

# MEMSCAP

THE POWER OF A SMALL WORLD

Laserloddemaskin,  
revitalisert teknologi for  
kompliserte  
sammenstillinger





# Sammendrag

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Del 2 Laserloddeteknologi

Del 3 Løsning

Del 4 Erfaringer



## Del 2 - Laserloddeteknologi

[Laser historie](#)

[Seica Firefly](#)

[Videoeksempler på lodding med laser](#)



# Laser - Light Amplification by Stimulated Emission of Radiation



# Seica

# FIREFLY

LASER SOLDERING

## NEXT SERIES

### T60 Top Laser System



### B60 Bottom Laser System



# Why Laser?

## Common Laser applications

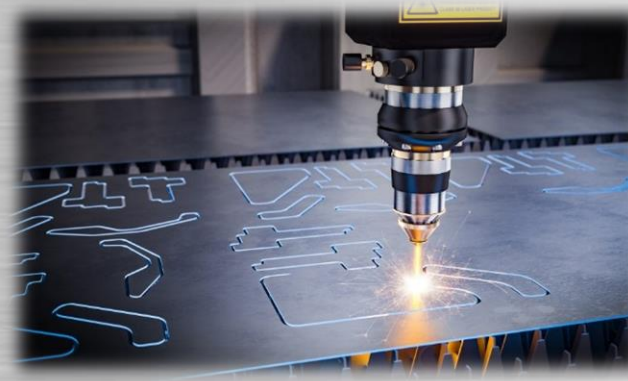
Laser annealing



The laser turn the metal surface color. On titanium it's also possible obtain different colors.

Used on industrial application for marking & traceability

Laser cutting



An high energy laser knife (up to 1KW) is able to easily cut metal sheet with 10mm thickness or even more

Laser spot welding



The laser weld the metal by a single high power spot. Used in jewelry manufacturing to weld gold, platinum and silver

Laser plastic printing



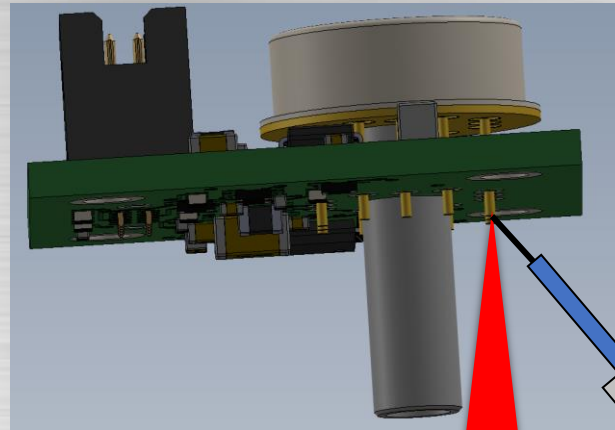
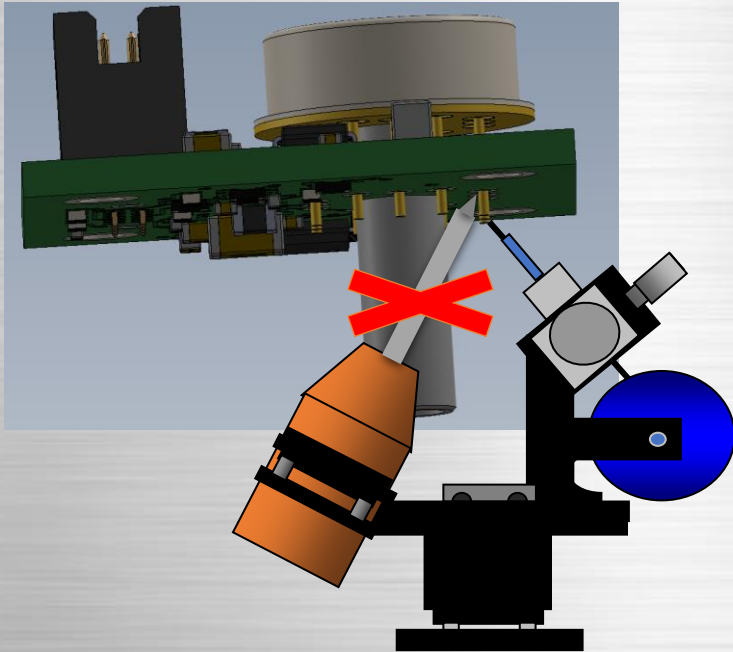
A low power laser is able to print polycarbonate document to produce text and images with high resolution. Used in ID and passport printing



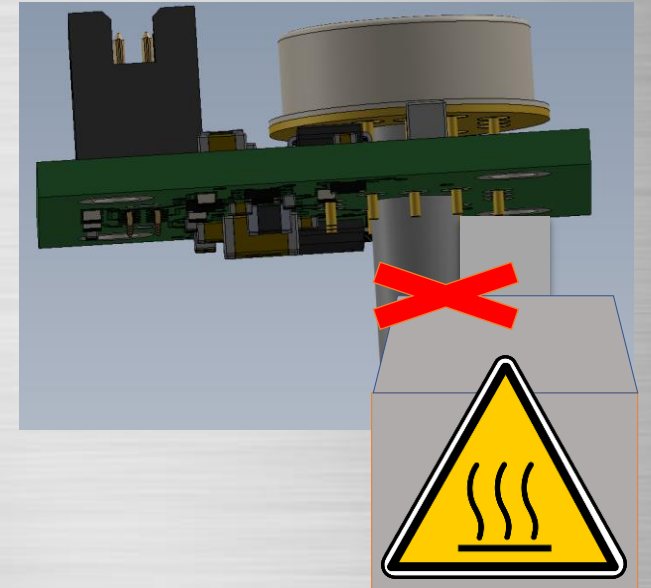
# Laser i loddeprosesser

## Laser

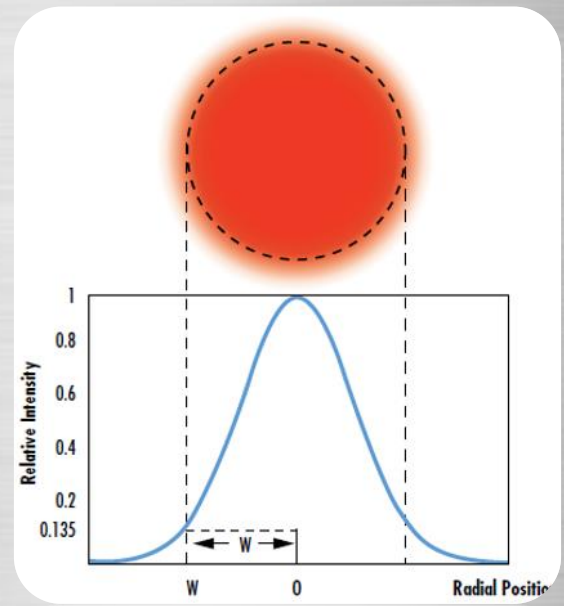
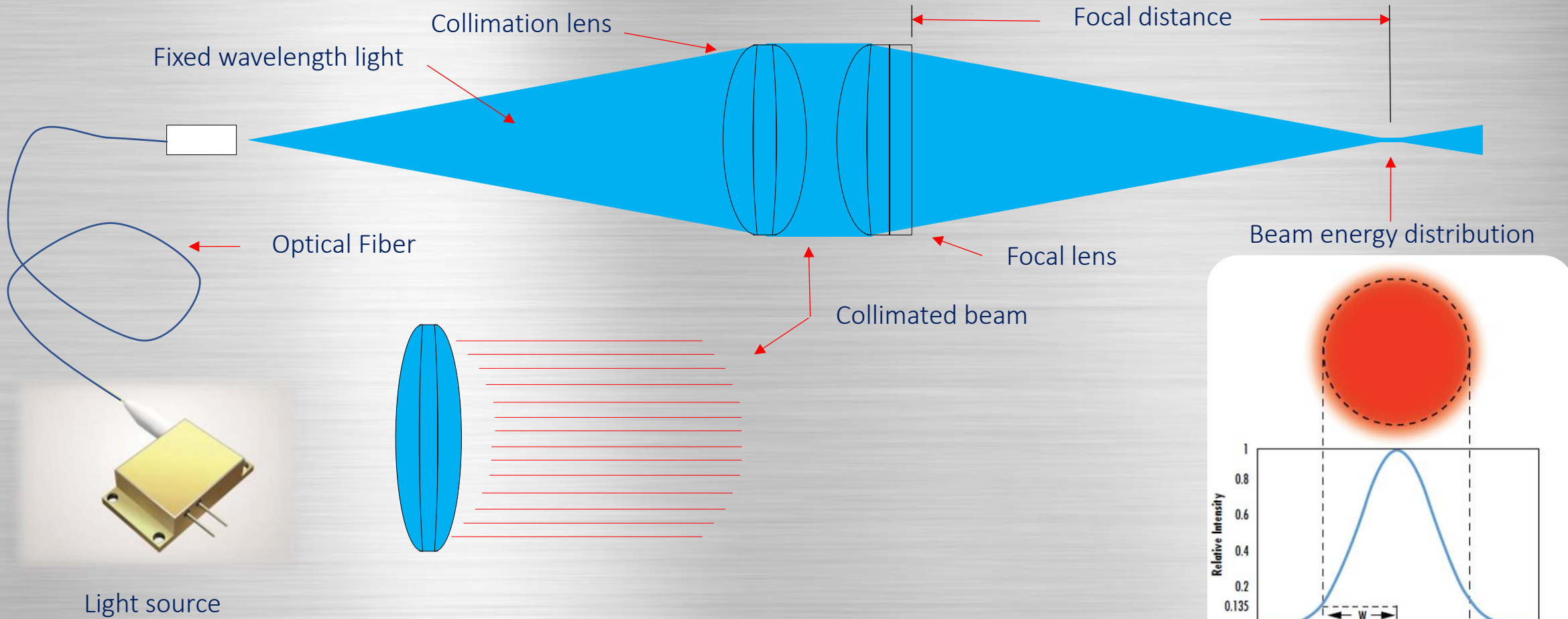
### Lodderobot med loddebolt



### Tinngryte med nozzel



# How Laser Works



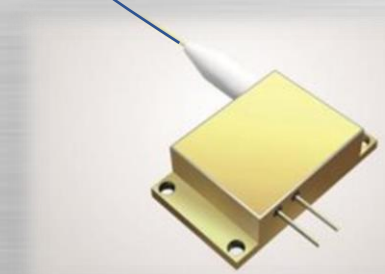
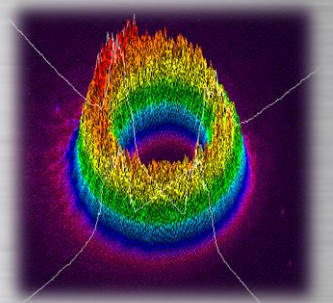
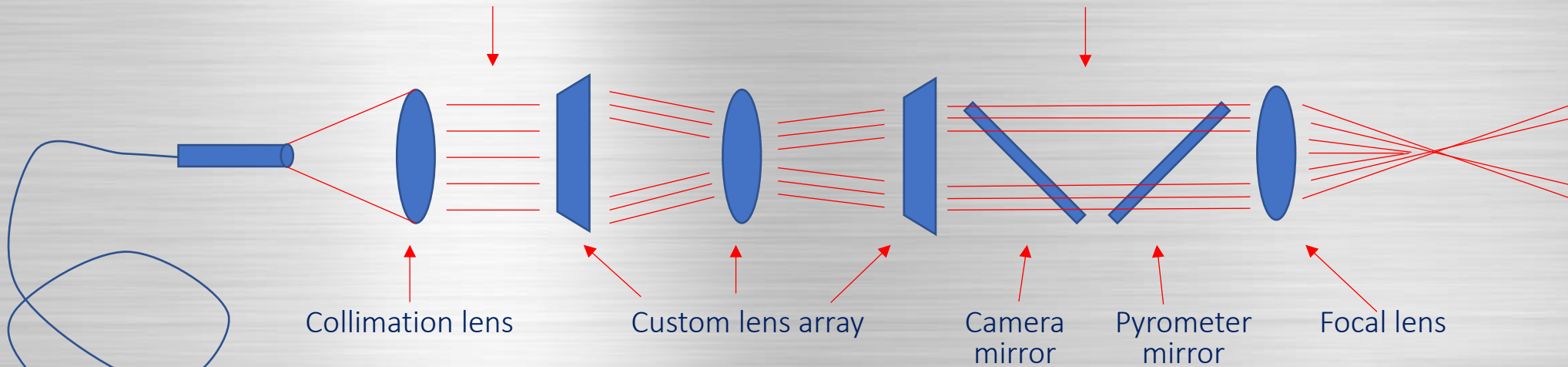


