

it's all about service...

SINCE 1946

Custom "Machined" Aluminum and Zinc Castings *innovation*

We are the First company to combine **All** these Services at One Location.

- ◆ Traditional and Computer Aided Manufacturing (CAM) Patternmaking
- ◆ Precision Sand Casting, No-Bake (Airset) Sand Castings, Permanent Mold and Rubber Plaster Molding (RPM)

Direct Metal-Aluminum, 3D Printed Sand Molds & Investment Casting processes.

- ◆ CNC Machining for all secondary operations (In-House)
This means managing all the details. From your electronic data, we will produce Patterns, Tooling, Castings, Secondary Machining, Chemical Conversion, Painting, Powder-Coating, Pad-Printing, and Silk-screening. A complete turnkey solution that will meet and exceed your expectations.

speed

Rapid Prototyping – providing your castings at record-breaking speed for your market releases.

endurance

Production Options – to meet all your needs.

- ◆ Low to Medium Volume Production for your "Bridge to Production" requirements.
- ◆ High Volume Production is our cornerstone - producing over 9 million castings during our 71-year history.

commitment

Once you have experienced our Service, you'll wonder why you haven't called us sooner.

**GENERAL
FOUNDRY**



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...it's all about **GENERAL FOUNDRY SERVICE**

Decision Matrix-Process Comparison

General Foundry Service proudly supplies components from these technologies.

Process	3D Printed Metal - Aluminum	3D Printed Sand Molds	Green Sand Molds	No-Bake (Air-Set) Sand Molds	Permanent Mold	Rubber Plaster Molding	Solid Mold Investment (Lost Wax)	Die Casting	"Graphite" Permanent Mold	V-Process Castings
Typical Size Range	oz. - 5 lbs. (Within 10" (254 mm) Cube)	10 lbs. - 500 lbs.	oz. - 200 lbs.	50 - 500 lbs.	oz. - 75 lbs.	oz. - 30 lbs.	oz. - 5 lbs. (Within 10" (254 mm) Cube)	oz. - 30 lbs.	oz. - 10 lbs.	Up to 150 lbs.
Tolerances	±0.005" for first inch, then add ±0.001" per inch thereafter. (0.13 mm for first 25.4 mm, then add ±0.025 mm per 25.4 mm thereafter).	±0.020" for first 10 inches, then add ±0.001" per inch thereafter. (0.51 mm for first 254 mm, then add ±0.025 mm per 25.4 mm thereafter). Add minimum of ±0.010" (25.4 mm) across the parting line and for cored features.	±0.020" for first 10 inches, then add ±0.001" per inch thereafter. (0.51 mm for first 254 mm, then add ±0.025 mm per 25.4 mm thereafter). Add minimum of ±0.010" (25.4 mm) across the parting line and for cored features.	±0.020" for first 10 inches, then add ±0.001" per inch thereafter. (0.51 mm for first 254 mm, then add ±0.025 mm per 25.4 mm thereafter). Add minimum of ±0.010" (25.4 mm) across the parting line and for cored features.	±0.015" for first inch, then add ±0.002" per inch thereafter. (0.38 mm for first 25.4 mm, then add ±0.051 mm per 25.4 mm thereafter). Add ±0.010" (25.4 mm) to ±0.030" (0.76 mm) across the parting line.	±0.010" for first 10 inches, then add ±0.001" per inch thereafter. (0.25 mm for first 254 mm, then add ±0.025 mm per 25.4 mm thereafter). Add minimum of ±0.005" (0.13 mm) across the parting line and for cored features.	±0.005" for first 4 inches, then add ±0.001" per inch thereafter. (0.13 mm for first 102 mm, then add ±0.08 mm per 25.4 mm thereafter).	±0.002" per inch. (0.051 mm per 25.4 mm). Add ±0.015" (±0.38 mm) across the parting line.	±0.005". (0.13 mm). Add ±0.002" (±0.05 mm) across the parting line.	±0.010" for the first inch, then add ±0.002" per inch thereafter. (0.25 mm for the first 25.4 mm, then add ±0.051 mm per 25.4 mm thereafter). Add a max ±0.020" (±0.5 mm) across the parting line.
(As-Cast)										
Flatness (Geometry Dependent)	Within .015" (0.38 mm)	Within .015" (0.38 mm)	Within .015" (0.38 mm)	Within .025" (0.64 mm)	Within .015" (0.38 mm)	Within .010" (0.25 mm)	Within .010" (0.25 mm)	Within .010" (0.25 mm)	Within .015" (0.38 mm)	Within .030" (0.76 mm)
Surface Finish	150-300 RMS	150-300 RMS	125-150 RMS (Can be improved on cored features).	125-300 RMS (Can be improved on cored features).	150-300 RMS	63 RMS	63 RMS	63 RMS	63 RMS	125-150 RMS
Minimum Draft Required	None	None	1/2° to 3°	1/2° to 3°	2° to 4°	1/2° to 2°	None	1° to 3°	1° to 2°	None (Within Tolerance of Drawing).
Typical Wall Thickness										
Inches	0.04	0.110	.125 -.187	.125 -.187	.187 -.200	.080 -.125	0.02	.030 -.060	0.100	0.125
Metric	1.0	2.8	3.2 - 4.8	3.2 - 4.8	4.8 - 5.1	2.0 - 3.2	0.5	0.8 - 1.5	2.5	3.2
(Geometry Dependent)										
Typical Quantities	<10	<25	All	All	>500	<2,000	All	>2,500	500-1500	All
Typical Tooling Price (N.R.E.)	No Tooling	No Tooling	\$2K - 15K (May be less if "Loose" Pattern is used)	\$2K - 30K (May be less if "Loose" Pattern is used)	\$10K - 30K	\$3K - 12K (May be less if "Loose" Pattern is used)	\$4K - 15K (May be less if Direct Wax Patterns are used)	\$15K - 200K	\$5K - 15K	\$2K - 15K
Nominal Lead Times	1 - 4 wks.	2 - 4 wks.	Samples: 2 - 4 wks. Production: 3 - 6 wks. after approval.	Samples: 2 - 4 wks. Production: 3 - 6 wks. after approval.	Samples: 12 - 16 wks. Production: 2 - 6 wks. after approval.	Samples: 2 - 4 wks. Production: 3 - 6 wks. after approval.	Samples: 2 - 4 wks. Production: 3 - 6 wks. after approval.	Samples: 12 - 26 wks. Production: 8 - 14 wks. after approval.	Samples: 3 - 6 wks. Production: 2 - 4 wks. after approval.	Samples: 2 - 6 wks. Production: 6-16 wks. after approval.

