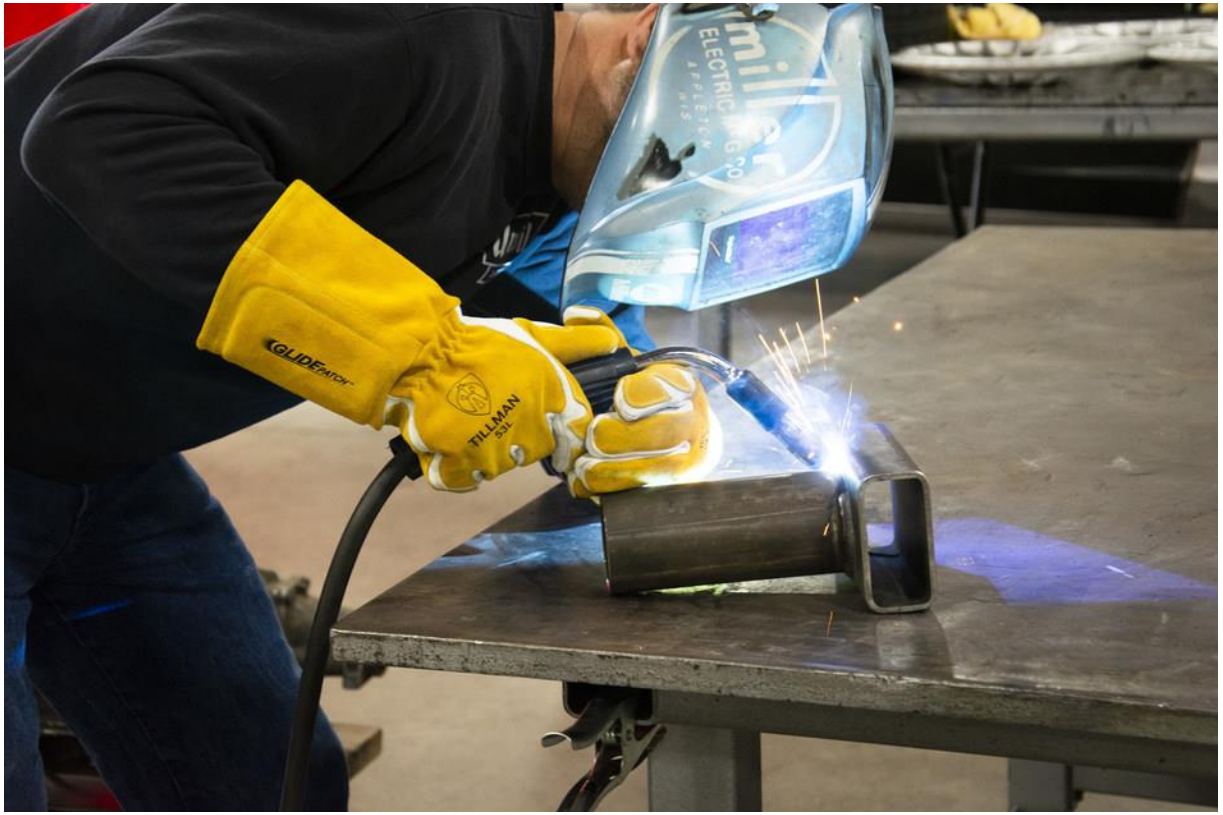
Kushed Procedures

MIG Welding | M4

Inverter and Handpiece

- Uni-MIG 200

Gas Cylinder E Size - Argoshield Light -BOC



The Shed provides items such as welding masks and gloves.

Members are required to provide their own footwear, eyewear, hearing protection and masks.

Safety

This is a very high priority for our Shed members. There are some aspects that are mandatory under our insurance policies and some which the The Shed requires members to adhere to for everyone's benefit.

The Shed Safety Induction

It is a requirement of attendance at The Shed that members have reviewed the Safety Induction Presentation

Personal Protective Equipment

This is required in various forms depending upon the equipment being used or the activity being undertaken.

