MUREX

Operating Manual

Transtig AC/DC 260 & 360 Square Wave

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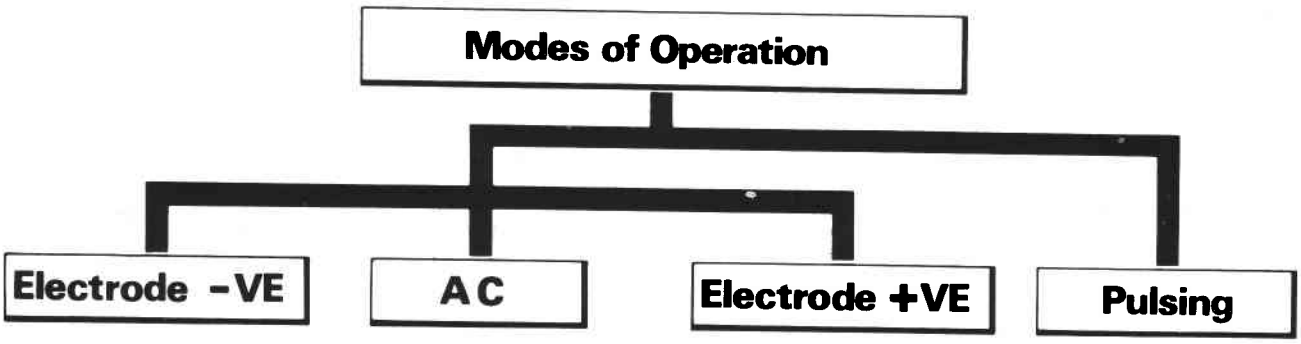
THE TIG WELDING PROCESS



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.

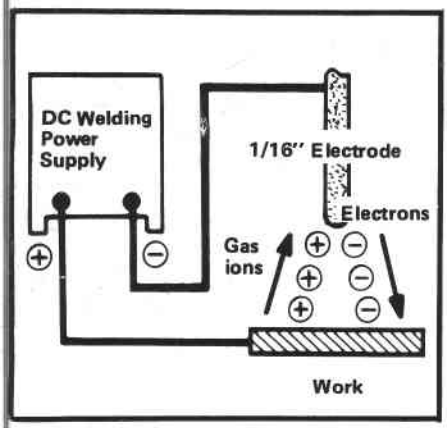
These phenomena are exploited in the a.c. mode when the electrode changes alternately from negative to positive.

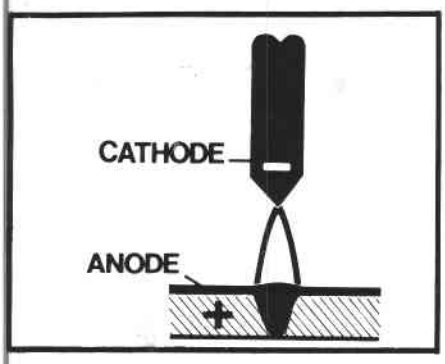
Pulsed d.c. mode allows greater control of heat input into the weld area.

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.

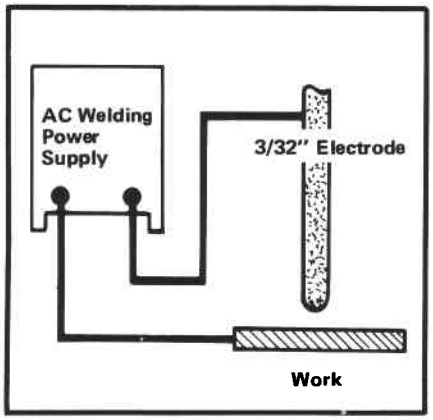
DC Electrode Negative

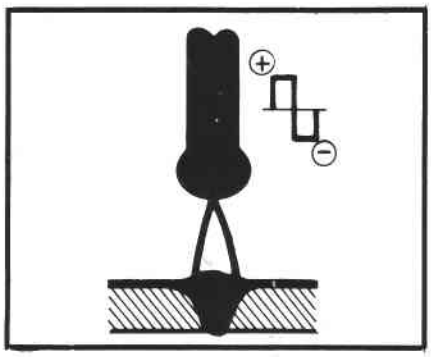




TIG welding with electrode negative gives deep penetration because it concentrates the heat in the joint area. No cleaning action occurs with this polarity. The process is particularly suited to Stainless Steel, Copper, Nickel, Alloy Steels, Nickel alloys and Titanium.

