

Next Generation Smeg Hand Mixer

Jordan Patten (netid: pjordan1) | R1.0 | 08 APR 2025
Project Materials Submission, MeEn 272



This document provides the following design artifacts for the Smeg Hand Mixer assembly:

1. Title page with rendering of final assembly.
2. Full page non-annotated rendering of final assembly without charger case.
3. Full page non-annotated rendering of final assembly with charger case.
4. Full page photo illustration of benchmark and next generation hand mixer.
5. Full page annotated exploded rendering showing names of parts.
6. Conceptual sketches.
7. CAD strategies.
8. Articulation of why the new design is justifiably next generation.
9. Articulation of analyses and results.
10. Assembly drawings (engineering drawings).
11. Part drawings (engineering drawings).

Revision History

Revision	Date	Description
R1.0	07 Apr 2025	Initial Release
R2.0	08 Apr 2025	Completed Design Package



Next Generation Smeg Hand Mixer | J. Patten



Next Generation Smeg Hand Mixer | J. Patten

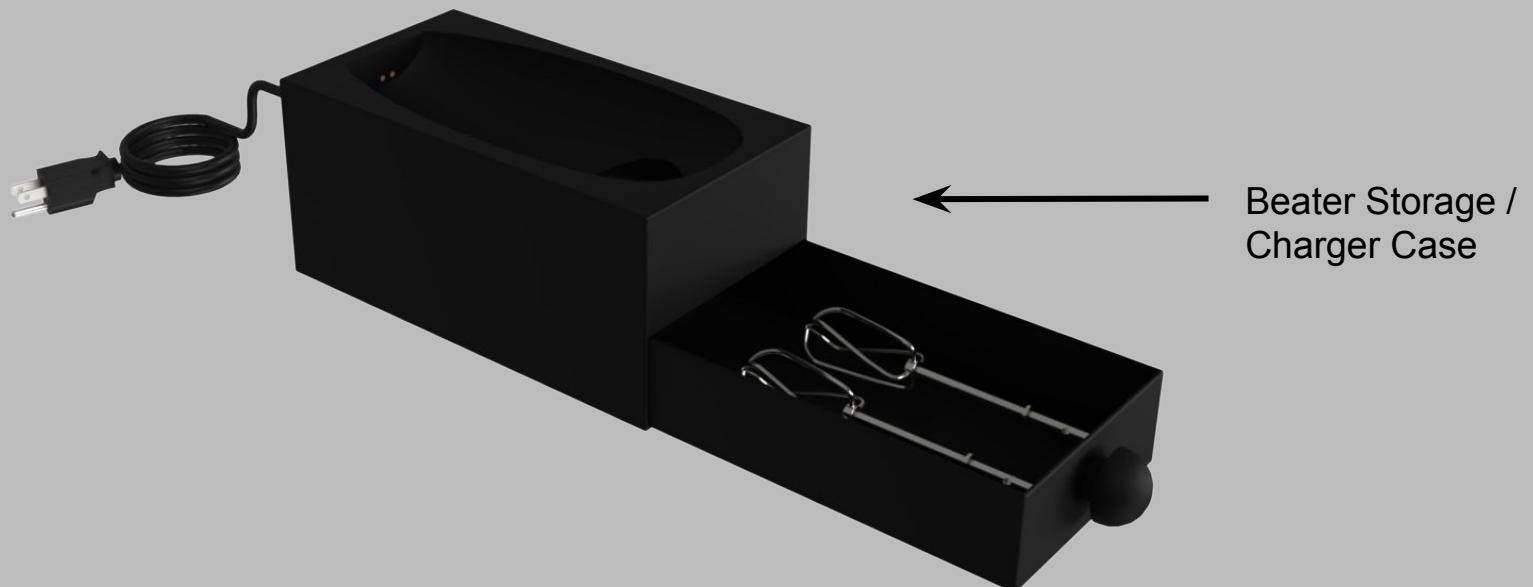
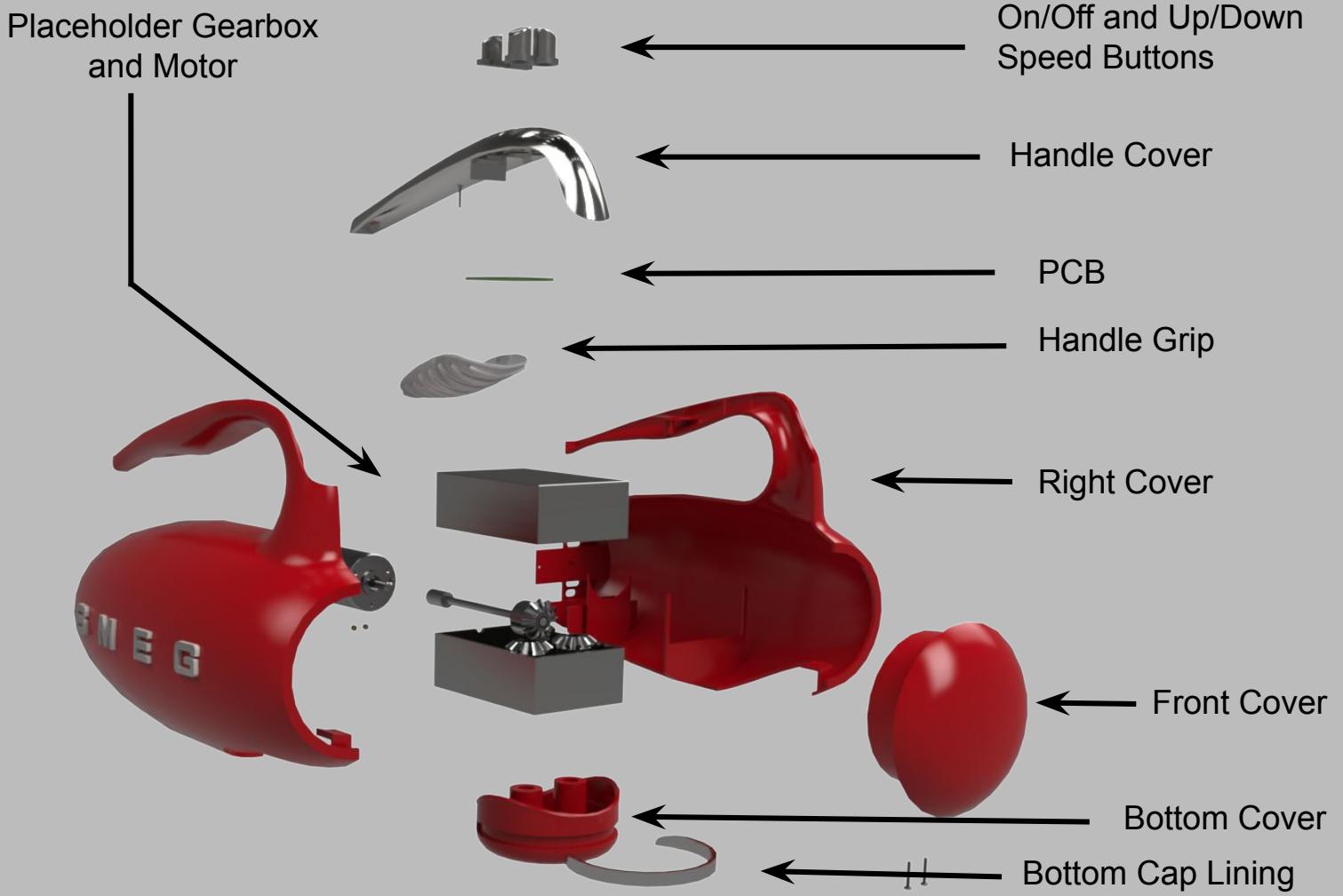


