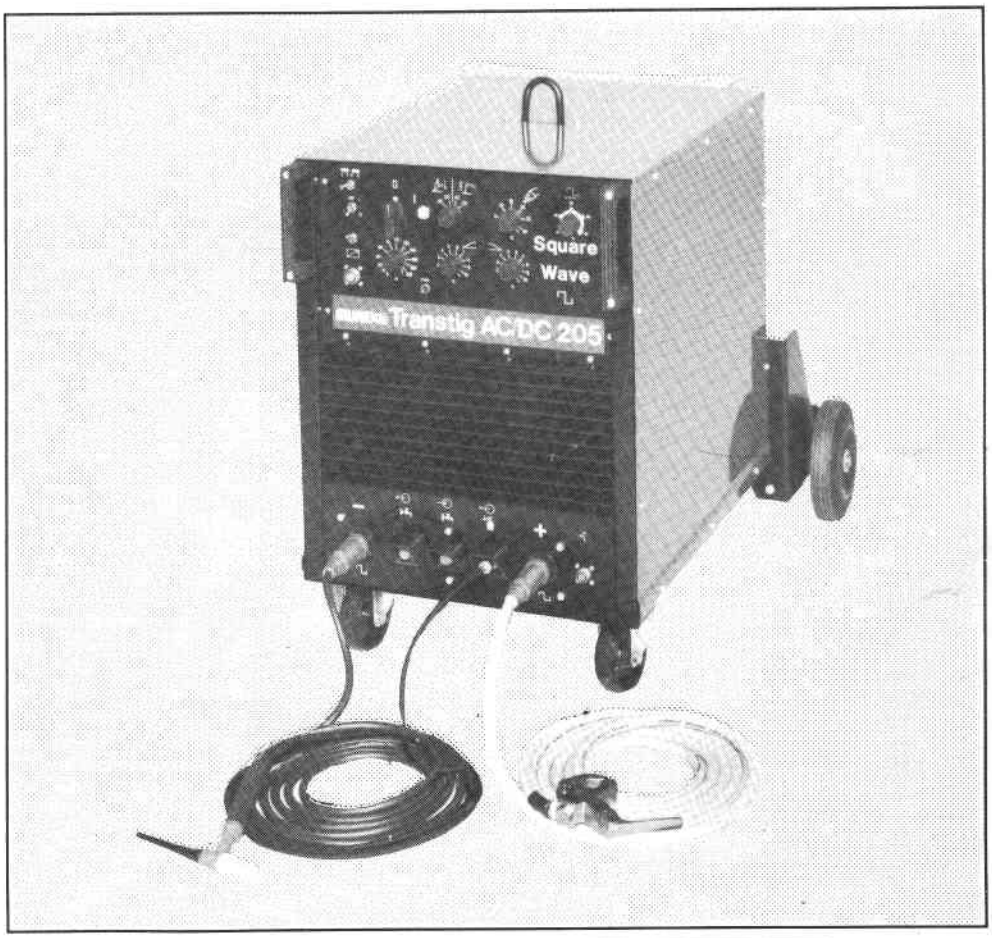
G. S.

Operating Manual

Transtig AC/DC 205 Square Wave



Please ensure that this Instruction Manual is made available to the user of the equipment.

£2:50

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, paticularly 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.

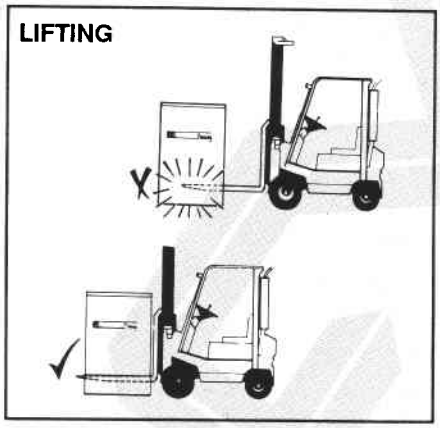
Have this equipment regularly inspected and maintained by an approved service centre.

