

WARNING

This welding equipment has been designed, manufactured and tested to the highest quality standards to ensure long and trouble free life. However, regular maintenance is an essential part of keeping the machine operating in a reliable and safe manner and your attention is drawn to any maintenance instructions that are contained in this manual.

In general, all welding equipment should be thoroughly inspected, tested and serviced at least annually. More frequent checking will be required when the equipment is heavily used.

Wear and tear, particularly in electro-mechanical and moving components, are gradual processes. Caught in time, repair costs are small and the benefits in performance, reliability and safety are significant. Left alone, they can put the equipment, and you, at risk.

Have this equipment regularly inspected and maintained by an approved service centre.

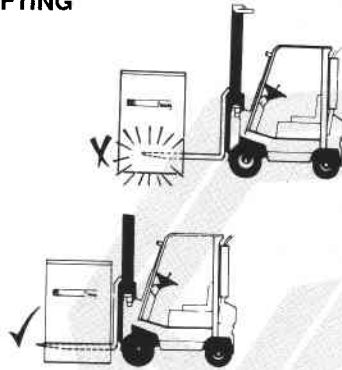
SAFETY

MUREX SERVICE



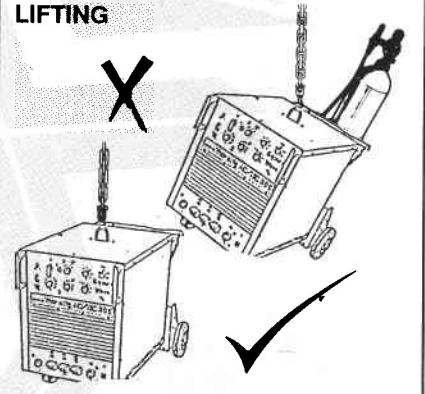
Call in your local Murex Service Centre if you don't know what to do.

LIFTING



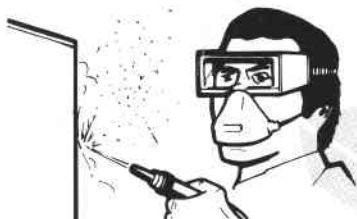
Use forks which are long enough

LIFTING



Lift the unit correctly

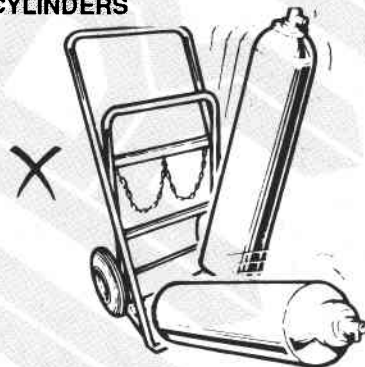
DUST



Air pressure not greater than 2 bar

Wear goggles and mask when removing dust with an airline.

CYLINDERS



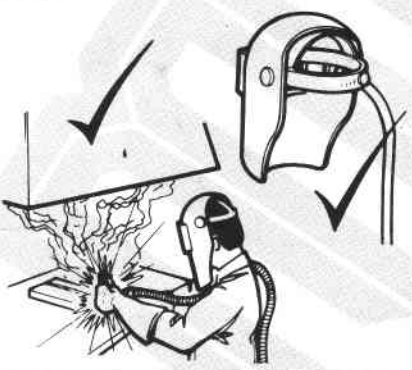
Handle cylinders carefully

FIRE



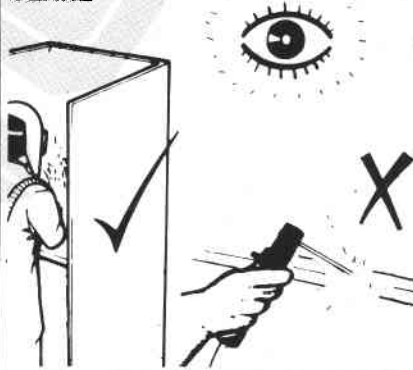
Before commencing welding, clear the area of inflammable materials.

FUMES



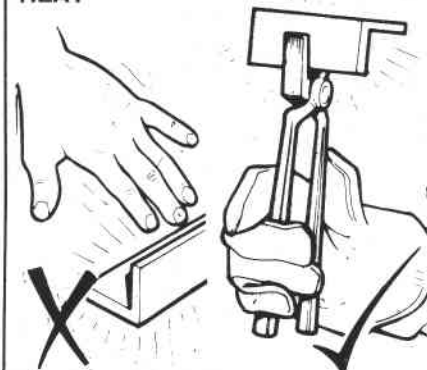
Ventilate the welding area to prevent a build-up of gas and fumes.

GLARE



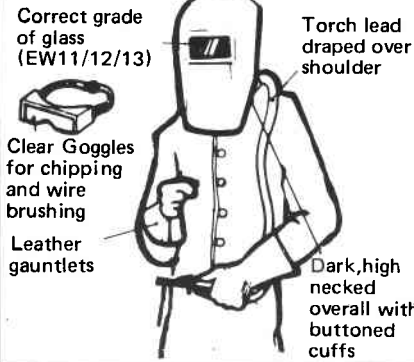
Wear your headshield (or face screen) and screen the cutting area.

HEAT



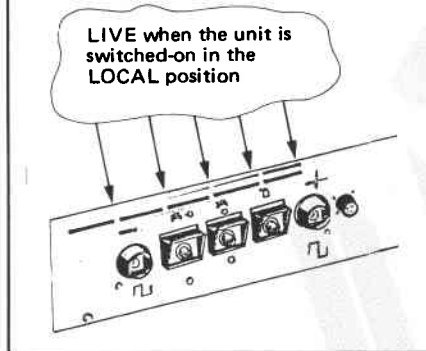
Don't burn yourself
Wear gauntlets and use tongs.

