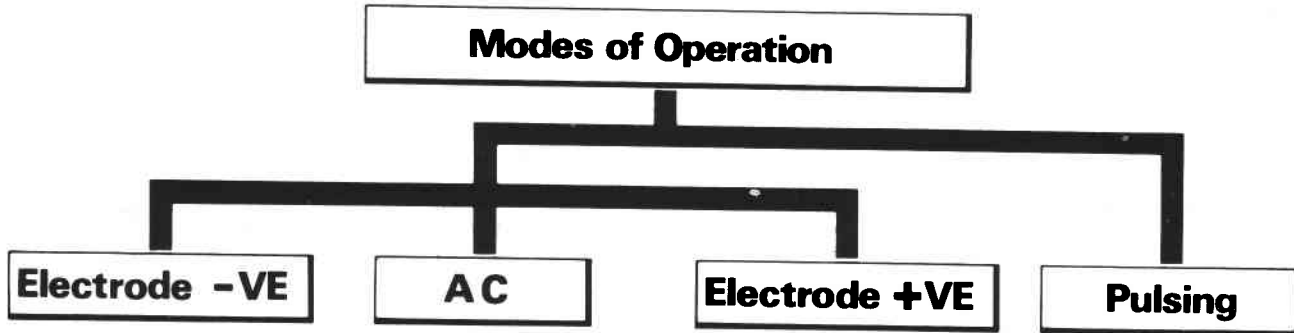


THE TIG WELDING PROCESS



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.

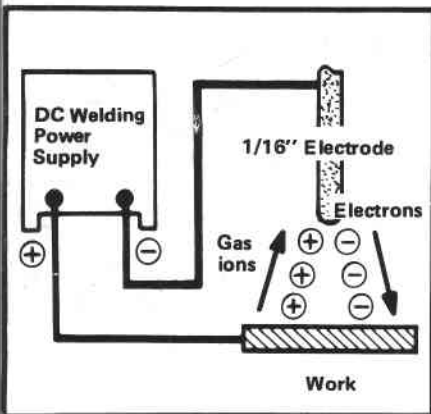
Pulsed d.c. mode allows greater control of heat input into the weld area.

Welding Power

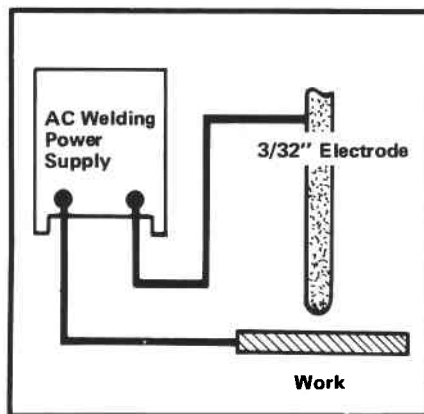
When TIG welding, the operator has three choices of welding current. They are: direct current negative electrode polarity, direct current positive electrode polarity, and alternating current. Each of these current types has its applications, and its advantages and disadvantages. A look at each type and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

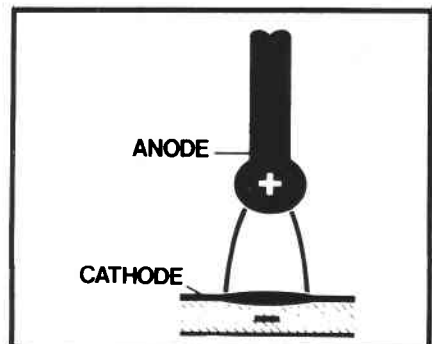
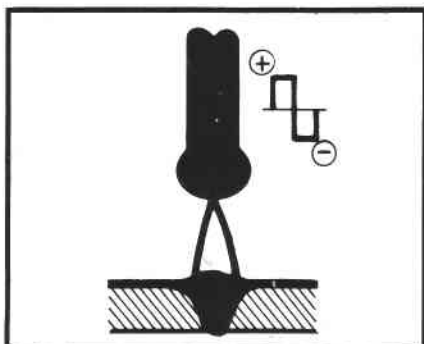
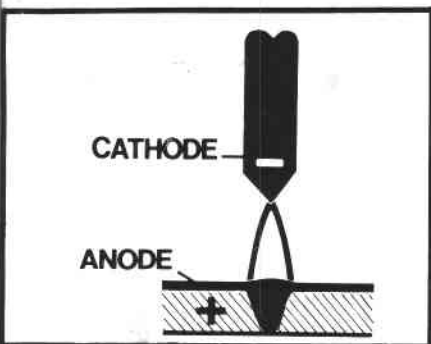
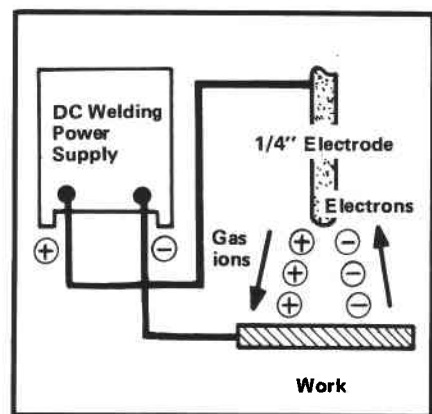
DC Electrode Negative



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 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 Transig 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 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:

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

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

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

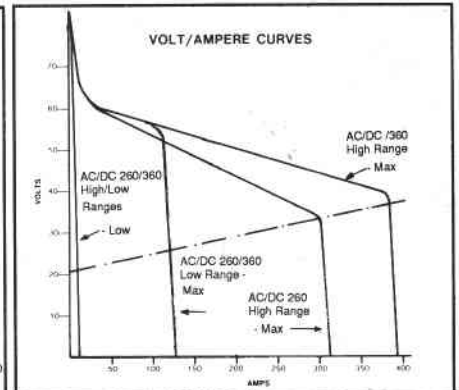
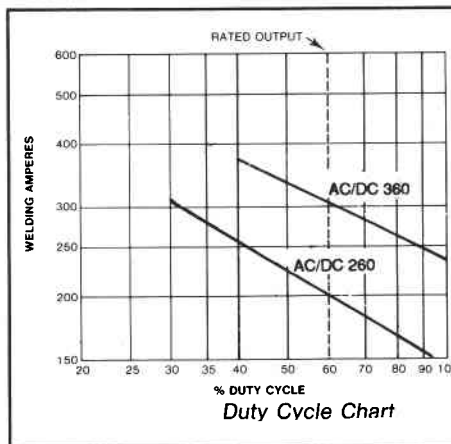
Pulse Width/Peak Controls — Provide control of heat input

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.



