Box Lewis

MFG research notes and interim updates

GOALS

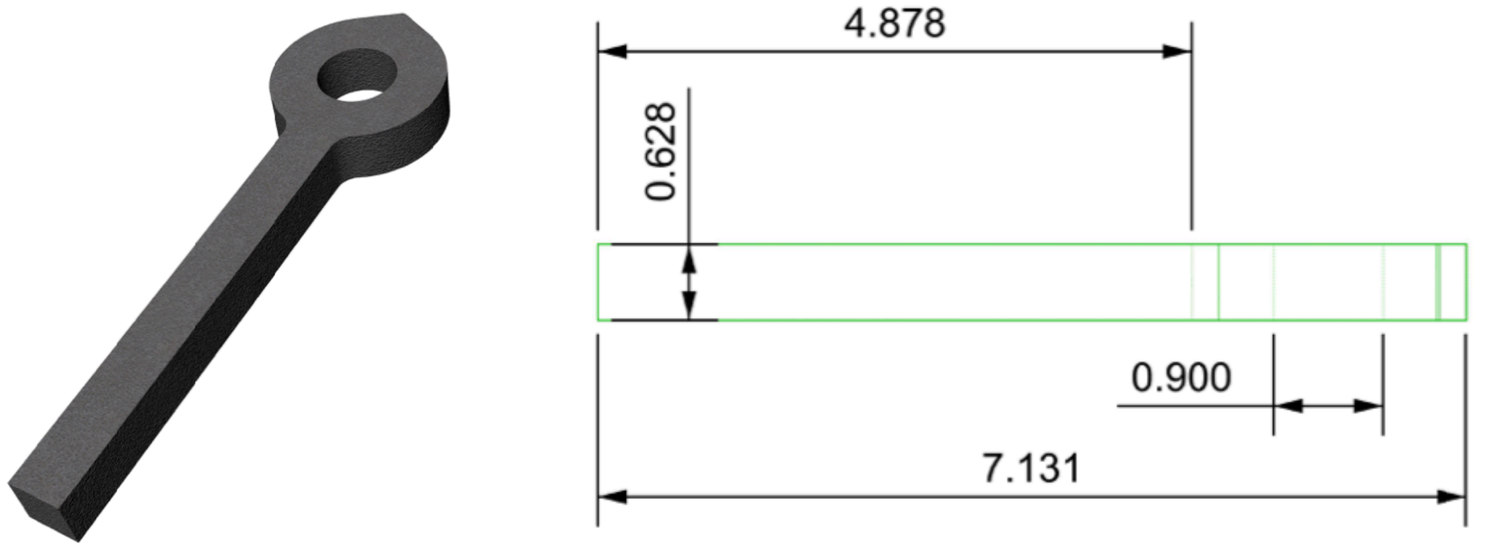
Manufacturing

- Identify the best manufacturing method for making a Box Lewis assembly.
  - Dimension based on the sample assembly
- Assembly must be functional
- Assembly must look as close to the original as possible
- Optimize cost as much as possible

