HARMONY Castings, LLC

a LIGON Company

V-PROCESS ALUMINUM CASTINGS

Transportation/Heavy Equipment

At Harmony Castings, we've developed strong partnerships with customers in the automotive, rail, heavy equipment, off-road vehicle and motorcycle markets. Our V-Process has earned us recognition for excellent casting integrity and unrivaled speed to market. These features make us your ideal partner from prototype to production for medium-volume casting projects. Unlike bonded sand, Harmony Castings' tight tolerances allow your engineering team to use die cast or permanent mold models for the V-Process, saving valuable time and resources. We also guarantee your pattern throughout the life of your product.

Key Features and Benefits:

- Speed to Market
- Excellent Casting Integrity
- Corrosion Resistant
- Unlimited Pattern Life
- Quick Pattern Revisions
- Tight Tolerances
- 150 RMS Finish
- Thin Walls
- Zero Degree Draft

MISSION STATEMENT

Harmony Castings exceeds customer expectations by delivering quality products and building long-term relationships based on trust and confidence in our performance. Our dealings with our customers, vendors, employees and our community are rooted in integrity.

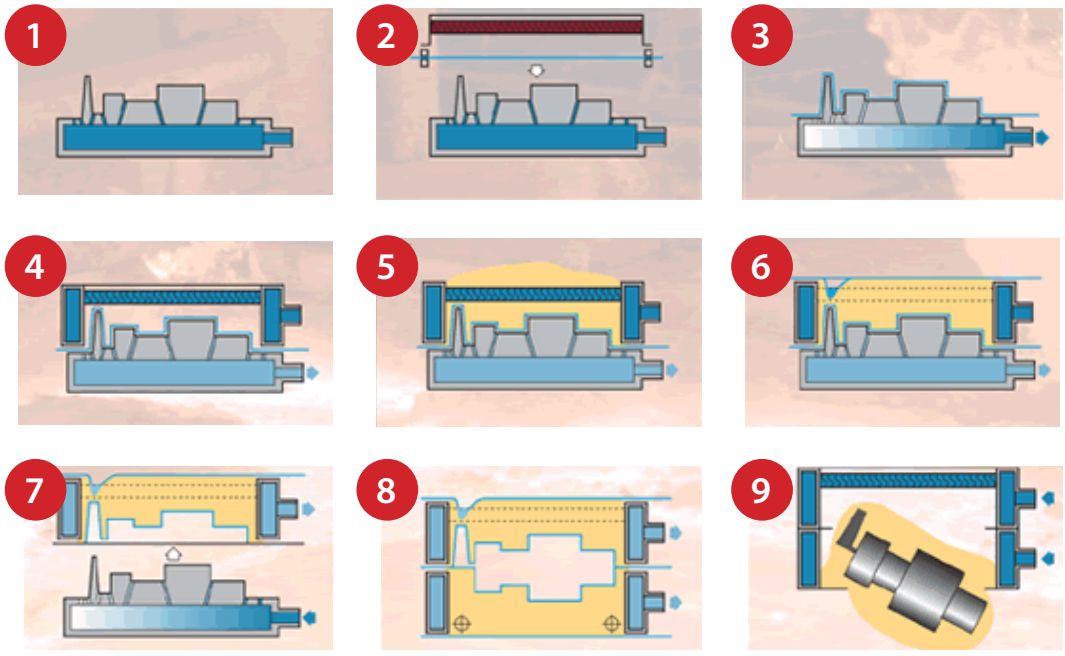
AS9100 SRI

ITAR International Traffic in Arms Regulations Compliant

Visit our website: harmonycastings.com

Send files and prints to: quotes@harmonycastings.com

V-PROCESS *Sequence*



Step 1: The pattern (with vent holes) is placed on a hollow carrier plate.

Step 2: A heater softens the .003″ to .008″ plastic film. Plastic has good elasticity and a high deformation ratio.

Step 3: Softened film drapes over the pattern with 200 to 400 mm Hg vacuum acting through the pattern vents to draw it tightly around the pattern.

Step 4: The flask is placed on the film-coated pattern. Flask walls are also a vacuum chamber with the outlet shown at right.

Step 5: The flask is filled with dry, unbonded sand. A slight vibration compacts sand to maximum bulk density.

Step 6: A sprue cup is formed and the mold surface leveled. The back of the mold is covered with unheated plastic film.

Step 7: Vacuum is applied to the flask. Atmospheric pressure then hardens the sand. The vacuum is released, pressurized air is introduced into the carrier and the mold is stripped.

Step 8: The cope and drag assembly form a plastic-lined cavity. During pouring, molds are kept under vacuum.

Step 9: After cooling, the vacuum is released and free-flowing sand drops away leaving a clean casting, with no sand lumps. The sand is cooled for re-use.

Aluminum Castings: Process Comparisons

Process	Typical Size Range	Tolerances	Surface Finish	Min. Draft Required	Min. Section Thickness	Nominal Lead Time
V-PROCESS Castings	Up to 150 lbs	± .010″ for the first 1″, then add ± .002″ per inch. Add a maximum .020″ across parting line	125-150 RMS	None	.125″	Samples: 2 to 6 weeks Production: 2 to 6 weeks after approval
Sand Castings	Ounces to tons	± 1/32″ to 6″, then add ± .003″ per inch. Add ±.020″ to .090″ across parting line	200-550 RMS	1 to 5 degrees	.25″	Samples: 2 to 6 weeks Production: 2 to 6 weeks after approval
Investment (Lost Wax)	Ounces to 20lbs	± .003″ to 1/4″ ± .004″ to 1/2″ ± .005″ to 3″, then add ± .003″ per inch	63-125 RMS	None	.060″	Samples: 8 to 10 weeks Production: 5 to 12 weeks after approval
Permanent Mold	Ounces to 100lbs	± .015″ to 1″, then add ± .002″ per inch. Add ±.010″ to .030″ across parting line	150-300 RMS	2 to 5 degrees	.1875″	Samples: 8 to 20 weeks Production: 10 to 12 weeks after approval
Plaster Mold	Ounces to 50lbs	± .005″ to 2″, then add ± .002″ per inch. Add ±.010″ across parting line	63-125 RMS	1/2 to 2 degrees	.070″	Samples: 2 to 10 weeks Production: 4 to 8 weeks after approval
Die Casting	Ounces to 15 lbs	± .002″ per inch. Add ±.015″ across parting line	32-63 RMS	1 to 3 degrees	.030″ to .060″	Samples: 12 to 22 weeks Production: 8 to 14 weeks after approval

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