Jet Printing of Low Temperature Solder Paste

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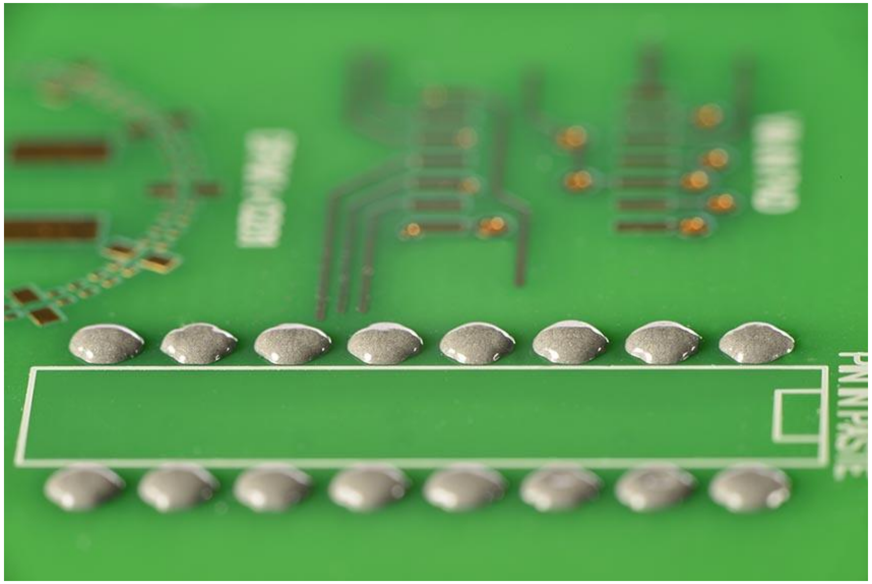
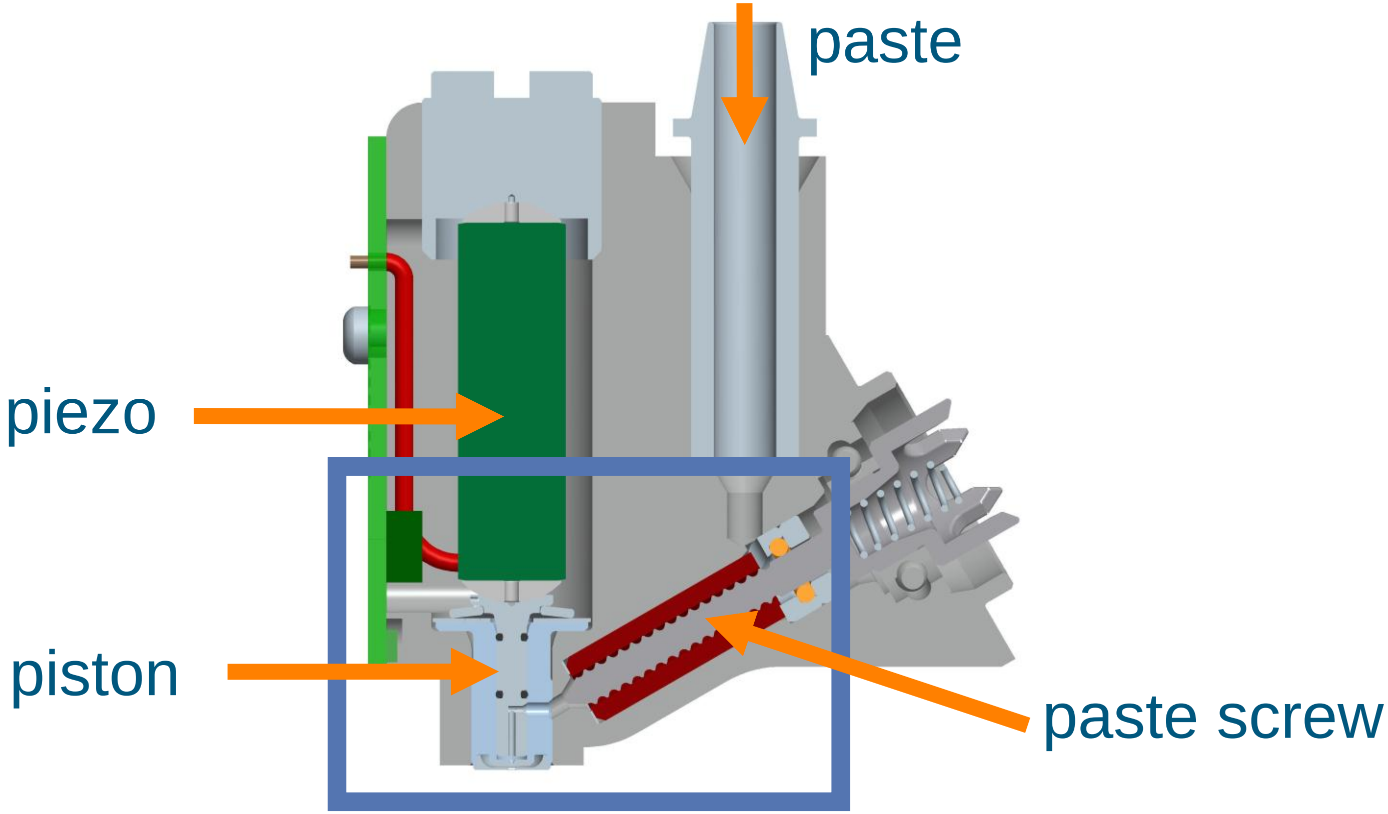
Feburuary 19, 2013

