

INSTRUCTION MANUAL FOR ARC WELDING MACHINE

IMPORTANT!!!

BEFORE USING THIS DEVICE ALL PEOPLE AUTHORIZED TO ITS USE, REPAIR OR INSPECTION, SHOULD READ THE FOLLOWING INSTRUCTIONS, PAYING SPECIAL ATTENTION TO THE SAFETY RULES. CONTACT YOUR DISTRIBUTOR IF YOU HAVE NOT UNDERSTOOD THESE INSTRUCTIONS.

1 SAFETY RULES FOR USING WELDING MACHINE

1.1 INTRODUCTION

Before using this device all people authorized to use, repair or control should read the following use and safety instructions.

Remember: YOUR SAFETY DEPENDS ON YOU!!!

Follow all safety rules and instructions.

It is your job to protect yourselves and others against the risks related to welding.

The operator is responsible for his own safety and the safety of others in the work area. He must therefore know and obey all safety rules.

NOTHING CAN REPLACE GOOD COMMON SENSE !!!

1.2 GENERAL PRECAUTIONS

1.2.1 Fire



- Avoid causing fire because of sparks, slag, hot metal or pieces.
- Make sure that suitable fire-proof devices are available close to welding area.

- Remove all flammable and combustible material from welding area and its surrounding (min. 30 feet).
- Do not weld containers of combustible or flammable material, even when empty.
- Allow the welded material to cool down before touching it or putting it in contact with combustible or flammable material.
- Do not weld parts with hollow spaces, containing flammables.
- Do not work under conditions with high concentrations of combustible vapours, gases, or flammable dust.
- Always check the work area half an hour after welding so as to make sure that no fire has started.
- Do not keep any combustible material such as lighters or matches in your pockets.

1.2.2 Burns

- Wear fire-proof clothing all over your body in order to protect your skin against burns caused by ultra-violet radiation given off by the arc, and from weld metal sparks and slag.
- Wear protective clothing-gauntlet gloves designed for use in welding, hat and high safety-toe shoes. Button shirt collar and pocket flaps, and wear cuff-less trousers to avoid entry of sparks and slag.
- Wear helmet with safety goggles and glasses with side shields underneath, appropriate filter lenses or plates (protected by clear cover glass). This is a must for welding or cutting, (and chipping) to protect the eyes from radiant energy and flying metal. Replace cover glass when broken, pitted, or spattered.

- Avoid oil or greasy clothing. A spark may ignite them. Hot metal such as electrode stubs and workpieces should never be handled without gloves.
- First-aid facilities and a qualified first-aid person should be available for each shift unless medical facilities are close by for immediate treatment of flash burns of the eyes and skin burns.
- Ear plugs should be worn when working on overhead or in a confined space. A hard hat should be worn when others work overhead.
- Flammable hair preparations should not be used by persons intending to weld.

1.2.3 Fumes



Welding operations give off harmful fumes and metal dusts which may be hazardous to your health, therefore:

- Work in a well-ventilated area.
 - Keep your head out of fumes.
 - In closed areas, use suitable exhaust fans, placed under the welding area if possible.
 - If ventilation is not enough, use breathing sets approved for this procedure.
 - Clean the material to be welded of any solvents or halogen degreasers giving rise to toxic gases. Some chlorine solvents may decompose with the radiation emitted by the arc, and create phosgene gas.
 - Do not weld plated metals or those containing lead, graphite, cadmium, zinc, chrome, quicksilver or mercury, unless you have the proper breathing set.
 - The electric arc creates ozone. A long exposure to high concentrations may cause headaches, nasal, throat and eye irritation as well as serious congestions and chest pains.
- IMPORTANT: DO NOT USE OXYGEN FOR VENTILATION.
- Gas leaks in a confined space should be avoided. Leaked gas in large quantities can change oxygen concentration dangerously. Do not bring gas cylinders into a confined space.
 - DO NOT WELD where solvent vapors can be drawn into the welding atmosphere or where the radiant energy can penetrate to atmospheres containing even minute amounts of trichloroethylene or perchloroethylene.

1.2.4 Explosions



- Do not weld above or near containers under pressure.
- Do not weld in environments containing explosive dusts, gases or vapours.

