World Wide Innovations

Manufacturing of Micro Medical Devices

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Agenda

- **Introduction WWINN**
- **Project Examples:**
  - Micro Pump
  - Hearing Implant
  - Eye Implant
  - Biochip
  - Micro Needle Array

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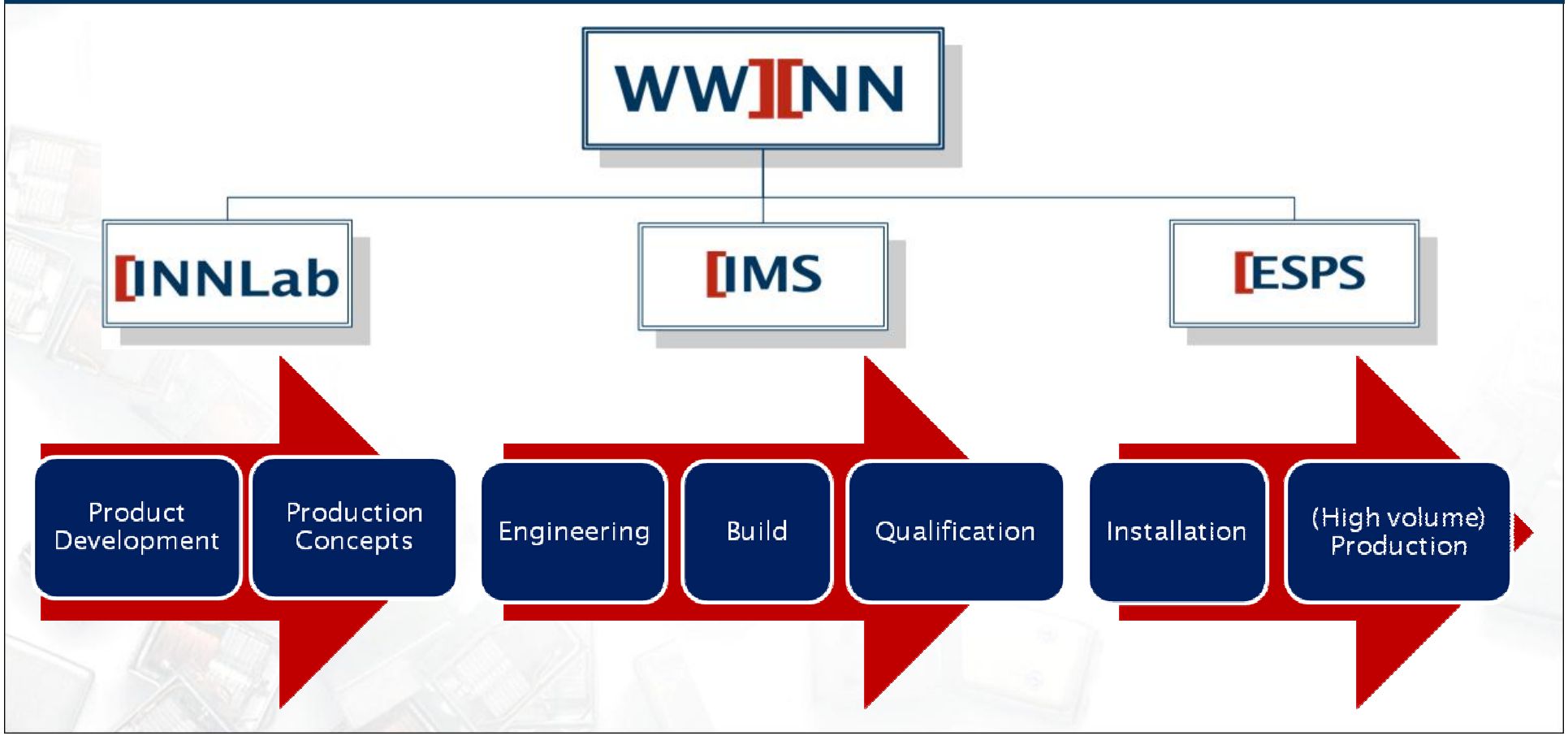