DRESS (MMA and TIG)



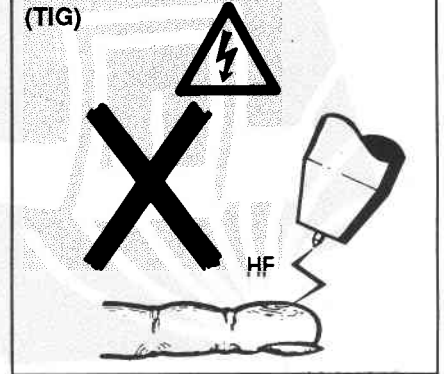
Dress correctly when welding and preparing the weld

ELECTRICAL



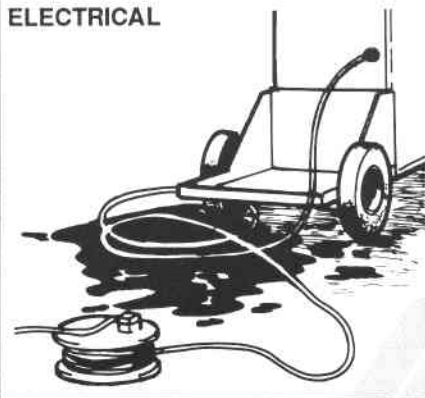
Switch off when electrode changing or setting up the MMA position

CAUTION ! (TIG)



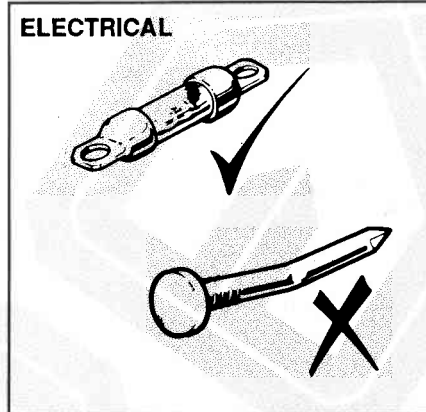
Do not strike the HF on your finger or any other part of the body

ELECTRICAL



Don't allow leads to lie in oil, water or corrosive liquid or extend them with extension leads - fit a longer cable.

ELECTRICAL

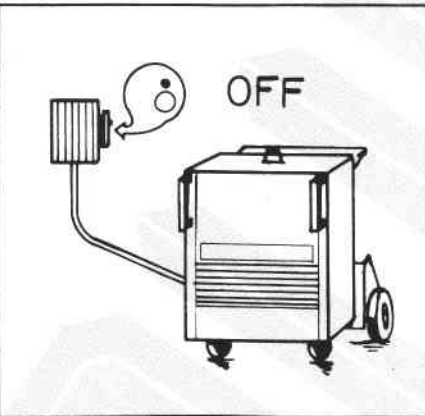


Don't replace a fuse with the wrong value (especially too high a value). See Technical Notes for fuse values.

ELECTRICAL

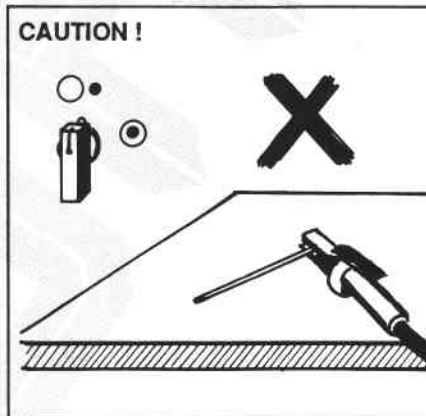


Don't work with the cover off. Leave it to the experts.

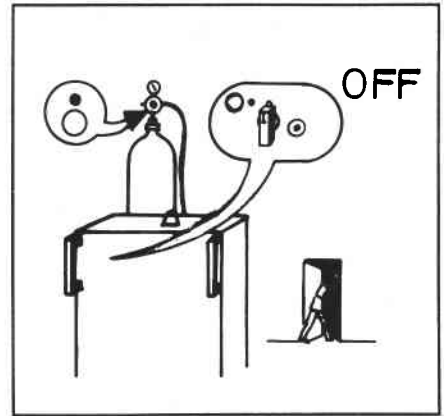


To isolate the unit from the mains supply, switch off and remove the fuses.

CAUTION !



Don't switch on with the electrode touched down on a metal surface.



Switch off Gas and Power before leaving the equipment unattended.

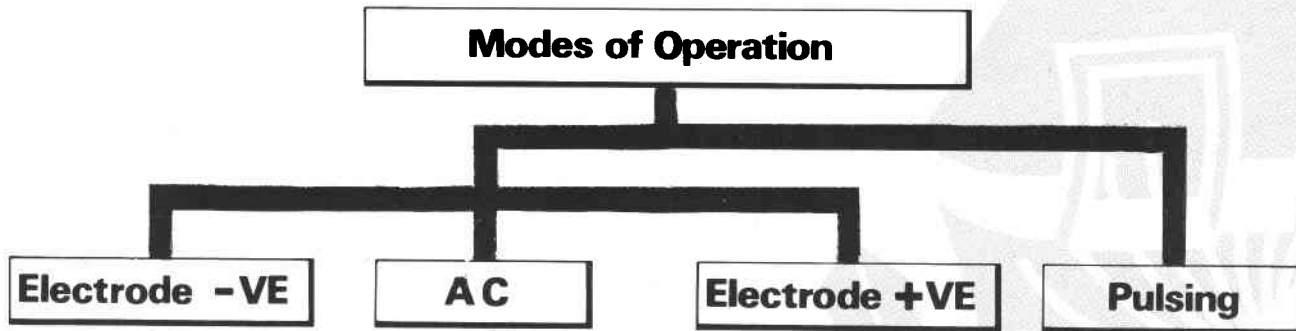
INTRODUCTION

The Transtig AC/DC 205 Square Wave is designed for high quality TIG and MMA welding. The constant current output gives either DC or AC Square Wave, with electronic control of the selected output current level. Control circuits modify the sinusoidal output from the main transformer to give a Square Wave output on AC. The Square Wave gives minimal transition time between positive and negative half cycles and this, coupled with a small AC pilot current, gives greater arc stability during AC crossover. An AC waveform balance control is provided to allow adjustment of the ratio between heating and cleaning. When

used with the PHA5 pulsing unit, preset peak and background levels of current together with variable mark/space (on/off) time settings (see page 5) can be provided. The output is controlled by means of a thyristor bridge with feedback from a current-monitoring shunt to 'sense' variations in output which differ from the preset value. The unit is provided with on/off and post weld gas control and also with current slope-in/slope-out controls. When high frequency starting is being used, the superimposed h.f. is disconnected once the arc has been established. Should the arc fail, h.f. is automatically re-established. The Local/Remote switch on the front panel

selects either front panel control (Local) or control from a foot or hand control unit (Remote) - See page 9. Both foot and torch switching can be used in the 2 stroke or 4 stroke modes. **2 Stroke** - Press ON, release OFF. **4 Stroke** - Press / Release - ON, Press / Release - OFF. Transformer and thyristor assemblies are cooled by air which is drawn in through the louvres at the back of the unit by a fan mounted in the rear panel. Thermostats, mounted on the thyristor bridge and inductor close the power source output current down temporarily in the event of overheating. They reset once the unit has cooled sufficiently.

THE TIG WELDING PROCESS



The polarity of the electrode determines the heat balance in the arc. 'Electrode negative' gives the greater heat input to the workpiece.

Normally 'electrode negative' is used, but with 'electrode positive' cathodic (workpiece) cleaning occurs.

These phenomena are exploited in the a.c. mode when the electrode changes alternately from negative to positive.