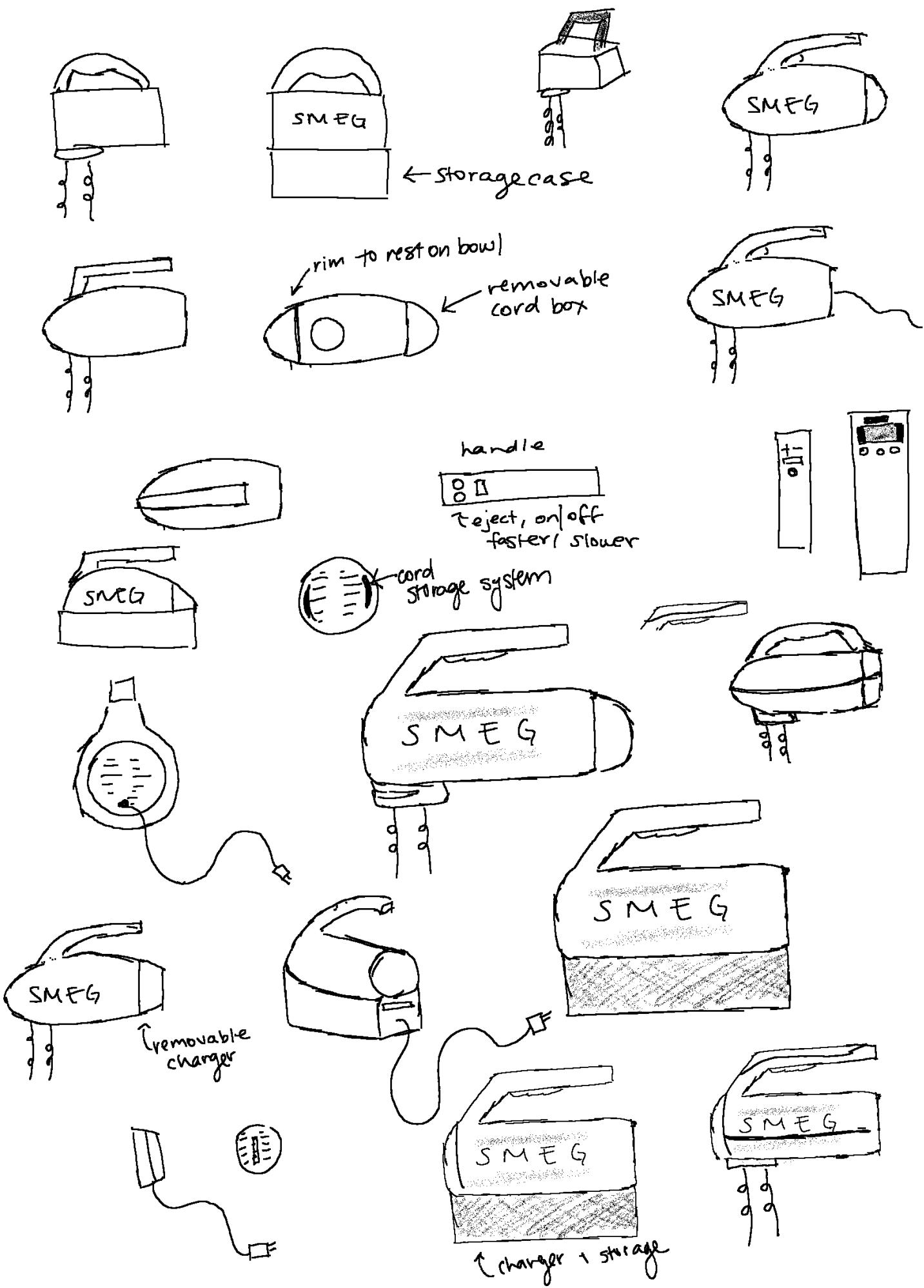
LED Display with Set
Timer / Adjustable
Speeds

Ergonomic Grip

Self Balancing

Bowl Rest

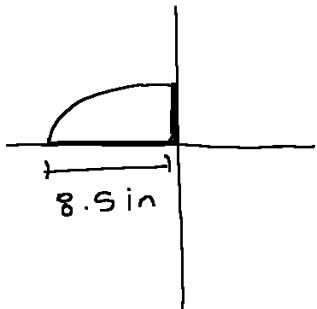




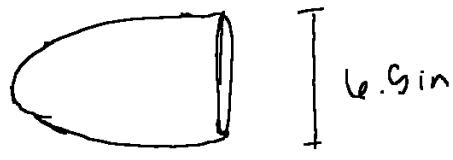
J. Patten

MASTER MODEL

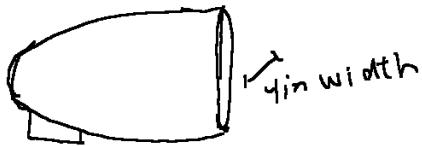
① Sketch on right plane



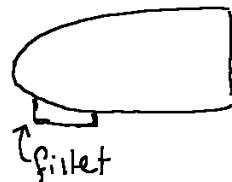
② Revolve



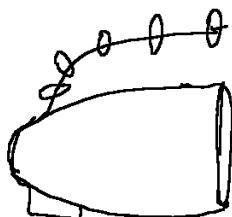
③ Sketch on Top plane
+ extrude down



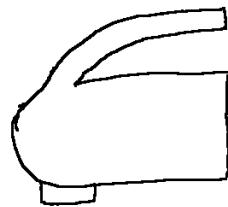
④ Add fillet



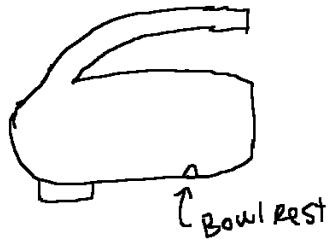
④ Draw guide curves +
sketches



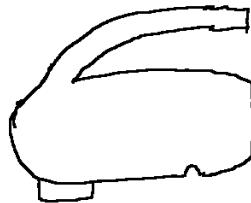
⑤ Complex Loft + match curvature



⑥ Sketch on Right Plane

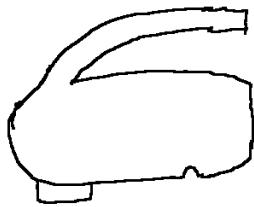


⑦ Extrude remove

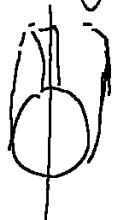


Right / Left Cover

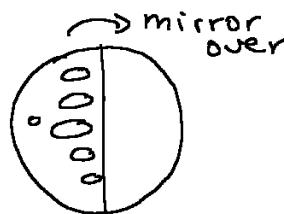
① Derive Master Model



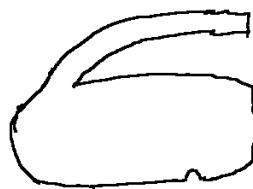
③ Split using right plane



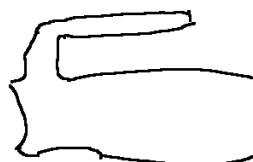
⑤ Sketch + extrude screw holes / vents on back



② Create offset surface + thicken



④ Use Boolean remove to take out handle cover / front cover / Bottom cover



⑥ Sketch + Extrude ribs on inside

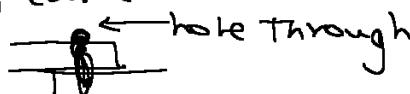
A Front cover



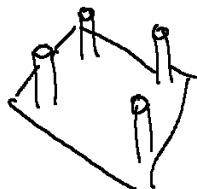
B Back Connection Both sides



C Top connection

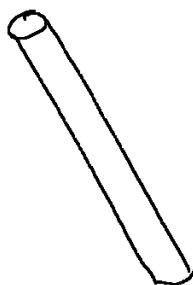


⑦ Sketch + Extrude PCB support in handle



Beater Attachment

① Sketch Circle + Extrude



② Draw Rectangles + half circles
extrude remove



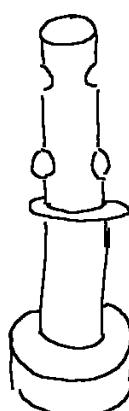
③ Fillet top + rectangles



④ Draw half circles + extrude



⑤ Draw + extrude cylinder in
middle and on end



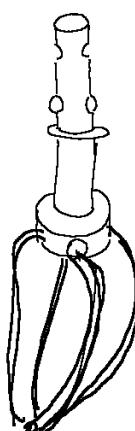
⑥ Draw circle on bottom cylinder
Draw free form spline



⑦ Sweep circle along spline



⑧ Circular Pattern x 4



Next Generation Justification

The benchmark design for this next generation model is the SMEG Hand Mixer HMF01. It received between 4 and 4.5 star ratings on the most common e-commerce sites. Examining the reviews placed by consumers, it was clear that many features were well-loved, but others still had room for improvement.

Features for improvement based on consumer reviews:

1. Eject button for taking the beaters out instead of an eject switch, allowing for easier access and a smoother eject process.
2. Included charger case so the cord doesn't get in the way during use, transitioning the mixer to be powered by a rechargeable battery.

Features for improvement based on personal experience:

3. Include a bowl rest located near the bottom back of the mixer so that a user can set the mixer on the edge of the bowl when not in use.
4. Larger surface area on the ergonomic grip (a highly rated feature).
5. Included storage case (combined with charger case) so the user can easily keep track of attachments.

Features assumed need improvement:

6. Styling update, including a flatter handle that doesn't connect back into the body at the back.
7. Modernization, including an updated button / screen interface.

