



# WEARPLEX Gamma Workshop: Printing Process Development and Upscaling



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TECHNISCHE UNIVERSITÄT  
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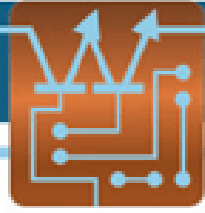
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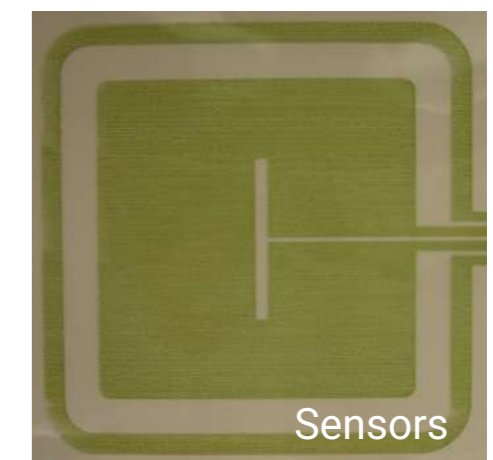
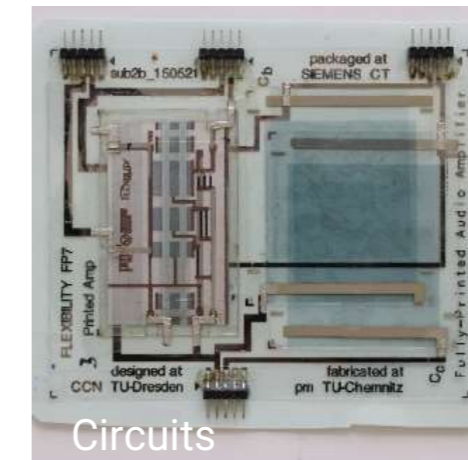
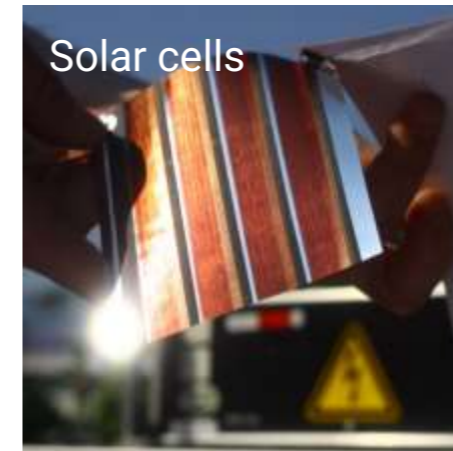


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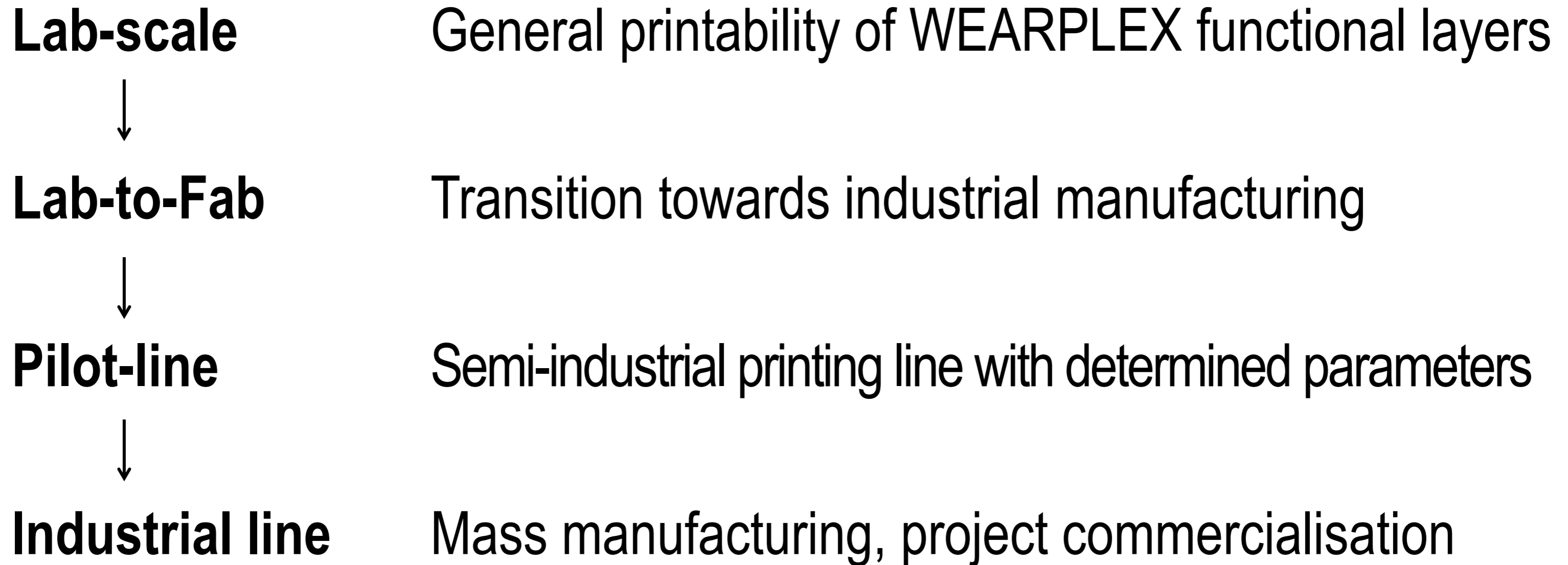
# Printed Electronics @ pmTUC