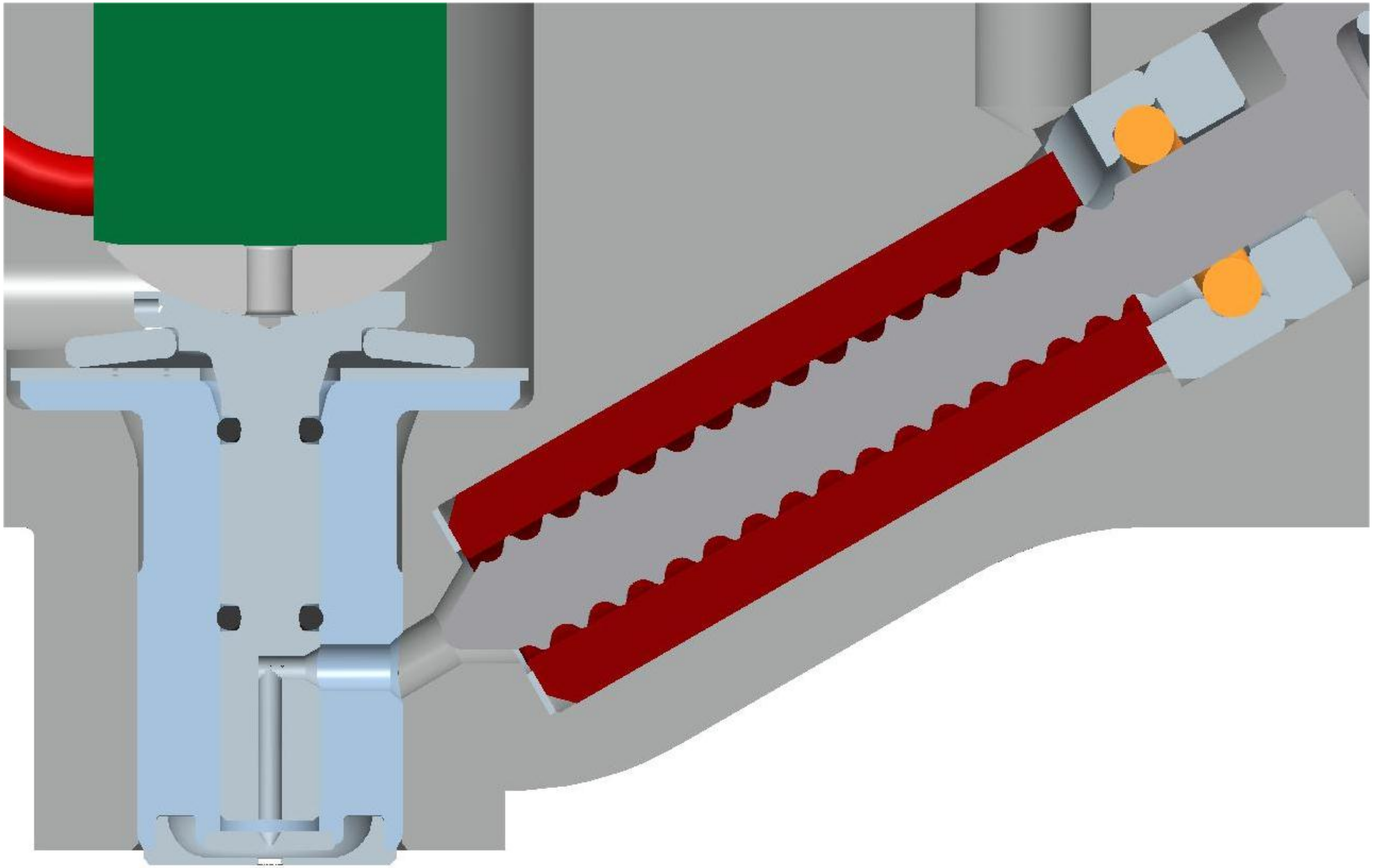
Agenda

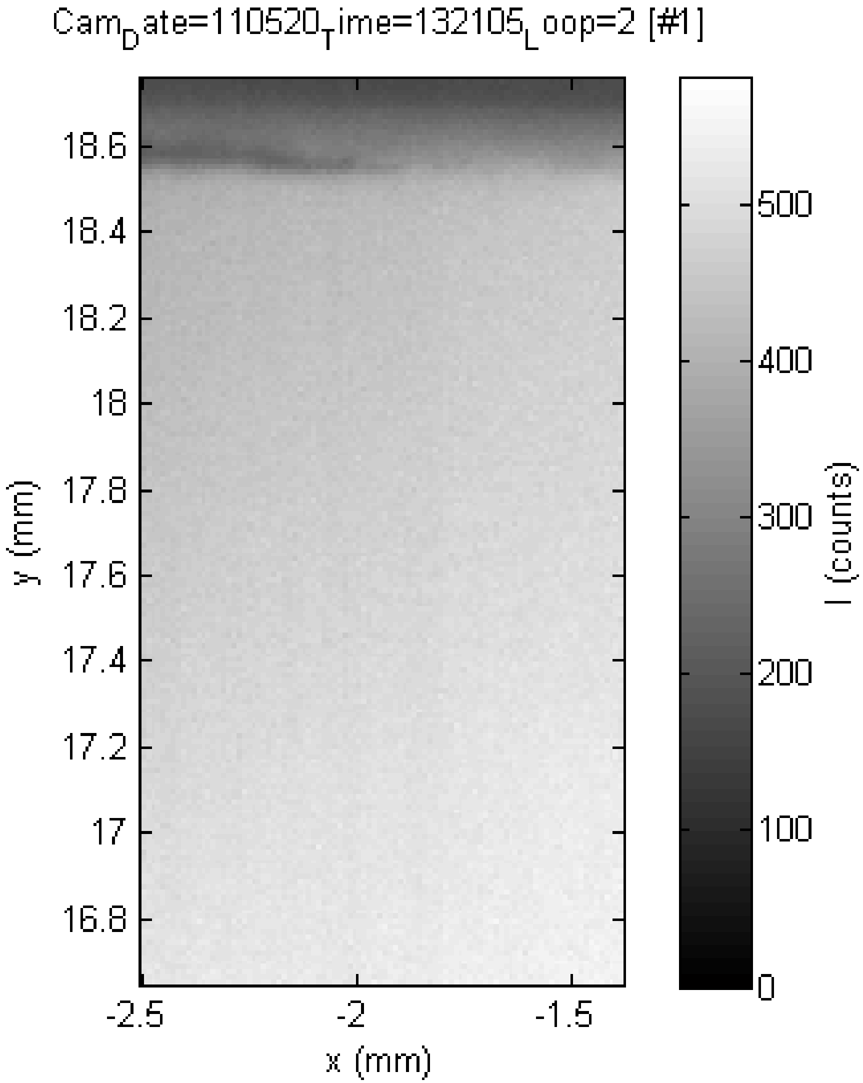
- Jet printing introduction
- Industry challenges
- Jet printing low temperature paste
  - Collaboration Alpha-MYDATA
  - Rheology
  - Results
- Summary



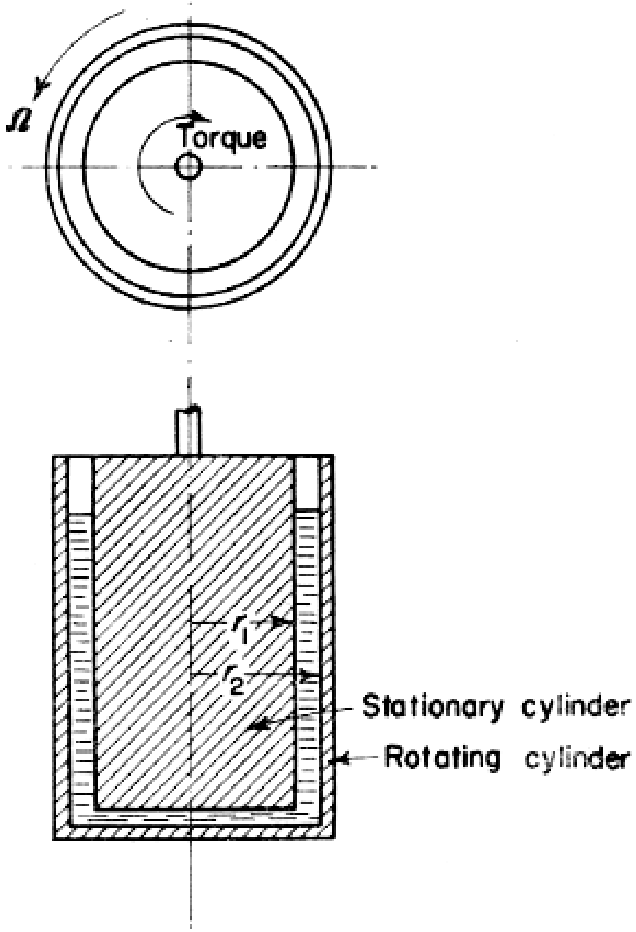
Jet printing principles






Cam$_D$ate=110520$_T$ime=132105$_L$oop=2 [#1]
y (mm)
18.6
18.4
18.2
18
17.8
17.6
17.4
17.2
17
16.8
-2.5
-2
-1.5
x (mm)
I (counts)
500
400
300
200
100
0

Rheology



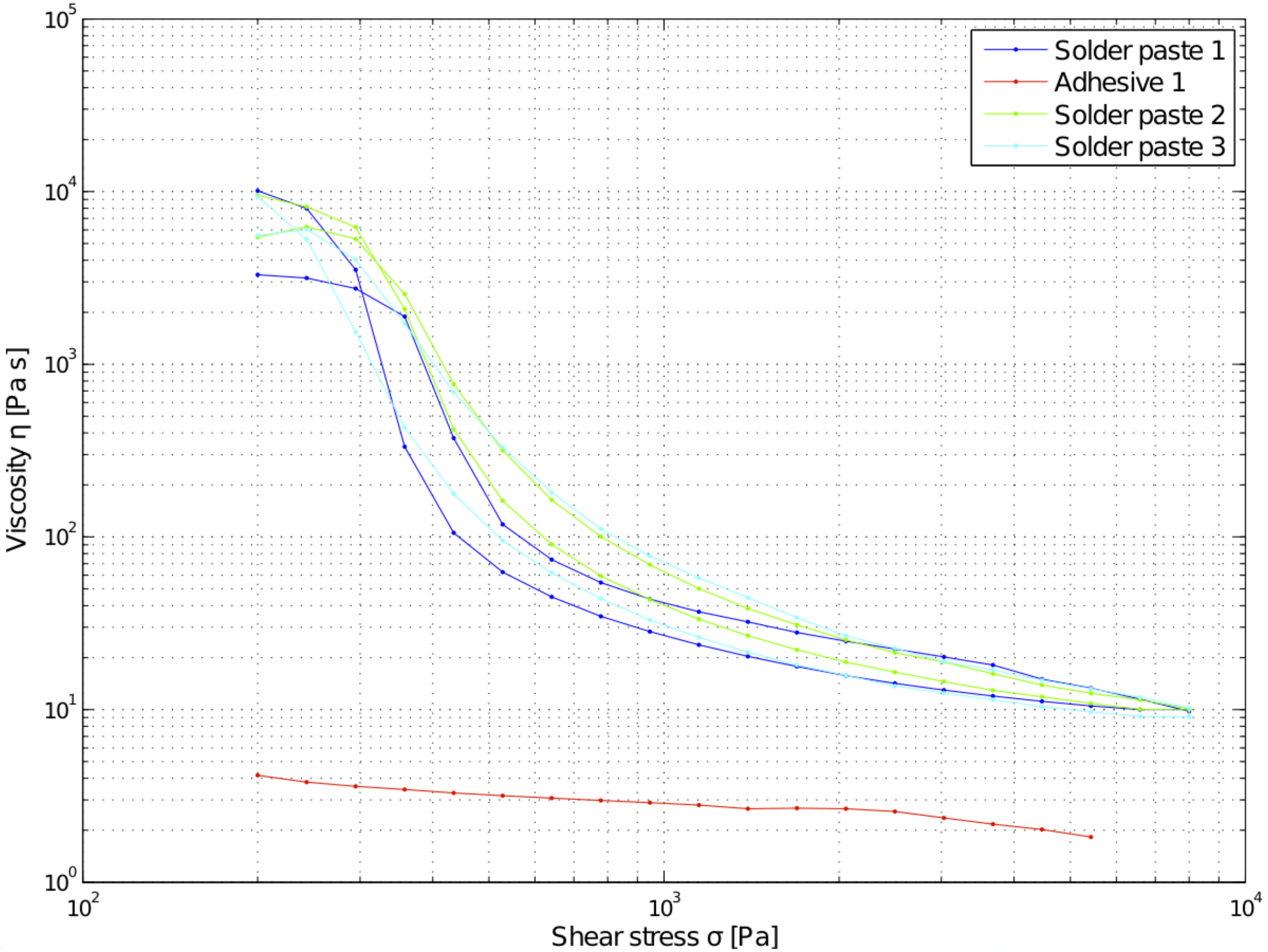
$$\sigma = \dot{\gamma}\eta(\dot{\gamma})$$