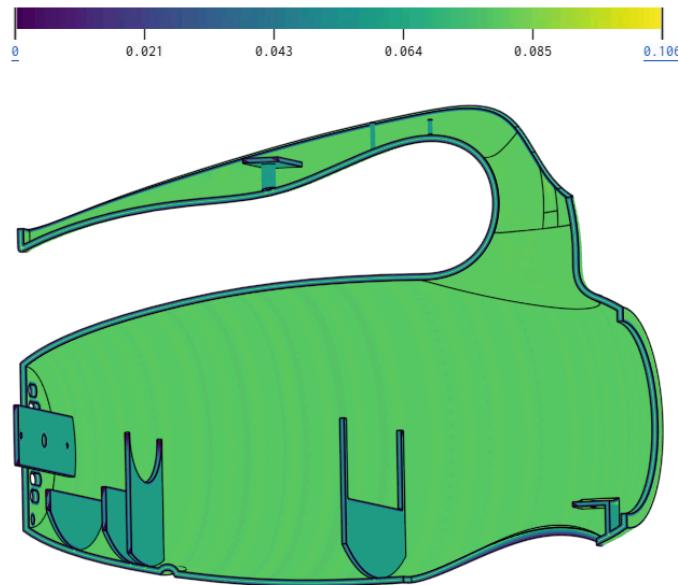
The next generation design improves these items. It also keeps recognizable and consumer approved features of the original design, namely:

- The same approximate size
- The smooth, retro look
- The self-balancing design
- The nine speed options and LED display with set timer

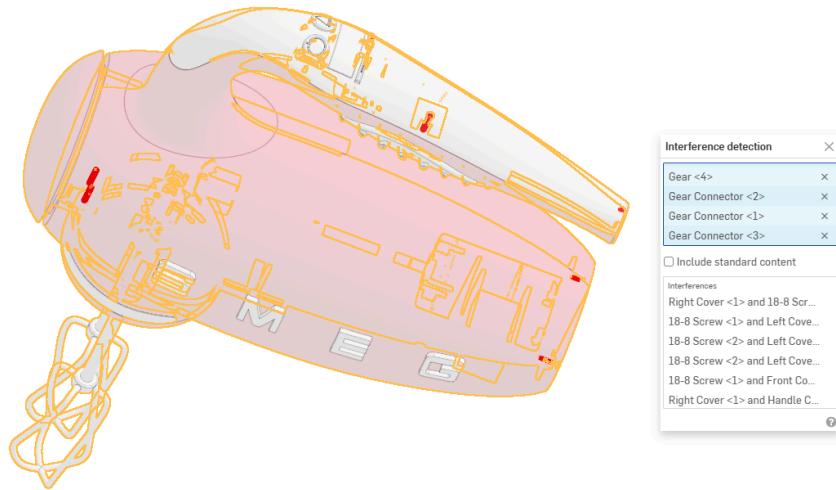
Summary of Analyses Performed

Throughout the modeling process, many evaluations were performed to verify that the finished product would follow the constraints placed upon it during the design process. These tests were all carried out several times so that corrections could be made between tests. The tests were performed, and the final results are outlined below.

- A mass properties test was performed for each part, verifying that all had suitable material assigned and proper volume.
- A mass properties test was performed on the total assembly, revealing a weight of 2.206 lb. This is well below the provided limit of 3.1 lbs. Some of the internal features were modeled only as placeholders or not at all, so this can account for the discrepancy in the weights.
- Measurements of final dimensions were taken using the measure feature in Onshape. The model has a height of 6.794 inches, a length of 8.596 inches, and a width 4.013 inches. The dimensions of the previous generation are 6.5 x 8.5 x 4 inches, so the next generation model fits well in size compared to the benchmark.
- An interference analysis was run on the both complete assemblies (one with included storage/charger case, one without).
- A thickness analysis was run on individual parts to ensure the model could be made with injection molding.
- Zebra stripes were used to ensure parts have a constant curvature.



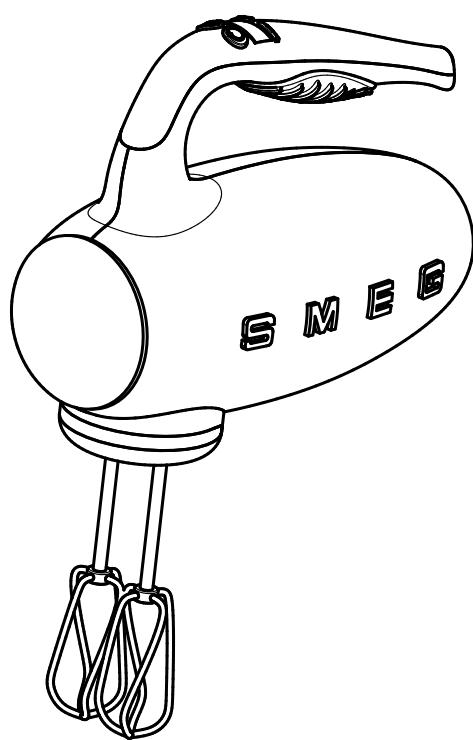
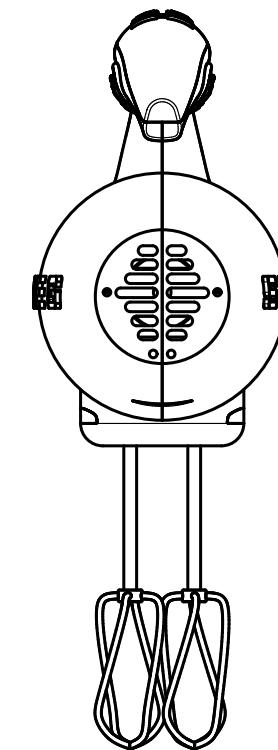
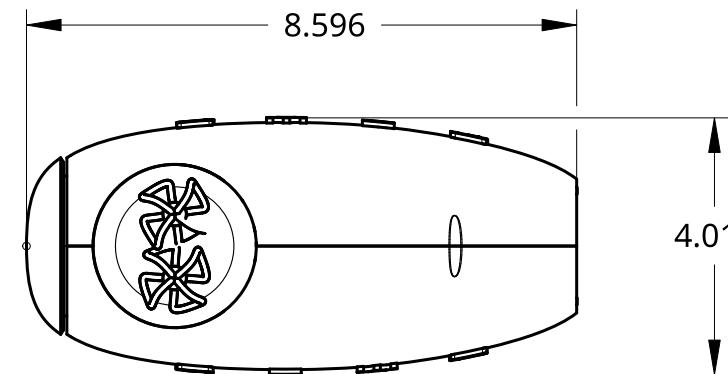
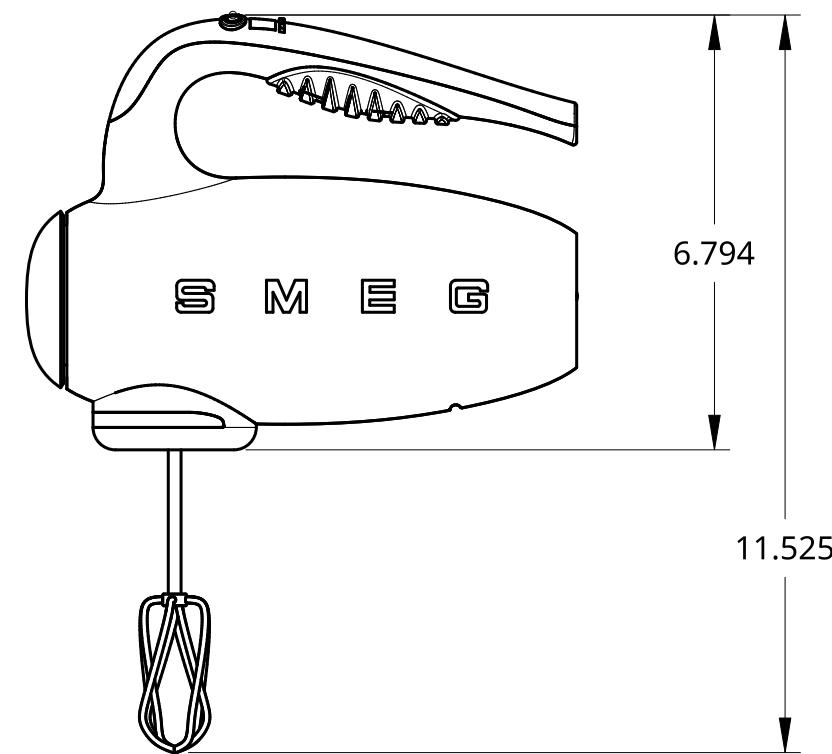
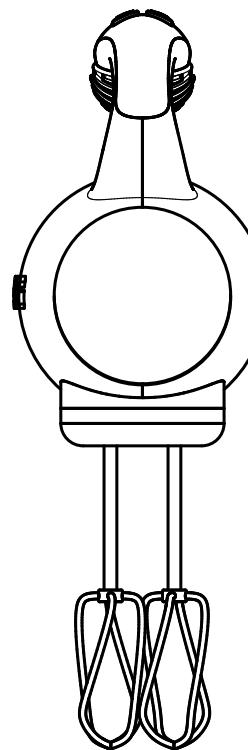
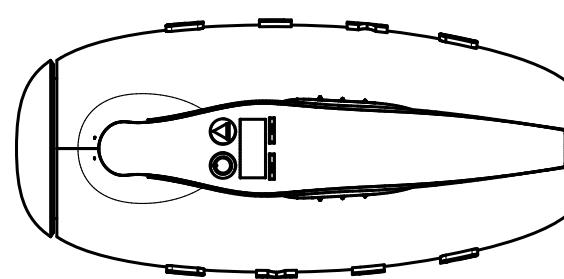
Thickness Analysis: When run on the plastic parts, the thickness analysis reveals a constant outer wall thickness of 0.08 inches, and a thickness of 0.06 for the internal ribs and supports, as outlined in the design constraints. This implies the part could be modeled by injection molding.



