



DESIGN GUIDE

Inkbit Vista

The goal of this guide is to provide the reader with a broad understanding of the printing capabilities of Inkbit's Vision Controlled Jetting (VCJ) platform - the Vista.

Inkbit Vista Design Guide

In this guide, accuracy is defined as the ability to repeatedly place material in a pre-defined specified location in space, while resolution refers to the ability to reliably produce certain features.

The figures quoted below are our recommendations for designing parts - parts that conform to this design guide will be repeatably accurate. Given effort and time working with Inkbit Applications Engineers you can expect to produce parts with finer and smaller features.

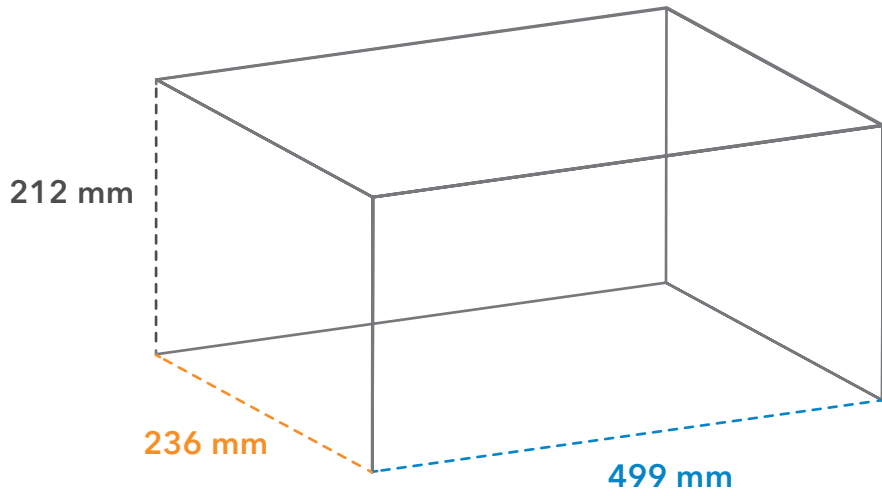
Most of the terminology and test artifacts were modeled after *ISO/ASTM 52902 - Geometric capability assessment of additive manufacturing systems*.

All figures are in millimeters, unless specifically noted.

Build Envelope

Whether a single part or a full production run, the Vista can print it as long as it fits within the build volume below:

(499 mm ● x 236 mm ● x 212 mm ●) (19.6 in. x 9.3 in. x 8.3 in)