This welding machine is used for TIG welding and uses ARGON gas for the protection of the arc, thus you should take special precautions:

A) CYLINDERS

- NEVER DEFACE or alter name, number, or other markings on a cylinder. It is illegal and hazardous.
- Do not use cylinders whose contents have not been clearly identified.
- Do not directly connect cylinder to reducing unit without a pressure regulator.
- Handle or use pressure cylinders in conformity with the existing rules.

- Do not use leaking or damaged cylinders.
- Do not use cylinders which are not well secured.
- Do not carry cylinders without the protection of the installed valve.
- Do not lift cylinders off the ground by their valves or caps, or by chains, slings or magnets.
- Never try to mix any gases in the cylinder.
- Never refill any cylinder.
- Never lubricate cylinder valves with oil or grease.
- Do not put the cylinder in electrical contact with the arc.
- Do not expose cylinders to excessive heat, sparks, molten slags or flames.
- Do not tamper with cylinder valves.
- Do not try to loosen tight valves by means of hammers, keys, or any other object.


B) PRESSURE REGULATORS

- Keep pressure regulators in good condition. Damaged regulators may cause damages or accidents, they should only be repaired by skilled personnel.
- Do not use regulators for gases other than those for which they are manufactured.
- Never use a leaking or damaged regulator.
- Never lubricate regulators with oil or grease.

C) HOSES

- Replace hoses which appear damaged.
- Keep hoses unwound in order to avoid bending.
- Keep the excess hose wound and out of the working area in order to avoid any damage.
- Cylinder fittings should never be modified or exchanged.

1.2.5 Radiation


 Ultra-violet radiation created by the arc may damage your eyes and burn your skin. Therefore:

- Wear proper clothing and helmet.
- Do not use contact lenses!! The intense heat coming from the arc may cause them to stick to the cornea.
- Use masks with grade DIN 10 safety lenses at the least.
- Protect people in the surrounding welding area.

Remember: the arc may dazzle or damage the eyes. It is considered dangerous up to a distance of 15 meters (50 feet). Never look at the arc with the naked eye.

- Prepare the welding area so as to reduce reflection and transmission of ultra-violet radiation: paint walls and exposed surfaces in black to reduce reflection, install sheathings or curtains to reduce ultra-violet transmissions.
- Replace mask lenses whenever damaged or broken.

1.2.6 Electric shock

 Electric shock can kill. All electric shocks are potentially fatal.


- Do not touch live parts.
- Insulate yourself from the piece to be welded and from the ground by wearing insulated gloves and clothing.
- Keep garments (gloves, shoes, hats, clothing) and body dry.
- Do not work in humid or wet areas.
- Avoid that the unit can fall into water.
- Avoid touching or holding the piece to be welded by hand.
- Should you work close to or in a dangerous area, use all possible precautions.
- If you should feel even the slightest electric shock sensation, stop welding immediately. Do not use the machine until the problem is identified and solved.
- Often inspect the mains cable.

- Disconnect power supply cable from mains before replacing cables or before removing unit covers.
- Do not use the unit without protection covers.
- Always replace any damaged parts of the unit, with original material.
- Never remove unit safety devices.
- Make sure that the power supply line is equipped with an efficient earth plug.
- Any maintenance should only be carried out by qualified personnel aware of the risks due to dangerous voltages necessary for the operation of the unit.

1.2.7 Pacemaker

Magnetic fields from high currents can affect pacemaker operation. Persons wearing electronic life support equipment (pacemaker) should consult with their doctor before going near arc welding, gouging, cutting or spot welding operations.

1.2.8 Noise

 These power sources alone do not produce noise levels exceeding 80 dB. The Welding process, however, may produce noise levels in excess of 80 dB in which case the machine take operator must take the necessary safety precautions as prescribed by the national take safety regulations.

2 GENERAL DESCRIPTIONS

2.1 SPECIFICATIONS

This welding machine is a constant direct current generator, created by the INVERTER technology, designed for welding with any coated electrode and with the scratch start TIG procedure.