Interference Analysis: There were five interferences detected. Four of the interferences are caused by screws holding the model together, which were expected. However, there is one interference between the handle cover and the right cover, the top right interference. This interference was caused by an incorrect boolean operation along an offset surface created by a loft. It was caught early on in the modeling process, but after working with several more knowledgeable persons, it was determined to be an error with Onshape processing and not worth the time it would take to fix because of the insignificant volume of the interference. When run on the other assembly (with the charger case), the interference analysis detected the same five interferences.



Zebra Stripes: When turned on, zebra stripes reveal a pretty constant curvature for each part. The curvature of the SMEG letters and of the front cover matches that of the body as intended, and the curvature of the buttons matches that of the handle, as does the handle grip. The merging of curvatures between the handle and the body is satisfactory as well.

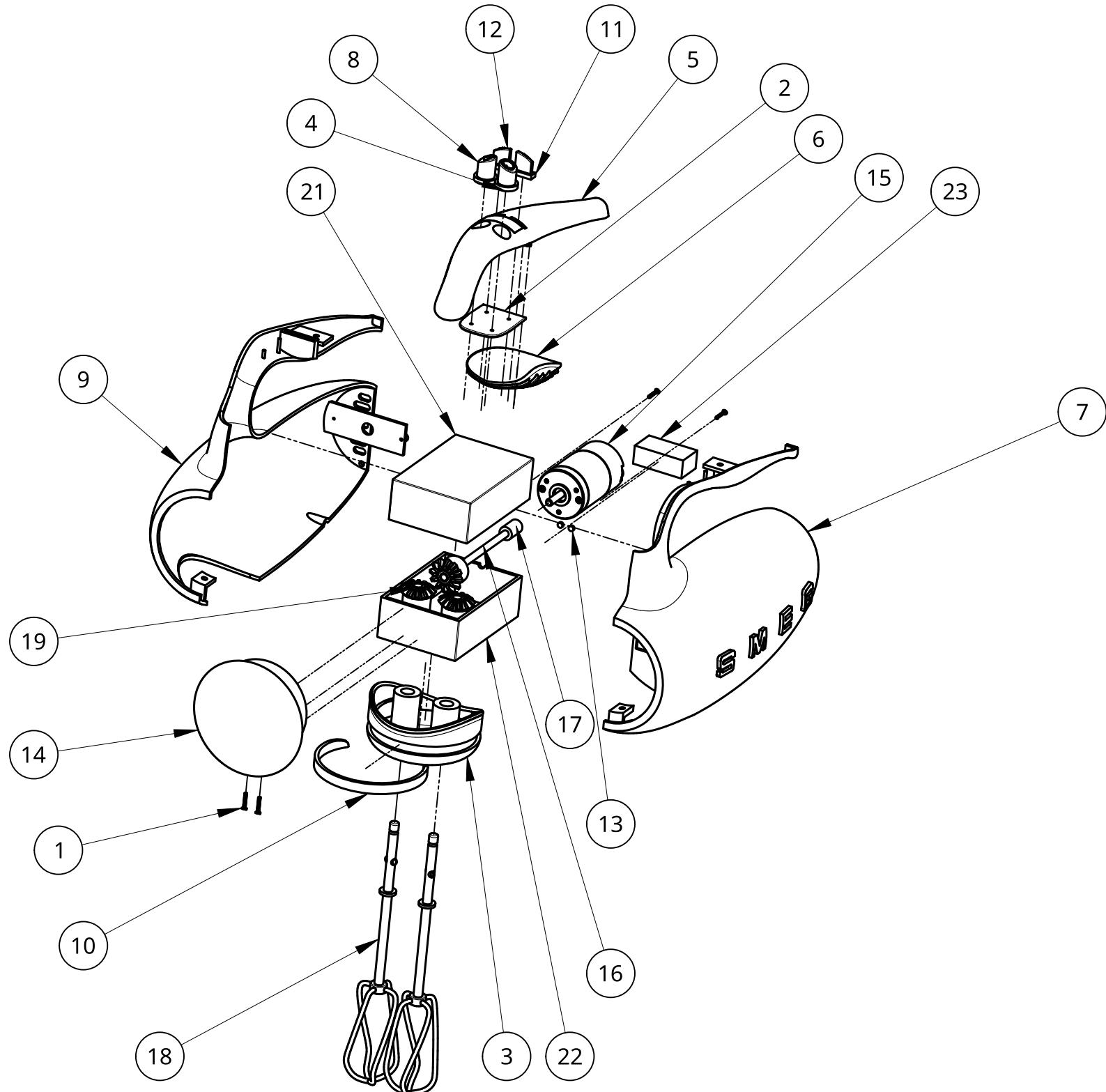


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0.00 = ±0.01	0.0 = ±0.25		
0.000 = ±0.005	0.00 = ±0.15		
	0.000 = ±0.05		
ANGULAR:		COMMENTS	
0.0 = ±1		STORAGE CASE WITH CHARGING PORT NOT INCLUDED IN DRAWING	
0.00 = ±0.5			
DO NOT SCALE DRAWING			

BYU ENGINEERING

HAND MIXER

SIZE	PART NUMBER	REVISION
B	4293A	A
SCALE	1:3	WEIGHT 2.206 LB SHEET 1 of 3



Item	Quantity	Part Number	Description
1	5	91792A057	18-8 Stainless Steel Pan Head Slotted Screw
2	1	93482B063	PCB
3	1	73469H007	Bottom Cap
4	1	43986B071	On/Off Button
5	1	58912M079	Handle Cover
6	1	9387K062	Handle Grip
7	1	87354C003	Left Cover
8	1	43986B072	Eject Button
9	1	87354C004	Right Cover
10	1	87354C005	Bottom Cap Liner
11	1	43986B073	Speed Down Button
12	1	43986B074	Speed Up Button
13	2	39287G017	Brass Charger Caps
14	1	87354C006	Front Cover
15	1	6331K14	Compact Round Face DC Motor
16	1	6778K17	Gear Shaft
17	1	6778K19	Gear Shaft Connector
18	2	18293A089	Beater Attachment
19	3	6529K43	Metal Miter Gear
20	3	6778K21	Gear Box Connector
21	1	6778K47	Gear Box Top Cover
22	1	6778K48	Gear Box Bottom Cover
23	1	91832M037	Rechargeable Battery

