MUREX

Operating Manual

Transmig 500 pulse

At the rear of this manual is a pull-out technical broadsheet and parts list. Please pass these documents to your Maintenance Department.

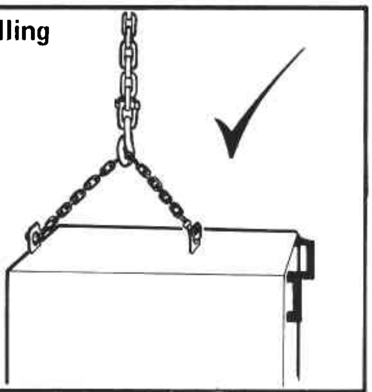
£1.50

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.

Service

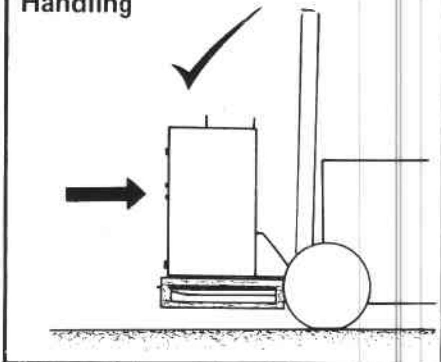
Call in the experts if you don't know what to do.

Handling



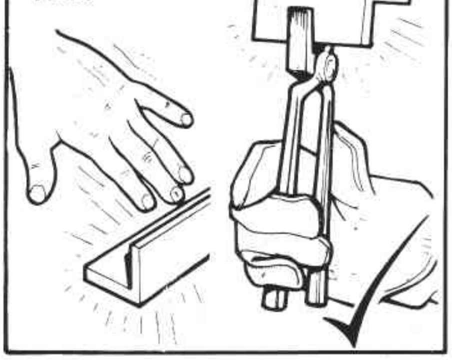
Lift the unit correctly

Handling



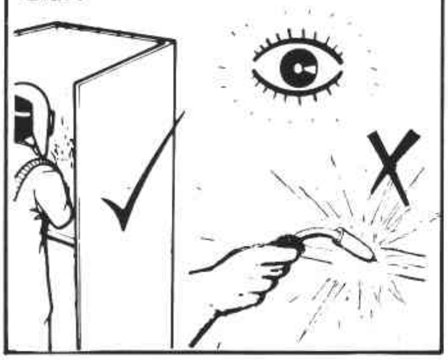
Most of the weight of this unit is at the rear, therefore transport with the front panel facing forward.

Heat



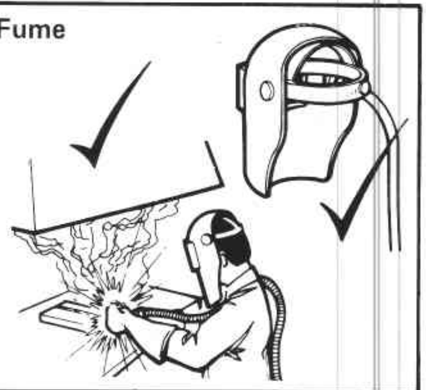
Don't burn yourself !
Wear gauntlets and use tongs.

Glare



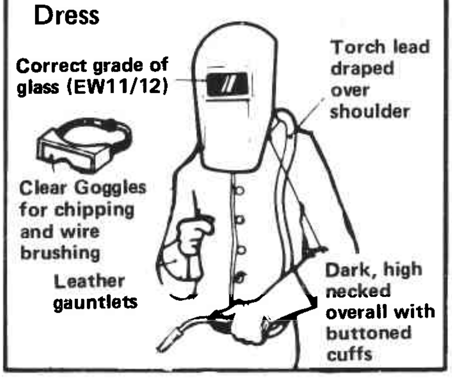
Wear your headshield (or face screen and screen the welding area.

Fume



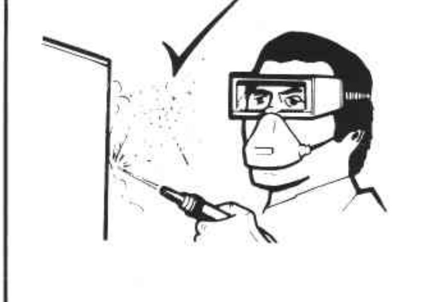
Ventilate the welding area to prevent a build-up of gas and fumes.

Dress



Dress correctly when welding and preparing the weld.

Dust



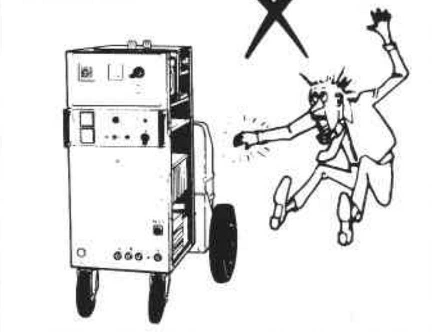
Note: *Use only DRY air.*

Wear goggles and mask when removing dust with an airline.

Fire

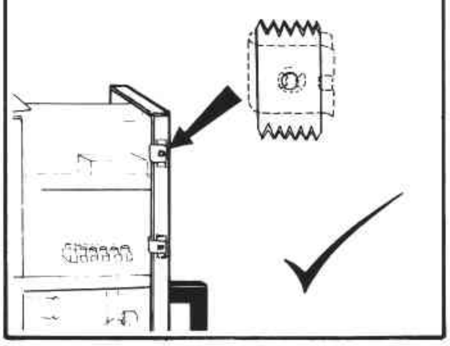
Before commencing welding, clear the area of inflammable materials.

Electrical



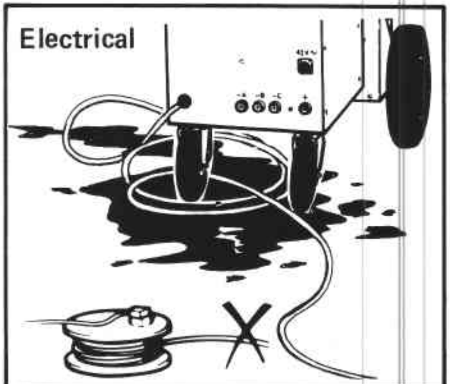
Don't work with the cover off. Leave it to the experts.

Electrical



These serrated washers provide earth bonding, replace in posi tion when refitting covers.

Electrical



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

INTRODUCTION

This constant voltage characteristic power source is designed for use as a MIG/MAG Welding unit in conjunction with the TM 3.2S wire feed unit, for semi-automatic MIG/CO_2 and Argon mixture welding, using dip transfer/spray techniques. Inductance output sockets A,B & C are provided for these techniques (see page 7).