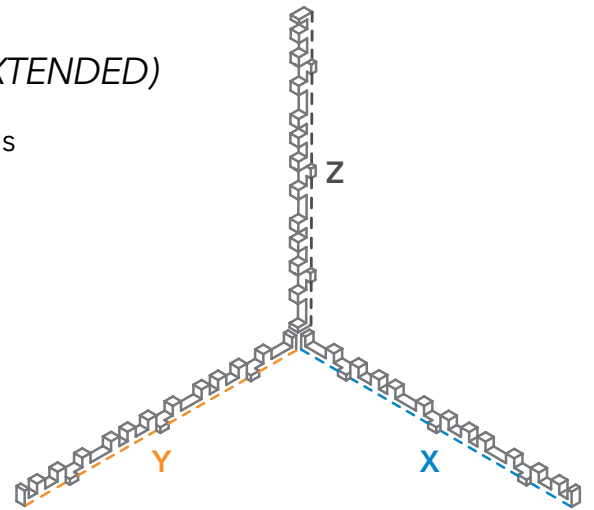


Accuracy

1. LINEAR ACCURACY (X,Y,Z) - ISO/ASTM 52902 (EXTENDED)

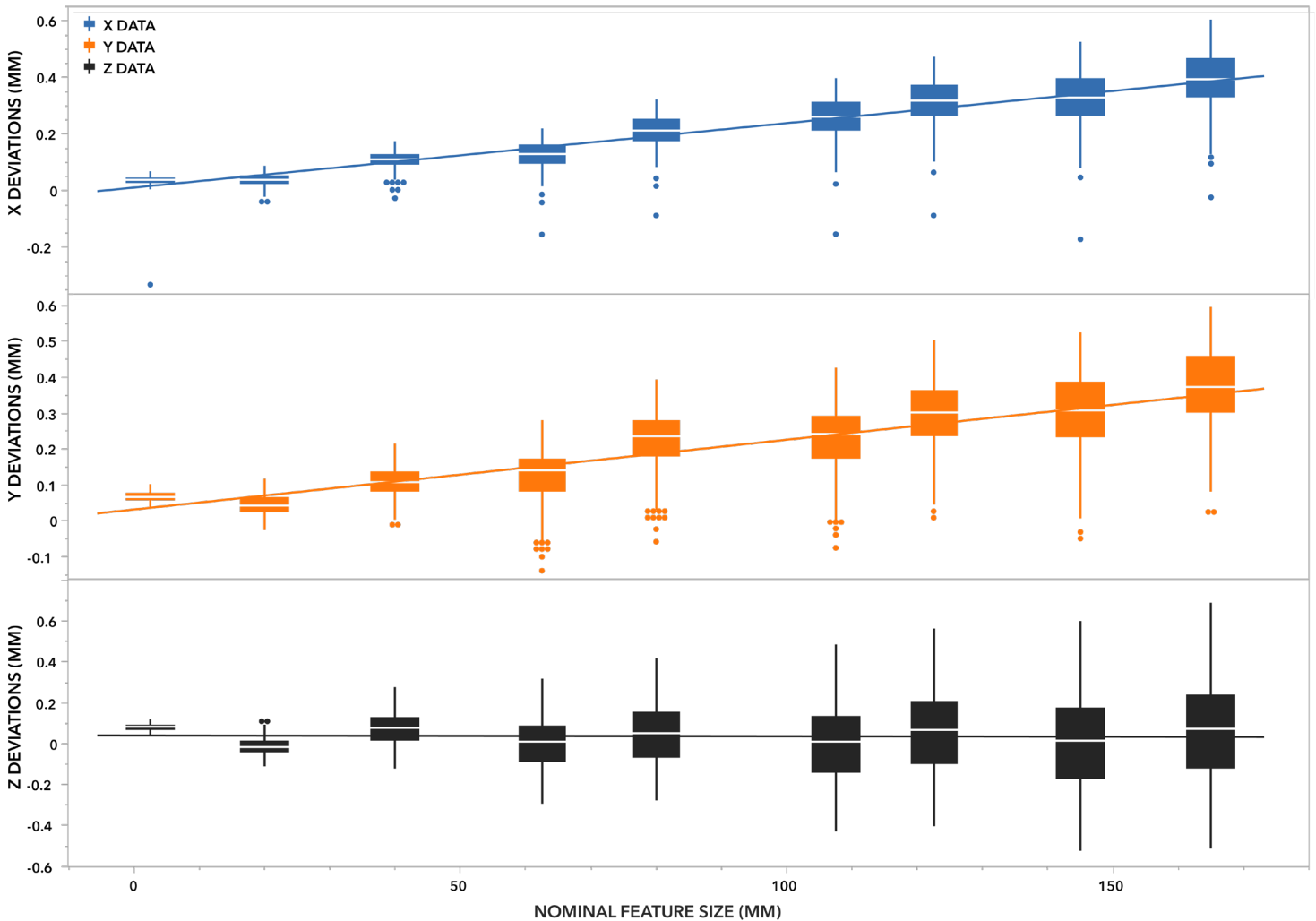
Linear accuracy measures the Vista's ability to place features along the three major axes.

| MATERIAL | AXIS | ACCURACY AND PRECISION |
|----------------------|-----------|--|
| Titan Tough Epoxy 85 | XY | +/- 40µm +0.3% / -0.1% of feature size |
| | Z | +/- 60µm +/- 0.3% of feature size |



ARTIFACT LENGTH: 165 MM

TITAN TOUGH EPOXY 85 DEVIATIONS BY AXIS

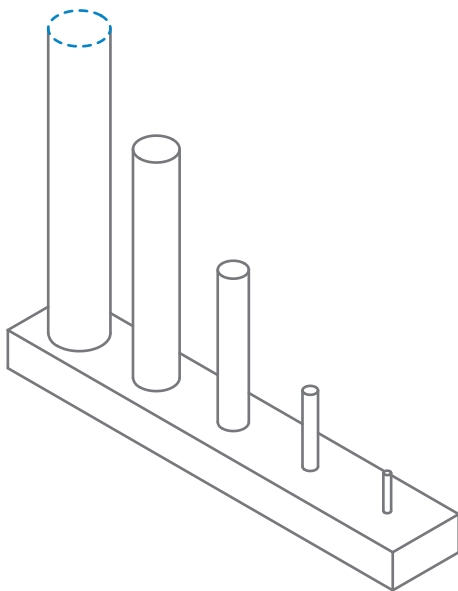
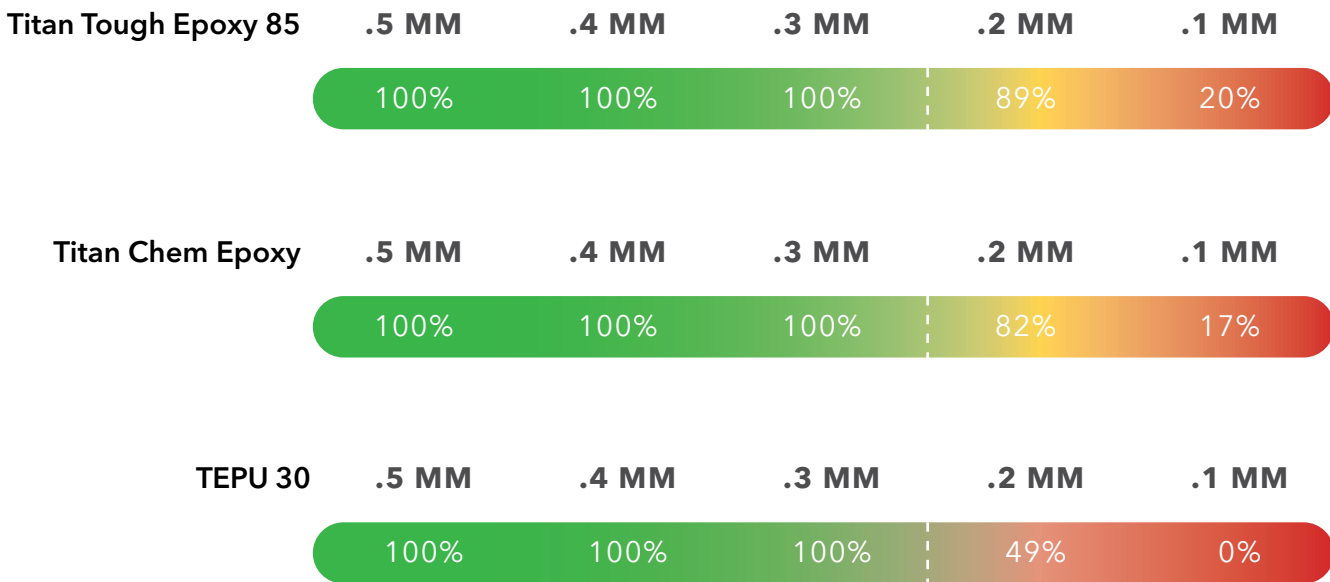