UNLESS OTHERWISE SPECIFIED
TOLERANCES ARE

INCH: 0.0 = ±0.02 MM: 0. = ±0.50

0.00 = ±0.01 0.0 = ±0.25

0.000 = ±0.005 0.00 = ±0.15

0.000 = ±0.05

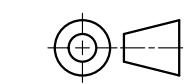
ANGULAR:
0.0 = ±1

0.00 = ±0.5

COMMENTS:
STORAGE CASE WITH CHARGING PORT NOT INCLUDED IN DRAWING

STORAGE CASE WITH CHARGING PORT NOT INCLUDED IN DRAWING

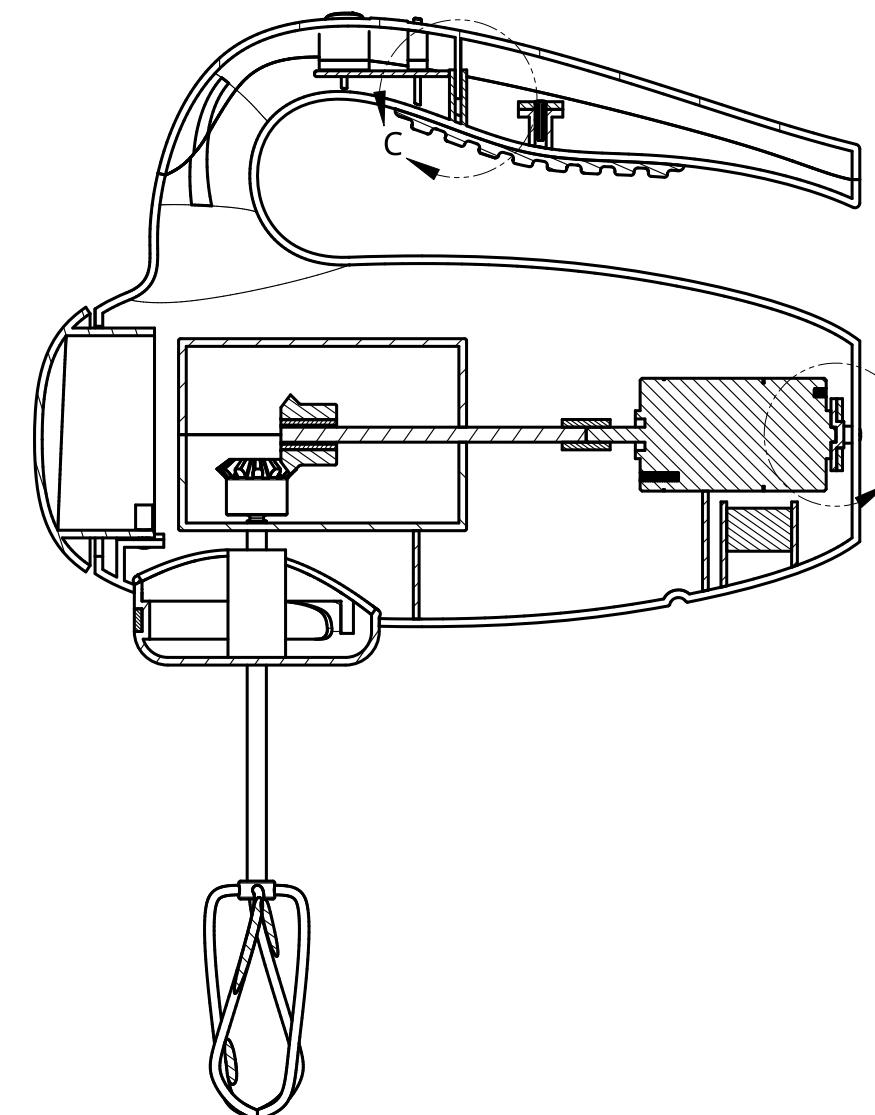
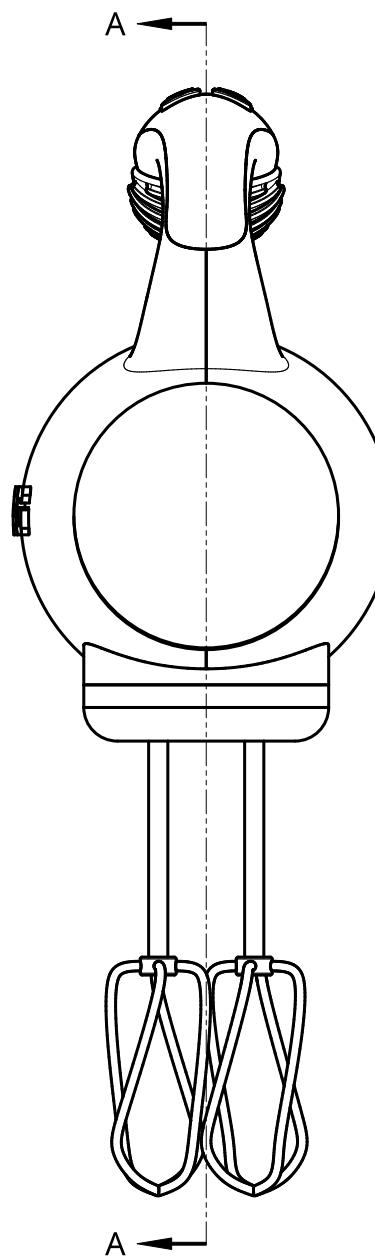
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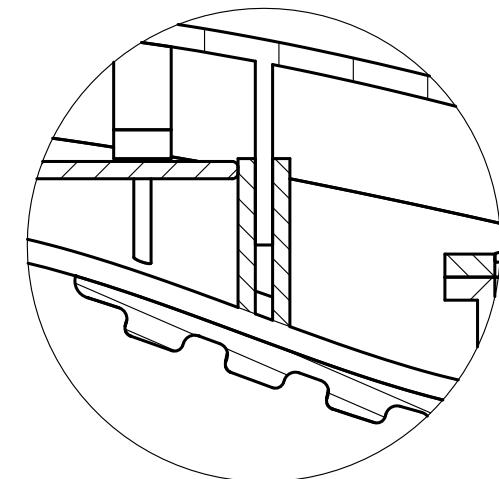
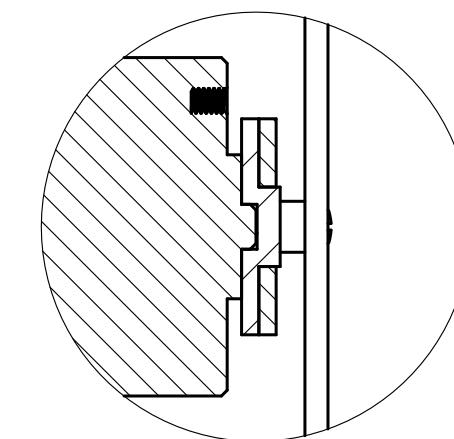
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HAND MIXER

