LUMIWELD

THE ORIGINAL LOW TEMPERATURE ALUMINIUM FUSION WELDING PROCESS
A DIFFERENT, MUCH EASIER METHOD OF FUSION WELDTNG ALUMINIUM AND ZINC DIE CAST MATERIAL

FUSION WELD WITH LITTLE OR NO EXPERIENCE
ALMOST ALL TYPES OF ALUMINIUM /ALUMINIUM
ALLOYS INCL. MAZAK, DIE-CAST, BIRMABRITE, GALVANISED STEEL ETC. ETC.

BUTANE OR PROPANE TORCH NEEDED NORMALLY
(PRE-HEAT LARGER COMPONENTS)
FUSION WELDED JOINT IS HARDER THAN MILD STEEL
FUSION WELDED JOINT IS UP TO 4 TIMES STRONGER THAN ALUMINIUM
NO FLUX REQUIRED
ROD MELTS AT 38OC

INCLUDED IN ALL KITS ARE RODS, 225mm x 3.2mm (9" x 1/8")
STAINLESS STEEL ABRADER,
STAINLESS STEEL BRUSH
EASY TO FOLLOW INSTRUCTIONS

INSTRUCTIONS

SAFETY!

ALWAYS USE LUMIWELD IN A WELL VENTILATED SPACE. IF YOU ARE BREATHING THE HOT AIR FROM THE FLAME THEN YOU ARE PUTTING YOURSELF AT RISK, - THE USE OF A RESPIRATOR IS STRONGLY ENCOURAGED IN ALL CIRCUMSTANCES.

PRACTICE

Always practice on a scrap piece first to get the feel and look of the Lumiweld on hot metal before you attempt your first repair. For most repairs an air aspirated blow torch is all that is needed. Gases such as Mapp, Butane, and Propane, Paraffin blowtorches are all suitable, also Oxy-propane, and Oxy-acetylene can be used. If you plan to use the latter, set a large nozzle to a neutral (just off carbonising) flame.

ALUMINIUM ALLOYS

STEP1. CLEANING
As with all welding, cleanliness is essential for a strong permanent joint. By "clean" we mean metallurgically uncontaminated. Only by using the abrader or wire brush will you achieve this. In hard to get to places, such as an odd-shaped casting, you can used the abrader bent to a suitable shape (see stripped threads)

STEP2. HEATING
Aluminium doesn't worry how it gets hot, just so long as the working temperature of the Lumiweld is reached & maintained. Keep the flame on the move as your aim is to heat the whole casting, not just the one small area. Preheating in a domestic oven will save time. Heat until the work piece melts the rod, NOT the flame. As aluminium is "hot short" (no colour change when heated) back off the flame occasionally and test the rod by touching the rod on the surface as you heat it up. Heat control, without any visual change in colour, is not easy; you need to observe the behavior of the Lumiweld not the aluminium. It takes a lot of heat to get up to the Lumiweld's working temperature, but very little to maintain it. Heat may also be applied to the underside of a work piece if more convenient. If you only have a small torch, a camping gas stove etc. can be used to provide backup heat. **Do not heat the Lumiweld rod in the flame at this stage as small sections of the rod will break off.**

STEP3. COATING
As the hot aluminium melts the rod "tin" the surface (as in soldering) with a thin layer of Lumiweld. This layer will be used to exclude air from the surface of the work piece. Once tinned, back off the heat and allow the Lumiweld to frost over, and then re-introduce the flame to melt the Lumiweld again. This way, you will develop a feel for holding the temperatures slightly hotter than 382C (715F)

STEP4. ABRADING
To penetrate the invisible oxide barrier, thorough scratching the surface of the base metal with the Lumibrader is essential to promote a molecular bond, as no flux is needed. This is what makes the Lumiweld Process different from other soldering, brazing & welding methods. When you feel the surface of the aluminium go soft under the Lumibrader, penetration has taken place. As an alternative you can draw the Lumibrush back and forwards once or twice ONLY along the weld area-this method gives a very neat but wide "tinned" area. Because the Lumibrush is liable to melt near the flame of the torch, raise the temperature of the weld area, then move the flame away when the brush is used. To clean the brush, quickly & carefully heat the end of the bristles to red heat and then run past the edge of a piece of scrap aluminium to flick off the molten Lumiweld