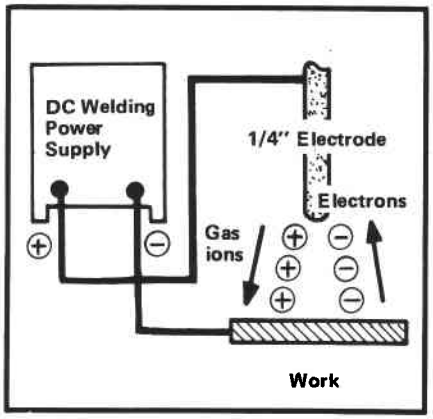
AC

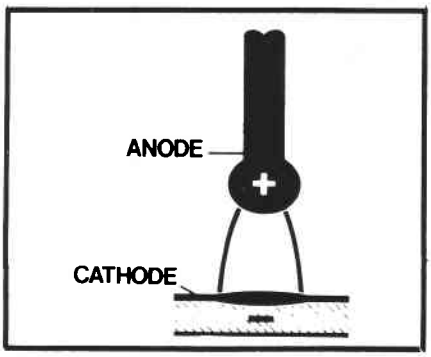




TIG welding with AC combines the good weld penetration on the negative half cycle with the desired cleaning action of the positive half cycle, giving improved welding quality when working with Aluminium and Magnesium Alloys.

DC Electrode Positive





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 magnesium. 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 dc 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. reverse polarity. This accounts for the higher current capacity of a given size tungsten electrode with d.c. normal than with a.c or d.c. reverse. 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 of cycles of alternating current are of equal time and magnitude.

The waveform 'balance' between positive and negative half cycles can be adjusted on the Transtig AC/DC 355 squarewave (see Controls Section).

DC Electrode Positive
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. normal 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. reverse. When used on aluminium the arc would be somewhat erratic as aluminium is not a good emitter of electrons.

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

Pulsed TIG (optional)
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

PulsedTIG is normally used with d.c. electrode negative.

The effect of varying the pulse controls can be summarised as follows:

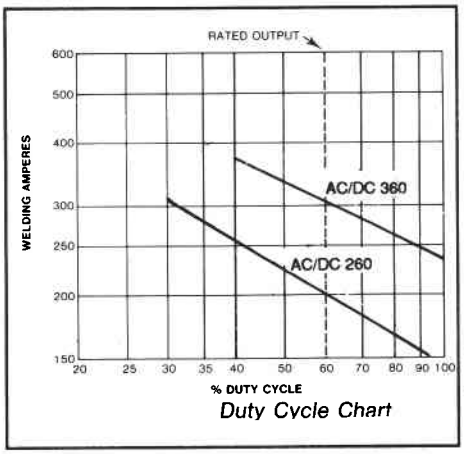
Pulse Width/Peak Controls — Provide control of heat input

Frequency — Various setting of frequency rates (pulse-per-second p.p.s) allows the optimum traverse speed to be selected to match the material being welded.