TITLE	SIZE	PART NUMBER	REVISION
	1:3	2.206 LB	Sheet 2 of 3



SECTION A - A

DETAIL C
SCALE 3:2DETAIL B
SCALE 3:2

UNLESS OTHERWISE SPECIFIED
TOLERANCES ARE

INCH: MM:
0.0 = ±0.02 0. = ±0.50
0.00 = ±0.01 0.0 = ±0.25
0.000 = ±0.005 0.00 = ±0.15
0.000 = ±0.05 0.000 = ±0.05

ANGULAR:
0.0 = ±1
0.00 = ±0.5



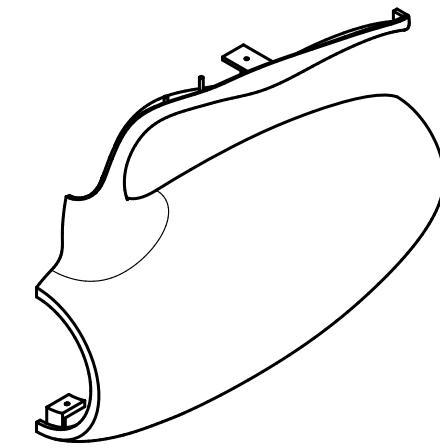
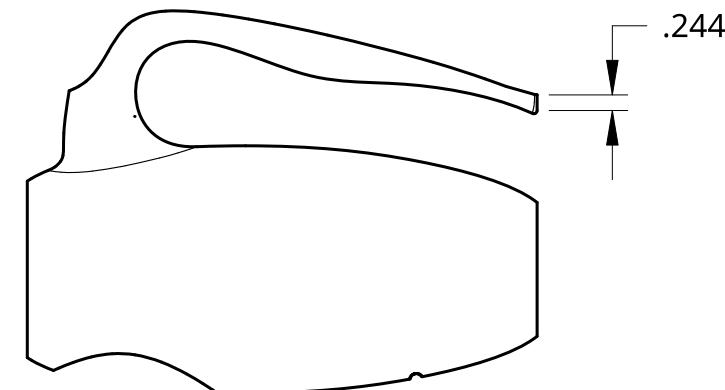
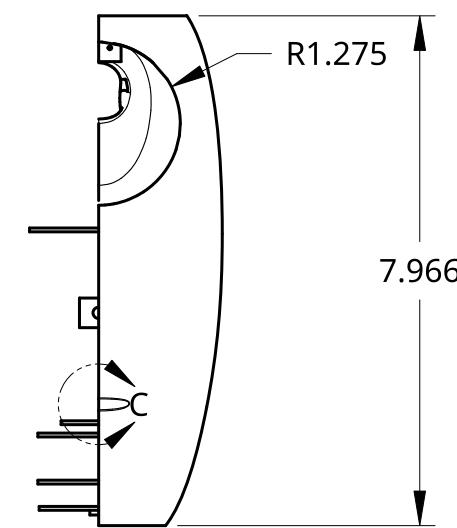
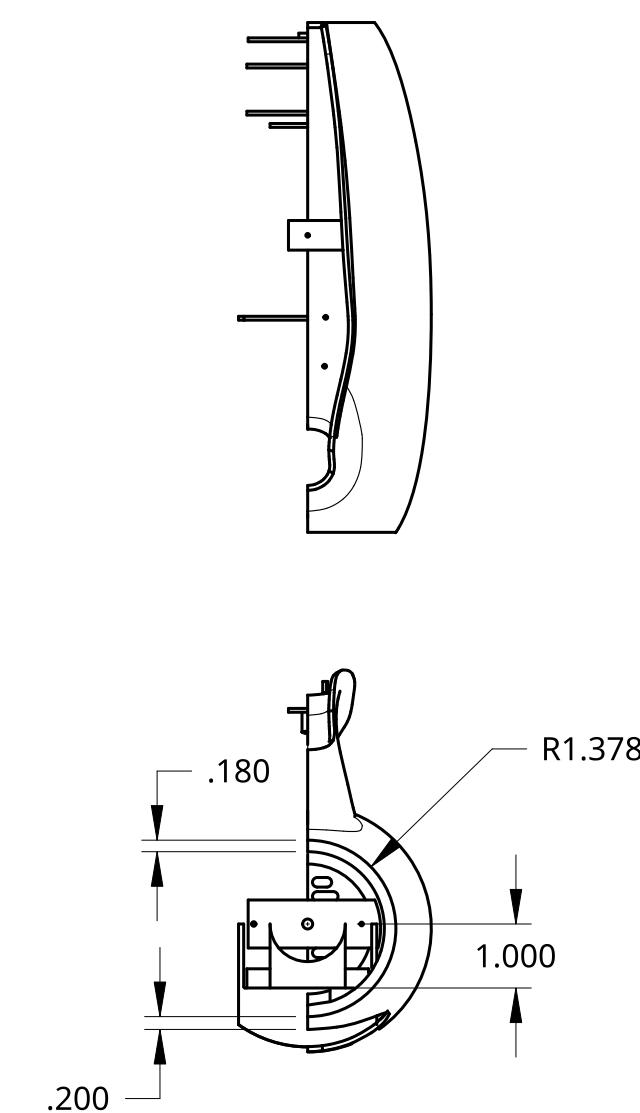
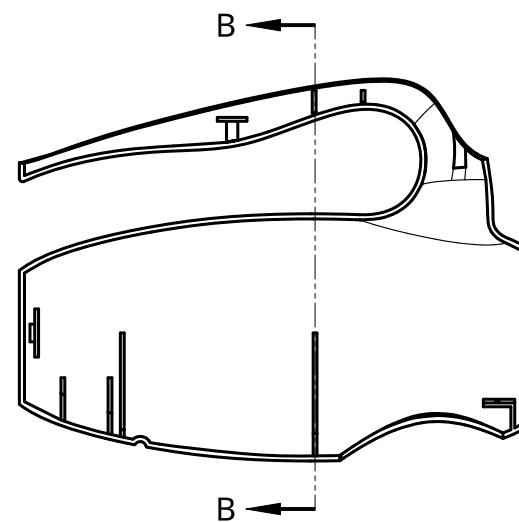
DO NOT SCALE DRAWING

BYU ENGINEERING**HAND MIXER**

TITLE		
SIZE	PART NUMBER	REVISION
B	4293A	A
SCALE 1:2	WEIGHT 2.206 LB	SHEET 3 of 3

REVISION HISTORY

REV.	DESCRIPTION	DATE
A	INITIAL RELEASE	04/08/2025



NOTES:

1. CONSTANT BODY WALL THICKNESS OF 0.08 IN
2. INTERNAL RIBS AND SUPPORTS HAVE WALL THICKNESS OF 0.06 IN

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE		NAME	DATE
INCH:	MM:	J. PATTEN	04/07/2025
0.0 = ±0.02	0. = ±0.50		
0.00 = ±0.01	0.0 = ±0.25		
0.000 = ±0.005	0.00 = ±0.15		
	0.000 = ±0.05		
ANGULAR:			
0.0 = ±1			
0.00 = ±0.5			
COMMENTS			
COLOR SPECIFICATION: R - 220 G - 15 B - 45			
DO NOT SCALE DRAWING			

BYU ENGINEERING**LEFT COVER**

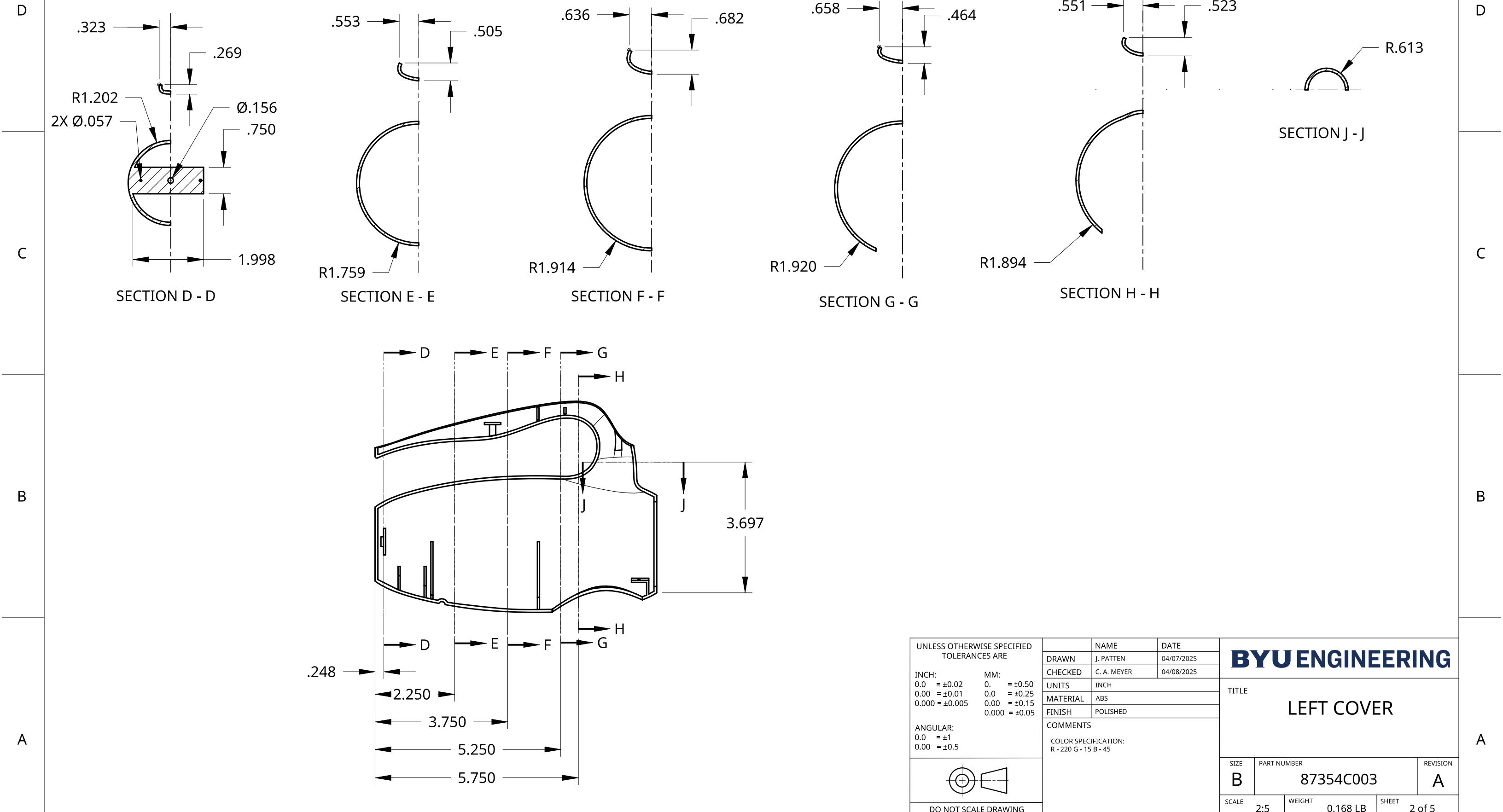
SCALE 1:3 WEIGHT 0.168 LB SHEET 1 of 5

4

3

2

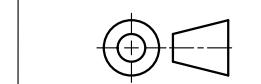
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UNLESS OTHERWISE SPECIFIED
TOLERANCES ARE