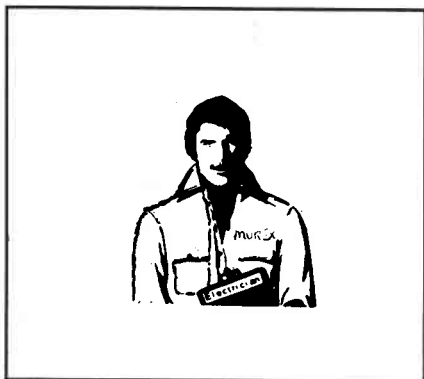
Volt - Ampere Curves

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.

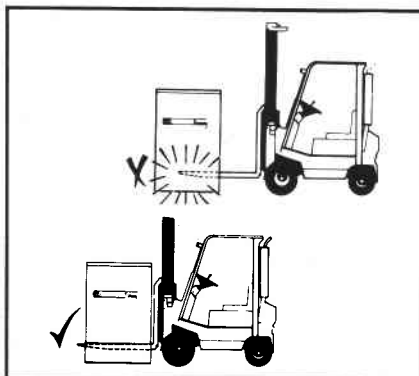
CAUTION:

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

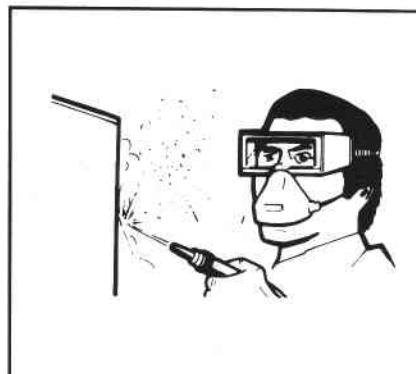
SAFETY Operators of Electric arc welding equipment must always be aware of the inherent risks involved in the arc welding process. Your attention is therefore drawn to the Safety Leaflets available from the Welding Institute, particularly Publications 236 and 237.



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



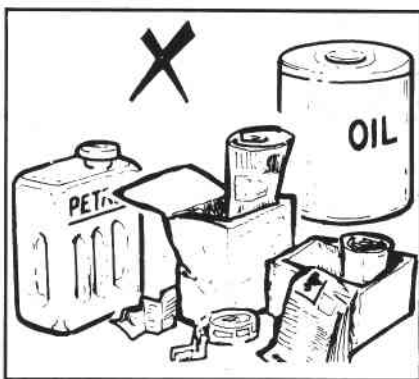
Use forks which are long enough.



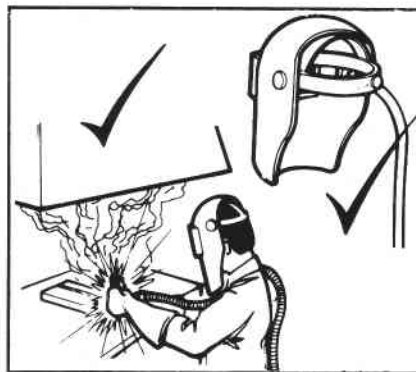
Wear goggles and a mask when removing dust with an airline.



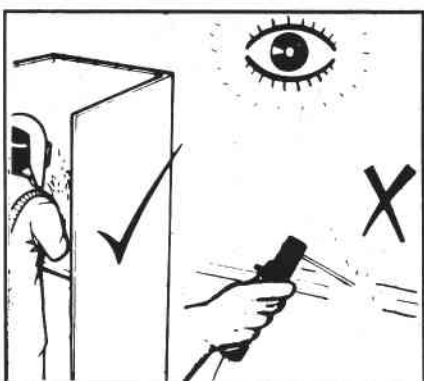
Handle cylinders carefully.



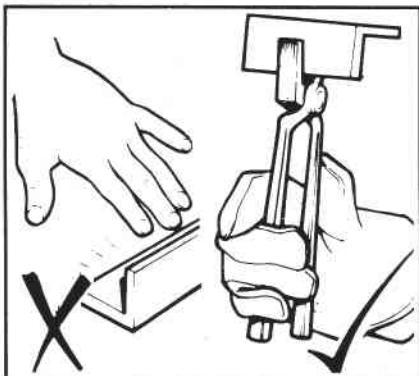
Before commencing welding, clear the area of flammable materials.



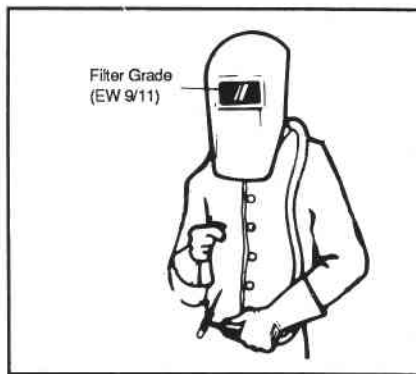
Ventilate the welding area to prevent a build up of gas and fumes.



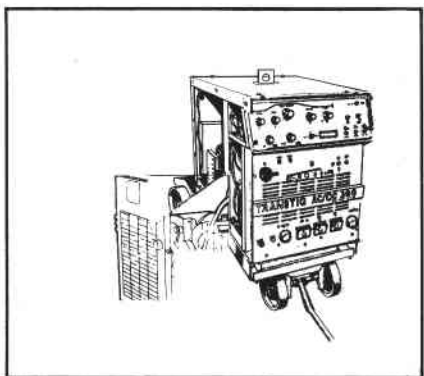
Wear your headshield or facescreen and screen the welding area.



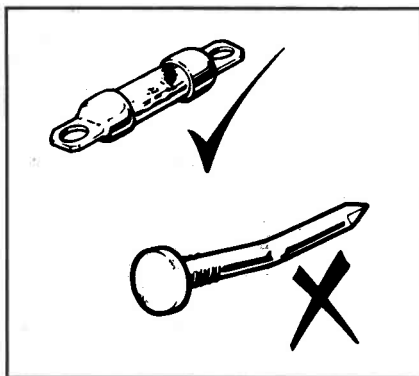
Don't burn yourself! wear gauntlets and use tongs.