Background — Provides control of penetration width and depth. Reduces thermal shock and improves grain size refinement

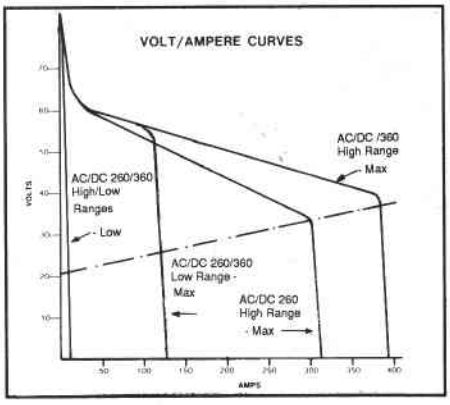
DUTY CYCLE

The duty cycle of these welding power sources is the percentage of a ten minute period that the power source can safely be operated at a given output. These welding power sources are rated at 35 percent duty cycle. This means that the welding power sources can be safely operated at rated load for three and a half minutes out of every ten. During the remaining six and a half minutes, the unit should idle to permit proper cooling. If the welding current is decreased, the duty cycle will increase and the figure opposite shows the operator how to determine the safe output of the welding power source for various duty cycles.



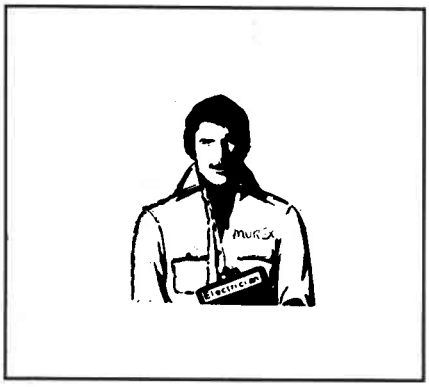
Duty Cycle Chart

CAUTION:
Exceeding the indicated duty cycle will cause the welding power source to overheat and may cause damage to the equipment.

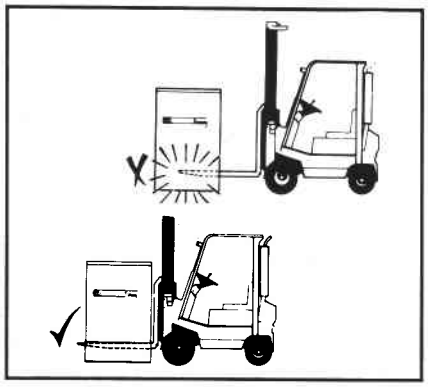


Volt - Ampere Curves
The volt-ampere curves show the output voltage available at any given output current within the limits of the minimum and maximum CURRENT CONTROL settings. Load voltage is pre-determined to a large degree by arc characteristics. With the use of the volt-ampere curves, it is possible to determine the amperage possible for a specific load voltage. With reference to the volt-ampere curves, the curves show the maximum and minimum settings of the CURRENT CONTROL only. Curves of other settings will fall between the maximum and minimum curves shown.

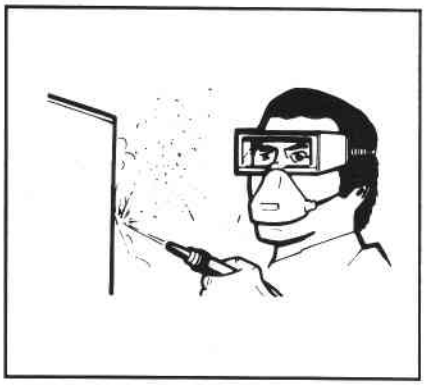
SAFETY Operators of Electric arc welding equipment must always be aware of the inherent risks involved in the arc welding process. Your attention is therefore drawn to the Safety Leaflets available from the Welding Institute, particularly Publications 236 and 237.



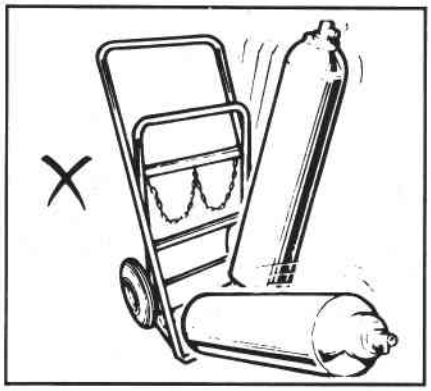
Call in your nearest Murex Service Centre if you dont know what to do.