2.2 EXPLANATION OF TECHNICAL SPECIFICATION




| | | | |
|---|--|---|-----|
| N° : | | | |
| 3~ | | EN 60974-1 CEI 26-13 | |
|  | - | - | - |
|  | U ₀ | X | - |
| | - | I ₂ | - |
| | - | U ₂ | - |
| U ₁ 3x380/415V 50/60Hz | | I ₁ | - |
| IP 23 | CLASSE DI ISOLAMENTO CLASS OF INSULATION CLASSE DES ISOLANTS INSOLIERSTOFFKLASSE CLASSE DE AISLAMIENTO | | H S |
| VENTILAZIONE FORZATA FORCED VENTILATION VENTILE KÜHLART F VENTILACION FORZADA | | PROTEZIONE TERMICA THERMAL PROTECTION PROTECTION THERMIQUE THERMISCH GESCHÜTZT PROTECCION TERMICA | |

fig. 1

IEC 974.1 The welder is manufactured according to this EN 60974.1 international standard.

N° Serial number which must be stated for any demands relating to the welding machine.

 Three-phase static frequency converter-transformer-rectifier.

 Drooping characteristic.

 Suitable for welding with coated electrodes.



Suitable for TIG welding.

- U₀ Secondary no-load voltage
- X Duty-factor percentage
The duty-factor expresses the percentage of 10 minutes in which the welding machine can operate at a determined current, without over heating.
- I₂ Welding current
- U₂ Secondary voltage with welding current I₂
- U₁ Nominal supply voltage
- 3~50/60Hz Three-phase supply 50 or 60 Hz
- I₁ Absorbed current at the corresponding welding current I₂. When using the machine for TIG welding, divide I₁ value by 1,5.
- IP23 Grade of protection of frame
Grade 3 as a second number means that this unit is fit to work outside under the rain.
- [S] Fit to work in high-risk areas.

NOTES: In addition, the welding machine has been designed to work in areas with grade 3 of pollution. (see IEC 664)

2.3 DESCRIPTION OF PROTECTIONS

2.3.1 Thermic protection

This unit is protected by a thermostat. When the thermostat switch-off, the machine stops supplying current, but the ventilator continues to work. The intervention of the thermostat is indicated by the led (H) turning on.

2.3.2 Cut-out

When this cut-out is triggered, led (G) lights up. The Led may appear in three different colours:

- Green: when the welder is functioning correctly
- Orange: when there is a fault in the functioning of the control card
- Red:
 - 1) when there is overcurrent in the two current transformers positioned on line with the MOSFET.
 - 2) whenever the microprocessor does not carry out the indicated process correctly.
 - 3) when there is an excessive reduction in the power supply

3 INSTALLATION

3.1 LAYOUT

Unpack unit and place it in a properly ventilated, possibly undusty room, making sure that air flow on cooling slots is not obstructed.

WARNING: RESTRICTED AIR FLOW causes overheating and possible damage of internal parts.

- Maintain at least 8 inches (200 mm) of unrestricted space on all sides of unit.
 - Do not place any filtering device over the intake air passages of this welding power source.
- Warranty is void if any type of filtering device is used.

3.2 STARTUP

This unit must be installed by skilled personnel. All fittings

must be in conformity with the existing rules and in full compliance with safety regulations. (GENELEC HD 427).

3.3 UNIT DESCRIPTION

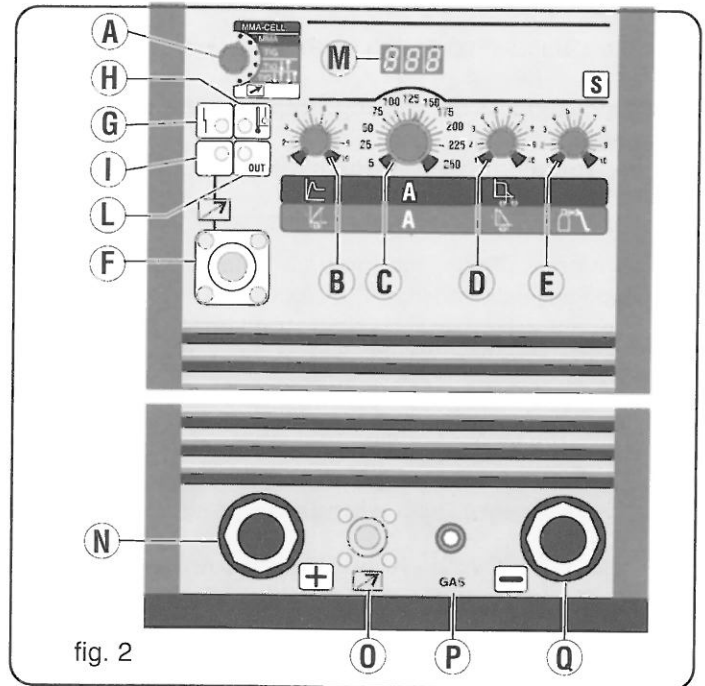


fig. 2

A) Process and mode selector switch.




