Eastwood

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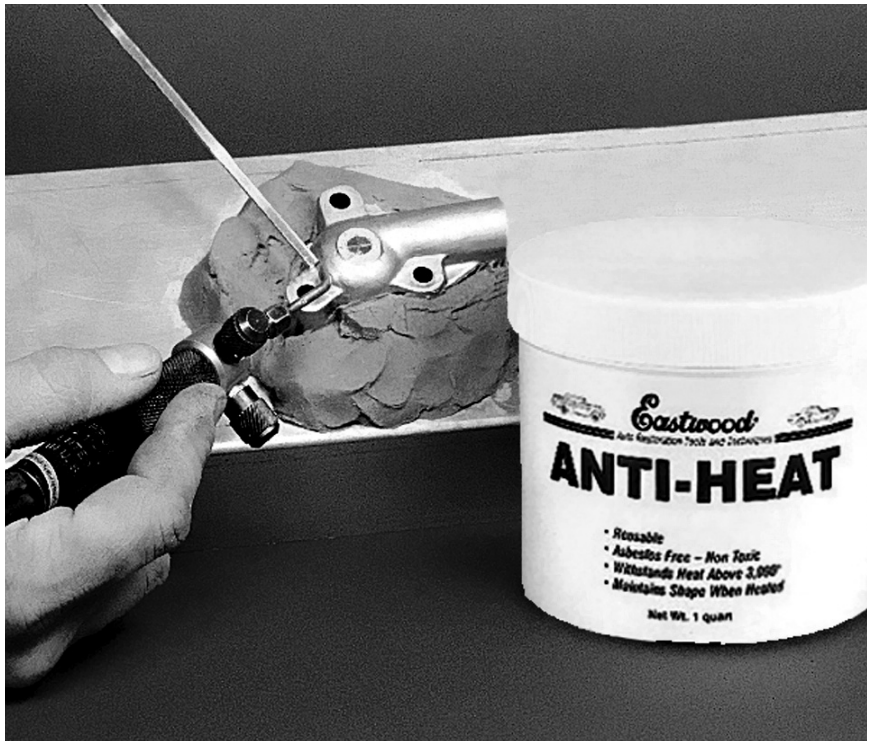
Alumiweld System

Standard kit part #19079
Deluxe kit with Anti-Heat part #19081



Instructions

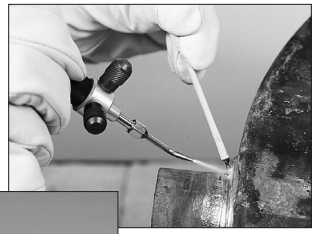
Introduction

ALUMIWELD is unlike any other brazing, welding or soldering process. It accomplishes welding without a flux by dissolving and fusing with the aluminum at temperatures 400˚F/205˚C below the normal melting temperature of aluminum.

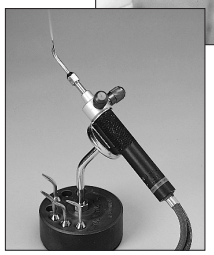
Because it is a different process, it is important to read the entire procedure before beginning. Even experienced welders may find some things are done a little differently. First, the base metal must be up to working temperature. If you let the heat from the work (instead of the flame) melt the rod, you will be sure of proper working temperature. Second, puncturing the oxide coating on the surface of the base metal is essential for good weld penetration.

Suggested Products

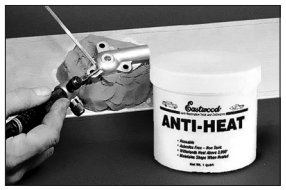
Other items to assist in better results:



#19046 Jeweler's Torch
Small enough to maneuver into areas where full-sized torches won't fit. Great for applying heat to stuck nuts and bolts without damaging the surrounding area.



#31042 Anti-Heat Compound
To hold broken parts in position during welding and to shield surfaces from heat damage. (Included with Deluxe Kit)



Alumiweld for Aluminum

1. **Clean the Weld Surface Until Shiny**
   Cleanliness is essential for a strong, permanent joint; "clean" means metallurgically uncontaminated. The best tool for this is a stainless steel brush or scratcher, or clean aluminum oxide sandpaper. Keep your brush exclusively for cleaning aluminum. Clean the surface to a bright shiny metal. In hard-to-reach places, such as air conditioner condensers or aluminum radiators, you can use a stainless paring knife or other sharp instrument. If the spot is too difficult to clean, it may also be difficult to weld. Abrasive blasting is acceptable using clean material.

2. **Heat the Base Metal (Not the Alumiweld Rod)**
   Heat the area evenly until the base metal melts the cool rod (730˚F/388˚C). Back off the flame occasionally and test the temperature by striking the cool ALUMIWELD rod to the surface. It takes a lot of heat to reach the working temperature but comparatively little to maintain it. When ALUMIWELD reaches 790˚F/421˚C it dissolves aluminum quickly. When heating the base metal, direct the flame at right angles to the base for a more even and efficient heating. Heat may also be applied from the opposite side when convenient. Apply a thin coating of ALUMIWELD (see STEP 3). Then back off with the heat until the coating hardens. This gives you a good feel for holding the temperature close to, but slightly hotter than 730F˚/388˚C (aluminum will not be dissolved or penetrated at less than 730˚F/388˚C).