Protective eyewear is always mandatory when using machinery.

The Shed schedules a Coordinator and a First Aid Safety Officer for each day of attendance and their safety directions are final and must be adhered to.

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MIG welding is an arc welding process in which a continuous solid wire electrode is fed through a welding gun and into the weld pool, joining the two base materials together. A shielding gas is also sent through the welding gun and protects the weld pool from contamination.

In fact, MIG stands for metal inert gas. The technical name for it is gas metal arc welding (or GMAW), and the slang name for it is wire welding.

Dangers when MIG Welding

- **Electrocution** – exposure to electrical potential sufficient to cause death if person becomes part of circuit or is in wet environment.
- **Electric Shock** – even when exposed to lower voltages.
- **Eye damage** – due to exposure to high intensity UV and infra-red light, even for short periods of time (known as “flash”), damage also due to burns caused by molten metal sparks getting in eyes. Seek medical attention for any eye burns or foreign matter in the eye which does not readily flush out.
- **Eye discomfort** – due to foreign material in eye or less serious exposure to welding flash. A “gritty” feeling like sand in the eye some time later can indicate flash exposure which can even occur due to reflected radiation from bright walls and clothing.
- **Serious burns** – due to molten or very hot metal contact with flesh (run cold water over burn as soon as possible – don’t wait for medical attention to arrive).
- **Minor burns** – less exposure to hot metals eg picking up partially cooled welded metal.

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Safety first

Before tackling any welding project, you need to make sure you have the proper safety apparel and that any potential fire hazards are removed from the welding area.

Basic welding safety apparel includes leather shoes or boots, cuff-less full-length pants, a flame-resistant and long-sleeve jacket, leather gloves, a welding helmet, safety glasses and a bandana or skull cap to protect the top of your head from sparks and spatter.

Dangers when MIG Welding

- **Inhalation of toxic fumes** – often as result of welding metals coated with paint, zinc or cadmium or welding in confined spaces.
- **Subsequent accident** – due to poor weld failing, such as on go-kart frame when subjected to shock load.
- **Physical injury** – due to lifting and handling larger projects or falling objects from benches and the like; also cuts and abrasions caused by sharp edges on metal.
- **Fires** – due to flammable materials in welding vicinity catching alight.

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Tutorials

The Shed's Marcon MIG Welding DVD, Part 1 (9½ min) and Part 2 (13 min) are to be viewed during training.

Further reference to a number of safety codes and standards will provide a deeper appreciation of risks when welding. AS 1674 and AS 1338 (several parts) are of particular relevance.

Key Features of the Uni-MIG Compact 200 MMA/TIG Inverter Welder

In gas shielded welding (MIG), ultra-violet and infra-red radiation from the arc is particularly intense and requires constant attention to avoid arc flashes when striking the arc.

The Shed's MIG welder is a composite plant and has various options including MMA (Manual Metal Arc ie Stick electrode), TIG (Tungsten Inert Gas), MIG (Metal Inert Gas) and MAG (gasless wire function).

For reasons of practicality, the set-up of choice for the Shed's Multi-Function welding plant is for MIG operation to weld steels. This obviates the need to change wire spools, guide rollers, hand piece fittings, wire guide liners and gas cylinders.

The Shed machine is equipped with a Euro style MIG torch and an E2 sized "Argoshield Light" gas cylinder. This gas contains approx. 5% CO2, 92% Argon and 3% O2. The machine is loaded with a spool of non-cored, copper coated, steel wire electrode of 0.9 mm diameter. Whilst this setup is suitable for welding of mild and carbon steel plate and tubing, it is not suitable for welding of stainless steels or aluminium or its alloys. It can be used on quite thin steels.

Weld Quality

In addition to operator skill, successful welds rely on good work preparation, well maintained equipment and correct settings of gas pressure, voltage and wire feed rate.

MIG welding is susceptible to loss of the gas shield in draughts or windy conditions. This can impact on weld quality.