Alloy Comparison

The following table illustrates properties of cast and wrought alloys.

Alloy	Heat Treatment ***	Tensile Strength (ksi) - Ultimate	Tensile Strength (ksi) - Yield	Elongation in 2 inches (%)	Brinell Hardness 500 kgf load (10-mm ball)
* Alloys Poured at General Foundry Service					
Aluminum - 356.0* - Sand Castings**	F	19	--	2.0	40-70
Aluminum - 356.0* - Sand Castings**	T51	23	16	--	45-75
Aluminum - 356.0* - Sand Castings**	T6	30	20	3.0	55-90
Aluminum - 356.0* - Sand Castings**	T7	31	29	--	60-90
Aluminum - A356.0* - Sand Castings**	T6	34	24	3.5	70-105
Aluminum - 356.0* - Permanent Mold Castings**	F	21	--	3.0	40-70
Aluminum - 356.0* - Permanent Mold Castings**	T51	25	--	--	55-85
Aluminum - 356.0* - Permanent Mold Castings**	T6	33	22	3.0	65-95
Aluminum - 356.0* - Permanent Mold Castings**	T7	25	--	3.0	60-90
Aluminum - A356.0* - Permanent Mold Castings**	T6	37	26	5.0	70-100
Zinc Aluminum - ZA8* - Sand Castings**	F	38	28	1.5	87
Zinc Aluminum - ZA12* - Sand Castings**	F	42	30	2	115
Zinc Aluminum - ZA27* - Sand Castings**	F	62	54	5	115
Zinc Aluminum - ZA27* - Sand Castings (Heat Treated)**	HT	46	37	9	95
535 (Almag)	F	35	18	8.0	75
A319	T6	31	20	1.5	80
A380 (Die Cast)	F	47	23	3.5	80
6061 (Machine Stock)	T6	45	40	12.0	95

(**Per Standards for Aluminum Sand and Permanent Mold Castings and ZA Alloy Foundry Practices Guide.)

***Heat Treatment of Aluminum Castings

- F** **As Cast** – Castings are cooled naturally from the mold in room temperature air with no further heat-treatment.
- T-51** **Aging Treatment** – Castings that are artificially aged by heating metal to 400F for 7-9 hours.
- T-6** **Solution Heat-treated and Artificially Aged** – Castings are Solution Heat-treated by heating metal to 1000F for 4-12 hours and quenched in water at 150-212F.
- T-7** **Solution Heat-treated and Stabilized** -- Castings are stabilized to carry them beyond the point of maximum hardness, providing control of growth or residual stress, or both.

**Equipment List – Machine Shop
(10.22.12)**

- (2) Haas – VF8 Vertical Machining Center (4-Axis Capability)**
- (1) Haas – VF6 Vertical Machining Center (4-Axis Capability)**
- (1) Haas – VM3 Vertical Machining Center (4-Axis Capability)**
- (1) Haas – SL30 Turning Center**
- (7) Fadal – VMC 4020 Vertical Machining Center (4-Axis Capability)**
- (2) Fadal – VMC 6030 Vertical Machining Center (4-Axis Capability)**
- (1) Fadal – VMC 20 Vertical Machining Center (4-Axis Capability)**
- (3) Bridgeport – Manual Milling Center**

Other New Equipment at General Foundry Service

- **Permanent Molding**
 - (For producing >1,000 “Medium Size” castings per year, dependent on geometry)
 - Hall 3HS - Tilt-Pour Permanent Mold Casting Machine.
- **No Bake Sand Casting**
 - (For producing “Large” castings; 64” x 64” x 18” deep that are 100 to 450 pounds)
 - Tinker Omega TOM-350 - Chemically Bonded Sand Mixing unit.
 - Quiptec – Mold Manipulator.
- **Tilt Furnace**
 - Pyro Industrial Services – 1000 pound Gas fired Tilting Melt Furnace
 - 300 Pound Tilt Ladle on an Overhead Crane.
- **Coordinate Measuring Machine**
 - Zeiss – Contura G2 – 1000mm x 1200mm x 600mm (39” x 47” x 24”)
 - Calypso Software.