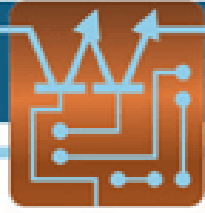
- 20+ years experience in Printed Electronics
- Unique set of lab equipment from small scale test printers to big R2R printing presses
- Pre- and Post-press technologies





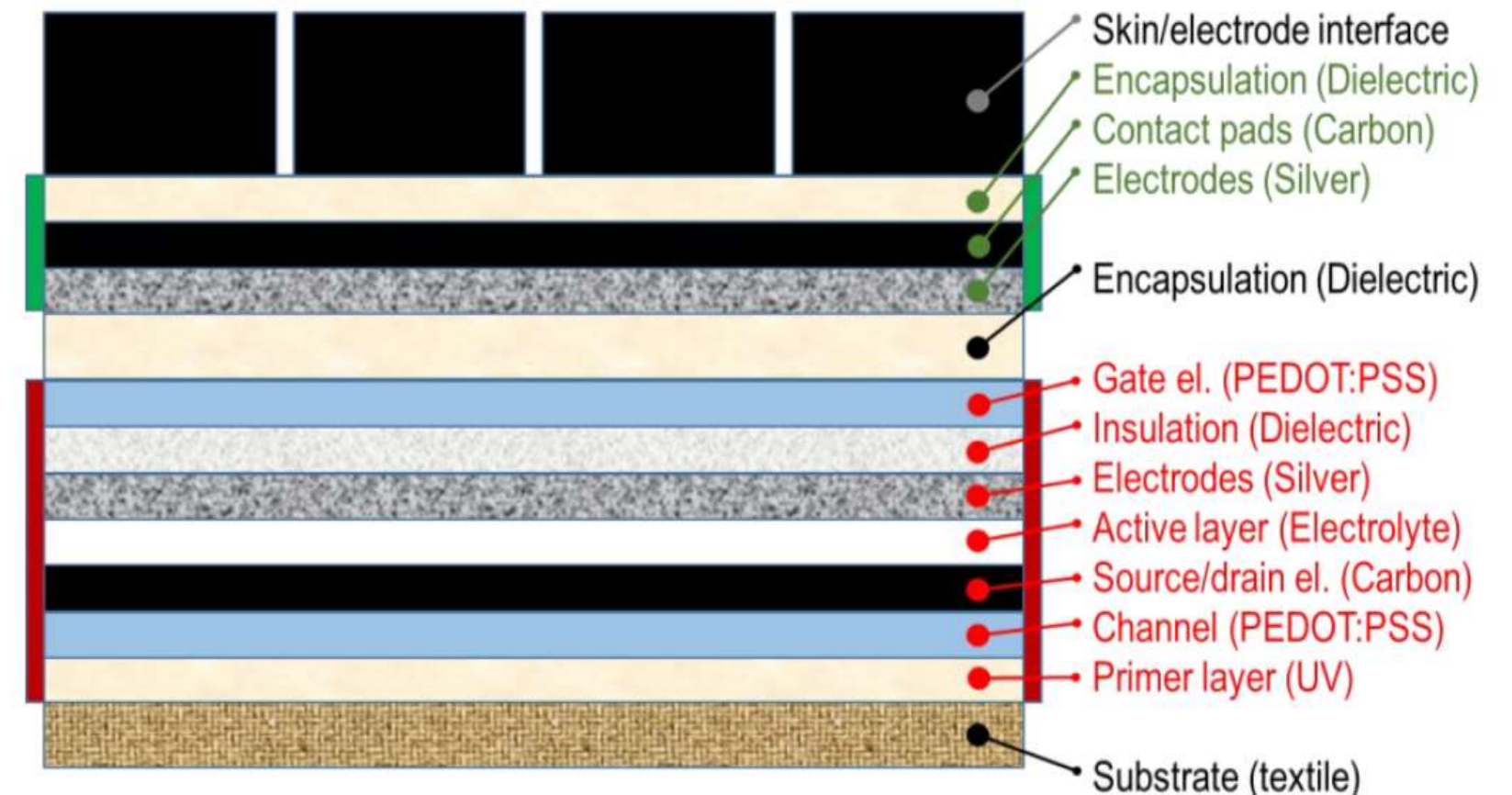
# Upscaling Workflow





# Lab Scale and Lab-to-Fab

- Evaluation of printability of all WEARPLEX functional materials
- Screen printing with focus on transfer to R2R process (metal screens)
- Development of a manufacturing recipe: Printing, pre- and post-processing parameters for all materials



