How to design for metal casting

The ultimate guide by

sculpteo.com

How does 3D printing metal casting work?

3D printing metal casting, otherwise known as a lost wax casting, uses the first master model to produce a cast. Typically, the master model is 3D printed in wax. Thanks to Additive Manufacturing the master model is high quality, producing a great quality cast.

When the master model is produced, the plaster mold is poured over it. Once the plaster hardens, liquid metal is poured into the mold, which pushes the wax out of the mold through tree-like channels.



What are the advantages of Lost Wax Casting?

3D printing casting offers an amazing solution for producing small, but **highly accurate** and **complex shapes**. The layer thickness is 25µm, which assures a **smooth surface and great detail**. Improving metal casting with Additive Manufacturing can result in **great quality** and fully functional products.

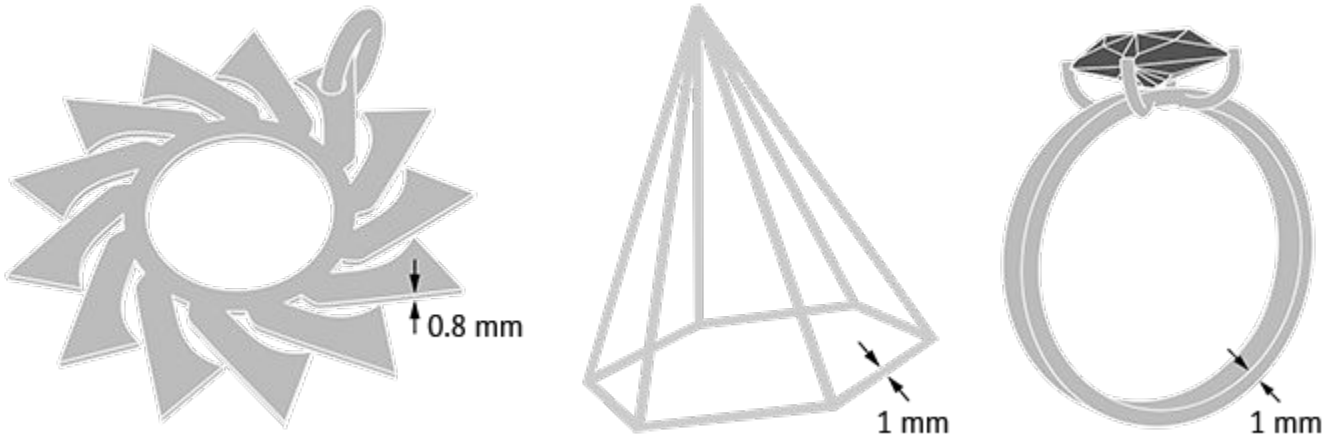
Metal casting can be especially interesting for jewelry makers. It allows for the production of parts as small as 2.4 x 2.4 x 0.8 mm, based on a 3D printed high-quality master model. Worth mentioning is also a wide range of finishes available for metal casting.

Design Guidelines

There are important values you need to consider when designing for metal casting. If you don’t respect them, your object most likely will not be printed correctly. Keep in mind the maximum and minimum size of the objects, there are also different values for minimum visible detail, wall thickness, and others. In the table below you can find all the important information.