3. **Coat the Weld Surface with Alumiweld**
   Coat the surface where penetration is to occur with a thin layer of ALUMIWELD™. This keeps the air (oxygen) away—much like the inert gas envelope on MIG or TIG welders.

4. **Remove the Oxides**
   As you heat the base metal, additional oxides form even more rapidly, but become stretched under tension. You must remove the oxides to achieve penetration. Remove the oxide barrier by going down through the molten coating and abrading the oxides. One way to do this is to turn the rod around and use the cold end because it is harder, more abrasive, and won't melt as fast. However, excess rod may melt into the puddle and be wasted. Using the included stainless steel rod to abrade away the oxides will save material. Continue with step 5.

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5. **Abrade the Remaining Aluminum Oxide**
When punctured, oxides break up into a fine powder and float visibly to the surface of the puddle. Draw the stainless steel rod through the puddle several times to remove oxides and promote fusion with the base metal. The more you abrade at the working temperature, the deeper the penetration into the base metal. However, complete penetration is not a good idea. A few strokes (.004" to .005" deep) is usually enough for maximum strength. Use the stainless steel rod the same way when working in a deep hole, such as with stripped threads. Drill out all old threads (with a hi-speed drill) to "clean" the hole. Work the rod on the walls to remove the oxides. Fill the hole, then re-tap when cold. (Additional details under Special Projects.)

6. **Fill or Bridge the Joint**
Fill or build-up the repair area to add strength, but just slightly higher than what you want when finished to avoid excess grinding. You can work with the rod in the flame at this point because you have completed the penetration. Fill a small hole by puddling all around the hole and then pulling material across. Use a patch on a larger hole: do steps 1 through 5 around the hole and on the patch. Apply or clamp the patch firmly and reheat. For proper fusion, direct the heat to get a remelt on both pieces. Do lap joints and butt welds the same way. Do the basic weld (Steps 1-5) on each piece as a separate operation. Fixture pieces into position, reheat to working temperature, and fill as needed. This fuses the ALUMIWELD material into each piece and then to itself. It's a little tricky to work on the top and bottom sides of a crack. The first side tends to remelt, particularly on thin material. Usually a repair on just one side is enough. (Refer to Miscellaneous Tips and Special Projects for additional information.)

7. **Cool at Room Temperature**
Allow the piece to cool at room temperature, but ***DO NOT IMMERSE IN WATER*** to speed cooling (cooling too quickly makes it brittle). The repair will harden in a few seconds and can be worked immediately. It will grind, machine, drill, tap, paint, etc., much like mild steel.

Alumiweld for Pot Metal

ALUMIWELD is compatible with "pot metal" – that is, parts made basically of zinc alloy castings (die casts) with a melting point equal to or higher than 730F˚/388˚C. You can temperature-test by placing a tiny bit of the workpiece (a drill chip, e.g.) and an equal size piece of ALUMIWELD on an aluminum plate (for even heating), apply heat evenly to the plate and see which one melts first.

1. **Surface Prep**
If the pot metal is electroplated, have it de-plated. You can also carefully abrasive blast. It is not necessary to strip off the copper; simply buff with a sisal wheel and emery compound or fine sandpaper. Stripping should expose any imperfections.

2. **Cleaning**
Remove all dirt, grease and old coatings. Clean down to the bright, shiny metal as with aluminum. Also, shine the ALUMIWELD rod with clean aluminum oxide sandpaper.

3. **Drying**
"Bake" the piece until dry. Pot metal can become quite porous (particularly with age) and may allow moisture or oil penetration. If you heat the piece too fast, this moisture or oil can vaporize faster than it can escape, so you may experience some minor "popping" or "exploding." To remove the hydrocarbons safely, place the piece in an oven, bring it slowly up to 250˚F/121˚C over a period of about an hour, then take it up to 400˚F/205˚C. Allow the part to cool. After cooling, wipe down with Acetone or lacquer thinner using a clean rag. Repeat this baking, cooling and wipe down process until there is no residue indicated on the clean rag.

4. **THE Supporting Fixture**
Support the pot metal to preserve its exact shape in the repair area because it will sag from its own weight before it melts, and also melts quite suddenly with no apparent color change. Broken pieces must be fixed (secured) in their original position, and missing pieces may have to be replaced by making a rough mold with Anti-Heat (#31042). If you are going to join broken pieces, glue them together with "super glue." The supporting fixture you will make will then know the exact original shape. Place the Anti-Heat Compound onto a board, and press the piece into it just far enough

to fully support the piece. Carve out the shape of any missing original piece. It may be necessary to weld one side, turn the piece over, then weld the other side.