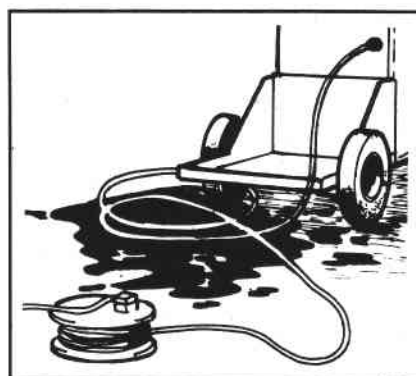
Dress correctly when welding



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

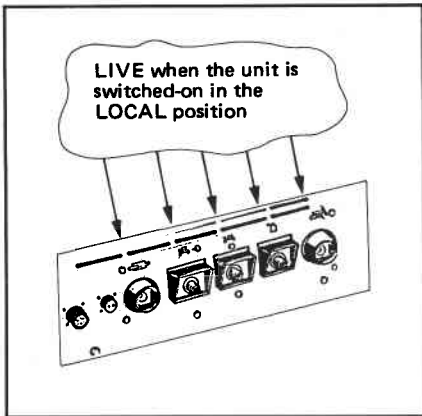


Don't replace a fuse with the wrong value (especially too high a value). See Technical Notes for fuse values.

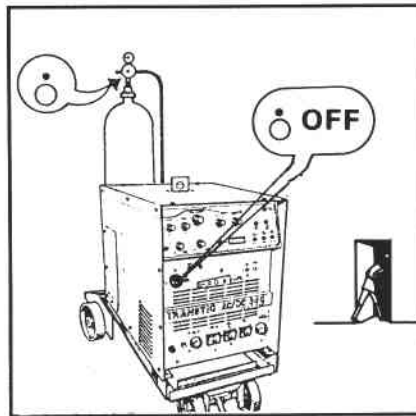


Don't allow leads to lie in oil water or any corrosive liquid. Don't extend the cable fit a longer one.

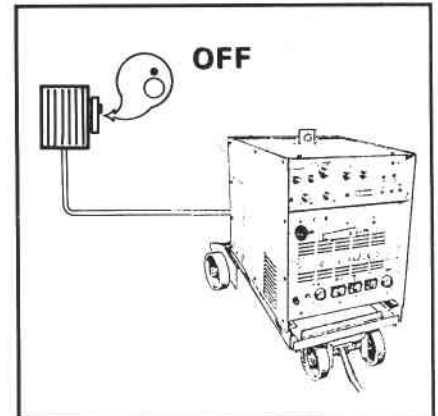
SAFETY (continued)



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 continuous 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 (pages 14/15)

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 over-emphasised 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.

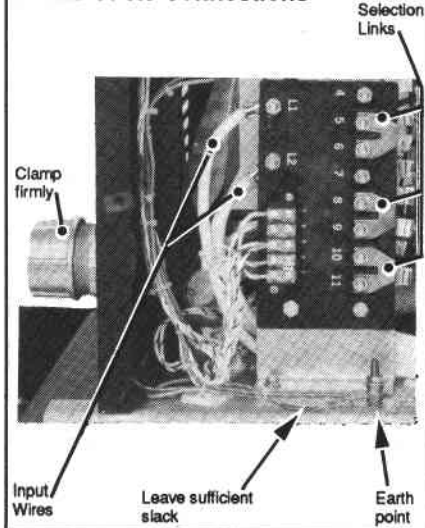
Input Electrical Requirements

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.

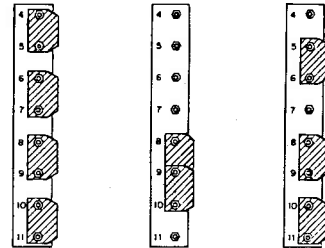
Input Connections

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.

Welding Connections

Note:
To obtain the full rated output from this unit, it is necessary to select, install and maintain proper welding cables. Failure to comply in any of these areas may result in less than satisfactory welding performance.

Cable Length

It is recommended that the welding cables be kept as short as possible, spaced as described below, and be of adequate current carrying capacity. The resistance of the welding cables and connections causes a voltage drop which is added to the voltage of the arc. Excessive cable resistance may result in overloading as well as reducing the maximum current output the welding unit. The proper operation of any welding unit is to a great extent dependent on the use of welding cables and connections that are in good condition and of adequate size. An insulated electrode holder should be used to ensure operator's safety.

Cable Insulation

It is important, especially where high frequency is used, that lugs or uninsulated portions of the welding cable do not touch or come too close to the case of the welding equipment.

Cable Spacing

When welding with AC or DC, if the welding cables are coiled up they will operate a magnetic field which will seriously affect the operation of the welding equipment. Always lay the welding cables out. The welding cables should not be taped together when using high-frequency, they should be placed about 1.9 to 2.5cm (3/4 inch to 1 inch) apart on a suitable board and fastened with plastic clamps or clips. Do not use metal clamps as they will tend to serve as an antenna and radiate high-frequency.

Gas and Water Connections

CAUTION
When connecting to gas and water solenoid valves, use non-conductive hose. Do not use metallic piping in the water discharge.

1. The gas inlet is located on the rear panel. Connect the gas hose from the gas supply, to the gas valve connection labelled 'Gas In'.
2. The water inlet and return are also located on the rear panel. Connect the power source inlet to the water cooler outlet and power source return to the cooler inlet using hoses provided.

3. The gas flow must be controlled accurately with the aid of a regulator and a flowmeter. No specific recommendations for rates of flow can be given, as this depends entirely on the specific welding conditions. Correct argon flow is usually between 227 to 991 litres (8 to 35 cubic feet) of gas per hour. The helium flow is between 510 to 991 litres (18 and 35 cubic feet) per hour.

When designing, fixturing, and setting up welding procedures, remember the specific gravity of argon is heavier than air, 1.38, and helium is lighter than air, .138, air being 1. More specific information concerning the process to satisfy the welding needs can be obtained from your MUREX representative.