SAFETY

MUREX SERVICE

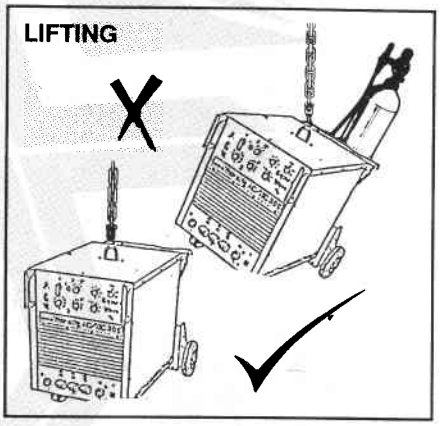
Call in your local Murex Service Centre if you don't know what to do.

LIFTING



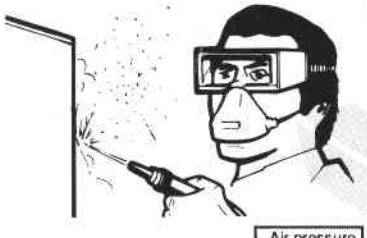
Use forks which are long enough

LIFTING



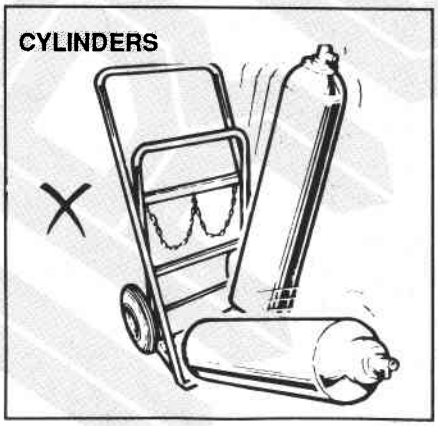
Lift the unit correctly

DUST



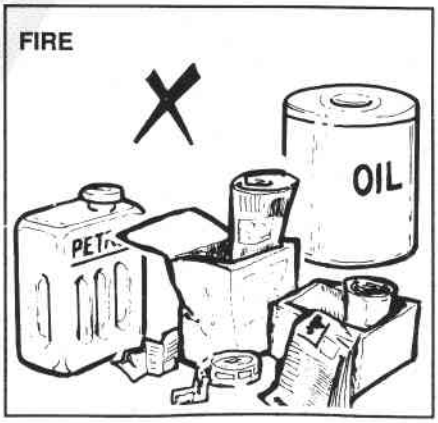
Wear goggles and mask when removing dust with an airline.

CYLINDERS



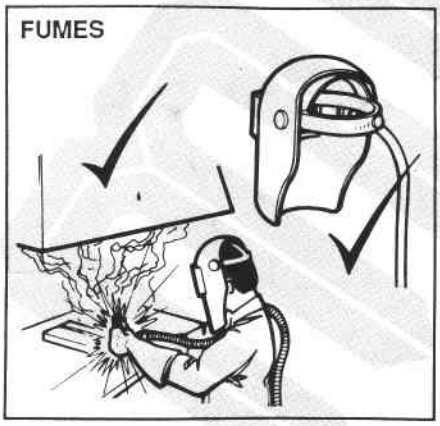
Handle cylinders carefully

FIRE



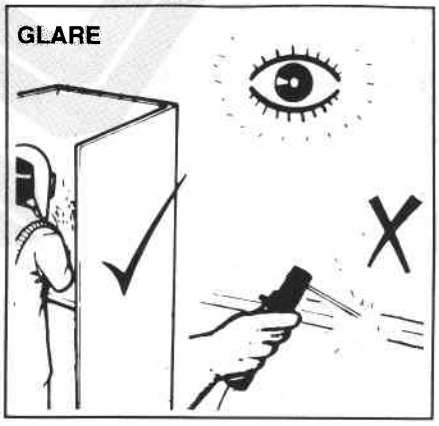
Before commencing welding, clear the area of inflammable materials.

FUMES



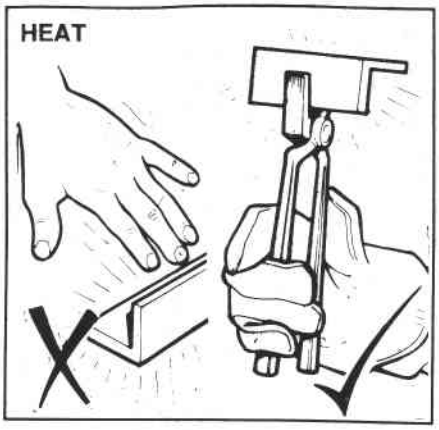
Ventilate the welding area to prevent a build-up of gas and fumes.