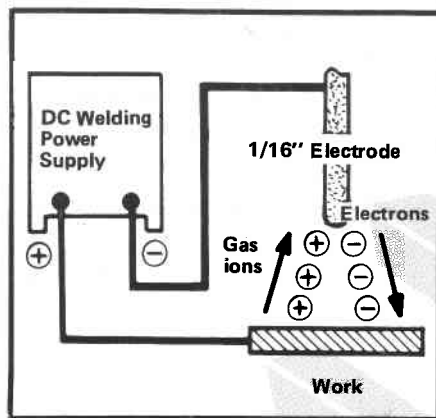
Pulsed d.c. mode allows greater control of heat input into the weld area.

Welding Power

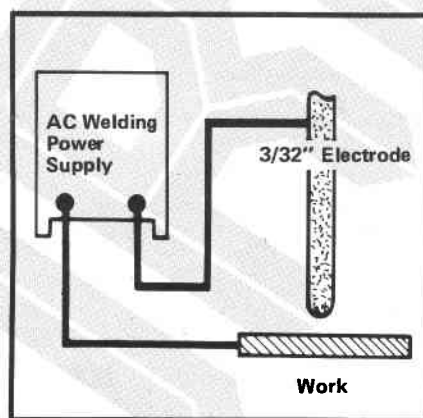
When TIG welding, the operator has three choices of welding current. They are: direct current negative electrode polarity, direct current positive electrode polarity, and alternating current. Each of these current types has its applications, and its advantages and disadvantages. A look at each type and its uses will help the operator select the best current type for the job.

The type of current used will have a great effect on the penetration pattern as well as the bead configuration. The illustrations below show details of the arc area with each current type.

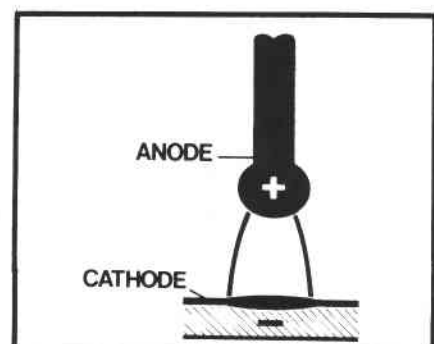
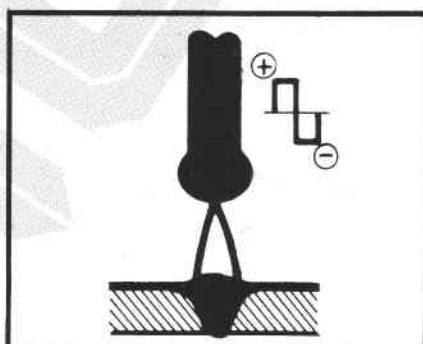
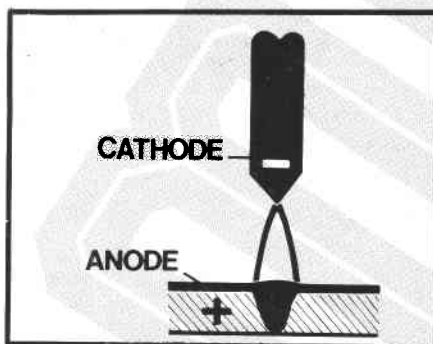
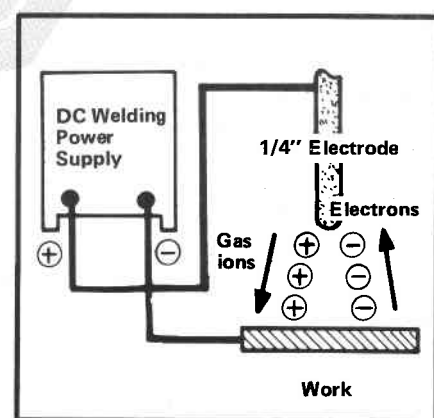
DC Electrode Negative



AC



DC Electrode Positive



TIG welding with electrode negative gives deep penetration because it concentrates the heat in the joint area. No cleaning action occurs with this polarity. The process is particularly suited to Stainless Steel, Copper, Nickel, Alloy Steels, Nickel alloys and Titanium.

TIG welding with AC combines the good weld penetration on the negative half cycle with the desired cleaning action of the positive half cycle, giving improved welding quality when working with Aluminium and Magnesium Alloys.

TIG welding with electrode positive produces good cleaning action as the argon ions flowing towards the work strike with sufficient force to break up oxides on the surface. Since the electrons flowing towards the electrode cause a heating effect at the electrode, weld penetration is shallow.

DC Electrode Negative

DC electrode negative polarity (d.c. normal) is used for TIG welding of practically all metals except aluminium. The torch is connected to the negative terminal of the power source and ground or work lead is connected to the positive terminal. When the arc is established, electron flow is from the negative electrode to the positive workpiece. In a d.c. arc approximately 70% of the heat will be concentrated at the positive side of the arc, therefore the greatest amount of heat is distributed into the workpiece. This accounts for the deep penetration obtained when using d.c. for TIG welding. The electrode itself receives a smaller portion of the heat energy, and will operate at a lower temperature than when using alternating current or d.c. positive polarity. This accounts for the higher current capacity of a given size tungsten electrode with d.c. negative than with a.c. or d.c. positive. The electron flow leaving the electrode results in a cooling effect on the tungsten; therefore it operates at a lower temperature. At the same time the electrons striking the work result in considerable heat being liberated at this point. The gas ions, which are positively charged, are attracted towards the negative electrode.

Alternating Current

When using alternating current the terms positive and negative which were applied to the workpiece and electrode lose their significance. The current is now alternating or changing its direction of flow. During a complete cycle of alternating current there is theoretically one half cycle of straight polarity and one half cycle of reverse polarity. Therefore, during a cycle there is a time when the work is positive and the electrode is negative (normal polarity half cycle) and a time when the work is negative and the electrode is positive (reverse polarity half cycle). In theory, the half cycles of alternating current are of equal time and magnitude.

DC Electrode Positive Polarity

When d.c. electrode positive polarity (d.c.

reverse) is used the torch is connected to the positive terminal, and the ground or work lead is connected to the negative terminal. When using this polarity, the electron flow is still from negative to positive, however, the electrode is now the positive side of the arc and the work is the negative side. The electrons now are leaving the work with the same cooling effect as before, and are impinging on the electrode with the resulting heating effect. The electrode receives the greatest amount of heat and becomes very hot. The electrode must be large even when low amperages are used to prevent overheating and possibly melting the electrode. The workpiece receives a smaller amount of the total heat resulting in shallow penetration. The positive gas ions are now attracted to the negative workpiece. They strike the work with sufficient energy to chip away the brittle aluminium oxides and provide "cleaning action".

