

D-M-E Pro Weld™



PREFACE

Please read this instruction manual thoroughly before using your D-M-E Pro Weld™ system.

The D-M-E Pro Weld unit is a newly developed resistance-type micro-welding machine. It is powerful enough to weld 0.3mm thick metal sheets and has a wide selection of welding materials in sheet, wire and powder form to choose from.

Applications

- ♦ Welding can be made to steel molds and dies for plastics, rubber, die casting, and compression molds.
- ♦ Welds can be applied on as-rolled steel, pre-hardened steel, quenched and tempered steel, free cutting steel, stainless steel, and others.
- ♦ To build up parting lines, mold seams, 3-point corners and edges.
- ♦ To fill in pores, repair of pinholes.
- ♦ To repair wear, worn areas on slides, ejector pins, sharp edge molds, and thin core parts.
- ♦ To design modification of inserts and cores.
- ♦ To add a radius to an inner corner due to a design change.
- ♦ To repair the shrinkage that occurs after argon arc and TIG welding.
- ♦ To repair damage due to overgrinding, from an end mill or EDM process.

D-M-E
Pro Weld™

Model No. UMW0001

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I. Introduction

Please read this instruction manual thoroughly before using your Pro Weld™ system.

Pro Weld is a newly developed resistance-type welder. It effectively builds up material to repair or redesign molds and dies. [Note: It is not recommended for use on press dies, blow molds (usually made from aluminum) or aluminum molds.]

The resistance welding method creates high energy discharges in very short cycles through a capacitance circuit. Almost no heat is created and, therefore, the base mold material is not altered or damaged.

The Pro Weld micro welding technique is revolutionizing the repair of molds by keeping this work in-house. Pro Weld welds 0.1mm, 0.2mm and 0.3mm thick metal sheets or strips, metal wire and metal powder to the damaged area. It is extremely easy to use, reduces downtime and improves quality.

Advantages

- ♦ No scaling or flaking occurs after welding as the sheet, wire and powder metals used are free from impurities, and because the weld has high strength, homogeneity and reliability.
- ♦ Easy to operate, no special training necessary.
- ♦ Hand and machine finishing is easier as the amount of weld metal is not excessive.
- ♦ As the process emits almost no heat, there will be no shrinkage, distortion, deformation or discoloration of the mold.
- ♦ No welding fumes or toxic gases are emitted.

- ✦ The process is optimally suited for small areas and micro welding.
- ✦ Hardening and plating can be done after welding.
- ✦ Welding work time is greatly reduced. Roll welding a 3/8" (10mm) long parting line can be done in 1 minute, treating a pinhole in 30 seconds.
- ✦ As the capacitor system charges slowly and unloads quickly, an input power can be used with low loading capacity.
- ✦ A built-in microprocessor allows stored energy to be easily adjusted.
- ✦ High quality selection of welding materials in 0.1 and 0.2mm thick metal sheet, 0.2-0.5mm diameter wire and powder metal.
- ✦ After the initial weld, if more padding is required, re-welding can be done easily.
- ✦ Pro Weld is powerful enough to weld 0.3mm thick sheet.

II. Specifications

| Model | Pro Weld UMW0001 |
|---------------------|----------------------|
| Input Voltage | 120 VAC |
| Consumable Power | 600 VA |
| Output Power | 700W |
| Output Voltage | 0 - 9V |
| Output Current | 0 - 1100 Amps |
| Control System | SCR Switching System |
| Auto Timer On | 0.5 sec. |
| Dimensions (inches) | W6.5 x D17.75 x H16 |
| Weight | 62 lbs |

Standard Accessories for Pro Weld UMW0001

Complete Pro Weld system includes: (Dimensions in millimeters)

| Catalog No. | Description |
|-------------|--|
| UMW0001 | Power pack with welding cord, grounding cord and plate, power cord, foot switch and all accessories listed below |
| UMW0002 | N51–Standard SKH-51 steel powder (50 grams) (63 Rc; for D-2/M-2/S-7 steels) |
| UMW0003 | N80–Standard NAK80 steel powder (50 grams) (38-40 Rc; for P-20/P-21 steels) |
| UMW0004 | NAK80–Standard steel sheet (10 sheets, 0.1T x 5W x 100L) (38-40 Rc; for P-20/P-21 steels) |
| UMW0005 | NTA1–Ni Alloy sheet (10 sheets, 0.1T x 30W x 70L) (135HV; for all steels) |
| UMW0006 | NTA2–Ni Alloy sheet (10 sheets, 0.2T x 30W x 70L) (135HV; for all steels) |
| UMW0007 | Protective glasses |

Standard Accessories for Pro Weld UMW0001 (continued)*Complete Pro Weld system includes: (Dimensions in millimeters)*

| Catalog No. | Description |
|--------------------|--|
| UMW0008 | Protective gloves |
| UMW0009 | Magnet electrode (2 dia. x 50L) |
| UMW0010 | Magnet electrode (3 dia. x 50L) |
| UMW0011 | Magnet electrode (4 dia. x 60L) |
| UMW0012 | Magnet electrode (4 dia. x 50L) |
| UMW0013 | Standard electrode (2 dia. x 50L) |
| UMW0014 | Standard electrode (3 dia. x 50L) |
| UMW0015 | Standard electrode (4 dia. x 50L) |
| UMW0016 | Standard electrode (1.2T x 5W x 35L) |
| UMW0017 | Standard electrode holder (black) (used with UMW0015) |
| UMW0018 | Magnet electrode holder (brown) (used with UMW0011 and UMW0012) |
| UMW0019 | Standard electrode holder (black) (used with UMW0016) |
| UMW0020 | Standard electrode holder (black) (used with UMW0013) |
| UMW0021 | Standard electrode holder (black) (used with UMW0014) |
| UMW0022 | Magnet electrode holder (brown) (used with UMW0009 and UMW0010) |
| UMW0023 | Tool box |
| UMW0024 | Sheet metal shears |
| UMW0025 | Screw and wrench set |
| UMW0026 | Fuse (2A) |
| UMW0027 | Insulation tape |

Additional Welding Materials for Pro Weld UMW0001

Welding Material: Fine Powder – Precision Work

| Welding Materials | D-M-E Catalog No. | Japanese Mold Steel | Quantity | Hardness Rockwell C | U.S. Mold Steel Equivalent |
|-------------------|-------------------|---------------------|----------|---------------------|----------------------------|
| SP-51 | UMPS010 | SKH-51 | 50 grams | Rc 63 Min. | D-2, M-2, S-7 |
| SP-11 | UMPS011 | SKH-11 | 50 grams | Rc 50 Min. | A-2, D-2 |
| SP-61 | UMPS012 | SKD-61 | 50 grams | Rc 53 Max. | H-13 |

Welding Material: Powder

| Welding Materials | D-M-E Catalog No. | Japanese Mold Steel | Quantity | Hardness Rockwell C | U.S. Mold Steel Equivalent |
|-------------------|-------------------|---------------------|----------|---------------------|--|
| N-11 | UMP0067 | SKD-11 | 50 grams | Rc 50-60 Min. | A-2, D-2 |
| N-38 | UMP0072 | HPM38 | 50 grams | Rc 30 Max. | All Die Steels 420SS (Prehardened) |
| N-39 | UMP0073 | PD555 | 50 grams | Rc 50-52 | STAVAX |
| N-40 | UMP0060 | Ni-Cr Alloy | 50 grams | Rc 36-42 | All Mold Steels |
| N-50 | UMP0062 | Ni Alloy | 50 grams | Rc 47-53 | All Mold Steels |
| N-61 | UMP0068 | SKD61 | 50 grams | Rc 40-53 Max. | H-13, 420SS |
| N-13 | UMP0063 | Ni Alloy | 50 grams | Rc 10-15 | All Mold Steels |
| N-90 | UMP0061 | Ni Alloy | 50 grams | Rc 16-20 | All Mold Steels |
| N-14 | UMPS017 | SCM, PHM-2 | 50 grams | Rc 30-35 | Good Choice for P-20 |
| N-15 | UMPS018 | SNCM, HPM17 | 50 grams | Rc 30-35 | Good Choice for P-20 |
| N-16 | UMPS019 | SNCM, 2767 | 50 grams | Rc 30-35 | Good Choice for P-20 |
| N-55 | UMP0071 | NAK55 | 50 grams | Rc 38-41 | P-21 |