Production Strategy

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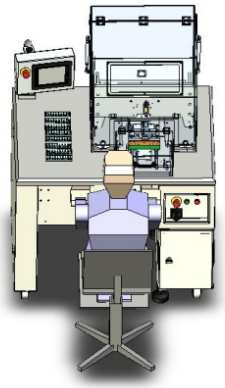
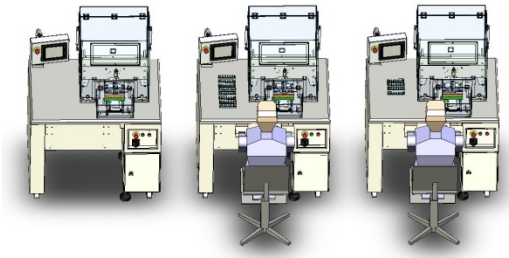
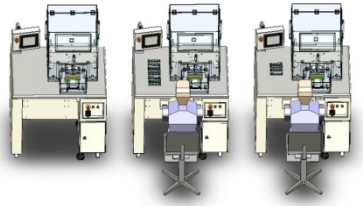
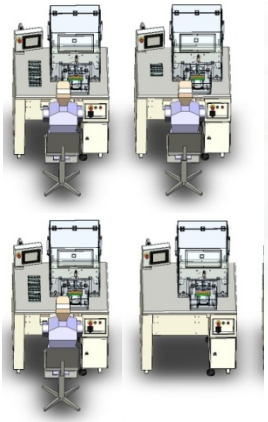
Sample production



