

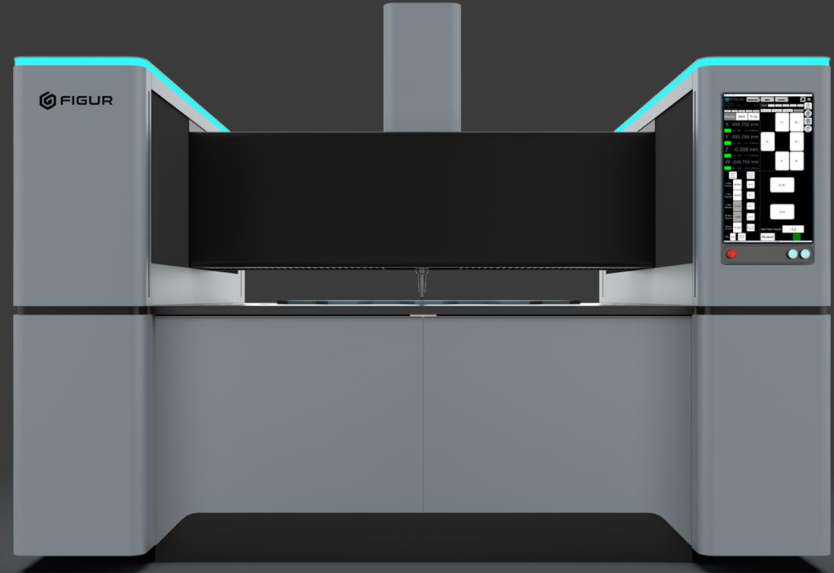
FIGUR – G15

Part Guidelines

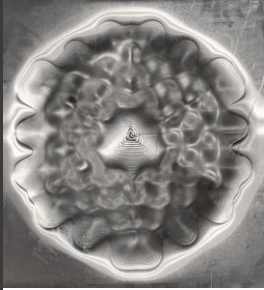
FIGUR G15

Figur G15 Specs

Technology	Digital Sheet Forming (DSF)
Max Sheet Size	1,600 mm x 1,200 mm (63.0 x 47.2 in)
Forming Area	1,450 mm x 1,050 mm (57.1 x 39.4 in)
Z Travel	400 mm (15.7 in)
Forming Force	2,000 lbs X, Y, & Z
Forming Speed	1 m/sec
Capacity	Aluminum: 3.2 mm Steel: 2 mm
Power	480 V / 3 Phase / 20 kw
Machine Dimensions	2.8 m x 2.2 m x 1.8 m (110.2 x 86.6 x 70.9 in)
Machine Weight	3,600 kg (8,000 lbs)



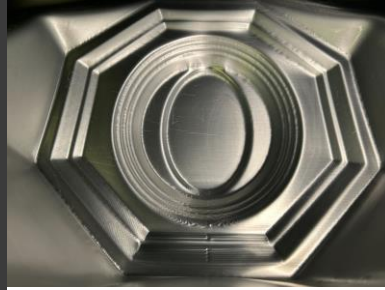
Figur Formed Parts – Sample Times



Sine Bowl
6061 – O Aluminum
18" x 18" x 0.063"
36 minutes



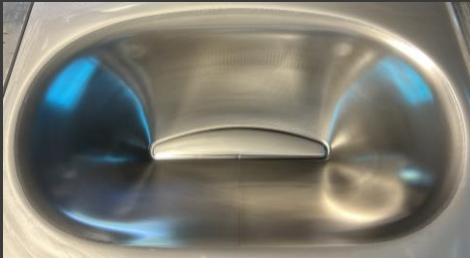
Automotive Interior
6061 – O Aluminum
36" x 48" x 0.063"
46 minutes



Logo Panel
6061 – O Aluminum
36" x 36" x 0.063"
60 minutes



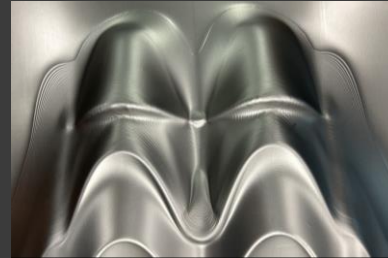
Automotive Fender Section
6061 – O Aluminum
36" x 48" x 0.063"
60 minutes



Aerospace Panel
Stainless Steel - 301
36" x 48" x 0.063"
65 minutes



Deep Aluminum Part
6061 – O Aluminum
36" x 48" x 0.125"
50 minutes



Roof Shingle
Cold Rolled Steel
24" x 24" x 0.032"
60 minutes



Lighting Fixture
Aluminum 5052
18" Diameter x ??
??