# How Firefly Laser Works

Collimated laser beam

Ring shaped laser beam

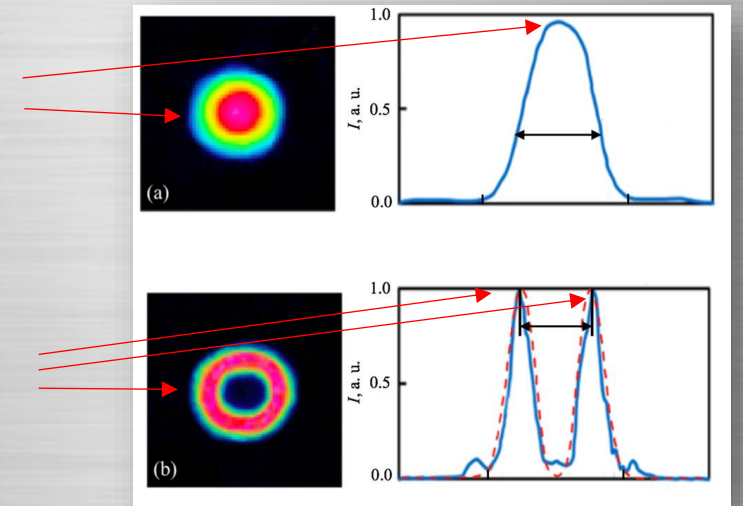
Ring shaped spot  
"The Donut"



Light source

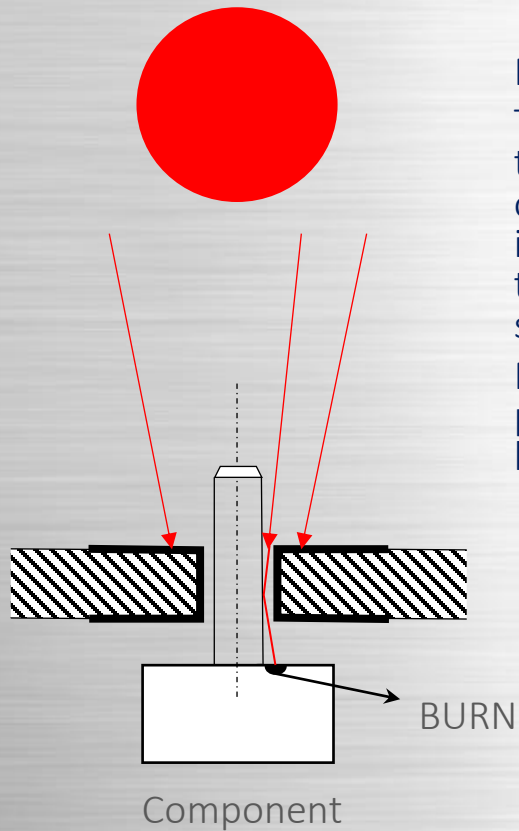
Standard Laser deliver higher energy in the center of the beam

Firefly Laser deliver higher energy in the outer part of the beam



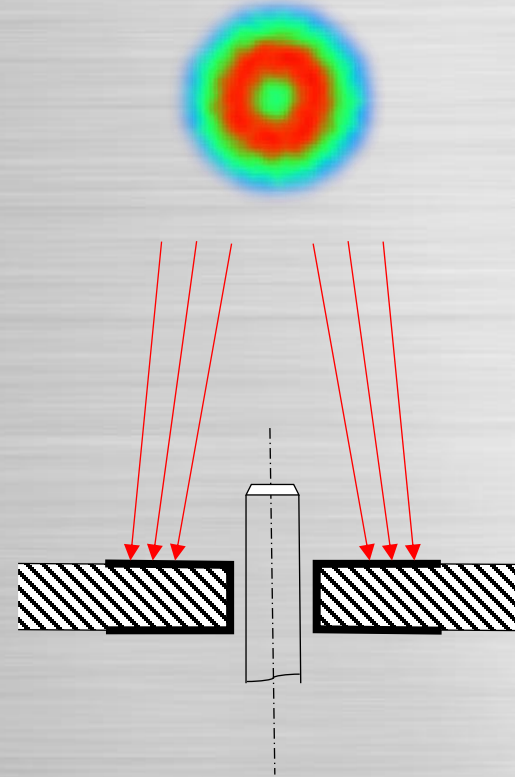
# Full laser beam vs ring shaped laser beam

## Full laser beam



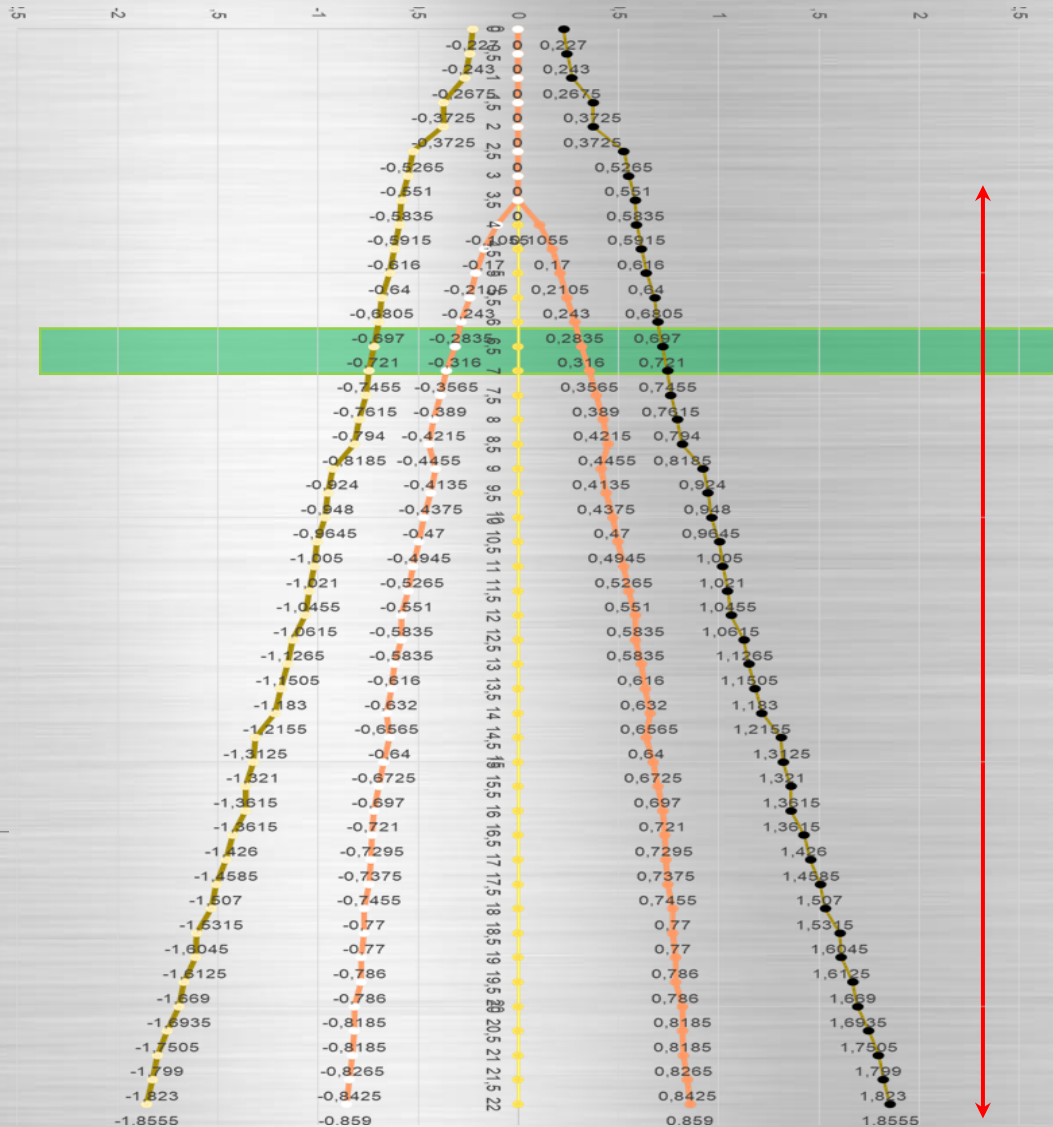
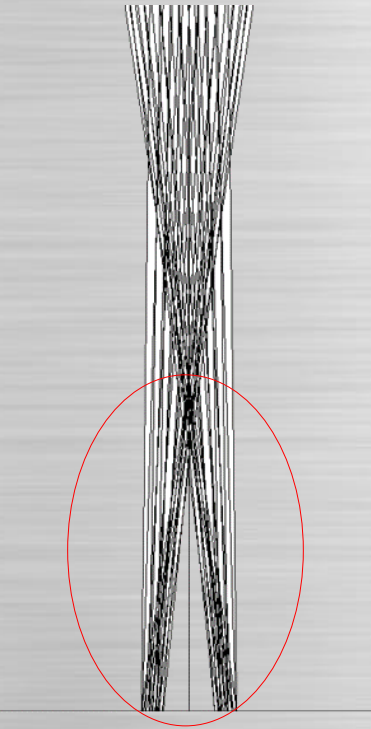
Full laser beam has 2 main issues.  
The higher spot energy is close to the center. This kind of laser overheat the pin causing an immediate pin oxidation that avoid the intermetallic connection. Cold solder.  
Part of the energy pass through the pin hole and burn the component body on the other pcb side

## Firefly laser beam



The Firefly laser beam drive the energy on the PCB metal ring without overheat the pin.  
This ring shaped spot give us the possibility to use less power compared to a full spot laser beam and doesn't burn the component on the other pcb side.

# LASER Beam DIVERGING Cone

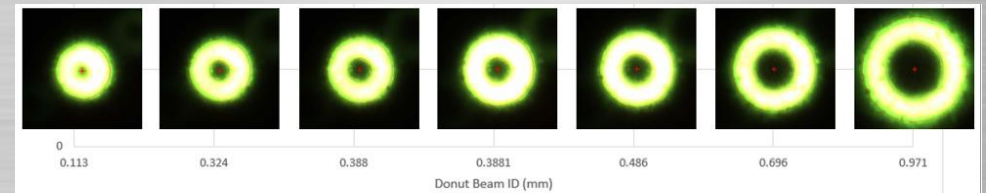


Relationships:

- ✓ Pad diameter
- ✓ Hole diameter
- ✓ Pin Height

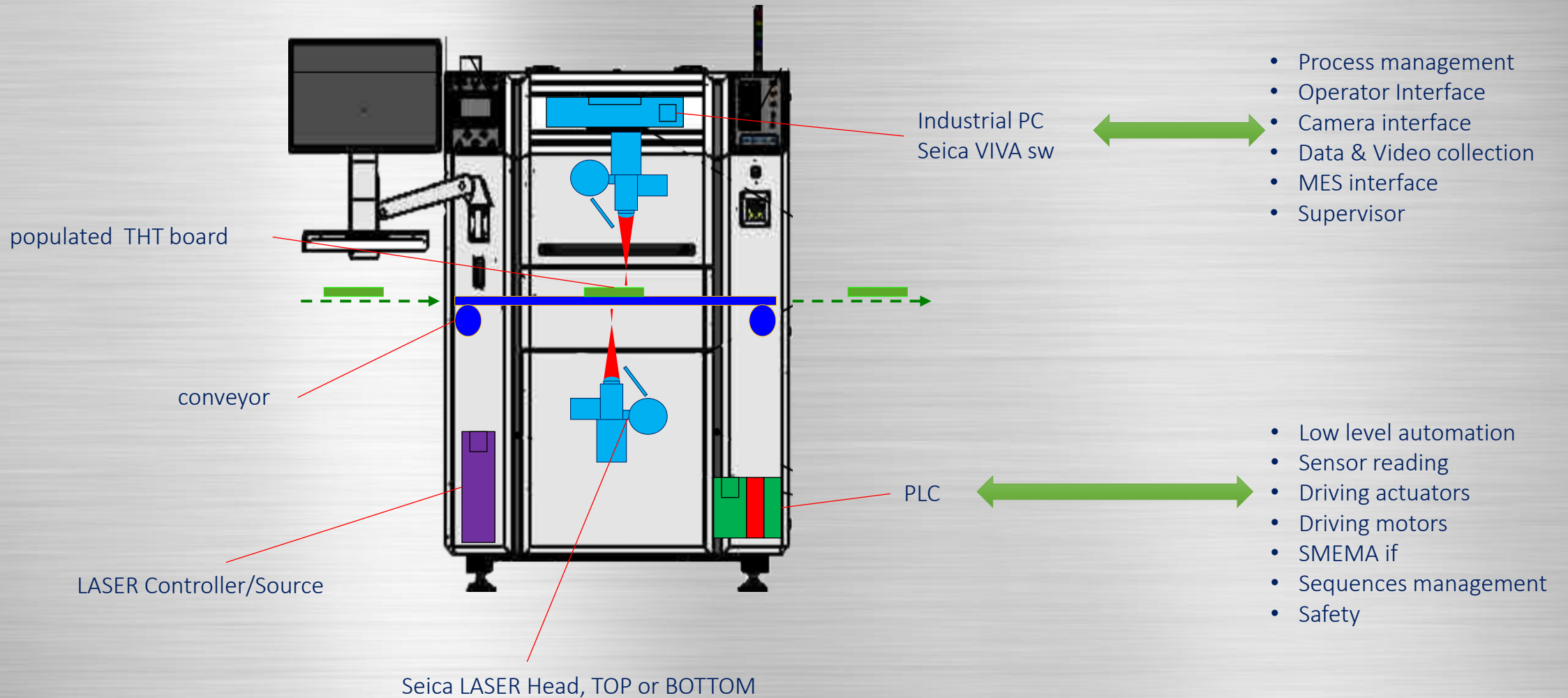
Pin height 0 - 2.2mm

Internal/external diameter ratio adapted to common values used on pcb

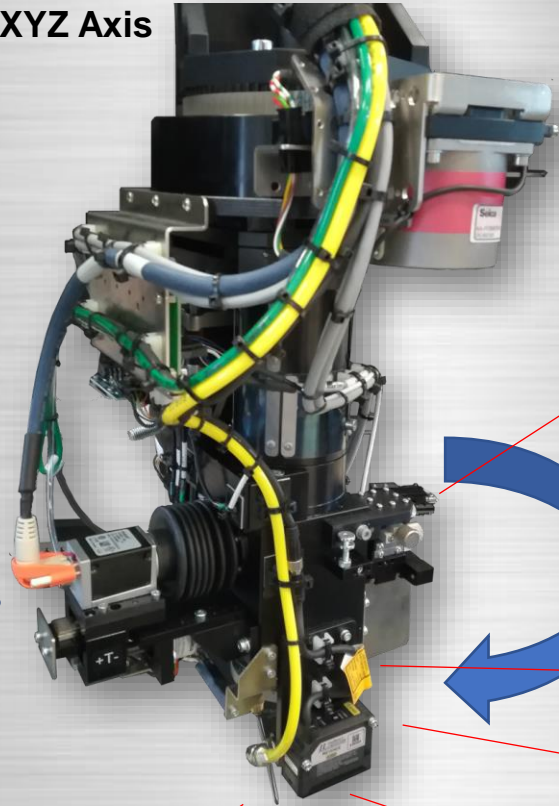
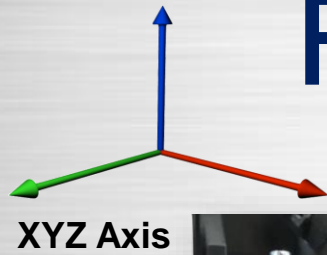