Remote Welding Current and TIG torch switch connections

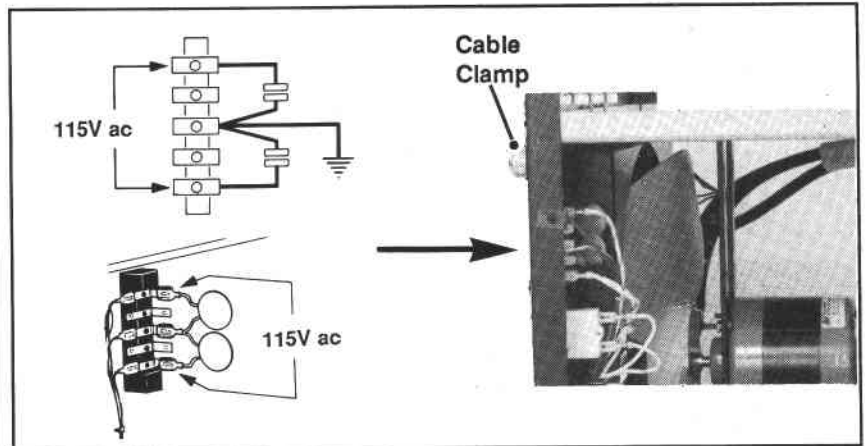
A front panel mounted Amphenol socket (6 way) permits both remote control of welding current and/or TIG torch switch on/off control. See page 18 of this manual for connection details. If remote current control is desired, set the front panel current control switch to remote. It should be noted that the range of the remote current control device depends on both the current range selected on the front panel and on the panel current control setting. The remote control will vary the current between the minimum of the range selected and the maximum as set by the front panel control.

Note
For fitting of Optional Extras - See pages 17 to 20

Water Recirculating Unit - Fitting Instructions

Electrical Connections

Feed the supply cable through the clamp on the rear panel and, using 'crimp' connectors, connect the live, neutral and earth wires as shown.

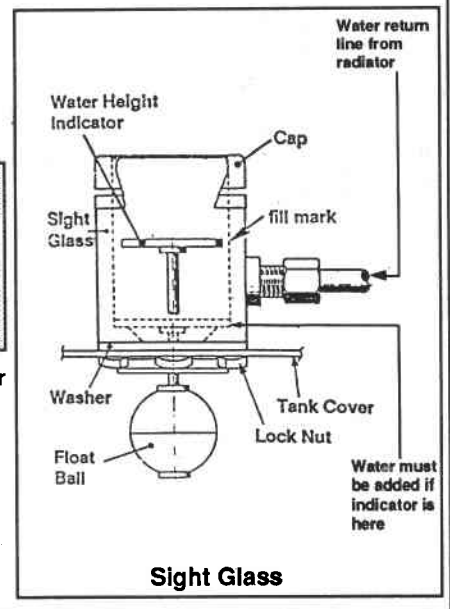


Water Connections

1. Attach the coolant inlet hose of the welding device to the connection on the body marked **Water Out**.
2. Attach the coolant outlet hose of the welding device to the connection at sight glass marked **Water In**.

Important
The motor must run continuously. Never connect the Water Circulating Unit so that its motor starts and stops with each operation of a welding contactor. The cooling efficiency of the unit will be hampered and the starting winding in the motor may burn out.

To fill tank, unscrew sight glass cap. Water height indicator should reach the fill mark on sight glass for maximum cooling. Where freezing conditions may be encountered, permanent type anti-freeze must be added. The proper quantity of anti-freeze to be added will depend on the lowest expected temperature in the area and quantity of water.



For further details of the Water Recirculating Unit - See Instruction Leaflet Pt.No. 100446

CONTROLS

See also 'Operational Safety'

1. Power

The power switch, in the on position, energises the fan and control circuitry, and places the welding equipment in a ready-to-weld status. Placing the power switch in the off position shuts down the welding unit.

WARNING

Placing the power switch in the off position does not remove power from all the welding unit internal circuitry. Completely isolate all electrical power to the power source by employing 'machinery lockout procedures' before attempting any inspection work on the inside of the unit. If the power source is connected to a disconnect switch, padlock the switch in an open position. If connected to a fuse box, remove the fuses and padlock the cover in the closed position. If the unit is connected to a circuit breaker, or other disconnecting device without locking facilities, attach a red tag to the device to warn others that circuit is being worked on.

2. Power Indicator lamp

Indicates that the unit is supplied with electrical power and that the power switch is on.

WARNING

When this lamp is not lit, mains electrical power may still be present in the unit at the mains input terminals.

3. Fault Indicator Lamp

An inbuilt thermal overload detector protects the unit from overload. In the event of an overload situation being detected, the power source is automatically disabled and the red fault lamp illuminated. The power source will remain de-energised until it cools sufficiently to reset the detector. The fan should be allowed to run to cool the unit.

4. Control Circuit Fuse (2A)

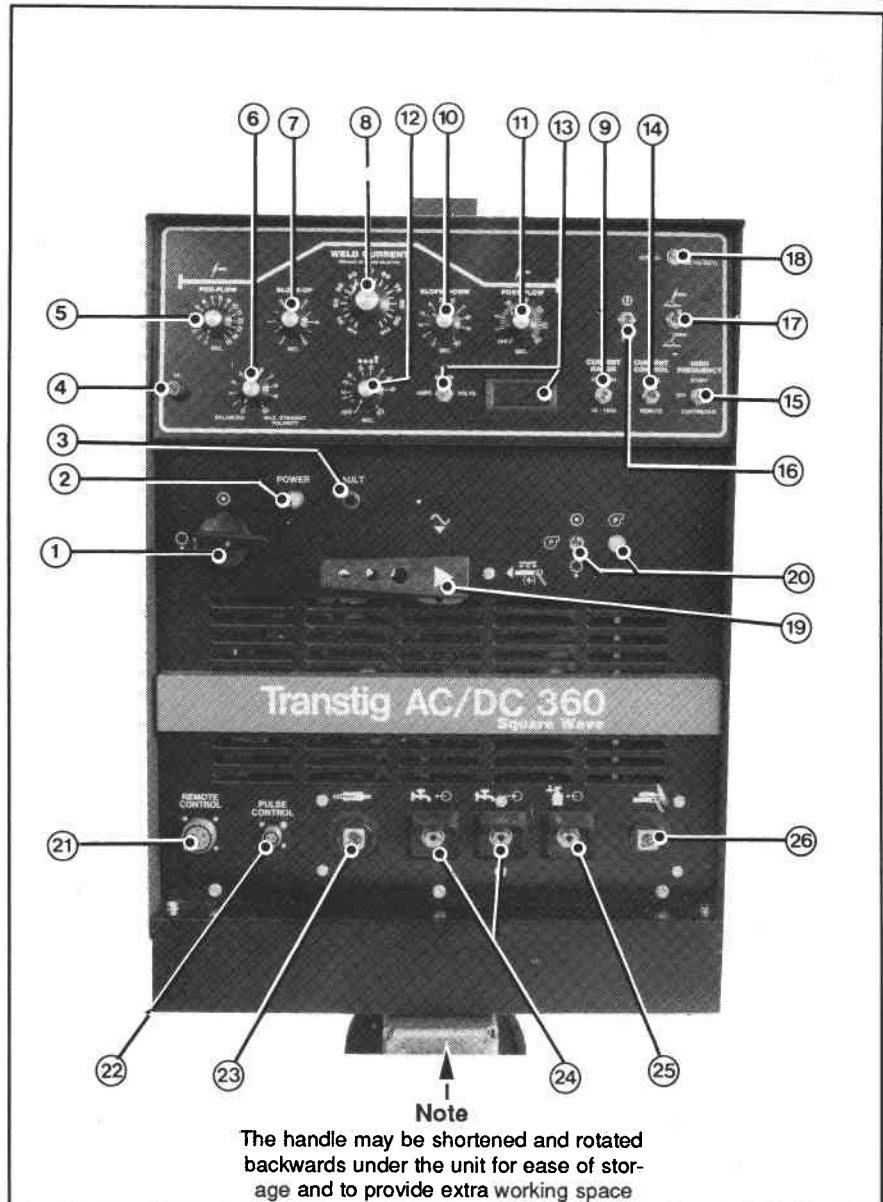
Protects the internal electronic circuits from overload. If the fuse fails, investigate the cause of the failure prior to replacing it.