Sheet Forming - Materials

Currently Supported Materials

Cold Rolled Steel	Up to 2 mm
Aluminum – 6061 O	Up to 3.175 mm

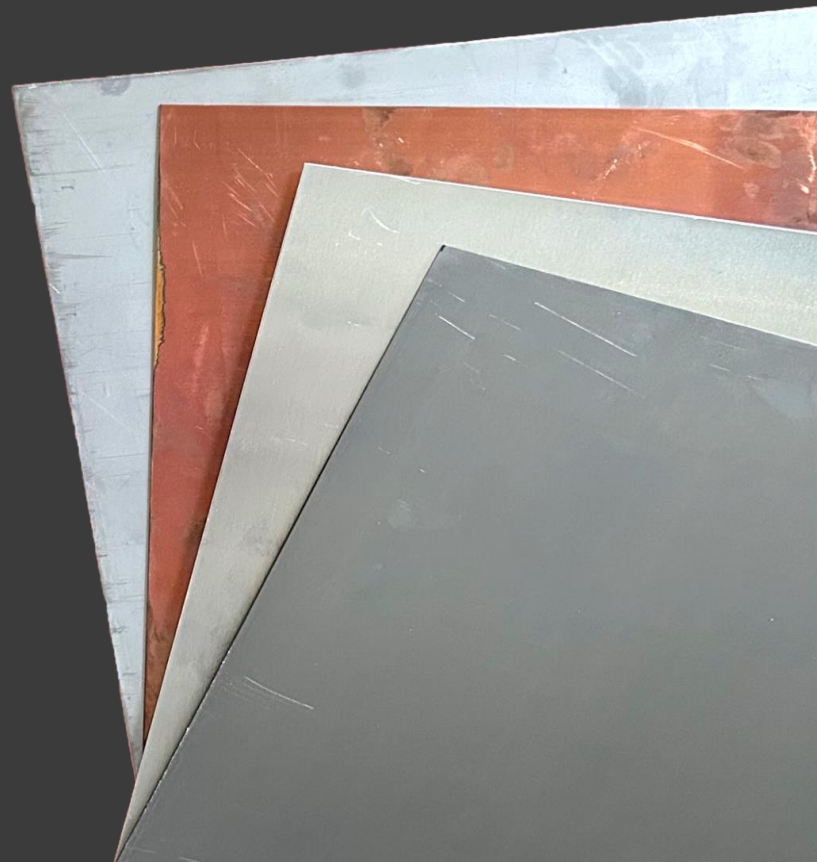
Materials in Development

Stainless Steel - 301	Up to 2 mm
Stainless Steel - 304	Up to 2 mm
Copper	Up to .55 mm
Aluminum – 1100 O	Up to 1.6 mm
Aluminum – 2024 O	Up to 3.175 mm
Aluminum – 5052 O	Up to 2.1 mm

Future Materials

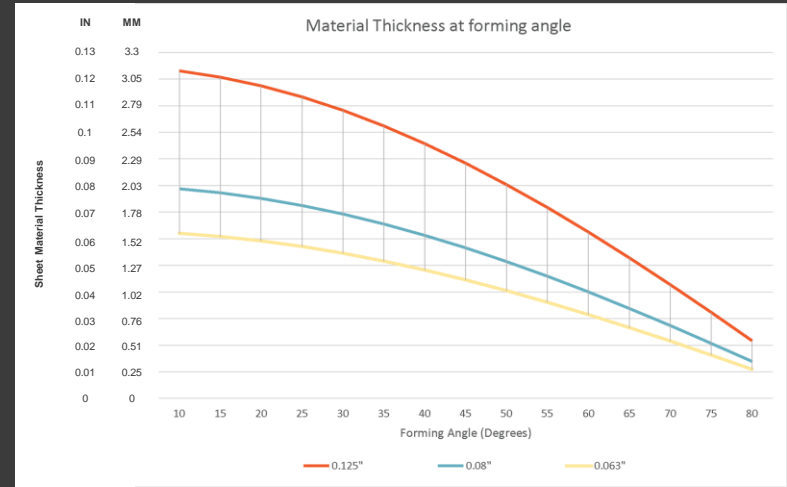
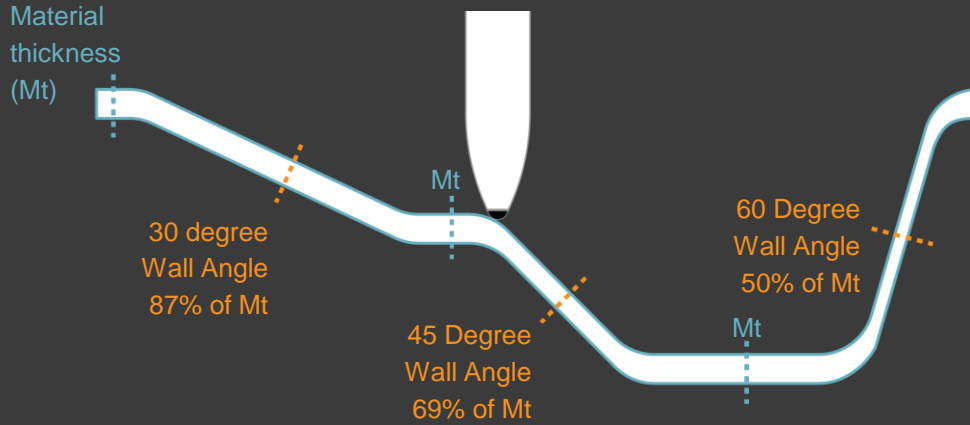
Inconel
Gold
Titanium