Use this selector switch to select the following:


- 1) MMA-CELL welding cellulosic electrodes (AWS 6010).
- 2) MMA welding of all coated electrodes with the exception of cellulosic type electrodes.
- 3) TIG TIG welding with contact starting. Select this position when the TIG torch has no pushbutton, so that the torch starts up when the electrode makes contact with the workpiece to be welded.
- 4) TIG ↓ Manual TIG welding with starting on contact: press the torch pushbutton to enable the machine power supply, release the pushbutton to extinguish the arc.
- 5) TIG ↓ ↓ Automatic TIG welding with starting on contact: once pressed, the torch pushbutton may be released without the arc being extinguished. To extinguish the arc, press and release the pushbutton once more.

N.B.: If during welding the electrode is moved away from the workpiece and the arc is extinguished, press and release the torch pushbutton to begin welding again.

- 6) Select this position to enable the remote control. The potentiometers B, C, D, E assume the value represented in the black band, below them, when the selector A is set to (MMA-CELL) or (MMA), or the value represented in the red band, when the selector A is set to (TIG) or (TIG ↓) or (TIG ↓ ↓):


B) "Hot-start" or "slope-up" potentiometers:

 (HOT-START) Regulates the overcurrent value supplied by the machine in the moment when the arc starts up.


 (SLOPE-UP)- Regulates the up-slope current time to the value set using the knob C (0.2+10 sec.)

C) Potentiometer for the regulation of the welding current.

D) "arc-force" or "slope-down" Potentiometer:

 (ARC-FORCE) - For the regulation of powersource dynamics. This is the force given to the drop which is being transferred from the electrode to the workpiece. You may regulate the welding transfer force depending on the situation, (level-vertical, etc.), the diameter of the electrodes, and the current set.

By increasing the "arc-force" value, you can prevent the electrode attaching itself to the workpiece in crucial situations, for example during the initial passes at the base of bevels with minimum currents.

 (SLOPE-DOWN) - Regulates the down-slope current time (0+10 sec.), or the time which elapses whilst the welding current passes from the preset value to the extinguishing of the arc. Activated whenever the command to stop welding is given, it allows the final crater to be filled (CRATER-FILLER) upon completion of the welding.

E) "Post-gas" potentiometer

Regulates the gas output time once welding is completed. The time may be regulated from a minimum of 0.3 sec. to a maximum of 30 sec.

F) Remote control connector.



G) Cut-out Led (See 2.3.2)



H) Thermostat Led.

Lights up when the operator exceeds the service or intermittence percentage allowed for the machine. The power supply is cut off simultaneously.

N.B.: **With the machine in this state, the fan continues to cool the generator.**

I) Remote control Led.

Lights up when the remote control connector is inserted.

L) Led out.

This Led **MUST** light up (Green) when you press the pushbutton for TIG welding or when you strike the arc for electrode welding (MMA).

M) Display.

- 1) Indicates the current selected using knob C.
- 2) Flashes error codes monitored by the microprocessor. If the code is 003, turn off the machine, wait at least is seconds and turn on again.

N) Positive output terminal.

O) TIG torch pushbutton connector.



The torch pushbutton wires must be connected to pins A and C.

P) Fitting (1/4 gas).

Used to connect the gas tube of the TIG welding torch.

Q) Negative output terminal.

3.4 GENERAL NOTES

Before using this welding machine, carefully read the CENELEC standards HD 407 and HD 433 also check insulation of cables, electrode holder clamp, sockets and plugs and that the section and length of welding cables are compatible with current used.