stress

viscosity

shear rate

Viscosity

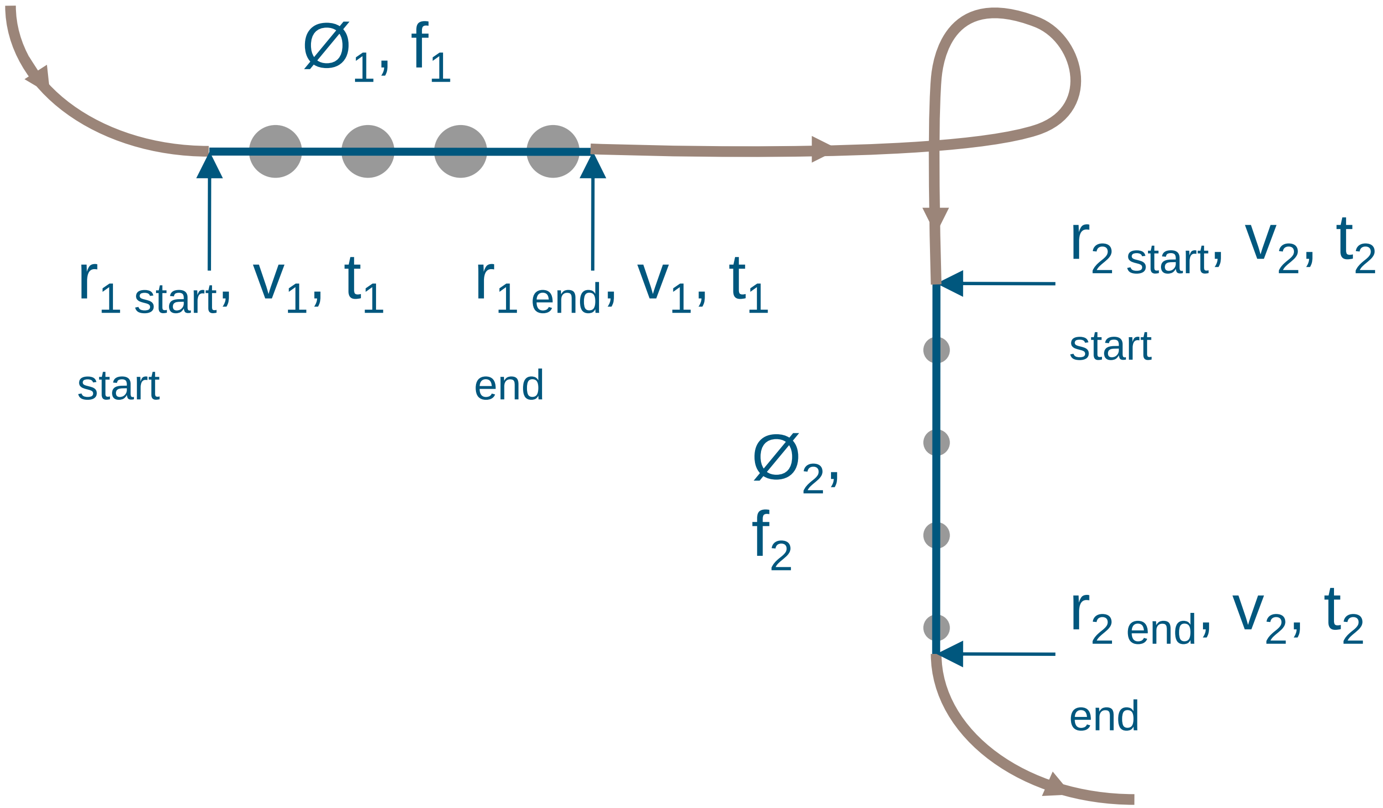


ketchup →

oil →

ink

Deposit strategy



$\varnothing_1$, f_1

$r_{1\ \text{start}}$, v_1, t_1

start

$r_{1\ \text{end}}$, v_1, t_1

end

$r_{2\ \text{start}}$, v_2, t_2

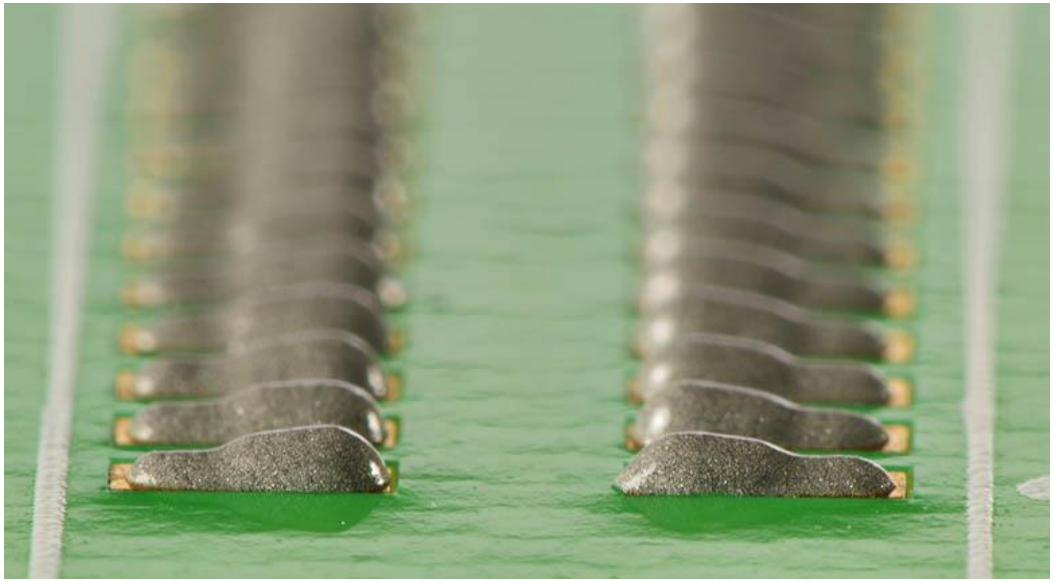
start

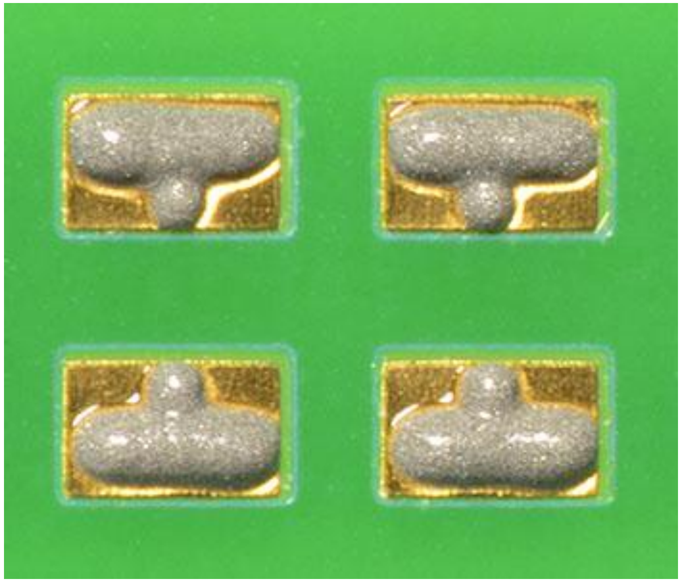
$\varnothing_2$, f_2

$r_{2\ \text{end}}$, v_2, t_2

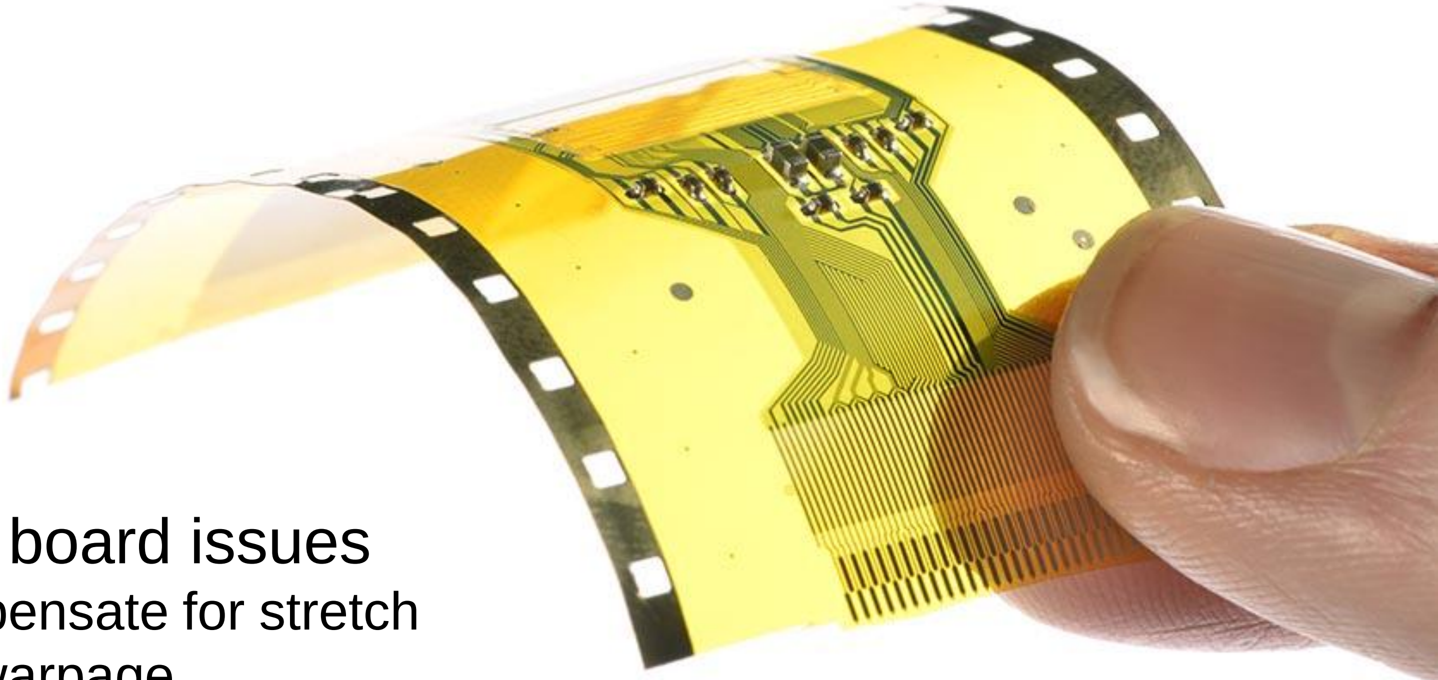
end

Deposit flexibility





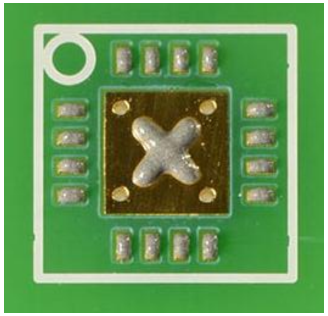
Challenging board designs

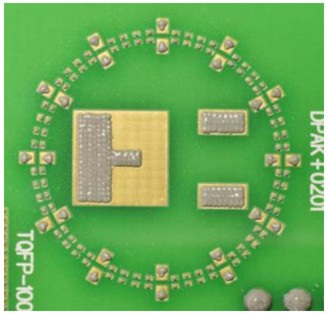


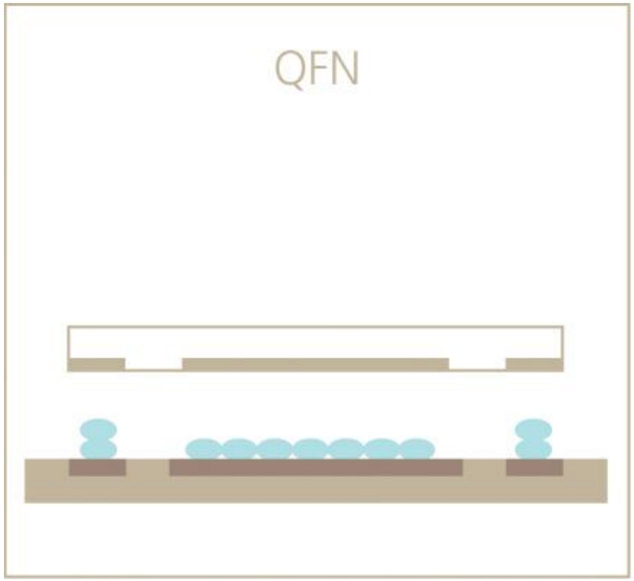
- Flexible board issues
    - Compensate for stretch and warpage

