SEALEY POWER WELDERS

INSTRUCTIONS FOR

TIG INVERTER

Model: TIG170/HF

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MODEL : **TIG 170/HF**

Thank you for purchasing a Sealey Welder. Manufactured to a high standard this product will, if used according to these instructions and properly maintained, give you years of trouble free performance.

⚠ ***IMPORTANT*: BEFORE USING THIS PRODUCT, PLEASE READ THE INSTRUCTIONS CAREFULLY. MAKE CAREFUL NOTE OF SAFETY INSTRUCTIONS, WARNINGS AND CAUTIONS. THIS PRODUCT SHOULD ONLY BE USED FOR ITS INTENDED PURPOSE. FAILURE TO DO SO MAY CAUSE DAMAGE AND/OR PERSONAL INJURY AND WILL INVALIDATE THE WARRANTY. RETAIN THESE INSTRUCTIONS FOR FUTURE USE.**

1. SAFETY INSTRUCTIONS

1.1 ELECTRICAL SAFETY. ❒ **WARNING! It is the user's responsibility to check the following:** ***You must*** check all electrical equipment and appliances to ensure they are safe before using. ***You must*** inspect power supply leads, plugs and all electrical connections for wear and damage. ***You must*** ensure the risk of electric shock is minimised by the installation of appropriate safety devices. An RCCB (Residual Current Circuit Breaker) should be incorporated in the main distribution board. We recommend that an RCD (Residual Current Device) is used with all electrical products. It is particularly important to use an RCD together with portable products that are plugged into an electrical supply not protected by an RCCB. If in doubt consult a qualified electrician. You may obtain a Residual Current Device by contacting your Sealey dealer. ***You must*** also read and understand the following instructions concerning electrical safety.

1.1.1. The *Electricity At Work Act 1989* requires all portable electrical appliances, *if used on business premises,* to be tested by a qualified person at least once a year by using a Portable Appliance Tester (PAT).

1.1.2. The *Health & Safety at Work Act 1974* makes owners of electrical appliances responsible for the safe condition of the appliance, and the safety of the appliance operator. ***If in any doubt about electrical safety, contact a qualified electrician.***

1.1.3. Ensure the insulation on all cables and product itself is safe before connecting to mains power supply. See 1.1.1. use a (PAT).

1.1.4. Ensure that cables are always protected against short circuit and overload.

1.1.5. Regularly check power supply, leads, plugs and all electrical connections for wear or damage, especially power connections to ensure none is loose.

1.1.6. Check the voltage marked on the product is the same as the electrical power supply to be used. Check fused plugs are fitted with correct capacity fuse.

1.1.7. DO NOT pull or carry the powered appliance by its power supply lead. Products such as inverters must not be pulled or carried by their output cables.

1.1.8. DO NOT pull power plugs from sockets by the power cable.

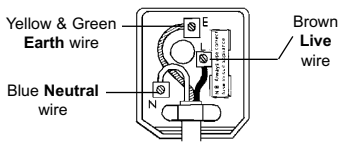
1.1.9. DO NOT use worn or damage leads, plugs or connections. Immediately replace or have repaired by qualified persons. In case of damage, cut off and fit a new plug according to the following instructions.

1.1.10 NO plug is fitted to this machine. Whilst it is possible to perform TIG welding at lower power settings using a 13amp mains source, ordinary ARC welding (without gas) and TIG welding at higher power settings will require the machine to be connected to a 30amp supply either by direct wiring into your mains circuit or by fitting an industrial round pin plug & socket for more flexible usage. In either case we recommend you contact a qualified electrician to assess your existing wiring installation and follow his recommendations in full. Particular attention should be paid to the provision of adequate fuses on the mains circuit and to the earthing of the machine.

If a 13amp power source is used wire the plug as shown to the right.

a) ❒ WARNING! Ensure the unit is correctly earthed via a three-pin plug.
b) Connect the Yellow/Green earth wire to the earth terminal 'E'.
c) Connect the Brown live wire to live terminal 'L'.
d) Connect the Blue neutral wire to the neutral terminal 'N'.

FUSE RATING 13AMP BUT TO GAIN MAXIMUM OUTPUT THE INVERTER MUST BE CONNECTED TO A 30AMP SUPPLY (see 1.1.10)



❒ **WARNING! Be very cautious if using a generator to power the Inverter. The generator must be self regulating and stable with regard to voltage, waveform and frequency. The output must be greater than the power consumption of the Inverter. If any of these requirements is not met the electronics within the Inverter may be affected.**
NOTE:The use of an unregulated generator may be dangerous and will invalidate the warranty on the Inverter.

❒ **WARNING! The Inverter may produce voltage surges in the mains supply which can damage other sensitive equipment (e.g. computers). To avoid this happening it is recommended that the Inverter is connected to a power supply that does not feed any sensitive equipment.**

1.2 GENERAL SAFETY

▲ ***DANGER! Unplug the inverter from the mains power supply before connecting or disconnecting cables or performing maintenance or service. Direct contact with the inverter circuit is dangerous.***

✓ Keep the inverter and cables in good working order and condition. *(Take immediate action to repair or replace damaged parts).*

✓ Use genuine parts and accessories only. *(Non recommended parts may be dangerous and will invalidate the warranty).*

✓ Locate inverter in adequate working area for its function. Ensure area has adequate ventilation as welding fumes are harmful.

❒ **WARNING! If it is necessary for you to assemble the work clamp cable, ensure that sufficient copper strands are exposed and turned back to make full contact within the dinse plug to ensure a good electrical contact. Loose connection will cause overheating, rapid deterioration and loss in efficiency.**

✓ Ensure there is no obstruction to the flow of clean cool air through the ventilation apertures and ensure there are no conductive dusts, corrosive vapours or humidity which could enter the inverter and cause serious damage.

✓ Keep working area clean and tidy and free from unrelated materials. Also ensure the working area has adequate lighting.

❒ **WARNING! Use welding head shield to protect eyes and avoid exposing skin to ultraviolet rays given off by electric arc. Wear safety welding gauntlets.**

✓ Remove ill fitting clothing, remove ties, watches, rings, and other loose jewellery, and contain long hair.

✓ Ensure the workpiece is correctly secured before operating the inverter.

✓ Avoid unintentional contact with workpiece. Accidental or uncontrolled switching on of the torch may be dangerous and will cause the nozzle to wear.

✓ Keep unauthorised persons away from the working area, and any persons working within the area must wear the same protective items.

✓ Operators must receive adequate training before using the inverter. The inverter must only be operated under supervision.

✓ Stand correctly keeping a good footing and balance, ensure the floor is not slippery, and wear non-slip shoes.

❒ **WARNING! When unit is switched off wait for 15 seconds whilst capacitors discharge before opening the case.**

✓ Turn voltage switch to "0" (off) when not in use.

✗ DO NOT operate the inverter if it or its cables are damaged.

✗ DO NOT use welding cables over 10m in length. (Cables should be as short as possible.)

✗ DO NOT attempt to fit any non genuine torches, components, or parts to the inverter unit.

✗ DO NOT use any metallic structure which is not part of the work piece as a substitue for the return cable. This may jeopardise results and may be dangerous. *Exception:* Metallic work bench, but connect as near to weld as possible.

✗ DO NOT hit the electrode on the workpiece, this may damage the electrode and make strike-up difficult.

✗ DO NOT get inverter wet or use in damp or wet locations or areas where there is condensation.

▲ ***DANGER! DO NOT weld near inflammable materials, solids, liquids, or gases.***

✗ DO NOT weld containers or pipes which have held flammable materials or gases, liquids or solids. Avoid operating on materials cleaned with chlorinated solvents or near such solvents.

✗ DO NOT pull the inverter by the cable, or the torch, and DO NOT bend or strain cables, protect from sharp or abrasive items, and DO NOT stand on cables or leads. Protect from heat. Long lengths of slack must be gathered & neatly coiled. DO NOT place cables where they may endanger others.

