



PPI

Polymer
Process
Innovation



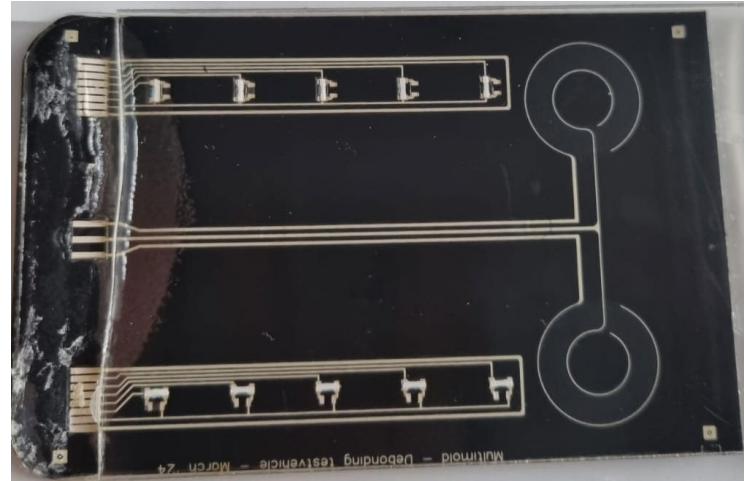
Montanuniversität
Leoben

Understanding Electronic Component Damage during Injection Overmolding

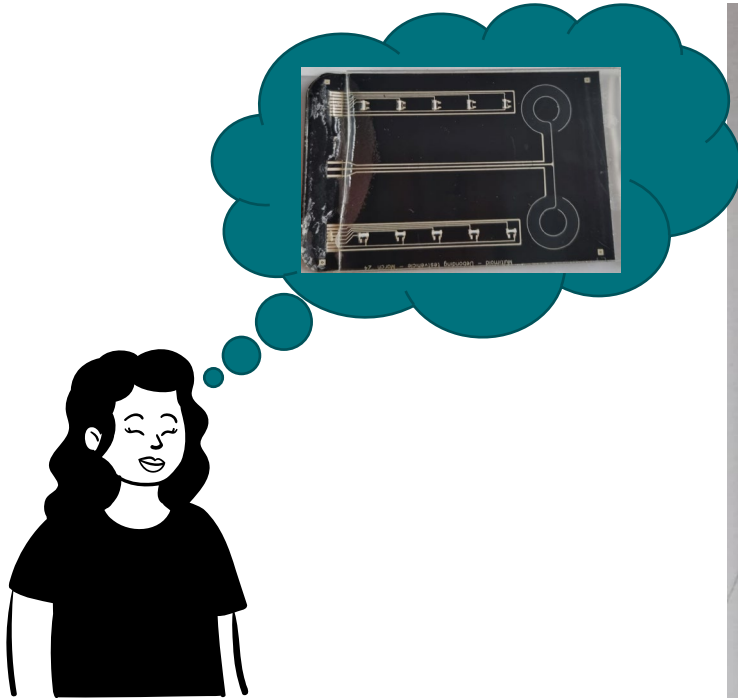
Annika Lenger

Move mountains

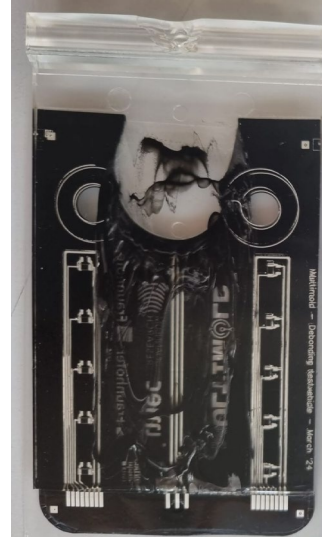
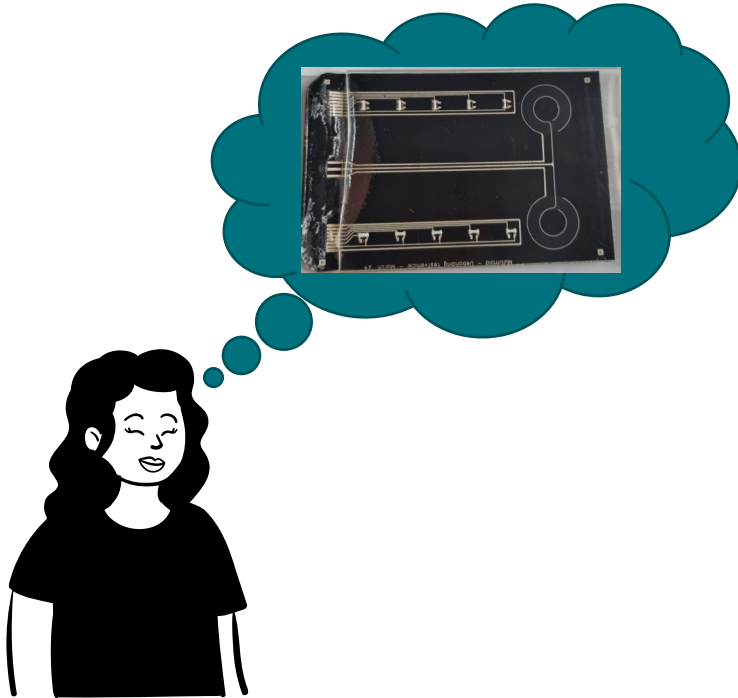
Expectation



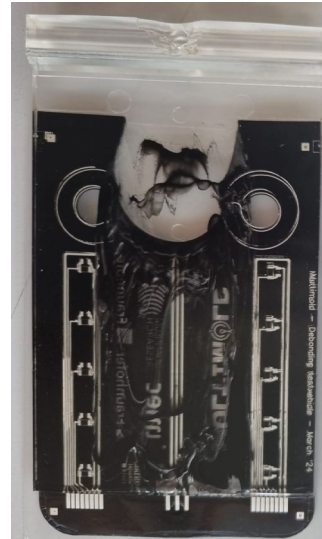
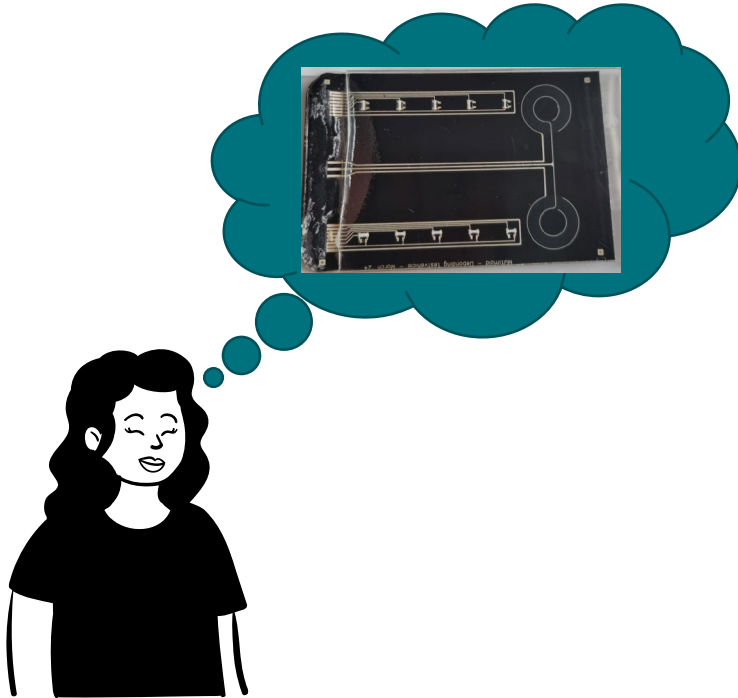
Expectation vs. Reality



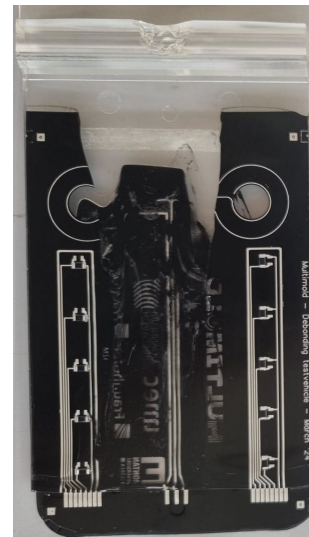
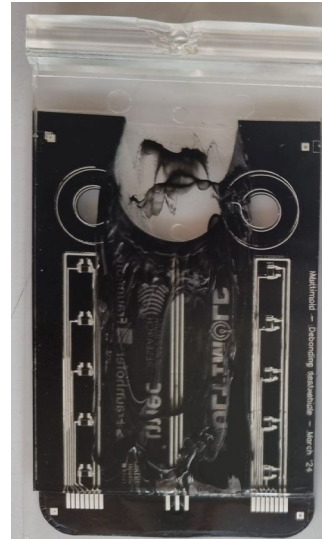
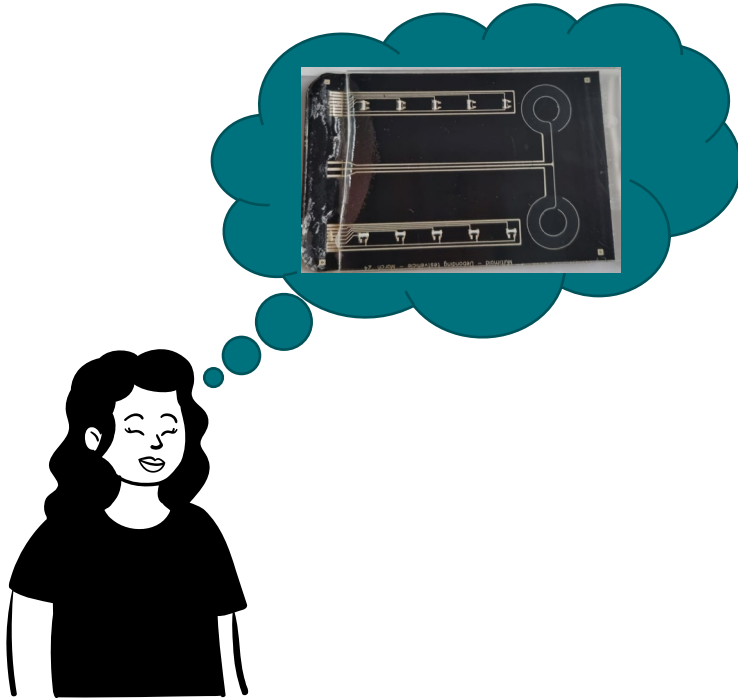
Expectation vs. Reality