Challenging components

- Optimize solder paste volume
  - Stop QFN from floating
  - Mix large and small components





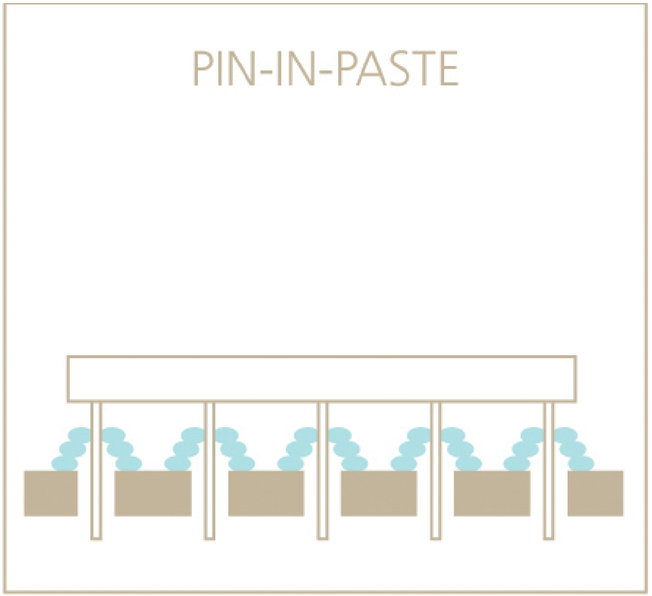


Collaboration Alpha-MYDATA

- Temperature sensitive devices do not want to have a second reflow
  - JP501 solder paste developed by Alpha
  - Jet printing parameters optimized by MYDATA

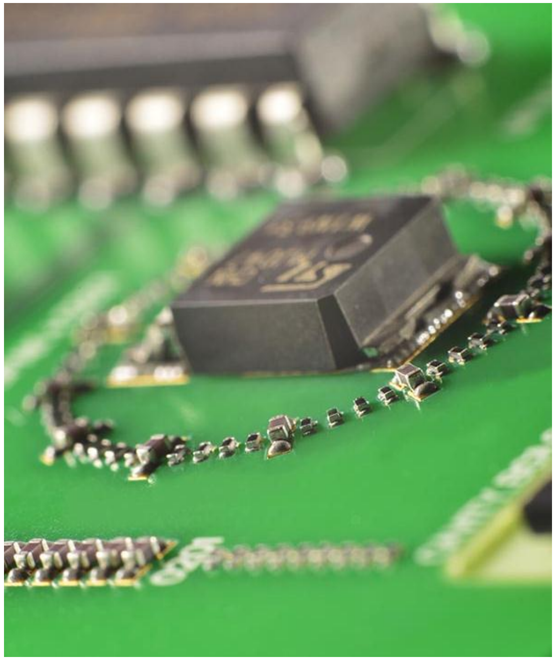
Low temperature paste application

- Pin-in-paste
  - Build volcanos of solder paste



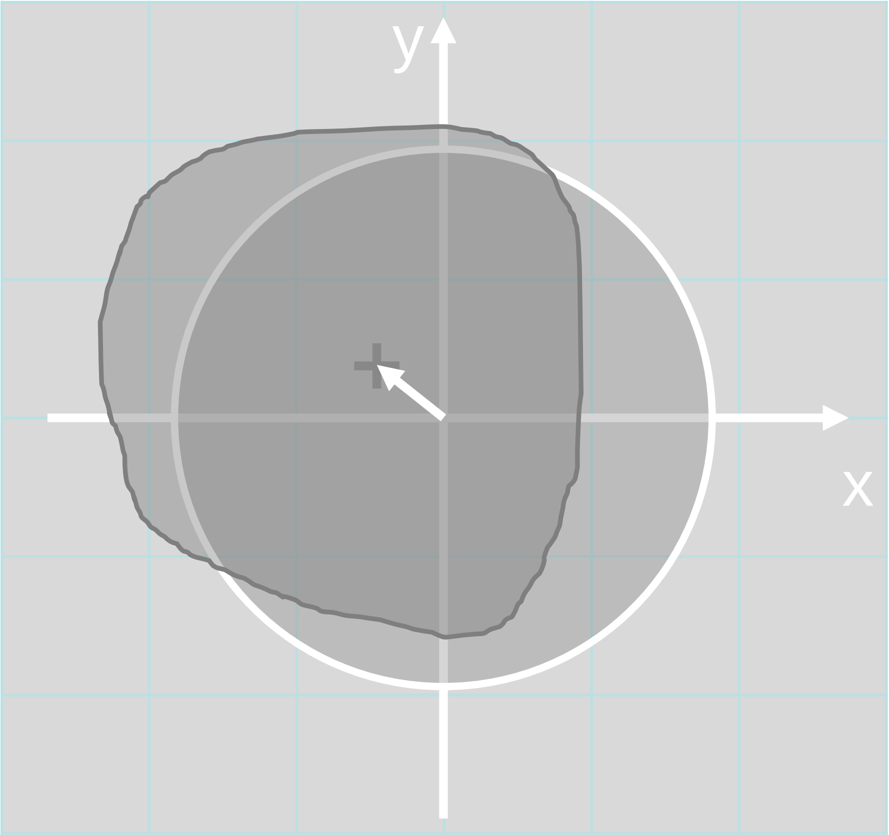
Low temperature paste application

- Shielding
  - Solder paste application to populated boards

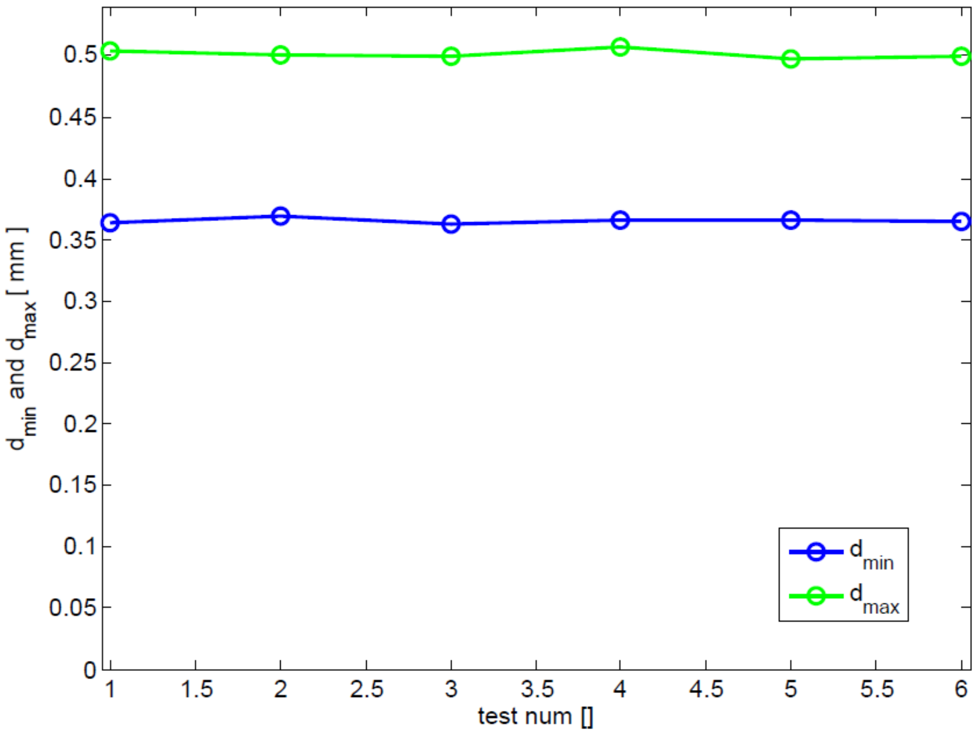


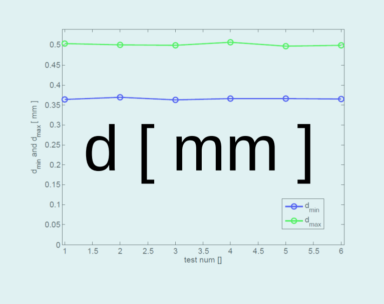
Quality measures for deposits

- Variation in diameter
- Variation in positioning
- Shape factor

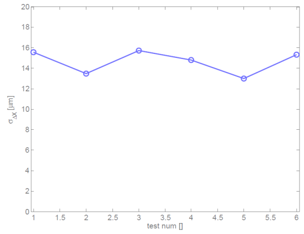


Results - dot size

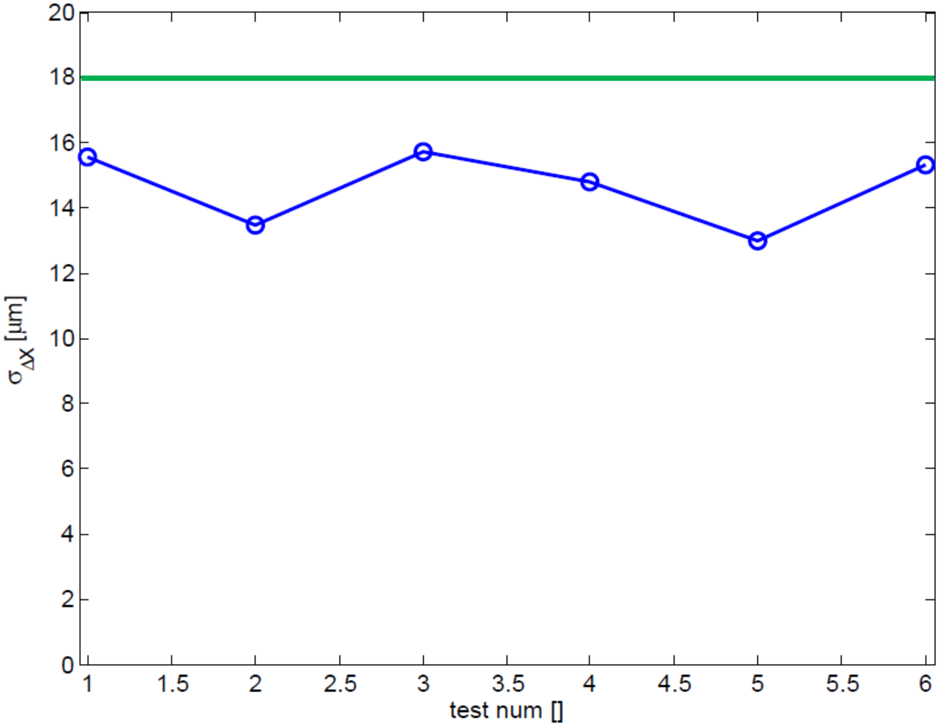


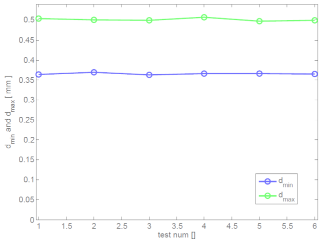


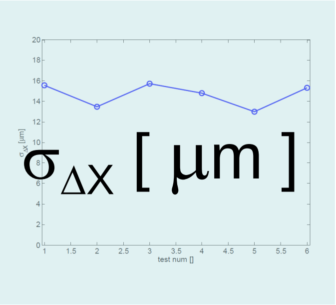
d [mm]



