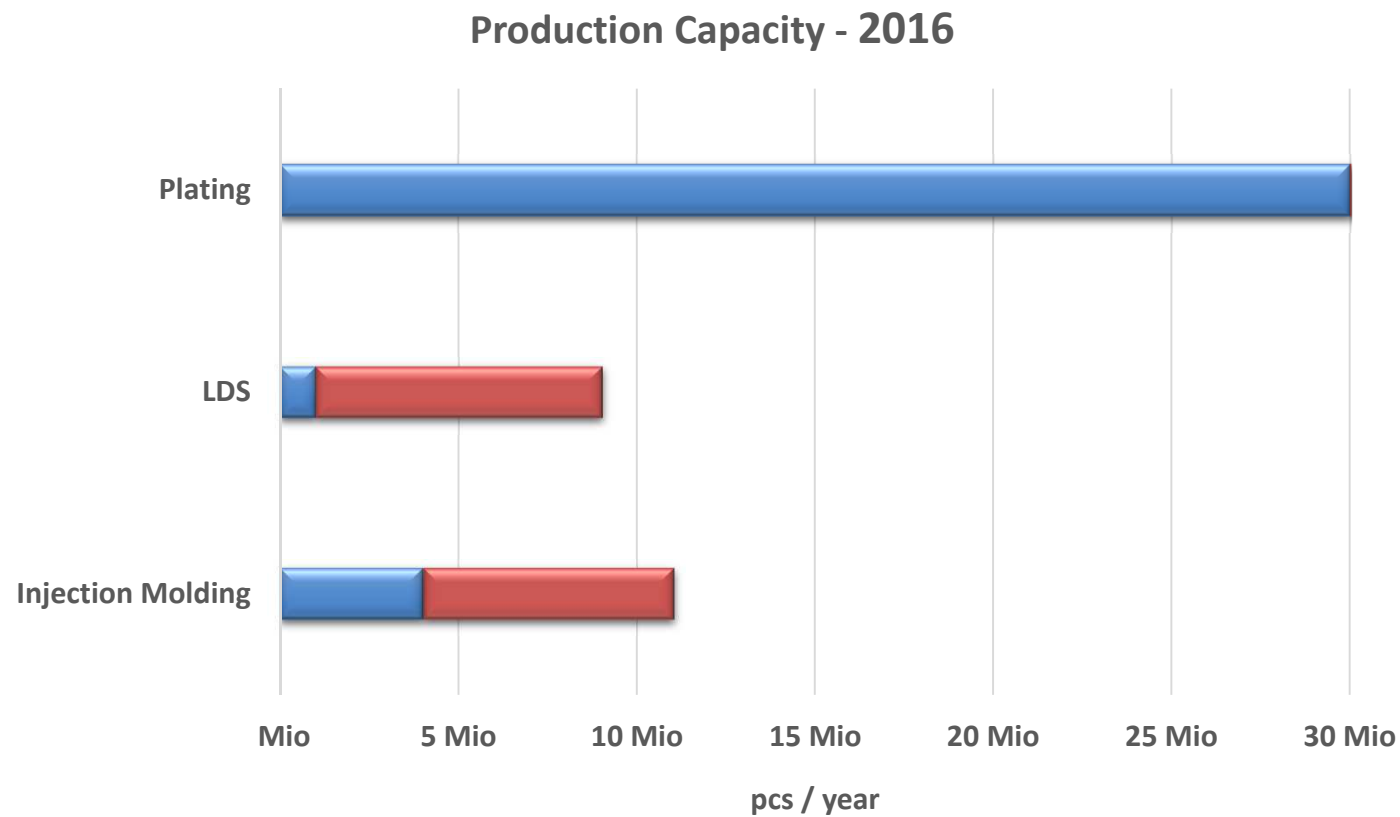
State of the art equipment



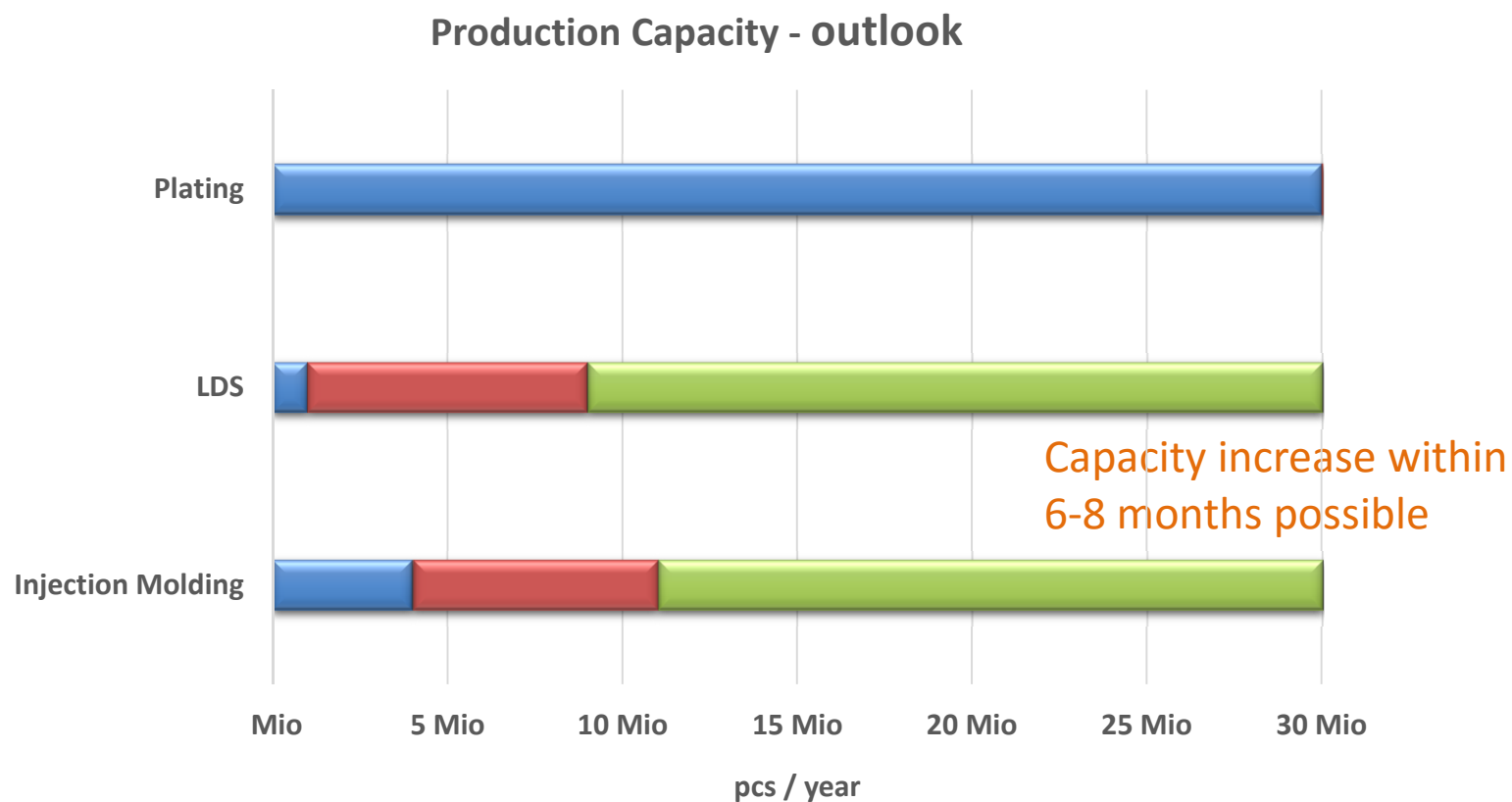
Production capacity



Production capacity



Production capacity



Electronic assembly line ready for serial production in Q3/2017

Injection molding

- Injection molding:
Fully electrical injection molding machines



Sumitomo Demag	IntElect 50/370-80	IntElect 160/520-340
Closing force	50kN	160kN
Cylinder bore diameter	22mm	30mm
Min. shot weight	1g	5g
Max. shot weight	45g	63g

Laser activation

- The line/space ratio: min. 80 μm
- Elimination of the laser debris cleaning
- Laser activation up to an angle of 70°



LPKF	MicroLine 3D 160i F
Working area X-Y	160 x 160mm
Vertical stroke	max. 24mm
Speed	4 m/s
Laser Wavelength	1064nm
Laser Frequency	20 – 200kHz



Fully automated metallization

- 100% water treatment
- 100% regeneration of gold and palladium
- Length of 23 meters
- 22 baths



Electronic assembly

■ Electronic assembly:

Assembly of electronic components by soldering, bonding, conductive gluing, or another technology; placement accuracy +/- 30 µm.