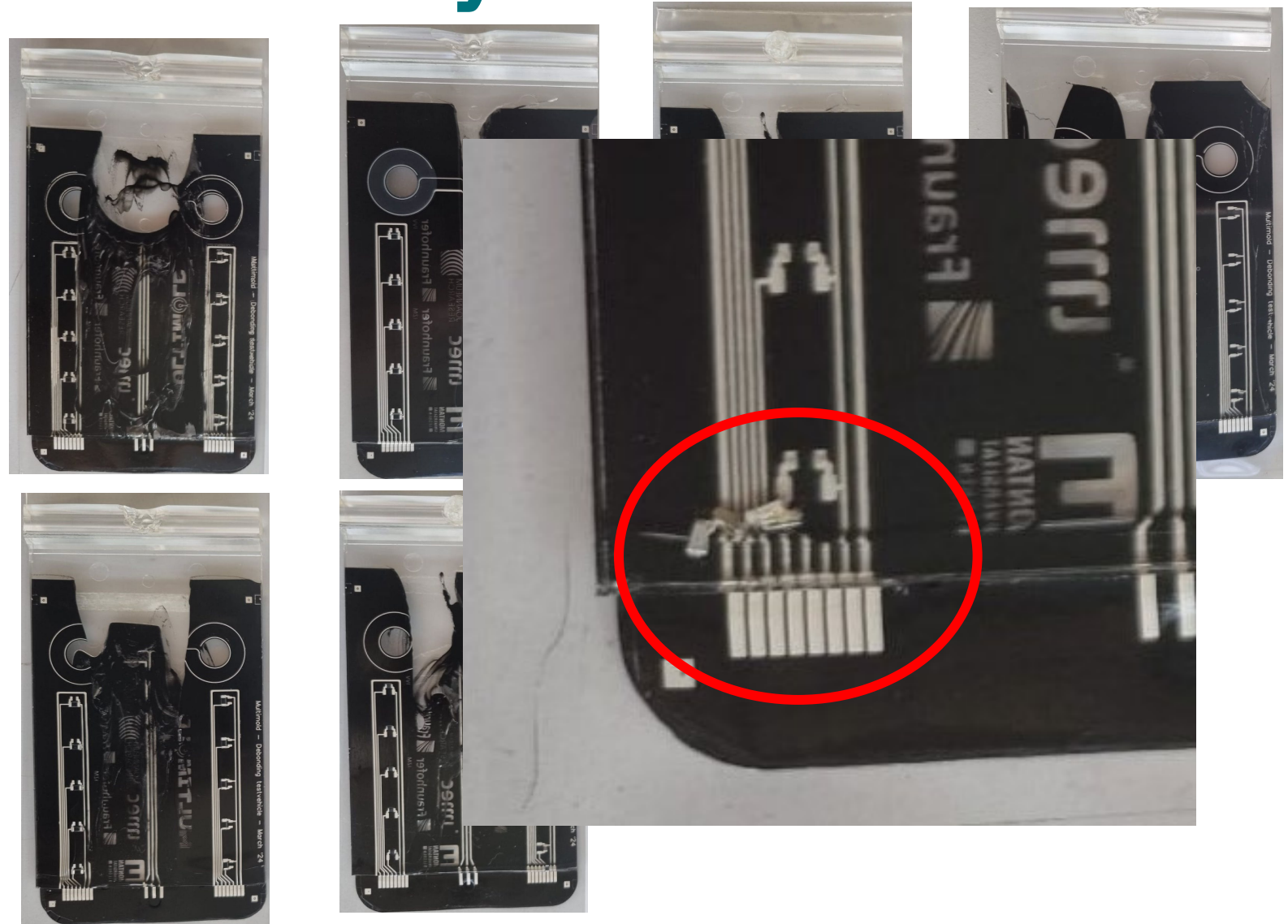
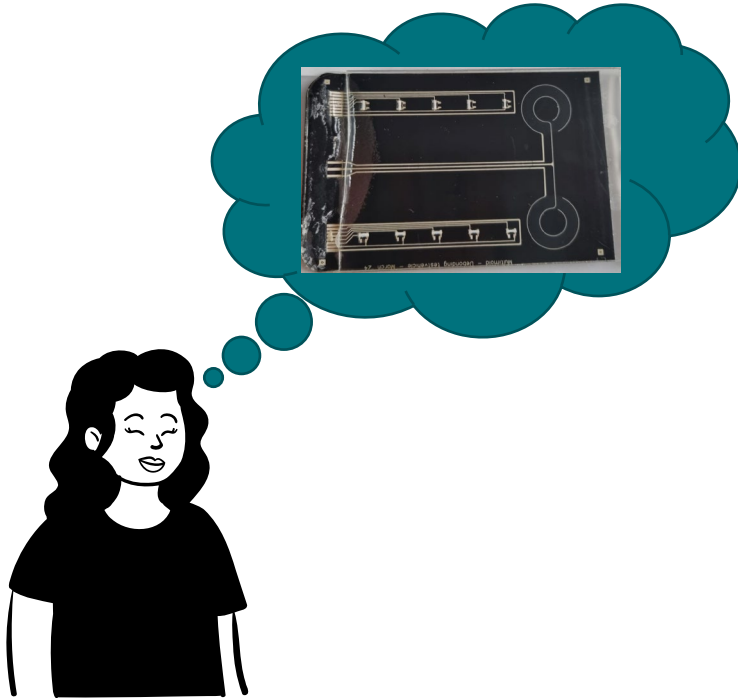
Expectation vs. Reality



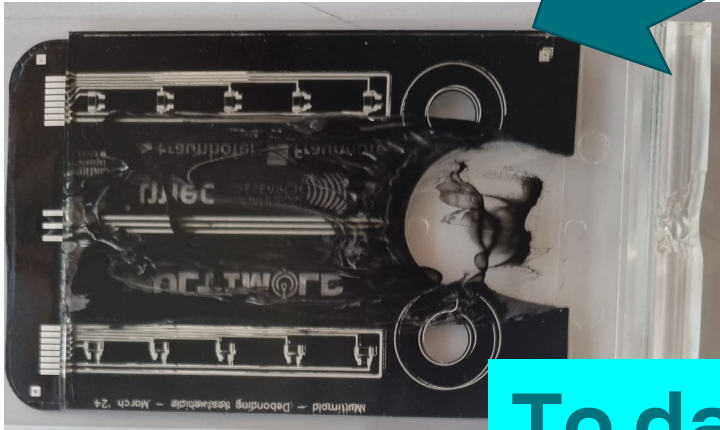
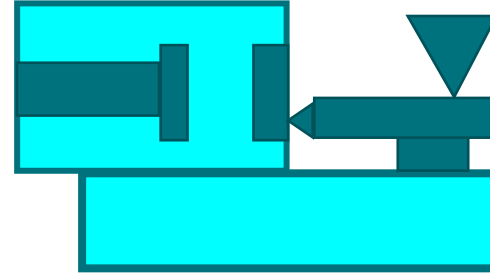
Expectation vs. Reality



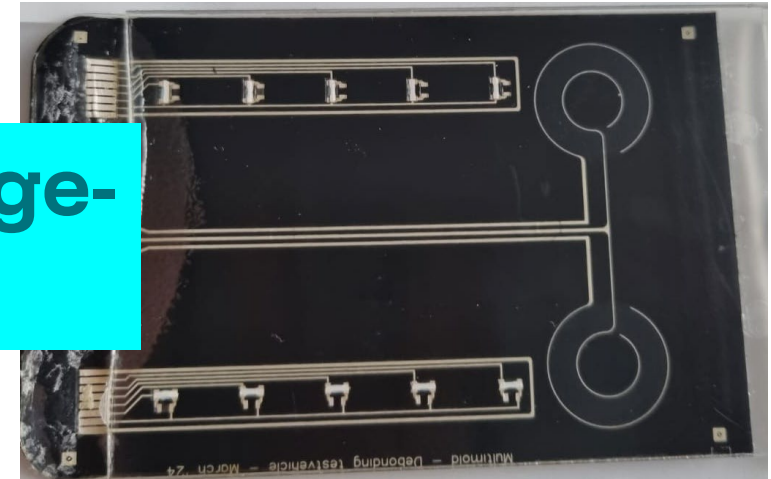
Expectation vs. Reality



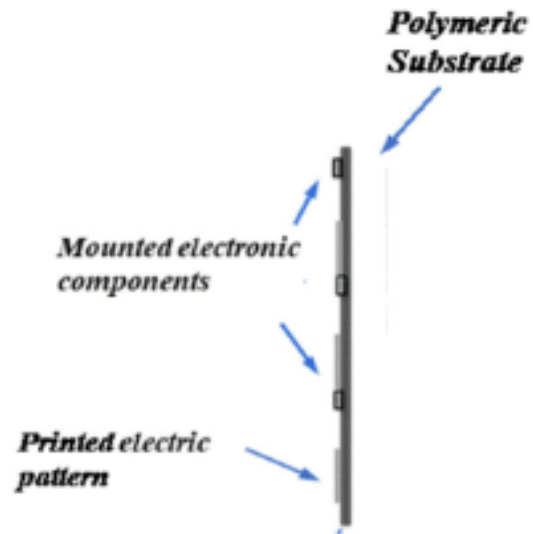
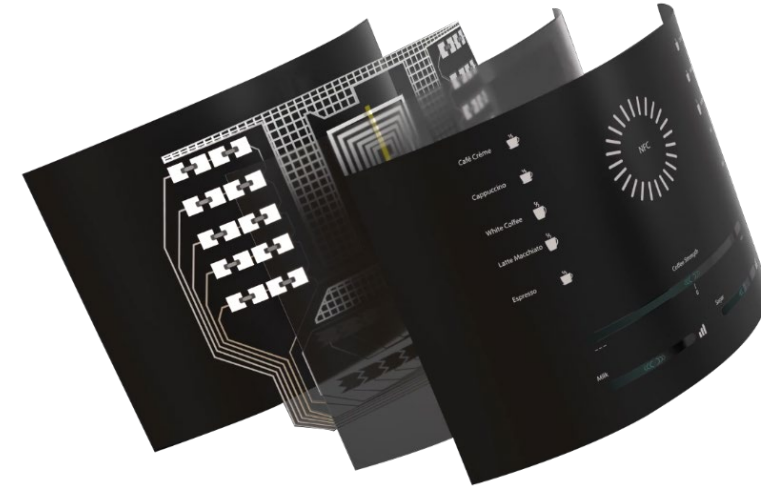
Surviving the melt