Cleaning action refers to the breaking up and removal of the oxide coating. Because of this beneficial oxide removal, this polarity would seem to be excellent for welding aluminium and magnesium. There are, however, some disadvantages. As was previously mentioned the tungsten electrode becomes very hot, therefore, a large electrode must be used for relatively low amperages.

As an example, a 6.3mm diameter electrode would be necessary to weld with d.c. reverse at 125 amperes. The large diameter electrode will naturally produce a wide puddle resulting in the heat being widely spread over the joint area. If d.c. positive were used at 125 amperes, a 1.6mm electrode would be adequate. The small electrode produces a more highly concentrated arc resulting in the heat energy being confined to a smaller area.

Since most of the heat is liberated in the electrode, the resulting penetration pattern will prove to be shallow when using d.c. positive. When used on aluminium the arc

would be somewhat erratic as aluminium is not a good emitter of electrons.

The good cleaning action of positive polarity plus the stable arc and good penetration of negative polarity, would seem to be the best combination for welding aluminium. A compromise to obtain the advantages of both d.c. negative and d.c. positive is to use alternating current.

Pulsed TIG

Pulsed TIG in its simplest form is a system in which the arc current alternates between two levels, heating and fusion taking place during the periods of higher current, with cooling and solidification during the periods of low current.

Continuous fusion along a seam is achieved by ensuring that the individual weld 'spots' overlap.

A low level 'background' current provides a pilot arc. Onto this background current pulses of current are superimposed usually at a rate of up to 10 pulses per second.

Research has shown that a pulse rate between 1/2 and 3 pulses per second provide optimum control of welding conditions for high specification work in such industries as aerospace and nuclear engineering.

The background current maintains the arc during pulse off conditions.

Using the pulsing facilities the operator can obtain a very fine control of heat into the weldpool achieving maximum penetration and a high quality finished result.

Improvements include:

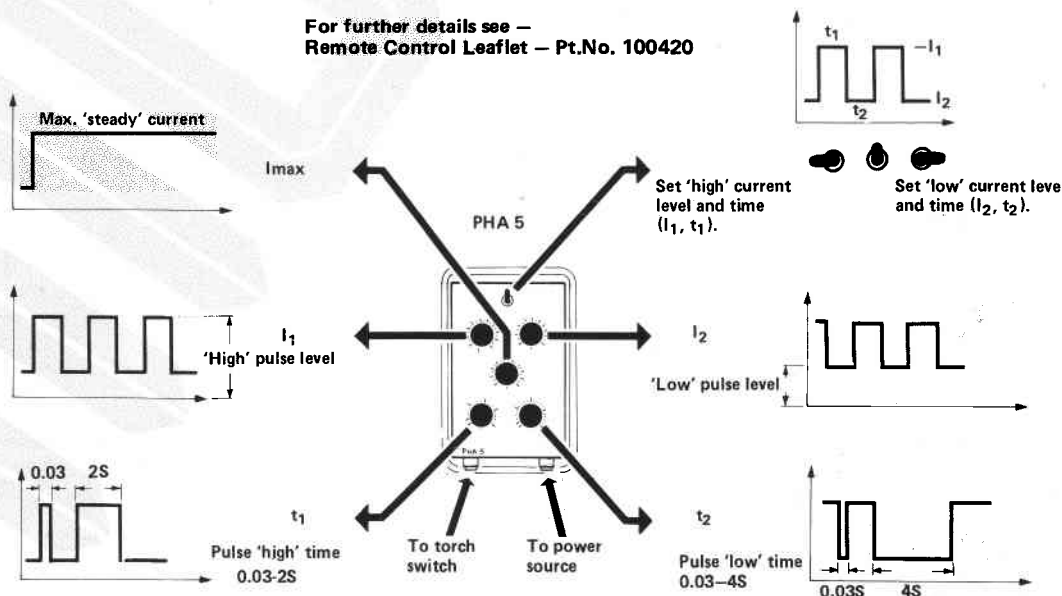
- Reduced distortion
- Reduced heat build-up
- Improved tolerance to joint fit up
- Improved ease of operation

Pulsed TIG is normally used with d.c. electrode negative.

The function of the pulse controls can be summarised as shown below:

PULSE WELDING USING THE PHA5 PULSING UNIT (The PHA5 pulsing unit is available as an Optional Extra)

For further details see —
Remote Control Leaflet — Pt.No. 100420



INSTALLATION

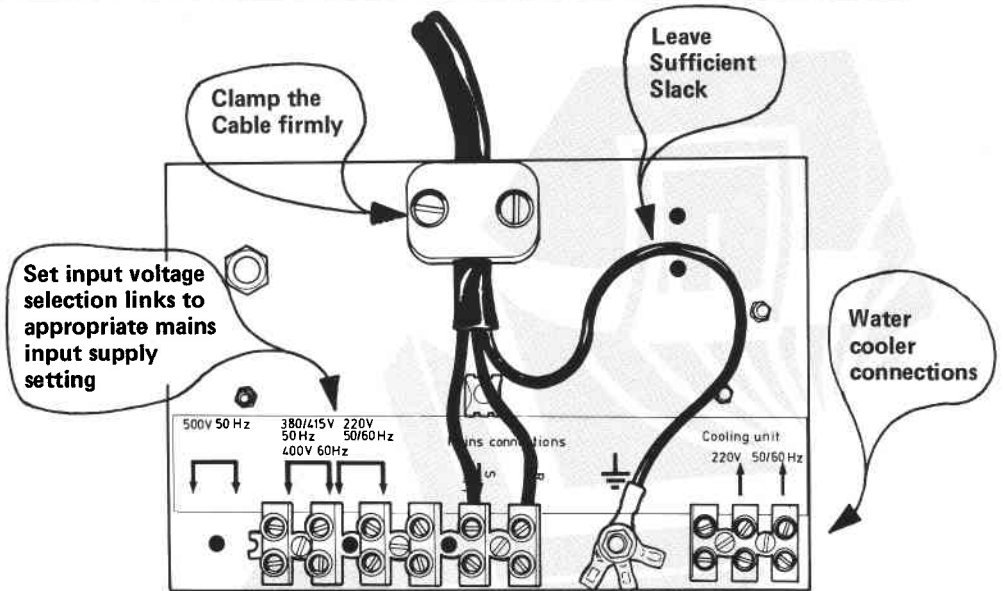
It is recommended that the Transtig Square Wave is installed by a competent electrician or suitably trained person.

On receipt or after periods of non-use carry out an insulation and continuity test as described in the Technical Notes.

If high frequency radiation is likely to cause interference with any local explosive, radio or electronic installation the chassis must be separately earthed (grounded) - See pages 18/19.