	Fox SMD Pick & Place
Cycle time Placement speed	714 ms 5'000 cph
Feeder capacity	120
Component size range	0201 – 33 x 33 mm incl. leads 0201 – 80 x 33 mm incl. leads with opt. MFOV license 0201 – 80 x 80 mm incl. leads with opt. MFOV box



Source: Essemtec

Quality system



Certificate



SQS herewith certifies that the company named below has a management system which meets the requirements of the standard specified below.

Multiple Dimensions AG
Erlenstrasse 44
2555 Brugg BE
Switzerland

Certified area

Multiple Dimensions AG
Erlenstrasse 44
2555 Brugg BE
Switzerland

Scope of certification

Manufacturing of products in 3D-MID technology
 and subassemblies (without product design)

Standard

ISO/TS 16949:2009 Quality Management System

Particular requirements for the application
 of ISO 9001:2008 for automotive production
 and relevant service part organizations

Swiss Association for Quality and
 Management Systems SQS
 Bernstrasse 103, CH-3052 Zollikofen
 Issue date: April 18, 2016

This SQS Certificate is valid
 up to September 14, 2018
 Date of audit: February 16 – 17, 2016
 IATF-Certificate number 0236436
 Registration number 42468



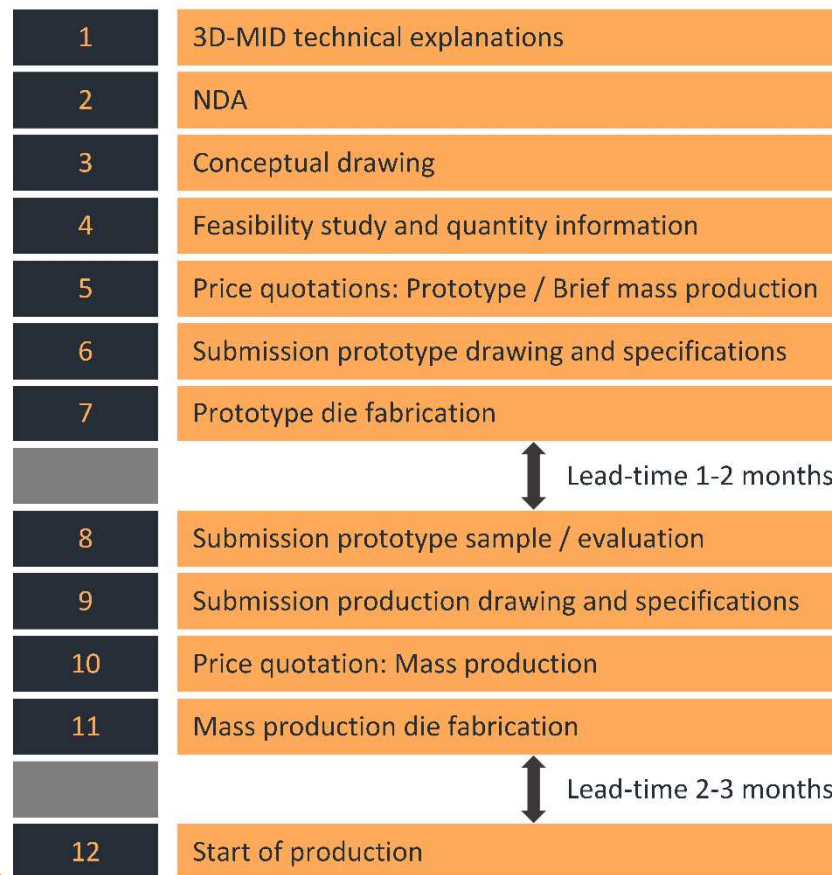
X. Edelmann
 X. Edelmann, President SQS

R. Glauser
 R. Glauser, CEO SQS

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Process definition / Quality certifications