**To damage or not to damage-
that is the question!**



In-mold Electronics



1. FLAT FILM PRINTING

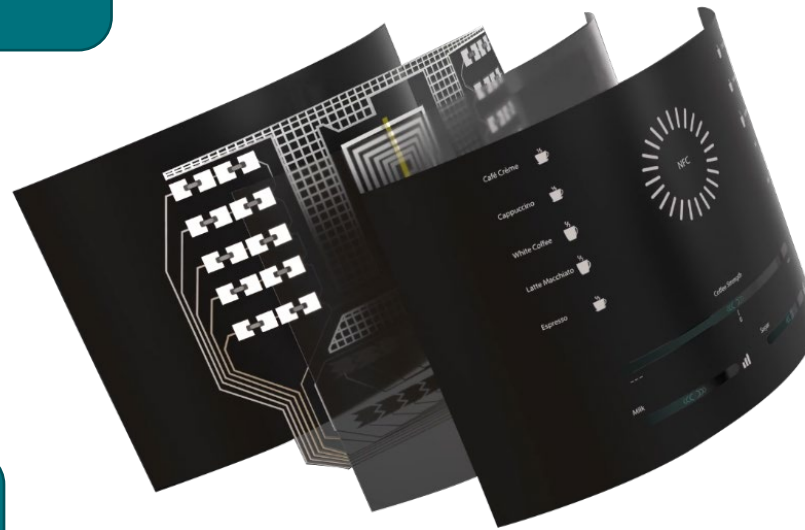
Why IME?