Key Features of the Uni-MIG Compact 200 MMA/TIG Inverter Welder

The MIG torch delivers a gas shield, a consumable wire electrode and a high amperage, low voltage, positive, DC current, through the electrode to the weld site. A hose is connected from the welding machine to the torch and carries the wire, gas and electrical current to the torch. At the weld site, the current creates a circuit by arcing across from the wire tip to a workpiece which is negatively connected via an earth cable to the welding machine.

When the wire touches the workpiece, the current passes across the gap and the electrical resistance is so high that intense heat is created in the form of a series of “sparks” at an approximate rate of 200 hz. This heat melts the end of the wire electrode and the surface of the workpiece and thus creates a molten weld pool which can effectively be used to bridge a gap between metal parts. When the pool cools it solidifies and creates a fillet of metal. During this process the weld area is shielded by the inert gas envelope supplied from the cylinder. This gas prevents oxidation at the weld site and prevents the need for flux. This thus eliminates the formation of slag on the weld.

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Safety & Procedural Issues

Before commencing welding:

- If in doubt about the operation you are about to do, seek a Coordinator's assistance.
- If you are not professionally qualified, ensure the work you are about to do does not involve welding on road vehicles, pressure vessels or critical structural work such as building support beams. Work of this nature requires a trade qualified professional welder and may require certification and testing such as X-ray or pressure testing.
- Welding should not be carried out on enclosed fuel or volatile liquid containers. These require special cleaning procedures and, even then, pose significant risk of explosion if welded.
- Avoid all contact with live electrical parts of the welding circuit, electrodes and wires with bare hands. The operator must wear dry welding gloves while he/she performs the welding task. The operator should keep the work piece insulated from himself/herself.
- Always ensure power is off if going to the aid of a person subjected to electric shock and, in more serious cases, shout for help.

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Fire Extinguishers

Know where the fire extinguisher and fire blanket are and ensure that they can be readily accessed in case of emergency i.e. the area surrounding them is to be clear and open.

They are hanging on the wall just inside the metal working area, adjacent to the external roller door. Intending welders should ensure they are familiar with how to operate both the blanket access sleeve and the fire extinguisher.

Safety & Procedural Issues

- Know what materials you are about to weld. Cast iron is difficult to weld and tends to crack on cooling contraction because of its poor tensile strength. Medium to high carbon steels may become hard and brittle if cooled too quickly after welding. Coated metals require special preparation. Welding alloys of aluminium and copper, and stainless steels are beyond the scope of our Shed's MIG set up. Our set up is most suited to welding mild steel.
- Ensure that you are not going to be exposed to fumes from welding metals which are painted (particularly with paints containing lead oxides) or metals which have been plated or hot dipped with cadmium or zinc. These fumes are poisonous and can result is acute stomach cramps and respiratory problems. Surface coatings may need to be mechanically removed from the weld sites prior to welding.
- Ensure the work area is isolated from unprotected observers and that welding curtains or shields are in place.

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Personal Safety

- Ensure you are correctly attired with:
- Solid protective boots (or shoes and spats),
- Darker coloured (non-reflective) cotton or woollen (not flammable flannelette or melt able synthetic) long sleeved shirt done up to top,
- Darker coloured (non-reflective) cotton or woollen (not flannelette or synthetic) full legged trousers without cuffs,
- Leather welding gauntlets,
- A suitable welding helmet. Members have their own helmets for Covid safety
- No contact lenses,
- No pacemakers or mobile phones,
- No metal underwire bras or jewellery ie watches, wedding rings, earrings,
- Sunscreen on exposed V neck, nose and other areas to lessen the damage caused by exposure to UV light from welding,
- Eye protection if grinding or performing machining operations in preparation or finishing welded jobs or cleaning up welding table surface.