The power source is a fan-cooled, thyristor controlled welding rectifier fitted with automatically reset overload protection.

A 220Volt output is provided to supply power to the OCD 1 cooling unit (see page 4).

The wire feed unit is supplied and controlled from an 8 pin socket on the front panel.

Remote control is selected by means of a switch on the front panel. This switch transfers control of welding current from the front panel to a hand-held control unit (see 'Optional Extras' page 6).

A voltmeter and an ammeter mounted on the lower front panel, indicate actual welding voltage and welding current values.

The upper portion of the unit contains a pulser unit. This unit produces pulses of fixed amplitude which are superimposed upon the welding output.

A twelve position switch allows the amplitude of these pulses to be adjusted for aluminium or steel wire, (changing amplitude of pulse changes heat input—see page 7).

For thin gauge metals (less than 2.5mm) or for positional welding, the pulse frequency may be cut by half (100Hz down to 50Hz) resulting in reduced heat input (see page 7).

PULSED TRANSFER (PULSED—ARC WELDING)

Pulsed arc welding is a controlled method of spray transfer welding. In spray transfer, droplets of metal are projected from the wire tip across the arc gap to the weld pool at a constant current. In dip transfer, metal is transferred to the weld pool somewhat irregularly during the periods of short circuiting. Pulsed arc welding enables the transfer of droplets to be controlled by projecting them across the arc gap at a regular frequency, using pulses of current.

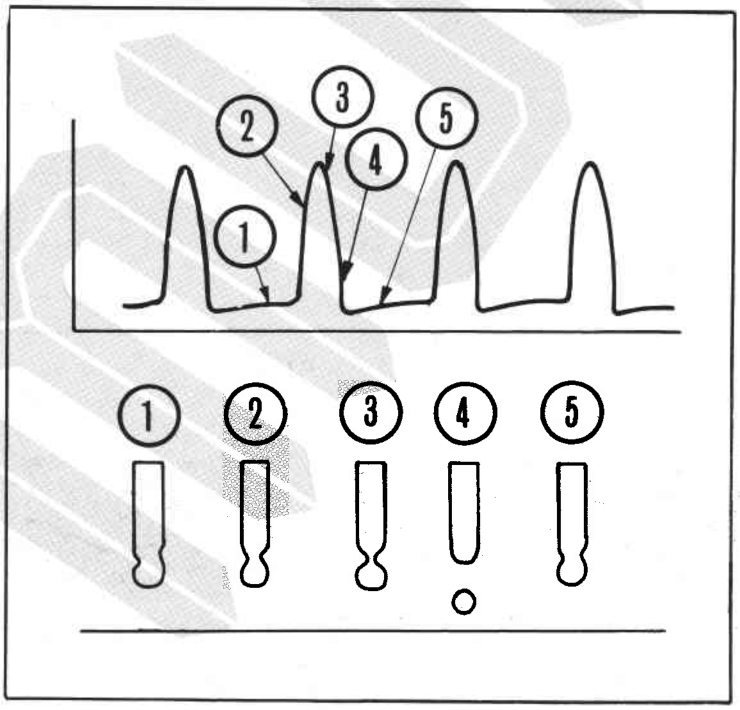
Transfer of metal from the wire tip to the weld pool occurs only at the peak of the pulse, or 'nip off' current. During the intervals between pulses, the 'background' current maintains an ionized arc between the wire tip and the weld pool to keep the wire tip molten, but no metal is transferred.

Control of transfer means that the weld metal is projected across the gap at high current, whilst the mean welding current remains relatively low. The operator has independent control of the pulse height and the background current. This allows full control of both the heat input and the amount of metal deposited.

Pulse-arc transfer can be used on mild and low allow steels, stainless steel, aluminium and its alloys with excellent results on light to medium plate sections.

FEATURES

- Unrivalled quality.
- Exceptional regularity of weld finish.
- Consistent penetration.
- No spatter.



ADVANTAGES

Unbacked corner and butt joints are much easier to weld than with other techniques and have an excellent appearance.

Using an argon-rich shielding gas, the alloy recovery is higher and the carbon level greatly reduced compared with CO_2 welding.

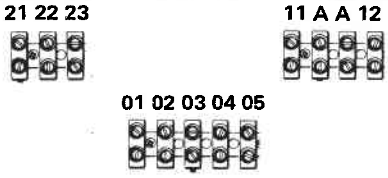
The high ratio of heat input to metal deposition gives much better quality positional welds than is possible with dip-transfer welding; the risk of lack of fusion is eliminated.

With pulsed-arc welding the usable current range on all wire diameters is extended, enabling only one wire size, or at most two, to be used for all applications — giving savings in time and cost.

MUREX

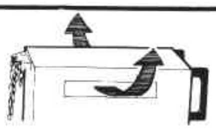
INSTALLATION

Installation must only be undertaken by a qualified electrician or suitably trained person.

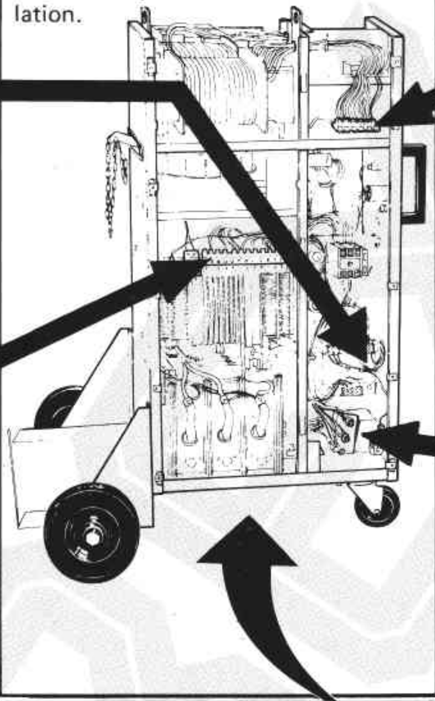


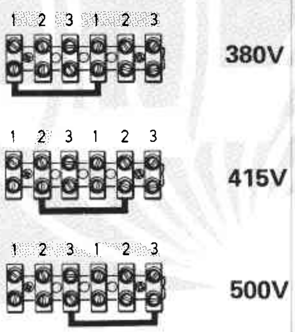
Voltage/ Freq.	Connections 01	02	03	04	05	11	A
380 50	37	30	–	29	–	18	–
415 50	30/37	–	–	29	–	18	–
500 50	30/37	–	–	–	29	18	–
415 60	30	37	–	29	–	–	18
550 60	30	37	–	–	29	–	18

When changing input voltage the wires to the auxiliary transformer must be connected as shown above.

