

## Pentz Cast Solutions

### Aluminum Casting: Molding Process Comparisons

Process	Benefits/Limitations (See Terms & Concepts for more detailed descriptions of process)	Typical Part Size	Typical Surface Finish (RMS)	Min. Draft Req.	Typical Linear Tolerances (as cast)	Typical Tooling Cost	Typical Volume
<b>Automated Precision Green Sand Molding</b>	Superior performance at any volume. Extremely efficient, flexible and cost effective. Utilizes automated system for building and handling the green sand molds used to cast parts. Pentz has a PLC-controlled state-of-the-art Sinto FBO II automated molding system capable of: <ul style="list-style-type: none"> <li>• 16x20 mold sizes</li> <li>• 2 minute tool changes</li> <li>• 30 second mold cycles</li> </ul>	1 oz. to 25 lbs.	Industry 250-1000  Pentz 200-400	1° - 3°	Industry Norm ± .030" up to 6". Over 6" add an additional ± .003"/in.  Pentz Typical ± .020 up to 6". Over 6" add an additional ± .002"/in.	Without Cores \$2,000 - \$5,000  With Cores \$4,000 - \$7,000	1-2,000,000 / year  Automated, efficient and effective at any volume
<b>Manual Precision Green Sand Molding</b>	The most versatile casting process. Produces castings with high strength and complex shapes in all sizes with excellent finish. Utilizes manually formed green sand molds to make castings. Economical solution for many castings applications.	1 oz. to several tons	Industry 250-1000  Pentz 125-400	½° - 3°	Industry Norm ± .030" up to 6". Over 6" add an additional ± .003"/in.  Pentz Typical ± .020 up to 6". Over 6" add an additional ± .002"/in.	Without Cores \$800 - \$4,000  With Cores \$4,000 - \$8,000	1-100,000 / year  Any Volume
<b>Precision Dry Sand Molding (AKA – No Bake, Airset, Cold Box CO2, etc.)</b>	Excellent for producing parts that require high strength and pressure tight/vacuum tight sealing characteristics. Utilizes chemically bonded dry sand to form molds used to cast parts.	1 oz. to several tons	Industry 250-750  Pentz 200-500	½° - 3°	Industry Norm ± .030" up to 6". Over 6" add an additional ± .003"/in.  Pentz Typical ± .020 up to 6". Over 6" add an additional ± .002"/in.	Without Cores \$800 - \$4,000  With Cores \$4,000 - \$8,000	1-100,000 / year  Any Volume
<b>Permanent Mold</b>	Produces very high-density castings that are pressure tight and have excellent structural characteristics. Parts are cast repeatably from the same cast iron mold. A mold typically lasts the life of the product.	1 oz. to 100 lbs.	Industry 150-750  Pentz 100-500	2° - 10°	Industry Norm ± .015" up to 3.875". Add an additional ± .020" up to 15.15"  Pentz Typical ± .012" up to 3.875". Add an additional ± .017" up to 15.15"	Without Cores \$5,000 – \$40,000  With Cores \$15,000 - \$70,000	2,000 / year minimum  Medium to High Volume
<b>Die Casting</b>	Casting forms in steel dies. Well suited for nonstructural components.	<1 oz. to 35 lbs.	Industry 32-63	1° - 3°	Industry Norm ± .004" up to 1" Over 1" add an additional ± .0015"/in. up to 12"	\$10,000 - \$400,000	5,000 minimum  High Volume
<b>Investment Casting (Lost Wax)</b>	Casting formed in a ceramic mold. Generally used for small, intricate parts requiring very high dimensional stability.	No minimum to 20 lbs.	Industry 10-85	No Minimum	Industry Norm ± .005" up to 1" Over 1" add an additional ± .005"/in.	\$3,000 - \$10,000	Under 1000  Low Volume
<b>"Hog Out"</b>	Cut aluminum from billet using CNC program. Typically used for one-off prototypes. Does not look or perform like actual casting.	1 oz. to 100 lbs.	Industry 20-60	No Minimum	Industry Norm ± .001"	\$1,000 - \$3,000 (Includes program & fixture costs)	5 or less  Low Volume

*Note: The above industry comparison depends on the casting supplier, metals, tool design, and casting design. Actual part and tooling costs vary significantly based on size, complexity, and tolerances required.*