GLARE

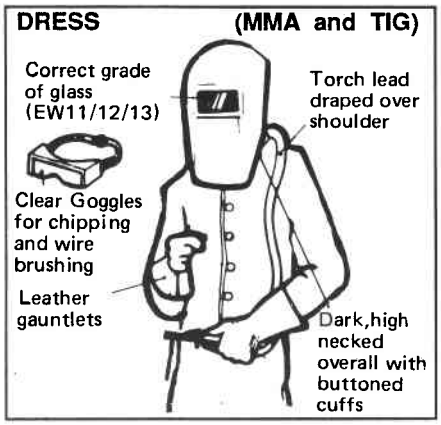


Wear your headshield (or face screen) and screen the cutting area.

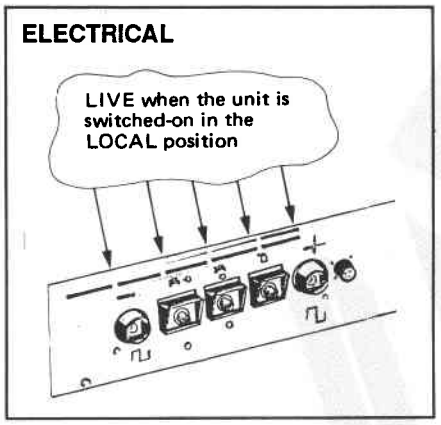
HEAT



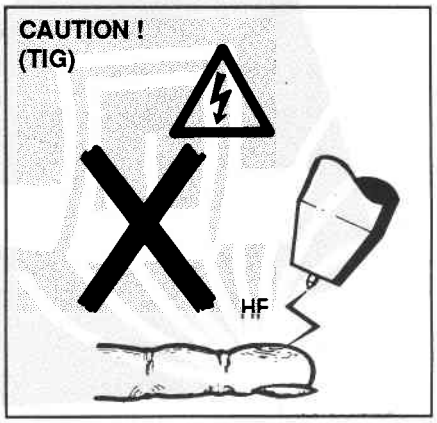
Don't burn yourself
Wear gauntlets and use tongs.



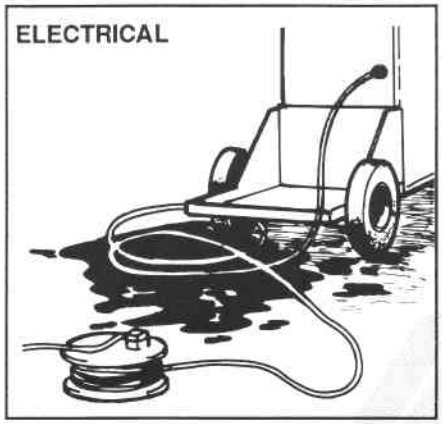
Dress correctly when welding and preparing the weld



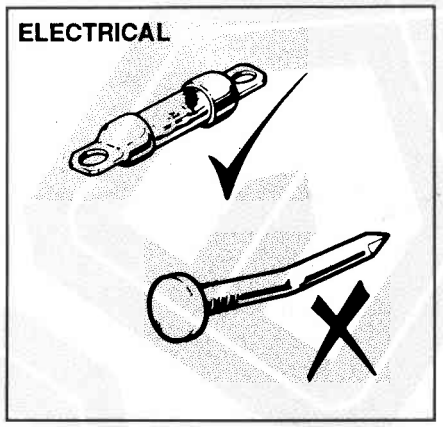
Switch off when electrode changing or setting up the MMA position



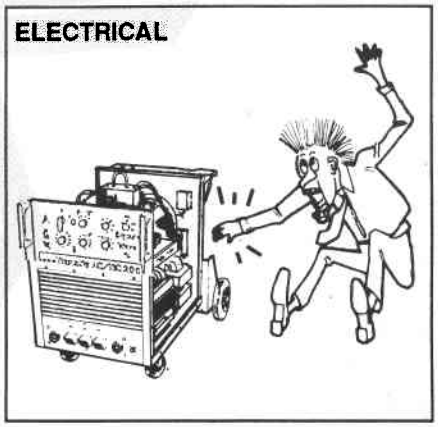
Do not strike the HF on your finger or any other part of the body