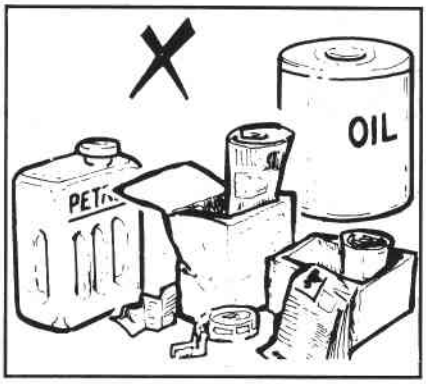
Use forks which are long enough.



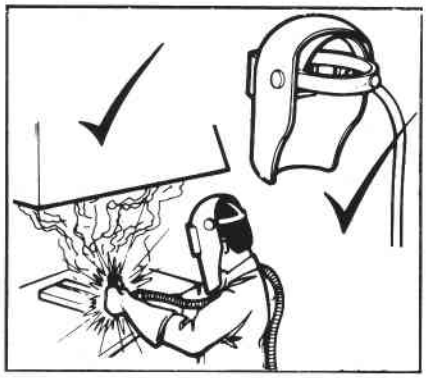
Wear goggles and a mask when removing dust with an airline.



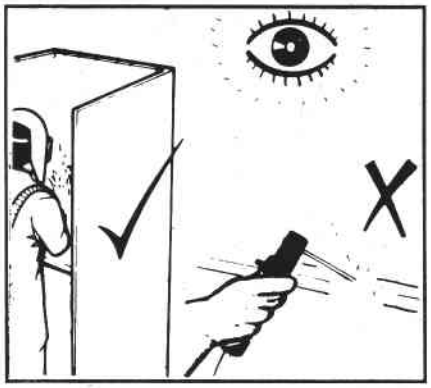
Handle cylinders carefully.



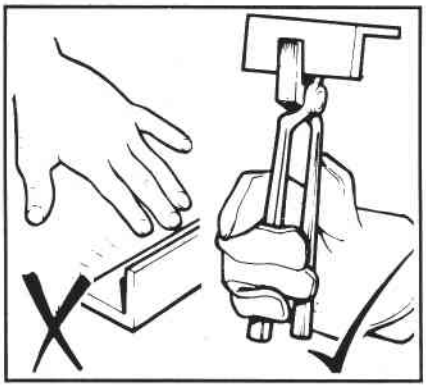
Before commencing welding, clear the area of flammable materials.



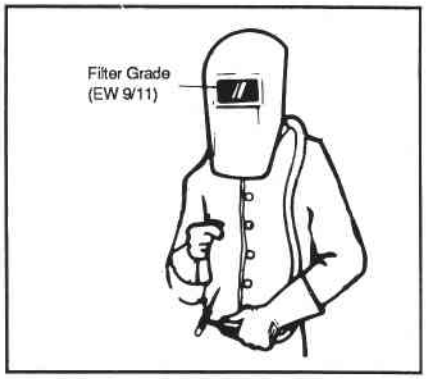
Ventilate the welding area to prevent a build up of gas and fumes.



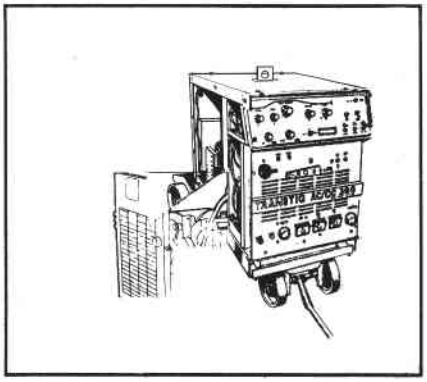
Wear your headshield or facescreen and screen the welding area.