# Firefly Structure



# Firefly Soldering Head Assembly



Pyrometer



Air Knife

Laser sensor for  
Z compensation

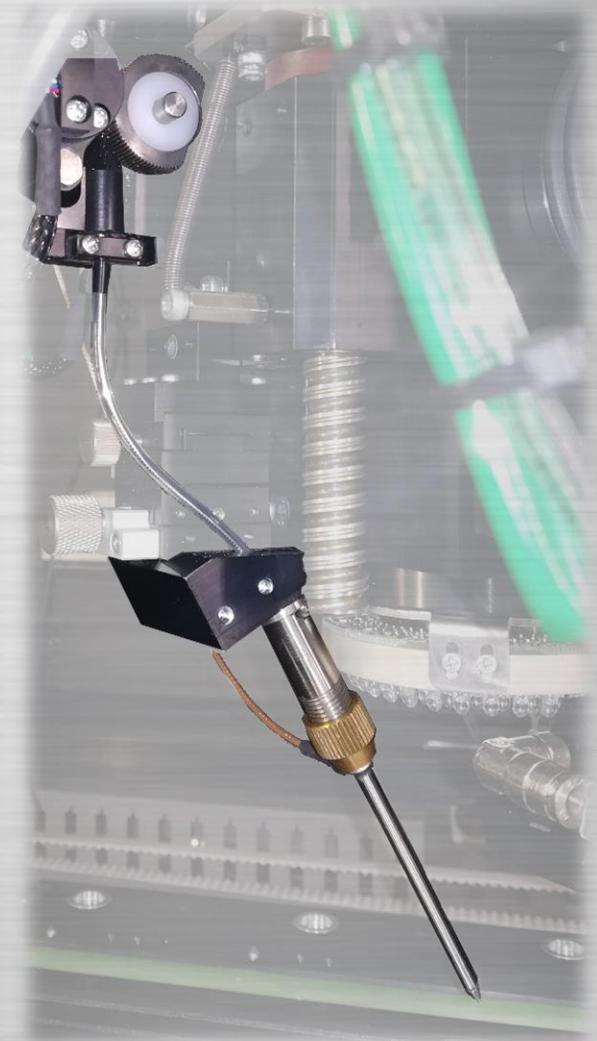
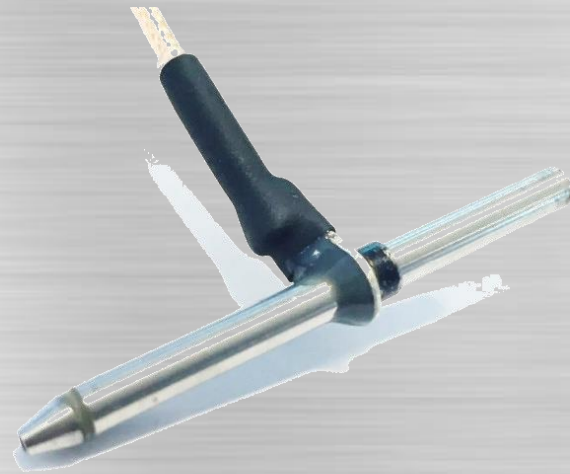
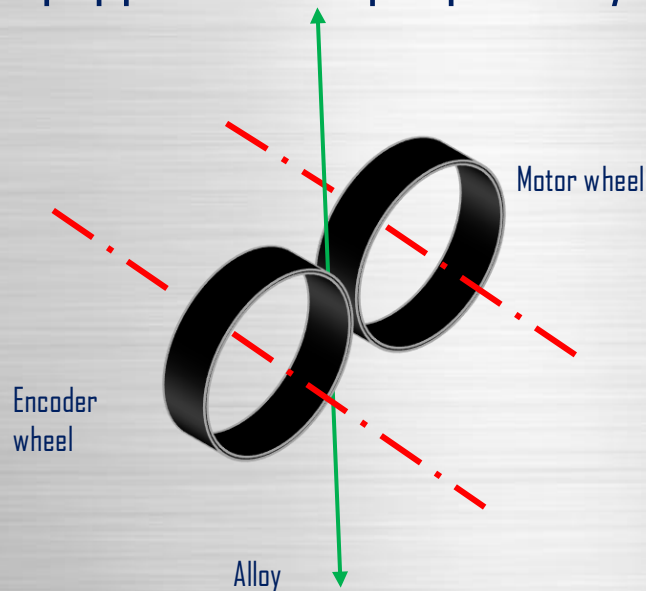


Local Fume Extractor

# Wire Feeding system

## The Dispenser of the wire:

- ✓ Can rotate independently
- ✓ Can rotate during soldering
- ✓ It's mounted on a Z independent axis
- ✓ It's encoder controlled for wire dispensing
- ✓ It's equipped with a proprietary wire capacitive sensor

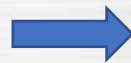




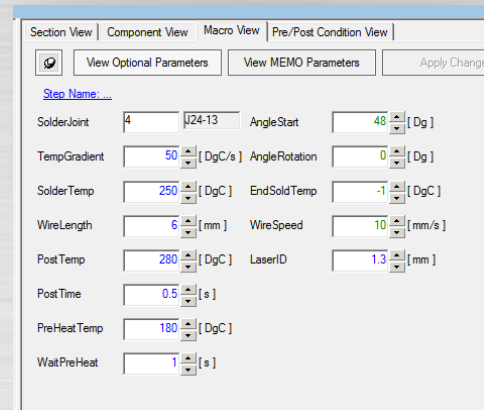
# VIVA Next> software

- ✓ VIVA is the software managing the complete machine
- ✓ The Soldering Program is a sequence of **Solder Joint MACROs**
- ✓ Each solder joint can be managed with dedicated parameters and settings

Viva Application  
Add PCB data



Generate Solder Macros



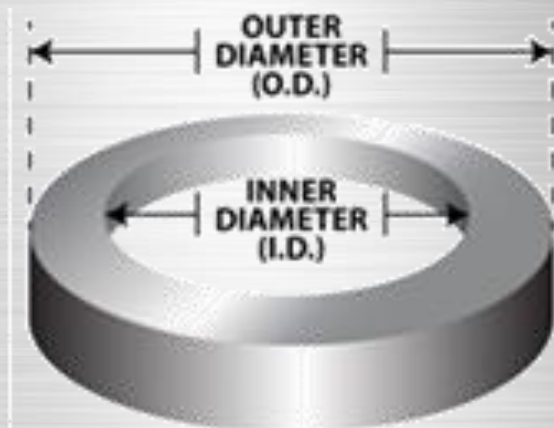
Program Execution



# How to Solder: *Macro SOLD*

**Laser ID (Internal Diameter):** This parameter define the internal diameter of the laser ring spot

LaserID  [ mm ]



Section View | Component View | Macro View | Pre./Post Condition View

View Optional Parameters | View MEMO Parameters | Apply Changes

Step Name: ...

SolderJoint	<input type="text" value="4"/>	J24-13	AngleStart	<input type="text" value="48"/>	[ Dg ]
TempGradient	<input type="text" value="50"/>	[ DgC/s ]	AngleRotation	<input type="text" value="0"/>	[ Dg ]
SolderTemp	<input type="text" value="250"/>	[ DgC ]	EndSoldTemp	<input type="text" value="-1"/>	[ DgC ]
WireLength	<input type="text" value="6"/>	[ mm ]	WireSpeed	<input type="text" value="10"/>	[ mm/s ]
PostTemp	<input type="text" value="280"/>	[ DgC ]	LaserID	<input type="text" value="1.3"/>	[ mm ]
PostTime	<input type="text" value="0.5"/>	[ s ]			
PreHeatTemp	<input type="text" value="180"/>	[ DgC ]			
WaitPreHeat	<input type="text" value="1"/>	[ s ]			

Negative Value of the LaserID will create a Solid Laser Spot

# How to Solder

## Laser Power/Time/Wire Profile

Soldering cycle is splitted in three sections:

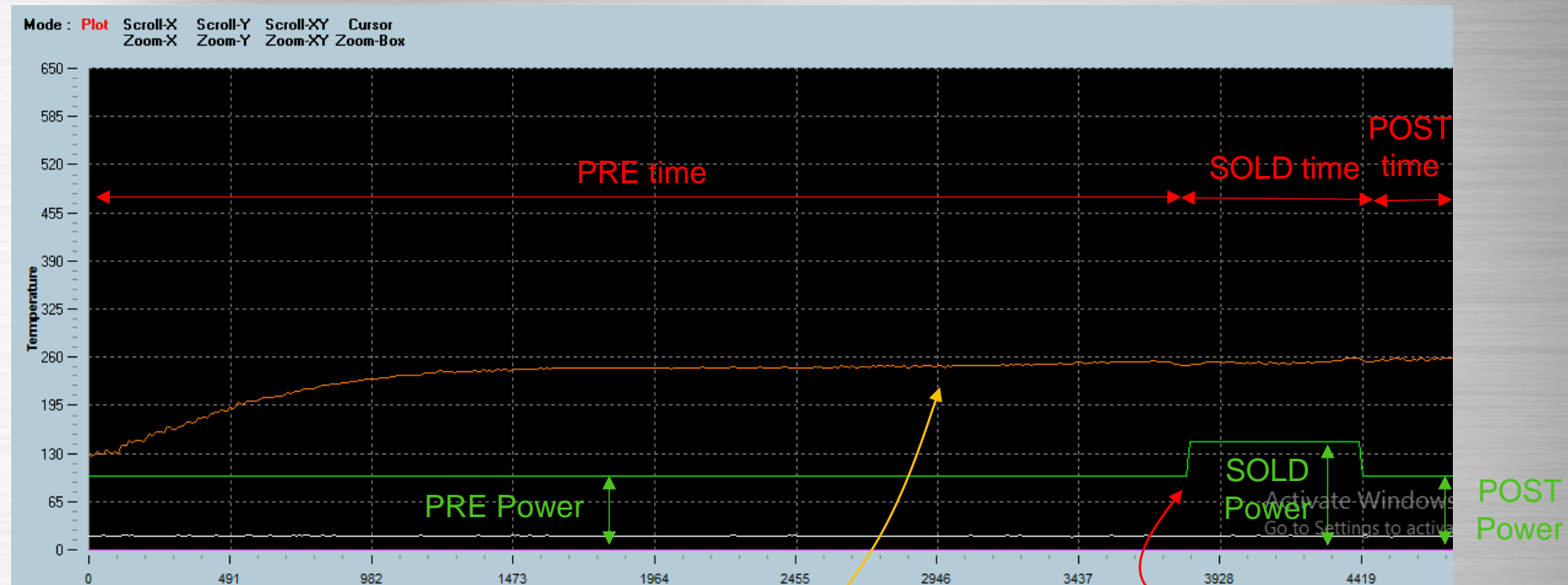
- PRE (preheat)
- SOLD (soak)
- POST (liquid)

For each section, the recipe can be customized in term of:

- ✓ Laser Power [W]
- ✓ Duration time [Sec]

Two other parameters:

- ✓ amount of wire [mm]
- ✓ wire dispensing time [Sec]



Pyrometer gives to the operator the right feedback to setup the best soldering profile