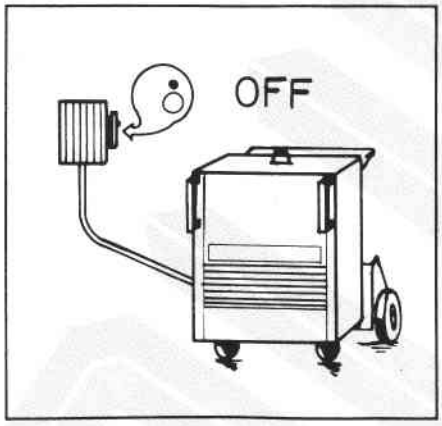
Don't allow leads to lie in oil, water or corrosive liquid or extend them with extension leads - fit a longer cable.



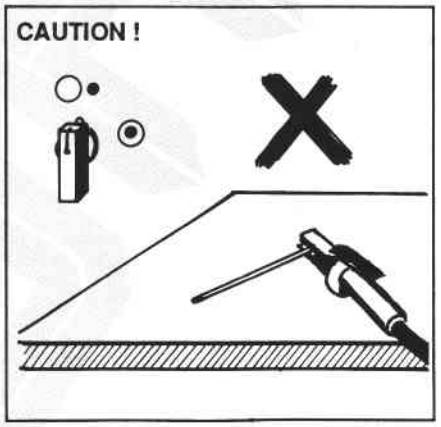
Don't replace a fuse with the wrong value (especially too high a value). See Technical Notes for fuse values.



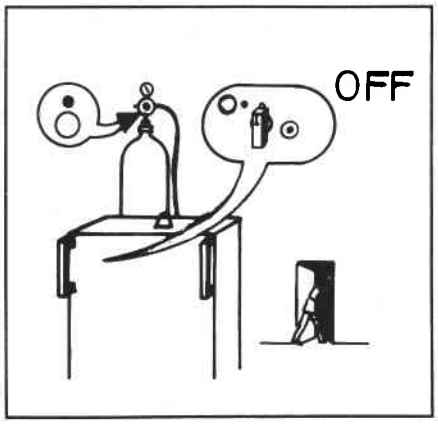
Don't work with the cover off. Leave it to the experts.



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



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.

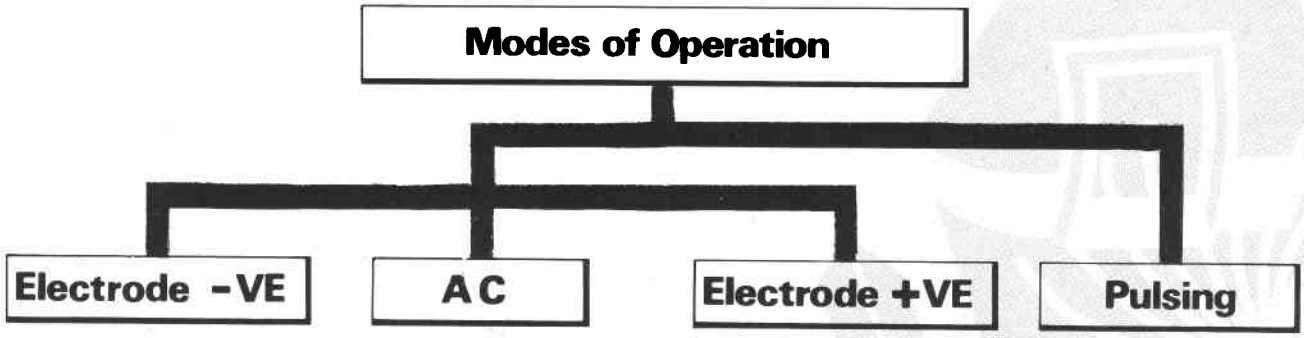
The output is controlled by means of a thyristor bridge with feedback from a current-monitoring shunt to 'sense' variations in output which differ from the preset value. The unit is provided with on/off and post weld gas control and also with current slope-in/slope-out controls.

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.