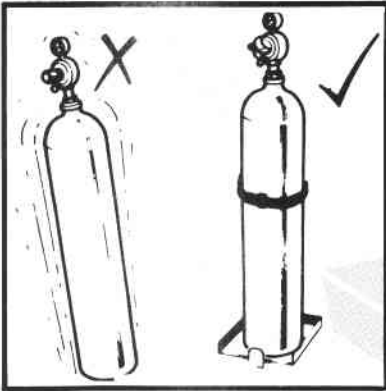
Position the unit to give good all round ventilation.

Connect the unit to the mains supply as shown.

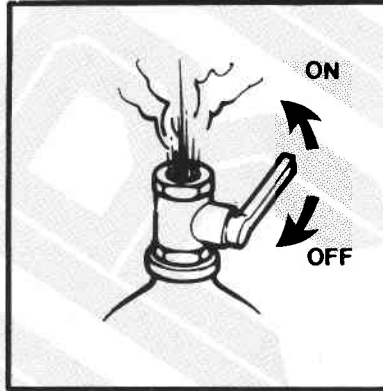


Mains Input Requirements

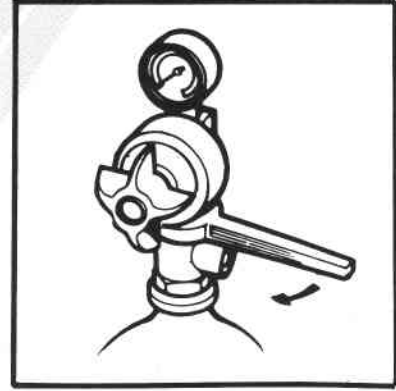
	50HZ				60HZ		
Voltage	230	400	415	500	220	440	550
Current A	74	42	46	31	61	41	35
Fuse slow A	50	35	35	25	50	35	35
Cable mm²	10	4	4	4	10	4	4



Support the gas cylinder with a retaining strap or mount it on a trolley.



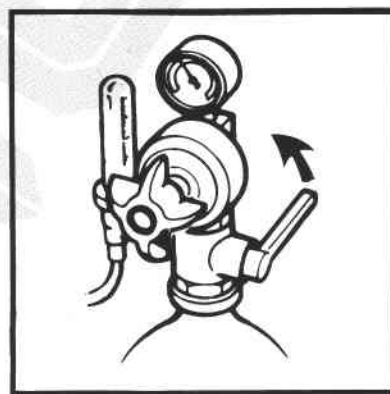
Protect the eyes and open the cylinder valve to remove any dirt in valve socket.



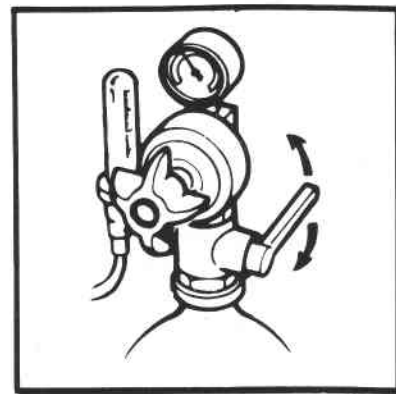
Fit the gas regulator to the cylinder and hand tighten using the correct size spanner. (A sharp blow with the hand at the end of the spanner will ensure a gas tight seal).



Fit the flowmeter and gas hose to the regulator. Ensure that the flowmeter is positioned vertically.



Open the cylinder valve and check the cylinder pressure. (Must be greater than 10 bar (150 lb/in²)).



Close the cylinder valve.

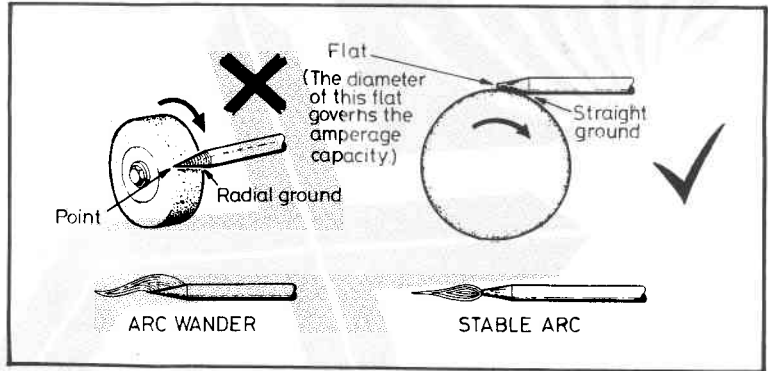
TIG TORCH PREPARATION

CAUTION:

Irreparable damage to the TW torches will occur if it is operated without an adequate flow of cooling water.

Electrode

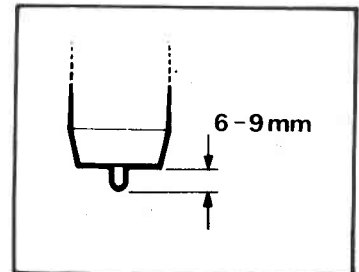
The electrode tip should be ground as shown. Do not use the grinding wheel for other purposes as contamination with other metals may cause electrode deterioration and weld contamination.



To adjust or renew the electrode, undo the electrode cap one turn to allow the electrode to be withdrawn from the collet. If the collet does not release its grip, lightly tap the end of the electrode. The electrode cap should never be tightened more than finger-tight.

To prevent damaging the collet, always ensure that at least 9.0mm (3/8in) of the electrode is gripped by the collet.

The electrode should not protrude more than 9.0mm (3/8in) from the nozzle except when acute angle welding or using a gas lens.



Shielding Gas

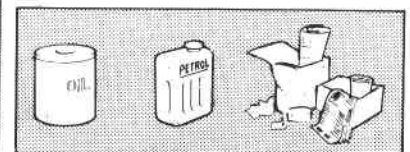
To prevent oxidation, always purge the argon hose before welding and maintain the argon flow until the weld has cooled sufficiently after welding has ceased.

Water Cooling

Always ensure that water is flowing before welding.