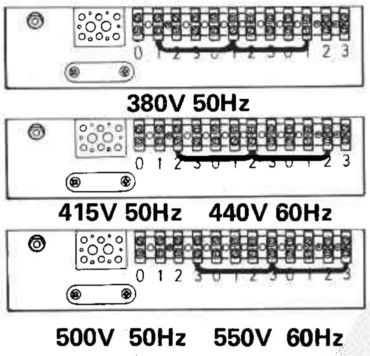


Place the unit so that the vents are clear of any obstruction to air circulation.



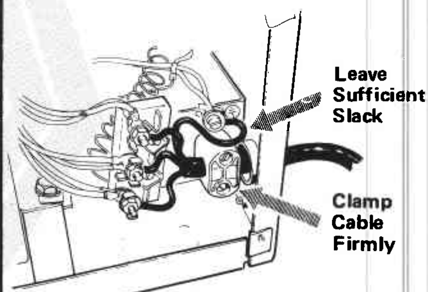


Locate the pulse mains input selection links and set according to the supply voltage.

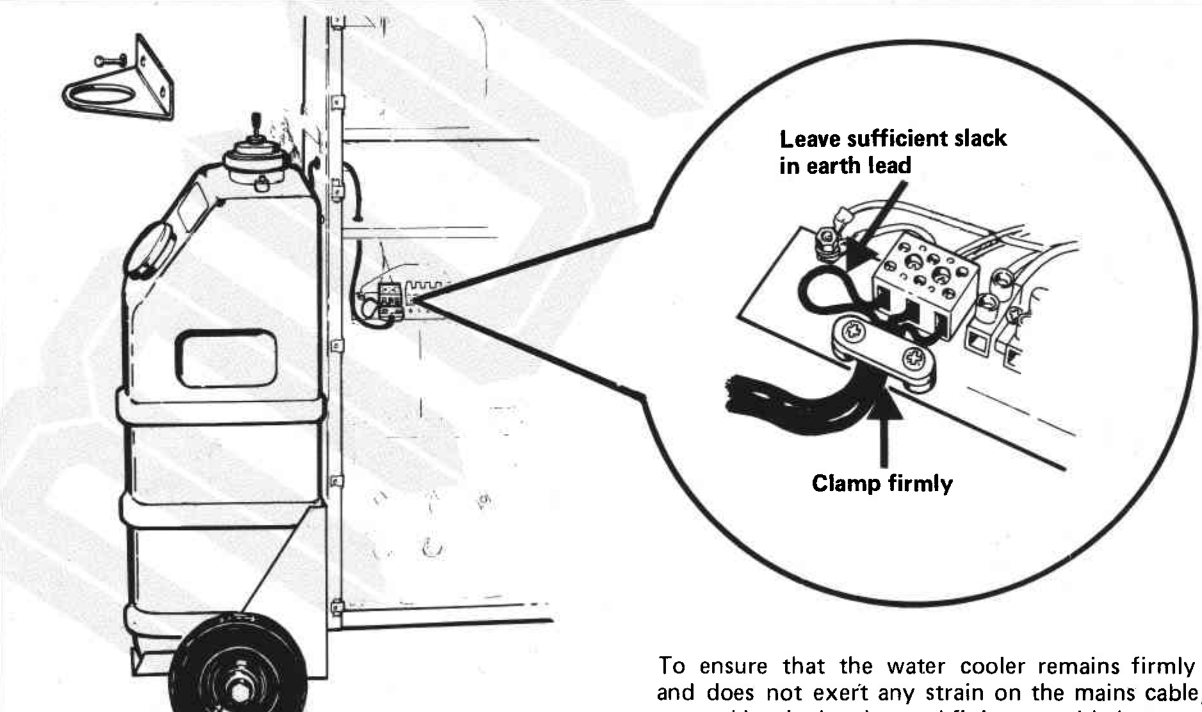


Locate the mains input selection links and set according to the supply voltage.

CAUTION: Do not operate this unit without the undergear fitted, observe the ventilation note given above.



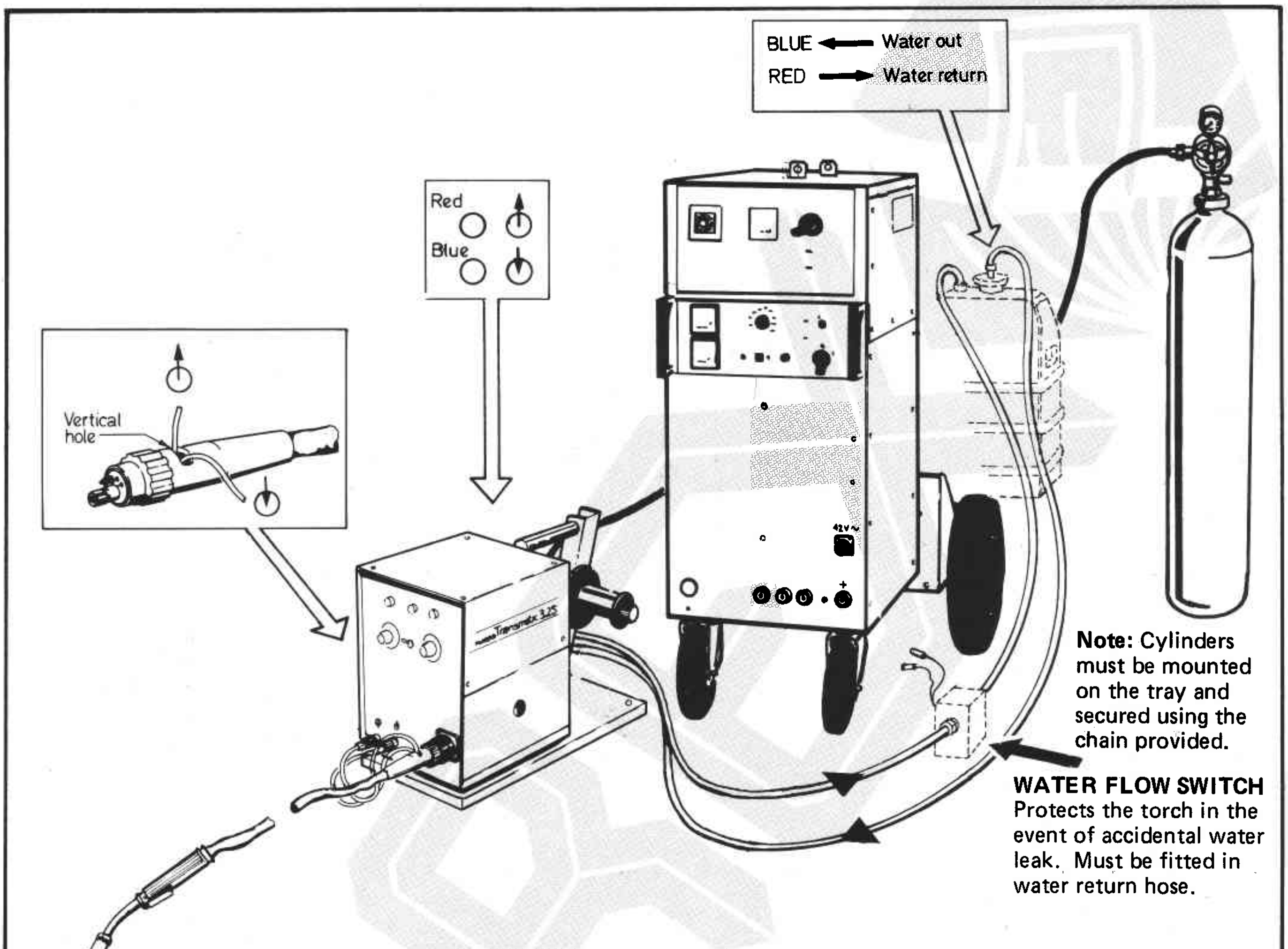
Locate the mains input terminal block (TB1). Connect the three phase wires and the earth wire (allowing sufficient slack) as shown above.



