Direct Metal Laser Sintering & Selective Laser Melting (DMLS & SLM)

Direct Metal Laser Sintering (DMLS) and Selective Laser Melting (SLM) produce parts in a similar way to SLS: a laser source selectively bonds together powder particles layer-by-layer. The main difference, of course, is that DMLS and SLM produce parts out of metal.

The difference between the DMLS and SLM processes is subtle: SLM achieves a full melt of the powder particles, while DMLS heats the metal particles to a point that they fuse together on a molecular level instead. Support structures are always required in DMLS and SLM to minimize the distortion caused by the high temperatures required to fuse the metal particles.

After printing, the metal supports need to be removed either manually or through CNC machining. Machining can also be employed to improve the accuracy of critical features (e.g. holes). Finally, the parts are thermally treated to eliminate any residual stresses.

DMLS/SLM is ideal for manufacturing metal parts with complex geometries that traditional manufacturing methods cannot produce. DMLS/SLM parts can be (and should be) topology optimized to maximize their performance while minimizing their weight and amount of material used. DMLS/SLM parts have excellent physical properties, often surpassing the strength of the rough metal. Many metal alloys that are difficult to process with other technologies, such as metal superalloys, are available in DMLS/SLM.

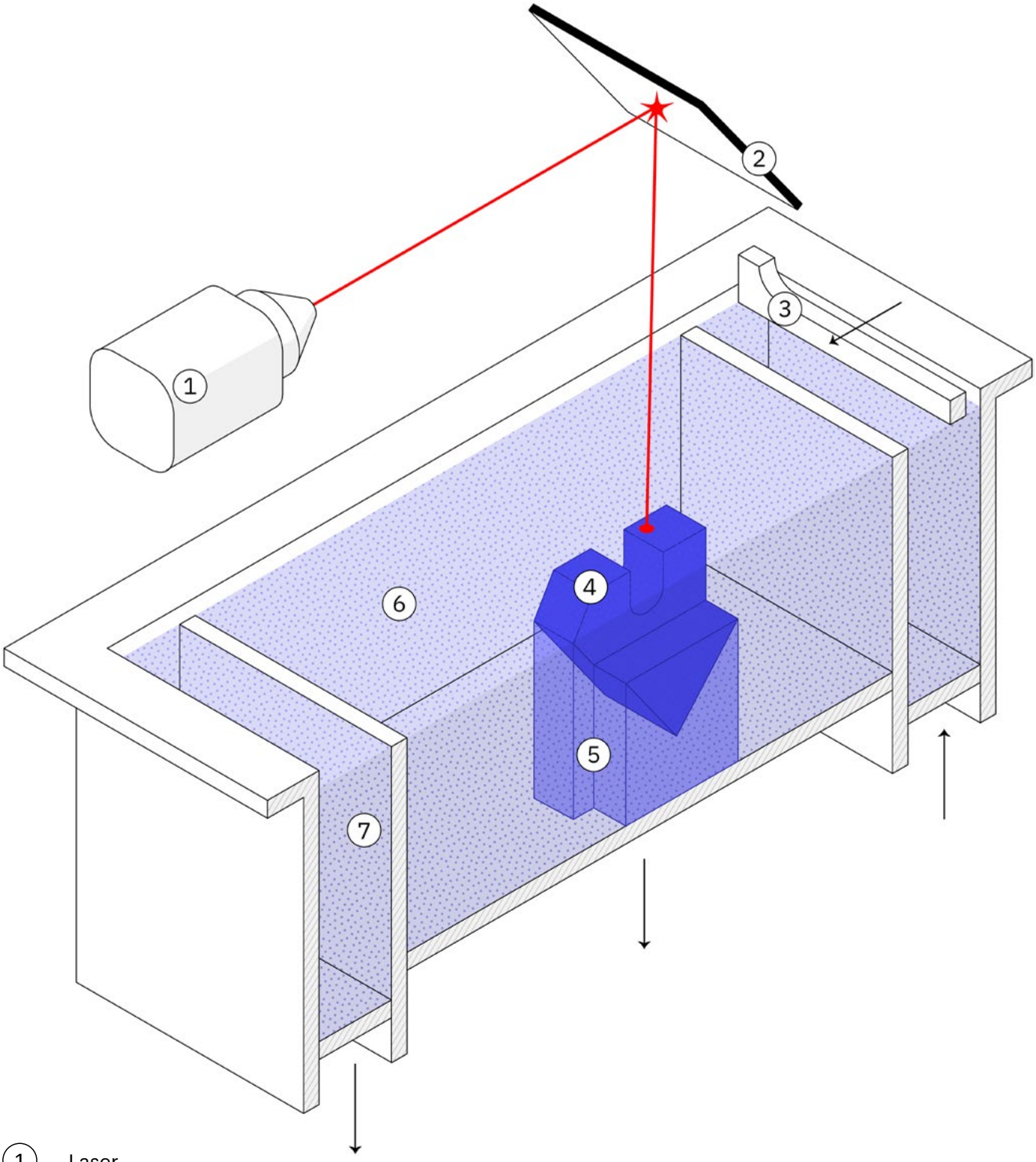
The costs associated with DMLS/SLM 3D printing are high: parts produced with this processes typically cost between $5.000 and $25.000.For this reason, DMLS/SLM should only be used to manufacture parts that cannot be produced with any other method. Moreover, the build size of modern metal 3D printing systems is limited, as the required precise manufacturing conditions are difficult to maintain for bigger build volumes.

Learn more about the DMLS / SLM process →

Popular DMLS / SLM materials

DMLS/SLM produce high performance, end-use metal 3D printed parts for industrial applications in aerospace, automotive and medical.

> Stainless steel
> Aluminum
> Titanium



1 Laser

2 XY scanning mirror

3 Recoater

4 Printed part

5 Support structure

6 Powder bed

7 Overflow bin

Pros

+ Highly complex, topology optimized metal parts
+ Parts with excellent material properties
+ Ideal for high-end engineering applications

Cons

- The most expensive plastic 3D printing process
- Mechanical properties degrade over time
- Produces relatively brittle parts