✗ DO NOT touch the workpiece close to the weld as it will be very hot. Allow to cool.

✗ DO NOT touch the torch immediately after use. Allow the torch to cool.

✗ DO NOT operate inverter while under the influence of drugs, alcohol or intoxicating medication, or if fatigued.

✓ When not in use store the inverter in a safe, dry, childproof area.

2. DESCRIPTION & SPECIFICATIONS

2.1 DESCRIPTION

Fan cooled AC/DC power supply suitable for TIG and ARC welding applications. Suitable for welding steel, deoxidated copper, nickel, titanium and aluminium. TIG cycle includes both pre-gas and post-gas regulation between 0.1 and 10 seconds and current rise and down-slope regulation between 0.1 and 10 seconds. AC balance fully adjustable between 50% and 90%. LED power read-out with push button programming. Includes burst HF start device and 'lift start' feature which reduces HF emissions. Features 15 user memory settings and 15 factory settings allowing fast and simple set-up. Includes remote control connector for foot pedal or hand controller.

2.2 SPECIFICATION

Power Output: . . . . . 5-160 A	Insulation Class: . . . . . .H
Duty Cycle: . . . . . .40% @ 160 A	Protection: IP23
Electrode Capacity: . . . . . .Ø1.6 - 4.0 mm	Weight: . . . . . .22 kg
Power Efficiency: . . . . . .5.0 kVA	TIG Accessory Ref: INV/TIG/3
Mains Voltage: . . . . . .230V -1ph	ARC Accessory Ref: . . . . . (optional) INV/25

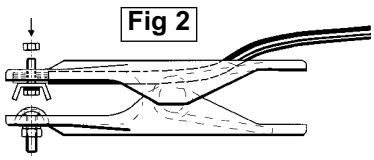
3. PREPARING INVERTER FOR USE

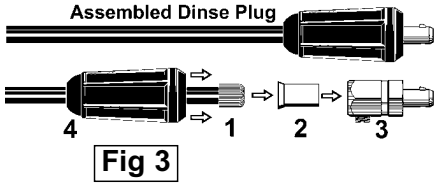
3.1 CONNECTION TO MAINS:

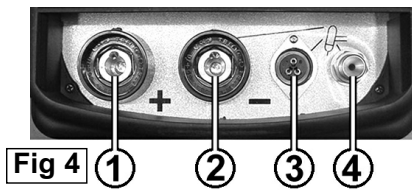
3.1.1 **Whilst welding at low power levels is possible on a 13amp supply the Inverter will normally be connected to a 30amp supply in order to TIG weld at higher power levels and in order to perform ordinary ARC welding. See section 1, item 1.1.10**

3.2 WELDING CABLE CONNECTION.

3.2.1 The torch cable is supplied ready assembled but it may be necessary for you to assemble the work clamp cable. Attach the work clamp to one end of the cable as shown in fig.2. To connect the Dinse Plug as shown in fig.3 first thread the cable through the outer cover of the plug (see fig.3 - 4). Now remove 20mm of insulation sheath from the end of the cable and fold back the copper wire all around the outside of the sheath (1). Push the cable end into the copper sleeve (2) so that the folded back wire makes good contact with the inside of the sleeve. Push the copper sleeve into the brass plug body (3) and tighten the large grub screw until the cable is firmly held. Now slide the outer plug cover up the cable and press the brass body into it as shown in fig.3.







3.2.3 **TIG CONNECTIONS:**

"TIG" TORCH CABLE. Dinse plug at end of the torch cable will be connected to the **negative socket (-)** on lower front panel (see fig.4 item **2**).
3 pin torch plug at end of torch cable will be connected to circular 3 pin socket on the lower front panel. (see fig.4 item **3**)
Black gas pipe with brass fitting at end of torch cable will be screwed to brass fitting on lower front panel. (see fig.4 item **4**)

WORK CLAMP CABLE. Dinse plug at end of the clamp cable will be connected to the **positive socket (+)** on lower front panel (see fig.4 item **1**).

3.2.4 ***(*) Please note that the way the welding cables are connected to the inverter for ordinary ARC welding may be different to the way the cables are connected for standard TIG welding. Whilst most stick electrodes are connected to the positive terminal certain types need to be connected to the negative terminal. It is therefore essential that the user refers to the manufacturer's instructions for the electrodes to ensure that the correct polarity is selected.***

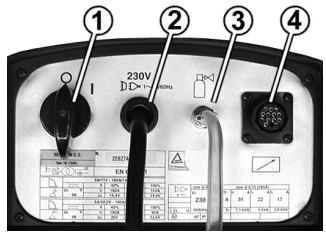
3.2.5 **ARC CONNECTIONS:** (You will need optional ARC Accessory Kit INV/25)

ELECTRODE HOLDER Plug at the end of electrode cable **will normally (*)** be connected to the **positive socket (+)** on the front panel (see fig.4 item **1**).

WORK CLAMP CABLE. Plug at the end of the clamp cable **will normally (*)** be connected to the **negative socket (-)** on the front panel (see fig.4 item **2**).

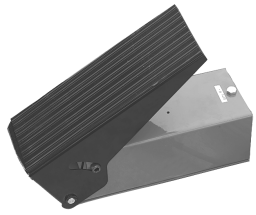
3.3 **REAR PANEL LAYOUT (refer to Figure 5).**

fig 5



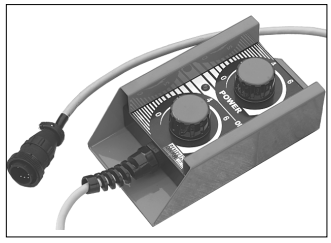
1. **ON/OFF SWITCH**: O = On, I = Off.
2. **MAINS CABLE**
3. **GAS INLET FITTING.** For connecting the gas cylinder to the welder using clear tubing provided.
4. **REMOTE CONTROL CONNECTOR.** For the connection of the **optional** remote controls shown below.

3.4 **REMOTE CONTROLS (Optional.)** Two types of remote control can be connected to the machine via the 14 pin connector situated on the back panel. Press the button in the bottom left hand corner of the front control panel to select the remote control option. When this option has been selected the knob on the main control panel becomes inoperative for those functions taken over by the remote control.



3.4.1 **Remote control pedal**. **(Model No. INV/TIG/4)** When activated the pedal will control the main welding current. Also if spot welding has been selected or 2 step TIG welding the first movement of the pedal will initiate the striking of the arc in place of the torch button.

3.4.2 **Remote control with two potentiometers. (Model No. INV/TIG/7)** With the machine in remote mode, the knob furthest away from the cable entry, controls the main welding current. The second knob will control one other parameter depending on the active welding mode. (See table below.) The rotation of the second knob automatically selects the appropriate parameter and brings it up on the display.



3.4.3 **Welding mode set up.** **Parameter for second Knob.**

MMA	.Arc force. (Not displayed)
TIG DC, HF, 4 STEP, DIRECT	.Base current
TIG DC, HF or LIFT, 2 STEP, DIRECT	.Fall ramp
TIG DC, HF or LIFT, 2 or 4 steps, PULSATED	.Base current
TIG SPOT, ANY MODE	.Spot time
TIG AC or MIXED or ASYMMETRIC, HF or LIFT, 2 or 4 steps	.Balance

3.5 CONNECTING THE GAS

3.5.1 When using Argon gas fit the Bull Nose Adaptor supplied, to the cylinder with a spanner.

3.5.2. Fit the gas regulator onto the Bull Nose Adaptor. (see fig.6)

3.5.3 Using the clear tubing supplied connect the regulator to the gas inlet on the back of the inverter (see fig.5 - 3). Hold the tubing securely in place on each connector by using the worm drive clamps supplied.

3.5.4 Open the regulator before opening the cylinder valve. Test for leaks.

3.5.5. Set the gas flow to suit the welding parameters required. See WELDING PARAMETER TABLES below for general guidance.