QUOTING REPRESENTATIVE PART

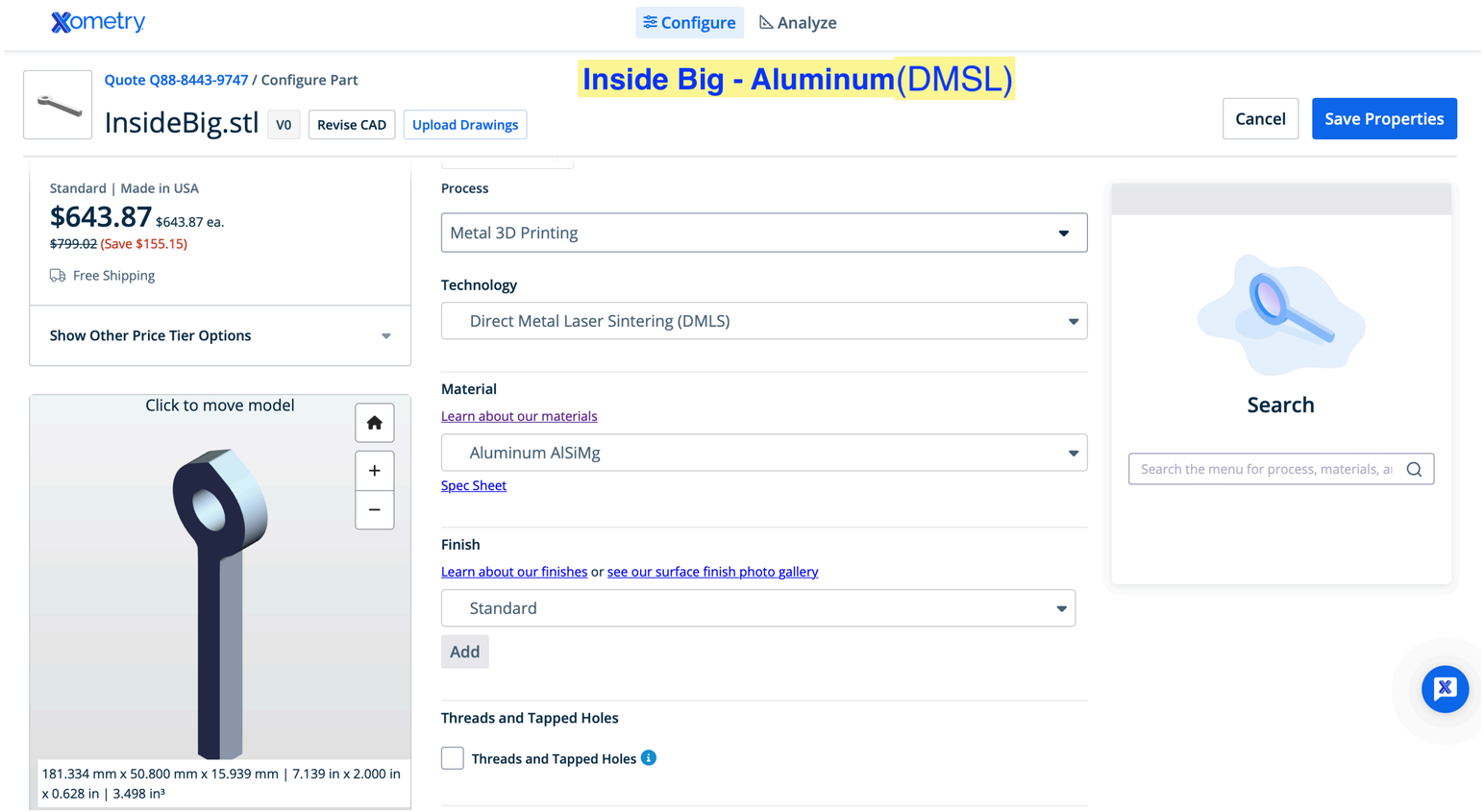
“Make” Parts representative only

- Selected “**inside large**” (see figure below) to get estimates.
- “Inside large” is a good representation of the rest of the parts that need to be manufactured. Not including the Clevis Assembly