To ensure that the water cooler remains firmly in position and does not exert any strain on the mains cable, it must be secured by the bracket and fixings provided.

Water Cooler Installation

INSTALLATION (Continued)



Gas and Water Interconnections

UNDERGEAR FITTING

1. Remove the two 16mm bolts (2) from the rear panel of the power source.

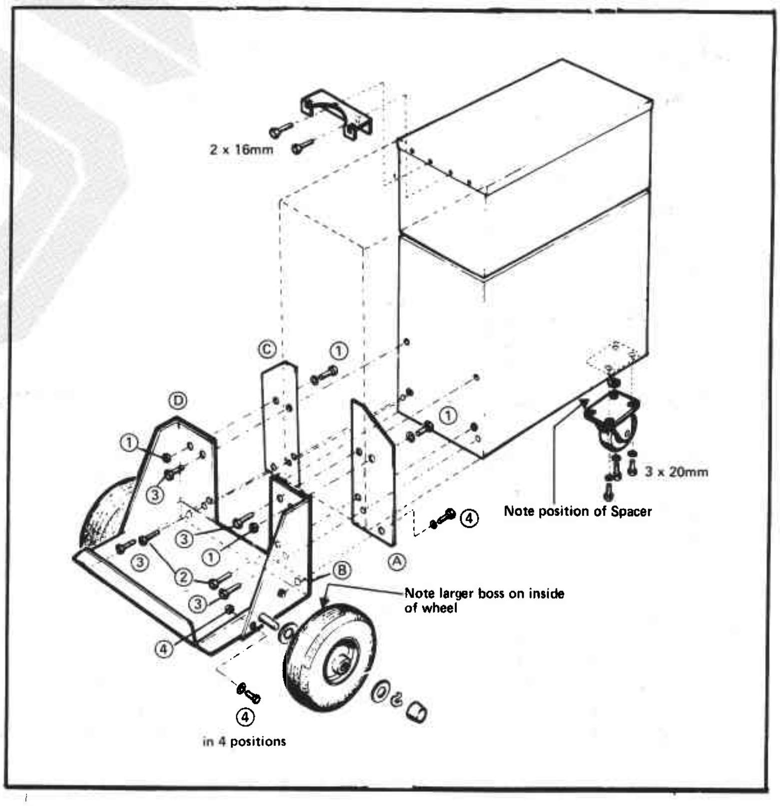
2. Fit plate (A) to bracket (B), and (C) to (D) using 16mm x M8 nuts, washers and bolts (2 off each), (1)

3. Loosely assemble AB and CD to back of unit using 2 each of 20mm x M8 bolts (3) and previously removed 16mm bolts (2)

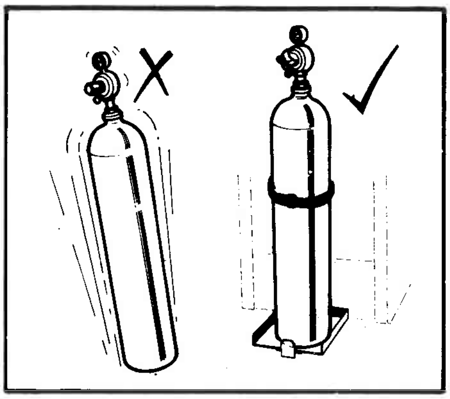
4. Hold the tray in position between brackets (B) and (D) and slide in the axle.

5. Bolt the tray and brackets together using the 20mm x M8 nuts, washers and bolts (4) in four positions.

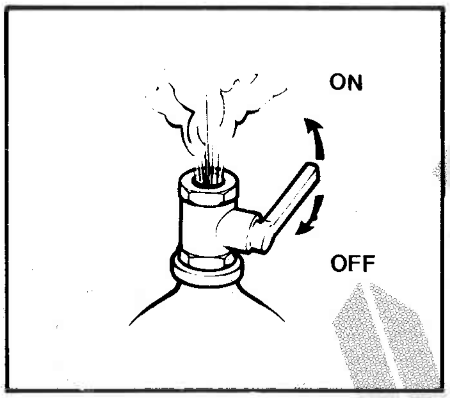
6. Tighten the assembly.



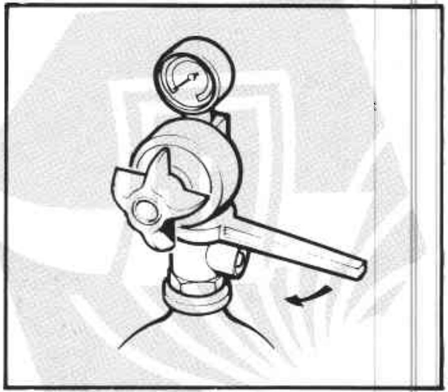
INSTALLATION (Continued)



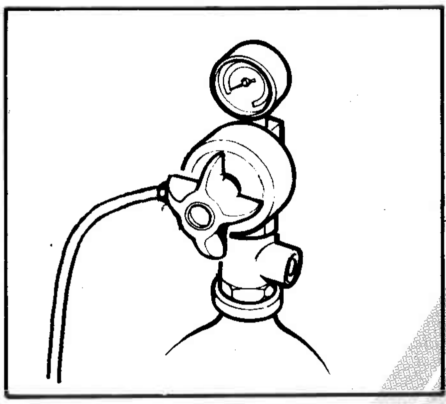
Support the gas cylinder with the retaining strap.