WELDING CABLE-SECTION MEASURED IN mm²

| WELDING CURRENT IN AMPERES | DISTANCE FROM THE MACHINE IN METRES | | | | | | |
|----------------------------|-------------------------------------|----|----|----|----|-----|-----|
| | 15 | 20 | 30 | 40 | 45 | 50 | 60 |
| 100 | 35 | 35 | 35 | 35 | 50 | 50 | 50 |
| 150 | 35 | 35 | 50 | 50 | 70 | 70 | 90 |
| 200 | 35 | 50 | 50 | 70 | 70 | 95 | 100 |
| 250 | 35 | 50 | 70 | 70 | 95 | 100 | 150 |

3.5 COATED ELECTRODE WELDING

- Use electrode holder clamps in compliance with the safety standards and without projecting tightening screws.
 - Make sure that the main switch is in 0 position or not inserted in supply socket then connect welding cables in accordance with polarity demanded by the electrode manufacturer which you will be using.
 - Welding circuit should not be deliberately placed in direct or indirect contact with protection wire if not in piece to be weld.
 - If earthing is deliberately made on the workpiece by means of protection wire, the connection must be as direct as possible, with the wire having a section at least equal to the welding return current wire and connected to the piece being worked on, in the same place as the return wire, using the return wire terminal or a second earth terminal closeby.
 - All possible precautions must be taken in order to avoid stray currents.
 - PLEASE NOTE: Upon request, it is possible to connect a remote-control to the connector (F) fig.2 and relative extension cable if you should need to regulate welding current from a distance.
 - Check to see that power supply voltage corresponds to voltage indicated on the welding machine technical specification tag.
 - **When taking voltage from a three-phase line, be very careful when connecting supply cable earth wire to the socket earth pole.**
 - Connect supply cable : When mounting a plug, make sure that its capacity is adequate and that the yellow-green wire of the mains cable is connected to the earth plug pin.
 - The capacity of magnetothermic switch or fuses in series with mains supply should be equal to current I₁ absorbed by the unit.
 - Absorbed current I₁ is determined by reading the technical specifications on unit i.e. power supply voltage U₁ available.
 - Any extensions should have adequate sections for absorbed current I₁.
 - Turn machine on with the main switch.
- WARNING: ELECTRIC SHOCK CAN KILL.**
- Do not touch live electric parts.

- Do not touch weld output terminals when unit is energized.
 - Do not touch torch or electrode holder and earth clamp at the same time.
- N.B.: Select using the selector **A** (MMA-CELL) or (MMA), regulate the Hot-Start current with knob **B**, the welding current with knob **C** and the Arc-Force current with knob **D**.
- When finished welding, always remember to turn unit off, and to remove electrode from electrode holder.

3.6 TIG WELDING (Scratch Start)

- This welding machine is fit for welding with TIG procedure: stainless steel, iron, and copper.
 - Connect earth cable wire to positive (+) pole of welding machine and terminal to working piece as close as possible to welding machine, making sure there is a good electrical contact.
 - Use TIG torch suitable for the welding current and connect power wire to negative pole (-) of welding machine.
 - The welding machine circuit should not be deliberately in direct or indirect contact with protection conductor if not in piece to be welded.
 - If earthing is deliberately made on the workpiece by means of protection wire, the connection must be as direct as possible, with the wire having a section at least equal to the welding return current wire and connected to the piece being worked on, in the same place as the return wire, using the return wire terminal or a second earth terminal closeby.
 - All possible precautions must be taken in order to avoid stray currents.
 - Connect torch connector to welding machine connector **O**.
 - Connect the torch gas tube fitting to the welder fitting **P**, and the gas tube from the cylinder pressure reducer to the gas fitting located on the rear panel.
- Select using knob **A** (TIG) or (TIG ↓↑) or (TIG ↓↑↑).
- Use a 2% thoriated tungsten electrode chosen according to table 2 and prepared according to that indicated in point 3.6.1.

| electrode \varnothing 2% thoriated tungsten (red band) | direct current negative electrode (Argon) |
|--|---|
| 0.5mm (0.020") | 15÷40 A |
| 1mm (0.040") | 25÷85 A |
| 1,6mm (0.060") | 70÷150 A |
| 2.4mm (0.095") | 150÷250 A |
| 3.2mm (0.130") | 200÷350 A |

- The most commonly used shieling gas is ARGON ,however, ARGON mixtures with a max. of 2% HYDROGEN can also be used for welding stainless steel, and HELIUM or ARGON/HELIUM mixtures can be used for welding copper. These mixtures increase the heat generated by the arc. If you are using helium gas, increase the flow rate (l/min) so as to obtain a ratio 10 times the size of the electrode (example: diam. 1.6x10 = 16 l./min. helium).
- Use protection lenses with shades D.I.N. 10 for up to 75A and D.I.N. 11 for 75A and above.
- Inert gas flow must be regulated to a value (l/min.)