XOMETRY

3D Printed Quote - Aluminum



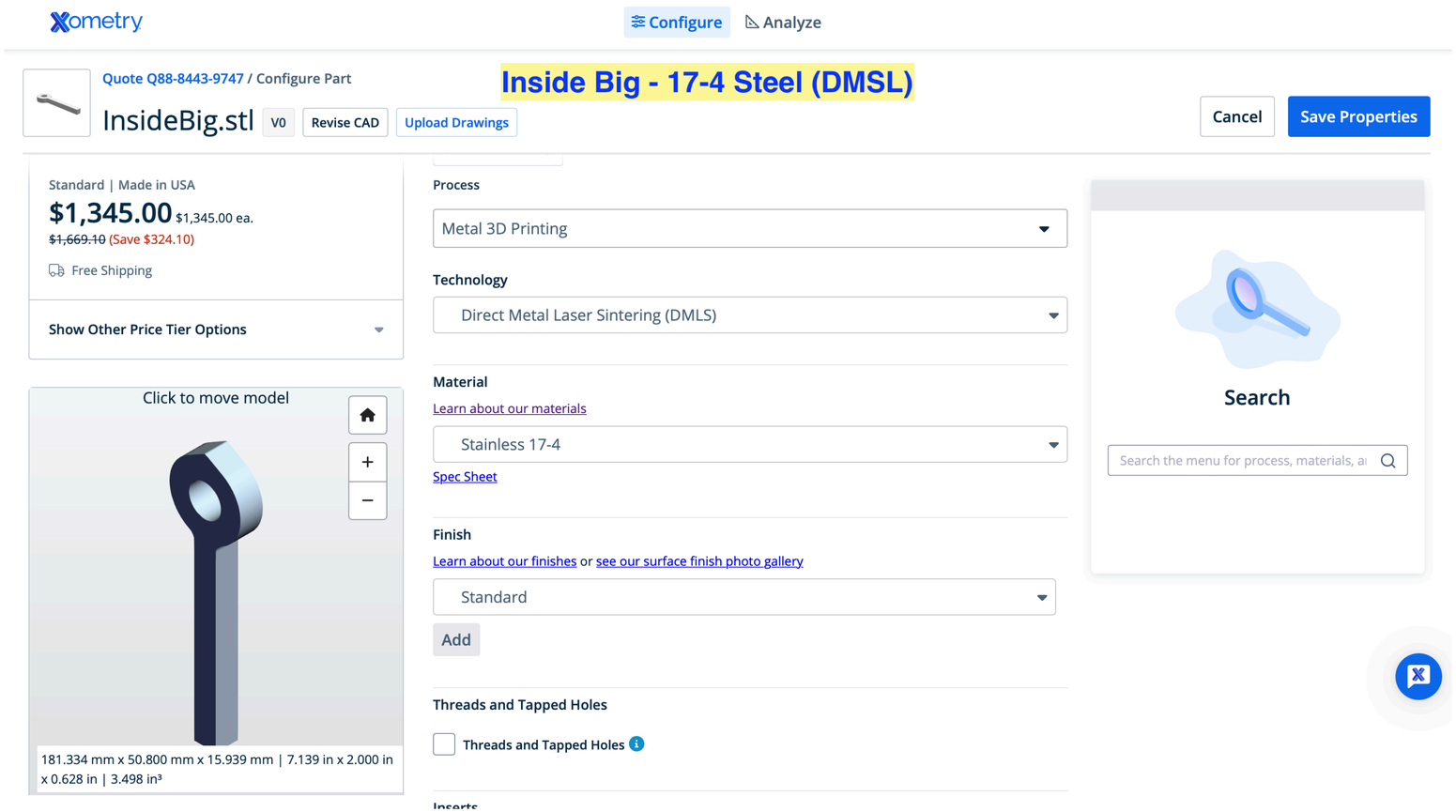
$643.87

Material: AlSiMg
Direct Metal Laser Sintering

Pending: Need to research material properties.
Notes: Continue if water jet or laser/plasma do not work

XOMETRY

3D Printed Quote - Steel 17-4



$1,345.00

Material: Steel 17-4
Direct Metal Laser Sintering

Pending: Need to research material properties.
Notes: Continue if water jet or laser/plasma do not work