Note* All Aluminum must be formed in O or Annealed condition. No hardened material**



Material Thinning

Part Section



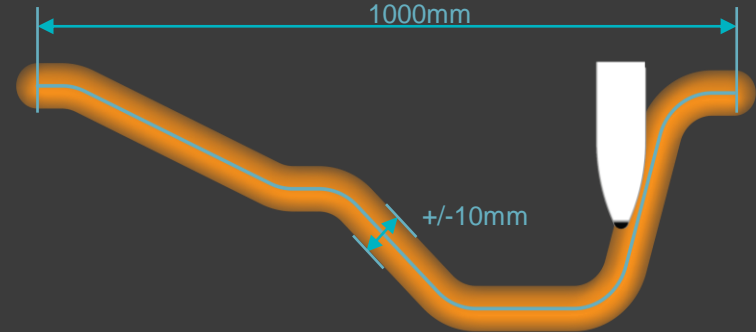
The figure progressively thins the material during forming. The material thins based on the wall angle.

The outcome part will have variable wall thickness based on the geometry. We accommodate this by checking the predicted thickness in the Figur software, and selecting an input material based on the minimum required thickness.

Forming Tolerances

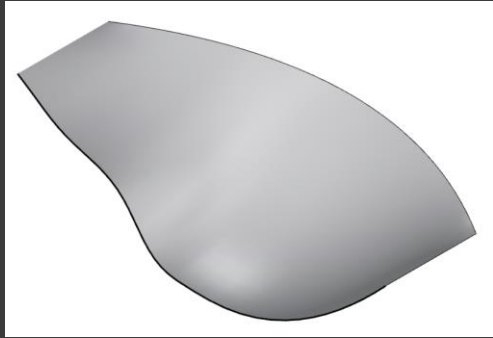
Part tolerances depend on several factors – part complexity, material, part orientation and tooling all affect part accuracy. Below are some general guidelines regarding part accuracy.

- General part accuracies are around **0.5% -2%** of the largest dimension of the part.
- Parts that are being cut out from the support skirt may warp / distort due to residual stresses built up in the material. Note sometimes simple shapes with very gentle curvature can warp more severely than complex parts. Heat treating (stress relieving) post forming can reduce or eliminate this effect
- Part detail – Figur tools have ball shaped tips, which can limit inner corner forming. In general, the radius of the surface being formed should be 2-3X the radius of the tool
- Measuring – large parts can be flexible making them difficult to measure as simply lifting or orientating them differently on a scan table will cause large variations in the part. The most accurate way scan a trimmed part is within a jig or fixture.



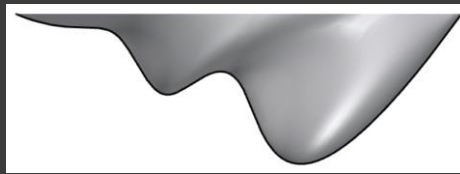
Tolerance Example:
A 1000mm long part
may have a deviation of
around 1% which
translates to a tolerance
band of +/-10mm.

General Part Qualification



Easy:

- Smooth
- 60 degree draft
- No peaks and valleys
- No large flat areas.