Additional Welding Materials for Pro Weld UMW0001

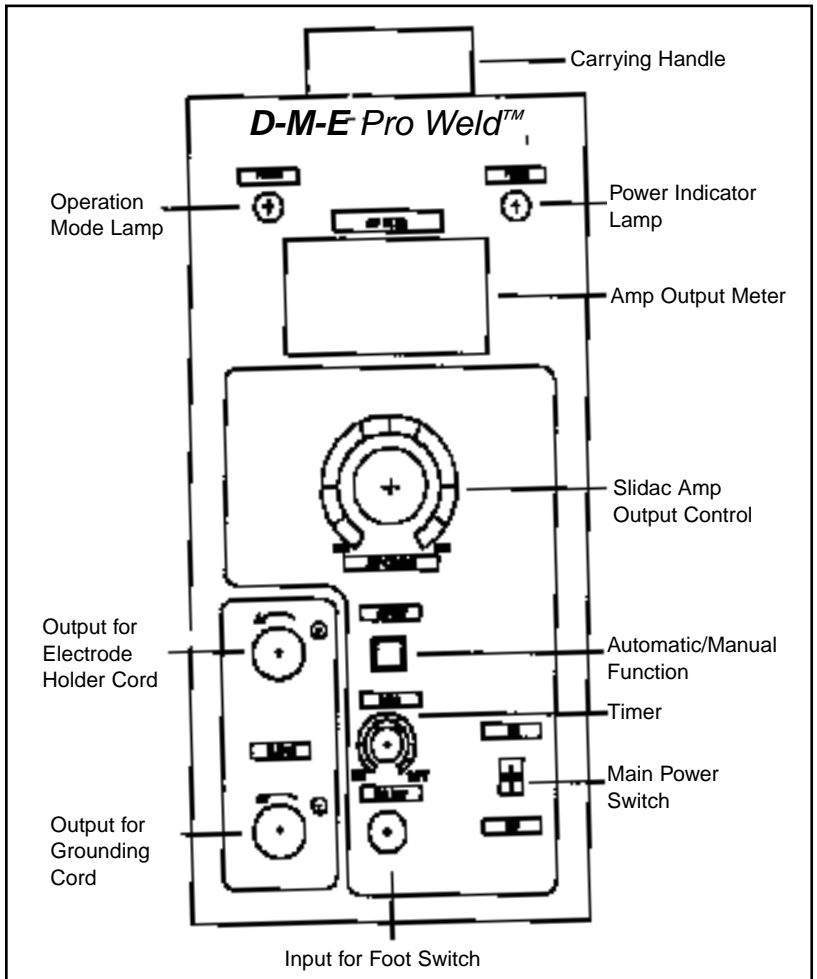
Welding Material: Sheet (Dimensions in millimeters)

| Welding Materials | D-M-E Catalog No. | Japanese Mold Steel | Quantity / Size | Hardness Rockwell | U.S. Mold Steel Equivalent |
|-------------------|-------------------|----------------------|-----------------------|-------------------|----------------------------|
| NT-6 | UMA0001 | | 10 / 0.2T x 5w x 100L | Rc 30 | All Mold Steels |
| NS-1 | UMA0054 | SS Alloy | 10 / 0.1T x 30w x 70L | Rb 90 | All Mold Steels |
| NS-2 | UMA0055 | SS Alloy | 10 / 0.2T x 30w x 70L | Rb 90 | All Mold Steels |
| HPM-50 | UMD0102 | HPM50 | 10 / 0.2T x 5w x 100L | Rc 38-40 | P-21 Improved |
| HPM-38 | UMD0107 | HPM38 | 10 / 0.2T x 5w x 100L | Rc 30-33 | 420SS |
| STAVAX | UMD0104 | STAVAX | 10 / 0.2T x 5w x 100L | Rc 50-52 | STAVAX, 420SS |
| HPM-2 | UMD0101 | SCM440, IMPAX, HPM-2 | 10 / 0.2T x 5w x 100L | Rc 30-50 | P-20 |
| MAS1 | UMD0103 | | 10 / 0.2T x 5w x 100L | Rc 50-53 | P-20 |
| NAK-55 | UMD0106 | NAK55 | 10 / 0.2T x 5w x 100L | Rc 38-40 | P-21 |

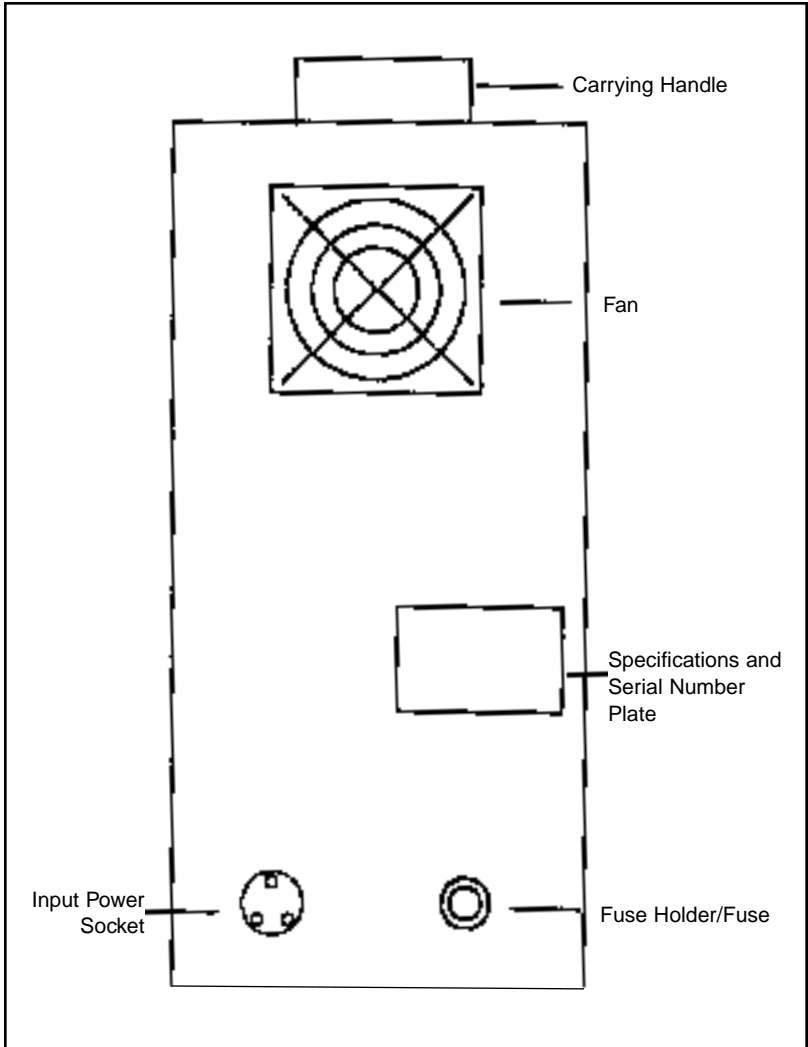
Welding Material: Wire

| Welding Materials | D-M-E Catalog No. | Japanese Mold Steel | Quantity / Size | Hardness Rockwell | U.S. Mold Steel Equivalent |
|-------------------|-------------------|---------------------|-------------------|-------------------|----------------------------|
| S2 | UMA0056 | SS Alloy | 1 / 0.2 dia. x 5m | Rb 90 | All Mold Steels |
| S3 | UMA0057 | SS Alloy | 1 / 0.3 dia. x 5m | Rb 90 | All Mold Steels |
| S4 | UMA0058 | SS Alloy | 1 / 0.4 dia. x 5m | Rb 90 | All Mold Steels |
| S5 | UMA0059 | SS Alloy | 1 / 0.5 dia. x 5m | Rb 90 | All Mold Steels |

III. Parts Nomenclature for Pro Weld™ UMW0001



Pro Weld UMW0001 Back Panel



IV. General Description of Use

IV.1 Function

Electric power is supplied from an AC120V source. As a resistance-type micro-welding machine, Pro Weld stores current in a capacitance circuit. Current is released by the foot switch and sent to the electrode in the electrode holder. This release of current causes the welding material to melt and fuse with the base metal.

