



# Design & Submission Guide



Precision



Design Flexibility



Speed



# Breaking New Ground

## In Micro Metal Additive Manufacturing



### Achieve CNC-Level Precision

- Gold standard for micro metals
- Matches CNC surface finish & tolerances
- Ultra-high precision (5-micron resolution)

### With MIM Materials

- Standard metal injection molding powders
- Standard MIM sintering furnaces
- Access to broad portfolio of materials

### In a 3D Printing Process

- Outperforms existing 3D tech
- Scales easily to high-volume production
- Handles complexity better than MIM



# Resin Infused Powder Lithography (RIPL)

Additive manufacturing with the precision of CNC

1

## Fabricate green parts

- Standard MIM metal powder
- Blend with photopolymer resin
- UV cure one layer at a time

2

## Remove excess material

- Excess material supports the build process
- No spiderweb support structures
- Washes away easily

3

## Sinter green parts

- Standard MIM sintering furnace
- Polymer binder burns away
- Metal fuses, dense part remains

4

## Net-shape part is ready

- 99% dense
- Tolerances as tight as 0.0006" (0.015mm)
- CNC-quality surface finish

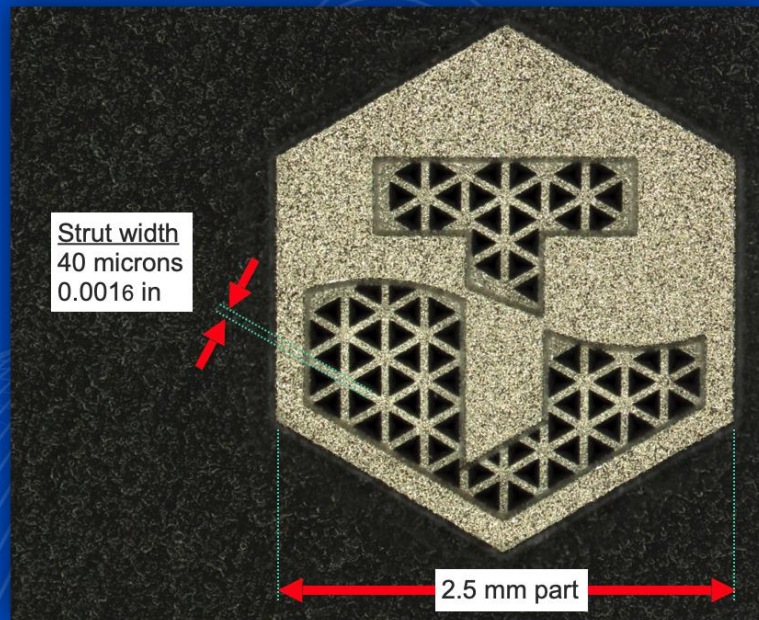
**Borrowing the best of MIM.** Materials, metallurgy, qualifications are similar to MIM — low barrier to proving quality.

**Not 3D printing as you know it.** More scalable, greater precision, fewer defects than SLS, DMLS.



# RIPL: Part Size & Resolution

|              |                                                                                              |
|--------------|----------------------------------------------------------------------------------------------|
| Maximum      | 0.480" x 0.300" x 0.197"<br>(12.2mm x 7.6mm x 5mm)                                           |
|              | Larger parts available 2025                                                                  |
| Minimum      | Smallest produced to date:<br>0.02" (0.05mm) overall size                                    |
|              | Minimums set by feature size, surface finish                                                 |
| Ideal Range  | 0.080" to 0.200" (2mm to 5mm)                                                                |
|              | Hard to mold/machine complex parts this size                                                 |
| Feature Size | Resolution: 5 micron voxels                                                                  |
|              | Wall thickness down to 0.001" (25 microns)<br>Post/hole diameter down to 0.002" (50 microns) |