5. Gas Pre-flow Control

A 0.1 to 15 second timer which sets the pre-flow gas period prior to TIG arc striking after pressing the torch switch. Note, that for DC TIG welding, using the lift-arc initiation mode, this control should be set to minimum.

6. AC Wave Balance Control

When the AC wave balance control is set in the 'O' balance position, the output waveform is balanced between reverse and straight polarity. By rotating the control clockwise to more straight polarity less tungsten heating results and a higher welding current may be applied to the tungsten to obtain more penetration. Sufficient cleaning action



is obtained for most applications over the entire range of the control, but set the control to the 'O' position when maximum cleaning is required, and for MMA welding.

Note:

The AC wave balance control is a continuous type control and may be adjusted whilst welding.

The scale surrounding the control does not relate to amperage or voltage values. It only adjusts the AC wave shape.

IMPORTANT

For the AC wave balance control to work properly, it is required that the electrode and work cables be connected to the correct terminals on the welding power source (electrode cable to the electrode terminal, work cable to the work terminal). If the cables are reversed, the AC balance control will appear to function backwards.

7. Slope-up Control

Allows the build-up of welding current following TIG arc striking to be controlled over a 0.1 - 5 second period. Note, for DC TIG lift-arc mode, this control is best kept near minimum to permit rapid arc stabilisation on the tungsten electrode.

8. Weld Current Control

The weld current control provides a means of selecting the exact weld current desired within the range being used. Rotating the control in a clockwise direction will increase the output.

Note:

The contacts of the weld current control are of the continuous type, thereby making it possible to adjust the output while welding.

The scale surrounding the weld current control is calibrated in percentage of range and should not be taken as an amperage reading.

9. Range Switch

The range switch provides the facility for selecting from one of two ranges of amperage control.

| | |
|--------------------|-----------------------|
| Transtig AC/DC 260 | 10-100A or 35-310A |
| Transtig AC/DC 360 | 10-125A or 25-375A |

10. Slope-Down Control

Allows the decay of welding current to be controlled over a 0.1-10 second period following the weld finish signal being received from the torch switch.

11. Post-flow/Gas off Control

A switched potentiometer to control gas post-flow to shield molten metal from atmospheric contaminants is standard on both units. The 'click' OFF position, used for stick (MMA) welding, stops the gas valve from operating and hence inhibits gas flow. As the control is rotated clockwise, post-flow can be set from 0.1 to 30 seconds.

12. Spot Weld Control

A switched potentiometer to control spot weld time period from 0.1 to 10 seconds.

Note:

The spot welding timer will only operate in the 4 stroke torch switch mode, (press / release to start, press/release to cease welding).

The spot weld time setting includes any desired slope-up time. Slope-down time begins at the end of spot weld time. This control must be set to the 'click' off position when the spot welding function is not required.

13. Digital Volt/Ammeter and Selector Switch (Optional Equipment)

An optional digital metering unit provides a display of either power source output voltage or current depending on the mode selected by the meter switch. The digital display circuitry includes a last reading hold facility which stores the recorded value of welding current at the instant the weld finish signal is received from the torch switch or remote on/off device.

14. Current Control Switch

If a remote current control is to be used, make connections from the Remote Control to the remote control socket, and switch to remote.

When in the local position, only the weld current control on the front panel will control the amperage.

The remote control circuit is designed so that the range switch and weld current control on the panel set the maximum welding output when a remote amperage control is used. Control from minimum to maximum is accomplished with the remote amperage control. If full range control is required, set the welding current control on the welding machine to maximum (100%) position.

For example, if the weld current control is set at one-half (50%) of the scale, the remote amperage control will provide current control from minimum to a maximum of one-half that range.

15. High Frequency Switch

For TIG welding applications, an inbuilt HF generator can provide either START HF at the torch for non-contact d.c. arc striking or alternatively, CONTINUOUS HF for a.c. arc striking and arc maintenance purposes. Further the HF can be permanently set to OFF when scratch start TIG operation is required. The HF generator is automatically turned off when either MMA mode is used or lift-arc starting is selected.

16. Two Stroke/Four Stroke Switch

This switch provides for the selection of either two or four stroke torch switch control of the welding output. Four stroke operation can be considered as electronic torch switch latching.

In the up (two-stroke) position, welding commences when the torch switch is depressed and will terminate when the switch is released, the switch must remain pressed for the complete welding cycle.

In the down (4-stroke) position the sequence is as follows:

Initial pressure on the torch switch will initiate the TIG welding cycle, gas preflow and arc strike. Once the arc is struck the torch switch can be released and welding will continue as desired. Reprising the torch switch a second time and then releasing it again will initiate the arc off sequence, slope - out and post gas purge.

Note:

In the four-stroke mode, if the arc extinguishes for a period exceeding 3 seconds the machine will automatically reset to off.

Note:

When using foot controls or other remote current control devices including weld start/stop functions the two-stroke mode should be selected.