IV.2 Attachment of Electrodes to the Electrode Holder

Electrodes are fixed in the Electrode Holders. To use the opposite end of an Electrode or to replace an Electrode, use the supplied Allen Head Wrenches. Do not over-tighten; leave approximately 25mm of the Electrode exposed.

IV.3 Usage of Electrodes

Electrodes are of two types: Magnetic Electrodes and Non-magnetic Electrodes. Magnetic Electrodes are pre-mounted in the brown Electrode Holders. Use these Electrodes to pick up metal welding powders and for tacking powders on the mold repair area. Non-magnetic Electrodes are fixed in the black Electrode Holders. Use these to tack welding sheet and wire and to weld in place powders, sheet and wire.

Operational Tip



*When using Magnetic Electrodes apply **less** pressure to the workpiece. Do not exceed the Amp output guidelines (see VI.4). To do so could cause the Electrode to de-magnetize.*

*Apply **more** pressure to the work surface when using non-magnetic Electrodes. Again, follow the Amp output guidelines.*

Use only Pro Weld Electrodes. The manufacturer does not accept liability for other manufacturers' electrodes. Do not use welding rods in the Electrode Holders because they may weld to the work surface.

IV.4 Start-Up Procedure

- ♦ Connect the Electrode Holder Cord to (+) Output, the Grounding Cord to (-) Output, and Foot Switch to Foot Switch Input on the Pro Weld according to Parts Nomenclature diagrams (see III).
- ♦ Check to ensure correct single phase voltage available is the same as that marked on the specifications plate located on the rear panel. Connect the power cable to the Main supply and put Main power switch ON. In the ON position, the Power Indicator Lamp will illuminate. Once the equipment has been connected as directed, your Pro Weld is ready to operate.
- ♦ In the Main ON position, you may select an amperage (power) output setting. Amperage output setting will be displayed on the Amp meter. Use the Slidac Amp Output Control knob to increase/decrease amperage according to the type and size of

Electrode selected and by the type of repair to be performed (see Amp output guidelines, VI.4).

- ✦ With the amperage output selected, connect an Electrode Holder with Electrode fixed to the Electrode Holder Cord by sliding it on to the end of the cord until snug (it need not be perfectly flush).
- ✦ Release of amperage to the Electrode is accomplished by depressing the Foot Switch on either the Manual or Auto setting (10).
- ✦ Welding material is bonded to the base metal by pressing down firmly on the repair area with the Electrode, then triggering the Pro Weld with the Foot Switch, in either the Manual or Auto setting, while slowly rolling the Electrode across the repair area.

All of the welding material must be covered by the Electrode to ensure a 100% bond.

- ✦ Rolling the Electrode slowly over the welding material forms interconnecting scallop-shaped weld spots approximately 1 to 2mm (0.04"-0.08") in diameter. This is the type of weld needed to ensure complete bonding.
- ✦ If greater build-up is desired, repeat the process over the initial build-up area, by applying another layer of powder, sheet or wire. Pro Weld will weld 0.3mm thick metal sheet but best results are achieved if the sheet is welded in 0.1mm thick increments.
- ✦ No finishing is required between applied layers; an unlimited number of layers can be applied.
- ✦ Finishing of any repair area can be done by standard methods including EDM, grinding, machining, plating, ultrasonic polishing, or hand stoning and lapping. Diamond laps work well as all repairs are in the hardened state.

Operational Tip

Be sure the Electrode Holder Cord and Grounding Cord are fully tightened in their respective sockets. If not completely tight, conductivity will be lost resulting in bad welding.

V. Operation

V.1 Cautions In Welding Work

Each Pro Weld has a caution sticker applied to the top of the unit. Please follow these guidelines before operation:

- ✦ Wear the supplied goggles during operation.
- ✦ Both the Pro Weld and its associated cables create strong magnetic fields around them. To avoid any problems, please ensure that neither the mold welder or machine cables are used in close proximity to:
 - People with medical devices like Pacemakers.
 - Magnetic products such as magnetic cards, floppy discs, audio and video tapes.
 - Electromechanical devices such as watches, clocks and televisions.
- ✦ Do not remove the mold welder cover. The unit's transformer carries high voltage.
- ✦ Ensure the welder is properly grounded.
- ✦ Main voltage must not exceed + or – 10% from the voltage stated on the Specifications Plate on back panel.
- ✦ Unit must be cooled for 20 minutes following 60 minutes of continuous operation. Leave the unit ON while fan is running.
- ✦ If the Electrodes become too warm while welding, use the supplied gloves to protect fingers.

V.2 Discharge of Stored Energy

Resistance type micro welding machines store voltage in condensers. It is important to discharge the stored voltage when the unit is not in use to avoid any danger and to save energy. Except at the time of welding (which is done by the discharge of stored voltage), Pro Weld has a special circuit which discharges the stored voltage automatically 10 minutes after the machine's Main Power Switch is turned OFF.

VI. Welding

In welding work using a Pro Weld unit, only the duration of each pulse (current discharge) is a constant. The variable factors are:

- ✦ the welding current
- ✦ electrode-applied pressure
- ✦ surface condition of the base metal, and
- ✦ selection of welding materials

VI.1 Workpiece, Electrode, Welding Materials

- ✦ Clean the mold surface of oil contamination. Remove oil on the workpiece with acetone or some other alcohol absorbent. With a brass or steel brush, remove any oxidation.
- ✦ Clean and smooth the Electrode surface with a fine emery cloth before welding unless the Electrode is new (previously unused).
- ✦ Use fine emery cloth on the Copper Grounding Plate to ensure good contact with the mold surface.
- ✦ Clean the welding material of oil with acetone or some other alcohol absorbent and remove oxidation with a fine emery cloth.
- ✦ Place the mold on top of the Grounding Plate. Better power transfer and welding will be achieved if the Grounding Plate is fixed close to the area to be repaired. Fix in place with a tension bolt, magnet or clamps. Small molds and inserts should be

secured in a vise with the Grounding Plate close to the repair area. (FIG. 1)

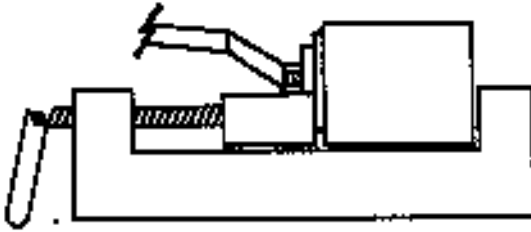
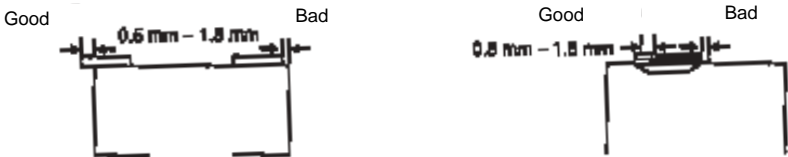


FIG. 1

- ✦ Cut the welding material to the proper size of the area to be repaired with supplied sheet metal shears. Place on workpiece. (FIG. 2)



VI.2 Pro Weld Control Features

Manual Function

1. Select the Manual Function by pushing the Automatic/Manual Function (10) so that the push button light does not illuminate. If this button light is illuminated, the unit is in the Automatic welding mode.
2. The manual mode is used for tack welding metal powder in place with a magnetic electrode or metal strip or wire in place with a standard (non-magnetic) electrode.