*Wearplex Layer stack*

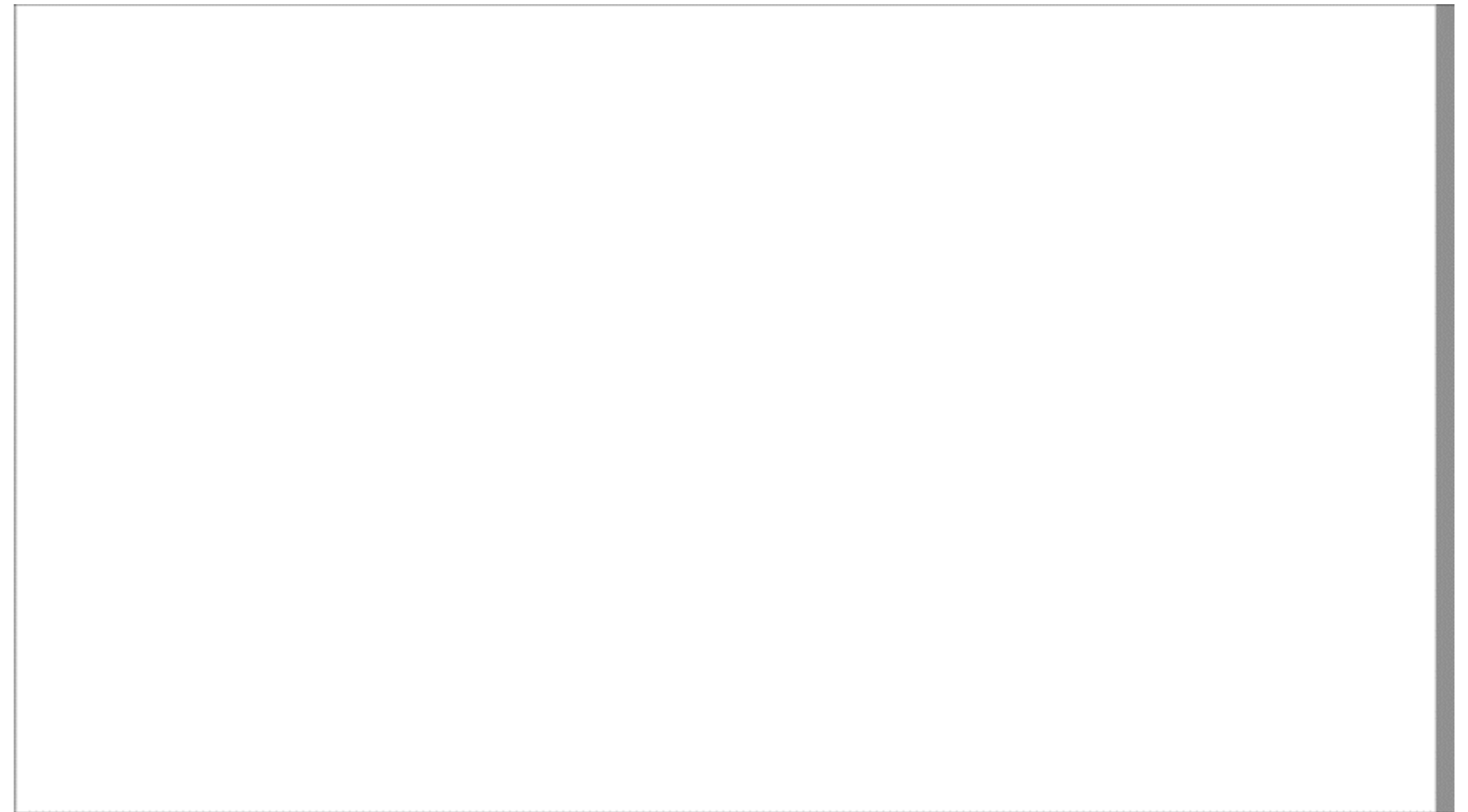


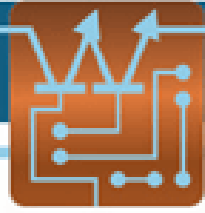
# Pilot-line and large-scale manufacturing

- Semi-industrial R2R line with rotary screen printing
- Flexible post-treatment for all Wearplex materials: UV, IR and Hot-Air
- Corona discharge pre-treatment



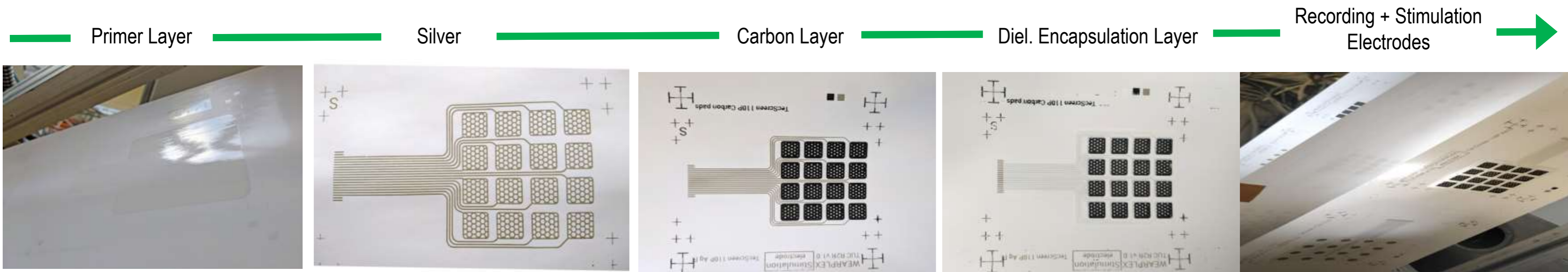