- approximately 6 times the diameter of the electrode.
- If accessories such as gas lenses are used, the gas flow can be reduced to approx. 3 times the diameter of the electrode.
- The diameter of the ceramic nozzle must be 4 to 6 times larger than diameter of the electrode.
- Check to see that power supply voltage corresponds to voltage indicated on the welding machine technical specification tag.
- **When taking voltage from a three-phase line, be very careful when connecting supply cable earth wire to the socket earth pole.**

- Connect supply cable: When mounting a plug, make sure that its capacity is adequate and that the yellow-green wire of the mains cable is connected to the earth plug pin.
- The capacity of magnetothermic switch or fuses in series with mains supply should be equal to current I_1 absorbed by the unit.
- Absorbed current I_1 is determined by dividing by 1,6 the value stated on the table.
- Any extensions should have adequate sections for absorbed current I_1 .

WARNING: ELECTRIC SHOCK CAN KILL!

- Do not touch live electric parts.
- Do not touch weld output terminals when unit is energized.
- Do not touch torch and earth clamp at the same time.
- Turn machine on with the main switch.

N.B.: Use knob **B** to regulate the (Slope-Up) time, knob **C** to regulate the welding current, knob **D** for the (Slope-Down) time and knob **E** for the (Post-Gas) time. Strike the arc on contact with a sharp, decisive movement.

- Start the arc , by contact, with a determined rapid movement.

CAUTION: do not use commercial ignition devices.

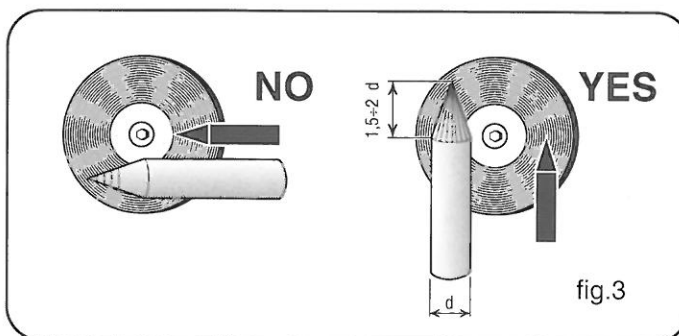
- Once welding is finished, remember to turn machine off and to close the gas cylinder valve.

3.6.1 Electrode preparation

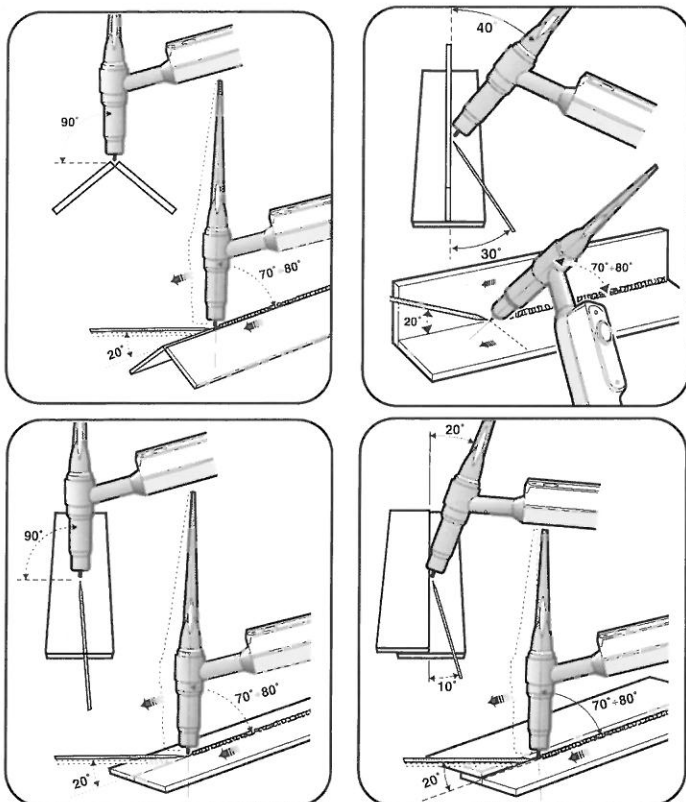
It is necessary to pay special attention to the preparation of the electrode point, grinding it so as to obtain vertical markings as shown in fig. 3.