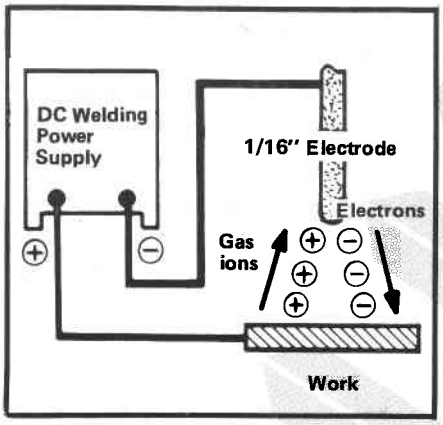
Pulsed d.c. mode allows greater control of heat input into the weld area.

Welding Power

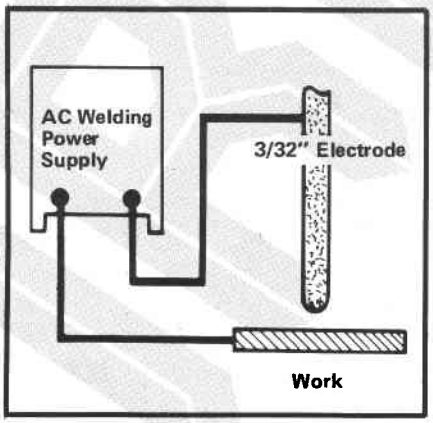
When TIG welding, the operator has three choices of welding current. They are: direct current negative electrode polarity, direct current positive electrode polarity, and alternating current. Each of these current types has its applications, and its advantages and disadvantages. A look at each type and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

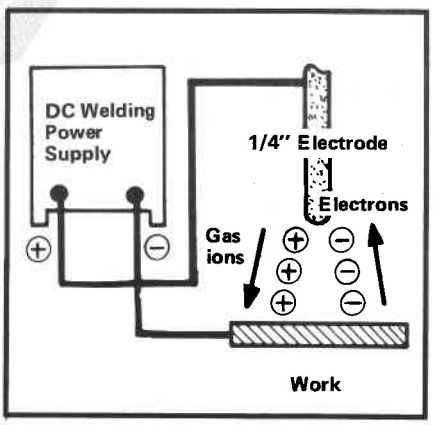
DC Electrode Negative

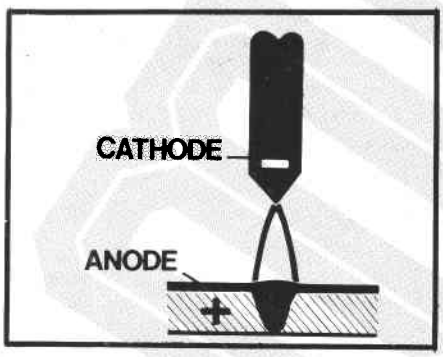


AC

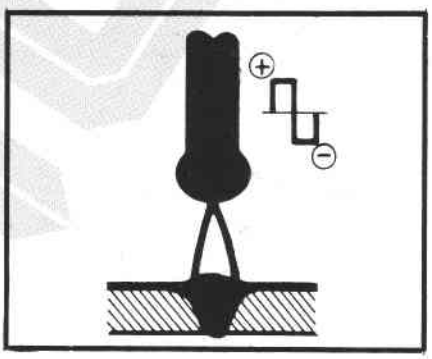


DC Electrode Positive

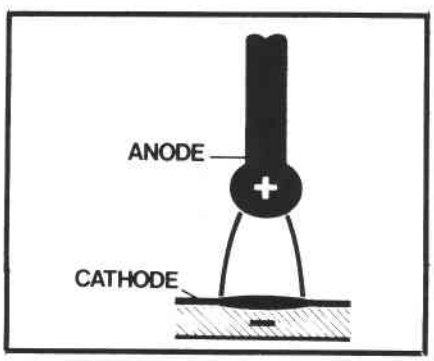




TIG welding with electrode negative gives deep penetration because it concentrates the heat in the joint area. No cleaning action occurs with this polarity. The process is particularly suited to Stainless Steel, Copper, Nickel, Alloy Steels, Nickel alloys and Titanium.



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 ½ 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:

a. Reduced distortion
b. Reduced heat build-up
c. Improved tolerance to joint fit up
d. 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