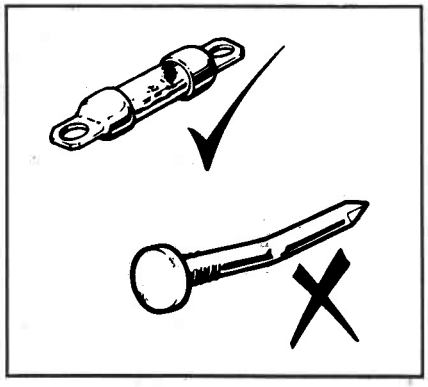
Don't burn yourself! wear gauntlets and use tongs.



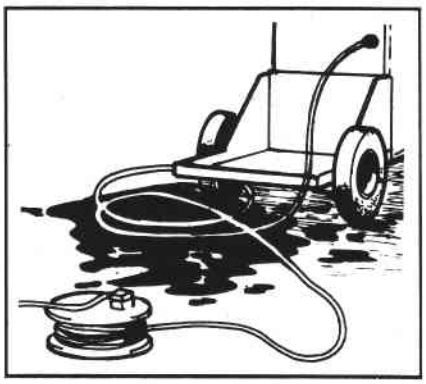
Dress correctly when welding



Dont work with the cover off. Leave it to the experts.

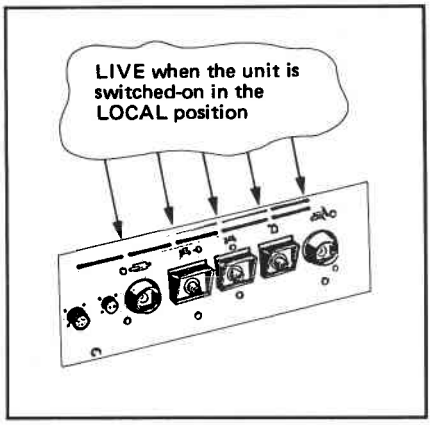


Don't replace a fuse with the wrong value (especially too high a value). See Technical Notes for fuse values.

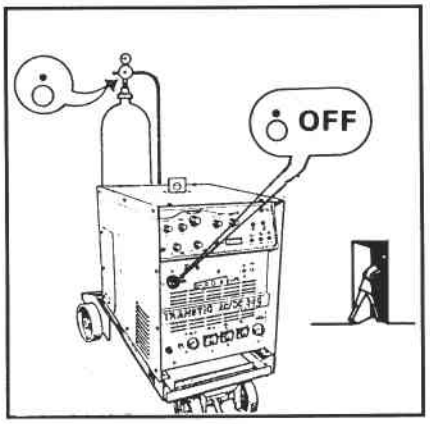


Don't allow leads to lie in oil water or any corrosive liquid. Don't extend the cable fit a longer one.

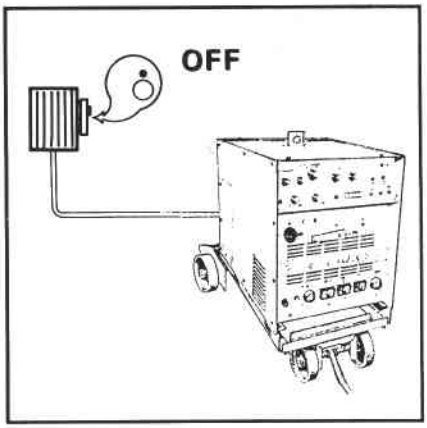
SAFETY (continued)



Switch off when electrode changing or setting up the MMA position.



Switch off power and gas before leaving the equipment unattended.



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

INTRODUCTION

The Transtig AC/DC 260 & 360 Square Wave power sources are designed to provide AC or DC current outputs from a single (two) phase AC mains input for TIG or Stick (MMA) welding applications; this includes non-ferrous metals such as aluminium, titanium, stainless and copper-based materials.