3.5.6 If necessary the gas flow can be adjusted during welding using the regulator knob.

fig 6

3.6 **PREPARATION AND CHOICE OF ELECTRODE .** In order to produce a good weld it is important to choose an electrode of the correct diameter for the current to be used. For a general guide to the settings to be used with particular diameters of electrodes please refer to the tables below. The electrode will normally protrude from the ceramic nozzle by 2 to 3mm but in order to gain access to inaccessible areas such as internal corners the electrode can be made to protrude by up to 6mm. The chosen electrode should be sharpened axially on a grinding wheel as indicated in the diagram to the right. The tip should be perfectly concentric in order to avoid arc deviations. The condition of the electrode should be regularly inspected to maintain it in peak condition.

3.7 **PREPARATION OF THE WORKPIECE.** For a good weld it is important that the workpiece is thoroughly cleaned so that no oxides, oil, grease or solvents remain on the surface of the material.

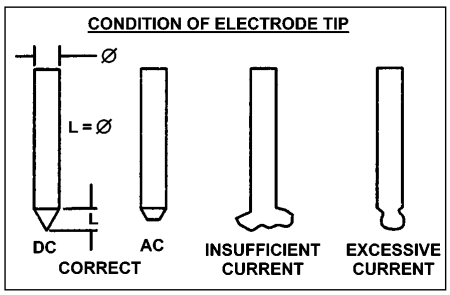


fig 7

TIG WELDING PARAMETERS FOR DEOXIDATED COPPER

Thickness (mm)	Current (A)	Electrode (diam mm)	Nozzle (diam mm)	Argon (L/min)	Filler Rod (diam mm)
0.3 - 0.8	15 - 60	0.5 - 1	6.5	4	---
1	50 - 100	1.0	9.5	6	1.5
1.5	30 - 60	1.6	9.5	8	1.5
2.0	70 - 100	1.6	9.5	8	1.5

TIG WELDING PARAMETERS FOR ALUMINIUM

Thickness (mm)	Current (A)	Electrode (diam mm)	Nozzle (diam mm)	Argon (L/min)	Filler Rod (diam mm)
1	30 - 40	1 - 1.6	6.5	4 - 6	1.2 - 2
1.5	60 - 85	1.6	9.5	4 - 6	2
2	70 - 90	1.6	9.5	4 - 6	2
3	110 - 160	2.4	11	5 - 6	2

fig 8

TIG WELDING PARAMETERS FOR STAINLESS STEEL

Thickness (mm)	Current (A)	Electrode (diam mm)	Nozzle (diam mm)	Argon (L/min)	Filler Rod (diam mm)
0.3 - 0.5	5 - 20	0.5	6.5	3	---
0.5 - 0.8	15 - 30	1	6.5	3	---
1	30 - 60	1	6.5	3 - 4	1
1.5	70 -100	1.6	9.5	3 - 4	1.5
2	90 - 110	1.6	9.5	4	1.5 - 2.0
3	120 - 150	2.4	9.5	6	2 - 3
4	140 - 190	2.4	9.5 - 11	5 - 6	3.0

4. PROGRAMMING

Once a useful combination of settings has been found to achieve any particular welding task this group of settings can be stored and retrieved for future use.

4.1 TO STORE A 'PROGRAM'. Press the 'STORE' button at which point the word 'stor' will be displayed. The 'PRG' led will blink and the word 'stor' will be replaced with the first program location 'P 01'. You can cycle through program locations P 01 to P 15 by turning the knob. As each program location is selected the leds on the front panel will display any settings stored there. (You can exit from programming mode at this stage if you wish by giving the 'STORE' button one brief press.) Once you have chosen the program location hold down the 'STORE' button until the word 'sure?' appears. One brief press of the button will then store the chosen parameters at that location. If you do not respond to the 'sure?' prompt the word 'NO' will appear after a few seconds and the machine will automatically exit from programming mode.

4.2 TO LOAD A 'PROGRAM'. Press the 'LOAD' button at which point the word 'load' will be displayed. The 'PRG' led will switch on and the word 'load' will be replaced by the first program location 'P 01'. Select the program you require by rotating the knob. After user program position P15 you will be able to select a further 15 factory set programs in locations P16 to P30. As each program location is selected the leds will display the settings stored there. To load your selected program hold down the 'LOAD' button until the word 'done' is displayed. If you change your mind and do not wish to load a program give the LOAD button one brief press. The word 'NO' will appear briefly and the panel will return to the settings displayed prior to pressing the load button.

LIST OF FACTORY PROGRAMS.

Prog.	Current type/state.		Start.	Torch mode.	Weld rod type & size.	Electrode.	Thickness.	Notes.
PF 16	Tig DC	Continuous	HF	(2 step)	Ferrous weld rod 1.5mm.	1.6mm.	Max 1.5mm,	
PF 17	Tig DC	Continuous	HF	(4 step)	Ferrous weld rod 1.5mm.	1.6mm.	Max 1.5mm,	
PF 18	Tig DC	Continuous	HF	SPOT	SPOT WELD for 2.5secs.	1.6mm.	Max 2.0mm,	
PF 19	Tig DC	PULSATED	HF	(4 step)	Ferrous weld rod 1.0mm.	1.6mm.		Pulsated at low frequency
PF 20	Tig DC	PULSATED	HF	(2 step)	Ferrous weld rod 1.0mm.	1.6mm.		High frequency. Difficult positions.
PF 21	Tig AC	Continuous	HF	(2 step)	Alumin weld rod 3.0mm.	2.4mm.	Max 2.0mm,	Low frequency
PF 22	Tig AC	Continuous	HF	(2 step)	Alumin weld rod 1.5mm.	1.6mm.	Max 2.0mm,	High frequency. Difficult positions.
PF 23	Tig AC	Continuous	HF	(4 step)	Alumin weld rod 1.5mm.	1.6mm.	Max 2.0mm,	
PF 24	Tig MIX	Continuous	HF	(2 step)	Alumin weld rod 1.5mm.	1.6mm.	Max 1.5mm,	Welding of oxidated materials.
PF 25	Tig ASSIM	Continuous	HF	(2 step)	Alumin weld rod 3.0mm.	2.4mm.	Max 2.0mm,	Mixed TIG
PF 26	Tig MIX	Continuous	HF	(2 step)	Alumin weld rod 1.0mm.	1.0mm.		Mixed TIG
PF 27	Tig ASSIM	Continuous	HF	(2 step)	Alumin weld rod 3.0mm.	1.6 or 2.4mm.	Max 2.0mm,	
PF 28	Tig ASSIM	Continuous	HF	(2 step)	Alumin weld rod 1.5mm.	1.6mm.	Max 1.2mm,	
PF 29	Tig DC	PULSATED	LIFT	(2 step)	Ferrous weld rod 1.5mm.	1.6mm.	Max 1.5mm,	LIFT START
PF 30	Tig DC	Continuous	LIFT	(2 step)	Alumin weld rod 1.5mm.	1.6mm.	Max 2.0mm,	LIFT START

4.3 RESET PROCEDURE. ***(Warning ! This procedure will overwrite all previously stored user programs.)***

The facility exists to store the fifteen factory programs provided, into the user program locations P01 to P15. You may wish to do this when you first start using your machine as you can use the factory programs as a basis for your own customised programs. Remember that if you use this facility having already created some programs of your own they will be overwritten by the factory programs.

4.3.1 To initiate the reset procedure turn the machine on whilst holding down both the 'LOAD' and 'STORE' buttons. The word 'RES' will appear on the display. To download the factory programs into the user locations press 'LOAD' and 'STORE' together again and the word 'DONE' will be displayed. (If you press only one of the buttons the machine will leave reset mode and return to its normal state.)

4.4 ALARM CONDITIONS. If the yellow fault LED illuminates the machine will be 'blocked' and one of three alarm conditions will appear on the display.