*R2R printing machine Laborman II*





# Demonstration of R2R printed Electrodes

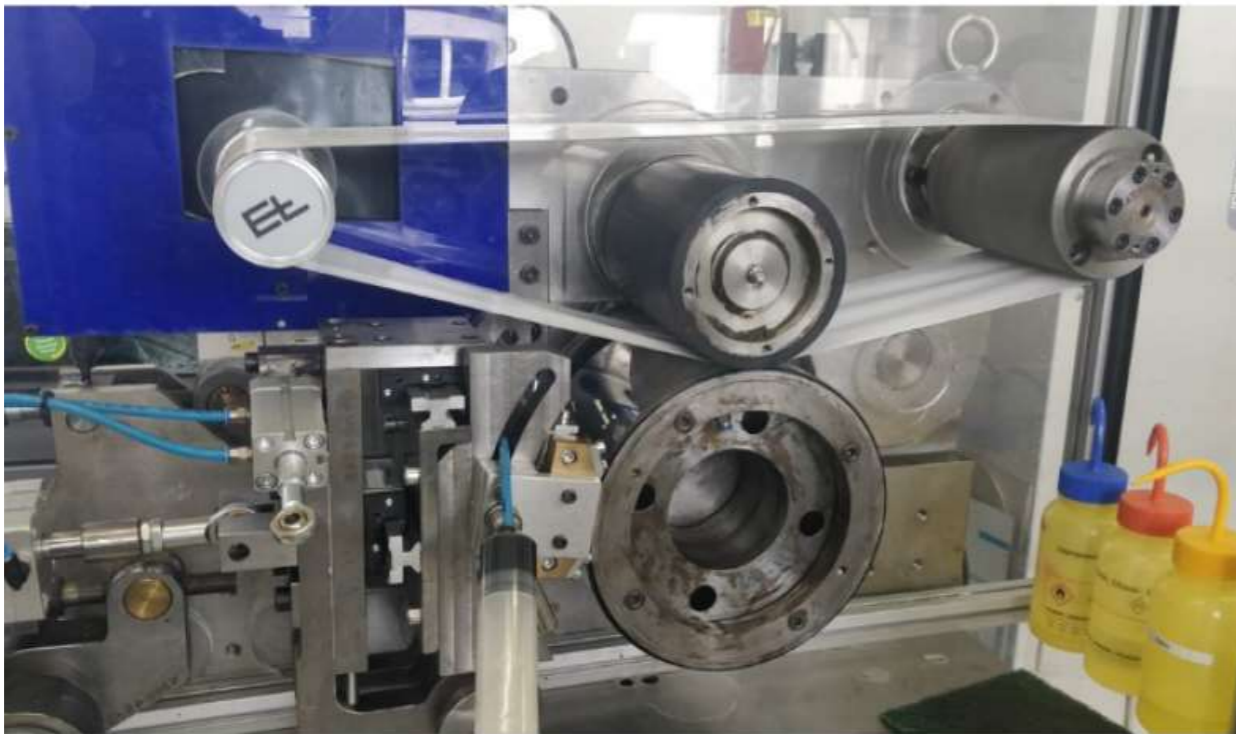
- Demonstration of fully R2R screen-printed Electrode stack at semi-industrial line
- Fine-tuning of printing and post-treatment parameters
- Identification of critical requirements for mass production