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SETUP

Position the work in a stable, securely fastened, sheltered and accessible position on the welding table or non-flammable surface and NOT ON A CONCRETE FLOOR or in the rain where heat can suddenly generate water vapour which can be dangerous. It can also be detrimental to the weld. The welding area should be “clear of obstructions” all the way around work.

Ensure surrounding area to the welding job is completely free of rags and flammable or volatile materials.

Personal Safety

Ensure that there are no fumes from volatile or flammable liquids such as paint thinners, mineral turpentine, deodorants, perfumes, hairspray and aftershave on your body or clothing.

ASSUME ANY METALS IN A WELDING AREA ARE HOT unless welding has only just commenced. To test for hot metals, use a wet rag and squeeze droplets onto the metal in question to observe any steam or rapid evaporation. Radiant heat can be detected when the back of a hand is held carefully near the metal. (Never use the front of your hand lest you are inadvertently bumped or misjudge proximity, resulting in contact with the metal. This may cause an automatic reflex reaction and cause the hand to close in on the metal). Particular care is required if trying to feel radiant heat and it is not recommended. The “wet rag” method is the better one to use provided the rag is kept well clear of electrical conductors.

Helmet Charging

Helmets with insufficient charge can be recharged by approx. an hour's exposure of the "solar cells" in the lens cartridge to direct sunlight, however, in some cases the welding lens cartridge may require replacement. The helmet automatically recharges during exposure to welding radiation. Always ensure the lens region is kept clean.

Personal Preparation

Auto darkening, variable shade welding helmets are used at The Shed. The operator should ensure that their helmet and lens is not cracked or damaged, is correctly fitted, has a protective clear lens cover and is correctly adjusted by setting:

1. the "SHADE" level knob on outside of helmet to 11 (10 minimum), and
2. switching the sensitivity switch on the back of the lens cartridge to "HIGH".
3. A "SLOW" response time setting on the back of the lens cartridge is recommended for high temperature processes.

WARNING: If there is insufficient electrical charge stored in the helmet, it WILL NOT auto darken and this can result in the operator being exposed to a welding "flash". FLASH can cause significant eye discomfort even after some time has elapsed and may even cause eye sight damage if serious enough. Aim helmet away from then directly at sun to test auto-darkening.

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NEVER LOOK DIRECTLY OR VIA REFLECTION AT WELDING OPERATIONS.

- Do not use a helmet which exhibits intermittent or no auto self-darkening.
- Do not use sunglasses or transition lenses together with or in place of a proper welding helmet.
- Ensure you are satisfactorily attired, as prescribed above, before attempting to weld.

Setting up the machine

(NB settings may require further adjustment to suit the nature of work).

If the torch nozzle is “dirty” with spatter, remove nozzle from the torch and clean out any spatter before spraying it with anti-spatter compound and refitting it onto the torch.

Connect the “earth” cable firmly to the workpiece and ensure a good contact. NEVER BECOME PART OF THE WELDING CIRCUIT BY BEING THE CONTACT BETWEEN THE EARTH, TORCH OR LEADS AND WORKPIECE OR PLANT.

Ensure the torch is in a safe, non-contact position ie nothing pressing on the trigger and the torch is not contacting any metal.

Turn both the wall power outlet and the main switch at the back of the machine on.

Check that the gas cylinder is properly secured in an upright position and release the gas from the cylinder into the regulator (HALF A TURN OF THE HANDLE IS SUFFICIENT IN CASE QUICK TURN OFF IS REQUIRED).