"AL 1" Failure in the primary power supply. (i.e. The power supply voltage is not within the range 190V - 264V.)

"AL 2" One of the safety thermostats has triggered due to the machine overheating.

"AL 3" Lack of protection gas pressure.

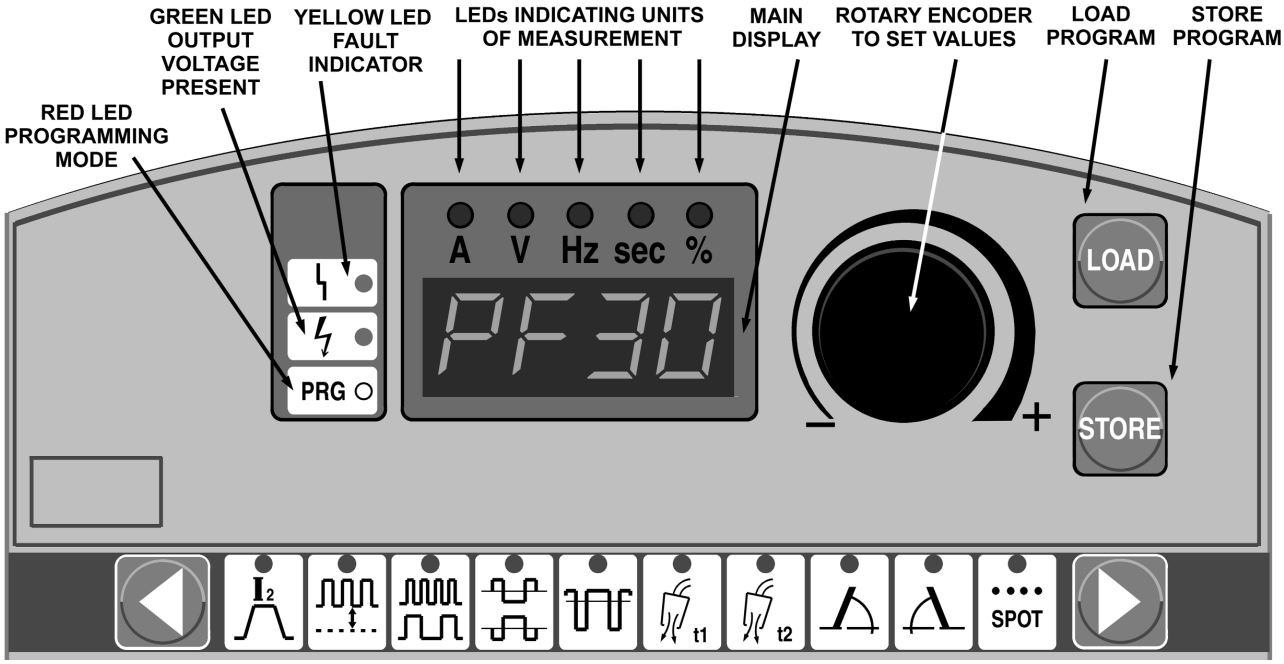
4.4.1 **Alarm memories.** When an alarm condition occurs the state of the machine at the time is memorised and stored. The last ten alarm conditions are retained and can be recalled by pressing 'LOAD' and 'STORE' simultaneously. The display will show either A0 1, A0 2, or A0 3 depending on the type of alarm that has occurred. By rotating the knob you can shift through the stored alarms A0 to A9. The mode LEDs will display the settings at the time the alarm in question occurred. To see the parameters in use at the time you can load the machine state by simultaneously pressing 'LOAD' and 'STORE'. To return to normal mode press either 'LOAD' or 'STORE' briefly once.

5. CONTROL PANEL

5.0 The TIG170/HF is microprocessor controlled allowing the setting of a very high number of parameters enabling the operator to make an optimal weld under all conditions and with all materials. Furthermore, useful combinations of parameters for particular welding situations can be stored in one of 15 available user programs for instant recall when required. The welder is supplied with a further 15 pre-set programs designed to show the operational possibilities of the machine. (When the machine is switched on the last active program will be automatically loaded.)

5.1 SELECTION OF WELDING PARAMETERS.

5.1.1 The 10 welding parameters are situated in a strip across the centre of the panel between two red cursor buttons. Use these buttons to select the parameter for adjustment. The parameter is active when the LED above it is illuminated. The value to be adjusted will appear in the main display and the units of measurement will be indicated by one of the five LEDs situated directly above the display. Adjust the value by using the rotary control to the right of the display.



Spot Welding Time. Sets spot welding time in TIG mode from 0.1 to 10 seconds.

Current Fall Ramp. Sets current fall time at the end of a weld from 0.1 to 10 seconds in 4-touch mode.

Current Rise Time. Sets rise time from base current to full current from 0.1 to 10 seconds in 4-touch mode.

Post Gas Time. Sets post gas time from 0.1 to 10 seconds.

Pre Gas Time. Sets pre gas time from 0.1 to 10 seconds.

EP Current (Electrode positive). Sets the EP current in the AC Asymmetric current option. and is expressed as a percentage of the main current. Minimum value that can be set is 20%.

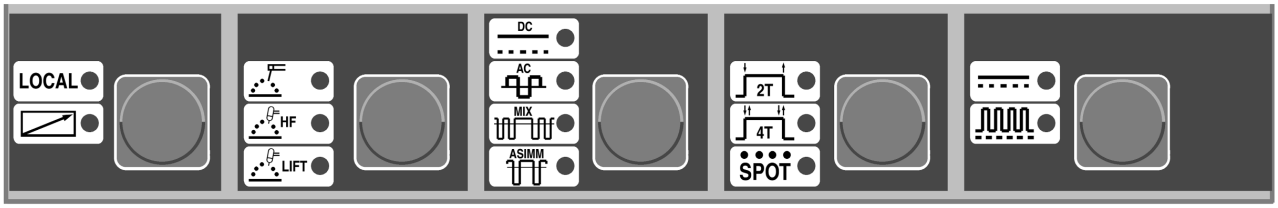
Balance. Sets a percentage ratio for current options AC, Mixed and Asymmetrical enabling the time during which the current is EN (electrode negative) to be varied from 50% to 90%. For DC pulsating current the percentage can be set from 1% to 99% and represents the ratio between the period that the current is high and the length of pulsation.

Frequency. Sets the frequency of the current for AC and DC. AC, Asymmetric and mixed currents can be set at frequencies between 100 and 200 Hz. DC pulsating current can be set between 0.2 and 999 Hz.

Base Current. Sets the base current which applies in 4 step mode whilst the torch button is depressed. Minimum value in DC is 5amps. Minimum value in AC is 7 amps. The current can be varied between the minimum value stated and the value of the main welding current that has been set.

Main Current. Sets peak or main current depending on the current mode selected. (See four modes below) Value range **: -** MMA arc welding - 5 to 160amps. TIG DC welding - 5 to 160amps. TIG AC welding - 7 to 160amps

5.2 SELECTION OF WELDING MODES. Press each mode button continuously to cycle through the available choices until you reach the one you require.