Lightweight part

Integrated functions

Freedom of design

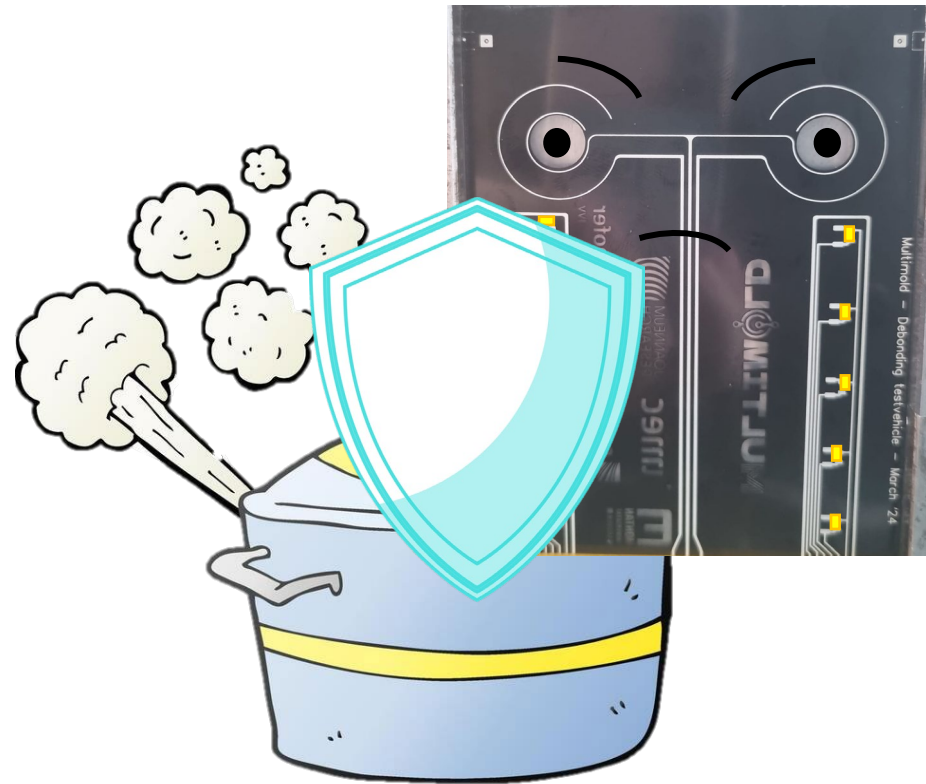
Electronics protected



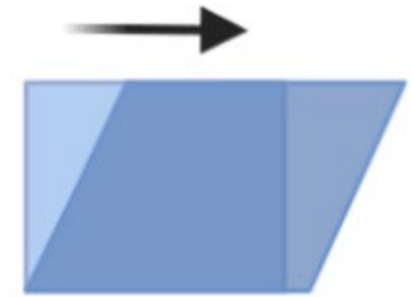
The challenge



Temperature

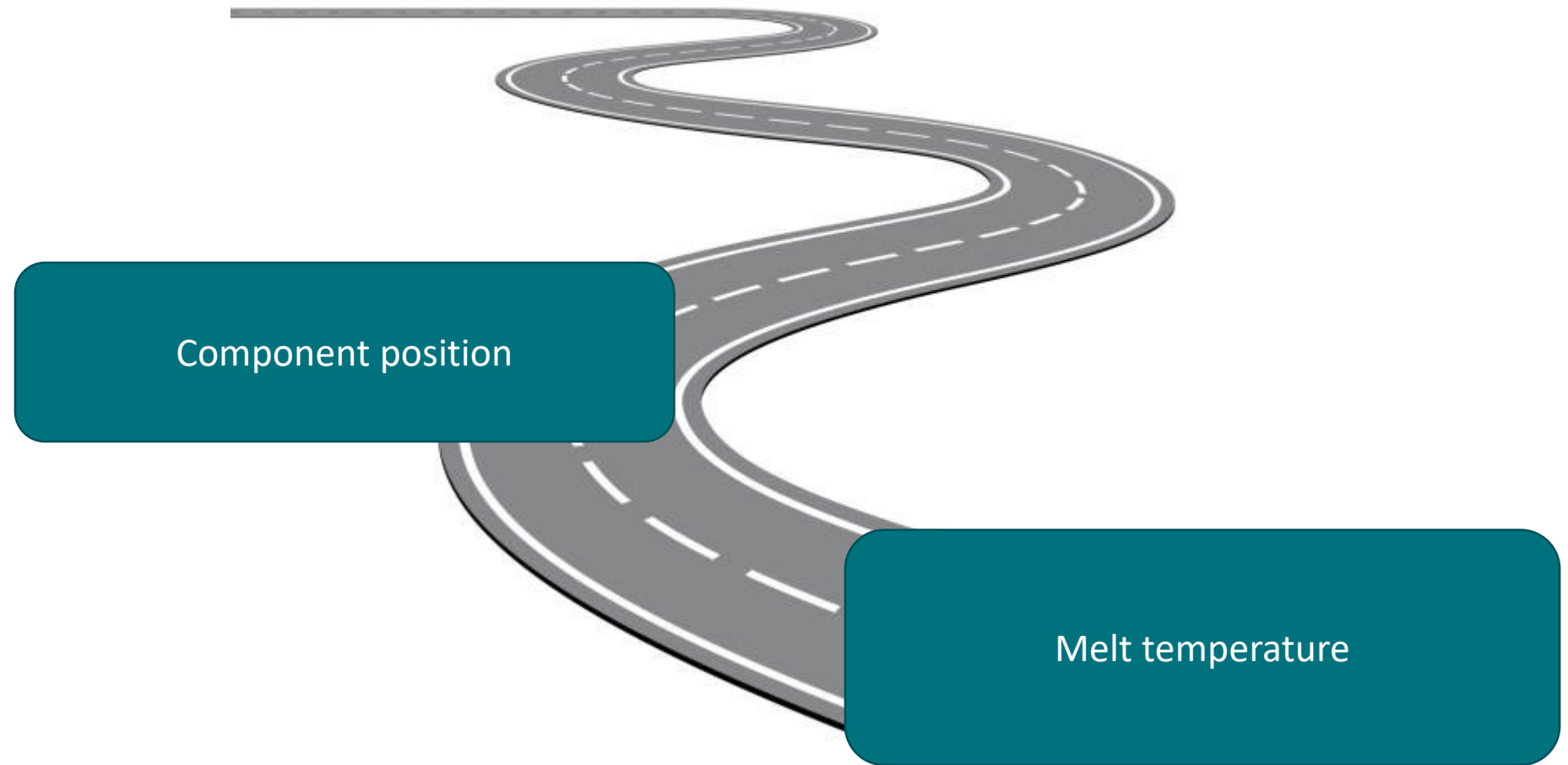


Pressure

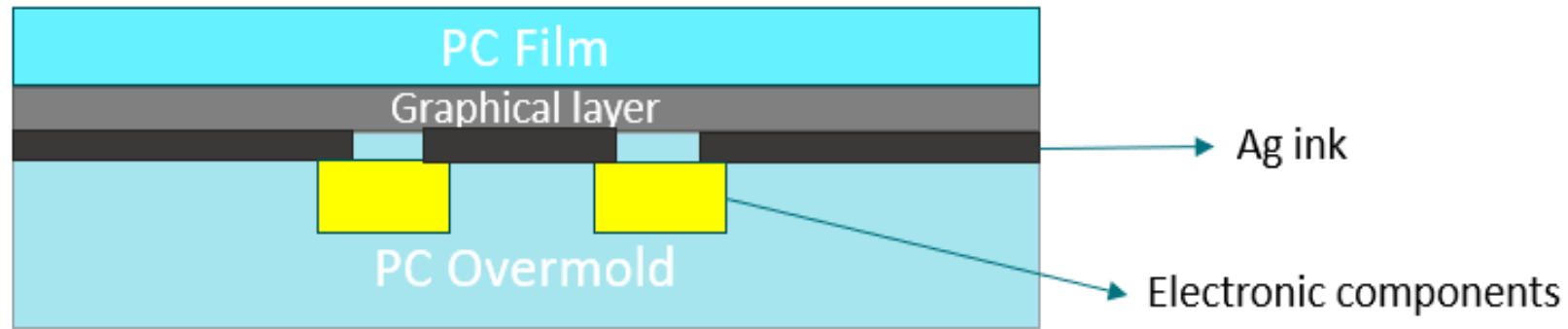


Shear stress

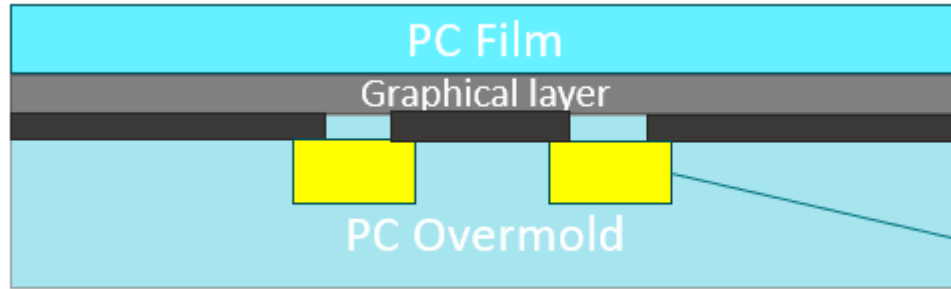
A path to good parts



Experimental setup

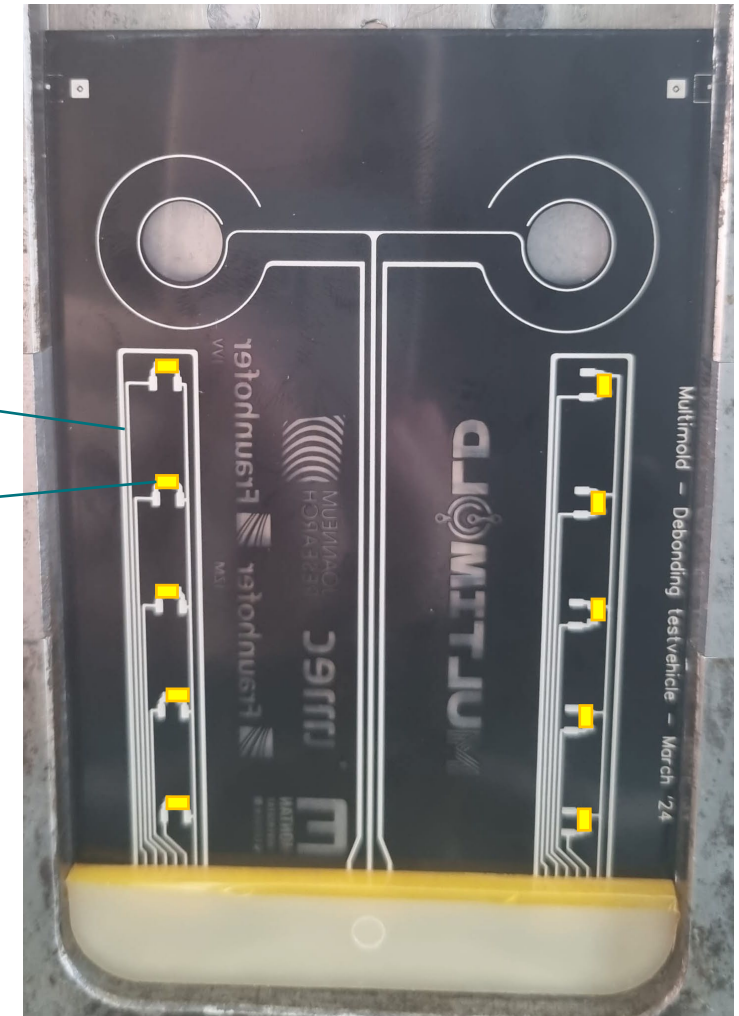