Results - position accuracy

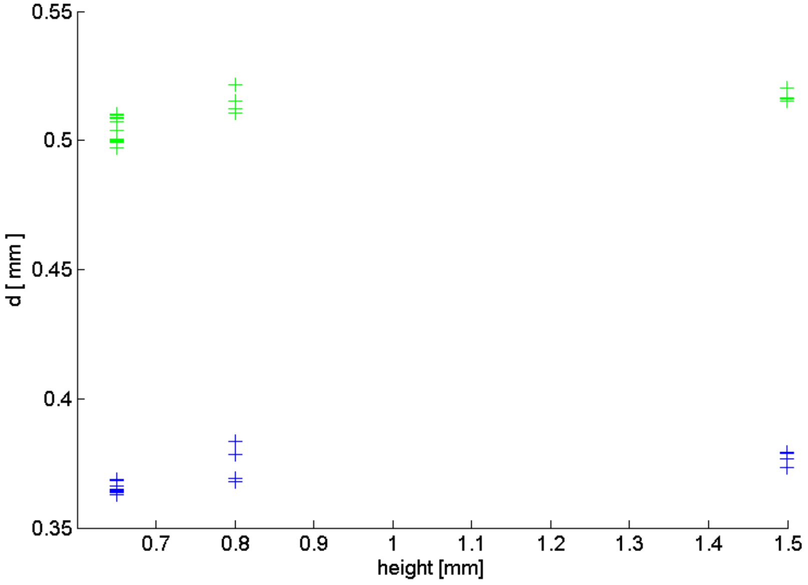


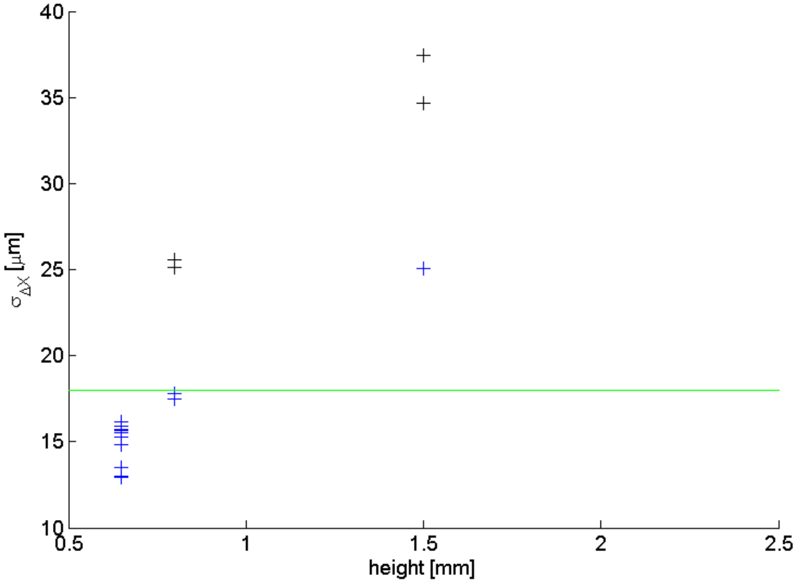




$\sigma_{\Delta X}$ [µm]

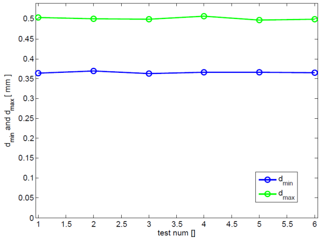
d and $\sigma_{\Delta X}$ vs height

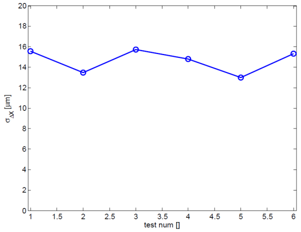




Specification
JP501LT and JP500LF

Quantity	**JP501LT**	**JP500LF**
d [mm]	0.37 – 0.52	0.29 – 0.47
V [nL]	6 – 14.5	5.6 – 15.9
$\sigma_{\Delta X}$ [μm]	18	18

