WACKER

CREATING TOMORROW'S SOLUTIONS

MOLDMAKING | RAPID PROTOTYPING

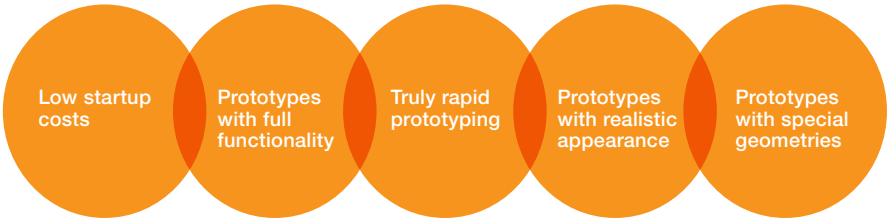
VACUUM CASTING WITH SILICONE MOLDS

Responding just in time to rapidly changing needs of globalized markets in the face of growing pressure from competitors requires technologies that can shorten innovation cycles. Rapid prototyping offers a way to dramatically speed up the production of prototypes and is therefore key to realizing shorter innovation cycles for products of critical design or shape.

On hearing the term "rapid prototyping" most people will only think of 3D printing. However, there are other modern methods of producing prototypes or small series that provide distinct benefits. Depending on the business case, these can even be far superior to 3D printing. Vacuum casting with silicone molds, for instance, offers an almost unlimited degree of geometric freedom, a high level of functionality as well as high-quality finishing options. These features have made it a popular, reliable, and accurate technique for producing prototypes and small series over many years.

Benefits of Vacuum Casting Compared to Other Rapid Prototyping Techniques

Compared to other prototyping techniques, the benefits of vacuum casting are surprisingly numerous:



Low startup costs: There is no need for expensive equipment, as a simple silicone mold is capable of producing even complex geometries very precisely. Capital investment costs are therefore significantly lower than for other techniques. As a rule of thumb, small series become economical at production levels of 5-35 pieces and more (actual number depends on the type of casting resin and its individual modification).

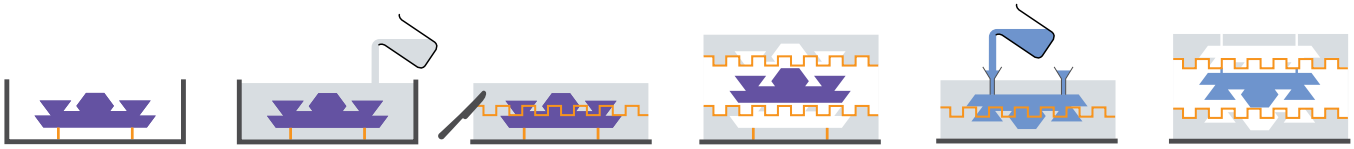
Prototypes with full functionality: With vacuum casting, it is easy to implement threaded inserts, magnets or other functional inserts. Not only that, but the casting can be done with a wide range of resins that have specific properties, such as shock resistance, flame resistance, rubberiness or high strength (Shore A hardness of 35 to 100). This means it is possible to make fully functional prototypes that, crucially, can be tested under real-life conditions.

Truly rapid prototyping: Once the design is ready, a fully functional prototype can be built within 7 to 14 days or even faster.

Prototypes with realistic appearance: Vacuum casting offers various finishing options, such as painting in any RAL color, glossy finishes, and chrome-plating. It is also possible to use crystal-clear resins for casting. The ability to make prototypes that realistically match the appearance of mass-produced articles is particularly important for pre-series and small-series manufacture.

Prototypes with special geometries: Working with varying wall thicknesses can still be problematic for 3D printing. With vacuum casting, however, generating unconventional shapes is easy.

Silicone Vacuum Casting Process



1.
The master pattern is mounted on struts and framed.

2.
The frame is filled with silicone rubber. The struts allow the silicone rubber to flow beneath the master pattern.

3.
After the silicone mold has cured, the frame is removed and the mold is cut open.

4.
The master pattern and the struts are removed.

5.
The silicone mold is reassembled, placed in a vacuum chamber and filled through the strut holes with casting resin, e.g. polyurethane resins or polyamide.
The vacuum supports resin hardening by removing all the air bubbles from the material.

6.
When the copy has cured, it is removed from the silicone mold. Depending on the copy material used, a silicone mold can be reused up to 30 times.

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Silicones – the superior mold material for vacuum casting

Thanks to its high, permanent elasticity, excellent release properties and extreme fidelity of reproduction, silicone is in general an ideal material for mold making. Its fast, shrinkage-free vulcanization at room temperature, excellent long-term stability and chemical resistance to casting resins make silicone the most reliable material for vacuum casting.

Advantages of ELASTOSIL® M silicone rubber grades from WACKER

ELASTOSIL® M silicone rubber grades from WACKER rank among the highest quality, most technically advanced materials used in vacuum casting. The properties of pourable, addition-curing RTV ELASTOSIL® M silicone rubber have been specially tailored to the needs of vacuum casting for rapid prototyping and small-series production.

Special characteristics of ELASTOSIL® M silicone rubber

- Good flow
- Fast, shrink-free curing at room temperature, which can be greatly accelerated by heating
- Good transparency
- High tear strength
- Outstanding long-term stability of the cured rubber's mechanical properties
- Excellent resistance to casting resins (PU/EP) and, in the case of M 4670, to polyamide too
- Very constant, continuous, and exceptionally long-lasting oil-bleeding in the case of M 4645

ELASTOSIL® M Silicone Rubber Grades[1]

Product	Properties	Color	Hardness [Shore A]	Tensile strength [N/mm²]	Elongation at break [%]	Tear strength [N/mm]	Viscosity [mPa s]
ELASTOSIL® M 4641 A/B	Hard, very high mechanical strength, "dry" system	Transparent	43	4.5	300	>25	30,000
ELASTOSIL® M 4644 A/B	Medium-hard, high mechanical strength, weak oil-bleeding	Transparent	40	5.5	400	>25	50,000
ELASTOSIL® M 4645 A/B	Medium-hard, high mechanical strength, strong oil-bleeding	Transparent	40	5.0	330	>28	35,000
ELASTOSIL® M 4670 A/B	Hard, high mechanical strength, for casting polyamide	Beige	55	5.5	250	>12	80,000

The data are only intended as a guide and should not be used in preparing specifications
[1] Mixing ratio of A to B = 10 to 1

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