Experimental setup

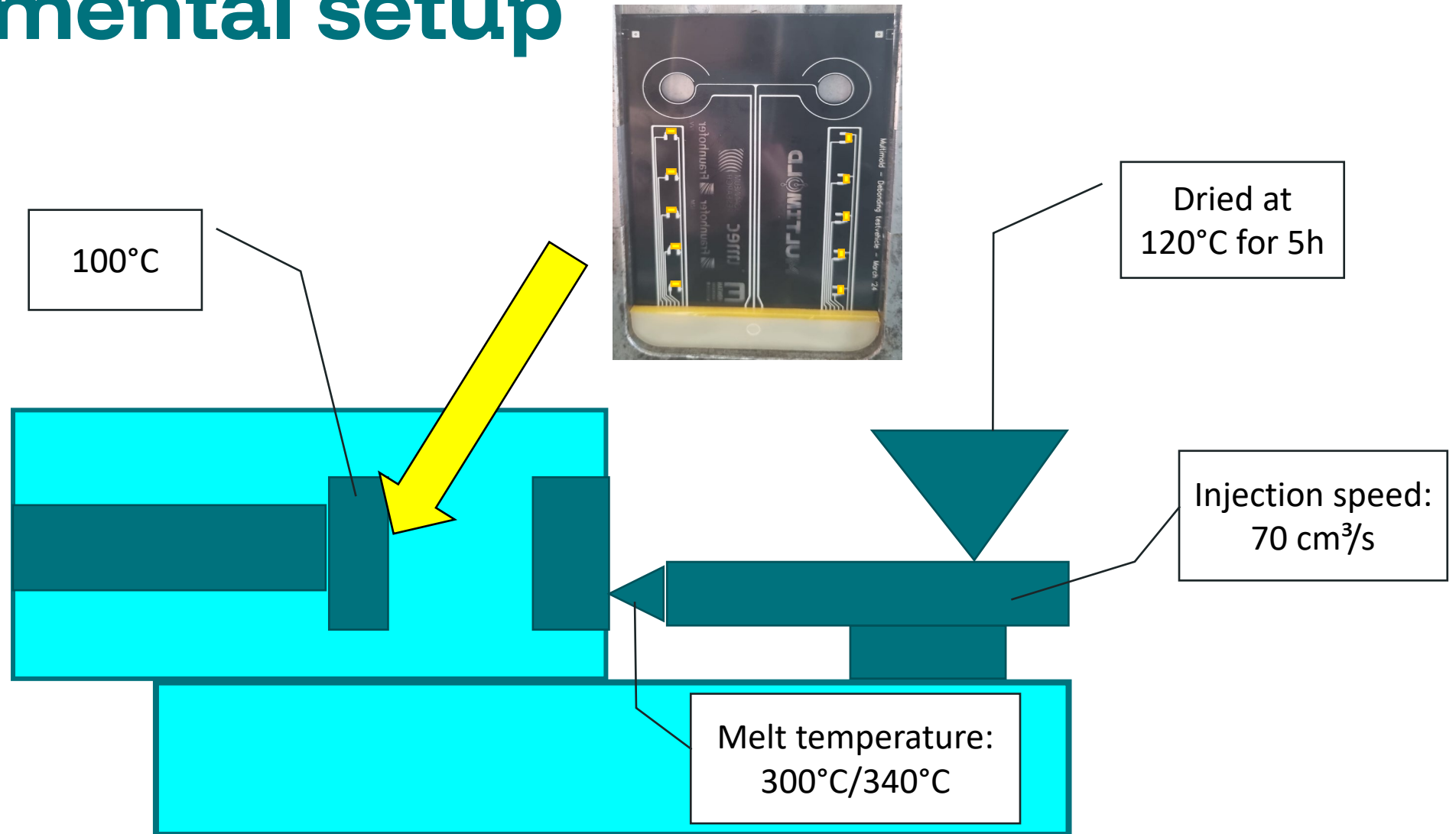


Ag ink

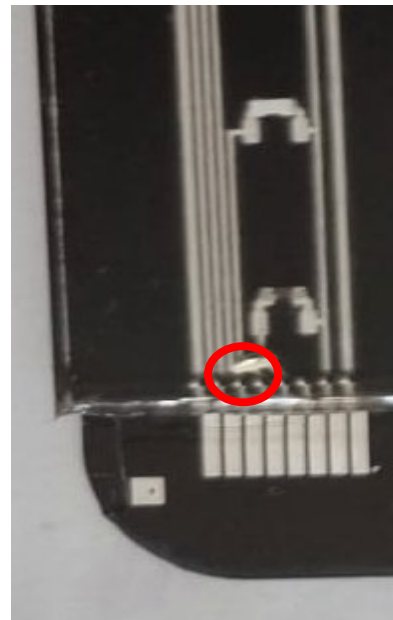
Electronic components



Experimental setup

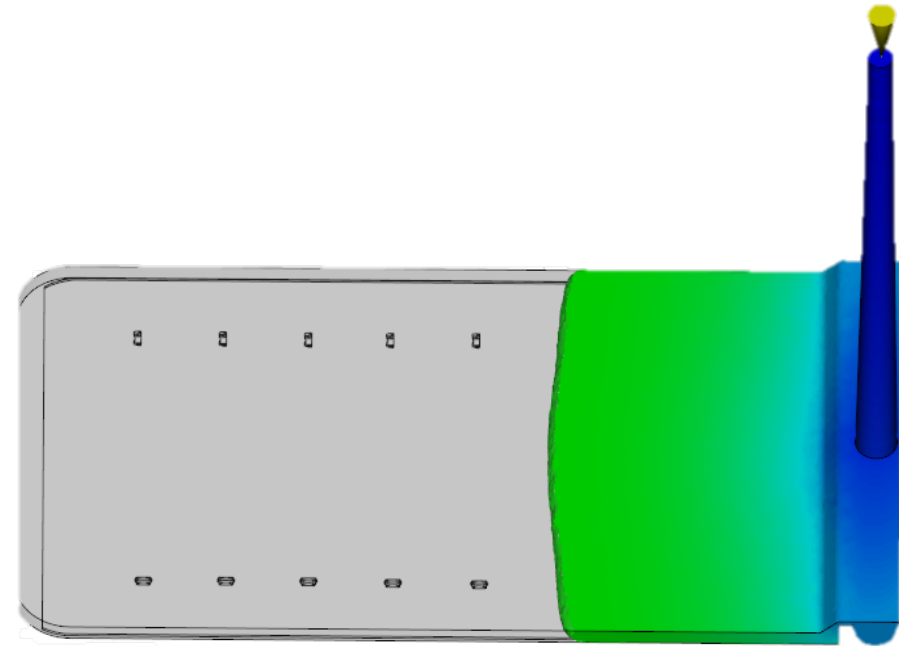
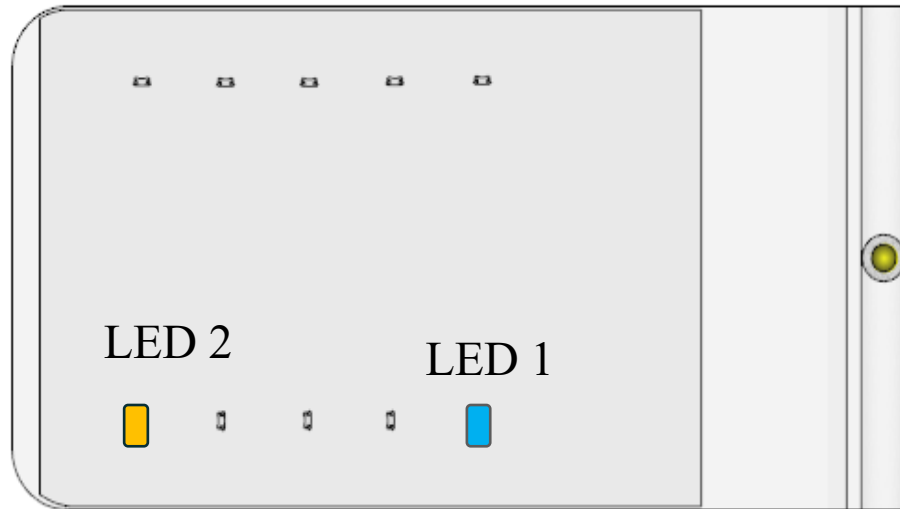


Fail Classified

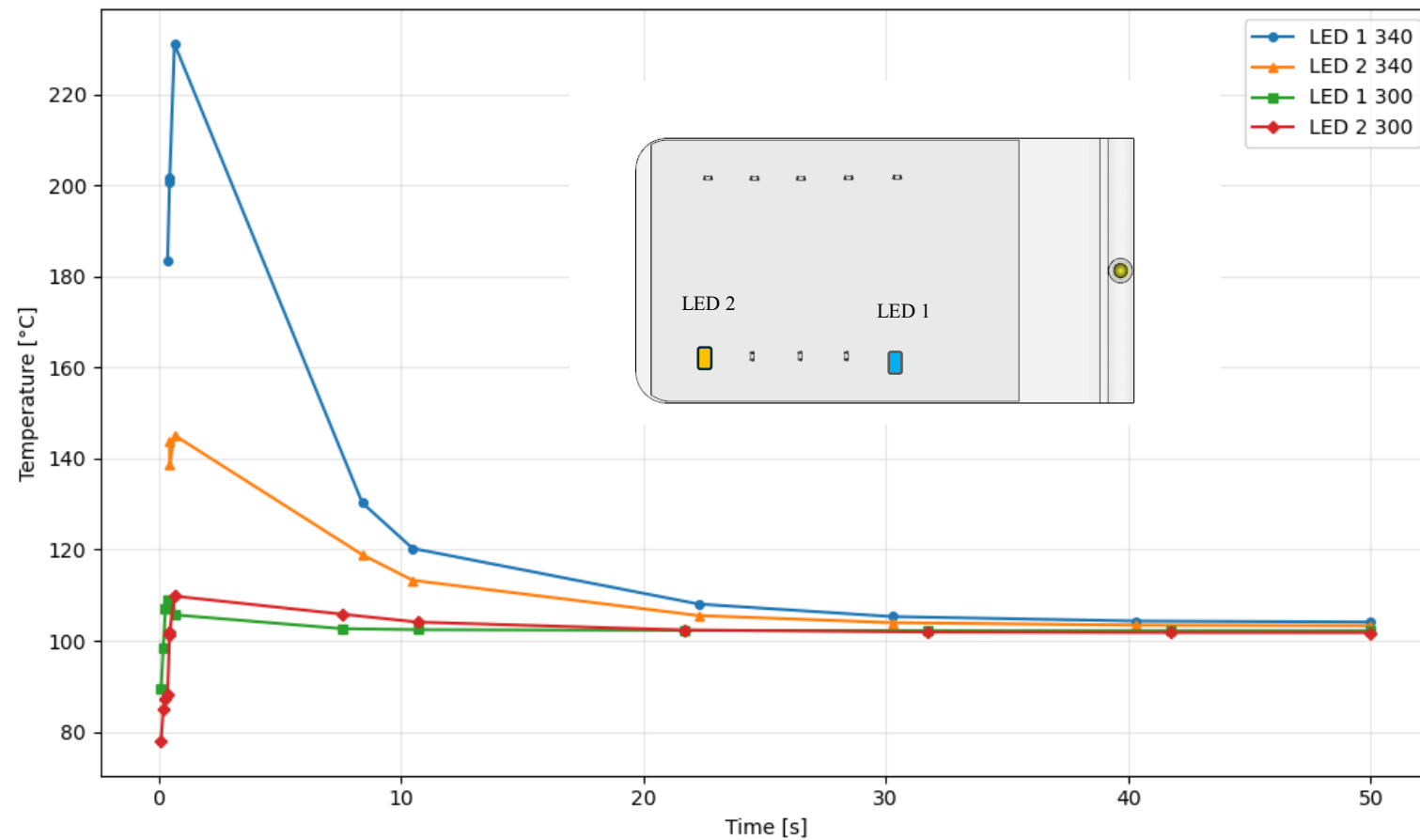


Melt temperature [°C]	Total specimens	Damaged	Detached LED	Intact	Damage factor [%]
300	44	36	21	8	82