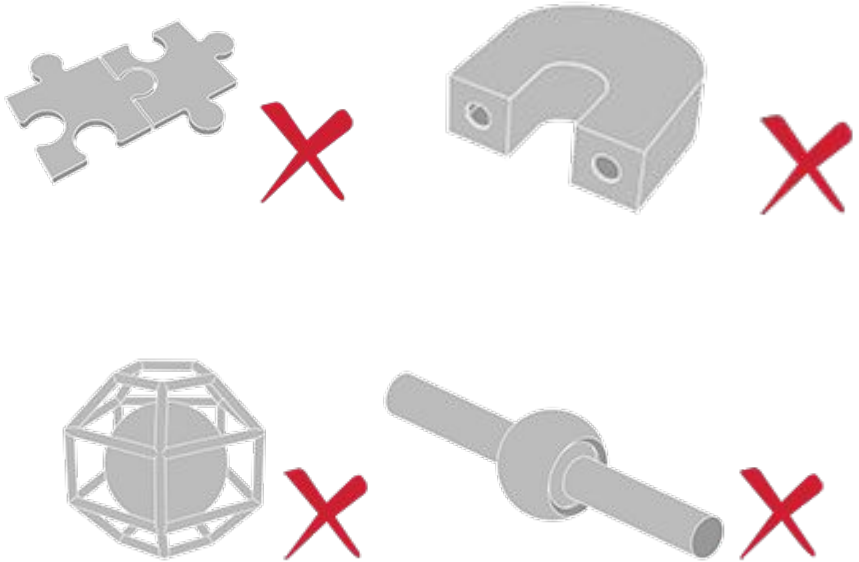
	Silver	Brass	Bronze
Layer thickness	25µm	25µm	25µm
Minimum wall thickness	0.8 mm	0.8 mm	0.8 mm
Minimum visible detail	0.4 mm	0.4 mm	0.4 mm
Maximum size	60 x 80 x 100 mm	120 x 88 x 88 mm	120 x 88 x 88 mm
Minimum size	2.4 x 2.4 x 0.8 mm	0.6 x 2.4 x 2.4 mm	-
Minimum clearance	0.3 mm	0.3 mm	0.3 mm
Melting point	951° C	927° C	913° C
Interlocking parts	No	No	No
Hollowing	No	No	No
Assembly	No	No	No



For some designs, it is safer to keep a 1 mm wall thickness

It is not possible to produce interlocking or assembly parts with metal casting nor to hollow them.

Please note that there is a difference between hollowing and a tube. A tube is a possible design to use for metal casting, which can also be plated inside. Hollowing is impossible because it would require supports inside the object, which we would not be able to remove.



Shrinkage

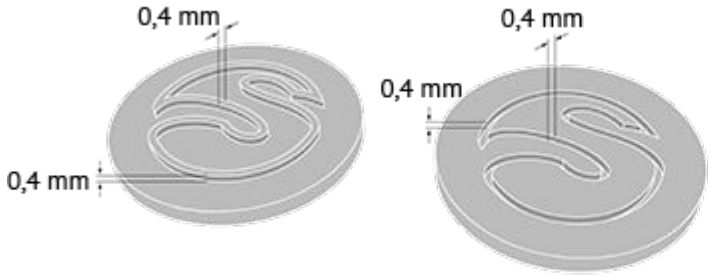
It is essential that you consider shrinkage which may occur due to the metal casting process. Therefore, the parts should be designed with the following volumes kept in mind:

- Raw parts: up to 2% shrinkage on average
- Polished: up to 3% shrinkage on average

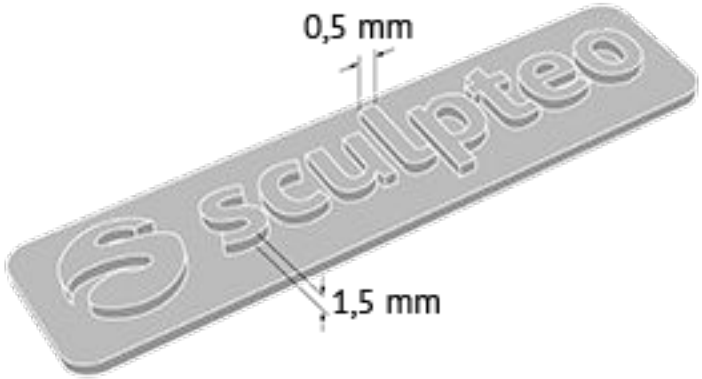


Etching, embossing and spacing

Embossing and etching can be an interesting option for decorative elements and jewelry that can be easily produced with metal casting. For Silver, Brass, and Bronze you need to remember that minimum space for etching and embossing is 0.4 mm.



Speaking of jewelry, you might have in mind a project for a necklace or bracelet which would involve using letters, for example, initials or an important date. This can be a beautiful way to celebrate an important event and metal casting is a great way to produce such decorative elements. For a readable text, the minimum height is 1.5 mm and width 0.5 mm.