INCH: 0.0 = ±0.02	MM: 0. = ±0.50
0.00 = ±0.01	0.0 = ±0.25
0.000 = ±0.005	0.00 = ±0.15
	0.000 = ±0.05

ANGULAR:
0.0 = ±1
0.00 = ±0.5

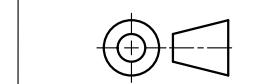


DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
TOLERANCES ARE

INCH: 0.0 = ±0.02	MM: 0. = ±0.50
0.00 = ±0.01	0.0 = ±0.25
0.000 = ±0.005	0.00 = ±0.15
	0.000 = ±0.05

ANGULAR:
0.0 = ±1
0.00 = ±0.5



DO NOT SCALE DRAWING

BYU ENGINEERING

LEFT COVER

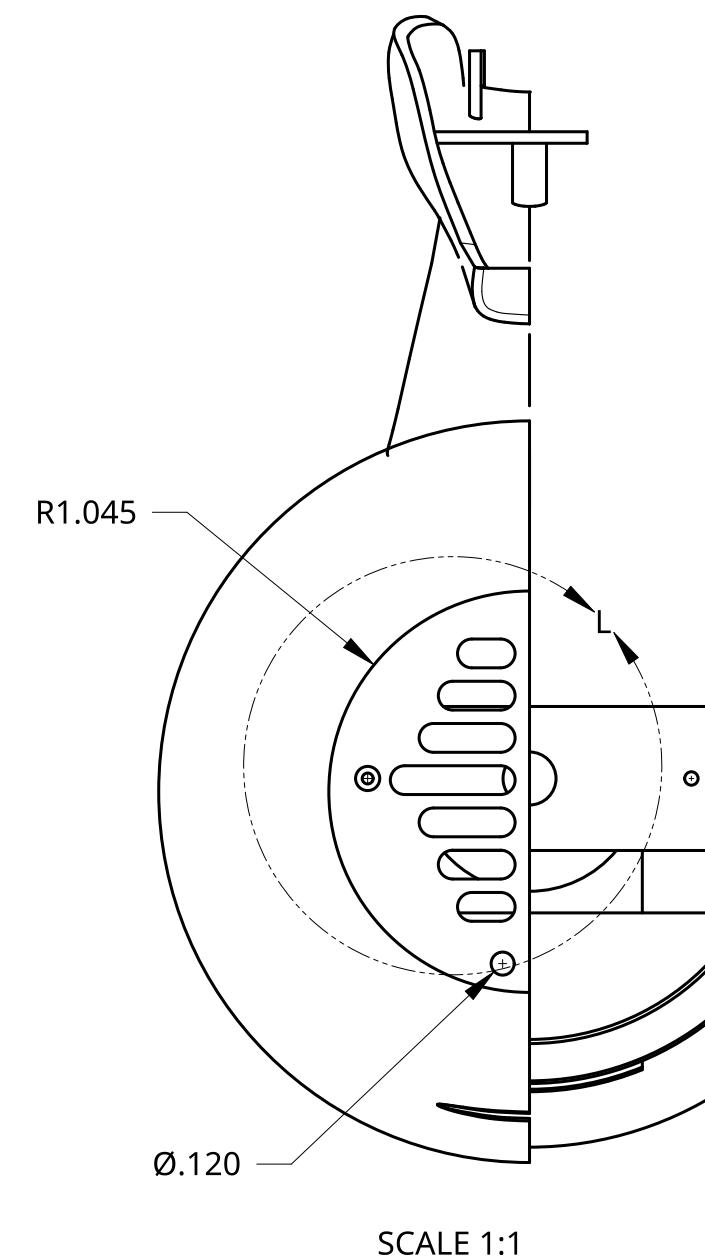
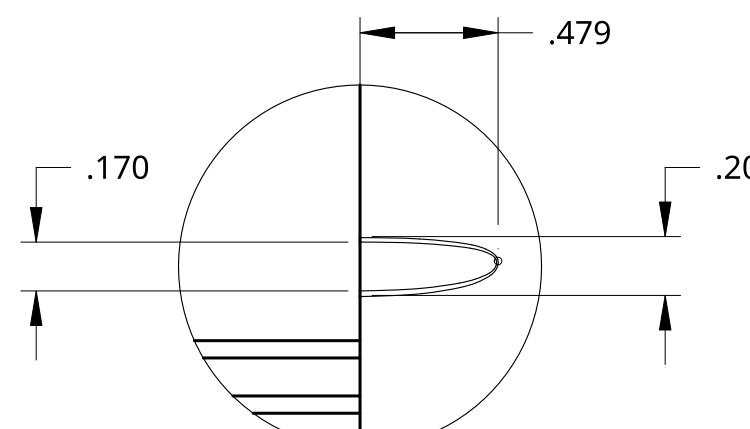
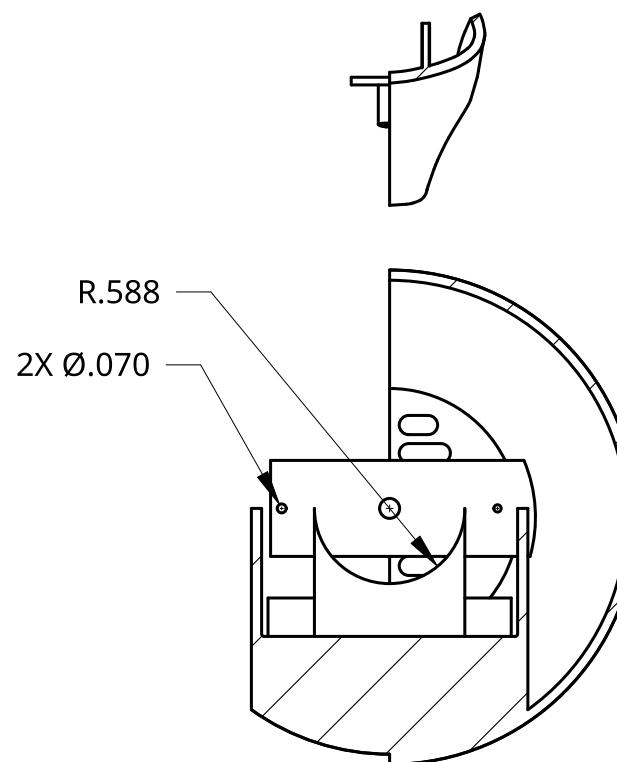
SIZE PART NUMBER REVISION