Operational Tip



It is important when using the Manual Function to depress the Foot Switch correctly and in a timely fashion. Each time the Foot Switch is depressed, current is discharged to the Electrode. If the Foot Switch is repeatedly depressed too fast (in quick succession), the unit will not produce a good weld.

Automatic Function

- ♦ Select the Automatic Function by pushing the Automatic/Manual Function (10) so that the push button is illuminated.
- ♦ The Automatic mode is used for “roll-welding” weld material that has been tacked in place. Roll welding can be done with either magnetic or standard electrodes.
- ♦ In the Automatic mode, Pro Weld discharges current in constant intervals according to the Timer Function setting. For constant current discharges, depress the Foot Switch and leave depressed until a new wrist position must be started in the roll welding process (see VI.7 Roll Welding Technique). Lift your foot from the Foot Switch each time you finish a roll and before lifting the Electrode off the weld surface to prevent excessive sparking.

Operational Tip



After roll welding powder welding material with a magnetic Electrode, use a bare (without additional welding material) standard Electrode with a slightly stronger output current setting and re-roll weld the repair area. Using this technique will create a stronger weld. Be sure the entire repair area is covered while re-roll welding (see Current Settings Chart VI.4).

Timer

1. The Timer will adjust the intervals at which the current is discharged.
2. The duration of each Pro Weld pulse (discharge) is 0.0040 second.
3. Turning the Timer knob from Slow to Fast will increase the frequency at which each pulse is released.
4. Generally, the "Slow" settings are used when the Pro Weld unit will be used to weld for a long time. The "Fast" settings are for short-term welding lasting for several minutes.
5. As an operator becomes more accomplished, he may prefer to operate the unit using only the Fast settings.

Fast – 300 pulses per minute

Moderate – 200 pulses per minute

Slow – 150 pulses per minute

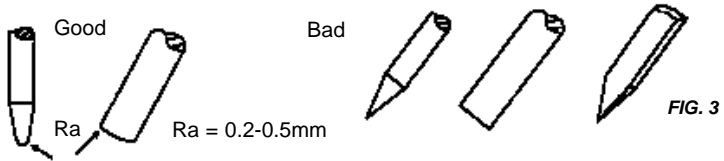
Note: The Pro Weld's thermal protection mechanism automatically reduces pulse rate when the unit's optimal internal operating temperature is exceeded. The unit will automatically resume selected pulse rate when the unit senses it is again operating within its optimal internal temperature range. Pro Weld's thermal protection mechanism will not adversely affect welding results.

VI.3 Shaping of Standard (Non-magnetic) Electrodes

Although the original shapes of the Pro Weld Standard Electrodes can do all the welding, it is recommended that the tips be shaped to conform to the mold surfaces to be repaired.* This will improve the efficiency of the welding process. The very tip of an Electrode should have a small round curve (0.2 to 0.5mm). See FIG. 3. When the tip is too sharp, the flow of current will concentrate to the tip and

*Magnetic Electrodes cannot be shaped without their losing magnetism.

cause excessive sparking. Standard Electrodes are made of a silver alloy and can be easily shaped using diamond hard tools and emery paper.



Shape examples of the Flat Electrode, Fig. 4



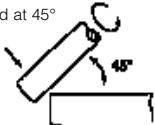

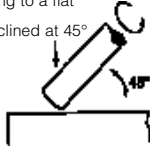

VI.4 Recommended Current Output Levels

Amperage output levels used during welding will vary according to:

- The type of mold repair to be welded.
- The type of welding material used for a repair.
- The type and diameter of the Electrode used for a repair.

To obtain a good strong weld, it is important to acquire optimal current values. Use the following chart as a guide to amperage settings. While welding, keep a note pad handy and note the optional current values used after obtaining a good weld. Amperage output is adjusted by turning the Slidac Amp Output Control. Turning to the right increases Amp output. Amperage levels are indicated digitally on the Amp Meter.

Current (Amperage) Settings for Welding

| Mold Repair Type | Electrode Diameter | Powder 1-0.2mm | Sheet Material 1-0.1mm | Wire Material |
|--|--------------------|----------------|------------------------|---------------|
| Tack Welding | 2 | | 200-300 | 300-500 |
| Roll Welding with electrode angled at 45°  | 2 | | | |
| | 3 | 200-400 | 400-600 | |
| | 4 | | | |
| | 5 | 300-500 | 500-700 | 700-900 |
| Roll Welding with round electrode angled at 10°  | 2 | | | |
| | 3 | 300-500 | 500-700 | |
| | 4 | | | |
| | 5 | 400-600 | 600-800 | 800-1000 |
| Roll Welding to a flat surface inclined at 45°  | 2 | | | |
| | 3 | 300-500 | 400-600 | |
| | 4 | | | |
| | 5 | 400-600 | 500-700 | 900-1200 |
| Spot Welding to a flat surface  | 2 | | | |
| | 3 | 200-400 | 400-600 | 900-1100 |
| Re-Welding powder material. After welding powder, re-weld with a bare standard electrode for a stronger weld period. | 2 | 300-500 | 300-500 | |
| | 4 | 400-600 | 400-600 | 900-1200 |
| | 5 | | | |

VI.5 Mold Material/Welding Material

Pro Weld welding materials are in powder, sheet metal and wire form. Each has a different hardness and metal mold application.

Generally, the powders, and sheets supplied standard with Pro Weld produce a strong homogenous weld on most large and small molds. Molds producing small parts and made of harder alloys should be welded using UMW0002 powder (supplied with Pro Weld) or harder sheet material (see Welding Materials Chart below).

Matching the base metal hardness to the welding material hardness will produce the ideal weld but using the above described procedure produces very good weld results.

The following charts list all the welding materials available for Pro Weld.

Welding Material: Fine Powder - Precision Work

| Welding Materials | D-M-E Catalog No. | Japanese Mold Steel | Quantity | Hardness Rockwell C | U.S. Mold Steel Equivalent |
|-------------------|-------------------|---------------------|----------|---------------------|----------------------------|
| SP-51 | UMPS010 | SKH51 | 50 grams | Rc 63 Min. | D-2, M-2, S-7 |
| SP-11 | UMPS011 | SKH-11 | 50 grams | Rc 50 Min. | A-2, D-2 |
| SP-61 | UMPS012 | SKD-61 | 50 grams | Rc 53 Max. | H-13 |

Welding Material: Powder

| Welding Materials | D-M-E Catalog No. | Japanese Mold Steel | Quantity | Hardness Rockwell C | U.S. Mold Steel Equivalent |
|-------------------|-------------------|---------------------|----------|---------------------|--|
| N-11 | UMP0067 | SKD11 | 50 grams | Rc 50-60 Min. | A-2, D-2 |
| N-38 | UMP0072 | HPM38 | 50 grams | Rc 30 Max. | All Die Steels 420SS (Prehardened) |
| N-39 | UMP0073 | PD555 | 50 grams | Rc 50-52 | STAVAX |
| N-40 | UMP0060 | Ni-Cr Alloy | 50 grams | Rc 36-42 | All Mold Steels |
| N-51* | UMW0002 | SKH51 | 50 grams | Rc 63 Min. | D-2, M-2, S-7 |
| N-50 | UMP0062 | Ni Alloy | 50 grams | Rc 47-53 | All Mold Steels |
| N-61 | UMP0068 | SKD61 | 50 grams | Rc 40-53 Max. | H-13, 420SS |
| N-13 | UMP0063 | Ni Alloy | 50 grams | Rc 10-15 | All Mold Steels |
| N-80* | UMW0003 | NAK80 | 50 grams | Rc 38-40 | P-20, P-21 |
| N-90 | UMP0061 | Ni Alloy | 50 grams | Rc 16-20 | All Mold Steels |
| N-14 | UMPS017 | SCM, PHM-2 | 50 grams | Rc 30-35 | Good Choice for P-20 |
| N-15 | UMPS018 | SNCM, HPM17 | 50 grams | Rc 30-35 | Good Choice for P-20 |
| N-16 | UMPS019 | SNCM, 2767 | 50 grams | Rc 30-35 | Good Choice for P-20 |
| N-55 | UMP0071 | NAK55 | 50 grams | Rc 38-41 | P-21 |

*Supplied with Pro Weld unit.