Equipment features include:

(a) Local/Remote control facility.
(b) AC Waveform balance control.
(c) Pre and Post weld gas flow timers.
(d) Slope - up and Slope - down controls.
(e) Spot weld timer.
(f) 2/4 stroke torch switch latching facilities.
(g) HF or lift arc DC TIG arc initiation.
(h) Thermal and current overload protection.
(i) Power Factor correction (Transtig 360 only)
(j) Auxiliary power output (115V and 220V AC).

The output current is selected by two switches (see page 8). The large polarity switch sets the type of output (AC, DC normal or DC reverse polarity). In addition a front panel range switch selects the full scale setting of the current control:

Transtig 260 10-100A, 35-310A
Transtig 360 10-125A, 25-375A

Fittings on the lower front panel permit the connection of either a water-cooled or air-cooled torch. Remote control facilities are provided via Amphenol type connectors.
Gas flow is controlled by an inbuilt solenoid valve.

115V AC auxiliary power for an external water-cooler is controlled by a front panel switch marked 'Pump'. The water recirculator can be mounted on the power source cylinder tray if required.

The unit incorporates a solid-state contactor requiring minimal maintenance.

A built-in High Frequency generator can be used to provide non-contact arc initiation in either DC or AC TIG modes. The HF can be set continuouse for AC TIG arc maintenance. Alternatively, a built-in lift-arc system for DC TIG welding, can be used for interference free arc striking.

The HF is automatically turned off when either the lift-arc or MMA mode is selected but it can also be manually inhibited if 'scratch' start operation is required.

Components are cooled by a fan which draws in air through inlets in the front panel and expels it through vents in the rear panel.

Thermal switches located on the rectifier heat sink, the choke windings on the 360 and in the main transformer in the 260, protect the unit from overheating. A red front panel fault lamp is illuminated if the thermal switch is tripped.

Note:
In the event of the unit overheating the welding output will be cut off. If this occurs, allow the unit to cool with the fan running.

Internal circuitry is protected by a front panel mounted fuse.
The auxiliary 115V & 220V AC supplies are protected by resettable circuit-breakers mounted on the rear panel.

Optional Extras

See Parts List page 21, and fitting instructions on pages 18 - 20.

Foot Control Unit
Hand Control Unit
Transtig Remote Pulse Control Unit
Analogue Volt/Ammeter Unit
Digital Display Volt/Ammeter Kit

TIG welders accessory kit comprising:
Gloves
Cylinder Key/Spanner,
Wire Brush
Plain Glass

INSTALLATION

WARNING

Review the safety section at the front of this manual and comply with all applicable precautions.
Follow the instructions included elsewhere in this manual relative to proper installation to reduce radio interference.

To prepare the unit for installation, several items should be checked. Clear all packing materials from around the unit and carefully inspect for damage which may have been caused by shipping. Be sure to read all the instructions before attempting to operate the unit. If a fork lift is used for lifting the unit, be sure that the lift forks are long enough to extend completely through under the base.

IMPORTANT

The use of lift forks too short to extend out of the opposite side of the base could cause internal damage should the tip of the lift forks penetrate the bottom of the unit, See 'Safety'.

Location

A proper installation site should be selected for the welding equipment if the unit is to provide dependable service, and remain relatively maintenance free.
The site should allow air movement into and out of the welding unit, and be free from excessive dust, dirt, moisture, and corrosive vapours. The location should also permit easy removal of the welding unit panels for maintenance.

IMPORTANT

Do not place any filtering device over the air intake passages of the unit as this will restrict the movement of air and could cause overheating and possible failure. Warranty is void if any type of filtering device is used.

High-Frequency Radiation (pages14/15)

IMPORTANT

Electrical equipment utilising high frequency energy is capable of radiating interference. Problems, caused to equipment sensitive to HF radiation, can be reduced or eliminated by correct installation (see pages 14/15).

