



Custom Manufacturing for Industry

Metal Forming



Metal Working

- FABRICATION** : Precision Sheet Metal & Weldments
Stretch Forming, Roll Forming
Painting & Plating
- MACHINING** : Milling, Turning, Drilling, Broaching, EDM
Multi-Axis CNC for Complex Components
Machining of Castings, Forgings, Extrusions
Screw Machine: Conventional & Swiss
Grinding: Surface OD/ID, 5-Axis, Creep Feed
Gears & Splined Shafts
- STAMPINGS** : Transfer and Progressive Die

Plastic Molding

- : Injection Molding
- : Insert-molding, Over-molding & 2 Shot Molding

Prototypes

- : Castings, Machining & Plastics

Contract Manufacturing

- : Mechanical & Electromechanical Assembly



GLASER-MILLER CO.

www.glaser-miller.com

Casting Technique Comparisons

DESCRIPTION	METALS	SIZE RANGE	GENERAL TOLERANCES	TOOLING COST RANGE AVG	PART COST 1: HIGHEST 5: LOWEST	DESIGN FREEDOM 1: LEAST 5: MOST	SURFACE FINISH	DRAFT REQUIREMENTS*	NORMAL MINIMUM SECTION THICKNESS**	ORDER QUANTITIES	NORMAL LEAD TIMES***
DIE CASTING											
Molten metal is injected, under pressure, into hardened steel dies.	Aluminum, Zinc, Magnesium and limited Brass	Not normally over 3 feet square. Some foundries capable of larger sizes	Zn: +/--.002" first in. +/--.001" each add'l in. Al: +/--.003" first in. +/--.0015" each add'l in. Add +/--.002" to +/--.020" across parting line, depending on size.	\$15,000-\$500,000 \$90,000	1	2	32-90 RMS	1-3° Typical	Aluminum: .040" Small parts .050" Large parts Zinc: .015" Small parts .030" Large parts	Usually 1,000 and up.	Samples: 10-26 weeks. Production: 4-12 weeks.
INVESTMENT CASTING											
Metal mold makes wax replica. These are sprued, then "invested" in ceramic slurry, baked out, and metal poured in resultant cavity.	Most all castable metals	Fraction of an ounce to 250 lbs, up to 48"	0"-1/4" +/--.003". 1/4"-1/2" +/--.004". 1/2"-3" +/--.005" in. Add +/--.003" in. over 3".	\$1,500-\$200,000 \$9,500	5	5	63-125 RMS	None	Non-Ferrous-.030" Ferrous-.060"	All Quantities	Samples: 4-12 weeks Production: 4-12 weeks
LOST FOAM											
Expanded Polystyrene bead pattern is coated with ceramic, surrounded with tightly packed dry sand. Molten metal is poured directly onto pattern which evaporates. Metal replaces pattern.	Aluminum, Iron.	900# gen'l max wt.	Less than 12" +/--.015". Over 12" Add +/--.0015"/in.	\$10,000-\$250,000 \$30,000	2-3	4	125-250 RMS	1-2° desired. 0° possible	.120" min	1,000 and up.	Samples: 10-18 weeks. Production: 5-10 weeks.
PERMANENT MOLD											
Molten metal is gravity poured (typically) into cast iron or steel molds coated with ceramic mold wash. Cores can be metal or resinshell	Aluminum, Zinc, Brass, Bronze, Copper and Cast Iron	Limitation mainly foundry capabilities. Small to large parts.	Aluminum: +/--.015" first in. Add +/--.002" each add'l in. Add +/--.010" to +/--.025" across partin line.	\$9,500-\$150,000 \$40,000	2-3	3	Aluminum: 150-200 RMS Iron: 200-350 RMS Copperbase: 125-200 RMS	Non-ferrous: Outside: 2° min. Inside 2° min Iron: Out:2°. In: 5°	Aluminum: .090" for small areas. .125" or more for large areas. Iron: 3/16" for small areas. 1/4" normal Copperbase: .060"min.	100 and up.	Samples 8-20 weeks. Production 2-8 weeks.
PLASTER MOLD											
Cope and Drag Method. Plaster slurry is poured onto pattern halves, allowed to set then mold is removed from pattern, baked, assembled, and metal is poured into resultant cavity.	Aluminum, Brass, Bronze, Zinc, Beryllium Copper.	Normally up to 800 square inch area. Some foundries capable of larger	One side of parting line +/--.005" up to 2". Over 2" Add +/--.002"/in. Add .010" across parting line. Allow for parting line shift of .015".	\$2,500-\$20,000 \$9,500	5	4	63-125 RMS	External: 0-2° Internal: 1/2 to 2°	.060"	1-500. Often used to prototype die castings.	Samples: 2-10 weeks Production: 2-6 weeks
SAND CASTING											
Mold halves made by packing tempered sand onto wood or metal pattern halves. Mold halves are removed from pattern assembled with or without cores, and metal is poured into resultant cavities.	Most all castable metals	Limitation mainly foundry capabilities. All sizes.	+/--.030" up to 6". Add +/--.003"/in. over 6". Add +/--.020" to +/--.060" across parting line.	\$3,000-\$30,000 \$7,500	1-3	3	Non-Ferrous: 150-350 RMS Ferrous: 250-750 RMS	1-5°. Cores: 1°-1 1/2°	Non-Ferrous: 1/8"-1/4" Ferrous: 1/4"-3/8"	All Quantities.	Samples: 3-10 weeks. Production 5-10 weeks.

*Increase Draft with Depth **Size and surface area influence minimum thickness

***This will vary widely depending on business conditions and foundry load.

The above are generalities and should be used only as a rough guide. Your GLASER-MILLER Sales Agent can elaborate on the above information as it applies to your specific parts. Often, two or more processes could be evaluated for a given part.