ALUMINUM MOLDS:
BASIC WELD PROCEDURE

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www.questindustries.net

❖ STEP 1: CLEAN THOROUGHLY

- Use aluminum cleaner to clear away any grease or grime that may be coating the surface, and allow the cleaner to completely dry before any welding is performed.
- Use a stainless steel brush that is designated for aluminum to clean the surface to be welded and the surrounding areas. A brush that has been used on dissimilar materials can contaminate aluminum.
- Be sure the surface to be welded and its immediate surrounding area is absolutely clean.
- Most impurities that do not get cleared off the surface, such as oxides, will have a higher melting temperature than aluminum. Aluminum will melt at approximately 1300 degrees f., while the oxide that coats aluminum will melt at approximately 3400 degrees f.
- Failure to clear the surface to be welded of all impurities will potentially create multiple pits that will show only after the part is machined, substantial color mismatch, substantial texture mismatch, and greater difficulty during welding process.

- Welding filler should be treated with same care as base material and cleaned thoroughly. Filler should be kept away from moisture and the normal shop environment.

❖ STEP 2: MACHINE SETUP

- A.C. or D.C. TIG can be used in repair. D.C. is highly recommended if the welder's skill level allows. D.C. is challenging but the result is well worth the effort. Chances of pitting are greatly reduced and the post machined weld blends better with the base material.

• A.C. or D.C. Currents

- Pre-flow: Each application is different. Start with .5 seconds if unsure of the need and adjust as necessary.

- Post-flow: Each application is different. Start with a 3 second post-flow and adjust as needed.

❖Tig Torch

- A gas lens is highly recommended over a collet body. The shielding gas is more evenly and directly spread, so the puddle is better protected. It is imperative that the gas lens or collet body is in like new condition. If the gas lens or collet body is in rough condition the gas could be constricted or uneven. Uneven or constricted gas means the possibility of contaminating the puddle during weld.

❖Pre Heat

- Preheating is not always necessary, unless working on a large piece. If the work piece is large or the material requires, heat to at least 100°F but no more than 130°F-140°F or "hot to the touch". If using A.C. process, heat to the high end for easier welding. NEVER HEAT ABOVE 250 degrees f. Heating to or beyond 250 f. will begin to alter properties of aluminum.

❖A.C. Weld Current

- Gas selection: Use a 75/25 (helium/argon) mix at a flow of 20 CFM to begin. A flow

increase or slight decrease may be necessary. If the puddle looks dirty and a good clean gas lens, as explained above, is being used the flow rate needs to be increased in small increments. Flow meters vary depending on age and abuse. An old or abused flow meter may not show the true flow at the cup.

- Arc Balance: Start with an arc balance of 75-80% and adjust as necessary.

- General Guide: Move quickly and weld hot to avoid creating too large of a heat affected zone. Keep beads from being too convex. If the bead has a horse shoe look and many of these are stacked side by side it leaves voids at the bottom, which will be visible after machining. More of a gently sloped bead is necessary. In a perfect situation, running a finger over top of the buildup should feel smooth and without dips between beads.

❖D.C. Weld Current

- Gas Selection: Use straight, Ultra High Purity (U.H.P) helium. Set gas flow at 25 C.F.M or more. The tungsten needs to be close to the puddle and not sticking out from the cup any further than necessary for the situation. If it is welding “dirty”, the gas flow could be too low, the tungsten/cup could be too far from the puddle, or the gas lens is dirty.

❖**General Guide**

- If done correctly a shiny spot will appear after the arc begins, this is the puddle. Add the filler quickly and precisely. Avoid keeping the filler too close to the arc, as it will melt before it gets to the puddle. Move quickly and weld hot to avoid creating too large of a heat affected zone. Keep beads from being too convex. If the bead has a horse shoe look and many of these are stacked side by side it leaves voids at the bottom, which will be visible after machining. More of a gently sloped bead is necessary. In a perfect situation, running a finger over top of the buildup should feel smooth and without dips between beads.

❖Post Weld Process

- To help eliminate "shrink lines" on the outside of the weld after machining, LIGHTLY peen the outside of the buildup or directly on the single bead. Use a dulled or blunt punch if the weld is not in the open for a ball peen hammer. This also helps to eliminate stress that is created when weld is added to some materials.
- Let the mold cool by itself. Do not quench or force a cooler temperature upon the work piece. The work piece may be placed on a thick plate or floor to let the heat be drawn equally from the part.

❖Filler selection

- Use ***Crown Alloys*** for reference if unsure of the correct filler to use with the work piece. There are thousands of base materials, compared with the approximately 20 fillers. NEVER assume when it comes to matching materials, leave it to the experts.

Crown Alloys:
Madison heights, Michigan
Contact- Chris Hoffmann
Phone-248-588-3798

- **There are materials, such as 7075, that are referred to as non weldable. This is because of intergranular corrosion. If two pieces of 7075 are welded together, regardless of filler, the weld WILL fail at some point. It is only recommended to weld these types of materials in a mold repair setting.**

❖ADVANCED SETUP

- If the machine has pulse capabilities and the welder's skill level allows, this function may be used to further the quality of the repairs. For example, small cutter marks, text changes, light dents or scrapes are all easily fixed with minimal heat and filler.
  Outlining a buildup with pulse can eliminate "shrink line."
  Pulse can greatly minimize the heat affected zone, and in turn the repair will be less likely seen on the plastic part that the mold produces.