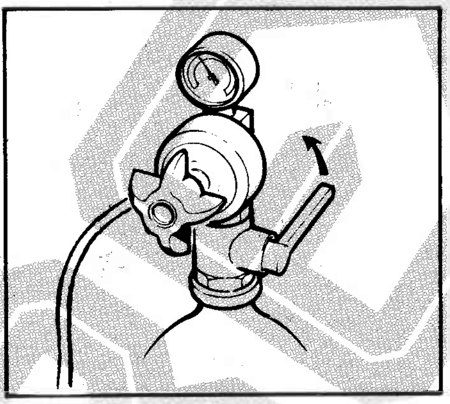
Protect the eyes and open the cylinder valve to remove any dirt in valve socket.



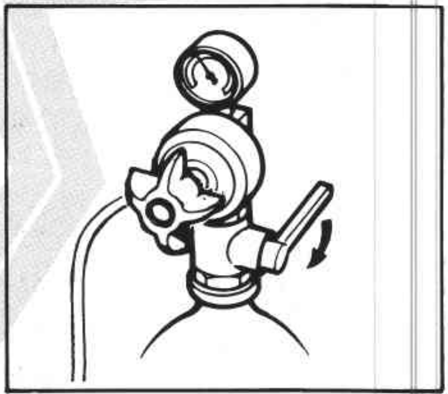
Fit the gas regulator to the cylinder and hand tighten using the correct size spanner. (A sharp blow with the hand at the end of the spanner will ensure a gas tight seal).



Fit the gas hose to the regulator.

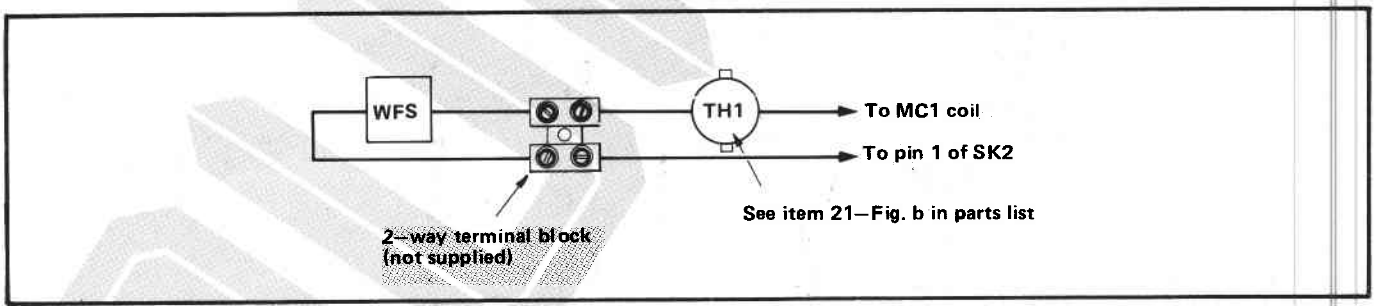


Open the cylinder valve and check the cylinder pressure. (Must be greater than 10 bar (150 lb/in^2)).

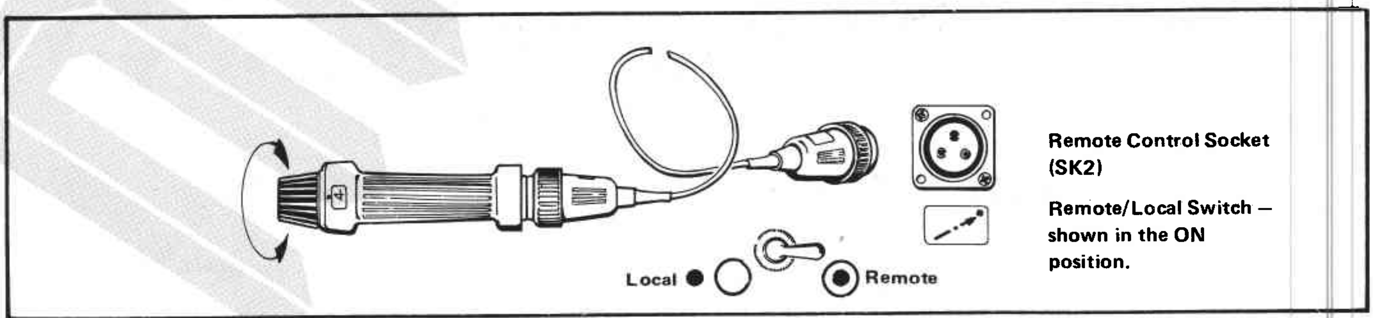


Close the cylinder valve.