Selects remote control. ***Upper* - Local.** Returns the control of the main current to the front panel. ***Lower* - Remote.** Switches main current control to a remote potentiometer or foot pedal.	Selects the welding mode. ***Upper* - MMA** (Arc welding with stick electrode.) ***Middle* - TIG (HF)** Strikes arc using high frequency. ***Lower* - TIG (LIFT)** Strikes arc using 'lift' technique. (See Section 7.8)	Selects current options. ***Upper* - DC** Direct current ***Upper middle* - AC** Alternating current ***Lower middle* - MIX** mixture of AC and DC ***Lower* - Asymmetric AC** Asymmetric between **+** & **-**	Selects torch modes. ***Upper* - 2 Step.** Standard torch button control mode. ***Middle* - 4 Step.** Allows extended welding with button released plus greater control. ***Lower* - Spot.** Sets spot welding timer.	Selects pulsated current in DC TIG ***Upper* - DC** Direct current. (Not pulsated) ***Lower* - Pulsated current**

6. TIG WELDING PRINCIPLES & FEATURES

6.0 If you have no welding experience we recommend that you seek training from an expert source before using this equipment. Good TIG welding may only be achieved with continued supervised practice. *Before commencing welding read the safety instructions in Section 1.*

6.1 **TIG WELDING - GENERAL PRINCIPLES OF OPERATION.** (For a concise explanation of the many facilities of the TIG170/HF refer to Section 5. Control Panel) The TIG welding procedure uses the heat produced by an electric arc, struck and maintained between a Tungsten electrode and a workpiece to soften and fuse the workpiece metal, usually in conjunction with a suitable filler rod. The electrode is held in an insulated torch which transmits the welding current to the electrode. The torch also has a gas connection which allows inert Argon gas to be dispensed from a ceramic nozzle surrounding the electrode. This produces a shroud of gas around the welding process which protects the electrode and molten weld pool from oxidation.

6.2 PROTECTIVE GAS TIMING FACILITY. A 'pre - gas' time can be set to allow the protective Argon gas to flow before the arc is struck and a 'post - gas' time can be set to protect the finished weld whilst it is cooling.

6.3 CURRENT RISE & DOWN SLOPE FACILITY. In 4 step mode a time can be set for the initial current rise from base current to full welding current and a time can also be set for the current fall at the end of a weld process.

6.4 On thin pre-prepared material (up to 1mm) welding can be achieved without a filler rod by fusing the edges of the metal together. Most welding however will be done using a filler rod to complete a joint. This rod is melted in the weld pool but should not make contact directly with the electrode. *It is essential that operators wear adequately insulated gloves to protect themselves from the heat of the welding process, metal spatter and any direct contact with the electrode.*

6.5 The tungsten electrode will be consumed during the welding process but at a very slow rate. The tip of the electrode must be periodically inspected and re-ground if necessary to ensure continued efficient welding. See fig.7 'Condition of electrode tip'.

6.6 **TORCH DUAL FUNCTION PUSH BUTTON.** The torch push button can control the switching of the power in two different ways depending on your welding requirements. (Select one of the following option from the control panel.)

6.6.1 **Two step weld cycle.** In this mode the push button is pressed and held down to strike the arc and to continue welding. When the end of the weld is reached the push button is released and the arc is switched off. Both 'pre-gas' and 'post-gas' can be used in this mode if required.

6.6.2 **Four step weld cycle.** This mode allows you to complete long welds without having to continuously hold down the torch button.The push button is first held down which strikes the arc and then provides power at the base current set as long as the button continues to be held down. Once the push button is released the current rises to the welding current set and stays at this level even though the push button has been released. If the button is then pressed and held down again the current will decrease to the base level and remain there whilst the button is held. When the button is released the current is turned off and the post gas time begins. (If initiated.)

6.6.3 **Rapid touch function.** This function is available in four touch mode only. During the course of welding at the current you have set (with the torch button released) the current can be made to dip down towards base current and back again by momentarily pressing and releasing the torch button.This function can be used as a sequence of rapid presses which can help to control heat and penetration during difficult welds. At the end of a rapid sequence of presses when the button is released, the current will remain at the weld current set and the welder will continue to function as previously described in four touch mode.

6.7 **SPOT WELDING.** (It is suggested that you do several tests with different settings before proceeding to the actual weld required.)

6.7.1 Select the spot welding mode on the front panel (situated beneath the 2 & 4 step options) and proceed to set the current value you require and the spot welding time up to 10 seconds.

6.7.2 Ensure that the items to be welded are firmly clamped together and place the torch electrode tip firmly onto the weld position at 90^{0} to the surface. Press and hold the torch button whilst keeping the electrode tip in contact with the weld point. The machine will apply the set current for the set time and then go into fall ramp and stop automatically. Do not remove the torch prematurely.

6.8 **PULSATING DC TIG WELDING.** In this mode the welding current "pulsates" between the maximum and minimum values where the frequency and length of time are controllable.

6.8.2 Working in a frequency range between 0.2 and 10 Hz offers a number of advantages such as :- Small weld pool, Better heat control, Limited heating. Aids the welding of parts of different thicknesses and of dissimilar steels e.g. inox and low alloyed. Improves welding on metals having a tendency to heat crack. Improves penetration control on horizontal butt joints without the use of a support bar.

6.8.3 Working in a frequency range between 50Hz and 1000Hz offers the additional advantage of better arc direction and controllability which is useful in precise welding operations or in particularly difficult positions.

6.9 **ALTERNATING CURRENT TIG WELDING PROCEDURE.** This type of welding is particularly suited to welding metals such as aluminium and magnesium which form a protective and isolating oxide coating on their surfaces. By inverting the polarity of the welding current, it is possible to 'break' the superficial oxide layer by means of a mechanism called "ionic sandblasting". The voltage of the tungsten electrode alternates between positive (EP) and negative (EN). During the time the electrode is positive the oxide is removed from the surface by a cleaning/pickling action thereby allowing puddle formation. During the time the electrode is negative the maximum heat is applied to the workpiece to allow welding to take place.

6.9.1 The main parameters that can be altered in AC welding are FREQUENCY, BALANCE and ELECTRODE POSITIVE CURRENT. Reducing the time and intensity of the EP current to the minimum results in a faster welding operation and less heat being applied to the electrode which consequently lasts longer.

6.9.2 The various settings described in TIG DC operations are also possible in AC mode. (i.e. HF or LIFT start, 2 or 4 Step torch operation and SPOT welding.) The welding procedures described for DC TIG are also valid for AC TIG.

6.9.3 Refer to fig.8 for relevant data regarding welding aluminium. It is recommended that a pure tungsten electrode is used for aluminium (coded green).

6.9.4 BALANCE. Balance is represented as a percentage and can be set from 50% to 90%. (See fig.9)
Greater values of balance will result in faster welding, deeper penetration, more concentrated arc, narrower weld pool and limited heating on the electrode. Smaller values will allow a better cleaning of the part. Too small a value of balance will result in an enlargement of both the arc and the deoxidated area, plus overheating of the electrode leading to the formation of a ball on its face and consequent difficulty in striking the arc and indiscriminate arc direction.
Too large a value of balance will result in a 'dirty' weld pool with dark inclusions.

7.0 **MIX TIG WELDING (Mixed AC & DC)** In this welding mode, AC current and DC current (EN) alternate at brief intervals. This produces an effect which further increases the welding speed while decreasing electrode wear. This mode however, is not suitable for materials which are very dirty or oxidated.

8.0 **ASYMMETRIC AC TIG WELDING.** In this welding mode it is possible to regulate the EN and EP current independently producing an asymmetric waveform. This is a new technique which enables the quantity of heat going to the workpiece to be precisely controlled. For example, it is possible to use a 120A EN current and and a 40A EP current thereby obtaining a greater speed of welding operation and a longer lasting electrode. This allows the diameter of the electrode to be reduced without reducing the current substantially thus obtaining better arc control. See fig.9 for a summary of the parameter variations when welding with AC current.

7. TIG WELDING PROCEDURE

❒ **WARNING: use welding head shield to protect eyes and avoid exposing skin to ultraviolet rays given off by electric arc. Wear safety welding gauntlets.**
If difficult welds are to be performed and the welding parameters are unknown, it is advisable to carry out several trial runs on test pieces in order to determine the right welding current and gas flow.

7.1 **SWITCH ON** the welder only when you are satisfied that the welder is correctly connected and the work to be done is fully prepared.
Setting the controls. (Load an appropriate user or factory program or set up the parameters from scratch.)