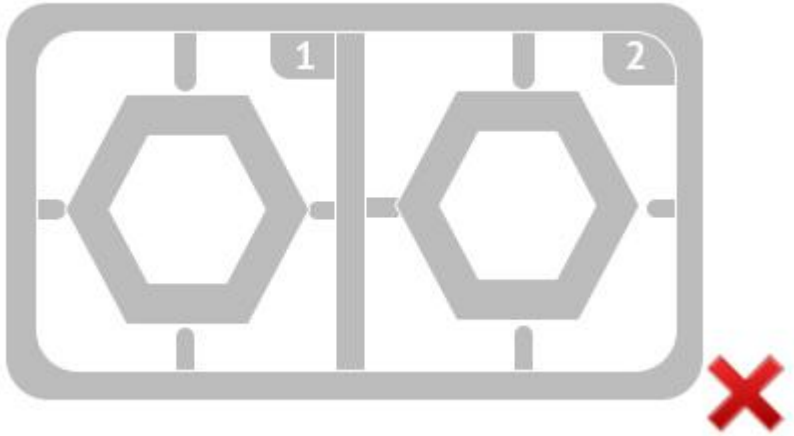


As metal casting is particularly compelling for jewelry applications, for some designs, such as rings, a minimum spacing between fixed walls in needed. It is 0.3 mm. Respecting this value assures that the 3D printing and metal casting will be successful.



Multiple objects and clusters

It is not possible to 3D print a file that contains several objects, thus also clusters are not acceptable. Those restrictions come from the complexity of metal casting.



What material to choose?

Sterling Silver

Sterling Silver is composed of 92.5% sterling silver and 7.5% metal alloy. For this material, you can choose one of the 2 finishes:

- Raw: your object will go through a quick sanding process which removes bigger imperfections
- Mirrored Polished: consists of applying a three-step polishing technique in a tribofinishing machine. The object will shine and will show a greater amount of detail.



Brass

Brass material is a metal alloy made of 80% copper, 15% zinc and 5% tin. Metal casting with brass offers the most finishing options. Your object can be left in a raw state, just polished or polished and plated.



All platings prevent the part from being oxidized and give it a nice, elegant look, especially important in the jewelry business. Let’s take a closer look at what your object can look like when you 3D print it with brass:

- Raw: the part is set for a quick sanding process to smooth out the material a bit
- Mirrored polished: used to achieve a fine and shiny finish in a tribofinishing machine
- Pink gold plating: after the object is polished, a thin layer of pink gold is applied
- Gold plating: the polished object goes through a procedure of plating it with a slim layer of gold
- White rhodium plated*: white rhodium is a precious metal and thin layer is applied by electroplating. In looks, it resembles white gold
- Black rhodium plated*: black rhodium is also a precious metal with a grey tint. It covers your object through electroplating with a thin layer of the material

*Rhodium plating might wear off when small objects are being used extensively

Bronze

The bronze material for metal casting is a mix of 90% copper and 10% tin. This alloy comes in raw and polished finishes. When polished, it is finished to a Standard 14K color. It is characterized by higher resistance to tarnish than brass. There are no platings offered for this material as it harder and doesn’t oxidize.



Start using metal casting to your benefit

We hope that our ebook gave you a better understanding of metal casting and its restrictions. There are important volumes you need to keep in mind, however, and it's also important to remember how beneficial metal casting can be for your project. With many finishes for **beautiful looks** and the **ultimate quality,** thanks to Additive Manufacturing technologies and **complex shapes** are possible only with 3D printing.

Starting your own metal casting project is as easy as uploading a 3D file to our online 3D printign service! And if you have any doubts, just contact us and our 3D printing experts will answer any of your questions.



Brass and Bronze comparison: gold plated Brass on the left-hand side and Bronze on the right.

MAKE YOUR BUSINESS THRIVE WITH 3D PRINTING



Think additive & Gain an adaptive advantage for your business.

Access to a one-stop-shop of resources to discover your Additive Advantage and develop a strategy that will **put game-changing technology into your hands**.

Use it to unlock the full potential of 3D printing, and:

- **Create room for innovation,**
- **Scale your production,**
- **Make adaptability one of your greatest strengths**.

We've compiled our best ebooks, playbooks, guides, and customers' stories, made for professionals who want new additive manufacturing opportunities
...all in one place.

Visit

sculpteo.com

for more 3D printing info