STEP5. FILLING
Having "tinned" the weld area move the flame to allow the Lumiweld to "frost over". This ensures you do not overheat the aluminium. Re-apply the heat, but this time melt the rod IN THE FLAME and build up to create a normal weld fillet. To produce a very smooth, clean surface, the Lumibrader can be drawn slowly across the surface of the molten Lumiweld to remove the dross before withdrawing the heat.

STEP6. COOLING
Once you are satisfied with the repair, withdraw the flame and allow the Lumiweld to "frost over" and cool naturally. When cool enough to handle, the Lumiweld can be worked immediately.
Do not accelerate the cooling process by quenching in water. It will make the Lumiweld brittle and soften the aluminium (the reverse effect to quenching steel).

PROJECTS

MISSING EDGE

If a lug or part of a casting is missing, the new piece can be cast onto the old with a little preparation. Jobs that can be tackled include missing chunks from aluminium marine propellers or a missing cylinder head cooling fin. Using sheet steel or anodised aluminium bent to the required shape, clamp in position. Prepare and weld the Lumiweld to the surface of the casting (see steps 1 to 6). When joining a small piece to a large piece such as a broken lug on a casting, heat and prepare the small one first. Put to one side then repeat on the larger casting. While playing the flame on the large piece bring the small piece into the flame and join as described earlier. Once the Lumiweld has been tinned to the old surface, you can start building out (& or up) to the required shape. Apply more than you need to eliminate dross and air bubbles. Once cool the new piece can be ground back to the required shape.

STRIPPED THREADS

Usually when you strip a thread, it can be quite a hassle to repair it. You need the right size drills, taps and insert coils and still the thread will only be as strong as the aluminium. Not any more! Two methods can be used, one technical the other - well lets just call is the emergency non technical method!!

Method I

Drill the hole 50% over size, heat, preferable from the underside. Melt enough Lumiweld to cover the bottom of the hole. Use the Lumibrader, modified earlier, (flatten the end and bend the last 2mm (0.06") at right angles). Abrade the hole and then draw the molten Lumiweld up the side of the hole. Next, fill the hole by pushing the Lumiweld rod into the bottom of the hole until the hole is filled and has a slightly domed top (this is to allow for shrinkage). Once cool, drill a 2mm pilot hole to ensure the main drill doesn't drift off into the softer aluminium. Drill & tap in the normal manner.

Method 2 - non technical

Drill out as before. Select a nut big enough to suspend the bolt in the hole. Heat and prepare the hole as described previously but only fill the hole to within 3mm (1/8") of the top. Next, heat the bolt to cherry red, at the same time keeping the Lumiweld molten in the hole. Position the nut over the hole then insert the bolt. Remove the heat and allow the piece to cool. Do not attempt to remove the bolt until it is cool. Once the bolt has been screwed out check the thread in the hole, you will observe the thread is not fully formed. Although this is an emergency method, there is nothing to say this can't be a permanent repair. Most threads in aluminium castings have a maximum torque of approximately l7 N/m (12.5lbft.), however, because Lumiweld is stronger than aluminium this torque can safely be doubled (even trebled if the bolt can take it!)

MISSING STUD

Method I

Again, two methods can be used. First, select a washer and place in the required spot on the aluminium. Heat and abrade aluminium in the centre of the washer as described previously. Next, select the nut one or two sizes bigger than you need. Place the nut over the washer and gently melt Lumiweld in to the centre of the nut (this is to stop the molten Lumiweld being forced out between the nut and the washer). Back off the heat to allow the bottom to cool so that a seal can be formed. Now direct the heat from the top and fill the nut to just below the top. When cool, unscrew the nut and remove the washer, file a bevel on the top of the new stud to allow the correct size die to start its cutting action.