multiple dimensions
3D-MID Technology



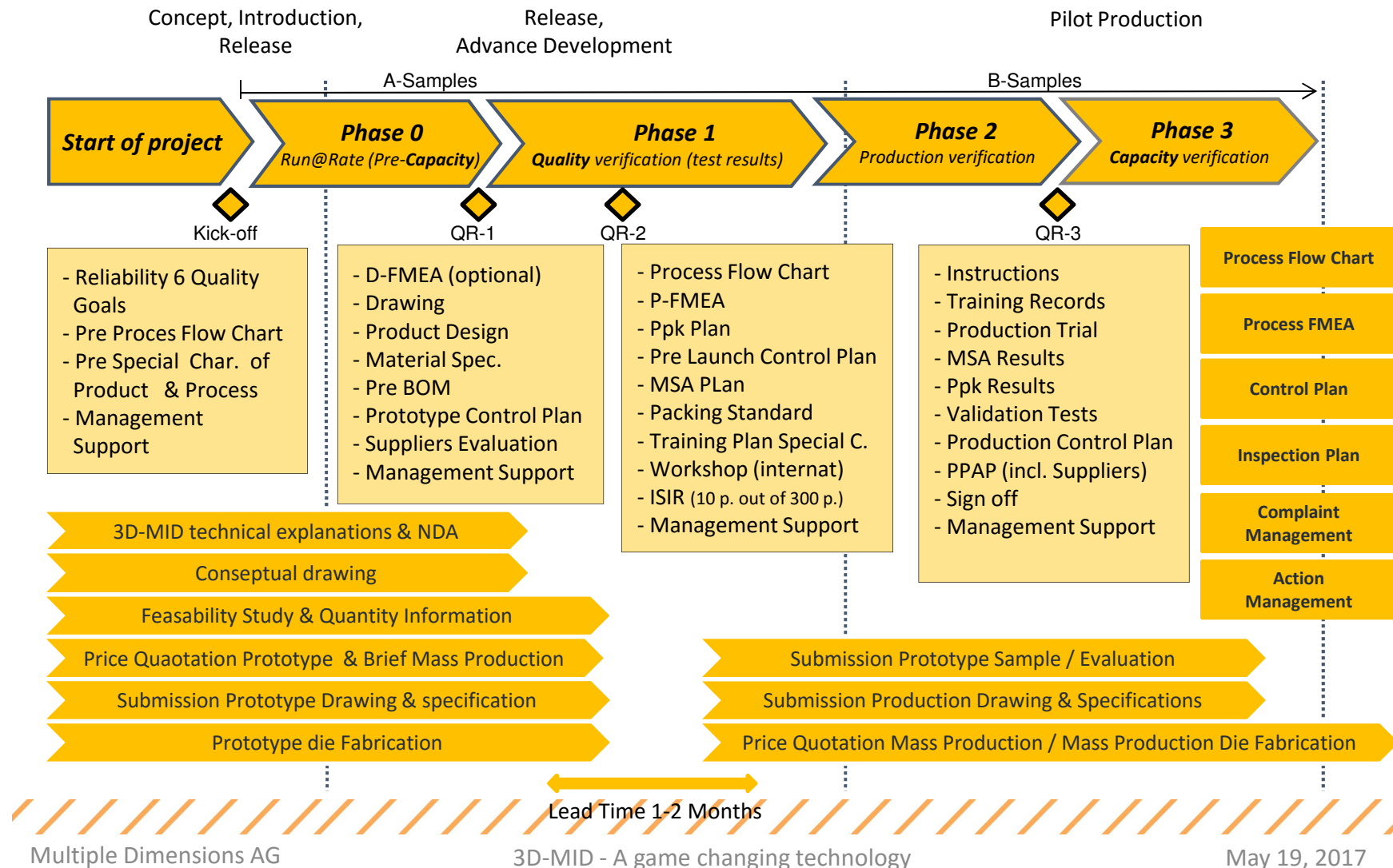
PPAP

„Production Part Approval Process“

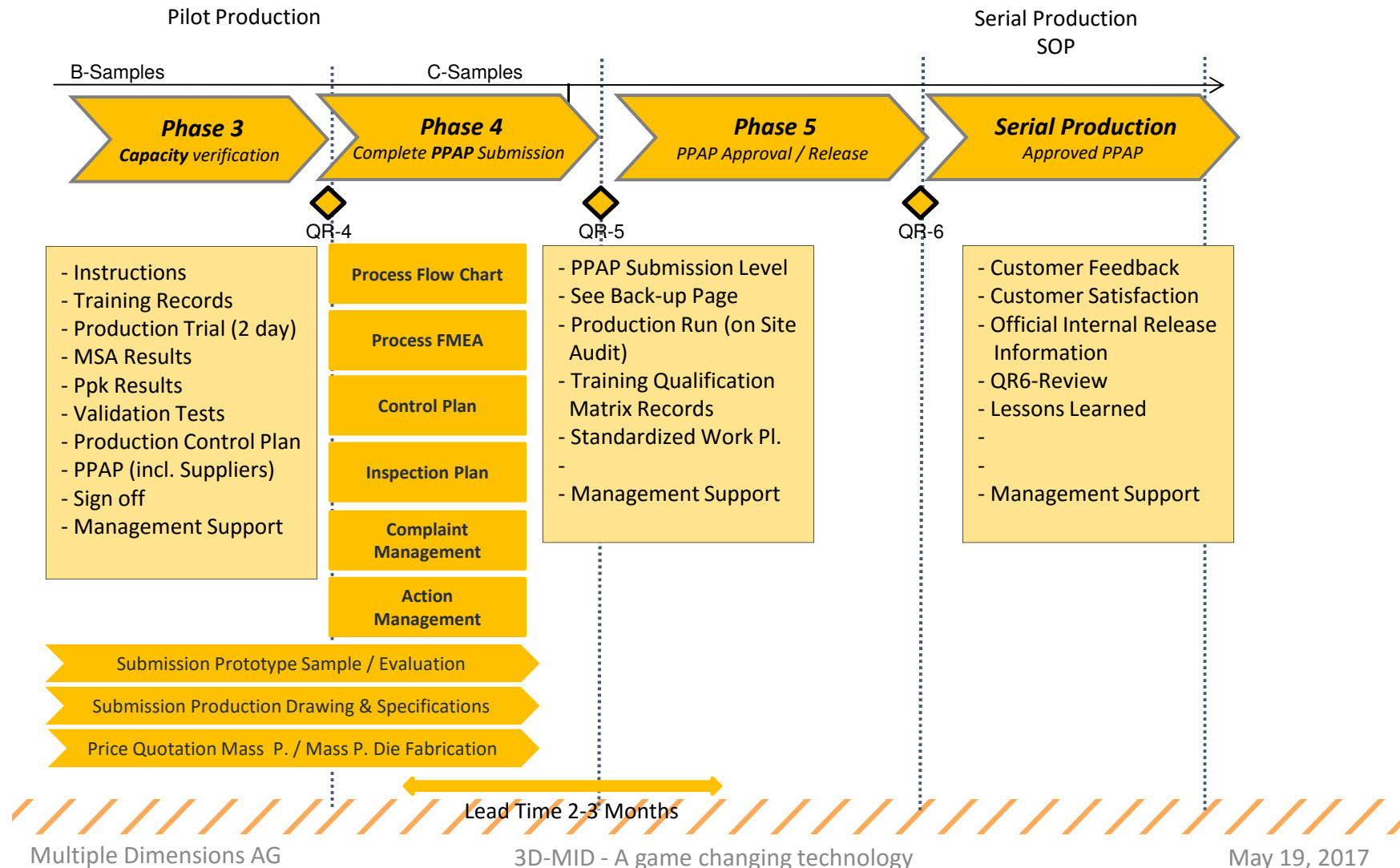
„Produktionsteile Freigabeverfahren“

(Sampling, PSW, Parts presentation)

APQP/PPAP Plan for program Timing supplied 1.



APQP/PPAP Plan for program Timing supplied 2.



Test equipment / Inspection

Test / inspection overview		
Micrometer	In-Process-Control (IPC)	Dimensional test on molded part
Microscope	IPC	Dimensional test on molded part
Microscope	IPC	Placement of Laser structuring
Fischerscope	IPC	X-ray for thickness inspection
Customized	100%	Automated optical inspection
Customized	100%	In-Circuit-Test
Customized	100%	End-Of-Line-Test

Test equipment / Inspection



	X-Ray	Measuring Microscope	Thermal chamber
Manufacturer	Helmut Fischer GmbH	Ryf AG	Vötsch
Type	XDV-μ	Nikon	VT 4011
Measurement	Layer thickness	Dimensions	Thermal
Precision	2μm	2μm	-70 to 180°C



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Dedicated to 3D-MID,
committed to customer satisfaction!

Thank you
for your attention!

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Multiple Dimensions AG

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