17. TIG/MMA Switch

The TIG/MMA switch enables the selection of either TIG or MMA welding modes. In the MMA position the contactor is permanently energised and welding output is available at the output terminals. In this mode the slope controls have no effect, and the HF generator is disabled.

18. Lift-arc Switch

For d.c. TIG applications, an inbuilt lift-arc initiation system is available. Selecting lift-arc mode disables the HF generator and enables an interference free arc striking system, providing no contamination of either tungsten electrode or work.

19. Polarity Switch

The polarity switch provides a means of selecting either AC, DC straight (Electrode-ve), or DC reverse polarity (Electrode+ve), without changing the secondary cable connections.

IMPORTANT

Do not change the position of the polarity switch whilst welding or under load as this will cause the contacts of the switch to arc. Arcing across the contacts will cause the contacts to become pitted and prematurely fail.

Placing the switch fully to the right provides DC REVERSE polarity (electrode positive); to the centre position provides AC; fully to the left provides DC STRAIGHT polarity (electrode negative) weld current.

20. Water Pump Switch and Lamp

Placing this switch in the ON position, energises the 115V a.c. auxiliary circuit for an external water cooler, and hence turns on the water pump.

21. Remote Control Socket (6 way)

Contact on/off switching and remote current control are available through this socket, page 18 for details.

22. Pulse Control Socket (2 way)

Auxiliary +24V d.c. power is available at this socket for supplying the Transtig Remote Pulse Control unit.

23. Work Return Connection

Must be connected to the workpiece.

24. Watercooled Torch Power Connections

Connecting the water supply/return to a water-cooled torch provides the torch with welding-power through these connections.

25. Gas Supply Torch Connection

Supplies gas and welding power for air cooled torches.

26. Electrode Torch Connection

For connection to an MMA electrode holder or air-cooled TIG torch.

CAUTION

*When connecting or changing electrodes, switch the unit OFF.
When using MMA, switch off the H.F.*

27. Meters (Optional)

An optional meter kit which includes an AC and DC welding voltmeter and ammeter is available. The meters monitor the welding output, and are connected to the output terminals.

The voltmeter indicates the voltage at the output terminals, but not necessarily the actual voltage at the welding arc (due to cable resistance, poor connections, etc.).

The ammeter indicates the current output from the unit.

REAR PANEL FACILITIES

1. 5A and 10A Circuit Breakers

Manually resettable overload trips, protecting the 220V (5A) and 115V (10A) a.c. auxiliary supplies for water cooling units.

2. Auxiliary Supply Access

A small access hole / strain relief grommet is provided for the 115V or 22V a.c. auxiliary supplies for an external water cooler.

3. Primary Cable Entry

4. Gas Inlet Connection

Connect the gas hose from the gas supply regulator to the gas valve connection labelled 'Gas in'.

5. Water Inlet and Return

The water inlet and return are also located on the rear panel. Connect the power source inlet to the water cooler outlet and power source return to the cooler inlet using hoses provided.

OPERATION

WARNING

Review and comply with all the safety notes at the front of this manual

TUNGSTEN INERT GAS WELDING (TIG)

1. Make all necessary connections as instructed under 'Installation'.
2. Place the TIG/MMA switch in the TIG position.
3. Place the polarity switch as required; DC negative or AC.
4. Place the current range switch in the desired position.
5. If a remote current control device is not to be used, place the current control switch in the local position. If a remote current control is to be used, place the current control switch in the remote position.
6. Rotate the weld current control to the desired setting.
7. Set the desired pre-purge and slope-up times. Note, for DC TIG using the lift-arc mode, pre-purge time should be reduced to minimum also it is wise to keep slope-up time short i.e., <1 second.
8. Set the required slope-down and post-purge times, ensuring the post-purge control is not in its gas 'off' position.
9. For AC TIG, set the AC wave balance control as required. Set the control fully anti-clockwise (50/50 balance) if welding DC.
10. For spot welding, set the spot weld timer to the desired time. Ensure the control is clicked off for normal operation.
11. Select either 2-stroke (up) or 4-stroke (down) torch switch operation by placing the switch in the relevant position. Note, for spot welding 4-stroke mode must be used.
12. Ensure the pump on/off switch is in its ON position when using an external water circulator and water cooled TIG torch.
13. For AC TIG welding set the high frequency switch to the continuous position and ensure the lift-arc switch is in its normal left hand position.
14. For DC TIG welding using HF start, set the high frequency switch to its start position and ensure the lift-arc switch is in its normal position.
15. For DC TIG welding with lift-arc start, set the lift-arc switch to its right hand lift-arc position.
16. Place the power switch in the ON position.

WARNING

Prior to welding, it is imperative that proper protective clothing (welding coat and gloves) and eye protection (glass and/or welding helmet) be put on. Failure to comply may result in serious injury.

Note:

For DC TIG welding, 1% or 2% thoriated tungsten electrodes are normally used.
For AC TIG welding, pure or zirconium tungsten electrodes are normally used

Welding

WARNING

When changing tungsten electrodes or when converting the unit for manual welding, the unit must be isolated from the mains supply.

Always commence with a last minute check for safety and protection.

Check for correct and secure torch and work return lead connections.

Check for correct position of controls.

Check that the electrode tip sticks out by 4 to 7mm and that it is ground as shown.

Using a cylinder key, turn on the gas and adjust the gas flow for a 6 to 7.5 litres/minute (12-15cu ft/hr) indication on the flowmeter.

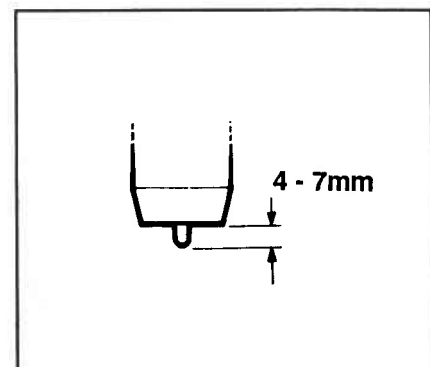
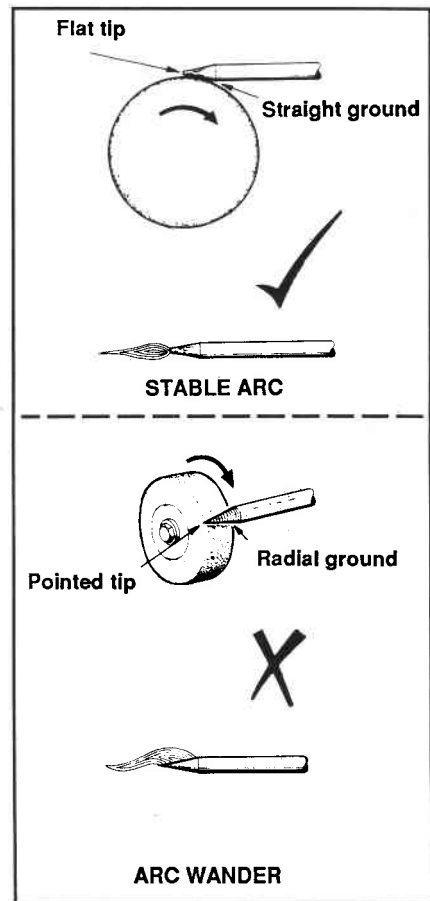
AC or DC TIG Arc Initiation using High Frequency