CAUTION. HOT FLYING METAL PARTICLES can injure personnel, start fires, and damage equipment: **TUNGSTEN CONTAMINATION** can lower weld quality.

- Shape tungsten electrode only on grinder with proper guards in a safe location wearing proper face, hand, and body protection.
- Shape tungsten electrodes on a fine grit, hard abrasive wheel used only for tungsten shaping.
- Grind the end of the tungsten electrode to a taper for a length of 1,5] 2 electrode diameters as shown in fig. 3.



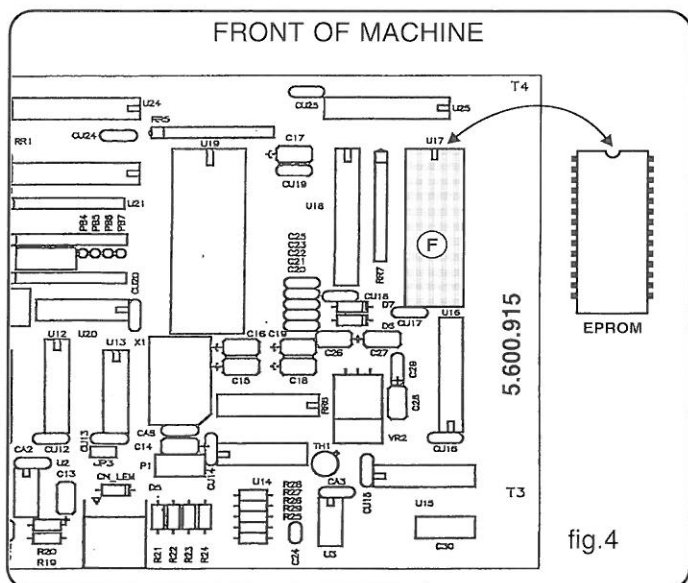
RECOMMENDED WELDING POSITIONS.



4 REMOTE CONTROLS

This device may be used with the remote control unit Art. 185, and with the pedal control Art. 183.


4.1 IMPORTANT!!




In order to be used with these two controls, the machine must have an EPROM with a metal label reading "Art. 263 + remote + date" or 5710450/AA+ art. 0263 on board 5.600.915 (fig. 4). All machines manufactured with serial numbers greater than or equal to 584428 are already equipped with this item; for machines with lower serial numbers, it must be ordered from your dealer, indicating the exact serial number of the

machines on which the new EPROM is to be mounted.

4.2 CONNECTION

To set up an interface between the machine and one of the two devices, set the mode switch **A** to the "remote" position , after first connecting the device to the connector **F** on the machine panel.

When the interface has actually been achieved, the green LED **I** will light and the device will be automatically recognized. If the welding machine does not recognize the presence of the device, the same green LED will flash intermittently.

NOTE: If you connect the remote control device without setting the mode switch **A** to the "remote" position , the machine will continue to operate in local mode. The operating features and potential of the two devices are described in the respective manuals.

5 MAINTENANCE AND CHECK UP

5.1 GENERAL NOTES

Any operation must be carried out by qualified personnel.

Note: The terminals of the filter and main switch are live even when the switch is set to 0 (off).

WARNING: ELECTRIC SHOCK CAN KILL.

- Do not touch live electrical parts.
- Turn off welding power source and remove input power plug from receptacle before, maintenance, servicing.
- MOVING PARTS can cause serious injury.
- Keep away from moving parts.
- HOT SURFACES can cause severe burns
- Allow cooling the unit before servicing.

5.2 WELDING MACHINE MAINTENANCE

Experience has shown that many fatal accidents originated from servicing which had not been perfectly executed. For this reason, a careful and thorough inspection on a serviced welding machine is just as important as one carried out on a new welding machine.

Furthermore, in this way manufacturer can be protected from being held responsible for defects when the fault is someone else.

- If the servicing is not done by the manufacturer, the repaired welding machines which underwent replacements or modifications of any component, should be labelled in a way such that the identity of the person having serviced it is clear.

5.2.1 Precautions to take while servicing:

- EXCESSIVE PRESSURE can break circuit board.
- Use only minimal pressure and gentle movements when disconnecting or connecting board plugs and removing or installing board.
- INCORRECT INSTALLATION OR MISALIGNED PLUGS CAN DAMAGE CIRCUIT BOARD.
- Be sure that plugs are properly installed and aligned before reinstalling cover.