Wire dispensing will begin at the end of the PRE time



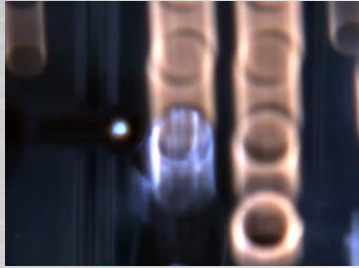
# Fordeler med Firefly Laser lodding

- ✓ Lavt strømforbruk. Laseren er bare aktivert under selve loddingen
- ✓ Ingen behov for oppvarmingstid etter oppstart
- ✓ Ingen forvarming nødvendig
- ✓ Reduserer termisk stress på kretskort
- ✓ Ingen høytemperaturinnretninger inne i systemet
- ✓ Minimalt behov for loddemateriale
- ✓ Behøver ikke ekstern fluss
- ✓ Enkel håndtering av kretskort
- ✓ Lavt vedlikeholdsbehov og enkel vedlikehold

1.3mm pitch  
0.4mm pad diam

# How Firefly behave with different product

Close pins



Fine pitch



Very thin pad



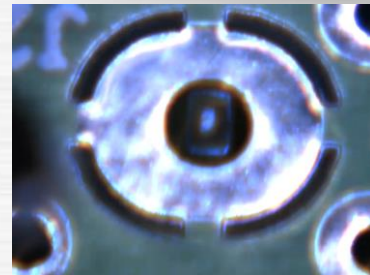
Very oval pad



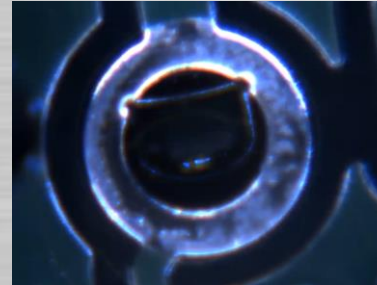
Large pad



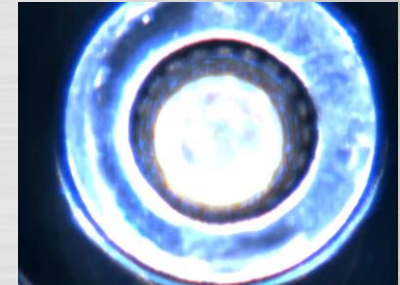
Large GND pad



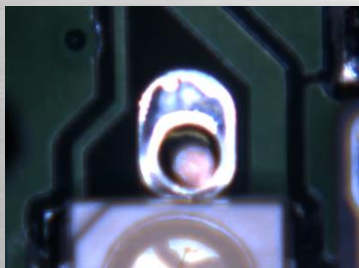
Large pad, large pin



Big One



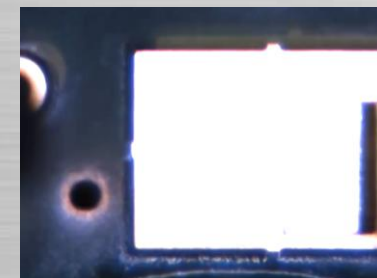
Close to LED



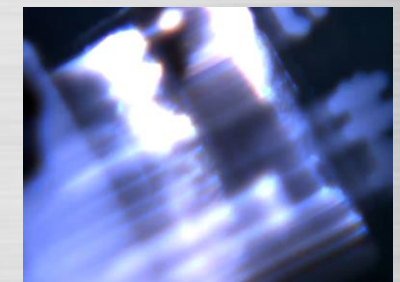
Close to plastic box



SMT Soldering

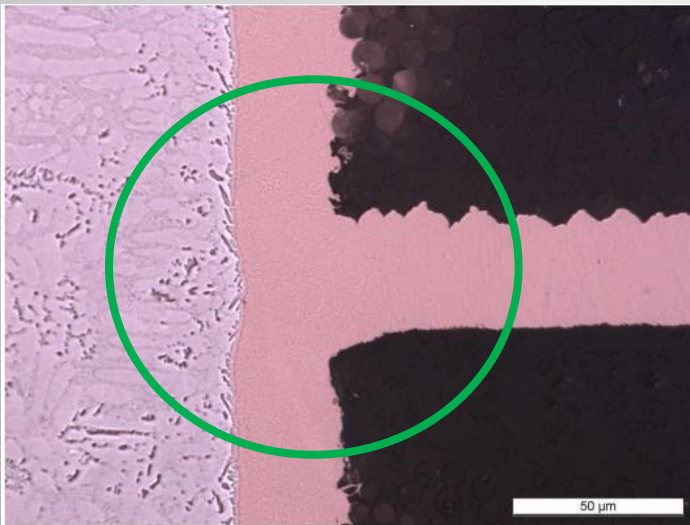
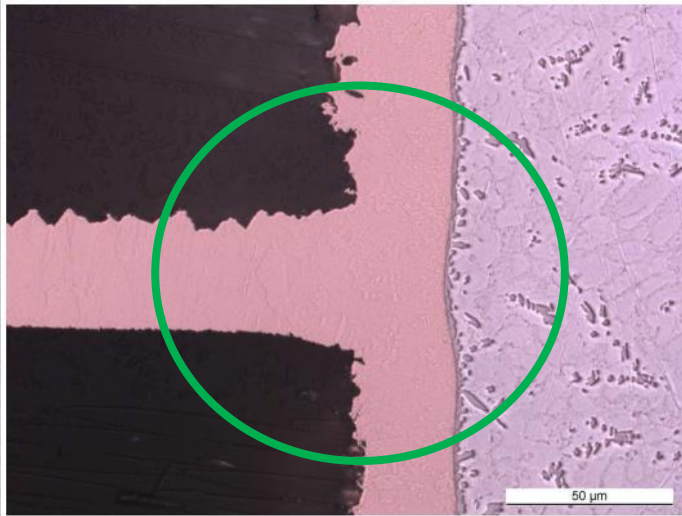


Wire on PCB



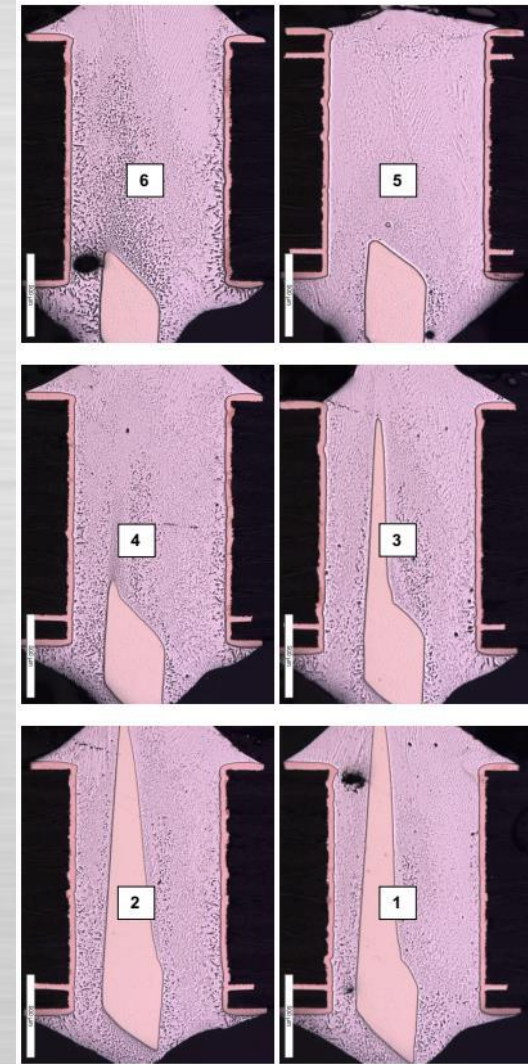


# Firefly soldering quality: micro section test




Controlled process mean:

- ✓ Short soldering time
- ✓ No thermal stress
- ✓ No Craks in inner layers
- ✓ Full hole filling