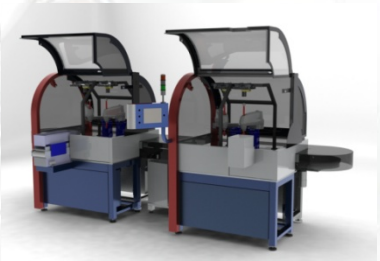
Low /medium volume production

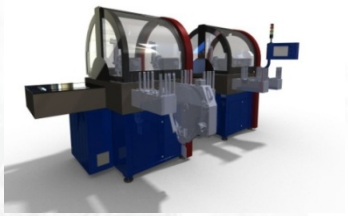




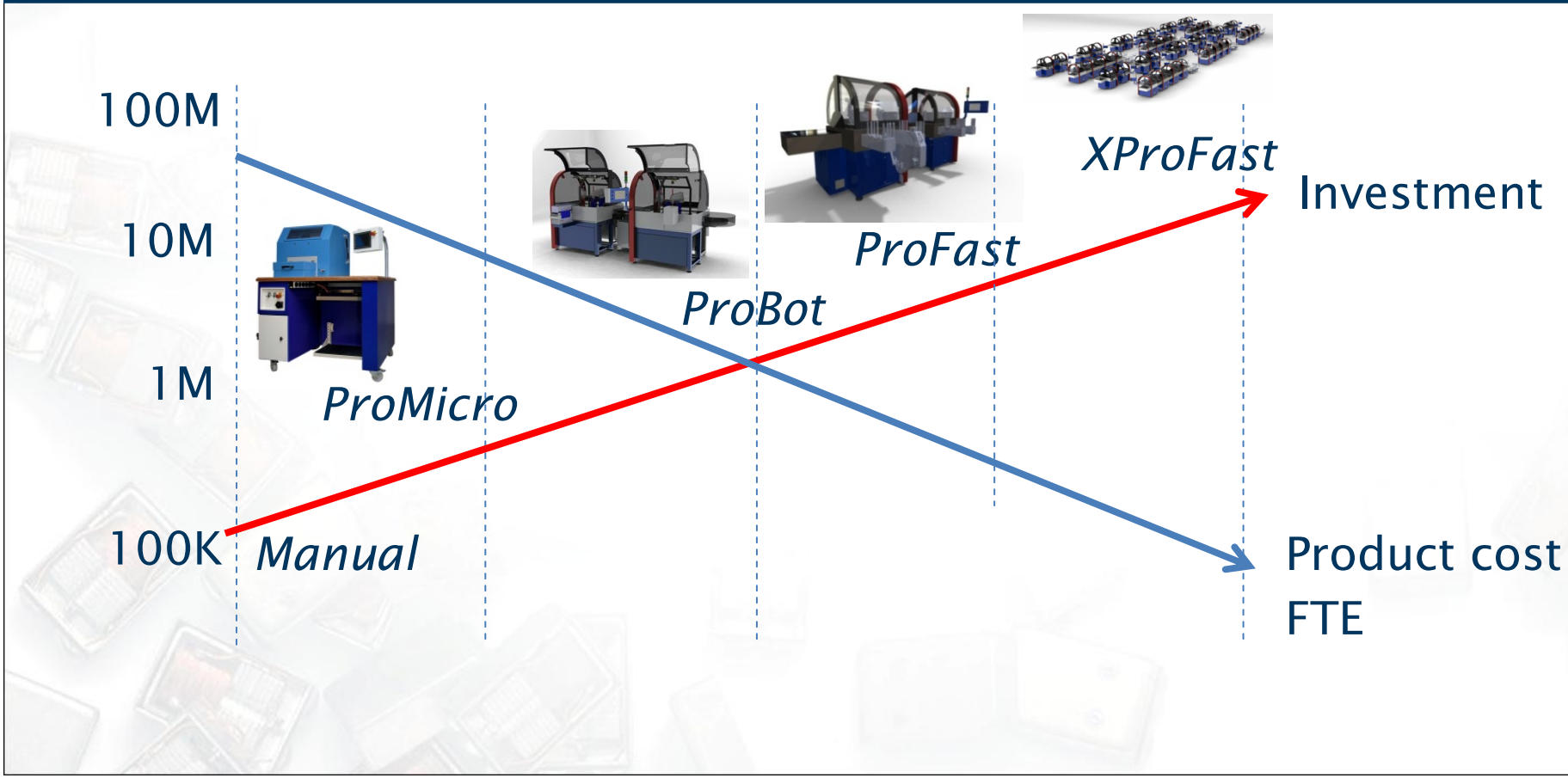


High Volume Production





Modular Platform & Tooling

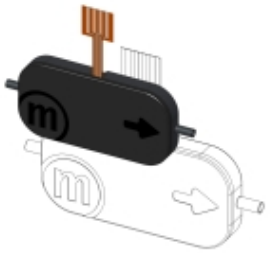


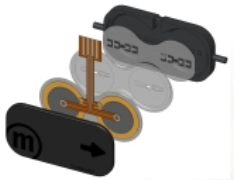
Assembly Project Examples

- Micro Pump
- Hearing Implant
- Eye Implant
- Biochip
- Micro Needle Array

Project Example: Micro Pump

- Transport of gases and/or liquids
- Made from plastics
- Intrinsic controlled-loop function
- Piezo driven
- 5 components





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Project Example: Micro Pump

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- **Assembly Equipment**
  - Pattern stamping foil: <25 µm
  - Cycle time: 90 sec for 4 part product
  - Plastic laser welding & coding
- **Test Equipment**
  - Flow
  - Leakage
- **Capacity <100k units/year**

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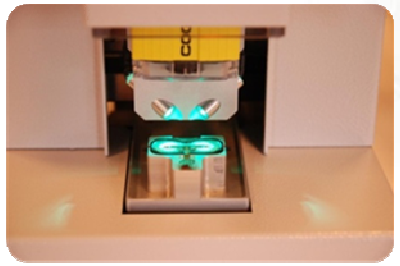

Project Example: Hearing Implant

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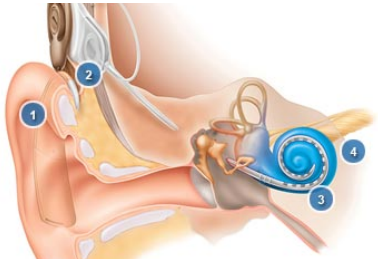
- **Cochlear Implant**
- **Electrical stimulation of nerves**
- **Proof of Concept Electrode Welding**
  - Semi-Automatic
  - 22 Platinum Electrodes Pads
  - < 30μm Diameter wire
- **Research phase is finished**
- **Development assembly equipment**