Welding Material: Wire

| Welding Materials | D-M-E Catalog No. | Japanese Mold Steel | Quantity / Size | Hardness Rockwell | U.S. Mold Steel Equivalent |
|-------------------|-------------------|---------------------|-------------------|-------------------|----------------------------|
| S2 | UMA0056 | SS Alloy | 1 / 0.2 dia. x 5m | Rb 90 | All Mold Steels |
| S3 | UMA0057 | SS Alloy | 1 / 0.3 dia. x 5m | Rb 90 | All Mold Steels |
| S4 | UMA0058 | SS Alloy | 1 / 0.4 dia. x 5m | Rb 90 | All Mold Steels |
| S5 | UMA0059 | SS Alloy | 1 / 0.5 dia. x 5m | Rb 90 | All Mold Steels |

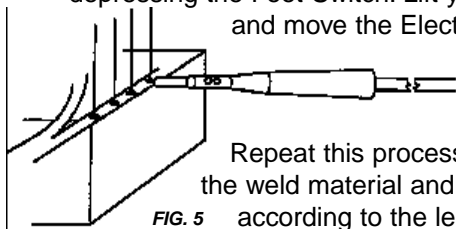
Welding Material: Sheet (Dimensions in millimeters)

| Welding Materials | D-M-E Catalog No. | Japanese Mold Steel | Quantity / Size | Hardness Rockwell Vickers (HV) | U.S. Mold Steel Equivalent |
|-------------------|-------------------|----------------------|-----------------------|--------------------------------|----------------------------|
| NT-6 | UMA0001 | | 10 / 0.2T x 5w x 100L | Rc 30 | All Mold Steels |
| NS-1 | UMA0054 | SS Alloy | 10 / 0.1T x 30w x 70L | Rb 90 | All Mold Steels |
| NS-2 | UMA0055 | SS Alloy | 10 / 0.2T x 30w x 70L | Rb 90 | All Mold Steels |
| NAK-80* | UMW0004 | NAK-80 | 10 / 0.1T x 5w x 100L | Rc 38-40 | P-20, P-21 |
| NTA-1* | UMW0005 | Ni Alloy | 10 / 0.1T x 30w x 70L | HV135 | All Mold Steels |
| NTA-2* | UMW0006 | Ni Alloy | 10 / 0.2T x 30w x 70L | HV135 | All Mold Steels |
| HPM-50 | UMD0102 | HPM50 | 10 / 0.2T x 5w x 100L | Rc 38-40 | P-21 Improved |
| HPM-38 | UMD0107 | HPM38 | 10 / 0.2T x 5w x 100L | Rc 30-33 | 420SS |
| STAVAX | UMD0104 | STAVAX | 10 / 0.2T x 5w x 100L | Rc 50-52 | STAVAX, 420SS |
| HPM-2 | UMD0101 | SCM440, IMPAX, HPM-2 | 10 / 0.2T x 5w x 100L | Rc 30-50 | P-20 |
| MAS1 | UMD0103 | | 10 / 0.2T x 5w x 100L | Rc 50-53 | P-20 |
| NAK-55 | UMD0106 | NAK55 | 10 / 0.2T x 5w x 100L | Rc 38-40 | P-21 |

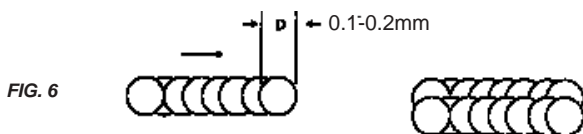
*Supplied with Pro Weld unit.

VI.6 Pro Weld Welding Process

- A. Having selected an Electrode Holder with Electrode and set the Amperage Control Knob to the desired output level (see IV.4), tack (fix) the weld material to the workpiece using the Manual (single pulse) setting. Firmly push the Electrode onto the weld material and trigger the current discharge by depressing the Foot Switch. Lift your foot from the Foot Switch and move the Electrode to another spot on the weld material. Depress the Foot Switch to tack the material down. Repeat this process to tack at each end of the weld material and at other points as needed according to the length of the weld sheet.



B. Turn the Auto(matic) Function to ON. Firmly push the Electrode on the weld material. Depress the Foot Switch and keep it depressed while slowly rolling (see VI.7, Roll Welding Technique) the electrode along the length of the weld material. Pro Weld will continually discharge and form overlapping weld spots (FIG. 6).



The speed at which you roll across the weld material should be a constant 0.1~0.2mm every discharge. This procedure will ensure the strongest weld by automatically bonding the weld material to the mold surface.

Operational Tip



Good conductivity results in a good weld. It is important to clean the surfaces of the repair area of the mold, the mold surface in contact with the Grounding Plate, the Grounding Plate itself, the Electrode and the Weld sheet material. The copper Grounding Plate should be firmly against the base metal and the Plate screw firmly tightened. This will promote good welding and reduce the chance of spark occurring.

VI.7 Roll Welding Technique

- A. With the Pro Weld micro welder, proper weld padding is obtained by rolling the Electrode across all surfaces of the weld material. This technique may take some practice.
- B. It will be helpful to hold the Electrode Holder like a pencil with the forefinger or middle finger touching and pressing on the Electrode itself. This will ensure that proper pressure is being applied against the weld material during machine discharge (welding). Do not apply too much pressure to the Electrode. Rather, try to develop a feeling with your fingers as if you can feel the Electrode sink into the welding material upon current discharge. Holding the Electrode Holder like a pencil will also help you guide the Electrode across the weld material surface. Further control can be obtained by using finger(s) from the other hand also pressed against the Electrode.
- C. Control over the “roll-welding” process is important to gain a strong and homogenous weld. Control will also keep the Electrode on only the weld material, and with the right amount of pressure. Failure to use pressure on the weld material and/or rolling off the weld material onto the base metal while the Pro Weld is discharging (Foot Switch depressed) will cause the unit to spark. Sparking can pit the weld material, causing a pin-hole or minor depression in the base material.
- D. While roll welding, if the Electrode becomes uncomfortably warm (this is a function of the amount of amperage selected and the length of time the unit is allowed to constantly discharge this current), use the supplied gloves to insulate the fingers.

-
- E. Proper roll welding is accomplished across a strip of weld material by holding the Electrode Holder as described above. Then, starting at one end of the weld material, turn your wrist as far as comfortable in one direction and roll turning the wrist as you roll as far as comfortable in the opposite direction. Lift your foot off the Foot Switch each time you finish a roll and before lifting the Electrode off the surface. This will prevent the possibility of sparking. Continue to weld where you stopped with the Electrode by turning your wrist again and rolling to the opposite direction. A strong weld is obtained by rolling across all of the weld material surface to form overlapping weld spots.