7.2 Set the required gas flow using the knob on the gas regulator.

7.3 Select either the 'two step welding mode' or the 'four step welding mode' on the front panel.

7.4 Set the 'pre-gas' and 'post gas' time if required.

7.5 Set the 'current rise' and the 'current down slope' if required.

7.6 Set the welding current required.

7.7 **Striking the arc. (HF facility)** Press and hold the torch button bringing the electrode tip to within 2 - 3mm of the workpiece. The arc will be struck by high frequency impulses. When the arc is established, form a molten pool on the workpiece, introduce the filler rod and proceed along the joint. When the arc is difficult to strike, despite the presence of gas and visible high frequency discharges it is not advisable to carry on for any length of time. Before continuing, check the integrity of the electrode surface and tip and if necessary regrind the tip.

7.8 **Striking the arc. (LIFT facility)** Lightly touch the workpiece with the electrode tip. Push the torch button fully and lift the electrode with a delayed action thereby obtaining the striking of the arc with the same value as that previously set. Proceed to weld as described above.

7.9 To cease welding release the torch button.

7.10 **SWITCH OFF** the welder and turn off the gas at the cylinder valve.

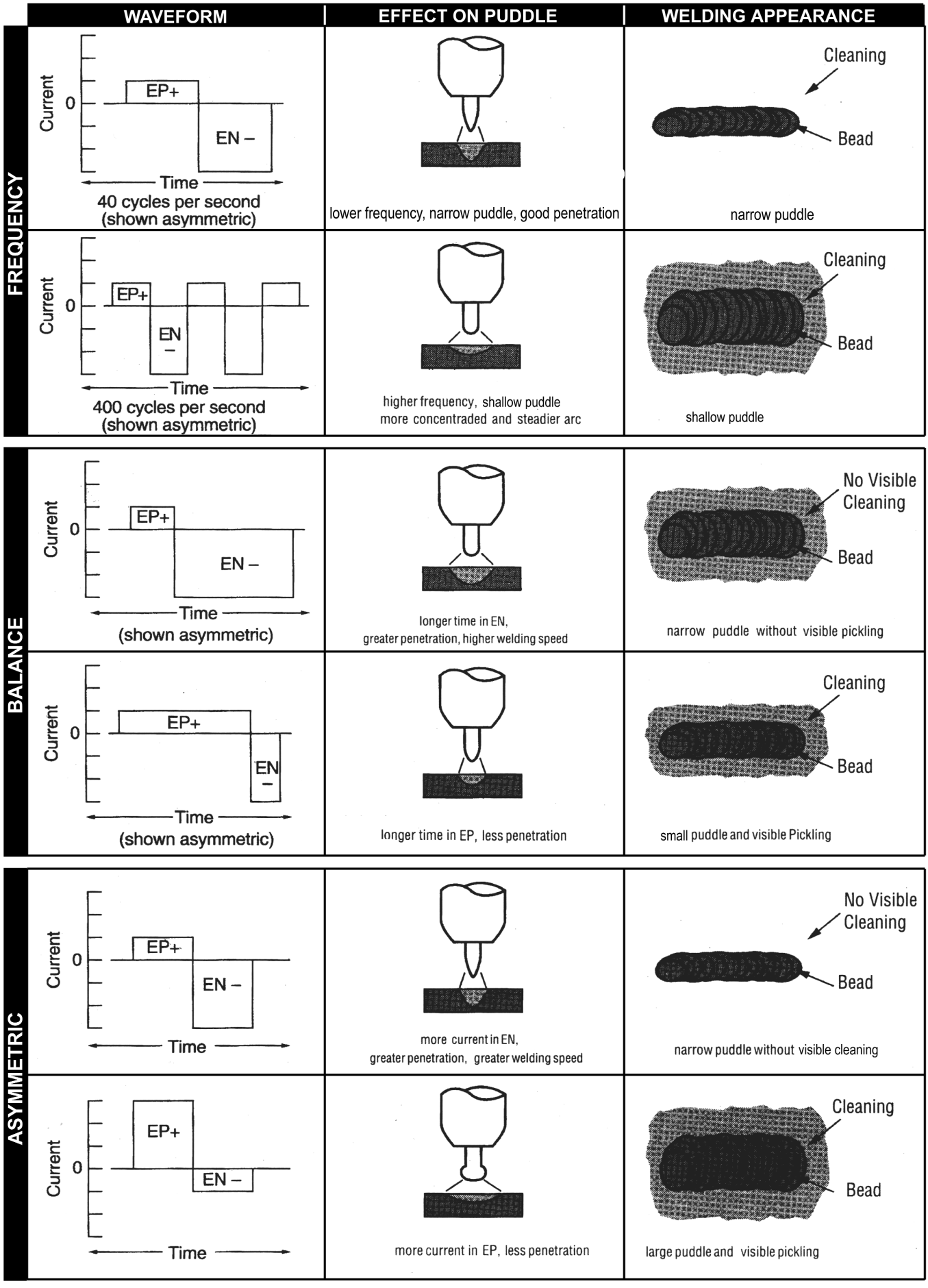


fig 9 **SUMMARY OF PARAMETER VARIATIONS WHEN WELDING WITH AC CURRENT.**

8. ARC WELDING PROCEDURE

8.1 The TIG170/HF will also perform ordinary ARC welding (without gas) using coated electrodes.(You will need optional ARC Accessory Kit INV/25)

8.2 ***Please note that the way the welding cables are connected to the inverter for ordinary ARC welding may be different to the way the cables are connected for standard TIG welding. Whilst most stick electrodes are connected to the positive terminal certain types need to be connected to the negative terminal. It is therefore essential that the user refers to the electrode manufacturers instructions to ensure that the correct polarity is selected.*** (Refer to section.3.2 regarding cable connection.)

8.3 The mechanical characteristics of the weld will be determined not only by the current used but also by other factors such as the diameter and quality of the electrode itself as well as the arc length, the speed of welding and the orientation of the electrode to the work surface. Unused electrodes should also be protected from moisture as a damp electrode will affect the quality of the weld.

Electrode diameter (mm)	Welding current Min.	-	Max.
1.6	25	-	50
2	40	-	80
2.5	60	-	110
3.2	80	-	160
4	120	-	200

8.4 The following table gives a general guide to the minimum and maximum welding currents to be used with the different diameter electrodes.

8.5 Depending on the diameter of the electrode the current used will have to be varied depending on the orientation of the workpiece itself. Higher current values will be used for flat welding whereas the current will have to be reduced for vertical or overhead welding.

8.6 ARC FORCE. When using the optional remote control with two potentiometers (See INV/TIG/7 in section 3.4.1 on remote controls.) an additional parameter of 'arc force' becomes available. Arc force relates to the dynamic behaviour of the machine. Higher values of arc force result in higher penetration and enable welding in any position using basic electrodes. By contrast, lower values of arc force result in a softer arc without sparks using rutile electrodes.

❒ **WARNING: Use welding head shield to protect eyes and avoid exposing skin to ultraviolet rays given off by electric arc. Wear safety welding gauntlets.**

If difficult welds are to be performed and the welding parameters are unknown, it is advisable to carry out several trial runs on test pieces in order to determine the right welding current and gas flow.

8.7 **SWITCH ON** the welder only when you are satisfied that the welder is correctly connected and the work to be done is fully prepared.
Setting the controls.

8.8 Select the arc welding mode on the front panel.

8.9 Set the welding current required by rotating the knob until the display shows the value you require.

8.10 **Striking the arc.** Strike the electrode tip on the workpiece as if you were striking a match. (Do not hit the electrode on the work piece as this could damage the electrode and make strike up difficult.)

8.11 **Welding.** As soon as the arc is ignited try to maintain a distance from the workpiece equal to the diameter of the electrode in use and maintain this distance throughout the duration of the weld. Remember that the angle of the electrode as it advances should be 20 to 30° from a vertical line over the workpiece. (See guide to weld bead characteristics in Section 10, Troubleshooting.)

8.12 At the end of the weld bead, move the electrode backwards in order to fill the weld crater and then quickly lift the electrode from the weld pool in order to extinguish the arc.