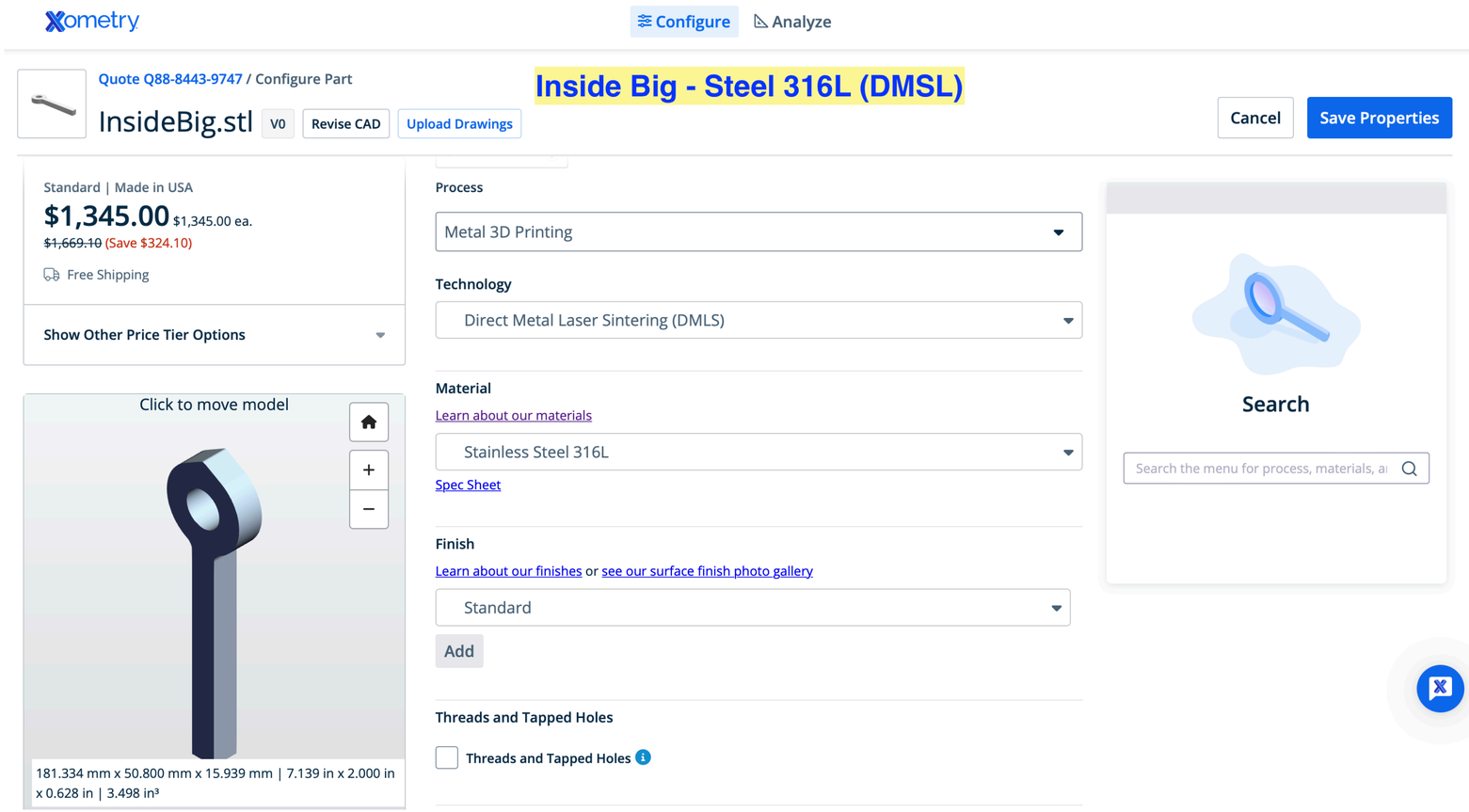
XOMETRY

3D Printed Quote - Steel 316L

$1,345.00

Material: Steel 316L
Direct Metal Laser Sintering

Pending: Need to research material properties.
Notes: Continue if water jet or laser/plasma do not work



PROTOLABS

3D Printed Quote - Multiple Metals

AlSiMg	$1,037.66
Cobalt Chrome	$1,866.02
Inconel 718	$2,006.53
Steel 17-4	$1,401.13
Titanium	$2,053.03