MISSING STUD
Method 2-Non technical
Using a correct nut prepare and fill the nut as described. When cool remove the nut and washer. Once again it will be noticed that the thread on the new stud is not fully formed but it is strong enough to be torque down to 20-25N /m (14.75-18.45 lbf-ft). Remember the stud is only as strong as the aluminium it is welded to.

CRACKS IN CASTINGS
When repairing a crack in a casting there is no need to "stop drill" beyond the end of the crack to stop it spreading. Grind out a bevel to at least half the depth of the casing on “ONE” side only, preferably on the inside where it won't be seen and then treat it as a butt weld.

SHEET METAL AND SEAMING
Seams are fabricated differently from the standard sheet metal techniques in that the flanges are reversed or turned inwards. Use the standard techniques for soldering, but because no flux is used, prepare the mated surfaces before bringing both together.

TUBING
Cylindrical shapes are a little tricky but still possible, the Lumiweld will want to run around and gather at the bottom. On thin tubes, make a "swage" by tapering one end and flaring the other for a loose fit. Prepare both surfaces, bring together, re-heat until the Lumiweld flows once more and sweat both tubes together. On tubes over 4cm (2") dia. using a small flame tack weld first then work your way round the tube, rotating it as you go. Work slowly to allow the Lumiweld you have just applied to harden over.

FINISHES
If left unprotected Lumiweld will slowly develop a pewter coloured patina. Where a lumiweld repair will be seen, on say a casting, one successful way to dress the repair is hand finishing. Care must be exercised when filing the harder Lumiweld level with the surrounding softer aluminium.
The file will pick up the Lumiweld, then transfer the filings to the aluminium and proceed to put scratches in your casting. To overcome this, carefully file the fillet almost level then change to aluminium oxide or wet & dry paper.

Metal polish can be used as a final touch. Alu-Magic is highly recommended for this as it provides a protective coating lasting up to 3 months between polishing. Lumiweld can also be painted, chromed, powder coated, zinc anodised and electroplated (incl. copper plating).
Experience has shown that if a casting is chrome plated, the Lumiweld repair is liable to show up slightly darker under the chrome. Therefore, it is advisable to copper coat first.

BRASS COPPER & PHOSPHUR BRONZE
Lumiweld can be used as a hard solder on brass and copper without any flux. Heat up the copper until it melts the Lumiweld rod, and then scrub the Lumiweld into the surface with the Lumibrush until the surface is "tinned". The same method above is used for joining brass except there is no colour change. Once the brass or copper has been tinned it can be joined to aluminium (following steps l-6) and zinc die-cast if suitably prepared.

GALVANISED STEEL
Heat the steel as you would the aluminium. Although Lumiweld will not adhere to the steel care has to be taken NOT to melt the zinc coating. Lumiweld can be used as a protective coating where two pieces of galvanised steel have been joined with a MIG weld.

ZINC DIE-CAST

Because Lumiweld has a lower working temperature than other welding process's available on the market, it is therefore more suitable for ALL types of zinc die-cast repair.

It's not easy to tell if a casting is made of zinc; colour and weight is one clue (heavier & greyer than aluminium). The melting point is the main clue; zinc die-cast usually melts at about 430C (800F). If you have any doubts about what you have before you, a small test can be carried out which involves equal sized samples of Lumiweld and the casting. Heat both on a metal plate. If the Lumiweld and the casting melt at about the same time, then you have in your hand a zinc casting. If the casting doesn't, assume it's an aluminium alloy. A different method is used to repair zinc than aluminium because of its lower melting temperature and composition. You will need aquantity of Mould Plaster (available from most glass fibre suppliers) and a small pencil type torch or a 0.75kw torch nozzle. A number of these are available on the market. Some are oxygen assisted but an air aspirated one will do just as well.