WELDING PREPARATION

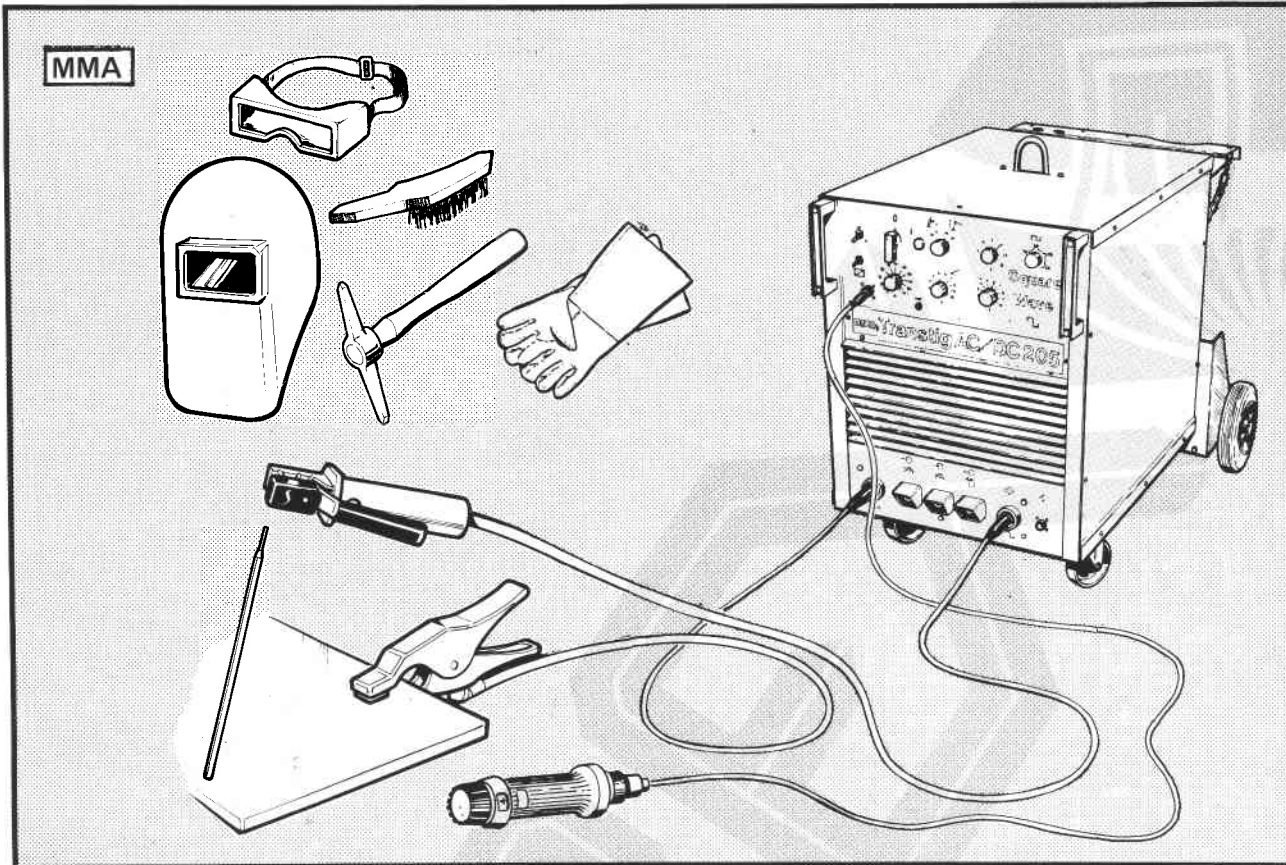
- 1 Clean the material to be welded with a wire brush.
- 2 Clamp the work return cable to a clean area of the workpiece.
- 3 Keep the gap between pieces to be welded to a minimum.
- 4 Clear the welding area and check that a fire extinguisher is available.



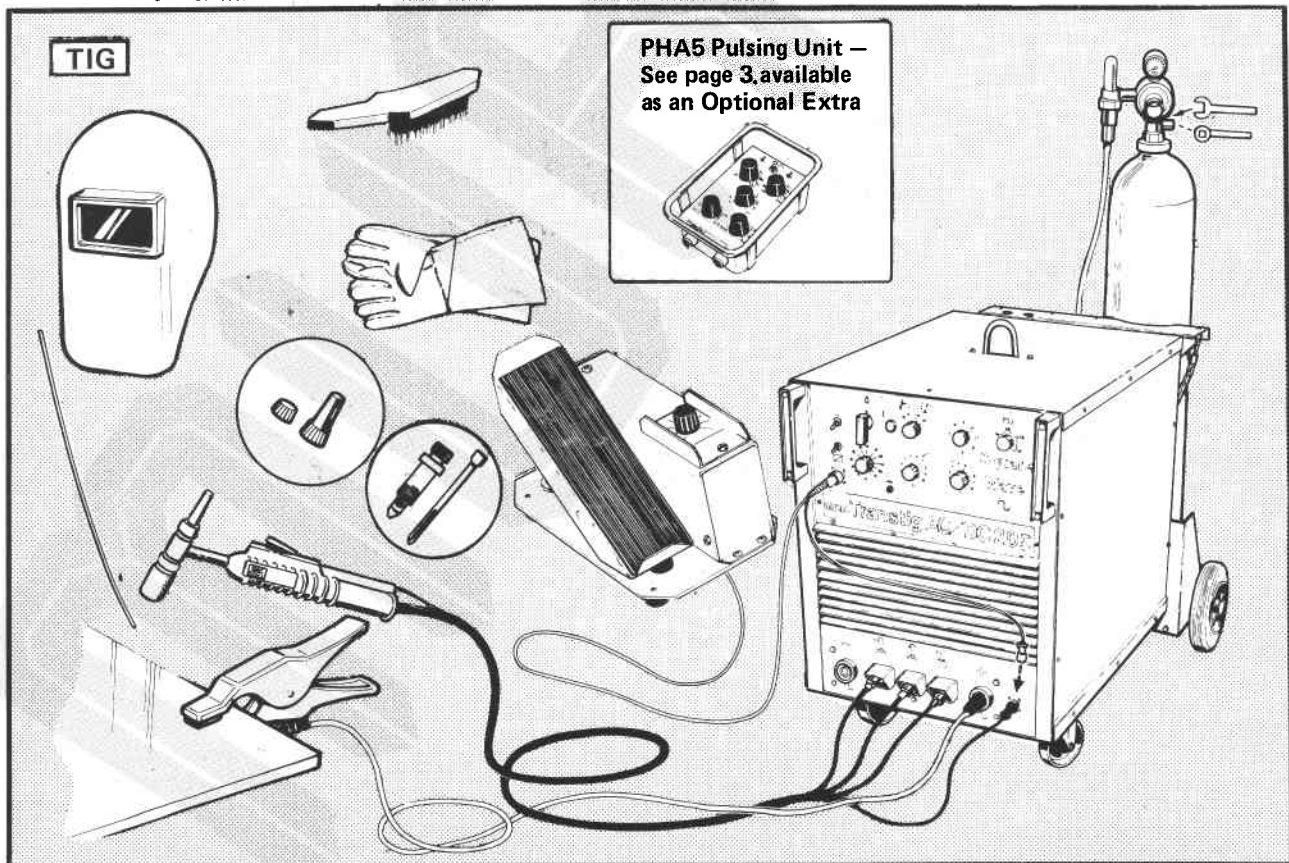
Remove all flammable material from the welding area.