Feature Resolution

Resolution measures Vista's ability to repeatably produce a certain feature such as a pin or a hole but does not guarantee the accuracy of the following features.

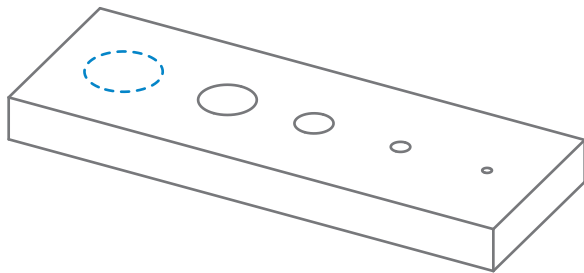
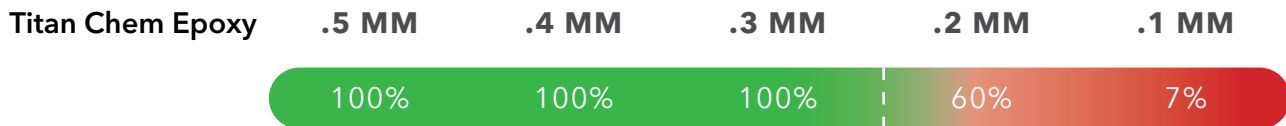
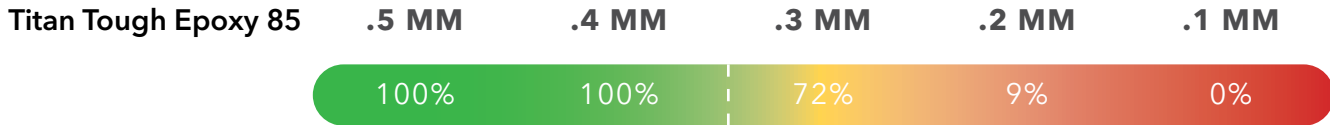
1. PIN RESOLUTION (X,Y,Z) - ISO/ASTM 52902

Pin resolution illustrates the ability to print thin, high aspect ratio, positive features like rods, pins, or other arbitrary profiles. The figures below represent the smallest diameter of a pin you can expect to reliably produce in each orientation, as signified by the dotted line.



2. HOLE RESOLUTION (X,Y,Z) - ISO/ASTM 52902

Hole resolution is the negative counterpart for the pin resolution figure and represents the ability to print straight holes. The figures below represent the smallest diameter of a hole you can expect to reliably produce, as signified by the dotted line.



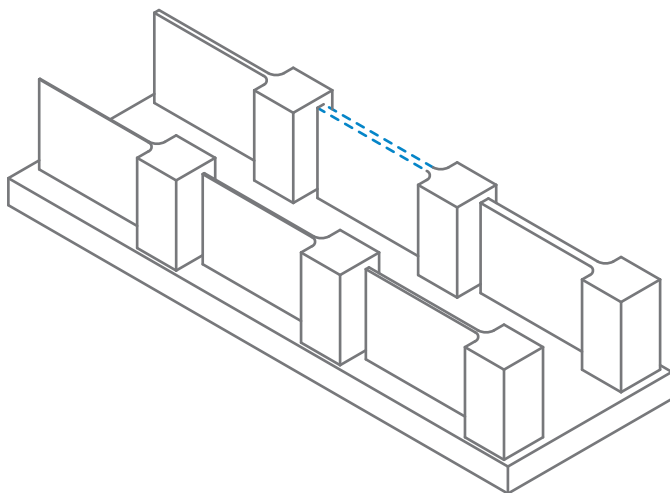
3. RIB (WALL) RESOLUTION - ISO/ASTM 52902