8.13 **SWITCH OFF** the welder after use.

9. MAINTENANCE

▲ ***DANGER! Unplug the inverter from the mains power supply before connecting or disconnecting cables or performing maintenance or service. Direct contact with the inverter circuit is dangerous.***

9.1 To avoid a build up of dust inside the machine which may block or restrict the ventilation system, periodically remove the covers and remove the dust with a low pressure air jet or vacuum cleaner. Replace covers immediately. Under no circumstances should the machine be operated with the covers removed.

9.2 TORCH. Avoid resting the the torch and its associated cable on any hot surfaces. If the insulation is damaged in any way the torch cannot be used.

9.3 Periodically check the condition of the gas tubing and the connections.

9.4 In the event of any problems of unsatisfactory weld performance please first go through the troubleshooting procedure shown below. If this does not solve the problem the Inverter must be taken to a qualified and authorised service agent for repair. Contact your local Sealey dealer for service.

10. TROUBLESHOOTING

10.1 **Yellow fault indicator is illuminated.** When this LED illuminates the machine will be 'blocked' and one of three alarm conditions will appear on the display.

"AL 1" **Failure in the primary power supply.** If the supply voltage drops below 190V AC or rises above 264V AC the machine is turned off. *Reconnect the inverter to a more stable supply of 230V AC. (Mains voltages over 280V AC will damage the inverter.)*

Short circuit has occurred. If a short circuit has occurred lasting more than 1.5 seconds (e.g. during the striking of the arc) the inverter is switched off. *In this case, wait for the inverter to restart automatically.*

"AL 2" **Inverter has overheated.** One of the safety thermostats has triggered due to the machine overheating. Leave the machine to cool to normal temperature at which point it will reset itself automatically. Do not restart the inverter until the reason for overheating has been understood and solved. (see below)

"AL 3" **Lack of protection gas pressure.** Check quantity of gas remaining and all gas connections.

10.2 **Overheating.** This may occur for one of the following reasons : -

a) Inverter casing is full of dust making cooling system inefficient. *Clean as described in section 9.1.*

b) Fan not working. *Have fan renewed by authorised service agent.*

c) Electrode does not match the collet and collet body fitted within the torch. *Obtain and fit the correct size of torch components for the electrode selected.*

d) Bad connection in welding cable and/or work clamp has made poor connection with workpiece. *Check and clean all connections..*

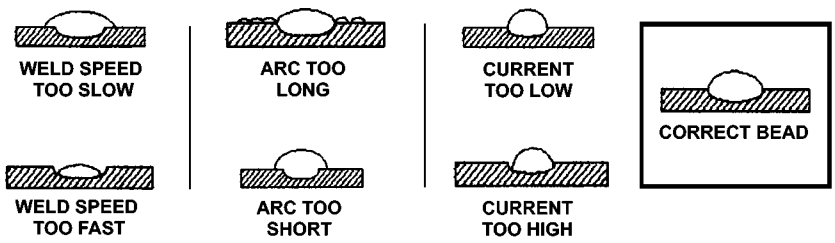
10.3 **Poor weld quality.**

a) Refer to arc weld bead diagrams to the right and also to AC welding parameters in fig.9.

b) Check condition of electrode. It should be ground to the correct shape as seen in fig.7 and should be symmetrically conical.

c) Check that correct gas flow is being used.

d) Check that correct ceramic nozzle is fitted to torch.



10.4 **Difficulty in striking an arc.**
This is usually due to the electrode not being in good condition. Grind to correct shape or replace.

10.5 **Incompatible settings.** In some instances the machine will not work due to the fact that a combination of settings has been chosen that are electrically incompatible. In such instances no damage can be caused to the machine but it will be necessary to review and alter the settings to a more appropriate combination.

ARC WELDING

10.6 **Burning through thin metal:** On very thin sheet, e.g. car body work, the lowest amperage setting may be too fierce. In this case revert to TIG welding.

10.7 **Machine cuts out:** Refer to fault indicator information above.

10.8 **Difficulty in striking an arc:** a). The electrode is damp. Heat it up to 60º - 70º before using. b). Wrong type of rod.

11. ELECTROMAGNETIC COMPATIBILITY

11.1 THIS EQUIPMENT IS IN CONFORMITY WITH THE EUROPEAN STANDARD EN 50199 : - ELECTROMAGNETIC COMPATIBILITY OF ARC WELDING EQUIPMENT AND SIMILAR PROCESSES (e.g. ARC AND PLASMA CUTTING)

11.2 **Protection against interference. (E.M.C.)** The emission limits in this standard may not, however, provide full protection against interference to radio and television reception when the welding equipment is used closer than 30m to the receiving antenna . In special cases, when highly susceptible apparatus is being used in close proximity, additional mitigation measures may have to be employed in order to reduce the electromagnetic emissions. At the same time there could occur some potential difficulties in having electromagnetic compatibility in a non-industrial environment. (.eg. in residential areas.) Therefore it is most important that the welding equipment is used and installed according to the following instructions.

11.3 **Installation and use.** The user is responsible for installing and using the welding equipment according to these instructions. If electromagnetic disturbances are detected, then it shall be the responsabillity of the user of the welding equipment to resolve the situation with the technical assistance of the supplier. In some cases this remedial action may be as simple as earthing the circuit (see Note *). In other cases it could involve constructing an electromagnetic screen enclosing the welding power source and the work complete with associated input filters. In all cases the electromagnetic disturbances shall be reduced to the point where they are no longer troublesome.
Note * : The welding circuit may or may not be earthed for safety reasons. Changing the earthing arrangements should only be authorised by a person who is competent to assess whether the changes will increase the risk of injury, e.g. by allowing parallel welding circuit return paths which may damage the earth circuits of other equipment. Further guidance is given in IEC 974-13,'Arc welding equipment - Installation and use.' (Under preparation)

11.4 **Assessment of area.** Before installing welding equipment the user shall make an assessment of potential electromechanical problems in the surrounding area. The following shall be taken into account :
a) Other supply cables, control cables, signalling and telephone cables, above, below and adjacent to the welding equipment.
b) Radio and television transmitters and receivers.
c) Computer and other control equipment.
d) Safety critical equipment,e.g. Security monitoring of industrial equipment.
e) The health of people in the vicinity, e.g. Persons fitted with a pacemaker or hearing aid.
f) Equipment used for calibration or measurement.
g) The immunity of other equipment in the environment. The user shall ensure that other equipment being used in the environment is compatible. This may require additional protective measures.
h) The time of day that welding and other activities are to be carried out.
The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

11.5 **Mains supply.** The Inverter should be connected to the mains supply according to these instructions. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. Consideration should also be given to shielding the supply cable of permanently installed welding equipment, in metallic conduit or equivalent. This shielding should be connected to the welding power source so that good electrical contact is maintained between the conduit and the welding power source enclosure.