B 87354C003 A

SCALE WEIGHT SHEET

2:5 0.168 LB 2 of 5

D



UNLESS OTHERWISE SPECIFIED
TOLERANCES ARE

INCH: MM:
0.0 = ±.02 0. = ±.50
0.00 = ±.01 0.0 = ±.25
0.000 = ±.005 0.00 = ±.15
0.000 = ±.005 0.000 = ±.05

ANGULAR:
0.0 = ±1
0.00 = ±0.5



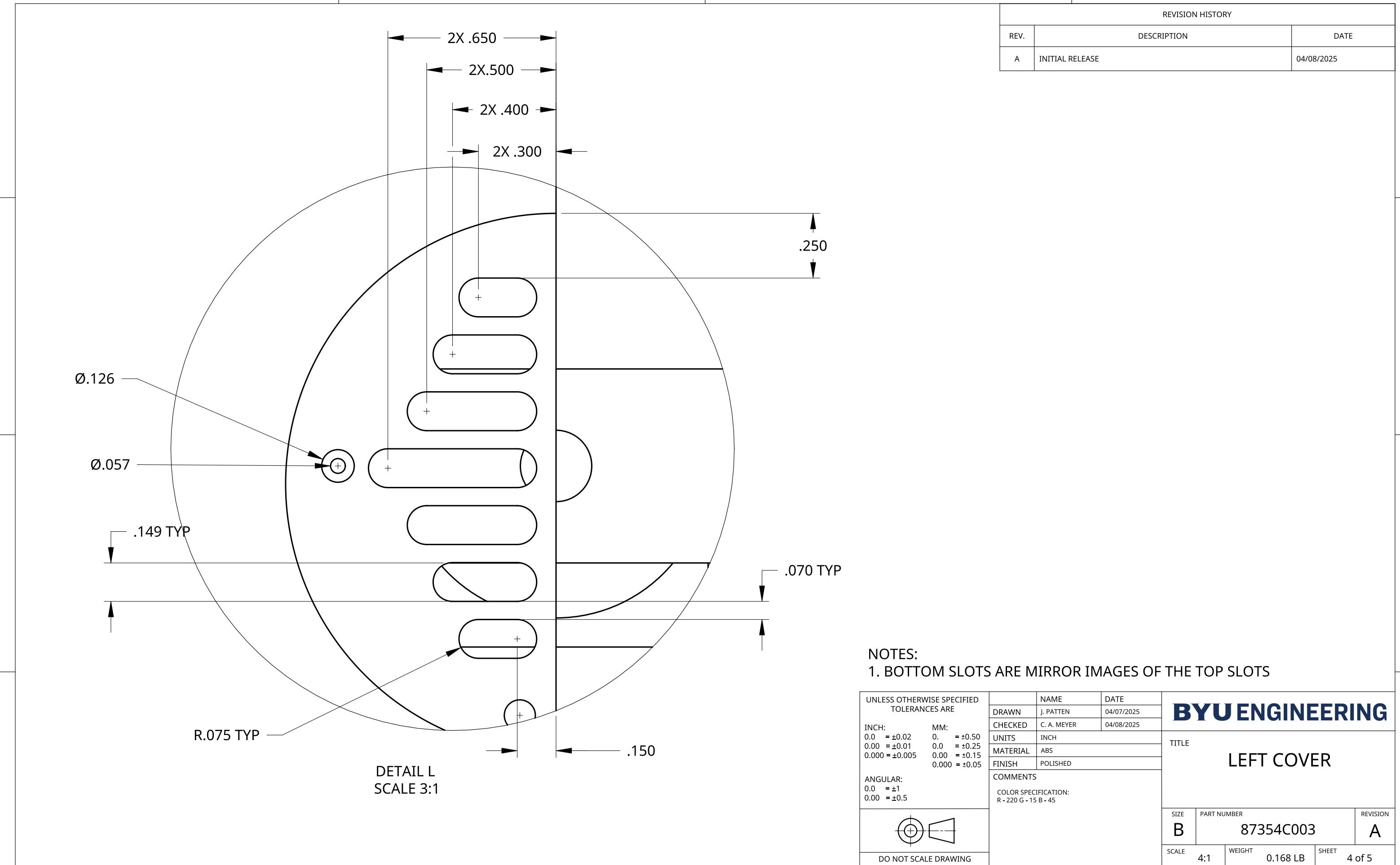
DO NOT SCALE DRAWING

REVISION HISTORY		
REV.	DESCRIPTION	DATE
A	INITIAL RELEASE	04/08/2025

BYU ENGINEERING

LEFT COVER

SIZE	PART NUMBER	REVISION
B	87354C003	A
SCALE 1:2	WEIGHT 0.168 LB	SHEET 3 of 5



4

3

2

1

D

D

.352

.175

1.163

1.386

.650

.240

.659

.875

1.638

2.952

SCALE 1:1

1.631

1.920

.463

.329

$\varnothing 0.177$

DETAIL A
SCALE 2:1

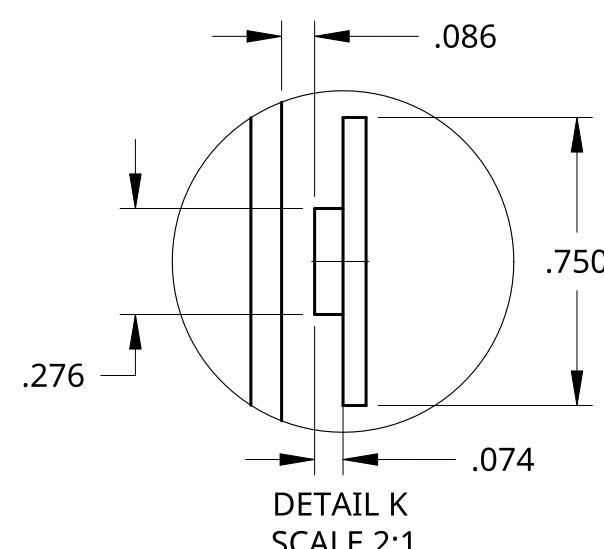
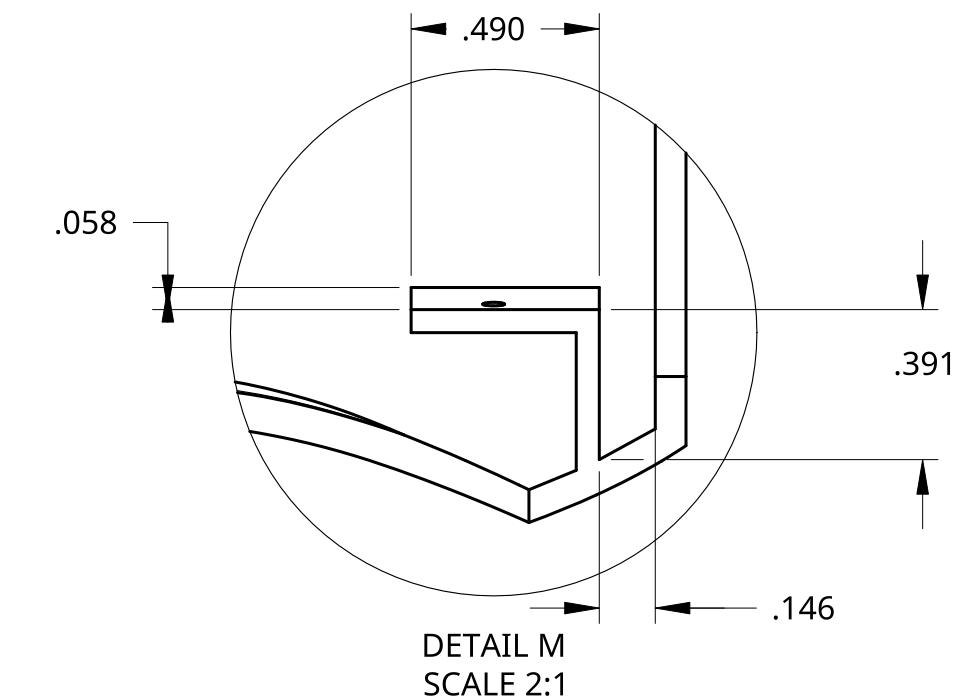
3

2

A

REVISION HISTORY

REV.	DESCRIPTION	DATE
A	INITIAL RELEASE	04/08/2025



UNLESS OTHERWISE SPECIFIED TOLERANCES ARE

INCH: MM:
 0.0 = ± 0.02 0. = ± 0.50
 0.00 = ± 0.01 0.0 = ± 0.25
 0.000 = ± 0.005 0.00 = ± 0.15
 0.000 = ± 0.05 0.000 = ± 0.05

ANGULAR:
 0.0 = ± 1
 0.00 = ± 0.5

COMMENTS

COLOR SPECIFICATION:
 R - 220 G - 15 B - 45



DO NOT SCALE DRAWING

BYU ENGINEERING

LEFT COVER

SIZE	PART NUMBER	REVISION
B	87354C003	A
SCALE 1:3	WEIGHT 0.168 LB	SHEET 5 of 5

4

3

2

1

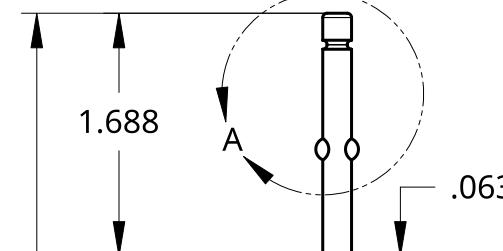
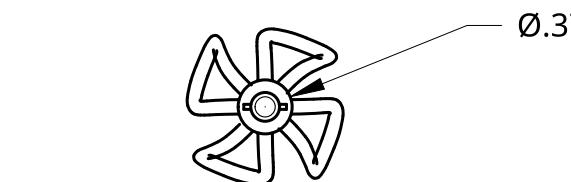
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1

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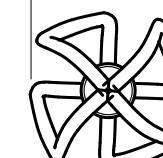


6.484

2.441

1.688

1.071



FREEFORM SPLINE

4X R.050

2X R.020

DETAIL B
SCALE 3:1Ø.20787
.20000

.621

.063

R.030

.188

R.030

2X R.080

DETAIL A
SCALE 3:1Ø.20787
.20000UNLESS OTHERWISE SPECIFIED
TOLERANCES AREINCH: MM:
0.0 = ±0.02 0. = ±0.50
0.00 = ±0.01 0.0 = ±0.25
0.000 = ±0.005 0.00 = ±0.15
 0.000 = ±0.05ANGULAR:
0.0 = ±1
0.00 = ±0.5

DO NOT SCALE DRAWING

REVISION HISTORY

REV.	DESCRIPTION	DATE
A	INITIAL RELEASE	04/07/2025

BYU ENGINEERING

TITLE
BEATER ATTACHMENT

SIZE	PART NUMBER	REVISION
B	18293A089	A
SCALE 3:4	WEIGHT 0.07 LB	SHEET 1 of 1

3

2

1