As per ISO/AST 52902, a rib is defined as a wall supported by a “floor” and a pillar. The figures below represent the thinnest rib that can be reliably produced with an area of 10x14 mm. Taller ribs are less structurally sound and for thin applications shorter ribs are recommended. *Resolved* describes how many samples printed fully without breaking or tearing. *Undeformed* describes how many samples, of those which resolved, did not warp or deform. Refer to the note below for more information.

| Titan Tough Epoxy 85 | 1 MM | .8 MM | .6 MM | .4 MM | .2 MM | .1 MM |
|----------------------|------|-------|-------|-------|-------|-------|
| Resolved | 100% | 100% | 100% | 100% | 100% | 100% |
| Undeformed | 100% | 100% | 100% | 77% | 45% | 38% |

| Titan Chem Epoxy | 1 MM | .8 MM | .6 MM | .4 MM | .2 MM | .1 MM |
|------------------|------|-------|-------|-------|-------|-------|
| Resolved | 100% | 100% | 100% | 95% | 79% | 1% |
| Undeformed | 100% | 100% | 100% | 77% | 60% | 33% |

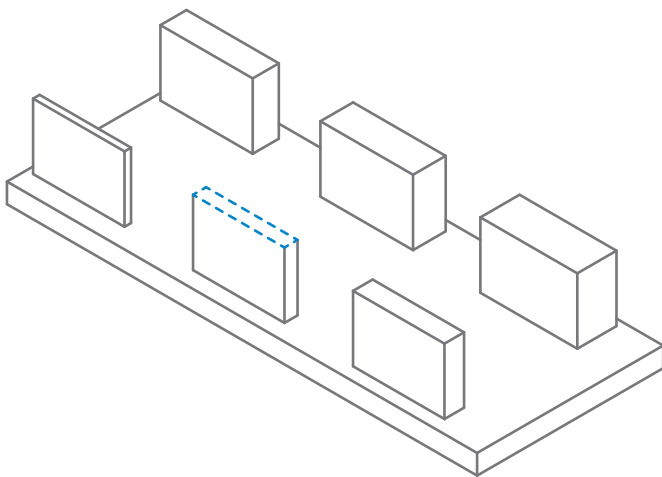
| TEPU 30 | 1 MM | .8 MM | .6 MM | .4 MM | .2 MM | .1 MM |
|------------|------|-------|-------|-------|-------|-------|
| Resolved | 100% | 100% | 100% | 100% | 100% | 73% |
| Undeformed | 100% | 100% | 100% | 85% | 71% | 25% |



Note: Undeformed is calculated by scoring each of the resolved samples on warpage and dividing the sum of those scores by the sum of the maximum possible score (a perfectly straight rib) for each resolved sample.

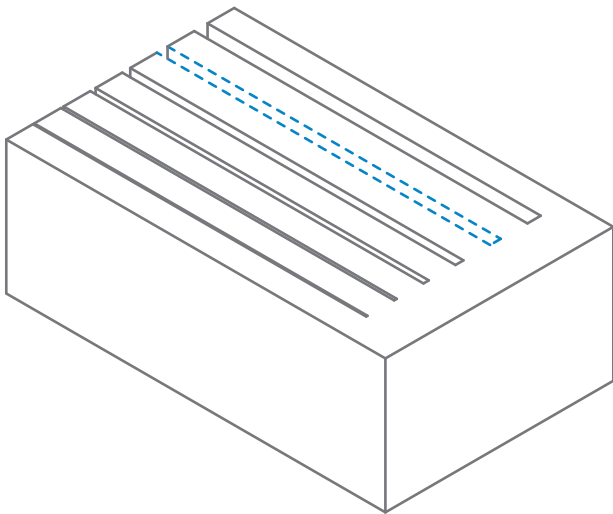
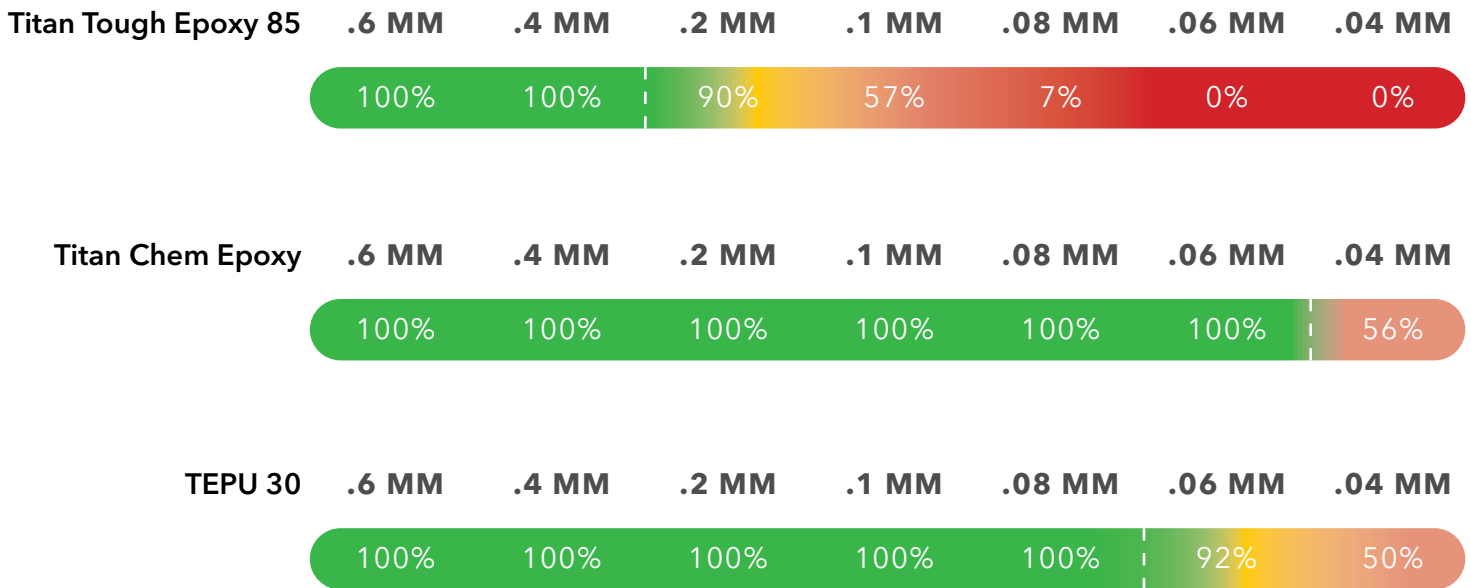
4. UNSUPPORTED WALL RESOLUTION - ISO/ASTM 52902