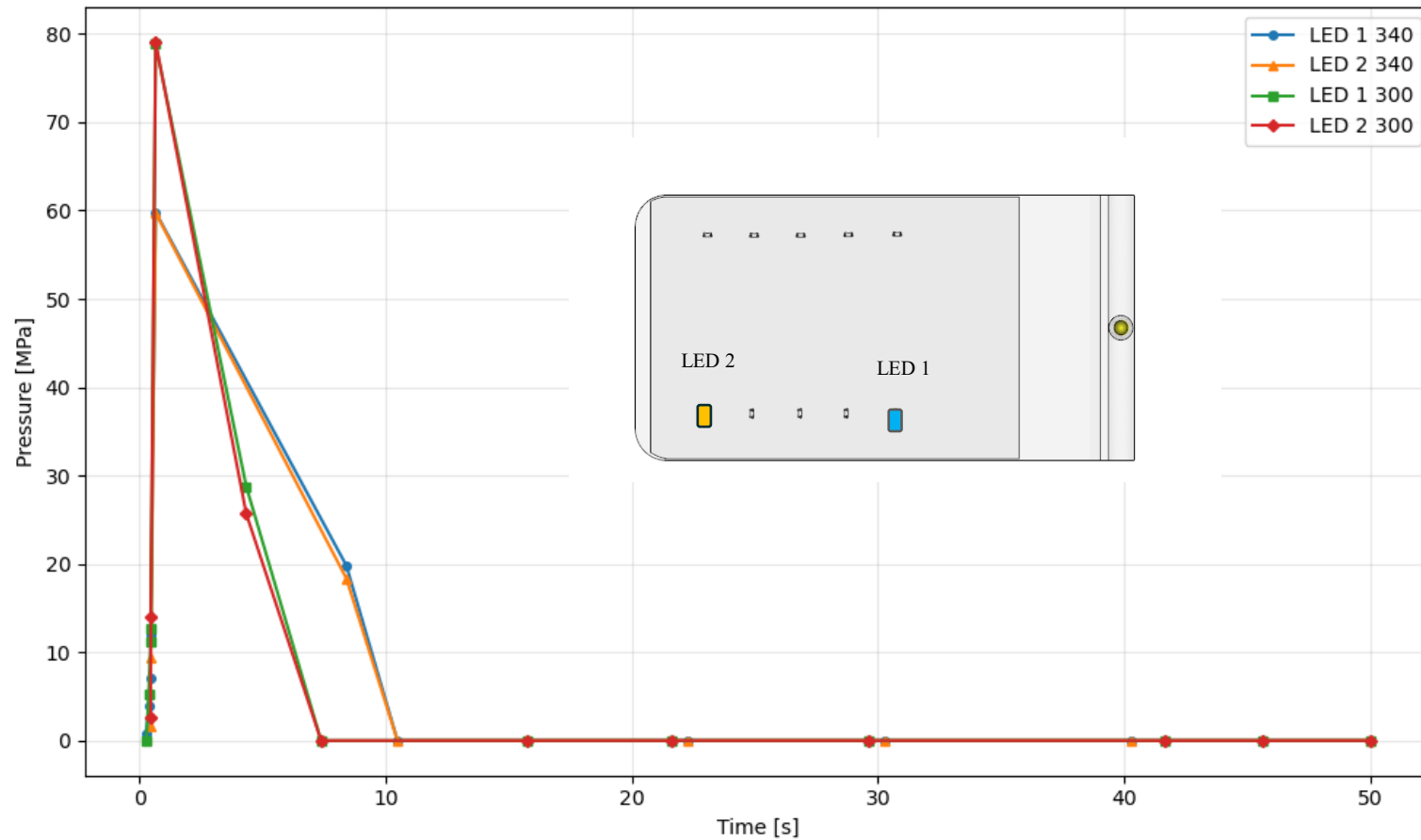
Injection molding simulation



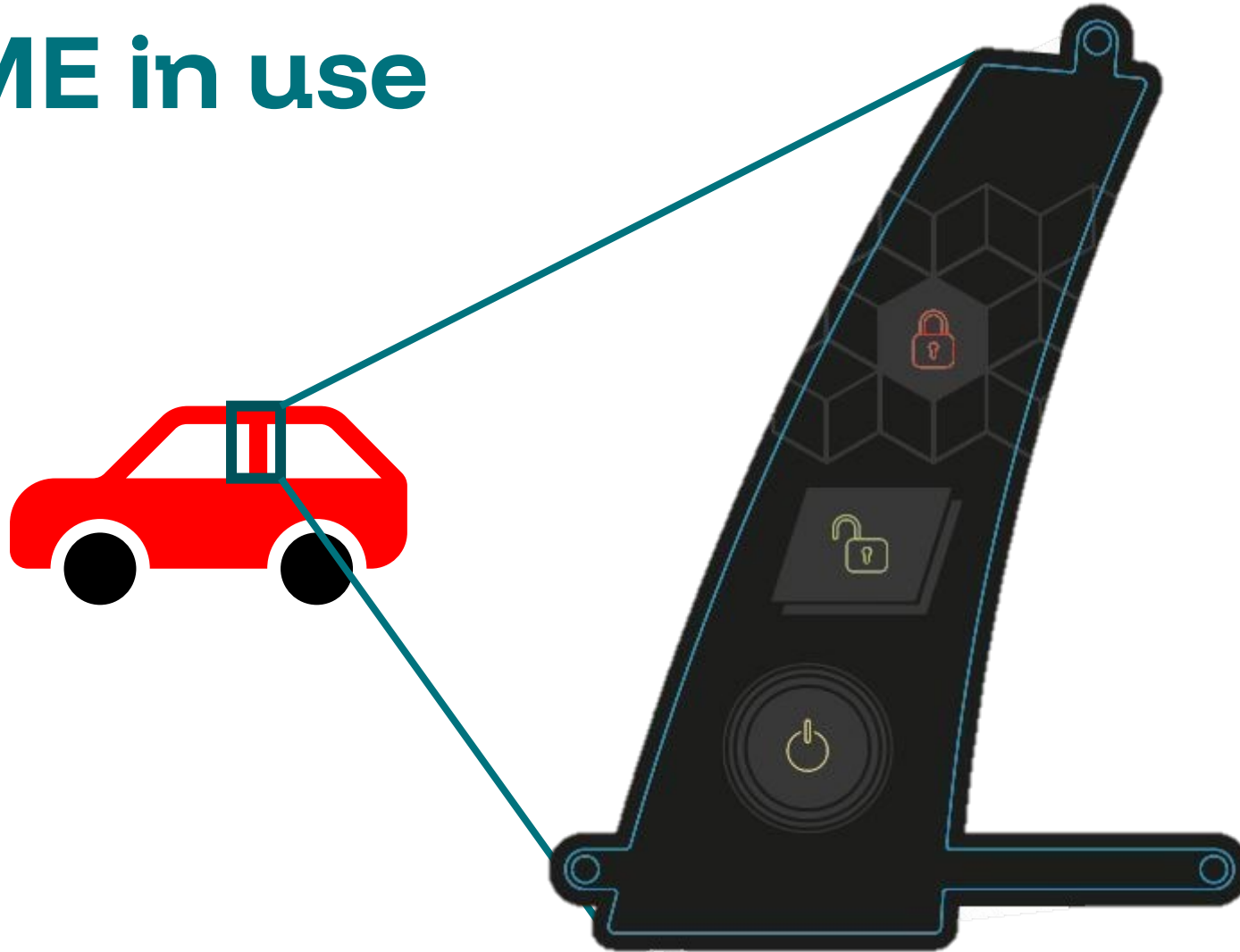
Temperature Load



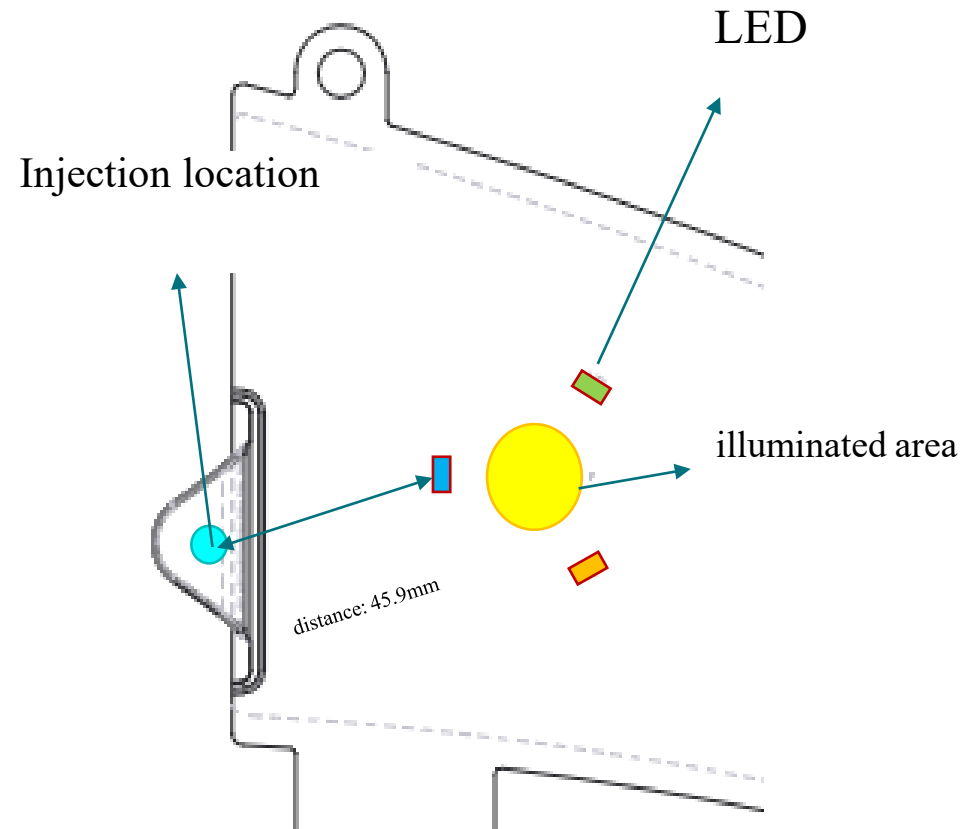
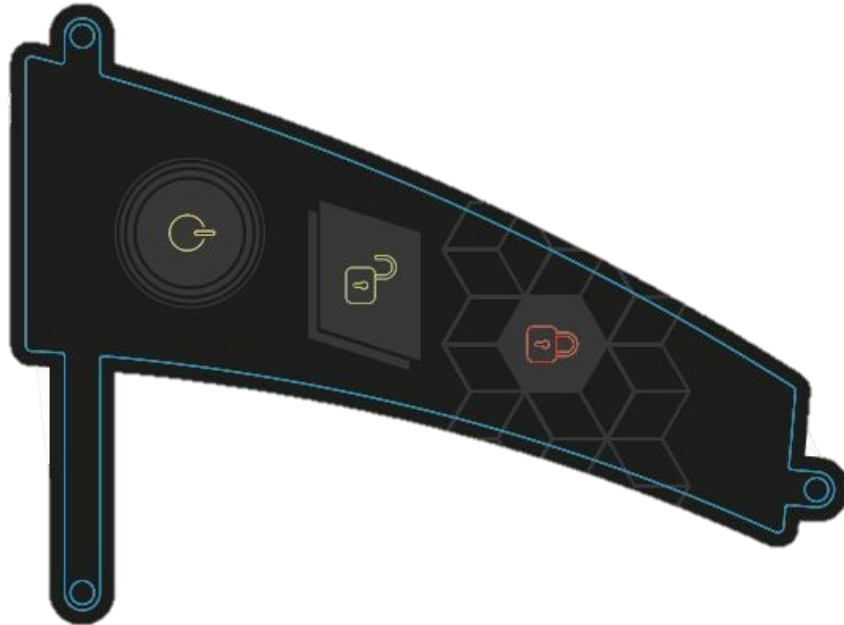
Pressure Load