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Front Machine Layout Description

FRONT PANEL LAYOUT

1. Amperage Meter
2. Voltage Meter
3. Wire Inch Button
4. Mig/MMA/Tig Mode Selector Switch
5. Wire Feed Adjustment Knob (MIG/MAG)
6. Standard Mig / Spoolgun Selector Switch
7. "-" Output terminal
8. SpoolGun Power Supply Connection
9. "+" Output terminal
10. Euro Mig Torch Connector (MIG/MAG)
11. Voltage Adjustment Knob (MIG/MAG)
12. Amperage Adjustment Knob (MMA/TIG)
13. Thermal Overload LED
14. Mains Power LED

- Check the regulator gauges to see that sufficient pressure is available in the cylinder (kPa gauge) and set the hose delivery capacity (Blue regulator control knob - Lt/min gauge) to approximately 15 Lt/min.
- Then set the two MIG related black knobs on front of the machine. The top knob "A" (of the set of three on the machine) can be ignored – it is not relevant for MIG. The voltage knob (middle) and the wire feed rate knob (bottom – m/min) should be set to approximately the "ten o'clock" position as a starting position.
- The MMA/MIG switch should be set to MIG. (MMA stands for Manual Metal Arc i.e. stick welding)
- The right hand switch (STANDARD / SPOOL GUN) should be set to the top setting – STANDARD
- (NB These switches are labelled differently on machine face in diagram in Machine Manual)
- NEVER CHANGE THESE SETTINGS WHILST WELDING. Test the settings by pulling the torch trigger whilst ensuring no metal contact with the wire. Wire should feed out and gas should be heard being released at the torch nozzle.
- Use side cutters or pliers to clip the wire to approximately 8mm length from the nozzle.

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TRIP HAZARDS

Once the machine is set up, BEWARE OF TRIP HAZARDS caused by cables, hoses and metal on the floor. Tripping is significantly more likely when helmets are down.

Report any damaged cables, handpieces, hoses, helmets or equipment to the Coordinator.

Personal safety during the welding operation

- Have another person available or an emergency phone at the ready but clear of the welding process. It is NOT advisable to weld alone.
- Treat any cuts or metal splinters as potential infection sites.
- Be particularly careful of metal particles in the eye. Seek medical attention immediately if foreign objects lodge in the eye. Metal sparks can burn their way into the eye and lodge there till medically removed.
- Have a stool or support to lean on to help prevent fatigue during extended periods of welding. Do not hold your breath during welding as this can cause fainting. Take breaks and do not weld if fatigued or under influence of medications or drugs. Be sure to maintain body hydration by fluid intake during extended welding operations.
- Be sure that the welding work area has adequate ventilation.
- Be alert to spatter and weld spray which can burn through clothing and particularly socks when dropping from the weld. It can also land on top of your head and cause burns to the scalp if you are close to or below the work.

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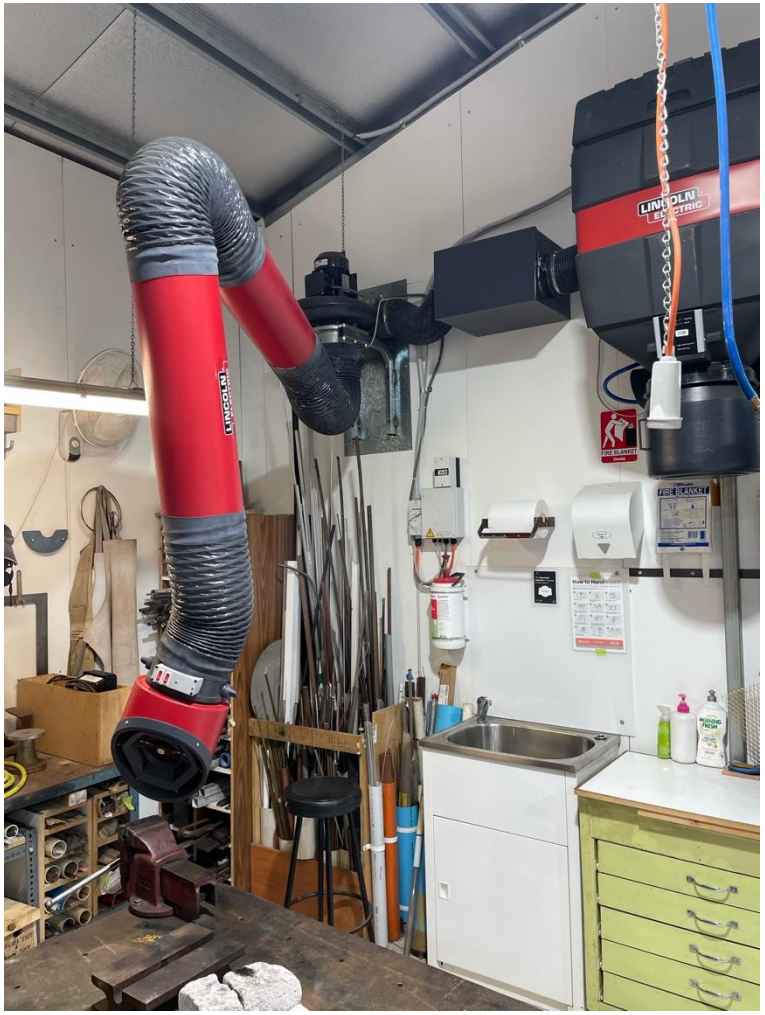