VII. Examples of Welding

VII.1 Focalization of Current, Electrode Shape and Formation of the Weld Spot

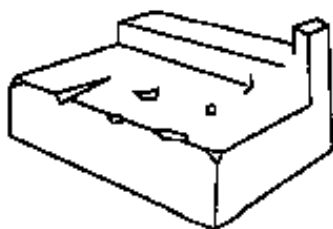


FIG. 7

Current Dispersion

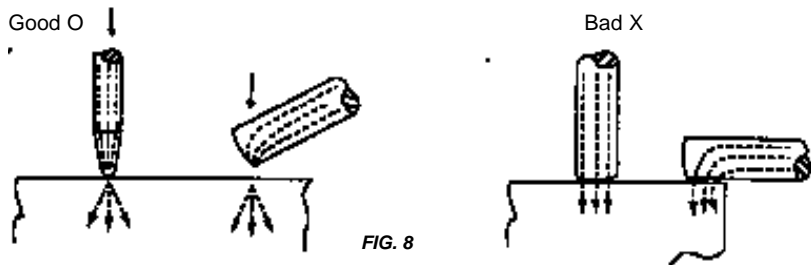


FIG. 8

Electrode Shape

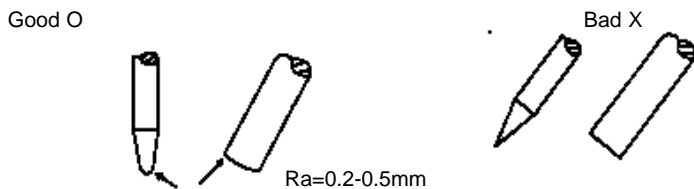


FIG. 9

Formation of the Weld Spot

The size of the weld spot formed during roll welding will vary with amperage output value, the end-shape of an Electrode and the applied pressure. Generally the spot formed will be 0.2~1.0mm in diameter per machine current discharge. Progression along the weld is made so that one spot overlaps another by half its diameter. A second weld line should overlap the first by half in diameter as should a third line. Welding a second layer should be done in the same manner.

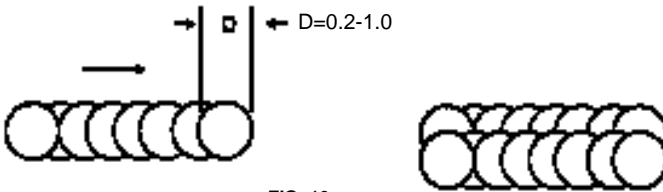


FIG. 10

VII.2 Powder Metal Application

Powder metal is an excellent material for welding on corners, edges and for repairing pinholes and cracks. Powder metal will form a stronger weld for these applications than will sheet material. Powder welding is done in two steps. Using a magnetic Electrode to pick up the powder, tack the powder in place and/or roll weld the powder along a parting line or edge. The next step is to re-roll weld the area using a bare standard Electrode. This two step procedure will create a strong and completely homogeneous weld.

Welding to a 3-point corner, parting line, edge

Roll the Electrode on a 3-point corner at various angles to ensure weld build-up at all points of the corner. Re-roll weld with a bare Electrode after the first layer. If second or third layers are needed, also re-roll weld between layer applications. This will ensure a strong weld.

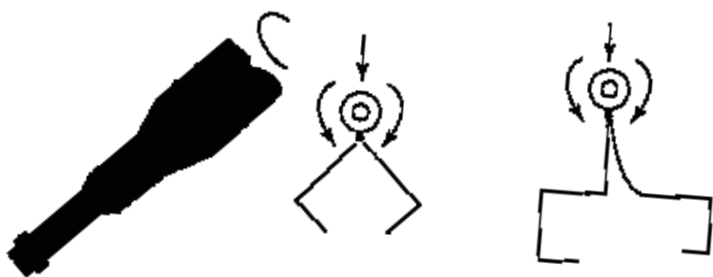


FIG. 11

Roll the Electrode along an edge or parting line in a clockwise and counterclockwise direction to obtain weld build-up. Hold the Electrode at different angles while rolling to cover all areas of the repair.

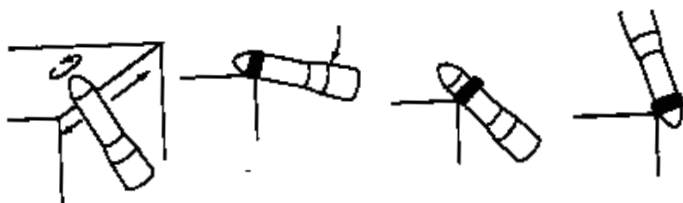


FIG. 12

Welding to a Flat Surface

- ✦ Put a small amount of powder onto the part to be welded. Using a standard Electrode with its end shaped like a ball point pen (magnetic Electrodes cannot be shaped without their losing magnetism), weld the powder down spot by spot.
- ✦ With a round Electrode whose edge has been shaped with a small radius, roll weld the repair area. This Electrode can also be used for the bare re-roll welding of the area.

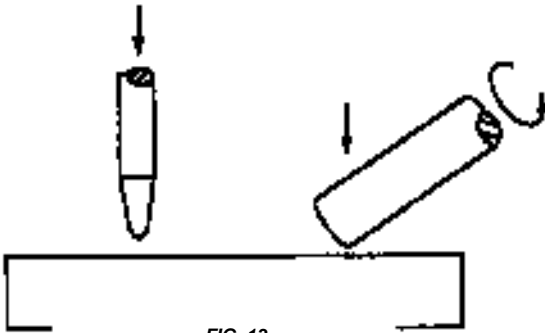
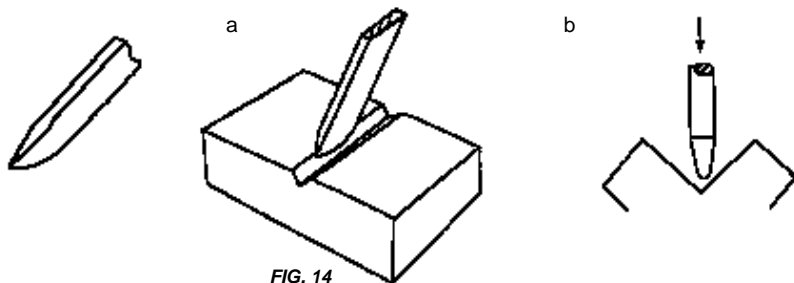


FIG. 13

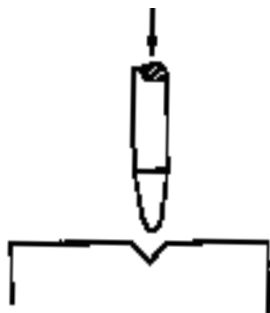
Welding an Inner Corner

- ✦ Put a small amount of powder onto an inner corner and use a flat Electrode shaped like a spatula to weld the first layer down (FIG. 14a).
- ✦ To add a second layer of powder material use an Electrode with its end shaped like a ball point pen and weld spot by spot (FIG. 14b). Also use this Electrode for bare re-roll welding.



Welding a Pinhole

Put a small amount of powder into the hole and then for best results add a small piece of sheet material on top of the hole. Weld both materials with a tapered Electrode. If the repair is a deep blowhole caused by argon welding, first hammer a centering punch into the pinhole. This expanded hole can now have powder put into it.



Welding a Crack

For repairing cracks, first groove the crack before placing powder or

welding.

Fill and weld the crack in approximately 0.15mm thick layers. Weld one layer and then another and so on. Wire welding material is also

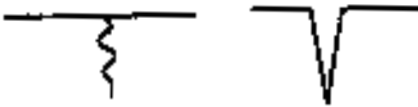


FIG. 16

effective in filling and repairing cracks.