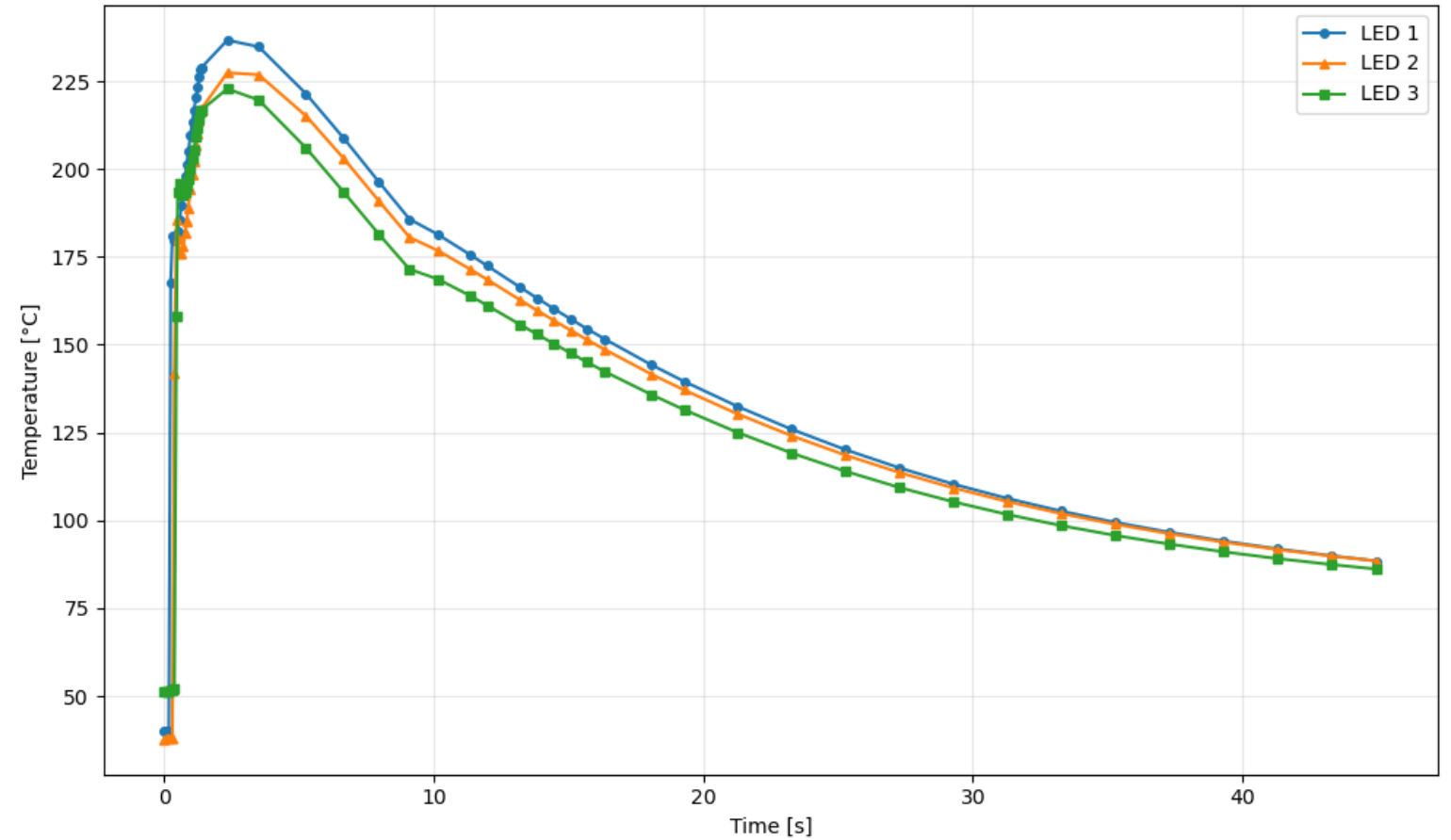
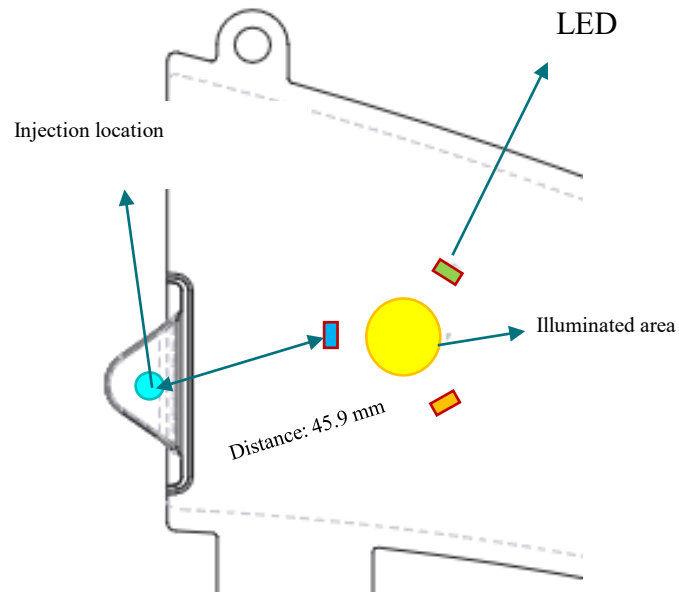
IME in use