Position the torch over the welding area (about 25mm above), warn bystanders to shield their eyes and lower your headscreens. Press the torch switch and slowly lower the torch. **(DO NOT TOUCH THE WORKPIECE WITH THE ELECTRODE)** after the pre-purge time. The High frequency output will allow the arc to strike without the electrode touching the workpiece.

DC TIG Arc Initiation using Lift-Arc

Position the torch over the welding area, about 10mm above, warn bystanders to shield their eyes and lower your headscreens. Press the torch switch, allowing the gas to pre-purge and then gently and momentarily touch the electrode to the work and lift it away again. The power source will automatically initiate the arc (at a low current) without contaminating either the tungsten or workpiece.

Alternatively lift-arc mode can be carried out by placing the tungsten gently in contact with the work prior to depressing the torch switch. Once the torch switch is operated, allowing the gas to pre-purge momentarily, the tungsten can be lifted from the work which, as before, will initiate the welding arc.



MANUAL METAL-ARC WELDING MMA

1. Make all necessary connections as instructed in 'Installation'.
2. Place the TIG/MMA switch in the MMA position.
3. Rotate the gas post-purge control to its OFF 'click' position.
4. Set the polarity switch as desired DC positive, AC, or DC negative.
5. Set the range switch as required.
6. Select the desired weld current control setting.
7. Set the AC wave balance control to the fully anti-clockwise position (50/50 balance).
8. Set the slope-up and slope-down controls to minimum.
9. Place the power switch in the ON position.

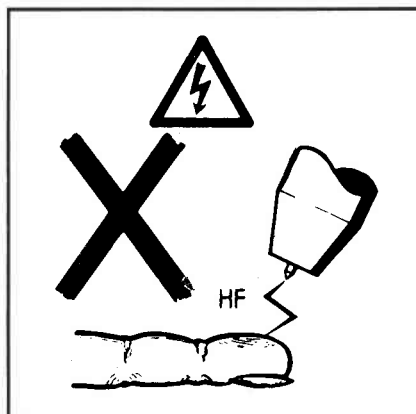
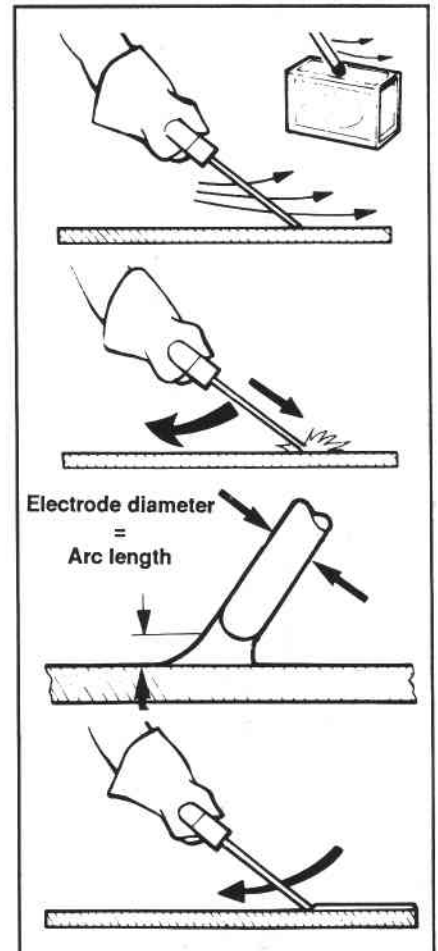
WARNING

Prior to welding, it is imperative that proper protective clothing (welding coat and gloves) and eye protection (glasses and/or welding helmet) be put on. Failure to comply may result in serious and even permanent bodily damage.

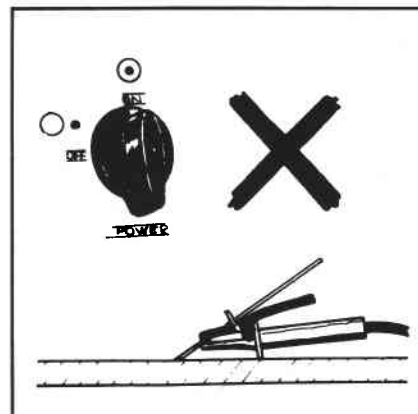
Welding

1. Position the electrode close to the point where welding is to commence, without actually touching the work.
2. Cover the eyes with a headscreen or handshield and warn bystanders.
3. (a) Scrape the electrode on the work surface near the start point (as though striking a match). The arc should strike.
(b) Carry on scraping the electrode across the surface of the workpiece until the arc is almost continuous, then feed the electrode into the hot pool of molten metal keeping the electrode at approximately 65-80° to the workpiece.
(c) Once the arc is successfully struck, adjust the arc length to about the size of the electrode diameter.
(d) Correct length of arc, (size of weld bead) is acquired by feeding the electrode backwards and downwards into the weld.

This downwards movement requires a little skill which will be acquired after a few practice welds.



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



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

Electrode Selection Guide

| Supply | | DC | | | | | | |
|---------------------|-----|--------------------------------|-----|-----|-----|-----|-----|--|
| | | Electrode Current (Max.) Amps. | | | | | | |
| Thoriated | 20 | 60 | 70 | 120 | 200 | 300 | 370 | |
| Electrode Dia. (mm) | 0.5 | 1.0 | 1.6 | 2.4 | 3.2 | 4.0 | 4.8 | |

| Supply | | AC | | | | | | |
|---------------------|-----|-------------------------------|-----|-----|-----|-----|-----|--|
| | | Electrode Current (Max.) Amps | | | | | | |
| Thoriated | 15 | 50 | 50 | 80 | 120 | 160 | 200 | |
| Zirconiated | 15 | 50 | 50 | 80 | 120 | 160 | 200 | |
| Electrode Dia. (mm) | 0.5 | 1.0 | 1.6 | 2.4 | 3.2 | 4.0 | 4.8 | |

Note: The figures given in the above table are recommended for Class 1 welded (balanced wave-form on ac) by British Standard 3019 Parts 1 and 2. Higher welded currents may be used by experienced welders.