Welding in a Rib

† The rib opening can be welded using a 2mm Electrode

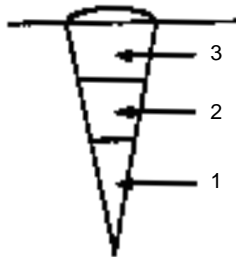


FIG. 17

(UMW0013) or one shaped to a smaller diameter.

- ✦ For a flaw on the side of a rib, apply powder onto the area and use a flat Electrode with its end thinned/dressed as necessary.
- ✦ For flaws at the bottom of a rib, apply powder as above and weld with a flat electrode with its end thinned as needed.

Operational Tip

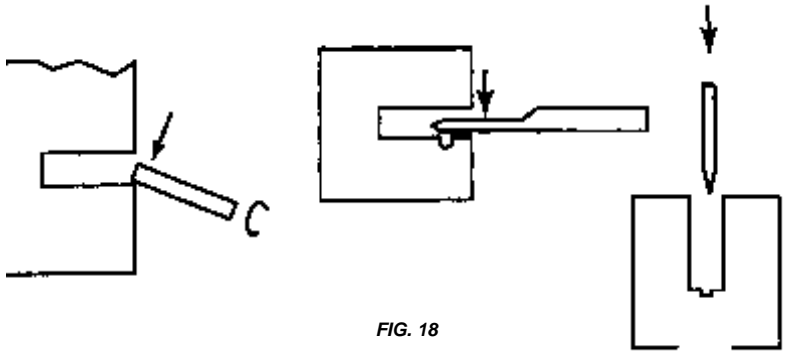


FIG. 18

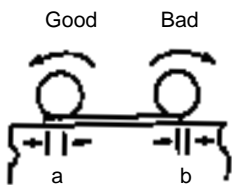
Magnetic Electrodes cannot be shaped without losing their magnetism. To wear these Electrodes down as little as possible, clean them when it becomes necessary using fine sand paper. Some weld repairs will require the use of a shaped standard (non-magnetic) Electrode. To use powder material in a confined space, make a paste by dipping the shaped Electrode into a drop of light machine oil and then into the powder material. Alternately, powder can be placed into a confined area with, for example, an Ejector Pin that has been magnetized.



VII.3 Welding of Sheet Material

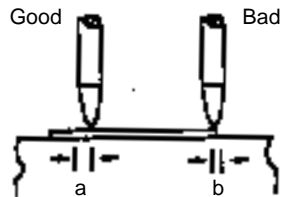
Proper Electrode Contact

While welding sheet material, it is important to keep the Electrode on the sheet to avoid sparking which could cause minor damage to the base material.



a = -0.5 -1.0mm

FIG. 19



b = 0 -1.0mm

Positioning of the Sheet Material

The sheet material should be slightly larger than the repair area and extend beyond the edge of the area to be repaired. This is true whether the repair is an edge, concave surface, v-notched flaw or pinhole.

Welding to a Flat Surface

- ✦ Position the sheet material on the repair area to be welded. Set

the Pro Weld to Manual Function and tack the material in place (see FIG. 19). Be sure the Electrode end is in a rounded shape.

- Using a round Electrode, its edge shaped with a small radius, include the Electrode and roll weld the sheet material. For best results, the first layer should be 0.1mmT sheet material. The second layer can be either 0.1T or 0.2T. Re-roll welding the area with slightly higher amperage setting will strengthen the weld.

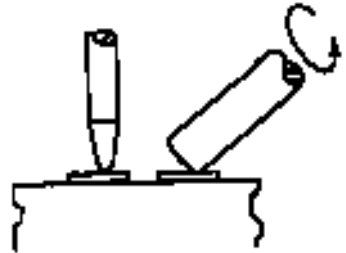


FIG. 20

Sheet Material Recession

Sheet Material will recess 15~30% when welded. For example,

in FIG. 21 below, if the sheet material (d) = 0.2mm, after welding (c) will = 0.15mm. Take this into consideration when doing build-up repair or design changes.

Repair of a 3-Point Corner Collapse

This repair can be done with either powder or sheet material.

A powder repair is

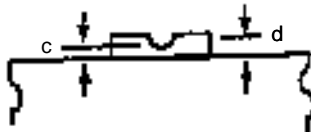


FIG. 21

described in VII.2 (see FIG. 22).

Repairing a 3-point corner with sheet material, use the profile (side) of a round Electrode or the side of a flat square shaped Electrode. Cover all of the weld material moving the Electrode in various directions (see FIG. 22 and 23 below). Re-roll weld the material at a slightly higher amperage setting to strengthen the weld. If a second and third layer is applied, use the same procedure used with the first layer.

Repair of a Parting Line or Edge

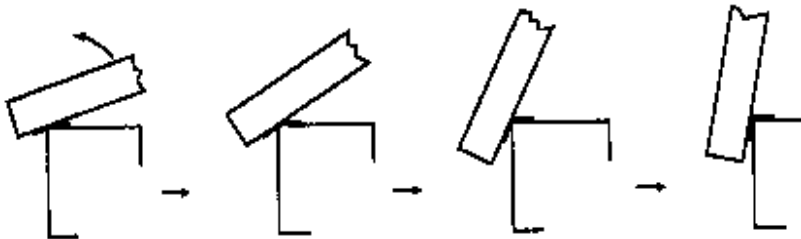


FIG. 22

Movement of the Electrode in Side View

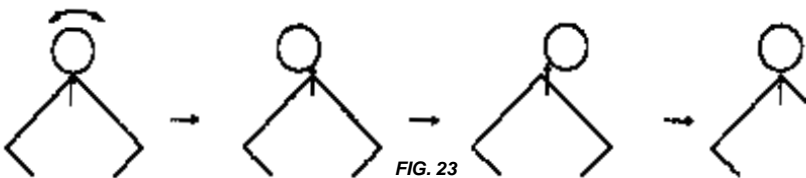


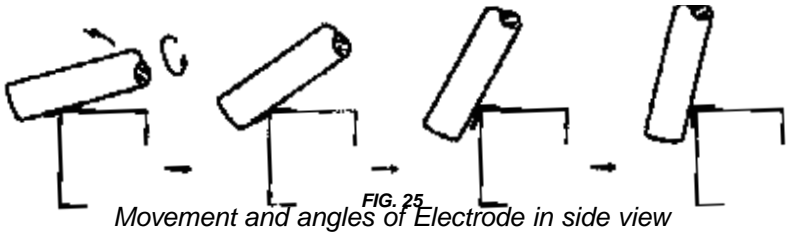
FIG. 23

Movement of the Electrode in Top View

Using the Pro Weld Sheet Metal Shears, cut a strip of sheet material large enough to cover the parting line or edge. Set the Pro Weld to Manual Function and tack the strip in place. Then, set Pro Weld to Auto and, with the profile (side) of a round Electrode, roll weld the material ensuring that each weld spot half overlaps the next. This should also be the case if a second layer is added and when re-roll welding.



Weld the strip in the 1 to 4 sequence depicted in FIG. 25 below.

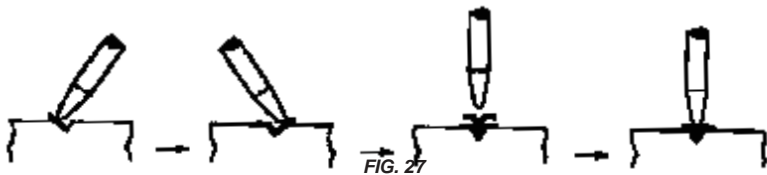


Repair of a Scratch or V-Notched Flaw and Pinhole

FIG. 26



If the flaw to be repaired is more than 1mm in width or diameter, multiple layers of sheet material must be applied in the sequence shown in FIG. 27 below.



A pinhole can be repaired using powder, sheet material or a combination of both. When using sheet material, if the hole diameter is less than 1mm, press weld the material directly into the hole (see FIG. 28 below).