Project Example: Hearing Implant

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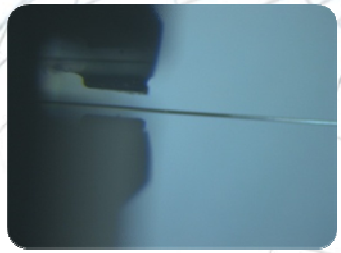
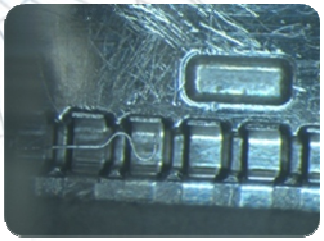
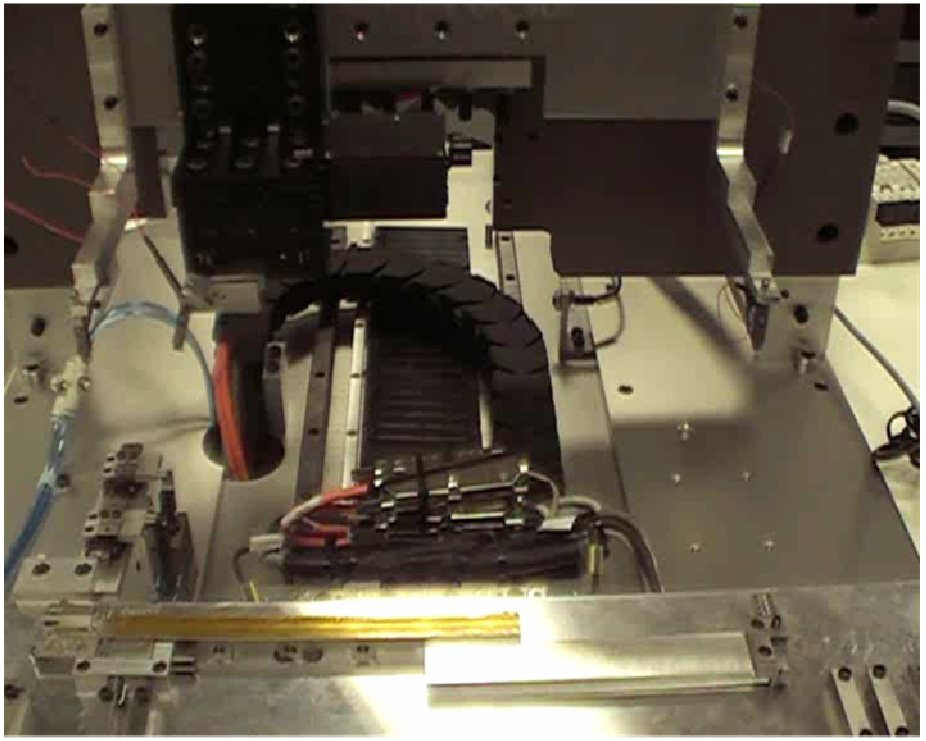
- Wire pick and place
- Wire cutting
- Strain relief formation
- Resistance welding







Project Example: Eye Implant

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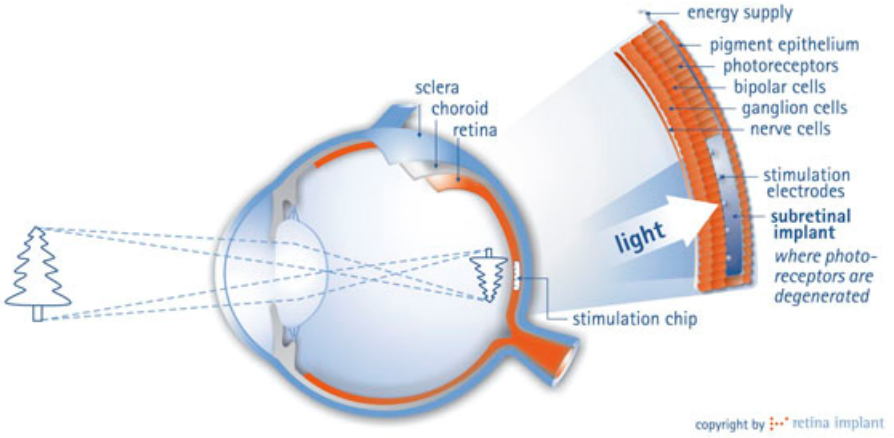
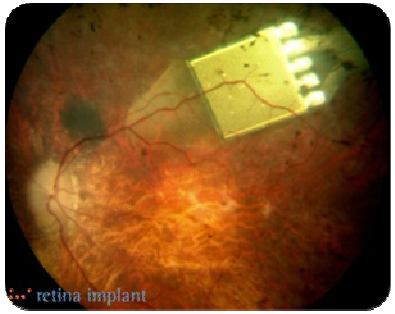
- Research Phase
- CMOS chip on thin film
- Silicone protection
- Sample reproducibility
- FDA Requirements