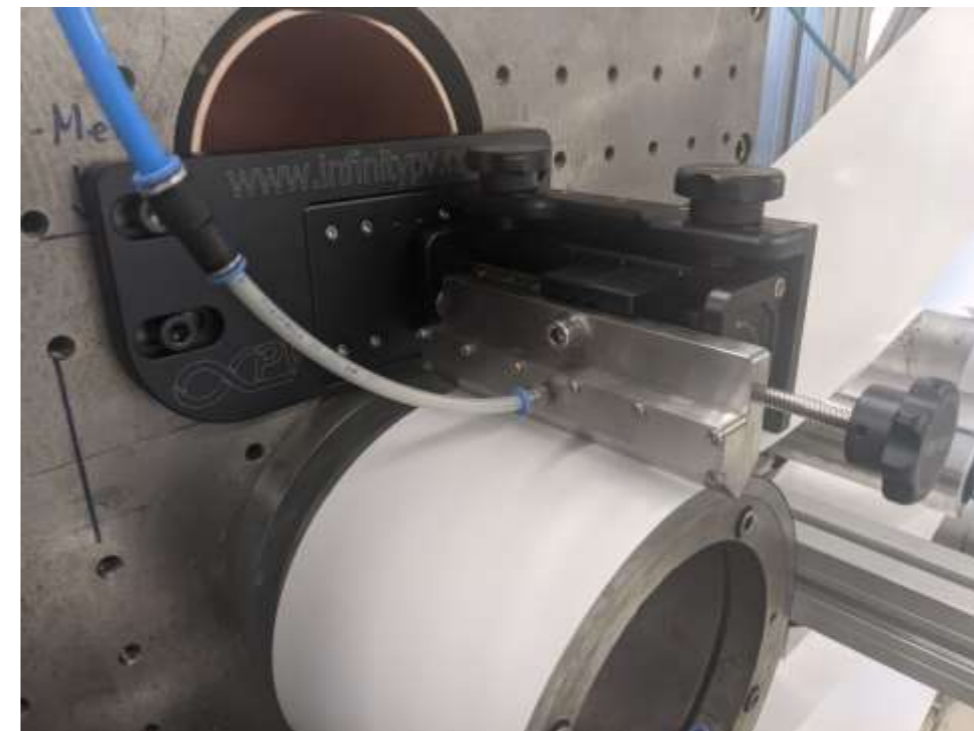


# Large-Scale printing methods

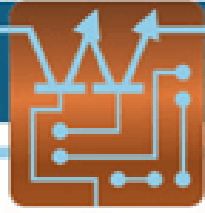
- All Layers except for 2 are printable with metal-mesh based screen printing
- Evaluation of alternative R2R production methods for PEDOT:PSS (Gravure printing) and Skin/Interface material (Stencil printing and Slot Die Coating)



*R2R Gravure printing test stand*



*Slot Die Coating unit at web-fed machine*



# Industrial Manufacturing Strategies

## Rotary R2R Line

- Efficient high throughput manufacturing
- All layers except for 2 printable with rotary (metal) screen printing
- Needs further refinement in alternative production methods for PEDOT + skin/interface Layer or in material development



## Flatbed R2R/R2S Line

- Lower throughput, stop-and-go process
- More flexible in printing form materials (PET Screens, Stencil printing..)
- Can handle all Wearplex Layer Materials
- Developed at SCT