## Del 3 - Løsning

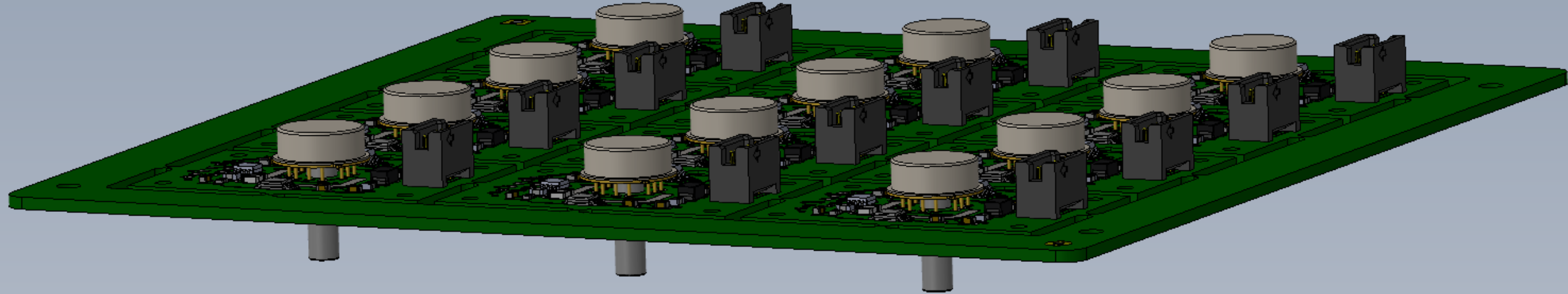
Workholder

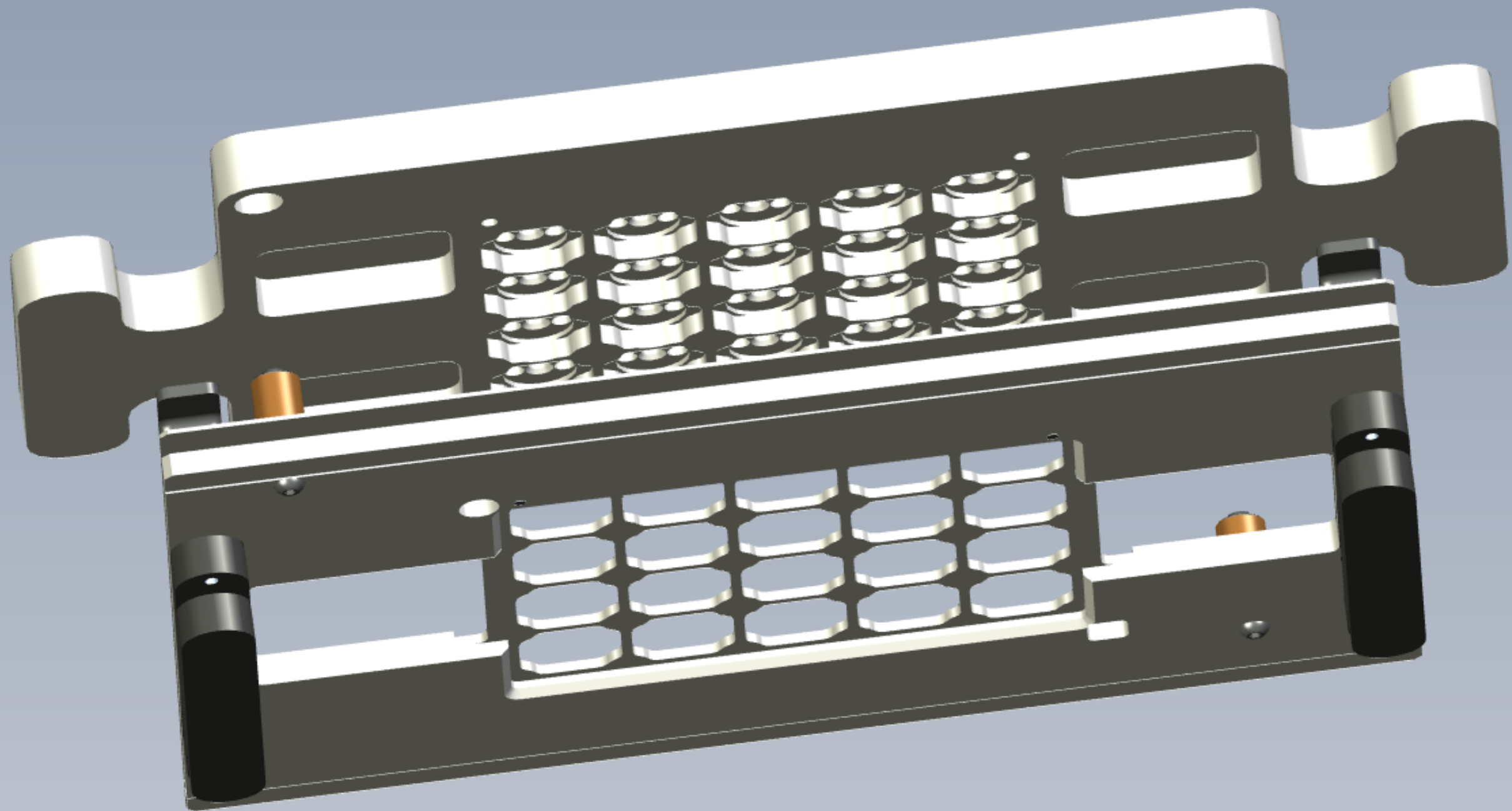
Lodding

Verifisering

Erfaringer etter 1 års bruk

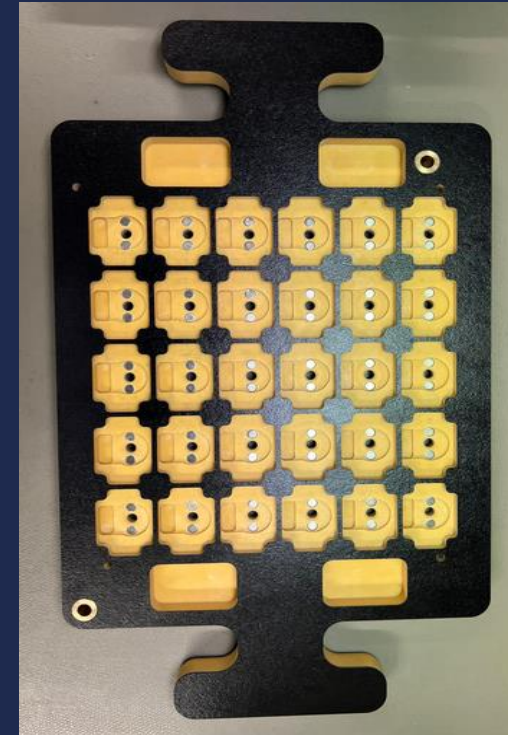
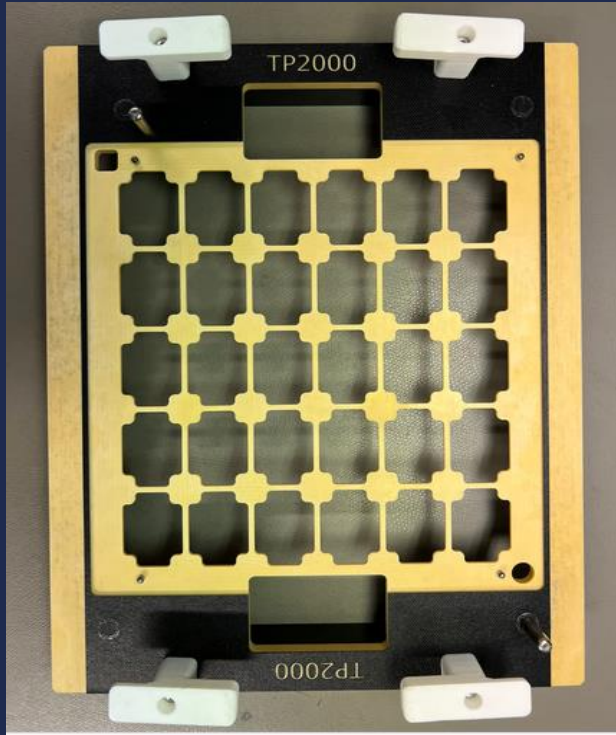
# Panel fra Memscap