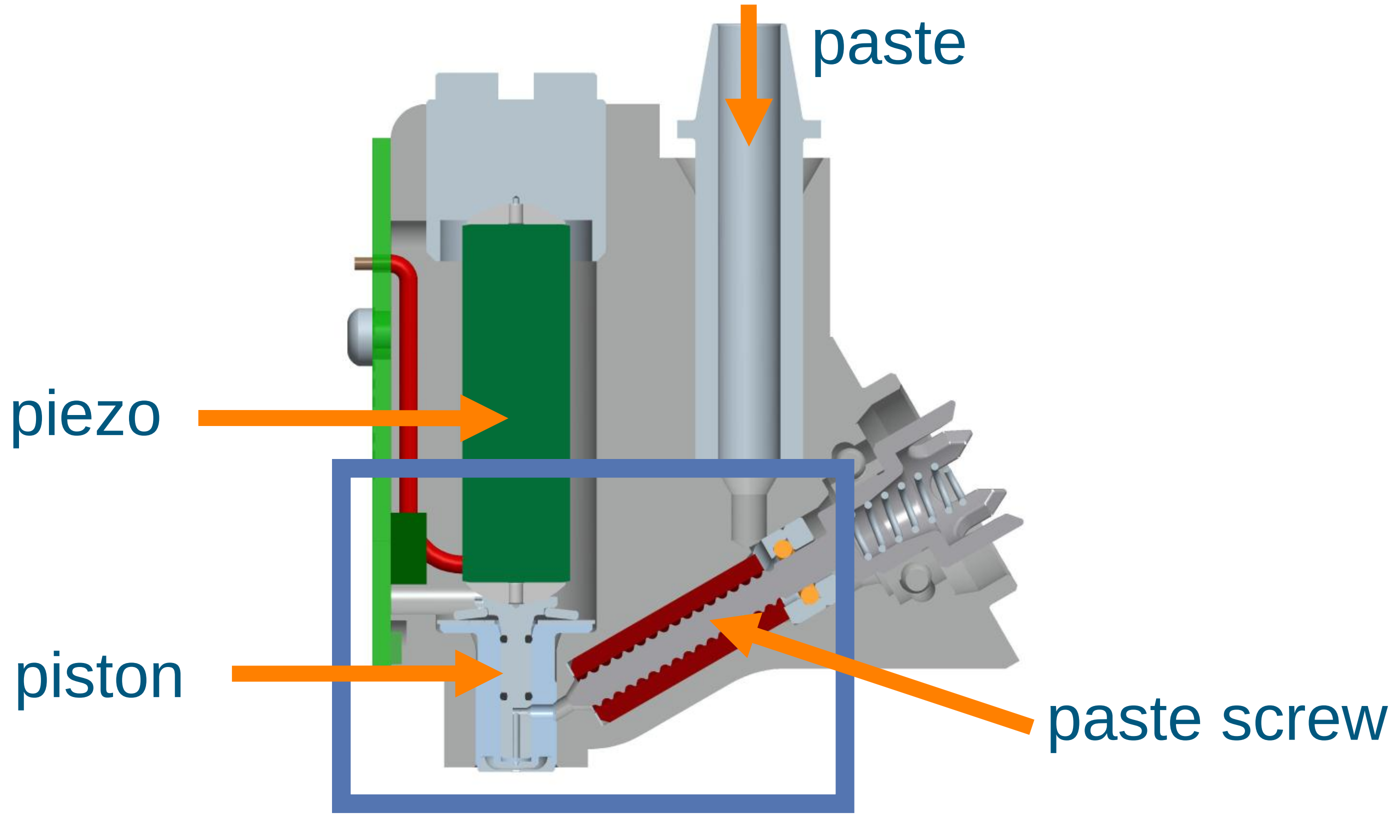


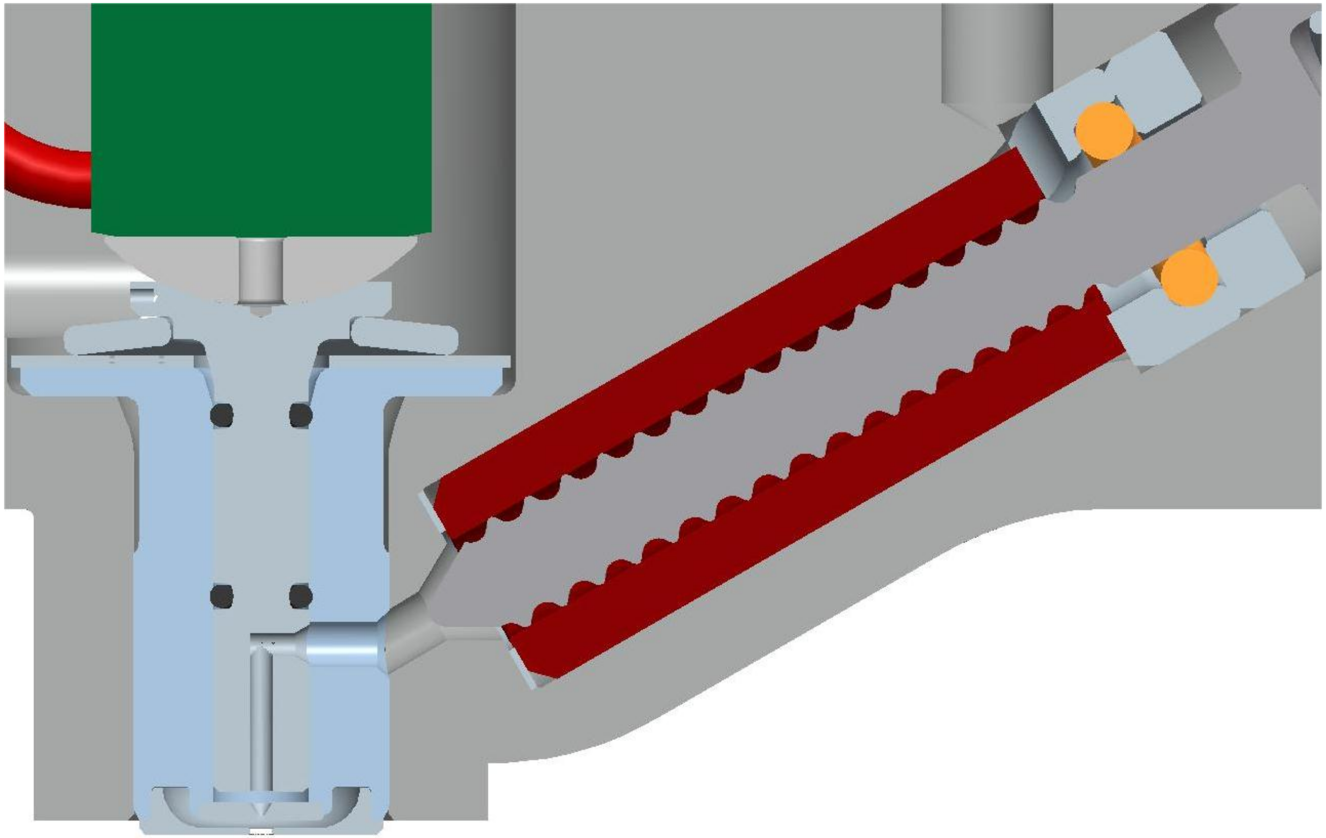


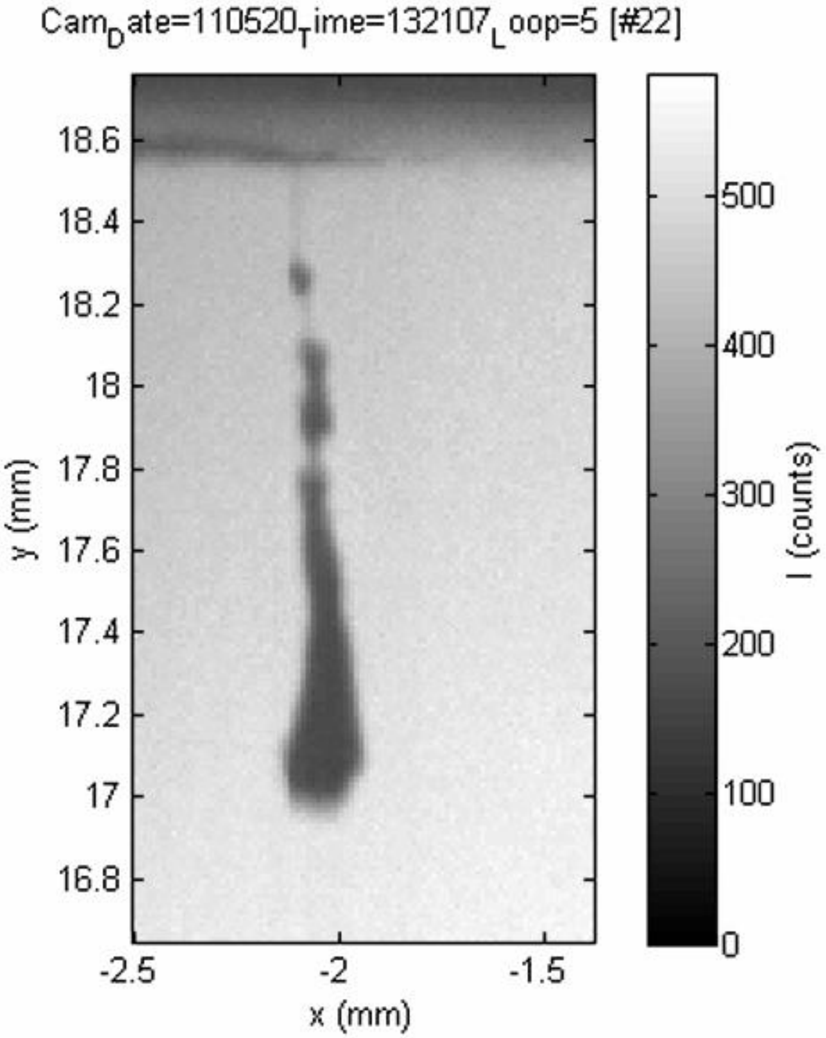
Summary

- Low temperature paste offers a production solution for advanced applications
- Jet printing furthers these opportunities

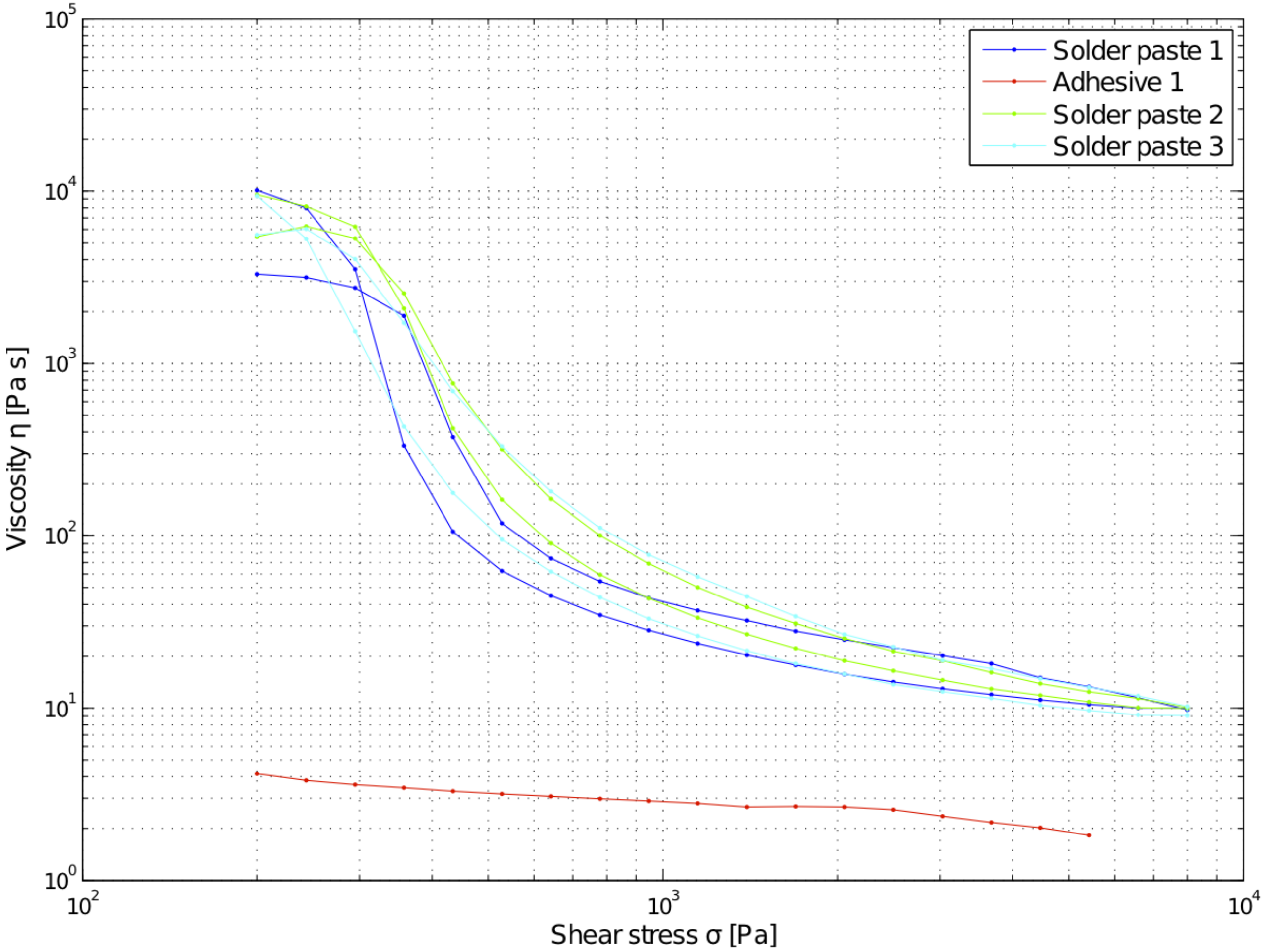
Jet printing principles






$Cam_Date=110520_Time=132107_Loop=5$ [#22]
18.6
18.4
18.2
18
17.8
17.6
17.4
17.2
17
16.8
y (mm)
-2.5
-2
-1.5
x (mm)
500
400
300
200
100
0
I (counts)