Machine care and general MIG welding procedures

- Ensure power is switched OFF when connecting welding leads, ensure good connections are made and that dirt and other obstructions do not prevent a good current flow.
- Ensure no falling objects onto the torch hose and that it is not kinked or constricted due to someone standing on it or sharp bends.
- Ensure that nothing is draped over the welding plant such as electrical cords, hoses or wet rags.
- Turn on the fume extraction system
- Before striking an arc, ENSURE YOUR HELMET IS DOWN.
- Shout “EYES” as a warning to any others in the vicinity who may inadvertently be exposed to a “flash”.
- Don’t in any circumstances allow an arc to be struck on the gas cylinder.

Cooling

- Keep torch nozzle cleaned of spatter, and allow cool off times if heavier setting (eg 12/12+) is used.
- Assume any metal on welding table is HOT. Use chalk to label as HOT metals which have just been welded. Chalk can be used to improve visibility of a weld line prior to actually running a weld.
- Use of water to cool the work is NOT recommended when the metal is very hot as it can generate dangerous steam clouds and may change the properties of the welded metal. It can sometimes cause cracking due to uneven cooling and metal shrinkage

Machine care and general MIG welding procedures

- Support torch arm and hold the torch at about 70o to the work and just clear (wire about 3+mm) from it. Pull the trigger to automatically turn on electric current and release the gas and wire. An arc will “strike” when the wire contacts the work. Push (or pull) the torch along the line of weld in a steady, continuous action. If the weld is too slow, there is too much build-up of weld metal; too fast and the weld will be stringy, may be inconsistent and have poor penetration. This gives a weak bond. If welder burns holes in work or if wire “stubbing” occurs, wire feed rate may need reducing.
- Listen to the welding process and ensure that the noise is a steady, continuous, crackling buzz. If the arc is unstable, intermittent or inconsistent, the welder is not operating correctly. If there is too much spatter, you may need to move the torch closer to the work.
- Avoid having the arc burn all the wire back to the torch as this can lead to clogging of the handpiece gas-diffuser and blocking of the wire feed. This can be caused by the wire feed being too slow or holding the torch too close to the work.
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For a full set of video tutorials go to

https://unimig.com.au/the-ultimate-guide-to-mig-welding/

Shutting down the welding plant

1. Turn the gas cylinder off first. Look around to see that there are no smouldering fires in area.
2. Pull the trigger on the handpiece to release any gas in the hose. The dials will show the drop in pressure. This will also release a short length of wire electrode which can be trimmed if excessive.
3. Release (turn anti-clockwise) the blue regulator handwheel until you can feel it is just free of the regulator diaphragm. (This step is only necessary if the plant is not going to be used for some time).
4. If plant has cooled, turn it off at the back of the machine first and then turn off the wall outlet.
5. Coil the hoses and earth lead out of the way and wheel the plant into its storage position.
6. Quench any metal likely to be hot and clean up any remaining welding apparatus and work area (including chipping or angle grinding/sanding welding table-top to remove spatter)