Material: see list
Direct Metal Laser Sintering

Pending: Need to research material properties.
Notes: Continue if water jet or laser/plasma do not work

inside_big

Materials and Resolutions

Direct Metal Laser Sintering (DMLS)	High Res	Micro Res	Normal Res
Aluminum AlSi10Mg	Request	N/A	**$1,037.66**
Cobalt Chrome	Request	N/A	**$1,866.02**
Inconel 718	Request	N/A	**$2,006.53**
Stainless Steel 17-4PH	Request	N/A	**$1,401.13**
Stainless Steel 316L	Request	N/A	**$1,428.47**
Titanium Ti-6Al-4V	Request	N/A	**$2,053.03**
Inconel 718 (X Line)	N/A	N/A	Request
Aluminum AlSi10Mg (X Line)	N/A	N/A	Request

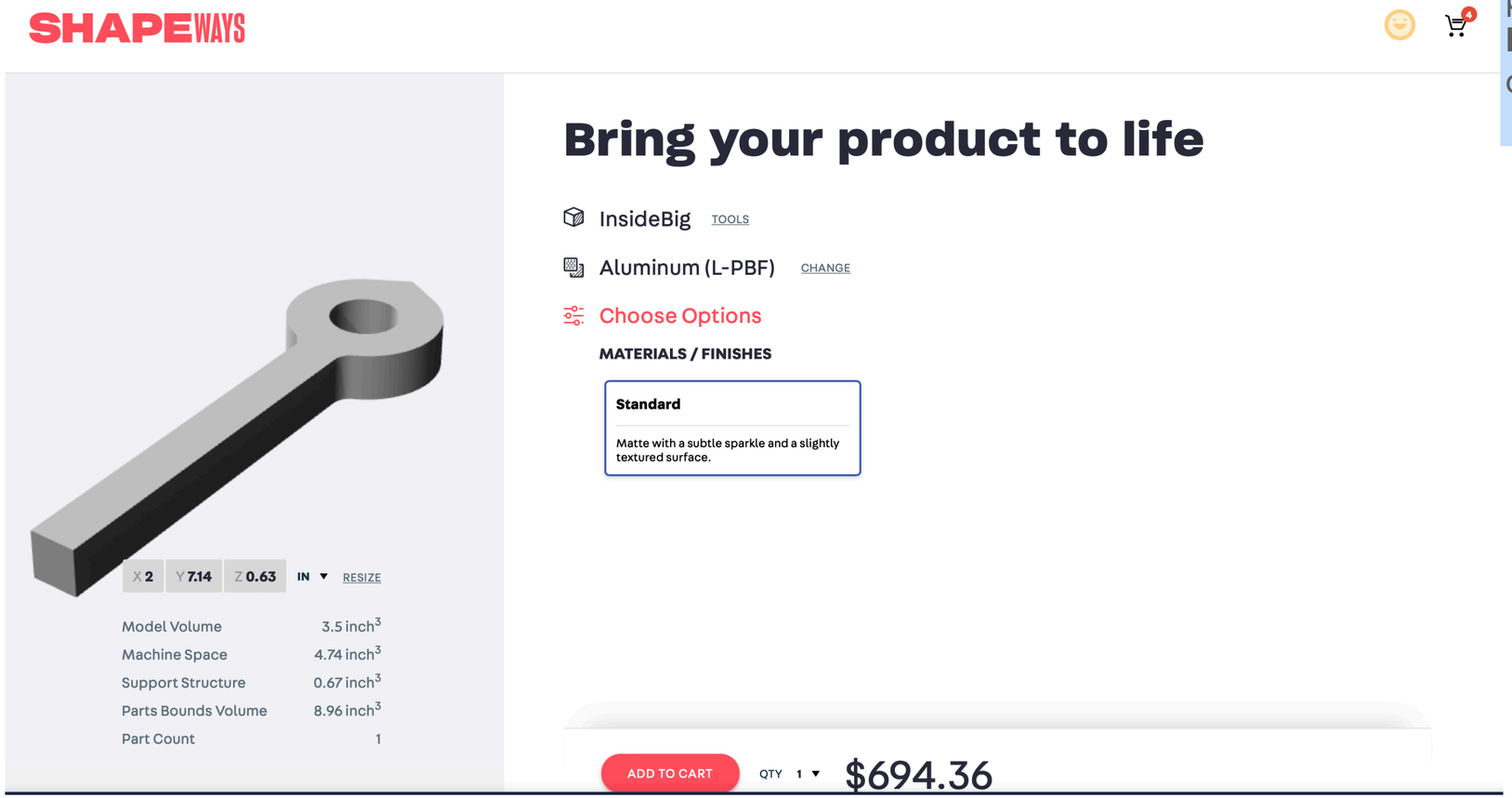
SHAPEWAYS

3D Printed Quote - Aluminum

$694.36

Material: AlSiMg
L-PBF

Pending: Need to research material properties.
Notes: Continue if water jet or laser/plasma do not work