Viscosity

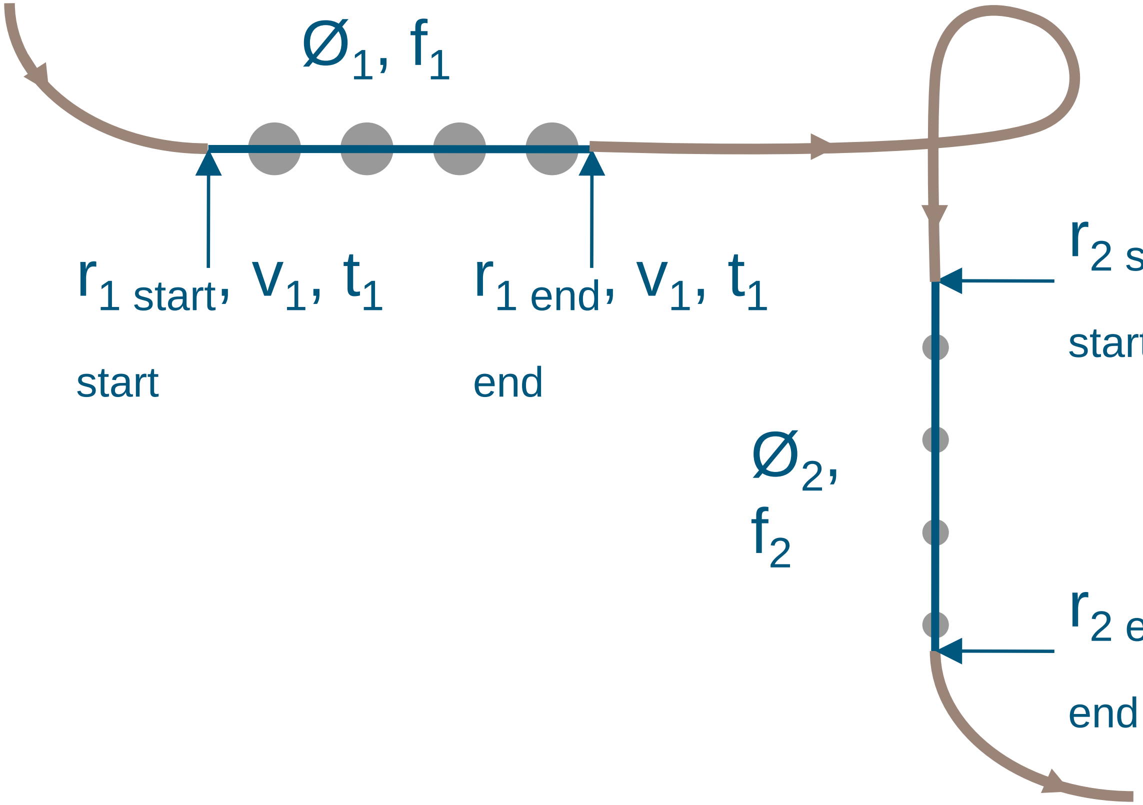


ketchup →

oil →

ink →

Deposit strategy



$\varnothing_1$, f_1

$r_{1\ start}$, v_1, t_1

start

$r_{1\ end}$, v_1, t_1

end

$r_{2\ start}$, v_2, t_2

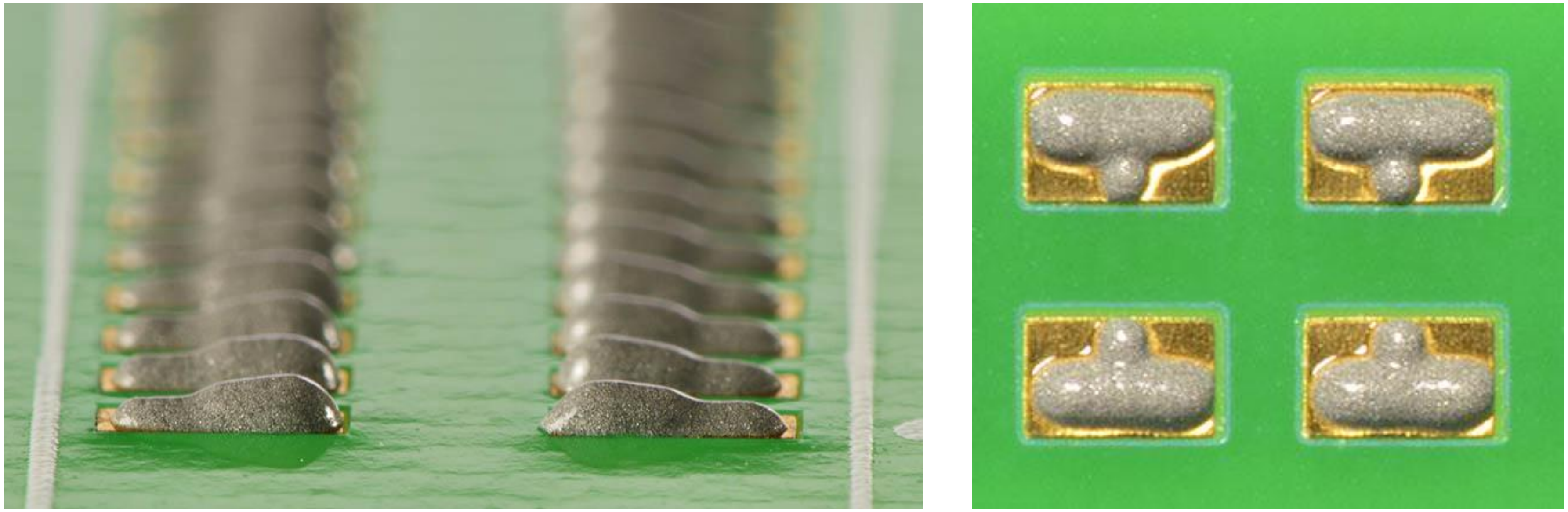
start

$\varnothing_2$, f_2

$r_{2\ end}$, v_2, t_2

end

Deposit flexibility



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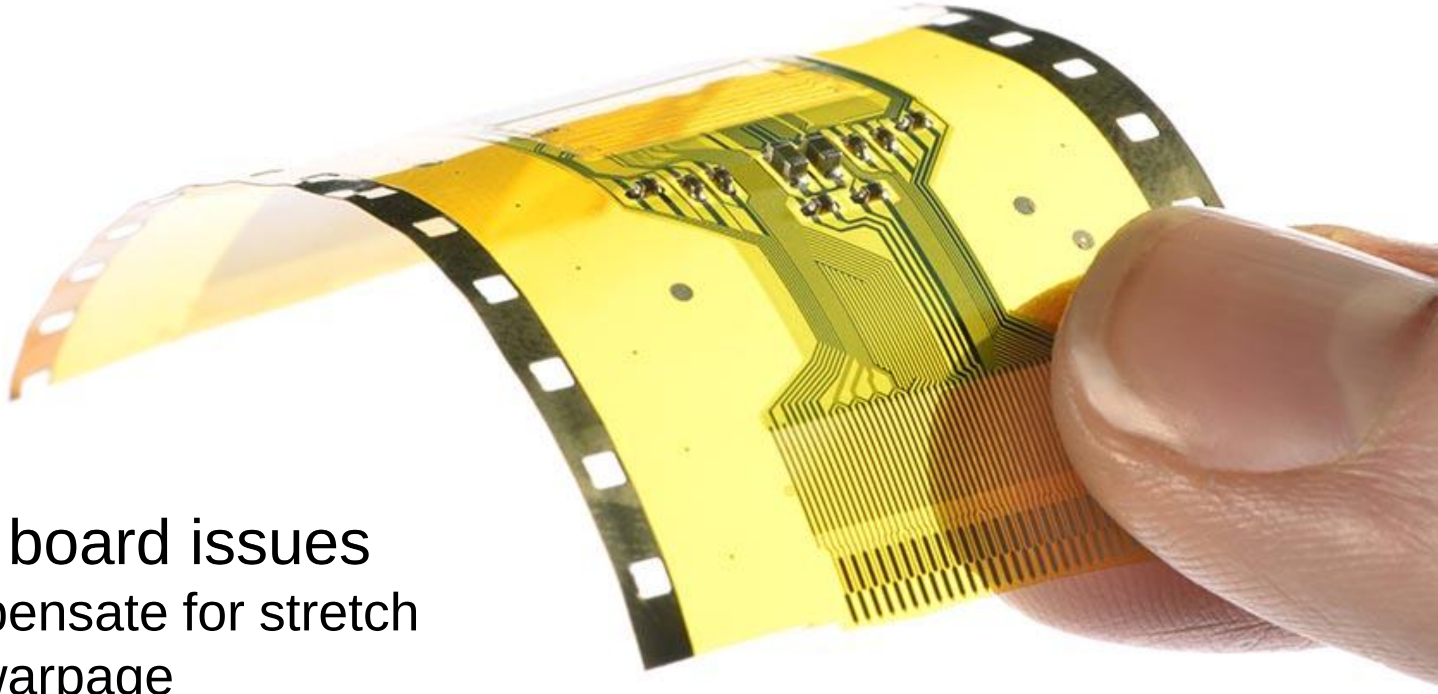

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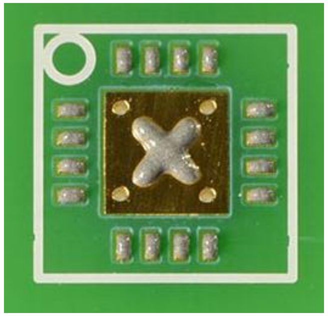

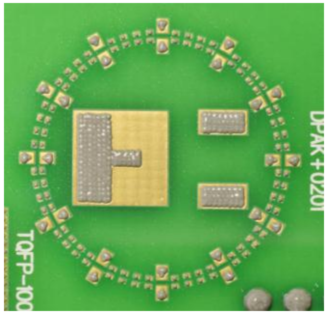

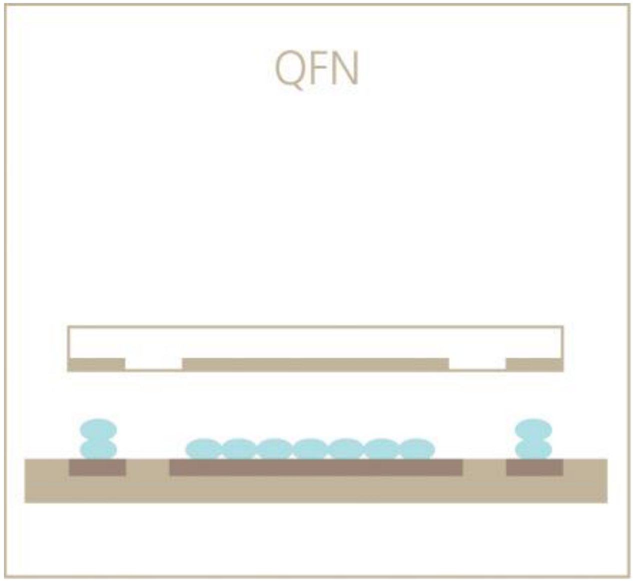

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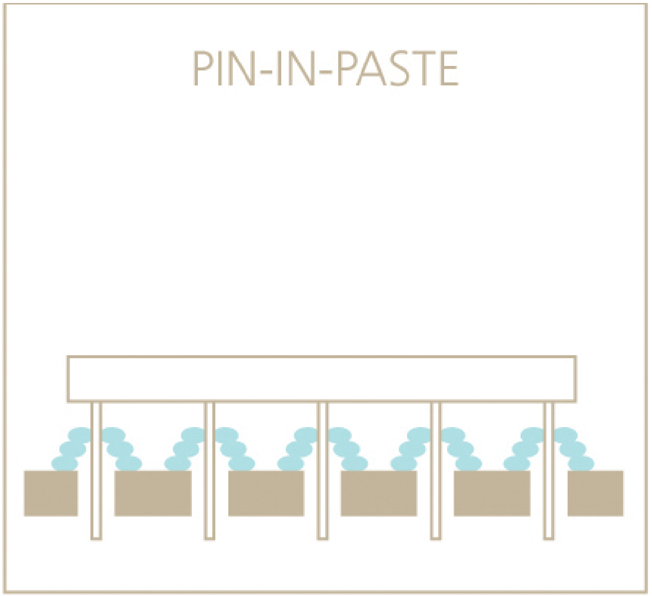