INSTALLATION (Continued)

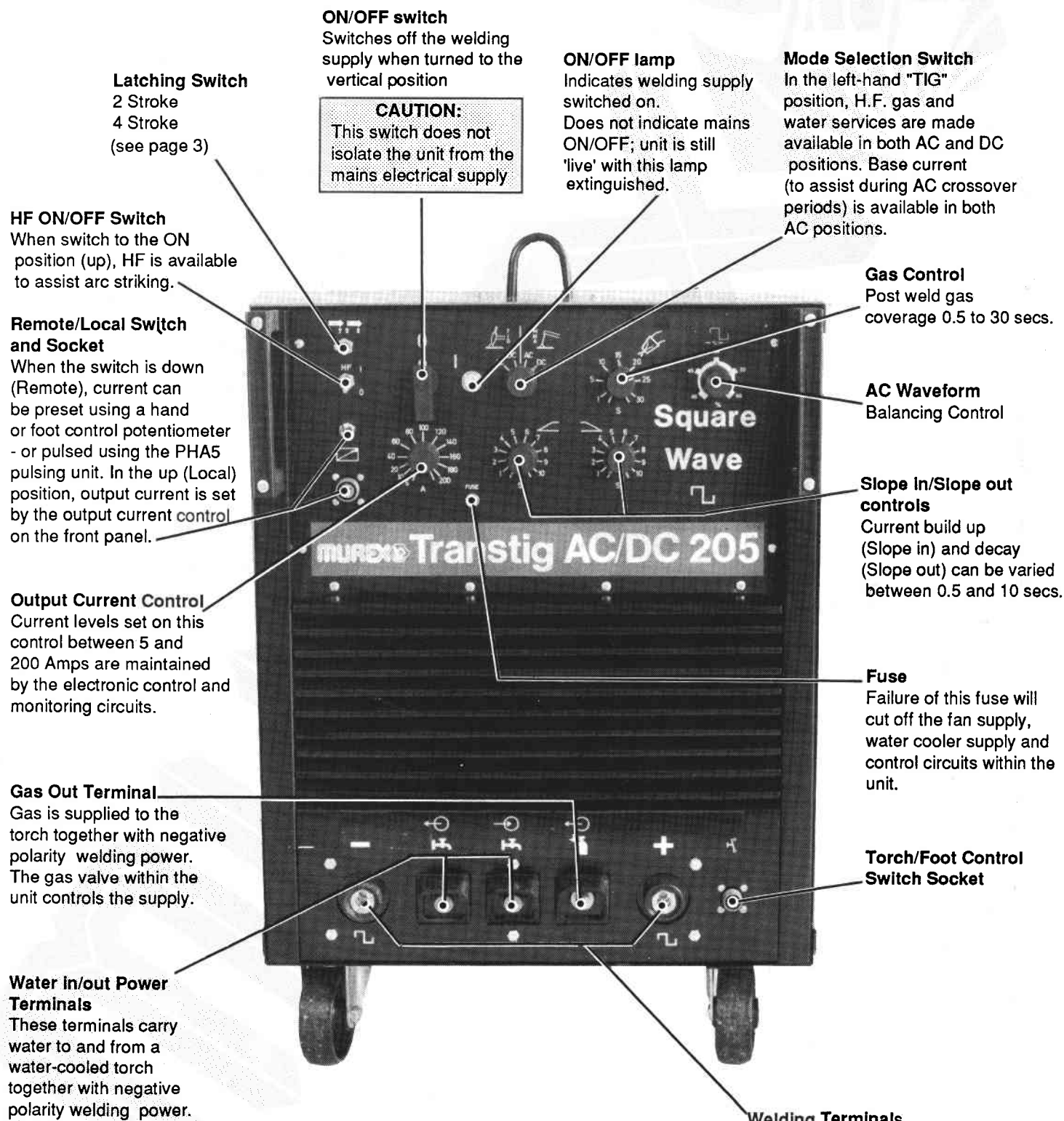
Note: For details of other MUREX welding accessories contact your local distributor.



WARNING: When setting up, with the process switch in the Manual Metal Arc (MMA) position and the unit switched on, the terminals are 'Live'. Therefore switch off before electrode changing or connecting welding.



CONTROLS



Latching Switch
2 Stroke
4 Stroke
(see page 3)

HF ON/OFF Switch
When switch to the ON position (up), HF is available to assist arc striking.

Remote/Local Switch and Socket
When the switch is down (Remote), current can be preset using a hand or foot control potentiometer - or pulsed using the PHA5 pulsing unit. In the up (Local) position, output current is set by the output current control on the front panel.

Output Current Control
Current levels set on this control between 5 and 200 Amps are maintained by the electronic control and monitoring circuits.

Gas Out Terminal
Gas is supplied to the torch together with negative polarity welding power. The gas valve within the unit controls the supply.

Water in/out Power Terminals
These terminals carry water to and from a water-cooled torch together with negative polarity welding power.

Foot Control Unit
Details of the foot control unit are given on page 12 of this manual.

ON/OFF switch
Switches off the welding supply when turned to the vertical position

CAUTION:
This switch does not isolate the unit from the mains electrical supply

ON/OFF lamp
Indicates welding supply switched on. Does not indicate mains ON/OFF; unit is still 'live' with this lamp extinguished.

Mode Selection Switch
In the left-hand "TIG" position, H.F. gas and water services are made available in both AC and DC positions. Base current (to assist during AC crossover periods) is available in both AC positions.

Gas Control
Post weld gas coverage 0.5 to 30 secs.

AC Waveform Balancing Control

Slope In/Slope out controls
Current build up (Slope in) and decay (Slope out) can be varied between 0.5 and 10 secs.

Fuse
Failure of this fuse will cut off the fan supply, water cooler supply and control circuits within the unit.

Torch/Foot Control Switch Socket

Welding Terminals
Connect as shown opposite. Polarities may be reversed for MMA electrode negative applications

Note:
If welding output current ceases the unit may have overheated causing thermostats to trip. Do not switch off - leave the unit switched on, with the fan running and check for ventilation restrictions.

TIG ELECTRODES

1% Zirconiated

Tungsten Electrodes containing 1% Zirconium are recommended when it is vital that tungsten contamination of the weld is to be avoided particularly where high quality A.C. welding of aluminium and magnesium and their alloys is called for.