Identical to Rib Resolution, but without the supporting pillar. Unsupported walls tend to deform more. Data measured in the same way as the previous artifact; refer to the above for more information.



4. SLOT (GAP) RESOLUTION - ISO/ASTM 52902

Slots are the negative counterparts for unsupported walls. The figures below represent the narrowest gap you can expect to reliably resolve. For this test, a gap was considered resolved if the solid sections could be easily separated from one another.



Design Considerations

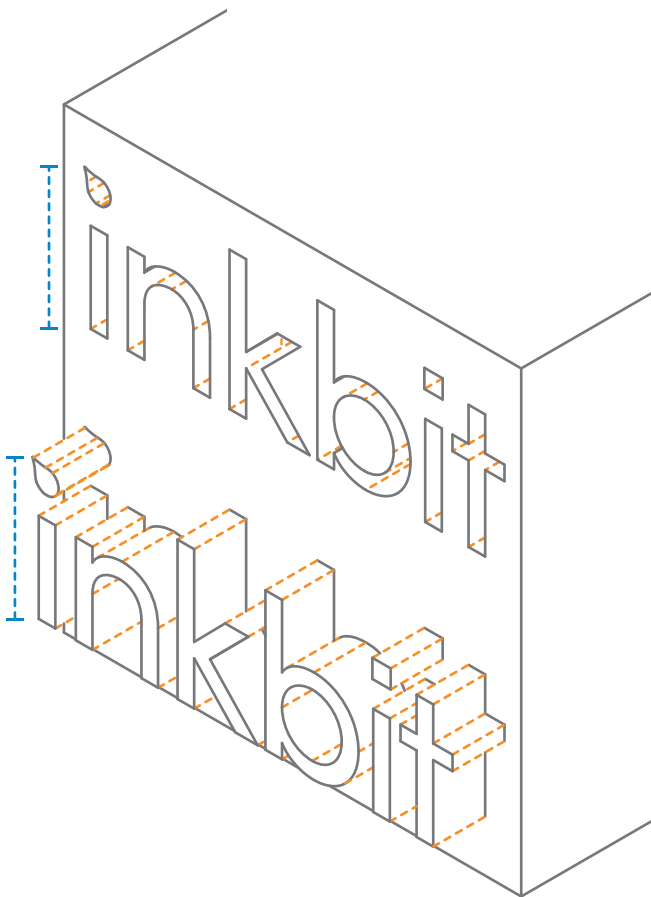
1. EMBOSSED AND DEBOSSSED FEATURES

To achieve legible text and resolved surface patterning, use the sizing guidelines below:

TEXT HEIGHT/DEPTH

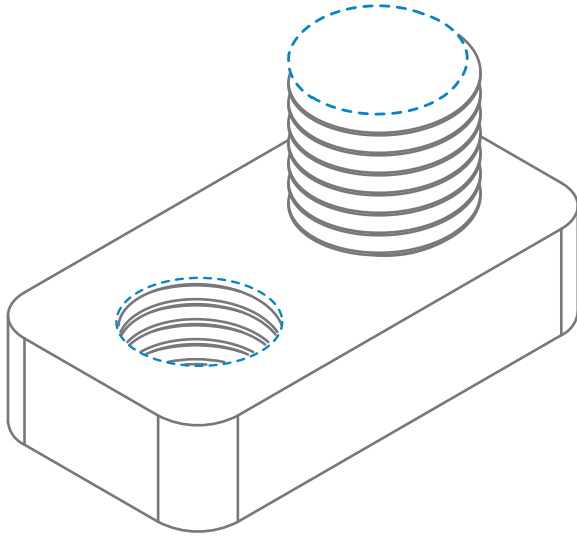
| FEATURE | TITAN TOUGH EPOXY 85 (MM) | TITAN CHEM EPOXY (MM) | TEPU 30 (MM) |
|----------|---------------------------|-----------------------|--------------|
| Embossed | 1.4/0.1 | 1.4/0.2 | 1.4/0.1 |
| Debossed | 2/0.3 | 1.6/0.2 | 1/0.2 |

Note: All quoted depths are the minimum achievable depth at the respective minimum text height. All larger texts will resolve down to 0.1 mm depth.



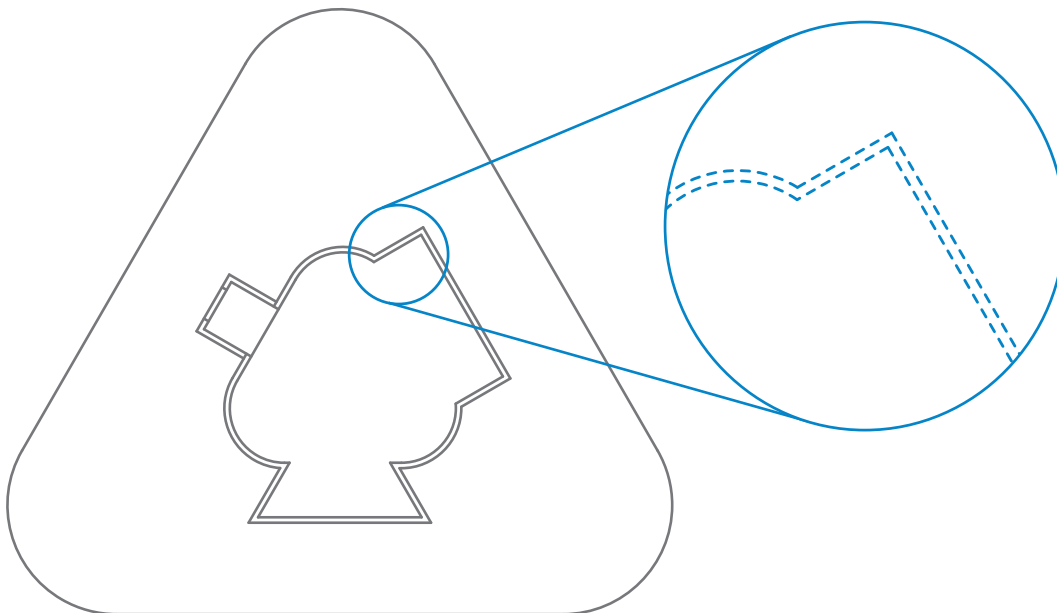
2. THREADS

The Vista system can produce useable threaded holes and studs down to M2. It is recommended to test a few thread pitches to ensure optimal fit.