FITTING OF OPTIONAL EXTRAS

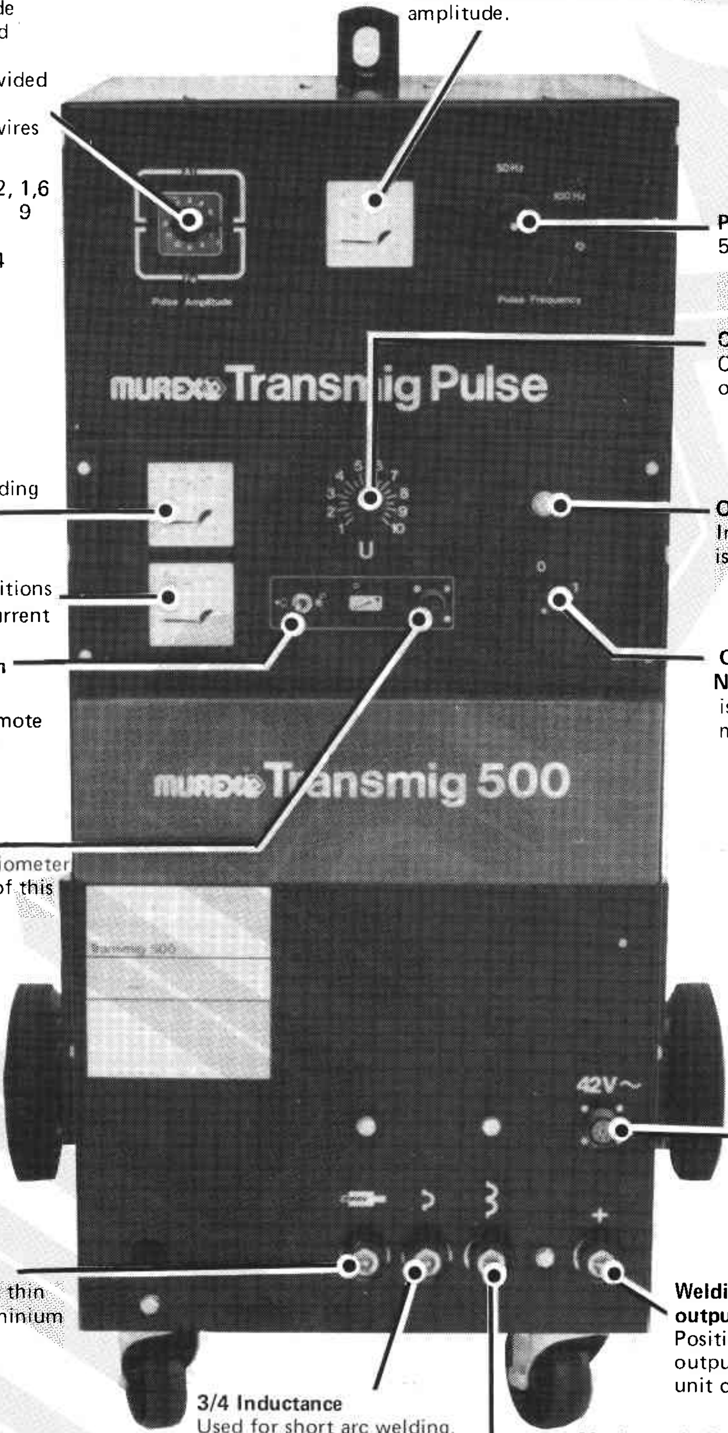


FITTING OF WATER FLOW SWITCH



HAND CONTROL UNIT

CONTROLS



Pulse Amplitude Selection Switch
This 12 position switch selects the amplitude of the superimposed pulse.
Six settings are provided for either Steel or Aluminium/cored wires

Steel (Ar + CO_2)

mm:	0,8,	1,0,	1,2,	1,6
Amplitude:	6	7	8	9

Aluminium (Ar)

mm:	1,2,	1,6,	2,4
Amplitude:	4	5	6

Ammeter
Indicates average value of pulse amplitude.

Pulse Frequency Selection
50 or 100Hz.

Current Control Knob
Continuously variable control of output current 50A – 500Amps.

Voltmeter
Indicates actual welding voltage.

Ammeter
Under welding conditions indicates welding current

ON/OFF Lamp
Indicates welding power is switched on.

Remote Control Switch
Switch right for ON– current adjusted by remote control unit.
Left for normal (local) control.

ON/OFF switch
Note: This switch does not isolate the unit from the mains supply.

Remote Control Socket
The remote control potentiometer is connected to the 3 pins of this socket.

Wire Feed Unit Socket
Carries contactor switch and 42V ac power to the wire feed unit.

Minimum Inductance
For short arc welding of thin materials root runs, aluminium and cored wires.

Welding power output socket
Positive polarity output to wire feed unit or torch.

3/4 Inductance
Used for short arc welding, gives slightly increased heat input.

Maximum Inductance
Used for spray arc welding of thick materials.

Work Return Lead Sockets: This output is connected to the workpiece.
WARNING: This terminal is NOT earth. A separate earth return must be connected via the input terminal block TB1 – (see Page 4)

APPLICATIONS

Mild Steel — In vertical welding 12.7mm (½in.) plate and over, the low heat input obtained with dip-transfer often results in poor fusion. Pulsed-arc welding overcomes this while remaining faster and more economical than manual-arc welding. It is also excellent for root runs where absolutely uniform penetration is required and the joint is accessible from one side only— for example, pipe butt welds. The ability to use lower currents with pulsed-arc welding is also of immense assistance in sheet metal work involving awkward shapes and unsupported butt welds. Pulsed-arc welding is particularly suitable for thicknesses between 2 and 6.3mm (14 swg and ¼in.), falling between the thickness ranges more suitably covered by dip- or spray-transfer. The recommended shielding gas for mild steel is an Argon mixture.

Alloy Steels — Pulsed-arc welding gives much better alloy recovery than welding with CO_2, and the carbon content remains at an acceptable level. This is vital for optimum low-temperature properties, particularly on quenched and tempered steels. The recommended shielding gas is an Argon mixture.

Stainless Steel — Pulsed-arc welding gives unequalled results in welding stainless steel. Using an Argon/Oxygen mixture, there is no increase at all in the carbon content of the weld, which can rise to an unacceptable level with CO_2.

Aluminium and its Alloys — Because heat input can be controlled with pulsed-arc welding, larger wire diameters can be used on thin sections. The risk of porosity is significantly reduced — particularly on vertical, overhead and horizontal welds.

In addition, the minimum thickness of alloy sheet which can be welded with push-type wire feed equipment is extended. One of the outstanding features of pulsed-arc welding that is of particular value in aluminium welding is the ability to make corner and unbacked butt joints which have a very good appearance. The recommended shielding gas is pure agron. pure argon.

Spot welding with steel wire (Ar + CO_2)

Wire (mm)	1,0	1,2	1,6	2,0
Setting	5	5	7	7
Inductance	–B	–B	–C	–C
Speed (m/min)	15	15	12	10

When considerable burn-through occurs during spot welding, weld time must be reduced. Insufficient burn-through requires increased weld time.

MAINTENANCE

Full details of maintenance and service tasks are given in the TECHNICAL NOTES.

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 welding torch for damage. Replace any suspect part(s).

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

6 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/cm^2), (30lbs/in^2), 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.