Project Example: Eye Implant

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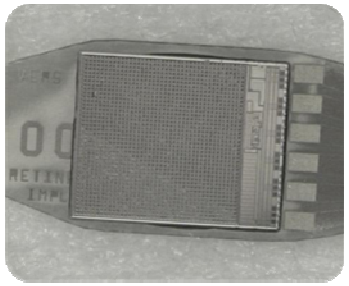
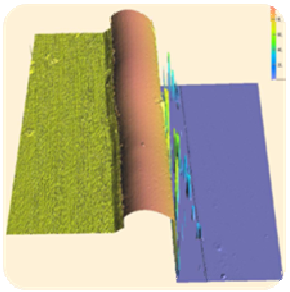
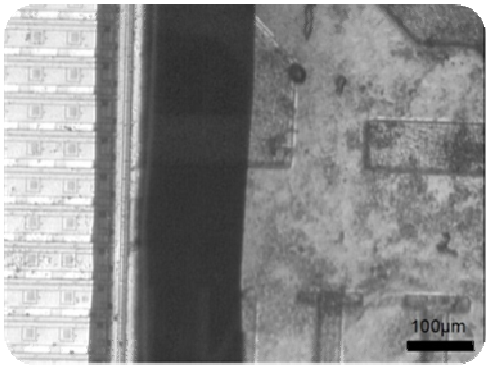
- Silicone dispensing
- Step coverage
- Around the chip
- Track process accuracy ~10 µm

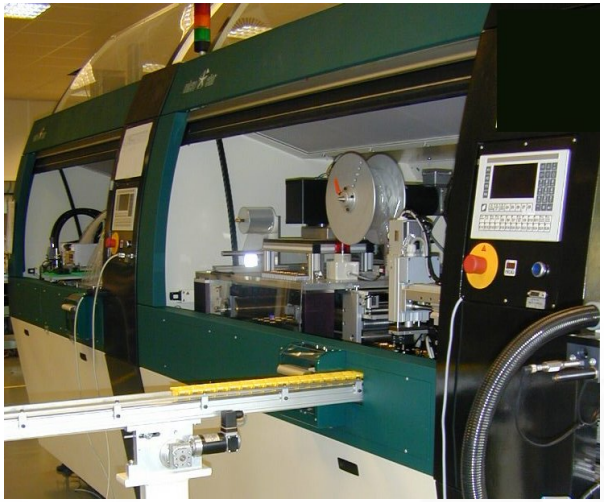






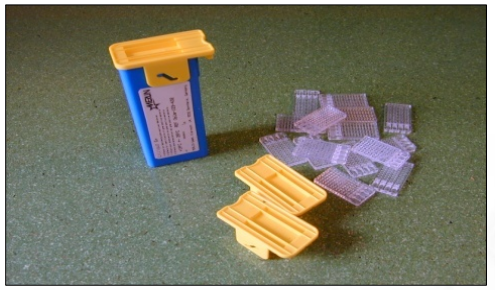
Project Example: Biochip Assembly

- Based on ICair platform
- Product : Lilliput Biochip
- Cycle time: 3 sec
- >5 million pcs/year



Project Example: Biochip Assembly

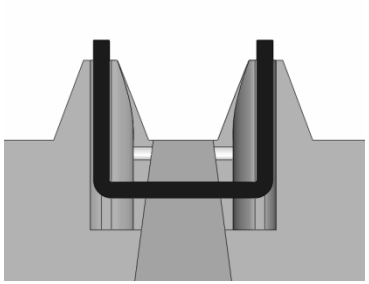
- Micro dispensing
- Drying of fluids
- Hot sealing
- Laser foil cutting
- Automatic packaging