Small diameter pinhole

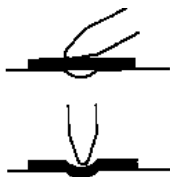


FIG. 28

To repair a pinhole larger than 1mm in diameter, weld in layers. First

weld a small piece of material into the bottom of the pinhole and then a full-size piece of material over the first weld.

Large diameter pinhole

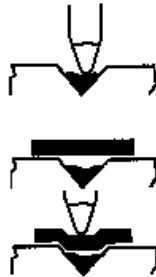


FIG. 29

An alternate method of pinhole repair is done by hammering a center punch into the pinhole and onto the sheet material at the same time. Place this material onto the pinhole and with a tapered round Electrode tack weld the piece in place. Next and with less current, incline and roll the Electrode around the hole for 5 or 6 discharges of current. Use the same procedure for a second layer.

Multi-Layer Padding

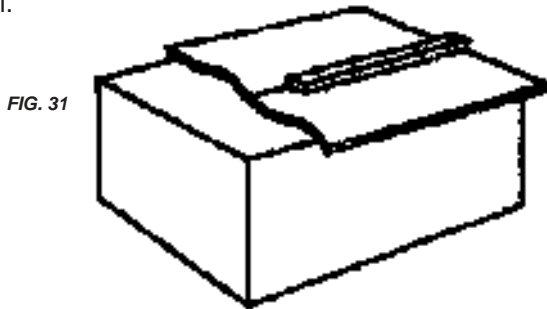
Proper multi-layer padding will take some time as each layer must be tack welded at many points and then thoroughly roll welded. Tack weld with a round Electrode tapered and rounded like a ball point pen.

For complete welding to the base metal, use 0.1mmT sheet material in the first layer. Before the second layer is applied, the surface of the first layer should be evened (flattened) out using a file. Follow this procedure also before the welding of a third layer. This procedure will ensure a strong weld without any pockets of improperly welded material.

To ensure a good, strong weld on the first layer, roll weld with a 2mm or 3mm diameter tapered Electrode with its end rounded like a ball-point pen. For the second layer, roll welding can be done with a round Electrode, its edge shaped with a small radius.



When two pieces of sheet material are used on the same metal face, weld the sheet material parting line with a narrow strip of additional material.



At any time during multi-layer padding or other types of welding repairs where it is important that surrounding areas to the weld not be touched by the Electrode, use the supplied Masking Tape and cover those areas.



Repair of Base Metal Impurities

If the base metal surface is found to have impurities due to nitriding etc., grind the surface by 0.1mm and then weld sheet material onto it. Add another layer as needed.

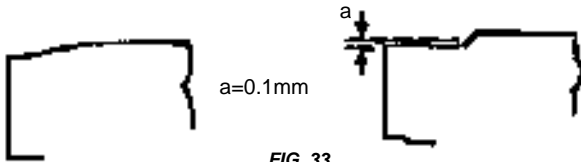


FIG. 33

Repair of an Inner Corner

To weld at an inner corner, use a length of wire material 0.2~0.4mm in diameter. Tack the wire in place using an Electrode with its end shaped like a ball-point pen. Weld the wire in place by using the same Electrode and welding spot-by-spot or with a flat Electrode shaped like a spatula with its edge rounded. Roll the Electrode from its point down onto its side along the wire material.

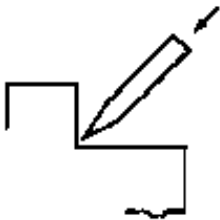
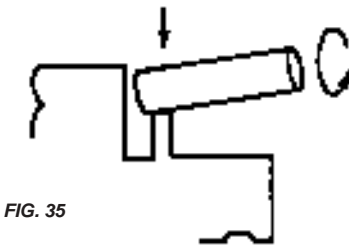


FIG. 34



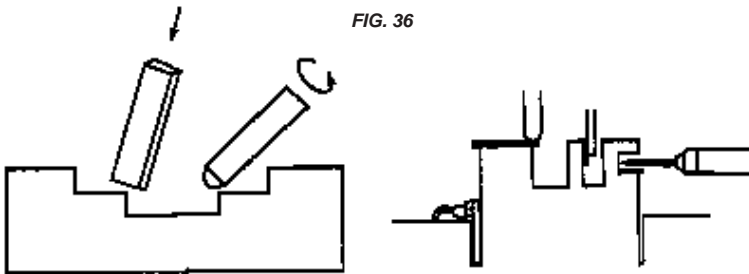
Welding to a Rising Wall

In a confined area where a rising wall needs to have material build-up, it may not be possible to roll weld. In this case, pressing onto the weld material and triggering current discharge with the Manual setting will be sufficient to properly weld the material in place. Use the Masking Tape to protect any surrounding areas not to be touched by the Electrode.



Welding to a Narrow or Concave Mold Section

Using the Pro Weld micro welder, repair welding into very small or very confined areas can be accomplished. It is unlikely welding of this nature can be done by argon arc, TIG or other types of welders. In each case, shape the Electrode according to the area to be welded. Mask tape off any parts of the base metal to be unaffected.

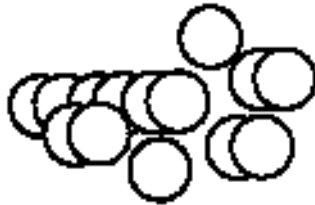


VIII. Examples of Bad Welding

VIII.1 Unconnected Weld Spots

The worst kind of welding will result if the weld spots are arranged with any gap or clearance between them. Each weld spot must overlap the next by half its diameter. Subsequent weld material layers must be done in this same manner.

FIG. 37



VIII.2 Improperly Shaped Electrodes

Proper welding can only be done with Electrodes that have a rounded end or edge with a slight radius. Electrodes with flattened ends or those that give linear contact will cause a bad weld even if the contact area is very small.



FIG. 38

VIII.3 Oxidized Base Metal or Electrodes

It is important that the mold surface and Electrode be cleaned of any type of stain or contamination using sandpaper or alcohol absorbent. For full details, see VI.1 Workpiece, Electrode, Welding Materials.

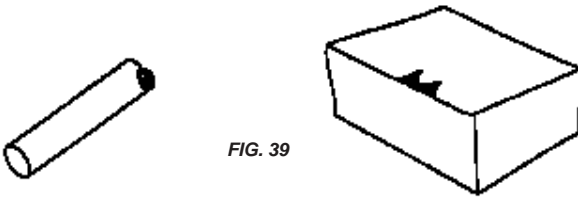


FIG. 39

VIII.4 Bad Conductivity

Bad Conductivity in welding current flow will cause bad welding. It is important to clean the surface of the mold repair area, the mold surface in contact with the Grounding Plate, the Grounding Plate, the Electrode and the weld sheet material. Check to ensure the Electrode Holder Cord and Grounding Cord are fully tightened in their sockets. The copper Grounding Plate should be placed as close to the repair area as possible, firmly anchored against the base material and the Plate tightening screw fully tightened. Following all of these precautions will provide good conductivity and result in a good weld.

IX. Maintenance Guarantee

D-M-E guarantees the Pro Weld UMW0001 free from defects in parts and workmanship for a period of one year from date of shipment of the unit. Within the guarantee period, D-M-E or the manufacturer will repair or replace defects free of any cost. All claims must be made in writing to D-M-E stating the date of purchase and serial number of the unit.

The Manufacturer shall in no way be liable for:

- ✦ Damages in shipment.
- ✦ Failures or damages due to misuse, abuse, improper installation or abnormal conditions of temperature, dirt or corrosives.
- ✦ Failures due to operation, intentional or otherwise, above rated capacities.
- ✦ Non-authorized expenses for removal, inspection, transportation, repair or rework.
- ✦ Consequent damages; and
- ✦ If the unit has been tampered with or dismantled in any way.

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