11.6 **Maintenance of the welding equipment.** The welding equipment should be routinely maintained according to these instructions. All access and service door covers should be closed and properly fastened when the welding equipment is in operation. The welding equipment should not be modified in any way except for those changes and adjustments covered in these instructions. In particular, the spark gaps of arc striking and stabilising devices should be adjusted and maintained according to these instructions

11.7 **Welding cables.** The welding cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

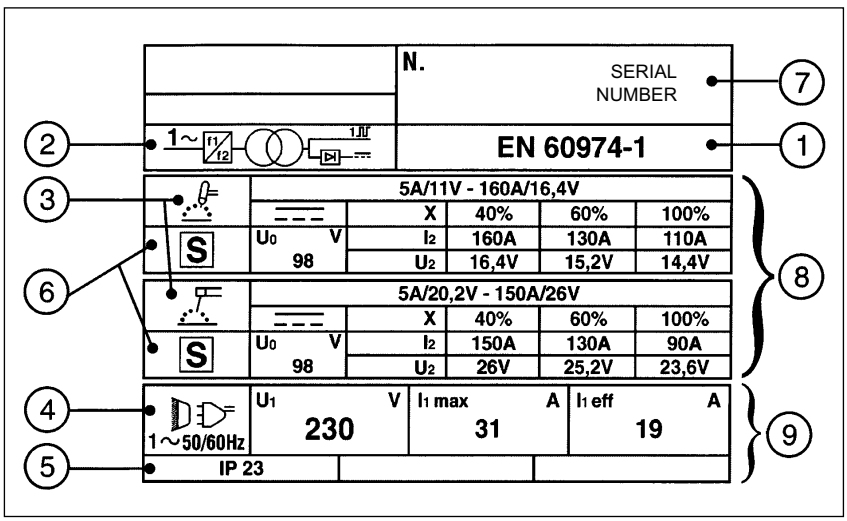
11.8 **Equipotential bonding.** Bonding of all metallic components in the welding installation and adjacent to it should be considered. However, metallic components bonded to the workpiece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

11.9 **Earthing of the workpiece.** Where the workpiece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, e.g. ship's hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to others or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by a suitable capacitance, selected according to national regulations.

11.10 **Screening and shielding.** Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications.

12. RATINGS PLATE SYMBOLS

Detailed technical data relative to the performance of the machine is located on the back panel plate. **Please note** that the ratings plate shown below is an example only intended to assist with the explanations of symbols. To determine the correct technical values of the machine in your possession, you must refer to the data plate.



(1) The EUROPEAN standard regarding safety and the construction of arc welding machines.

(2) Symbol for the main internal parts of the welder : i.e. frequency converter (inverter) - transformer - rectifier.

(3) Symbols for the welding process chosen : i.e. TIG and manual arc welding with stick electrode.

(4) Symbol for mains supply : alternating current, single phase and frequency.

(5) Case protection grade: IP23. Standard governing the required protection from water ingress and isolation of internal parts from persons and objects.

(6) Symbol S: Indicates that welding operations may be carried out in areas with greater risk of electric shock (e.g. close to metal masses).

(7) Serial Number : Refer to your particular machine

(8) PERFORMANCE OF THE WELDING CIRCUIT:

U_o : Maximum voltage with no-load peak (welding circuit open)

$1_2/U_2$: Current and corresponding voltage are normal [$U_2=(20+0.04\ I_2)$ V] and may be supplied from the machine during welding.

X : Intermittent welding ratio: Indicates time during which machine can supply the corresponding current (same column). This is expressed in % on the basis of a 10min. cycle (e.g. 60% = 6 min of work, 4 min. break and so on).

A/V-A/V : Indicates the regulation range of the welding current (maximum - minimum) at the corresponding arc voltage.

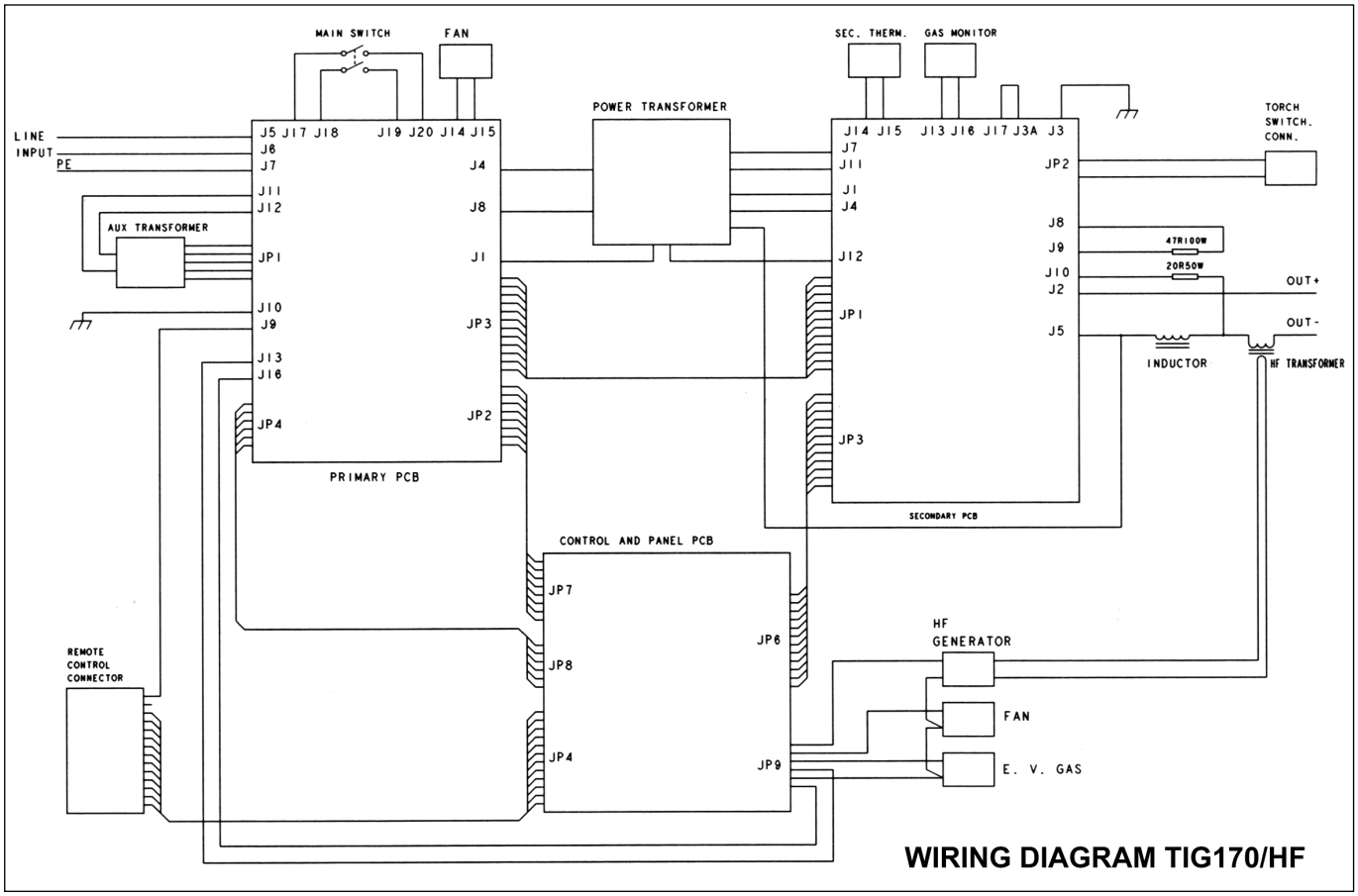
(9) DATA REGARDING THE MAINS.

U_1 : Alternate current and supply frequency of the machine allowed limits (+ 10-15%).

Value of delayed fuses for mains protection.

I_1 : current absorbed by mains at the corresponding current, welding voltage and relative intermittent ratio.

SEALEY POWER WELDERS



WIRING DIAGRAM TIG170/HF

Declaration of Conformity We, the sole importer into the UK, declare that the product listed below is in conformity with the following EEC standards and directives.

INVERTER Model TIG170/HF

Low Voltage Directive (S.I. 1994/3260) 73/23/EEC

EMC Directive (S.I. 1992/2372) & Amendments. 89/336/EEC

CE

The construction file for this product is held by the Manufacturer and may be inspected by a national authority on request by contacting Jack Sealey Ltd.

Signed by Mark Sweetman. 18th October 2001

For Jack Sealey Ltd. Sole importer into the UK of Sealey Power Welders.

NOTE: *It is our policy to continually improve products and as such we reserve the right to alter data,specifications and component parts without prior notice.*

IMPORTANT: No liability is accepted for incorrect use of this equipment.
WARRANTY: Guarantee is 12 months from purchase date, proof of which will be required for any claim.
INFORMATION: For a copy of our latest catalogue and promotions call uson 01284 757525 and leave your full name and address, including postcode.

SEALEY POWER WELDERS

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