



Talbot's guide to the proper selection of casting techniques

Description	Metals	Size Range	Tolerances *	Tooling Costs+	Part Price+	Design Freedom +	Surface Finish	Minimum Draft Requirements**	Normal Minimum Section Thickness+	Ordering Quantities	Normal Lead Time++
Die Casting	Aluminum, Zinc, Lead and Limited Brass	Not normally under 2 feet square. Some foundaries capable of larger sizes	Al and Mg ± .002"/in. Zinc ± .015"/in. Brass ± .007"/in. Add ± .001" to .016" across parting line depending on size	1	5	4	32-63 RMS	Al & Mg: 1 to 3 Zinc: ½ to 2 Brass: 2 to 5	Al: .03" Small parts .06" Medium Parts Mg: .03" Small Parts .045" Medium Parts Zinc: .025" Small Parts .040" Medium Pparts	Usually 2,500 and up.	Samples: 12-20 weeks Production: 4-8 weeks A.S.A
Permanent Mold	Aluminum, Magnesium, Zinc, some Brass, Bronze, H. C. Copper, Lead, and Gray Iron	Limitations mainly foundry capabilities. Copper base onces to 100 lbs. Ferrous: 60 lbs. max.	Aluminum: basic ± .015". Add ± .002"/in. If across parting line add ± .010" to ± .030" depending on size. Copper Base: Similar to investment.	2	Non-ferrous 3-4 Ferrous 4	Non-ferrous 3 Ferrous 5	Aluminum: 150-250 RMS Copper Base: 125-200 RMS Ferrous: 200-350 RMS	Non-ferrous: Outside: 2 Min. (3 desirable) Inside: 2 Min. (4 desirable) Ferrous: Outside: 1 Inside: 5	Non-ferrous: .100 Small Areas, up to ¼" Large Areas. Ferrous: 3/16" Small Areas, ¼" Normal	Minimum One Day's Run: (100-1,000, depending on size)	Samples: 8-20 weeks Production: 4-8 weeks A.S.A

	castings ejected. New Low Pressure Perm Mold method pressure pours with up to 15 p. s.i.			Iron: ± .03" Basic								
Investment (Lost Wax)	Metal mold makes wax or plastic replica. These are sprued, then surrounded with investment material, baked out, and metal poured in resultant cavity. Molds broken to remove castings.	Most castable metals	Fraction of an ounce to 150 lbs.	± .003" to ¼" ± .004" to ½" ± .005" per in. To 3" ± .003" for each additional inch	3	1	1	63-125 RMS	None	.030" Small Areas .060" Larger Areas	Aluminum: usually under 1,000. Other metals: all quantities	Samples: 5-16 weeks (depending on complexity). Production: 4-12 weeks A.S.A (depending on subsequent operations)
Plaster Mold	Plaster slurry is poured onto pattern halves, allowed to set, then mold is removed from pattern, baked, assembled, and metal is poured into resultant	Aluminum, Magnesium, Zinc, Limited Copper Base	Up to 500 square inch area. Copper Base much smaller	One side of parting line ± .005" up to 2". Over 2" add ± .002"/in. Across parting line add ± .010"	4	1	2	63-125 RMS	External: 0 to ½ Internal: ½ to 2	.070"	Usually low. Often used to prototype for die castings. Average: 50-250 pieces	Samples: 2-6 weeks Production: 2-4 weeks A. S.A

Graphite Mold	Same as Permanent Mold, except no ceramic mold wash is needed, since Graphite molds are used. Core pins are usually steel.	Presently limited to Zinc alloys ZA12, ZA27	One once to 10 lbs. Currently 12" by 14" with a depth of 7"	First inch: ± .005 Additional inches ± .002"/in. Across parting line add ± .005"	4	3	4	63-125 RMS	2	.100" (can go to .06 for very small areas)	Usually 300 and up	Samples: 6-10 weeks Production: 4 weeks A.S.A
Resin Shell Mold	Resin-coated sand is poured onto hot metal patterns, curing into shell-like mold halves. These are removed from pattern, assembled with or without cores. Metal is poured into resultant cavities. Molds broken to remove castings.	Most Castable metals	Normal maximum 550 square inches usable mold area. Depends on equipment at each foundry	Non-Ferrous: ± .008"/in. Decreasing with size. Ferrous: ± .010"/in. Add ± .005" to .010" across parting line	2	2	2	Non-Ferrous: 125-200 RMS Ferrous: 200-350 RMS	Outside: ½ to 1 Inside ½ to 2	Non-Ferrous: 3/32 Ferrous: 1/8	Non-ferrous usually 100 and up. Ferrous usually 1,000 and up.	Samples: 12-16 weeks Production: 6-10 weeks A.S.A

Semi-Solid Metal (SSM)	Specially prepared metal slugs are gradually heated to a semi-solid state, then transferred to forming machine, where ram injects (squeezes), under pressure, the metal into die. Die opens and part is ejected.	Aluminum, magnesium, and some copper alloys	Ounces to 5 lbs., some processors capable of larger sizes	Al and Mg ± .002"/in. Brass ± .007 Add ± .001 to ± .010 across parting line depending on size.	1	4	3	32-63 RMS	1 preferred ½ possible	.030"	2,500 pieces and up (usually 50,000 pieces and up)	Samples: 10-15 weeks Production: 6-8 weeks A.S.A
Metal Injection Molding	Very fine metal powder, combined with binder material, is injected	Primarily ferrous alloys limited Copper Base	.0005 lbs. to .22 lbs.	± .005"/in.	2	1	1	45 RMS	1/4	.015" Small areas	Usally 10,000 and up	Samples: 10-16 weeks Production: 4-6 weeks A.S.A

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The above are generalities and should be used only as a rough guide. When in doubt, check with your TAI Sales Engineer. Often you will wish to evaluate two or more processes for a given part. He can elaborate on the above information as applied to your specific parts.

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A.S.A. After Sample Approval
 * These are for critical dimensions and should not be specified where not necessary.
 ** draft Requirements inversely affected by depth of draw.
 + 1-Most. 5-Least.
 ++ Size and surface area influence this considerably
 +++ This will vary widely depending on business conditions and foundry load. Availability of CAD files and New Rapid Prototyping processes can cut sampling time in half or less.