3. FITMENT TOLERANCE

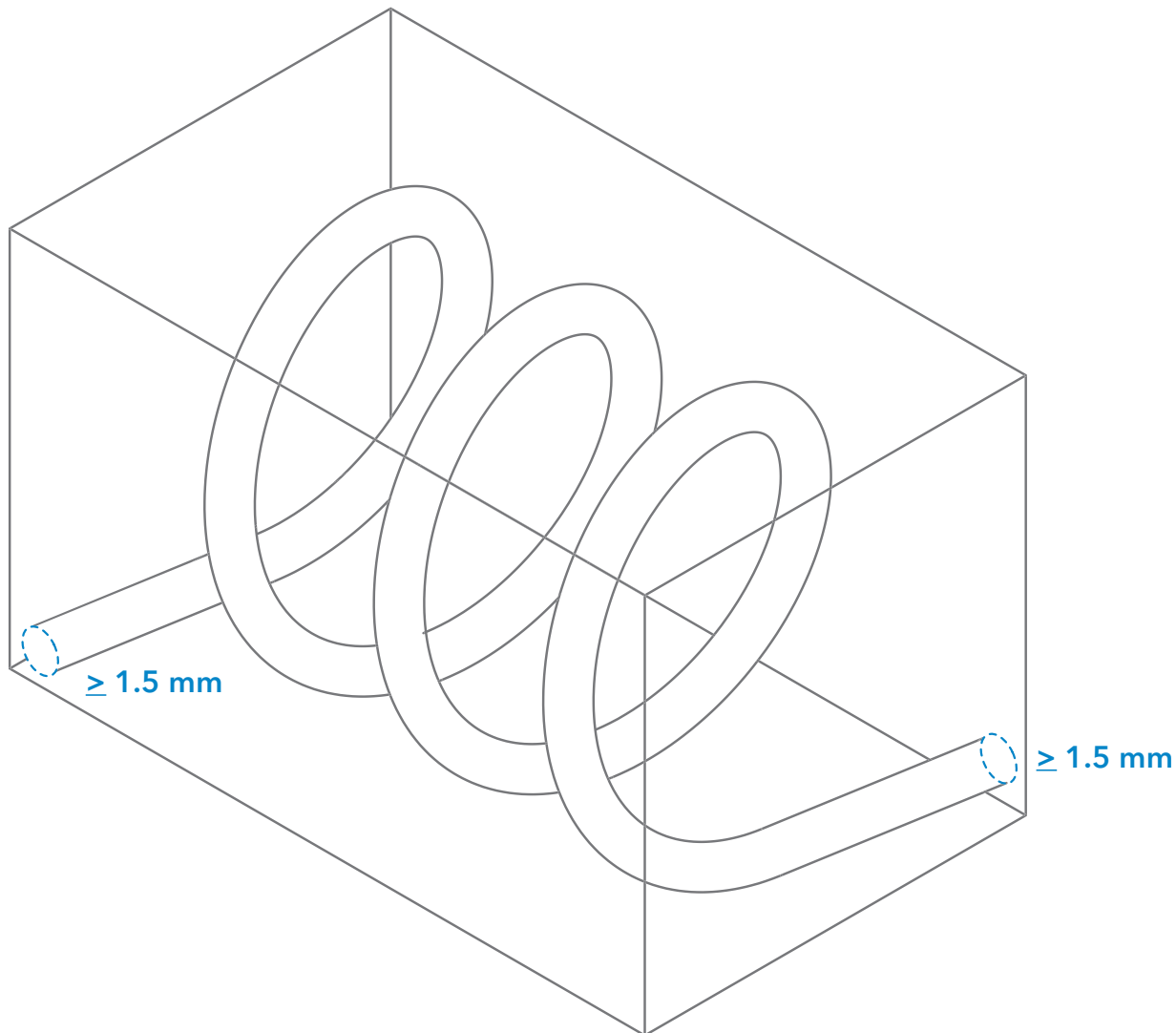
For parts that are intended to interface with one another when used, design parts with a 0.1-0.2 mm gap between meshing features.



Note: Tested with 10 mm pins, 30 mm dovetail and square joints. A larger gap may be required for larger features.

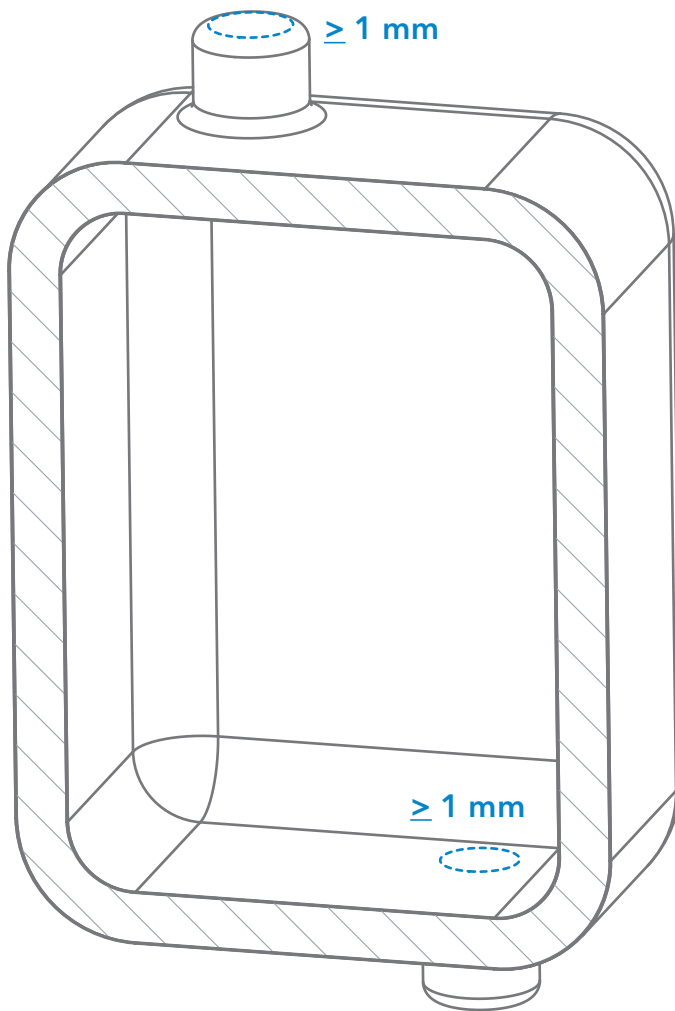
4. CHANNELS

An important capability of the Vista system, made possible because of the use of meltable wax support material, is its ability to produce complex, high aspect ratio channel geometries. Designers are not constrained to straight channels but rather can print serpentine, intersecting or helix-based channels. For these applications, it is recommended that the minimum channel diameter be larger than 1.5 mm.