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

MAINTENANCE

WARNING

Maintenance involving the removal of outer covers must only be undertaken by qualified or suitably trained personnel.

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

Daily (operator task)

1. Check all welding and electrical cables for signs of cracking or general deterioration.
2. Check that all electrical connections are in good physical condition.

3. Check the 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.

Monthly (Maintenance Department Task)

1. Switch off the unit and disconnect from the mains electrical supply.
2. Remove the cover (retain the fixing screws).

3. Using a soft brush, remove any dust or dirt from the interior of the unit. If compressed air is used to clean the unit the pressure must not exceed 2kg/cm² (30lbs / in²). and the air must be dry.

SUITABLE EYE AND MOUTH PROTECTION SHOULD BE WORN.

4. Replace the cover.
5. Reconnect the unit to the mains supply.

MAINTENANCE - (continued)

WARNING

Be sure that the circuit or main isolation switch is open or electrical input circuit fuses are removed before attempting any inspection or work on the inside of the welding unit. Placing the POWER switch on the welding unit in the OFF position does not remove all power from inside the welding unit.

IMPORTANT

Inspection, troubleshooting, and repair of this equipment may ordinarily be undertaken by a competent individual having as least general experience in the maintenance and repair of semiconductor electronic equipment. Maintenance should not be undertaken or attempted by anyone not having such qualifications.

Fan Motor

All models are equipped with an exhaust fan and rely on forced draft for adequate cooling for high duty cycles and overloads. The fan motor is manufactured with lifetime lubricated sealed ball bearings and no attention should be required.

Transformer

Occasional blowing out of the dust and dirt from around the transformer is recommended. This should be done periodically depending upon the location of the unit and the amount of dust and dirt in the atmosphere. The welding unit case cover should be removed and a clean dry air stream should be used for this cleaning operation.

Input Power and Welding Cables

These cables should be inspected periodically. Fraying and broken wires may occur at the electrode holder and work clamp. The insulation should be checked for cracks and bare spots.

Thermal Protection

These welding units are protected with a normally closed overload thermostat. Any excessive overloading will cause the contactor to open, stopping the welding unit's output. If this occurs, stop welding and allow the unit about three minutes cooling off time. Normal operation can then be resumed.

High Voltage Capacitor

This part requires no attention and is rarely a source of trouble. A defective capacitor, however, is evident usually by the appearance of melted sealing material at the bottom of the housing or evidence of oil leakage in certain cases.

Spark Gaps

The spark gaps can be readily inspected by removing the right side 'High Frequency Spark Gap' access panel of the unit.

The spark gaps are set at 0.20mm (0.008 ins.) at the factory. It will be necessary to re-adjust these periodically after extended operation. Usually inspection, cleaning by blowing out dust and dirt and adjustment every three or four months will suffice. Readjustment is also indicated when intermittent operation of the gaps is noted. Usually this occurs when the setting has increased to 0.33mm (0.013 ins.) or greater.

Adjustment

CAUTION

Widening the spark gaps through normal operation may, if not corrected, increase the loading of the high voltage capacitor discussed in a previous section, and thus contribute to its premature failure. Cleaning or dressing of the points of the spark gaps is not recommended as the material at the points is tungsten and is impossible to file.

Generally speaking, the high-frequency output varies directly (up to a certain point) with the spark gap spacing. In extreme cases where the greatest amplitude of high-frequency is needed, it may be necessary to adjust the spark gap setting to 0.25mm (0.010 ins.) or even 0.3mm (0.012ins.). This naturally also increases the high-frequency radiation and it is suggested that the minimum gap setting 0.1 to 0.2mm (0.004in to 0.008in.) consistent with good welding operation be used.

Proceed as follows to adjust the spark gap.

1. Disconnect all power to the unit.

WARNING

Be sure the branch circuit or main isolation switch is open or electrical input circuit fuses are removed before attempting any inspection or work on the inside of the welding unit. Placing the "Power" switch on the "High Frequency" in the "off" position does not remove all power from inside the unit.

2. Remove the 'High Frequency Spark Gap' access panel from the right side panel.
3. Loosen the pan head screw that secures each single spark gap contact point assembly.
4. Insert 0.2mm (0.008 ins.) feeler gauge between the spark gap contact points. If a feeler gauge is not available, use a double thickness of ordinary paper as a gauge until a feeler gauge can be obtained

5. Move the loosened contact point down until a slight drag is felt as the gauge is moved between the points.

6. Tighten the loosened pan screw to secure the contact point assembly. Repeat for both contact points.

7. Refit the access panel.

8. Reconnect the input power to the unit.

By-pass Filter

The purpose of the by-pass filter is to reduce the high-frequency feedback into the welding unit.

A defective capacitor in this filter would reduce the high-frequency output and might be evident by loss of oil from the metal case. The resistors would show evidence of being cracked if they are defective. Failure in this filter circuit is rare and would be suspected only as a last resort.

Failure of High-Frequency

Check the following when no high-frequency is apparent on the welding cables:

1. Be sure the switch in the control panel labelled high-frequency is in either start or continuous position.
2. Be sure the spark gaps are set between the allowable limits.
3. Check for broken leads to the high-voltage transformer.
4. Check for voltage across terminals to which primary of the high-voltage transformer is connected. Voltage at this point and not at transformer terminals may indicate a defective high-frequency switch.
5. Check capacitors for failure.
6. Check by-pass filter for defective capacitor or resistor.
7. Check for defective circuit breaker.

Circuit Breakers

The auxiliary power circuit breakers are rated at 5 and 10 amperes and are mounted on the rear panel. The purpose of these circuit breakers is to provide protection for the transformer windings.

In the event of failure before resetting the breaker, examine the equipment fitted to the 115V a.c. supply for overload or shorts. Equipment drawing a total exceeding 10 amperes will cause the circuit breaker to open.