Maximum Electrode Ratings

Electrode Dia.	Length	Recommended max. current – amperes	
Thoriated 1% (yellow tip)			
0.8mm 1/32in	76mm 3in	a.c.*	d.c.
1.2mm 3/64in	76mm 3in	20	45
1.6mm 1/16in	76mm 3in	30	70
2.4mm 3/32in	76mm 3in	60	150
3.2mm 1/8in	76mm 3in	90	240
4.8mm 3/16in	152mm 6in	140	380
1.2mm 3/64in	152mm 6in	30	70
1.6mm 1/16in	152mm 6in	60	150
2.4mm 3/32in	152mm 6in	90	240
3.2mm 1/8in	152mm 6in	140	380
4.0mm 5/32in	152mm 6in	195	450
4.8mm 3/16in	152mm 6in	250	500

Electrode Dia.	Length	Recommended max. current – amperes	
Zirconiated 1% (white tip)			
1.2mm 3/64in	152mm 6in	a.c.*	d.c.
1.6mm 1/16in	152mm 6in	30	—
2.4mm 3/32in	152mm 6in	60	—
3.2mm 1/8in	152mm 6in	90	—
4.0mm 5/32in	152mm 6in	150	—
4.8mm 3/16in	152mm 6in	210	—
4.8mm 3/16in	152mm 6in	275	—
Thoriated 2% (red tip)			
1.6mm 1/16in	152mm 6in	60	150
2.4mm 3/32in	152mm 6in	90	240
3.2mm 1/8in	152mm 6in	140	380

*Although thoriated electrodes may be used for a.c. welding, zirconiated electrodes are preferred when welding aluminium as the risk of tungsten contamination is reduced.

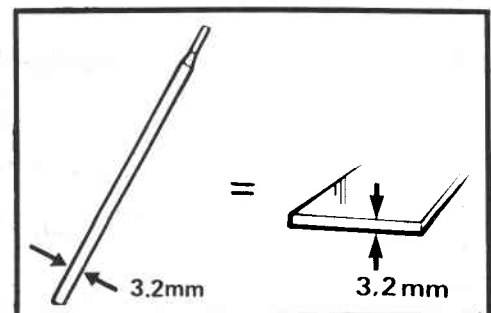
MANUAL METAL ARC ELECTRODES

Electrode Type	dia (mm)	Voltage (min ocv) Polarity	Materials
Zodian Universal or Satinex	2.5 to 6.3	ac(50v) dc +/-	Mild Steel Medium tensile and mild steels
Fortrex 7018	2.5 to 6.0	ac(80v) dc +/-	Carbon and low alloy. Mild steel and medium tensile steels
Ferex 7018LT	2.5 to 6.0	dc +/- (-preferred)	Medium tensile steels and mild steels
Nicrex E316L-16	2.0 to 5.0	ac (60v) dc +	Stainless Steels

Electrode Type	dia. (mm)	Voltage (min ocv) Polarity	Materials
Bronzoid 1	to 2.5 to 5.0	dc + only	Bronzes, Brass & copper
Armoid 1	2.5 to 6.0	ac (75) dc +	High tensile Stainless Steels Dissimilar metals
Cinex	2.5 to 5	ac (40) dc +	Cast Iron – normal grades
Ferroid 3	2.5 to 4	ac (40) dc –	Cast Iron – high duty grades
Alumoid 3	2.5 to 4	dc + only	Wrought and cast aluminium and its alloy
Hardex 800	4.0 & 5.0	ac (70v) dc +/-	Hardfacing

This chart is given as a general guide to the MUREX electrodes. For more detailed information, contact your local MUREX distributor.

As a rough guide, select the electrode which is approximately the same size as the material thickness.



Switch off and disconnect the unit from the mains supply before undertaking any maintenance tasks.

Daily (Operator task)

If a water recirculating unit is fitted, check the water level in the tank and top up as necessary. The water level should also be checked whenever the welding torch is changed.

Check welding and mains cables for deterioration, cracks, etc:

Check the torch or electrode holder for damage. Replace any suspect part(s).

ALWAYS CHECK THE WELDING AREA DAILY FOR POSSIBLE SAFETY HAZARDS. IF IN DOUBT CONSULT YOUR SAFETY OFFICER.

Lubrication

The fan motor is fitted with a sealed, lifetime lubricated bearing which should require no maintenance.

Overload Protection

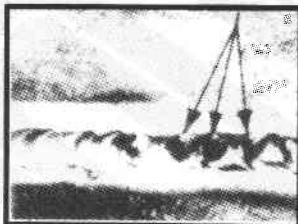
Overload protection thermostats are mounted on the choke and thyristor assemblies and will interrupt the welding current when the rectifier is overloaded.

If the unit shuts off, leave the fan running and allow the unit to cool for approximately 5 minutes.

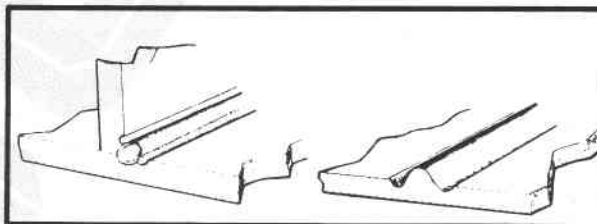
WELDING AND GENERAL FAULTS

Symptom	Fault	Remedies
Surface porosity	a) Insufficient shielding gas (TIG). b) Bore of nozzle too small (TIG). c) Surplus degreasing agent (MMA and TIG). d) Arc too long (MMA and TIG). e) Incorrect torch or rod angle (TIG). f) Poor quality materials. (MMA and TIG)	a) Check shielding gas flow. b) Fit larger ceramic nozzle. c) Remove degreasing agent and dry. d) Shorten the arc. e) Correct the angles (see TIG WELDING). f) Use better quality materials.
Undercut (MMA and TIG)	a) Incorrect welding technique. b) Current too high. c) Incorrect welding speed. d) Wrong electrode (MMA).	a) Correct rod handling. b) Reduce current setting. c) Increase hand travel speed. d) Change to correct size/type).
Lack of penetration (MMA and TIG)	a) Insufficient current. b) Welding too fast.	a) Increase current setting. b) Decrease hand travel speed.
Cracking and Inclusions	These faults are difficult to detect without the use of specialised equipment. If cracking shows, seek the advice of a welding engineer.	
No welding output fan runs	a) Thermostat tripped	a) Allow to cool. Decrease welding duty cycle (welding on to off time).
Fan does not run	b) Check front panel and mains input fuses.	b) Replace with the same value fuse

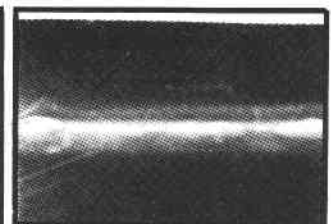
Samples of Tig Welding



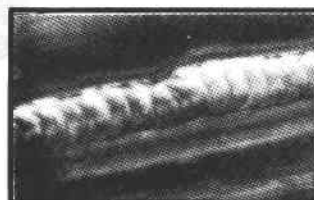
Surface Porosity



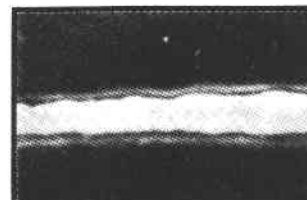
Undercut



Lack of penetration



Good weld TIG



Good penetration TIG