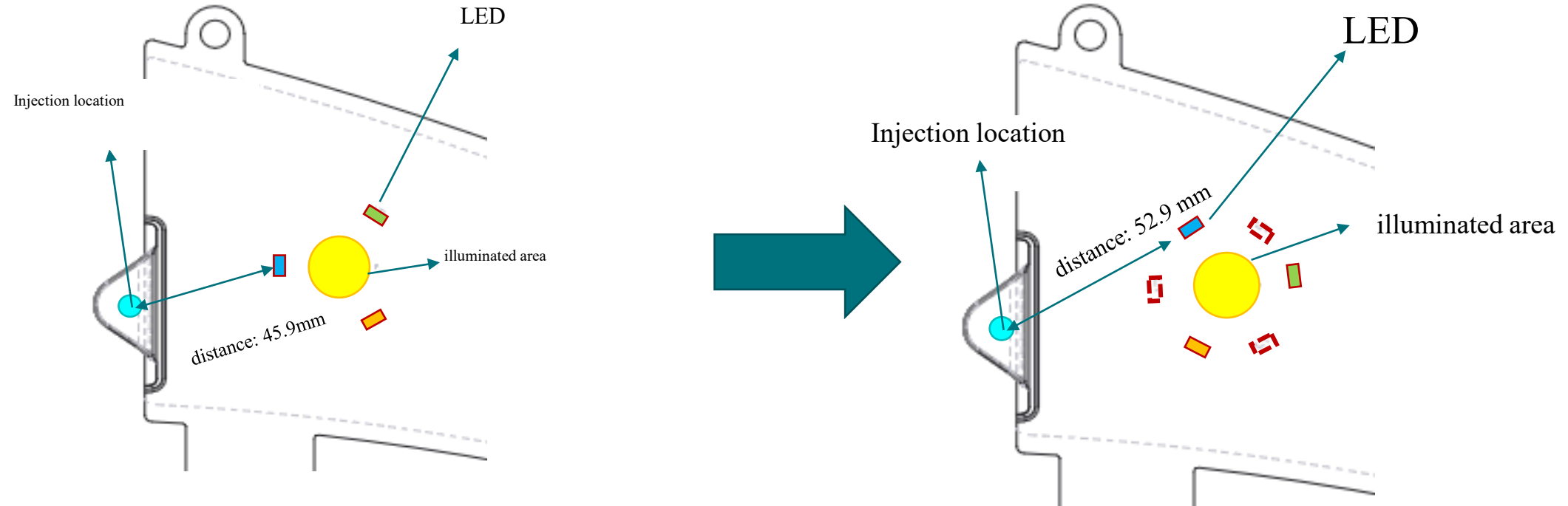
LED Position



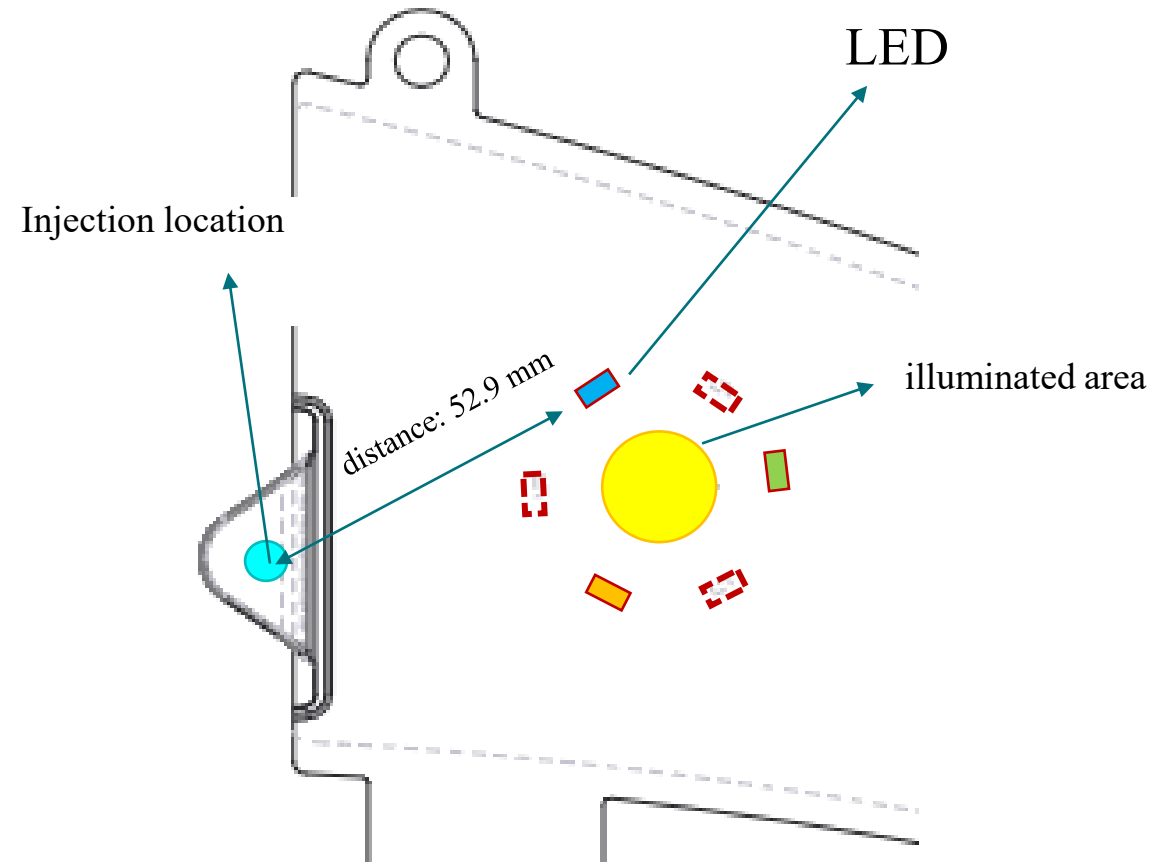
Temperature at LED



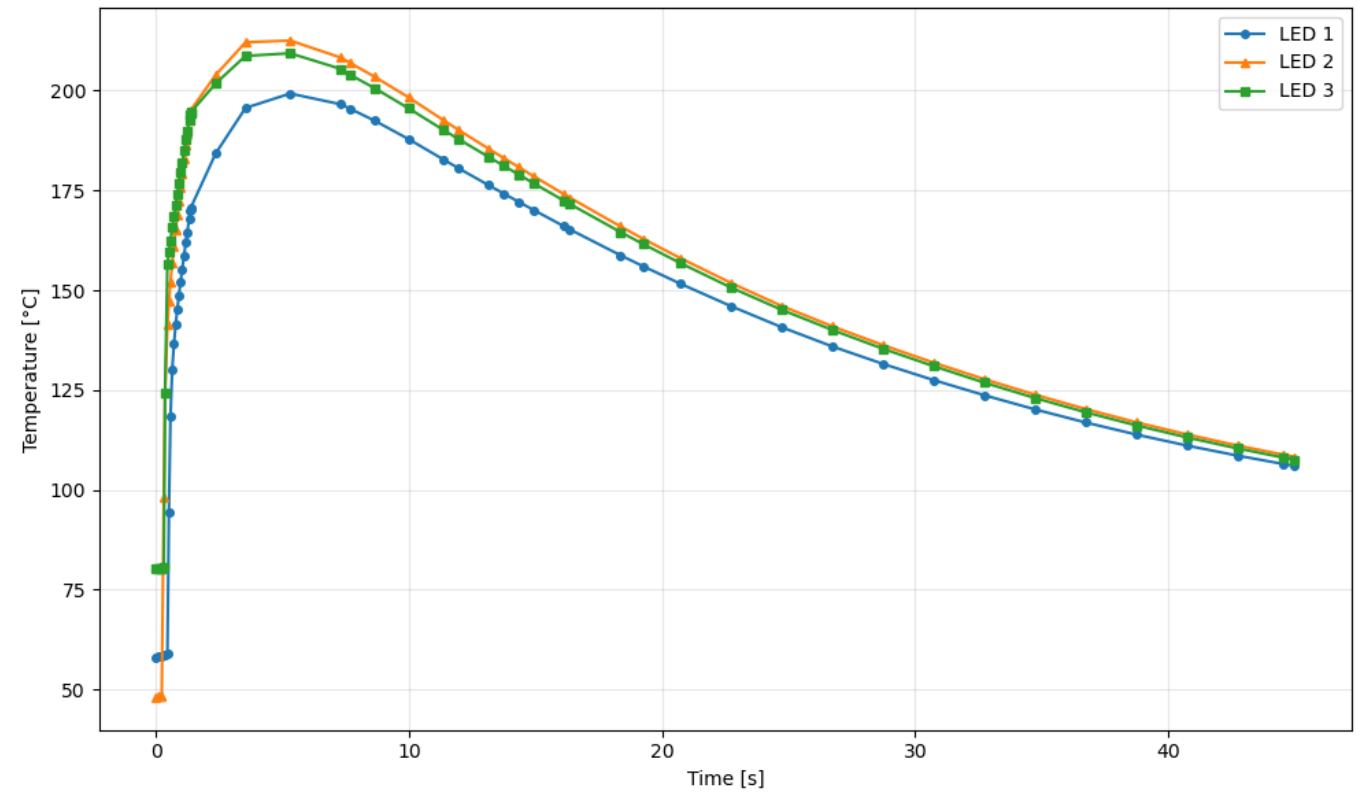
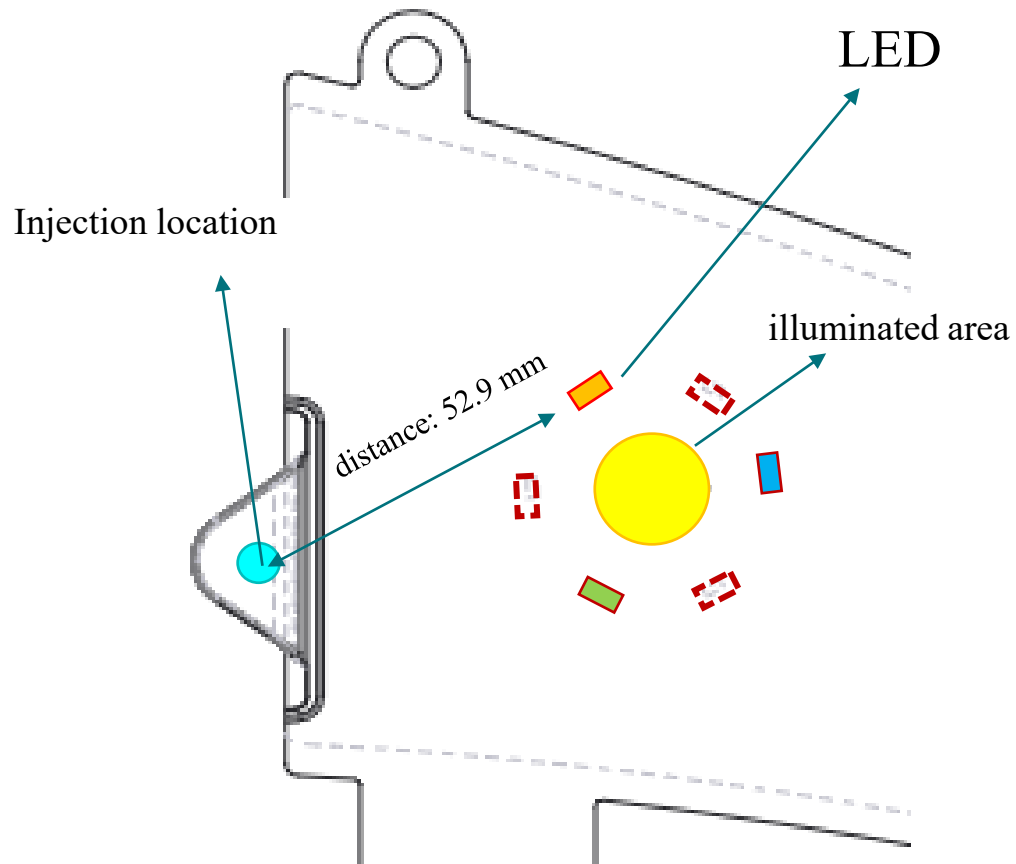
Temperature at LED



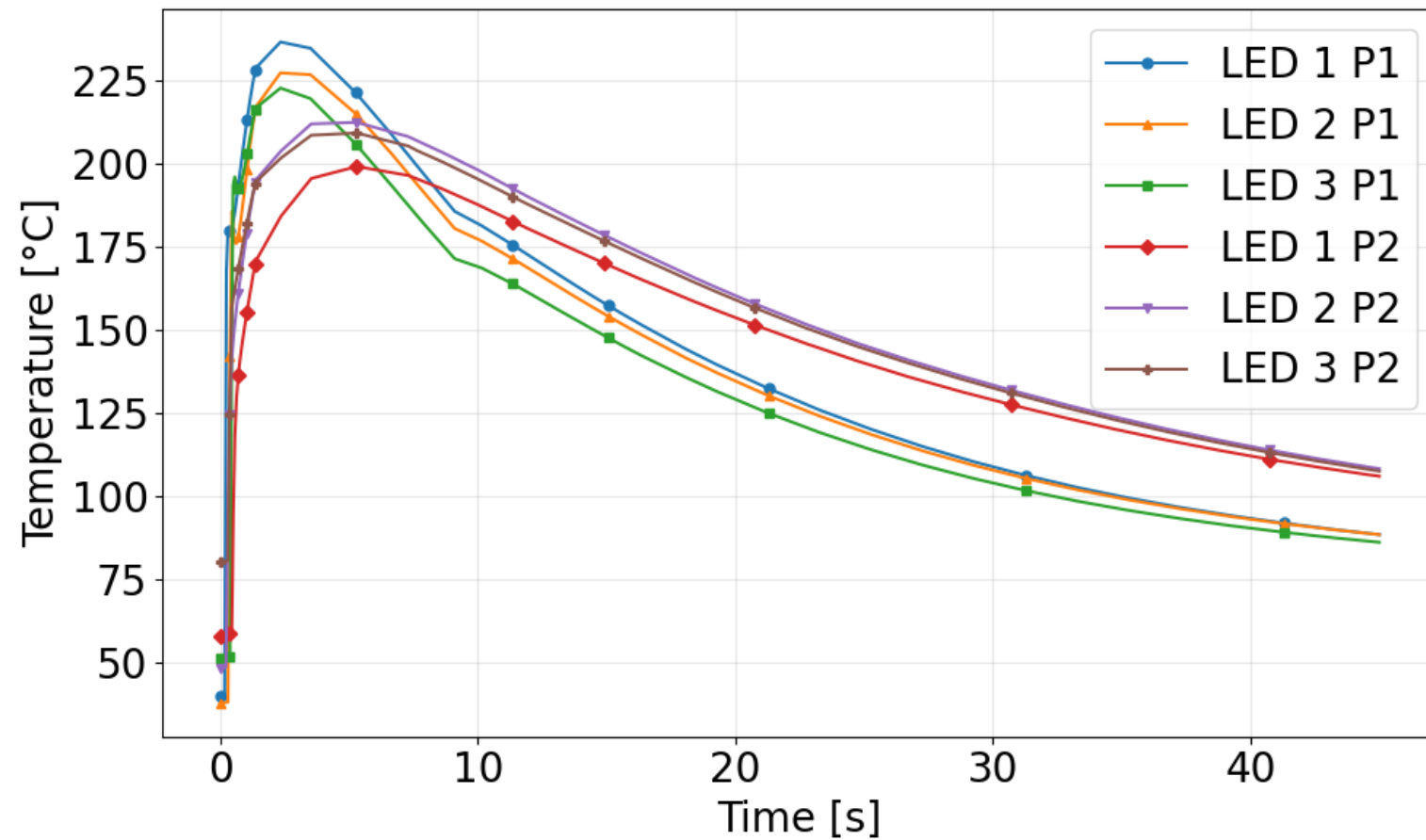
LED Position



LED Position



Comparing Positions



Conclusions and Outlook

- Temperature influences component integrity
- Position determines local process loads
- Simulation can help predict critical conditions

Next step:

- Correlate simulated loads with experimental damage
- Predict critical conditions

MULTIMOLD

Molding the Future



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