Medium

- Smooth
- Peaks and valleys
- 60-75 degree walls



Difficult

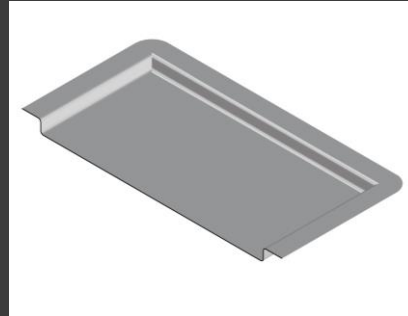
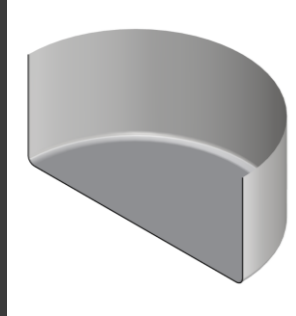
- Steeper wall angles 75 – 90 degrees
- Convex geometry within the part
- Large flat areas

Incompatible parts for Digital Sheet Forming



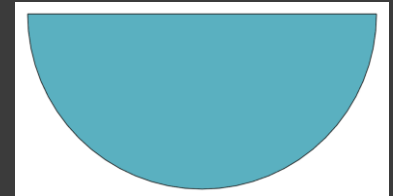
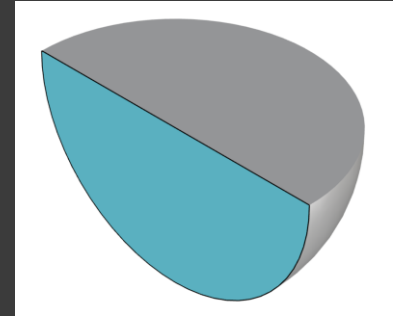
Parts with Overhung Areas

Any overhung part will not be able to be formed as one part. The part will need to be split and formed as separate pieces.



Steep + Flat Parts

“pots and pans” type shapes are not ideal parts. They have 90 degree walls that would need custom toolpathing not currently available in the figur former software.



Solid objects

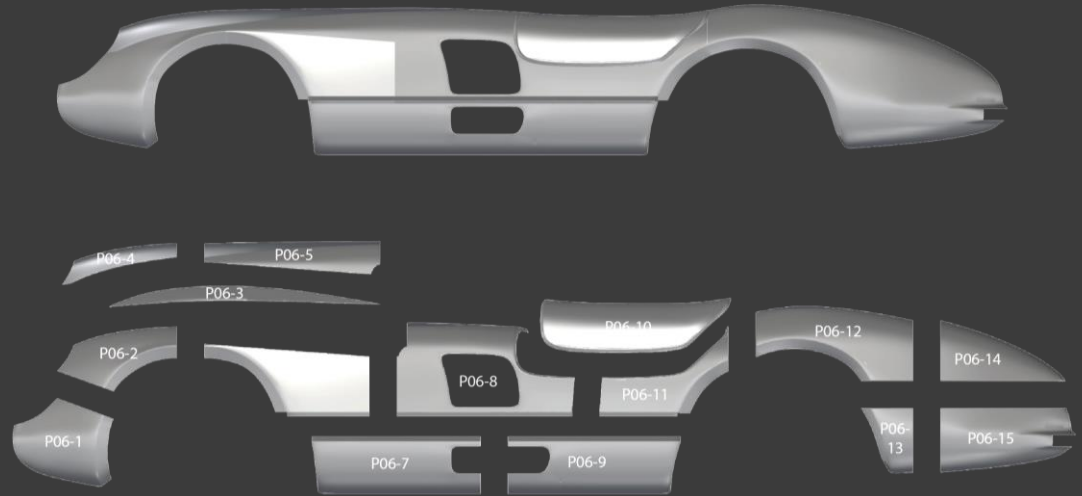
our process is “sheet forming” which means solid objects are not possible

Oversized Parts + Splitting

Part Split examples:

- Parts that exceed the max formable area of 1450 x 1050 must be split into separate parts.
- Parts may also be split if the original part is impossible to form as one.
- If a part has 2 parallel walls greater than 60 degrees - part is split between those two walls.
- If one side of the part has smaller features that need to be oriented a different way from the rest of the part.

Car Body Side



Required Intake Information

- Name of the company
- 3D Model file – STEP, IGES, RHINO, STL (high quality)
- Part Overall Dimensions
- Material Type
- Minimum Material Thickness
- Desired number of parts to be formed.
- Intended Application / Industry of part