4. DRAINAGE HOLES

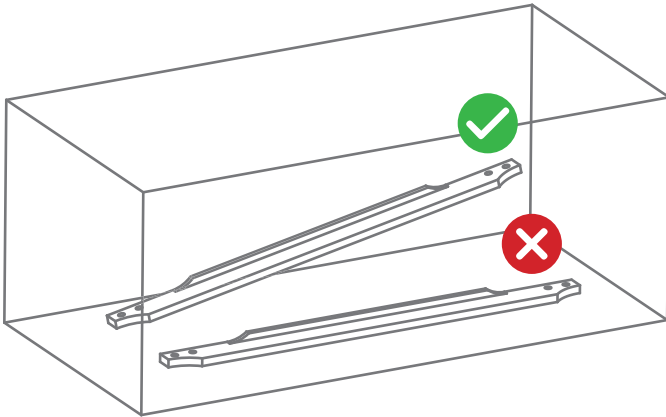
Since wax is used as a support material, it's important to include escape holes for wax to drain out of your part. Fully trapped wax should be avoided. For most applications, drainage holes should be no smaller than 1 mm. Drainage holes can be as small as the minimum resolvable hole diameter (0.4 mm) but will make post processing harder. To improve flow, include at least two holes.



Plating Recommendations

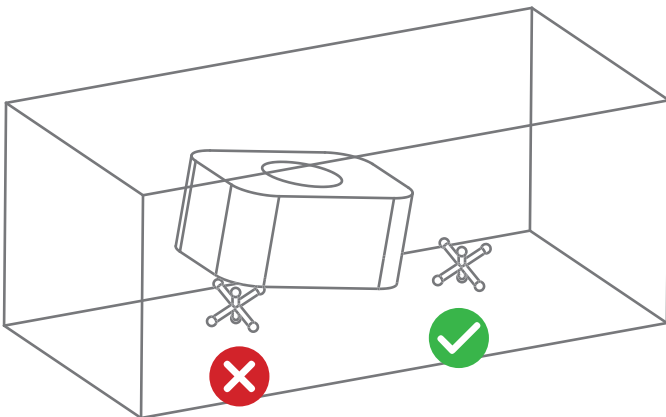
1. HIGH ASPECT RATIO PARTS

For long, thin, and/or flat parts, try to plate them at a more aggressive angle (minimize cross-sectional area) to avoid potential warpage.



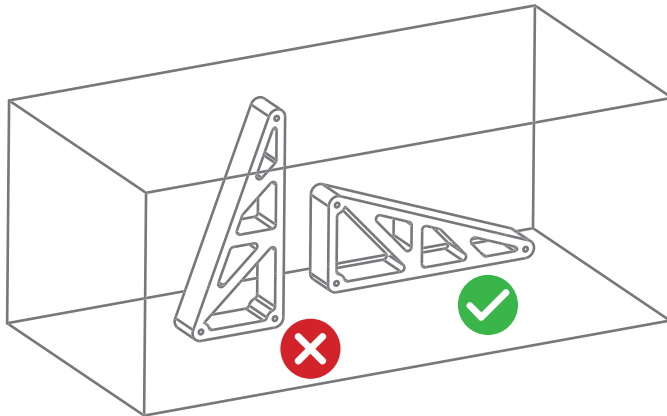
2. PLATING DELICATE PARTS

Vista has the ability to print small parts with very delicate features. To avoid crushing these parts during melt off, do not plate them underneath heavy parts.



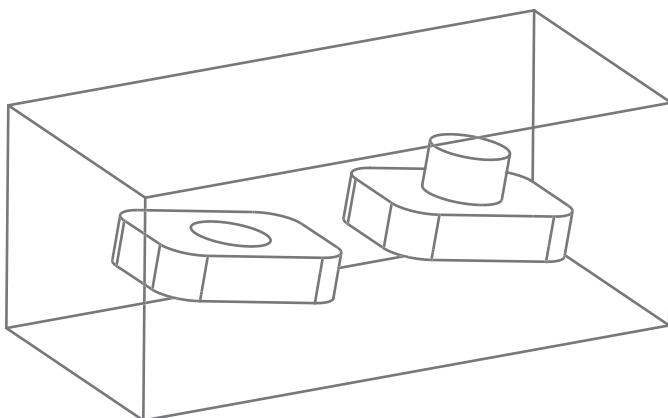
3. ACHIEVING DESIRED MECHANICAL PROPERTIES

Refer to the material data sheet when considering material properties against part orientation.



4. PLATING MATING PARTS TOGETHER

When printing parts that are meant to interface with one another, plate them in the same orientation for best results.



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