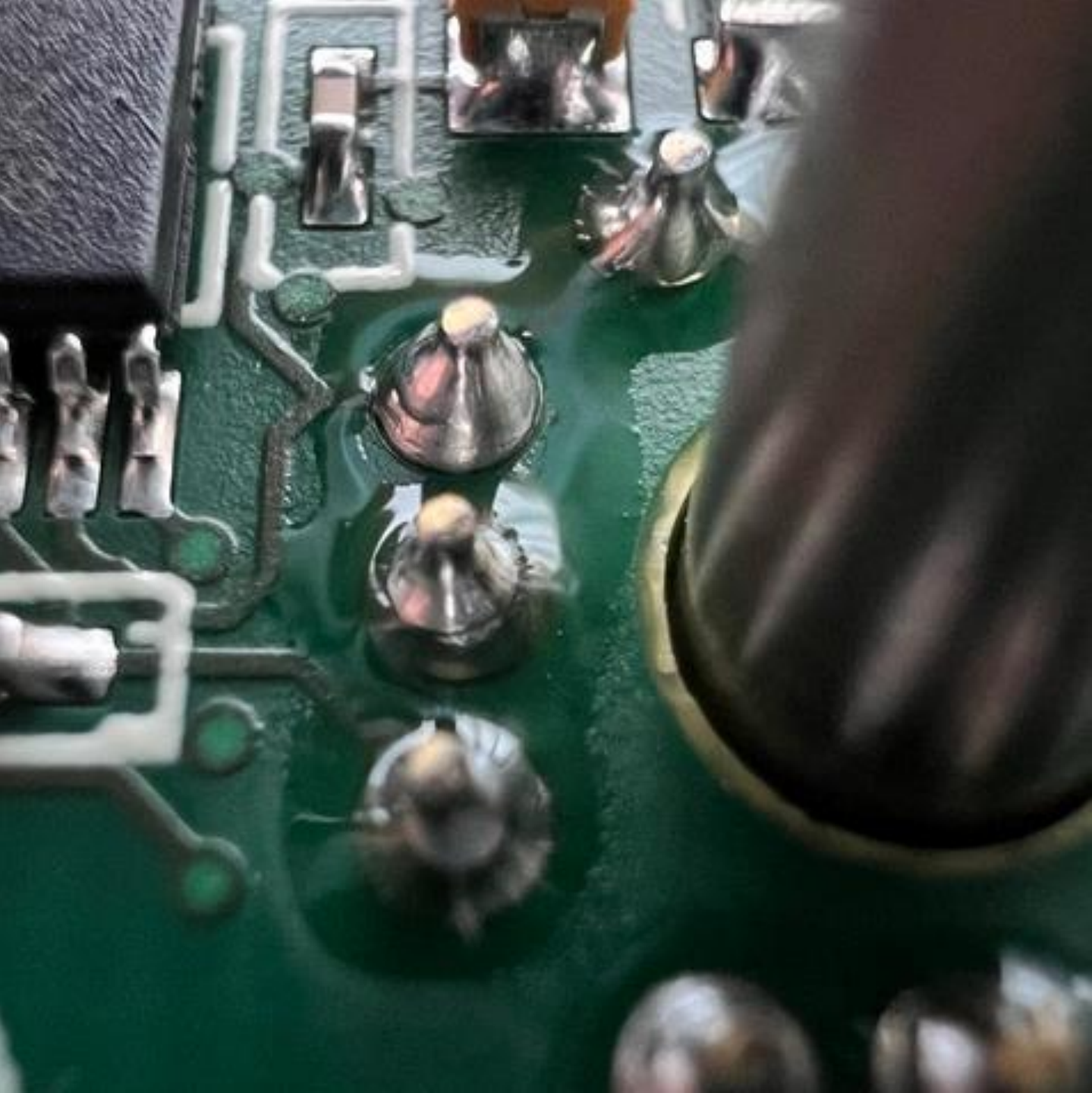




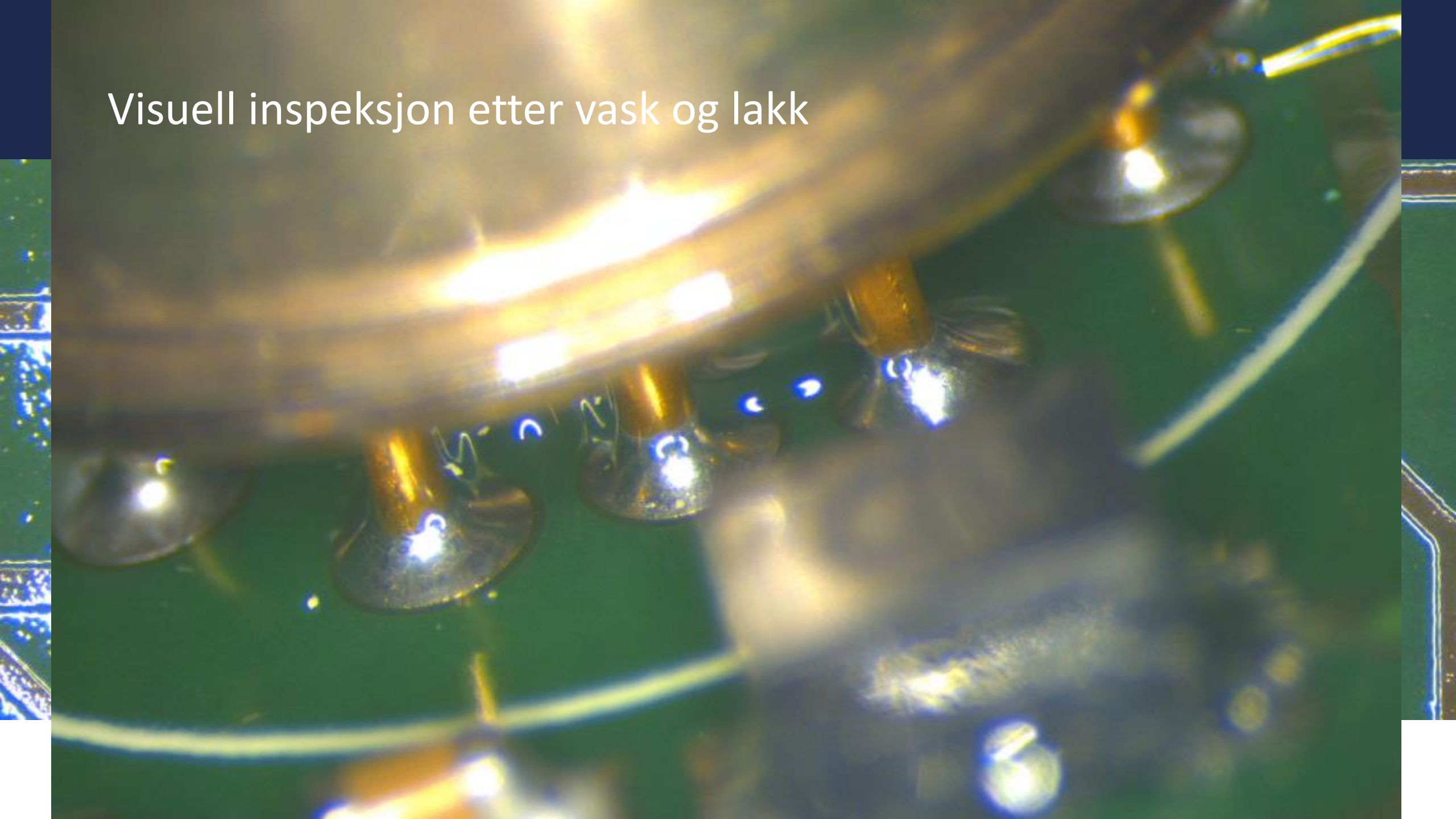
# Workholder med vårt panel





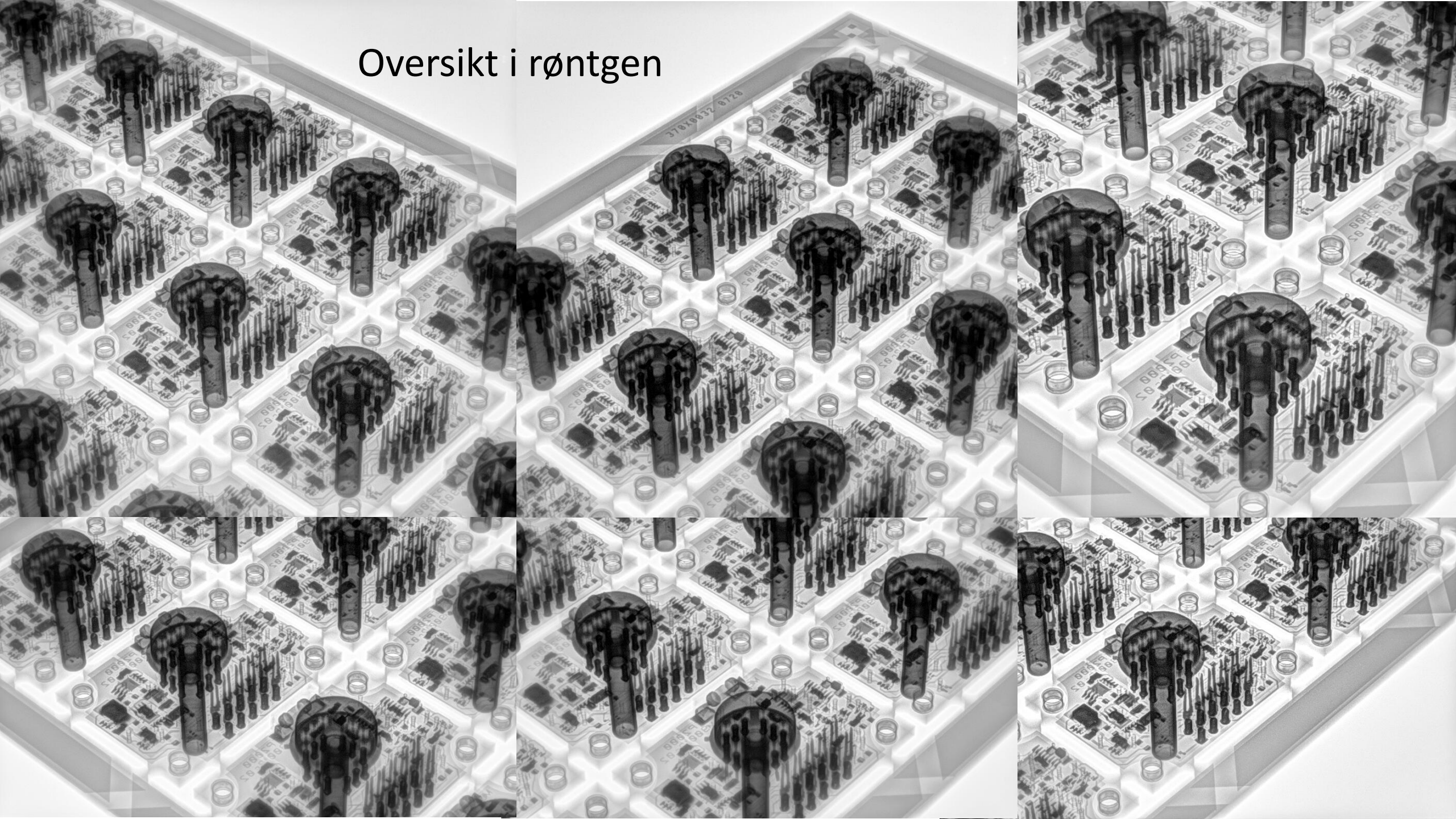


Visuell inspeksjon etter vask og lakk

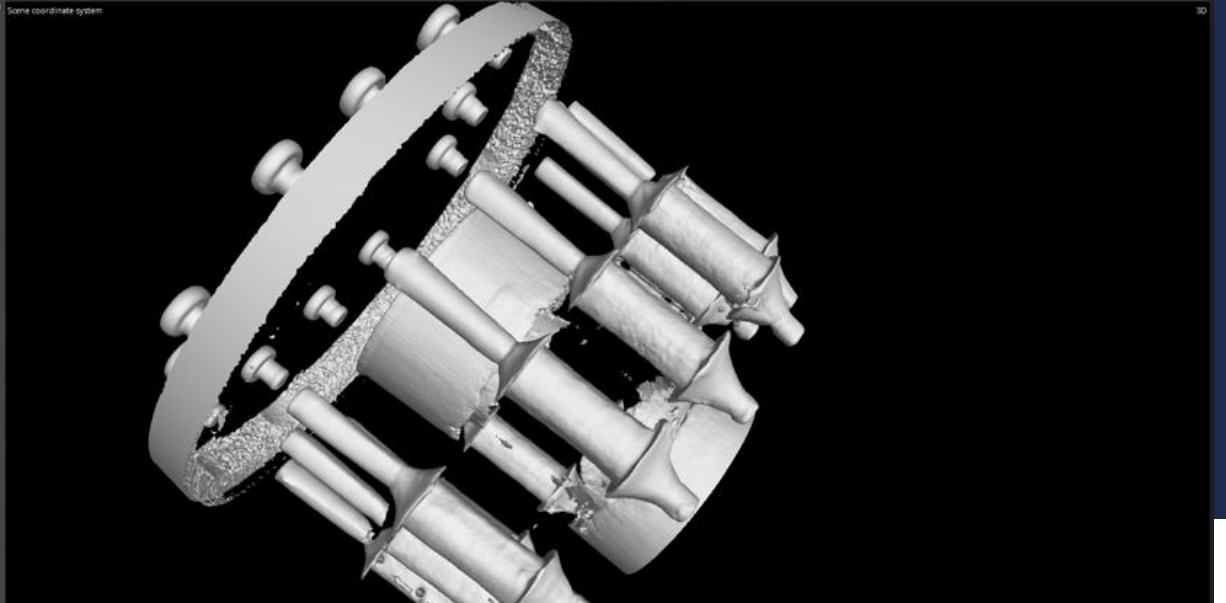
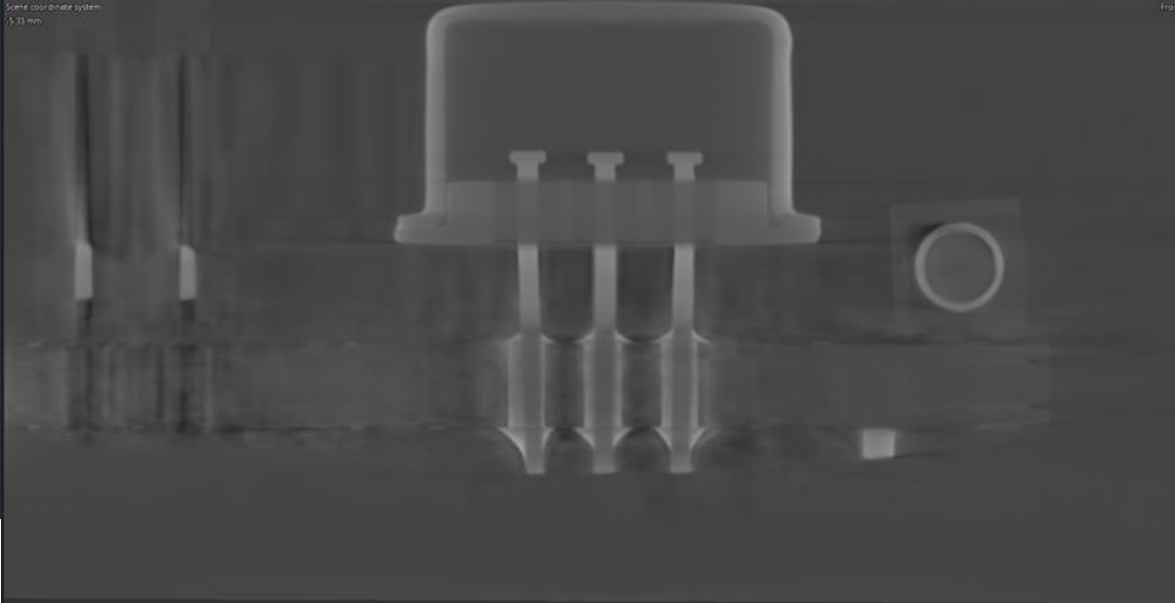
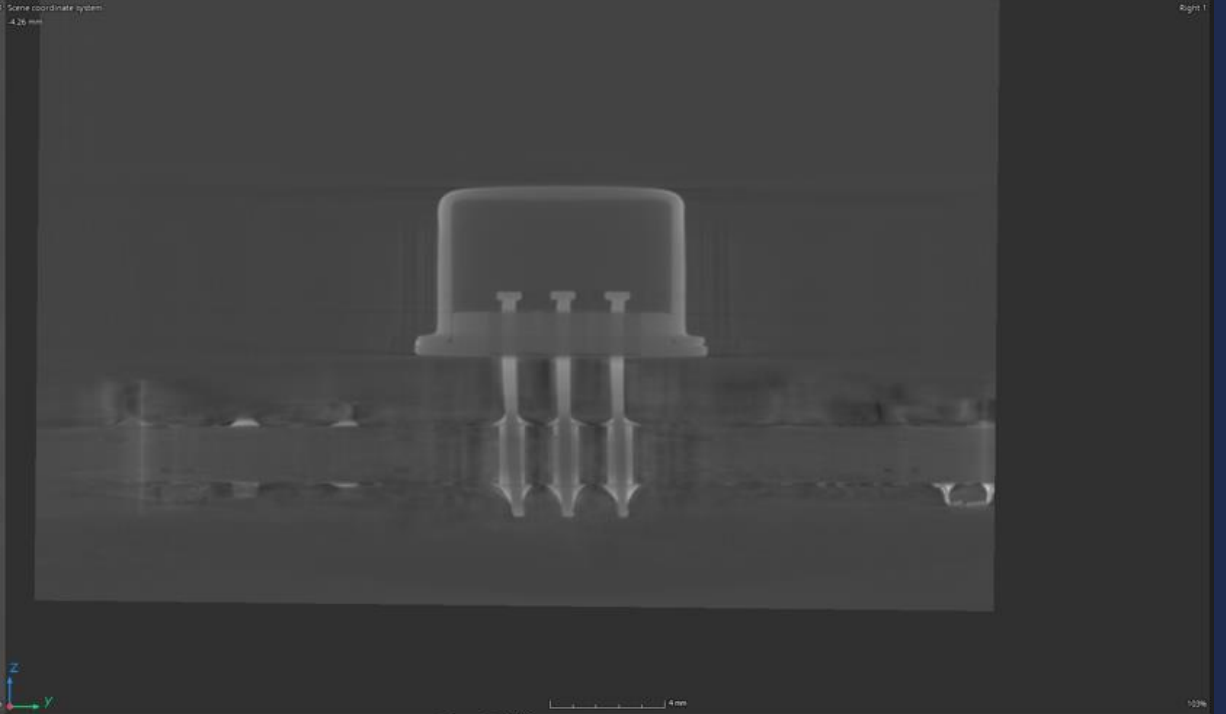
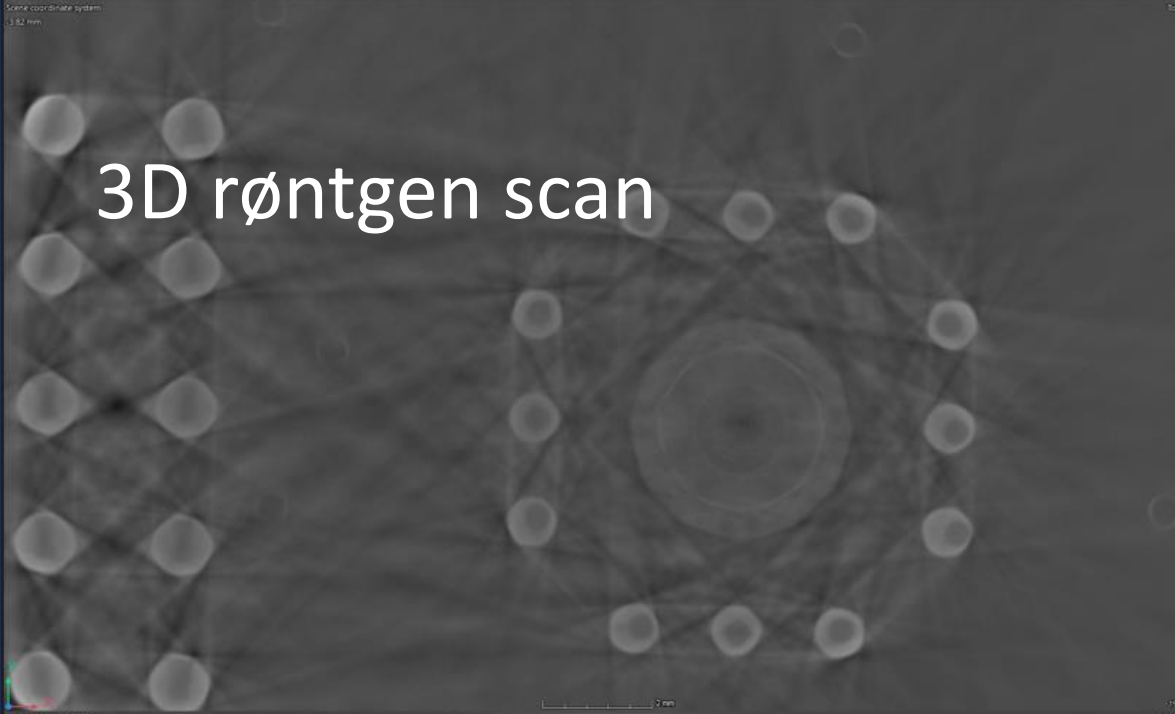