| Feature                     | Value                                                                                                                                                     | Comments                                                                                                                                        |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Materials</b>            | <ul style="list-style-type: none"> <li>17-4PH SS</li> <li>99% density</li> </ul>                                                                          | Other stainless-steel alloys will be available in the future; titanium, nitinol, and ceramics are in longer term pipeline                       |
| <b>Minimum feature size</b> | <ul style="list-style-type: none"> <li>0.002" [50 µm] posts, &lt;0.006" [150 µm] tall</li> <li>0.0016" [40 µm] walls, &lt;0.012" [400 µm] tall</li> </ul> | Minimum geometries are very dependent on specific designs, these specs are provided as an initial reference                                     |
| <b>Hole sizes</b>           | <ul style="list-style-type: none"> <li>Blind Holes: aspect ratio 3:1 or less</li> <li>Through Holes: aspect ratio 5:1 or less</li> </ul>                  | Higher aspect ratios may be achieved in certain cases                                                                                           |
| <b>Edges</b>                | <ul style="list-style-type: none"> <li>Edge radii of 5-7µm are achievable where needed</li> <li>Fillets of 25-50µm are recommended</li> </ul>             | In areas where design intent is not compromised, fillets are recommended                                                                        |
| <b>Surface finish</b>       | <ul style="list-style-type: none"> <li>Ra32µin [Ra 0.8µm]</li> </ul>                                                                                      | Finer surface may be achieved through polishing or tumbling, Ra32 is the native surface finish for many features directly after sintering       |
| <b>Maximum part size</b>    | <ul style="list-style-type: none"> <li>XY: 0.300" [7.6 mm] x 0.480" [12.2 mm]</li> <li>Z: 0.197" [5 mm]</li> </ul>                                        | Taller builds will be available soon, wider builds are in the technology pipeline                                                               |
| <b>Minimum part size</b>    | <ul style="list-style-type: none"> <li>XY: 0.080" [2 mm] x 0.080" [2 mm]</li> <li>Z: 0.040" [1 mm]</li> </ul>                                             | Smaller parts will be considered on a case-by-case basis                                                                                        |
| <b>Layer thickness</b>      | <ul style="list-style-type: none"> <li>0.0002" [5 µm]</li> </ul>                                                                                          | 2-micron layers are in the technology pipeline                                                                                                  |
| <b>Tolerances</b>           | <ul style="list-style-type: none"> <li>Larger of +/- 1.5% or +/-0.0006" [15 µm]</li> </ul>                                                                | Smaller features may have tighter tolerances for specific details, overall dimensional tolerances will vary with geometry and overall part size |

# RIPL: MedTech Applications



## Surgical Robotics

- Clevises
- Jaws
- Drive Components
- Linkages
- Articulation Stacks
- Complex Internal Cable/Wire Pathways

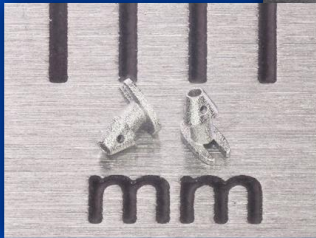


## Interventional Catheters

- Coupling Rings
- Tips
- Drive Components
- Markers



# RIPL: MedTech Applications



## Orthodontic

- Alignment Brackets



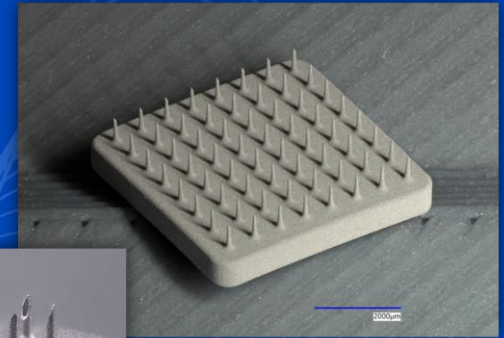
## Ophthalmic

- Glaucoma Shunts
- Instrumentation



## Microneedles

- Drug Delivery
- Diagnostics





## Meet With Trio:

Click Here

- Technology primer (if needed)
- Go over project needs
- Review CAD and drawings
- Discuss DFM, clarify critical tolerances



**Contact Trio Labs:**  
[sales@triolabs.com](mailto:sales@triolabs.com)

**Arrange a meeting:**  
Use button (left) or visit  
[www.triolabs.com](http://www.triolabs.com)

## Request for Quote:

Click Here

- Submit in STEP file format (STL lacks full design fidelity)
- 50-micron fillets on sharp edges wherever it doesn't negatively impact design intent
- Provide drawings and indicate critical tolerances (when necessary) – less is more!
- If no drawings provided, please indicate standard inspection is acceptable

**Typical Quote Response:**  
<24 Hours

**Delivery Time:**  
~2-4 weeks depending on order (frequently faster!)





# TRIO LABS

## Our Mission:

IMPROVING PATIENTS' LIVES BY ENABLING  
CRITICAL HEALTHCARE INNOVATION

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