Cleaning

Clean down the zinc to bright metal, as with aluminium. Also shine up the Lumiweld rod with aluminium oxide sandpaper.

Baking

Zinc die-cast can become quite porous, allowing moisture and oil to penetrate deeply. If you heat the piece too fast, this moisture & oil can vaporize faster than it can escape causing "spalding" (minor explosions below the surface which show up as a flaking surface). To eliminate this problem, you need to bake the casting. To do this, put the casting in an oven (check with your wife first!), bring the temperature up to l22C (250F) over a period of 30 mins. Increase the temperature to 206C (400F) for 15 mins to remove any hydrocarbons.

Preparing

If your zinc die-cast is electroplated you must first de-plate it. This can be a D-I-Y operation or a commercial electroplater will carry it out for you. With a broken casting, first glue the two pieces together with superglue. Clean up the area by removing any excess glue, if a small piece is missing, fill with melted candle wax and shape. What you are doing is preparing the casting for the mould plaster to mimic.

MOULDING

Like aluminium, zinc die-cast is "hot short" (it doesn't change colour when heated). Unlike aluminium, the melting safety margin between zinc and Lumiweld is only 43C (ll2F)

Zinc also melts very suddenly-from the inside-due to the higher melting temperature of the oxide barrier. Therefore, the piece must be supported to preserve its exact shape around the repair area.

To do this mix Plaster as directed by the manufacturer. Pour into a suitable sized cardboard or plastic tray. Press the casting half way into the plaster with the repair area submerged (ensure you can release when the plaster has set). Once the mould plaster has set (it gets hot as it cures) repair the casting and check the impression. Clean up the mould if necessary. As you will see, the mould remembers just how the casting fits.

Now you can break the superglue joint and remove the wax (if any). Bevel the edges on the Opposite side of the casting to the mould plaster. Place the casting back in the mould ready for heating.

WELDING

Welding zinc die-cast is very similar to brazing but at a much lower temperature (because of The lower temperature it's technically classified as soldering). Heat control is a little harder. Heat the casting with the rod in or near the flame, occasionally touching the surface of the casting with the rod until they both go soft, back off the heat immediately and come in again puddling the rod into the molten casting until you have a satisfactory repair.

It pays to keep withdrawing the heat to ensure you don't have a "melt down" situation. You can also stir the weld with the Lumibrader to eliminate any voids you may uncover when grinding back to finish.

FINISHING
Coarse finishing may be done with a grinding wheel, belt sander, file or any of the methods mentioned under the heading "ENGINEERING RECOMMENDATIONS". For final finishing and dressing see under “FINISHES". Your casting can be buffed up to a chrome like luster ready for plating if need be.

EI\GINEERING RECOMMENDATIONS
MACHINING H.S.S. cutting tools will give excellent results.
DRILLING Standard drills can be used. Fast spiral drills give lower torque and better swarf clearances, low spiral drills give better finishes and less burring.
REAMING; For best performance use normal 6 flute reamers 0 deg. rake 45deg.lead chamfer. For best results try a right hand spiral reamer.
MILLING; No problems occur with pick-up or finish when milling
END & PLAIN MILLING; for deep cuts, speeds of 3Om/min.to 75mlmin are recommended whilst shallow cuts are best done at 60m/min to 15Om/min.Shallow finish cuts of 0.5-0.6mm.

TAPPING; As Lumiweld gives very high thread strength, torque setting can be double the norm. Standard utility taps work well, but for best results use spiral taps (Note -not flute).
BANDSAWING: Coarse blades give you the highest productivity and minimize pick-up, skip tooth and hook tooth types are very suitable. Thin castings may require finer pitch blades
Because two teeth must be in contact with the work at all times.
Finally, if you are one of those people who cannot pat his head and rub his tummy at the same time, you'd better get someone else to weld your zinc die-cast. It takes a little co-ordination.
Should you experience any problems working with Lumiweld or require more technical advice, please contact us.

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