If this is the case, make a fixture suitable for the second weld using jigging putty. Now, and only now, can you separate the pieces; clean them until bright with the Hanging Flex-Shaft Motor (#12793), sandpaper, etc. Scarf (bevel) the edges on thicker pieces. Even if you destroy the original fit, it's preserved in the fixture. Place pieces back in the fixture.

5. **Welding**
   Welding techniques for pot metal are similar to those for aluminum, but in miniature. Use a miniature, fuel-oxygen torch. For best results, use the Jeweler's Torch (#19046) for pinpoint heat control. Tips are as small as 0.003", for surgical-type stitching of low-melt metals. (On heavier pieces of pot metal, you can get by with a standard welding torch, but use only the smallest tip). Melt the base metal and flow it together using ALUMIWELD rod to add the missing or extra material. Watch for the pot metal to melt. Feel with the rod for the surface to soften. This will warm the rod so that it is ready to blend with the melted base metal. Build the fillet a little high. Stir out all potential voids or you may uncover them when finishing and have to redo the job.

6. **Finishing**
   Coarse surface finishing may be accomplished with a grinding wheel, belt sander, or file. When you get close to the original surface, switch to a Hanging Flex-Shaft Motor (#12793) or Mini Buffer/Grinder (#25308). Polish with Tripoli compound and a spiral-sewn cotton buff first, then color with the white rouge and a loose cotton buff. Your pot metal will come up to a chrome-like luster, ready for plating if you choose to do so.

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Miscellaneous Tips

Heat Source: A simple LP gas torch with a general-purpose tip is usually sufficient, just so you reach and maintain 730˚F/388˚C. For heavy pieces use a fuel-oxygen torch and a large tip, with a neutral flame to spread the heat evenly. Heat with the middle or outer cones of the flame only.

Heat Control: Preheated large pieces of aluminum lose less heat into the rest of the casting. Working with a cool rod is best; if you've been working one rod for while, switch to cool one. Using the torch flame with careful temperature control, a short stub can be fused to a new rod.

Joining different-sized pieces: Apply most of the heat to the larger piece so they arrive at working temperature about the same time.

Butt welds may need a backup (a brick or sheet of stainless steel or copper) to keep ALUMIWELD from dripping through. Anti-Heat (#31042) may also be of help here.

Lap welds may be clamped or spliced together when molten to get intimate aluminum contact and high strength.

Some T-joints may avoid the use of clamps or fixturing if you can keep part of the joint solid while working at a temperature just above the melting point at the other end of the joint.

Bridge joints: ALUMIWELD is stiffer, harder and stronger than most heat-treated aluminum. The aluminum will fail before a big fillet will.

Special Projects

Tubing: Welding cylindrical shapes is tricky, though possible, because the molten fillet wants to run around and gather at the bottom. There are two solutions to this: 1) apply heat control as described in the pot metal section, or 2) make a "swedge." Flair one tube, taper the other. Make a very thin, basic weld on each interface. Join the pieces, reheat until the fillets flow together; fill with more rod if necessary. You can even join copper to aluminum this way. Flare the aluminum and taper the copper. "Scrub in" the liquid ALUMIWELD with a stainless steel brush. ALUMIWELD is reluctant to penetrate the copper, but it will adhere like a good, hard solder.

Thick-to-Thin (or large-to-small): Apply the basic weld on the thin (small) piece. Do the same thing on the thick (large) piece. Fixture and reheat until the fillets flow together. A little stirring with the rod helps.

Missing Edge: Start with the basic weld on the broken edge, and back off a little on each side to provide an “anchor” upon which to build. Clamp a piece of steel (tin is okay, but stainless is preferable) to the edge and level it. Reheat the anchor and “build” onto the steel by placing the rod into the flame. (This is the only time you normally put the rod into the flame.) Grind and fill as necessary. If the piece is bent, it must be heated and reshaped first.

Building and Bridging: You can bridge a gap or hole as big as a dime by making the basic weld around the hole; then building a “doughnut” of liquid ALUMIWELD and “buttering it across.” This takes some practice.

Sheet Metal Seaming: Cracks and tears can be fixed with a simple overlay, since the metal is probably too thin to scarf (bevel). Go beyond the end of the crack (drilling a small hole at each end of the crack will prevent the crack from spreading). Make repairs on the underside when possible.

Stripped Threads: Drill out the old threads so that you have clean, shiny walls. Apply ALUMIWELD to the walls of the hole. If the hole fills before you have removed the oxides (and you don’t want to melt away more rod) use a stainless steel wire in place of the cold end of the rod. Be sure the top and bottom of the hole are up to working temperature. If you leave the hole not quite filled, you can easily find the old hole for redressing, etc. Think “steel” when you machine this material. It is HARD. Your drill will want to slide off the hard fillet into the soft aluminum. Your new thread is several times stronger than the original old threads.

If you have any questions about the use of this product, please contact The Eastwood Technical Assistance Service Department:

1-866-759-2131 email: techelp@eastwood.com

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