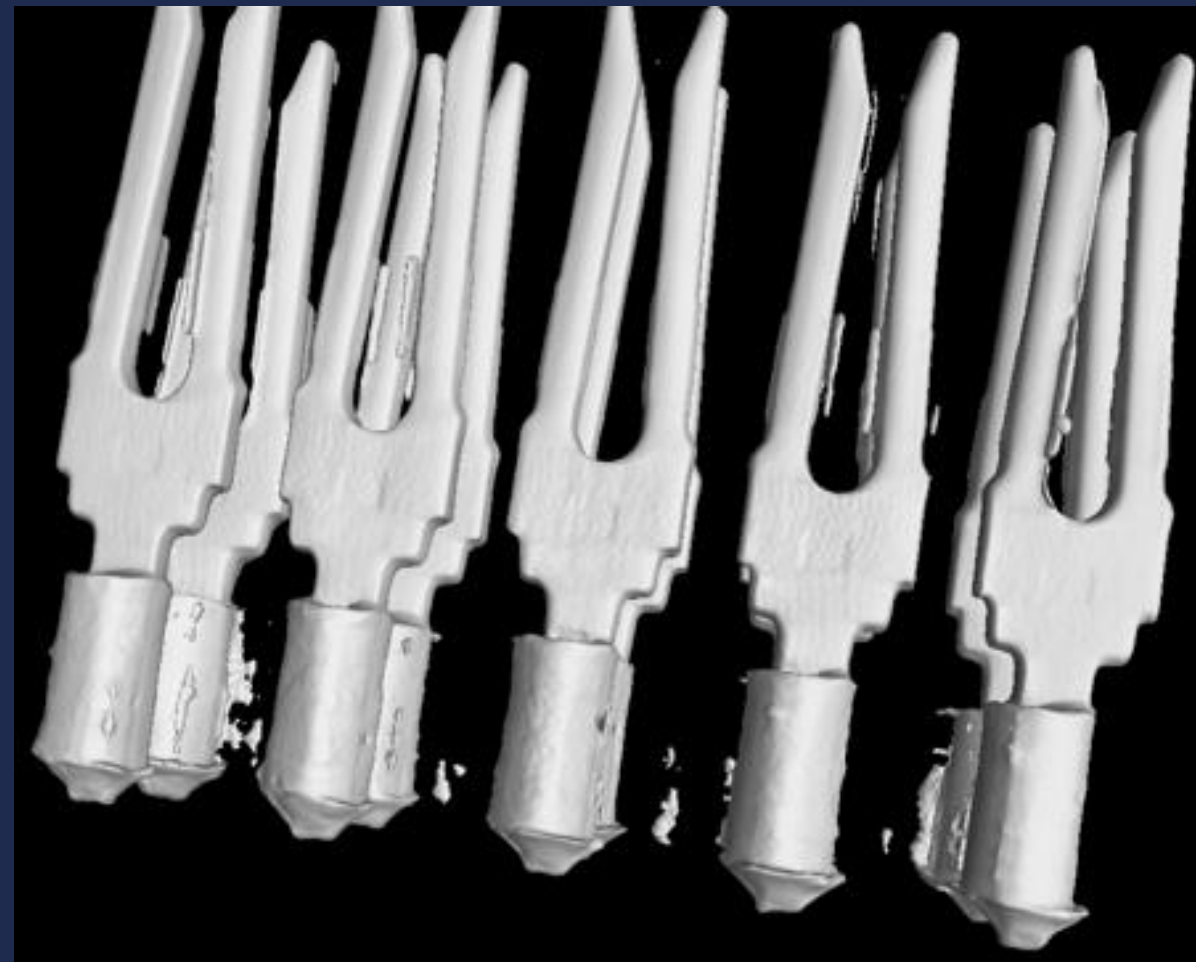
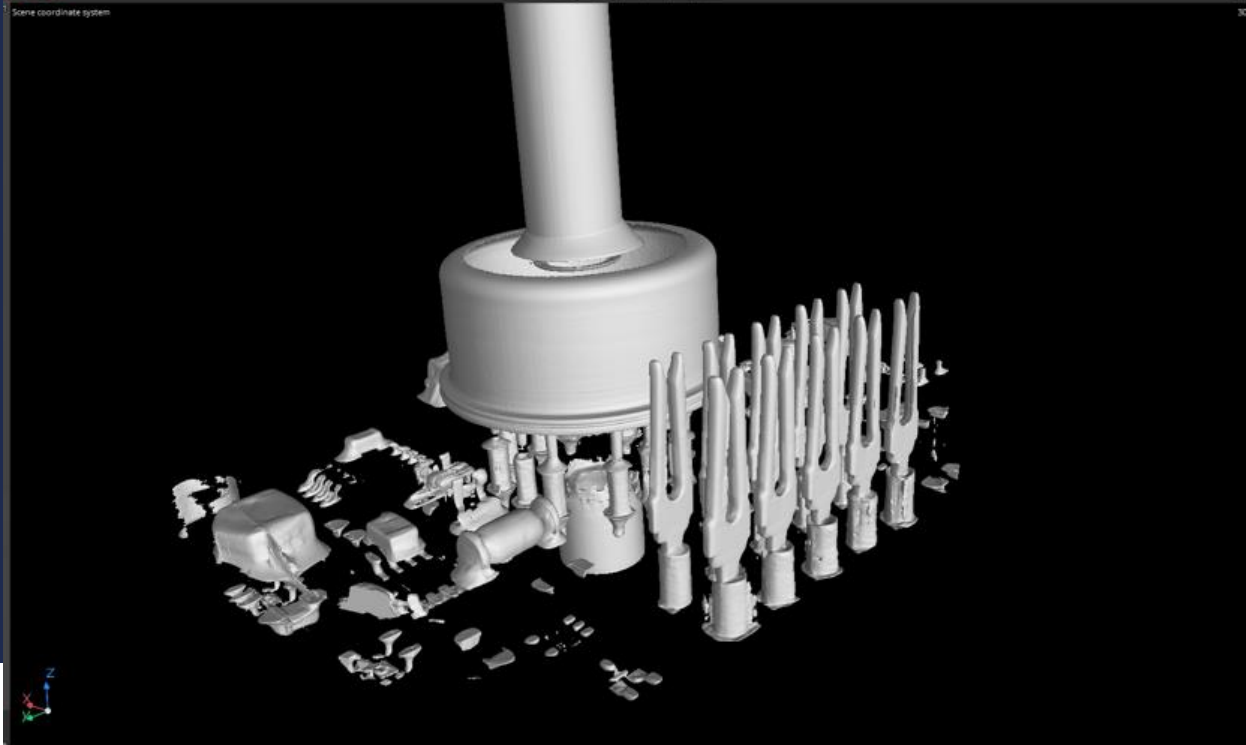
# Oversikt i røntgen



# 3D røntgen scan



# 3D røntgen scan





Mikroslip

PCB

Copper plating PCB

7.9 $\mu\text{m}$



Intermetallic layer

8.5 $\mu\text{m}$

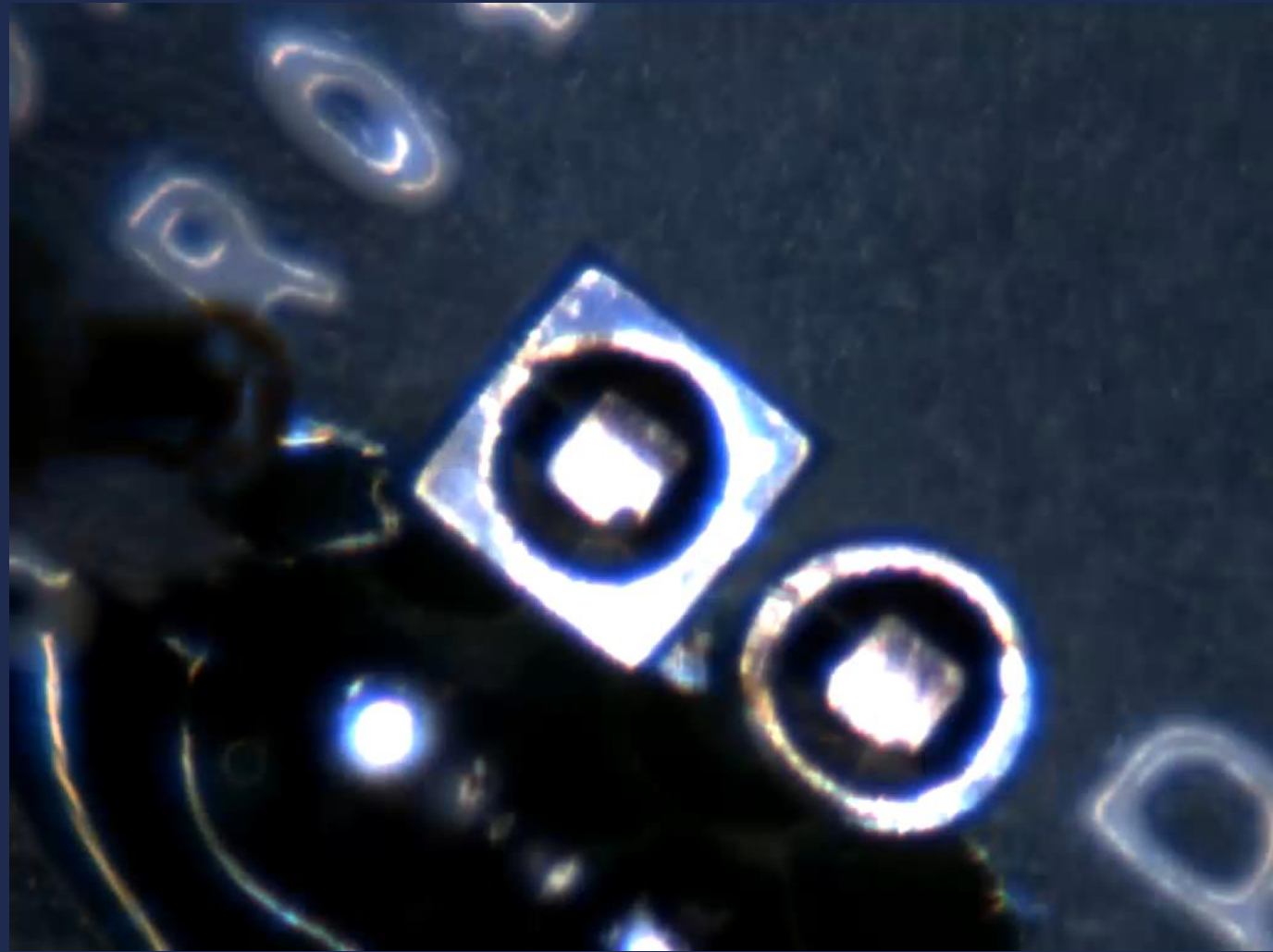
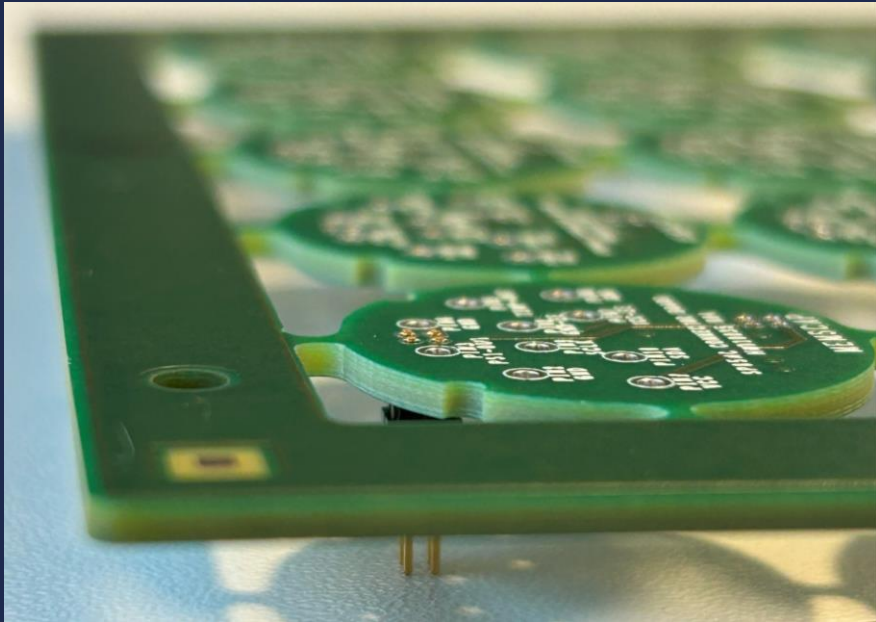
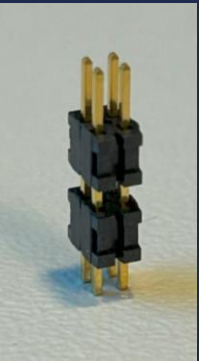