Project Example: Micro Needle Array

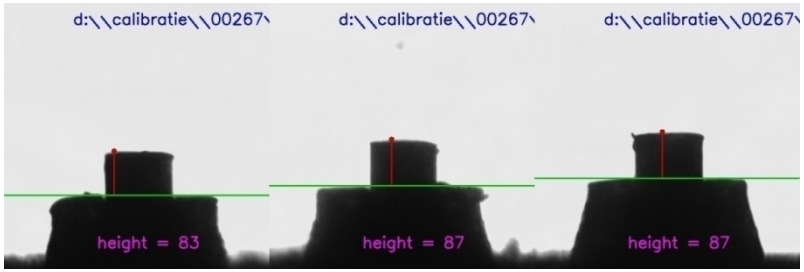
1 Array = 144 Micro Needles = 72 wires

- Process & product development



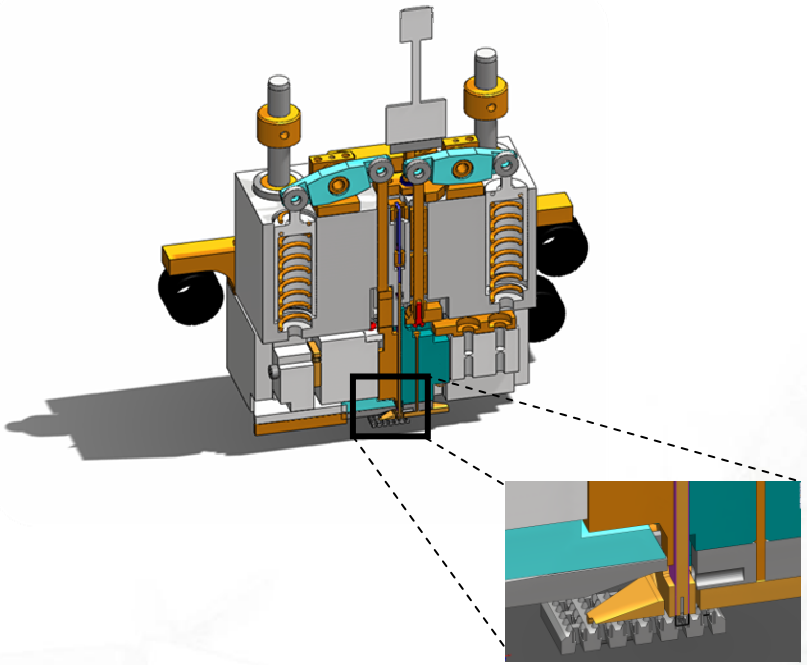
- Clean room production

- Optical height measurement



Project Example: Micro Needle Array

- **Stitching thin wire**
  - 100 wires/min ~ 1000 pcs/day
  - Tolerance 3µm (needle length)
  - Wire thickness 60-80 µm



Project Example: Micro Needle Array

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Development Time Line Micro Needle Array

2005 – 2007	Proof of Principle	samples
2007 – 2008	Phase 1: Pilot production	~10k units
2008 – 2009	Phase 2: Production	~100k units
2010 – 2011	Phase 3: Start Mass Production	>1m units
2011 – 2012	Phase 4: Preparation Commercial Production	>> 1m units

Project Example: Micro Needle Array

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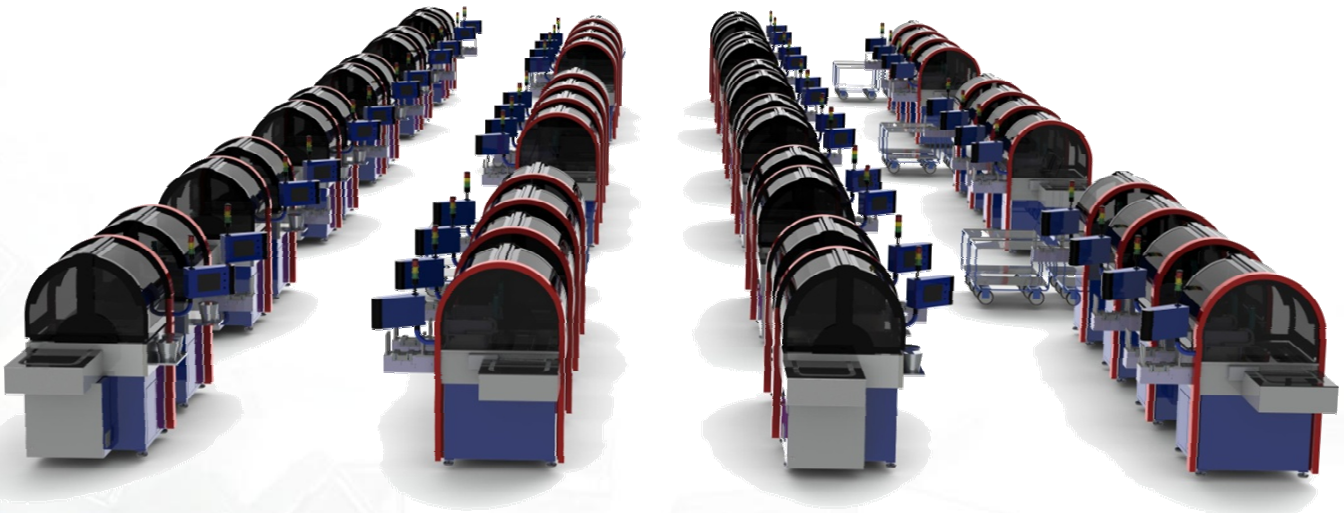
High volume, high speed assembly lines



Lessons Learned

1. *Realize that after a successful functional prototype a large effort is needed for developing a producible product.*

2. *Arrange that the new assembly processes are tested and validated before building production equipment.*

3. *Extensive planning of ramp-up and investment planning.*

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Thank you for your attention

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