Transmig 500 pulse Technical Notes

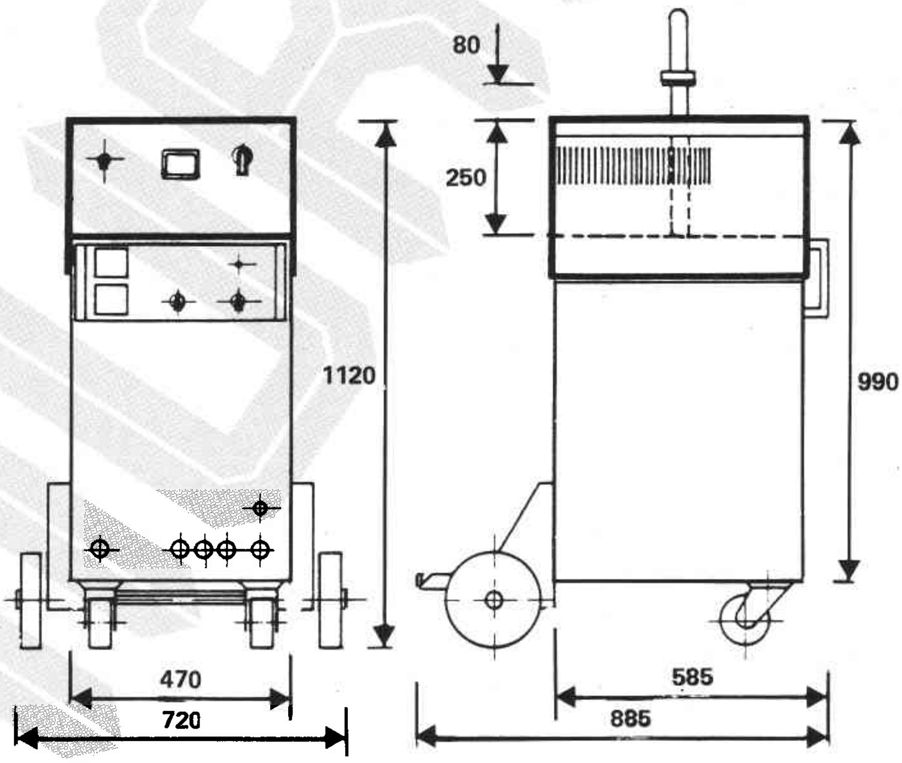
SPECIFICATION

INPUT

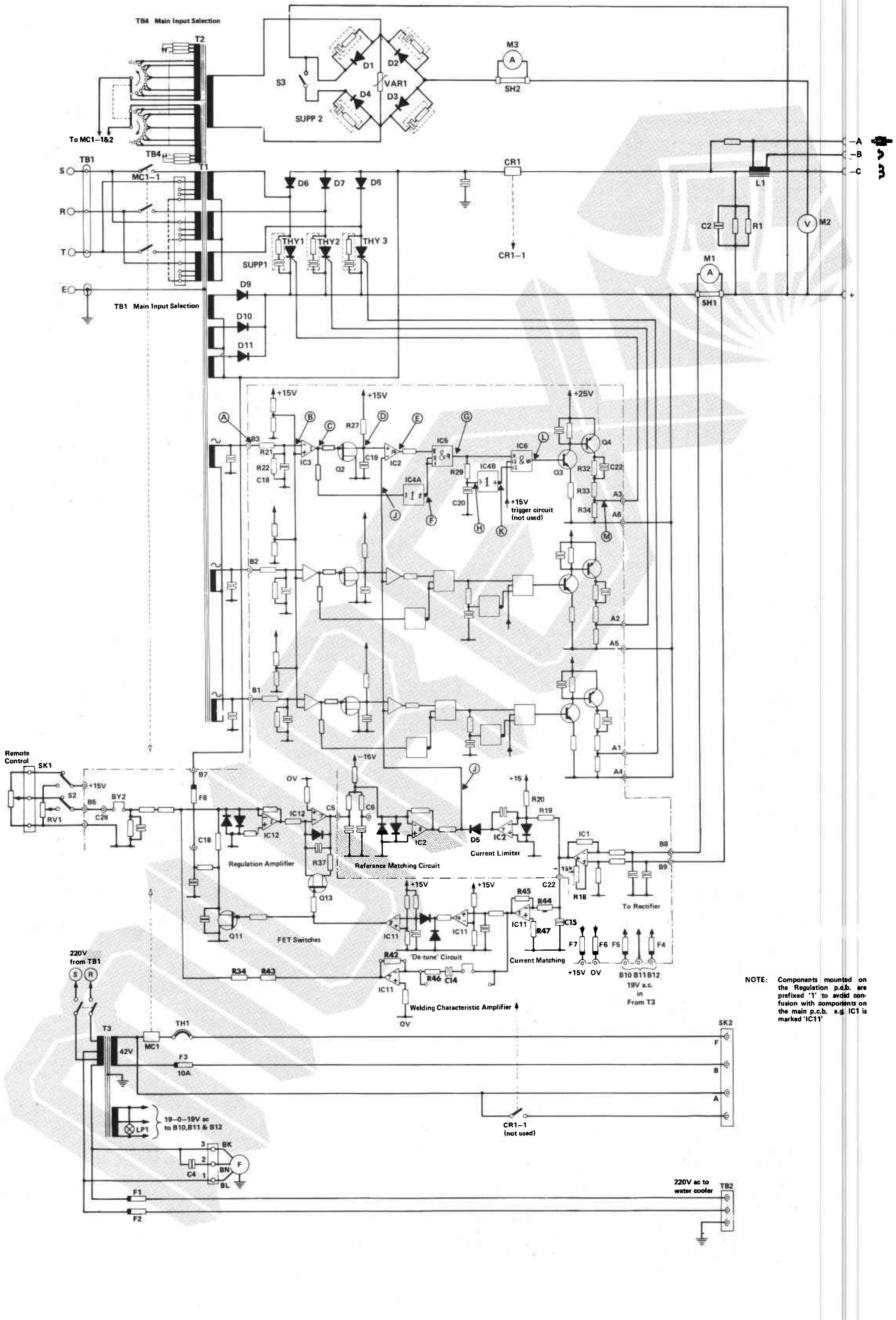
		3–50Hz			3–60 Hz	
Voltage		380	415	500	440	550
	60%A	41	38	31	38	31
Current	**80%A**	37	34	28	34	28
	100%A	33	30	25	30	25
Fuse (slow) Amps		35	35	35	35	35
Mains Cable (size) (mm2)		4x6	4x6	4x6	4x6	4x6
Fuse (fast) Amps		50	50	35	50	35
Mains Cable (size) (mm2)		4x10	4x10	4x6	4x10	4x6

OUTPUT

Permitted Load	
at 60% duty cycle	500A/39V
at 80% duty cycle	450A/37V
at 100% duty cycle	400A/34V
Current Range	50A/16V–500A/39V
Auxiliary Voltage	42V, 50/60Hz
Max. open-circuit Voltage	17–50V
Efficiency and power factor at 60% duty cycle	500A/39V
Power Factor	= 0,79
Efficiency	=0,91
Temperature classification	H 180°C
Protection standard	IP 22AF
Application classification	K



Weight 280Kg



NOTE: Components mounted on the Regulation p.c.b. are prefixed '1' to avoid confusion with components on the main p.c.b. e.g. IC1 is marked 'IC11'

CIRCUIT DESCRIPTION

Switching On
When ON/OFF switch S1 is pressed, 220V from input terminals S and R is applied across auxiliary transformer T3 primary and 42V appears across the control circuit for main contactor MC1.

220V also powers the cooling fan F and supplies the water cooler via TB2, F1 and F2.

Pressing the torch switch energises MC1 via the thermal overload protection device TH1 and fuse F3.