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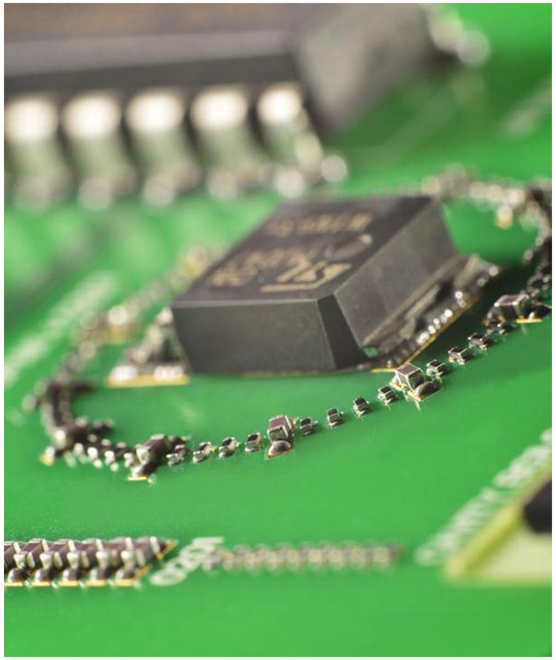

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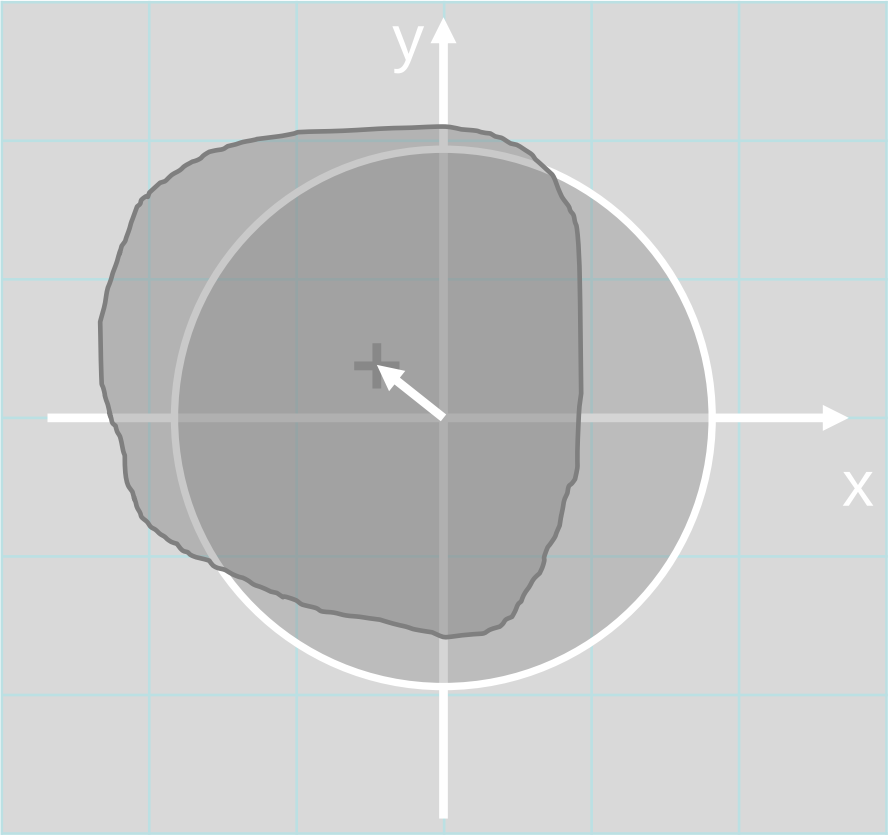
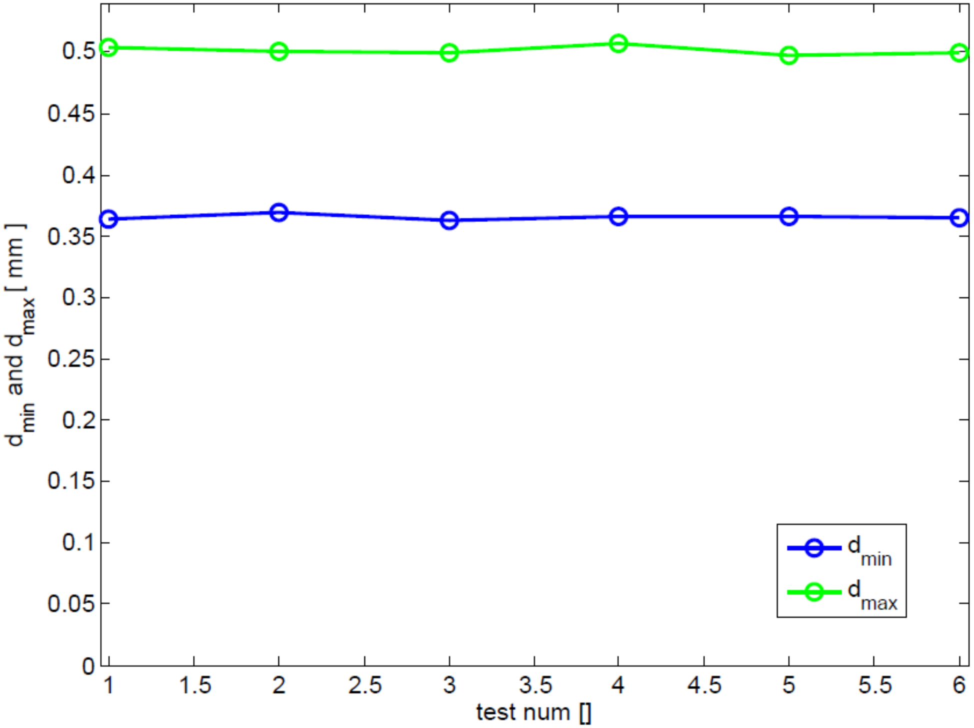
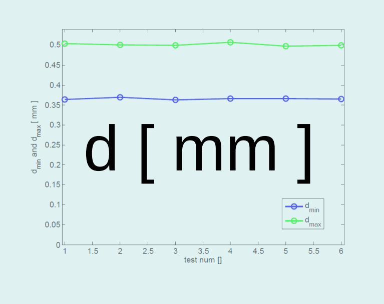
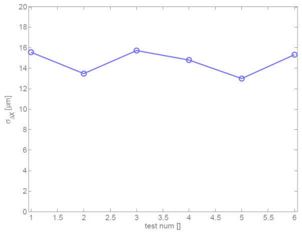


Results - dot size

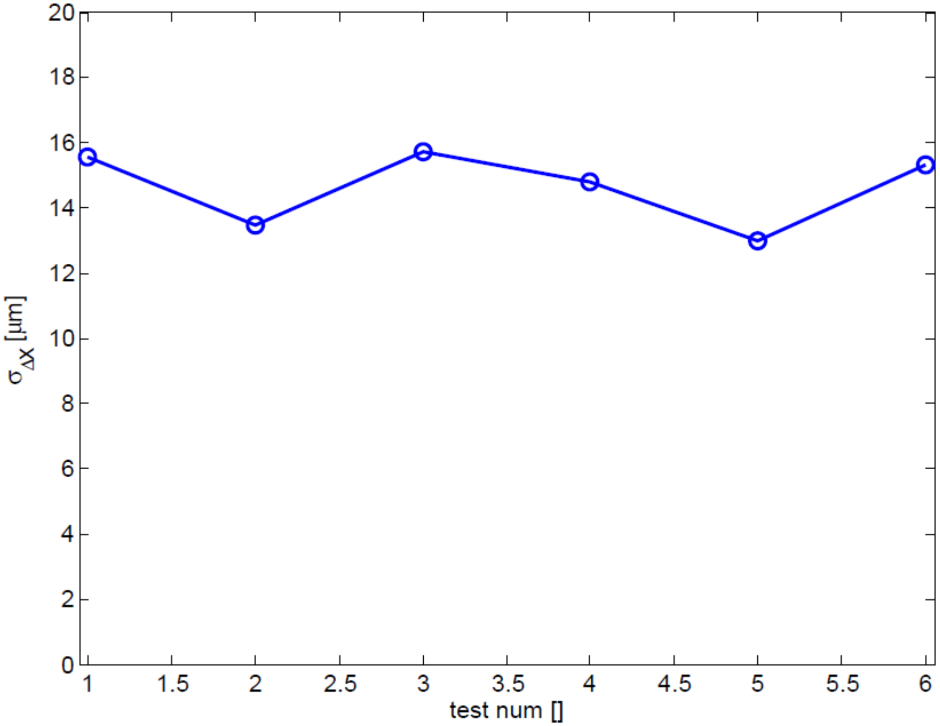


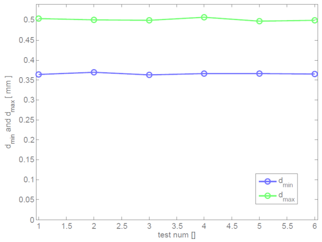


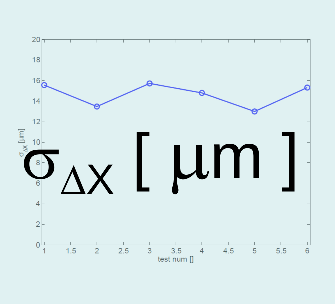
d [mm]



Results - position accuracy



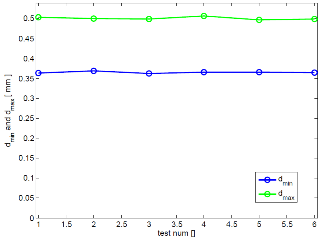


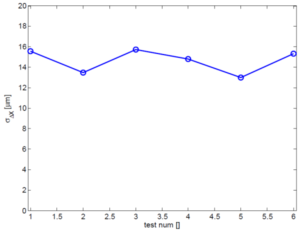


$\sigma_{\Delta X}$ [μm]

Specification JP501

- d = 0.37 – 0.52 mm
- V = 6 – 14 nL
- $\sigma_{\Delta X} < 20\ \mu m$





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