8.1 $\mu\text{m}$



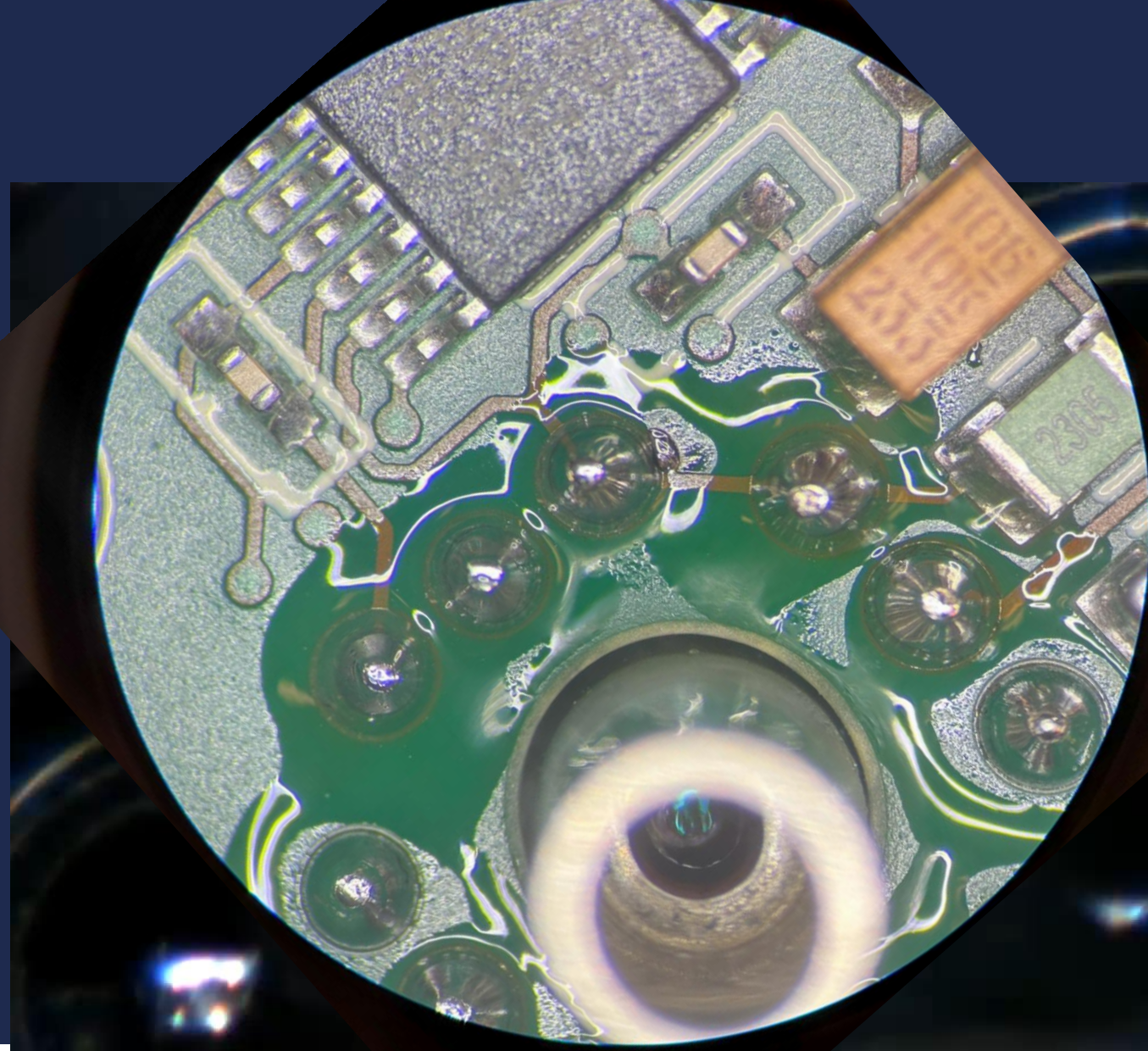
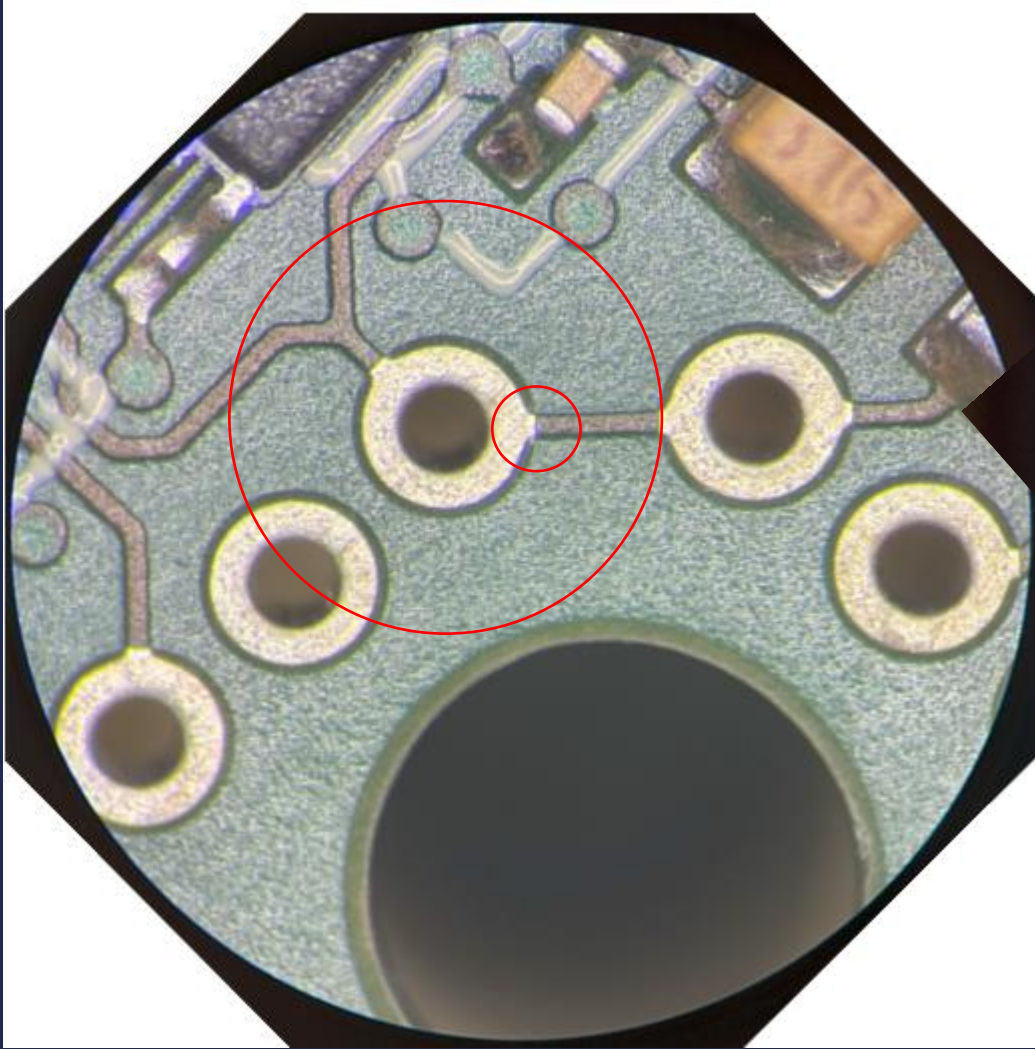
SnPb connection

# Erfaringer - benlengde



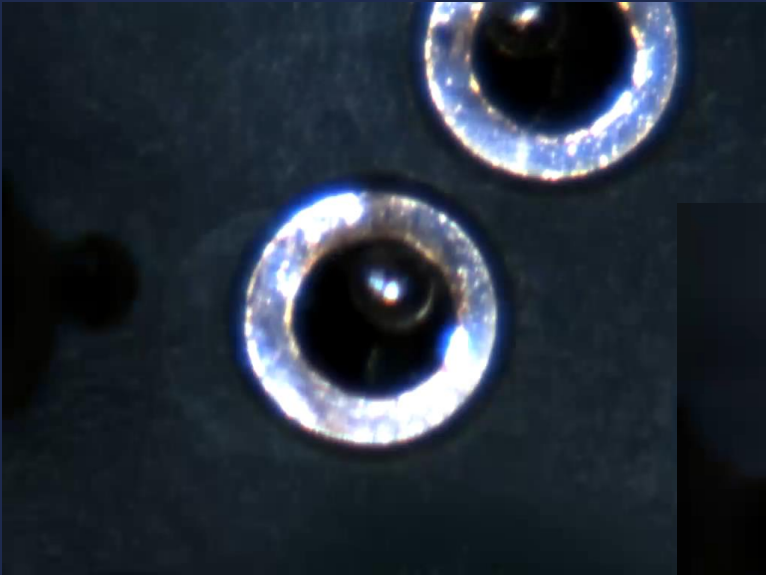


# Erfaringer - renhet

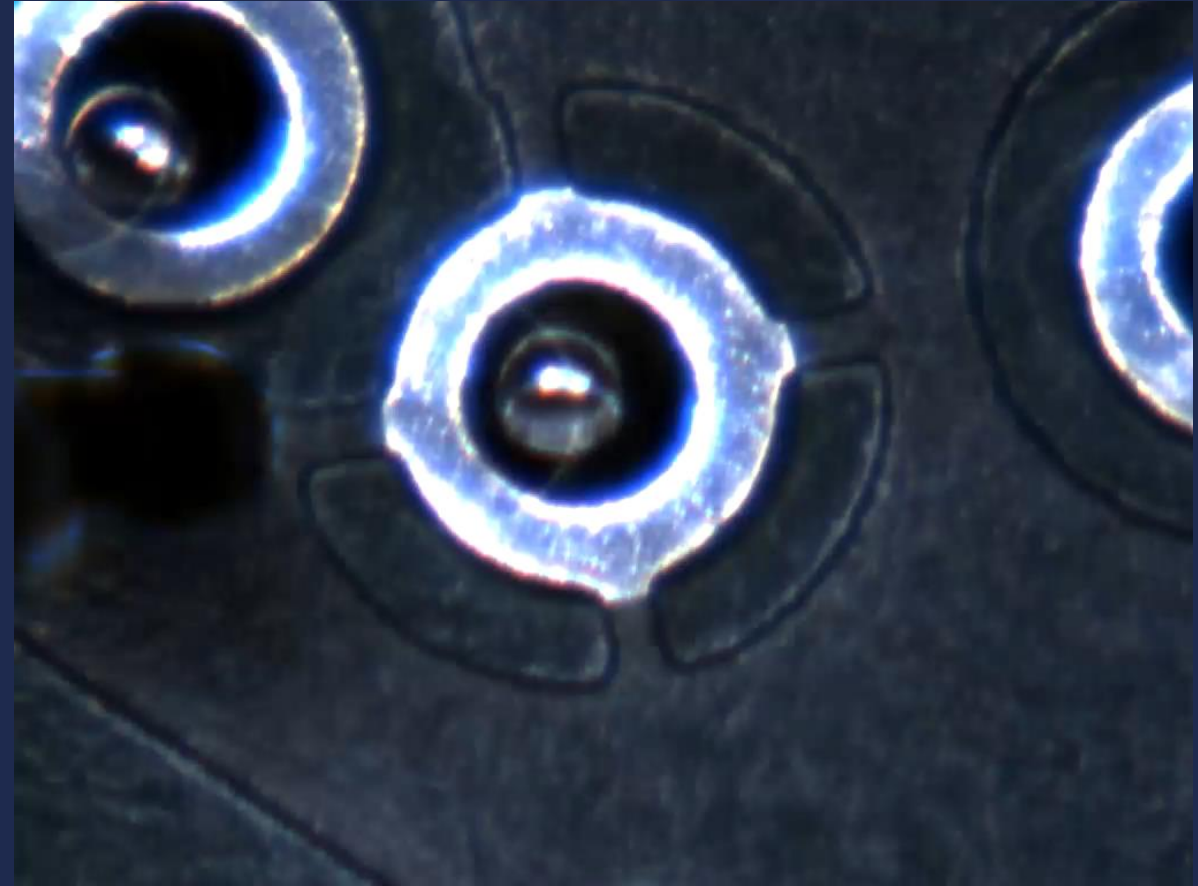
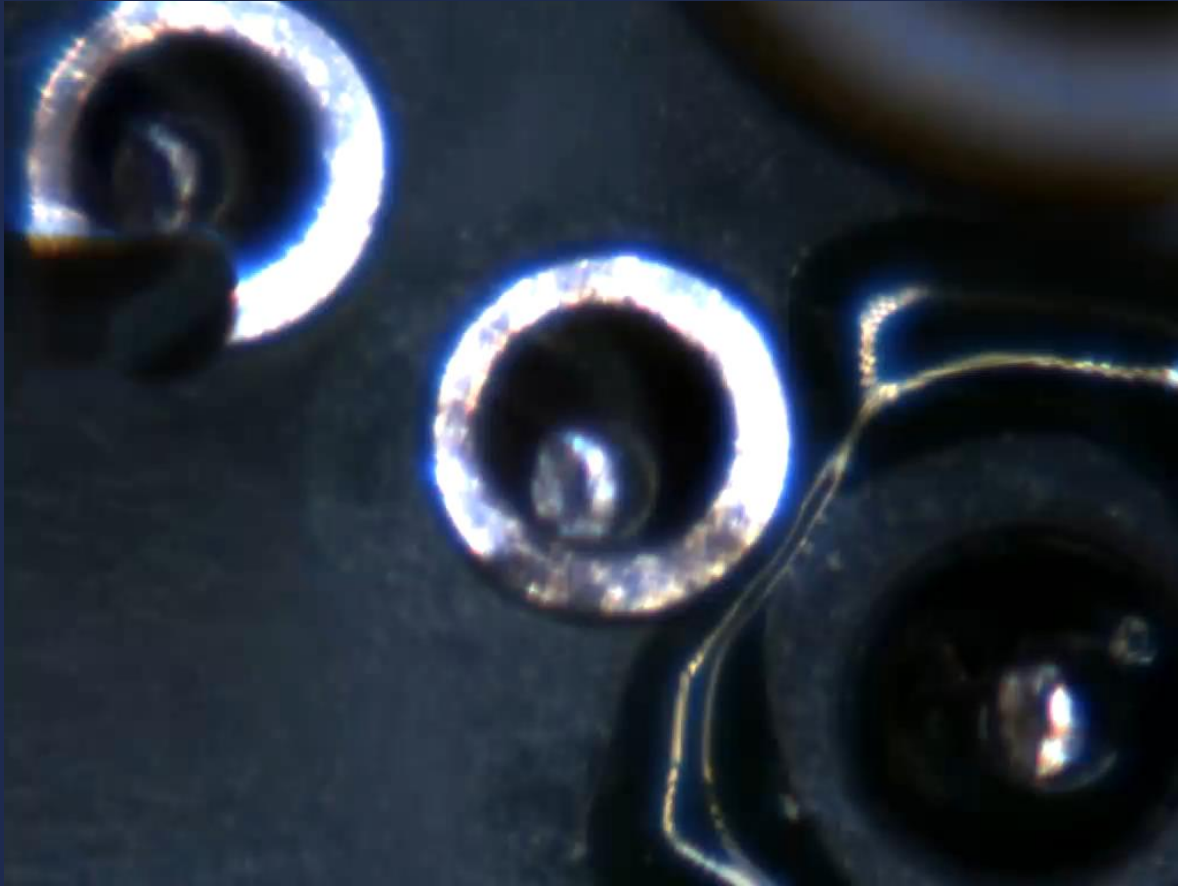




# Erfaringer – brenning på pcb



# Erfaringer – andre problemer



# Erfaringer – finale





**Spørsmål?**