Welding Supply
Mains input supply is selected by the links on TB1 (for the main welding circuit) and TB4 (pulser supply).

When the main contactor MC1 closes, the thyristor/diode bridge circuit (THY 1,2,3, D6, D7 & D8) rectifies the incoming a.c. supply, and output current is drawn by the torch, via the current relay CR1, inductance L1 and shunt SH1. The output current is displayed on ammeter M1 and welding voltage by M2.

Shunt SH1 'samples' the output current and senses any changes in fluctuations due to mains input variations or changes in welding conditions.

The value of welding current, (plus any variations) is fed back to the control circuit board.

Diodes D9,10 & 11 maintain a rectified output during a.c. crossover periods i.e., whilst the a.c. waveform is passing through zero and thyristors have insufficient firing potential. This maintenance current ensures that the arc is not extinguished during these periods, thus resulting in an improved welding characteristic.

Pulsing Circuit
Switch S2 selects the value of a.c. supplied to bridge rectifier D1,2,3 & 4 and hence the amplitude of the 'un-smoothed' waveform appearing across (and superimposed on) the welding output.

Either 50 or 100Hz output can be selected by S3 which open circuits half of the bridge for 50Hz.

VAR1 is a surge protection component for the bridge diodes.

Ammeter M3 shows the average value of pulsing current.

Output Current Control
A reference level J is set by output current potentiometer RV1 (or the remote control) and is applied to the reference matching circuit via IC12.

IC2 inverts the reference level so that with a demand for more current (0 to + 10V at C5) the output at IC2 pin 8 is negative going (+8.5V to OV).

Voltage feedback from the welding output (via B7 and fuse F8) is summed with the reference level.

The value of this reference level determines the firing angle of Thyristors THY1, 2 & 3 and hence the amount of output current drawn when the arc is struck.

Current Limiter
Shunt SH1 monitors the level of output current being drawn. Under normal conditions the feedback to the current limiter circuit is up to approximately 60mV.

The output at IC2 pin 7 of the limiter circuit is normally −13V and hence, with the reference level 'J' at a positive diode D5 is cut off.

If an overload occurs, SH1 output rises to approximately 75mV and IC2 pin 7 switches to +14V. D5 is now forward biased and the reference level is raised to +14V resulting in minimum welding current output.

Current Regulation
Variations in output current are reflected at the input of IC12, from shunt SH1 via the welding characteristic amplifier IC11 C14, R46, R42, R34 and R43 and current matching circuit IC11, R44, R45, C15, R47. This current feedback modifies the thyristor firing reference level, so compensating for variation in output current.

Voltage Feedback
When the arc is extinguished, the welding voltage rises to OCV and the input to IC12 is driven negative, subsequently driving the thyristor firing angle back to minimum current state (Negative voltage is fed back to IC12 via B7 and F8).

Under these conditions, the gain of IC12 would not permit output current to rise fast enough when the arc is restruck (maximum negative feedback)

To prevent this occurring IC11 and associated components switch on Q11 and Q13 which modify the gain of the Reference Amplifier and limit the effect of voltage feedback as follows:

When welding current ceases to flow, IC1 pin 6 goes 'high' and the output from IC11 pin 1 (current matching circuit) goes 'low'. IC11 pin 14 goes low and IC11 pin 8 goes high operating the FET switches Q11 and Q13. Q13 switches in resistor R37, reducing the gain of the regulation amplifier, whilst Q11 lowers the value of voltage feedback.

Arc Re-striking
When the arc was extinguished the firing angle of the thyristors was retarded as described above.

Once shunt SH1 senses welding current being drawn, Q11 and Q13 switch off and normal current feedback takes over from the voltage feedback.

Thyristor Control Circuits.
The firing angle of thyristors THY1, 2 & 3 is controlled, each in turn, by three identical circuits. This description deals with the control circuit for THY1 (IC3, IC2, IC4, IC5, IC6, Q3 and Q4).

Waveforms 'A' to 'M' show the generation of thyristor firing pulses in relation to the a.c. waveform applied to the thyristors. The reference level 'J' controls the firing angle.

'A' A synchronising waveform is applied to input B3. This waveform is approximately 30V a.c. in amplitude.

'B' To match the phase angle of the start point of the thyristors the waveform is shifted by 30°. The anplitude of the waveform at this point is approximately 5V a.c.

'C' IC3 is a zero crossing detector and the output at pin 1 is a squarewave whos edges are synchronised with a.c. crossover points.

'D' Q2, R27 & C19 form a ramp generator rising from OV to approx. +8V.

'E' IC2 compares the 0 to 8V going ramp with the reference d.c. level 'J' and produces pulses at pin 14 the width of which are proportional to the d.c. level of 'J'.

It can be seen that, when 'J' is 'low' the pulses are wide; when 'J' in 'high' the pulses are narrow.

Notice also, that as the reference level is lowered or raised it is the leading edge of the pulse which changes in angle (earlier or later compared to the original a.c. waveform). The trailing edge remains static and synchronised to the zero crossover.

'L' The leading edge of 'E' is used to create 2mS pulses which are 'early' or 'late' as previously described.

These pulses are shaped by the 2mS Pulse Generator (IC4, IC5 and IC6) as described below.

'M' Q3 and Q4 form a pulse amplifier whose output at A3/A6 controls the ON/OFF firing of Thyristor THY1.

'N' This waveform represents the original phase-shifted a.c. as applied to the thyristor with the firing time of the thyristor shown shaded.

Hence, the higher the reference level 'J' the less thyristor conduction time and the less the welding current output.

The lower the reference level the longer the thyristor conducts and the higher the output welding current.

Pulse Amplifier Q3/Q4
The pulse applied to the base of Q3 drives it into conduction. The negative going Q3 collector switches on Q4 and the resulting positive-going pulse appears across R34.

At this instant C22 short circuits R32 resulting in a 'spike' which ensures positive firing of the thyristor.

2mS Pulse Generator
'F' & 'G' The output from the zero crossing detector 'C' is inverted by IC4A and the inverted waveform 'F' is used to hold pins 1 & 2 at +15V whilst pin 5 of IC5 follows waveform 'E' from 0 to +15V. ('G')

'H' R 29 and C20 provide an integrated waveform at pin 3 of IC4B which reaches the threshold level of IC4B after 2mS.

'K' At this 2mS point IC4B switches from +15V to OV and remains there until waveform 'H' falls below the threshold level.

'L' Pin 10 of IC6 follows waveform 'G' leading edge up to +15V and is 'switched off' after 2mS by waveform 'K'. This waveform is used to produce the firing pulses 'M' as previously described.