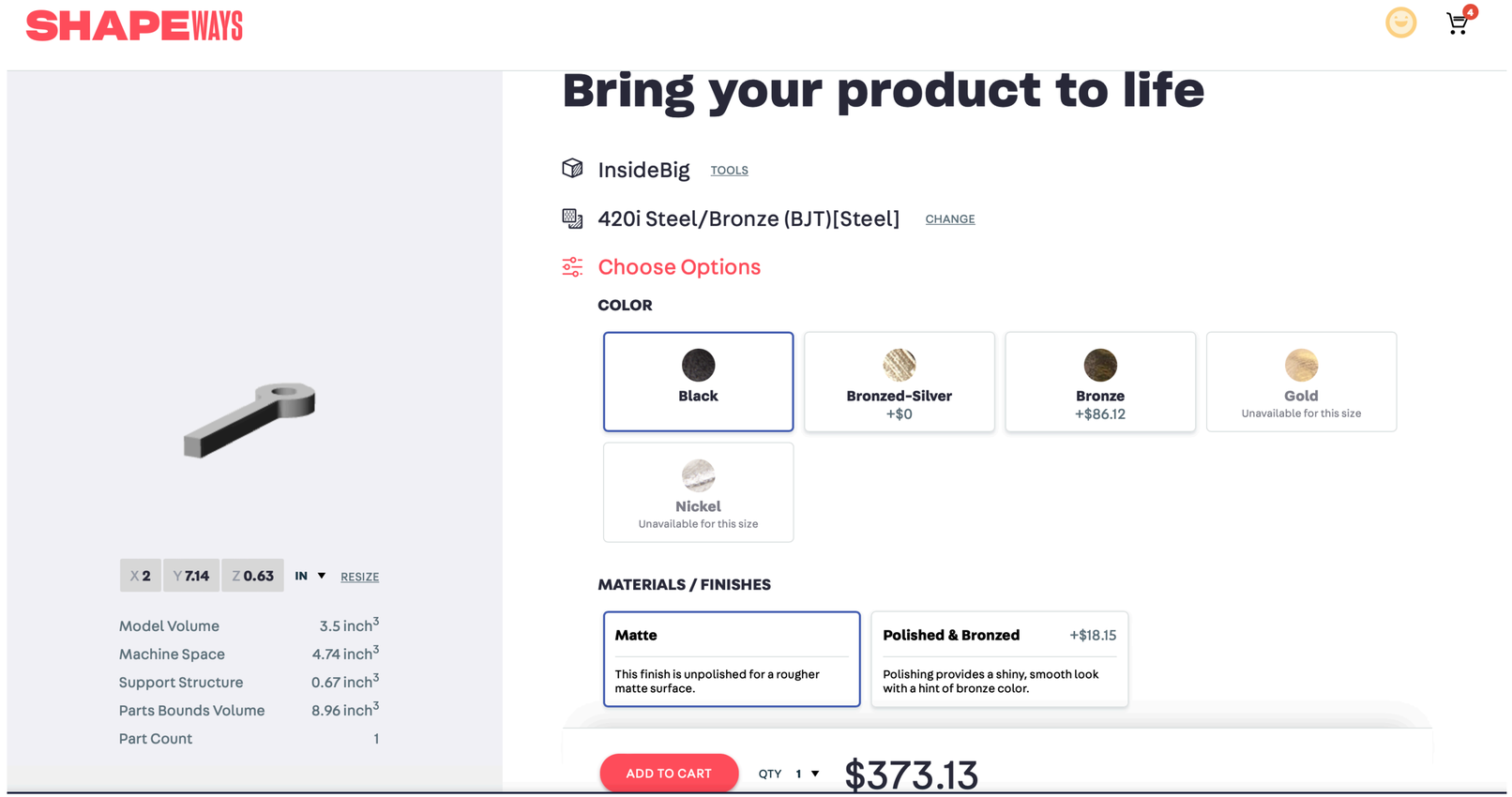
SHAPEWAYS

3D Printed Quote - Steel 420 / Bronze

$373.13

Material: 420 Steel/Bronze
BJT

Pending: Need to research material properties.
Notes: Continue if water jet or laser/plasma do not work

- 

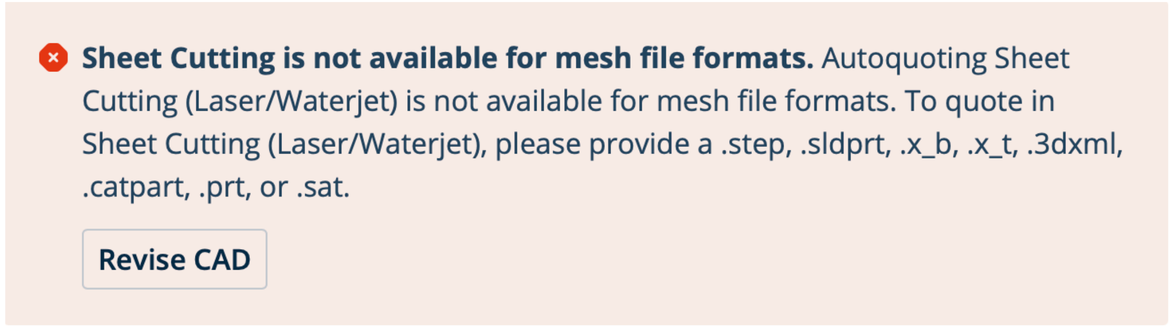
QUOTE SUMMARY

3D Printed Quote - Metal

	Xometry	Protolabs	Shapeways	Method	“Inside Large”	~ for X Parts
AlSiMg	643.87	1,037.66	694.36	3DP		
Steel 17-4	1,345.00	1,401.13		3DP		
Steel 316L	1,345.00			3DP		
Cobalt Chrome		1,866.02		3DP		
Inconel 718		2,006.53		3DP		
Titanium		2,053.03		3DP		
Steel 420 / bronze			373.13	3DP		

STATUS AND NEXT STEPS

5/9/2023



- Status:
  - Initial RFQs for 3D printed metal completed
    - Cost is high, ~ 1K per component.
    - Material properties need verification is used.
  - Unable to quote Waterjet or Laser cutting due to CAD file formats
    - STL files cannot be used for this mfg method.
- Next Steps:
  - Covert files into required formats for Waterjet or Laser cutting quotes
  - Continue research for COTS parts (clevis assembly)

Back up

REFERENCE DOCUMENTS

Documents in GitHub repo

- Shapeways All Materials-Guide-2021.pdf
- Shapeways-Aluminum_General_Info.pdf
- Shapeways-Steel_General_Info.pdf
- Protolabs Aluminum Datasheet - Material-Data-SheetAluminum.pdf
- Xometry - Stainless Steel 3D Printing | Material Properties and Applications.pdf