The manufacturer of the equipment covered in this manual has conducted approved field tests on this type and model and certified that the radiation can reasonably be expected to be within the legal limits. IF THE CORRECT INSTALLATION PROCEDURES ARE FOLLOWED AS OUT-LINED IN THE HIGH-FREQUENCY RADIATION PREVENTION SECTION OF THIS MANUAL. The importance of a correct installation cannot be overemphasised since case histories of interference due to high-frequency stabilised arc welding equipments have shown invariably an inadequate installation was at fault.

Electrical Input Connections

WARNING

Before making electrical input connections to the welding unit, use 'machinery lockout procedures': If the connection is to be made from a mains disconnect switch, the switch should be padlocked in the off position. If the connection is made from a fuse box, remove the fuses from the box and padlock the cover in the closed position. If locking facilities are not available, attach a red tag to the mains disconnect switch (or fuse box) to warn others that the circuit is being worked on.

Placing the welding unit power switch in the 'Off' position does not shut off all power within the equipment.

Be sure that the switch box is attached directly or by cable to a suitable ground such as a water pipe or ground rod. Do not ground to gas piping or electrical conduits. Comply with local ordinances and electrical inspection authorities.

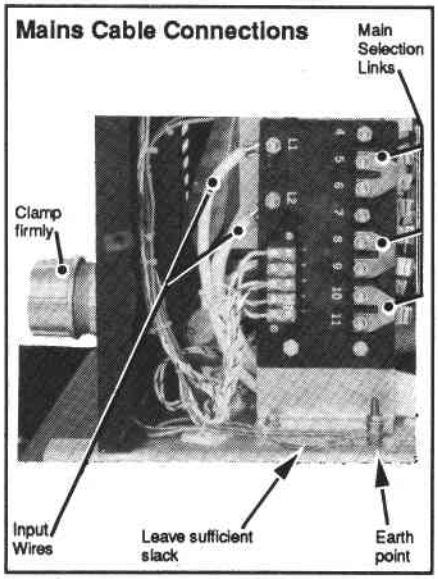
Input Electrical Requirements

This ac/dc welding unit is SINGLE-phase unit and must be connected to a SINGLE-phase power line or any two phases of a three - phase system of the proper voltage.
If there is any question about the type of the system used locally, or the proper connections to obtain single-phase primary input voltage to the welding unit, consult the local power authorities.

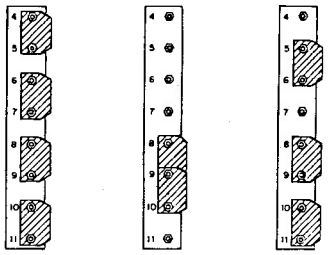
Input Connections

The welding unit should be operated from a separately fused or circuit breaker-protected circuit. The maximum capacity of the welding unit is affected by the mains voltage and if the circuit is overloaded, the performance of the welding equipment will be impaired.

Mains Cable Connections



Mains Input Selection Links



220V 380V 415V

Position the links as shown above for the appropriate mains input voltage.

CAUTION

Connect the input cable to the unit before making connections to the single phase power line.
Lift left side access panel to expose primary terminal board.

CAUTION

Be sure when installing the welding unit that a earth wire is connected from the ground lug to a suitable ground. This is absolutely necessary as any development of stray currents may give a severe shock should anyone touch the welding unit and at the same time touch any grounded object. The ground lug is connected to the welding equipment chassis and is for ground purposes only. If the welding unit is to be connected to two phases of a three-phase line, do not connect the third wire from a three-phase line to the ground lug as this will result in a 'live' welding unit chassis.

The input cable wires connect to terminals labelled 'L1 and L2'. A third conductor, ground connections, should be fastened to the ground lug. When a commercial supply is not available the other end of the ground conductor should be attached to a suitable ground such as water pipe, ground rod, etc. Use a grounding means that is acceptable to the local electrical inspection authorities. Clamp the mains cable firmly and leave sufficient slack in the earth wire so that, in the event of strain on the cable, the earth wire is the last to be affected.