

# INSTRUCTION MANUAL FOR ARC WELDING MACHINE

## IMPORTANT!!!

READ THIS MANUAL CAREFULLY BEFORE INSTALLING, USING, OR SERVICING THE WELDING MACHINE, PAYING SPECIAL ATTENTION TO SAFETY RULES. CONTACT YOUR DISTRIBUTOR IF YOU DO NOT FULLY UNDERSTAND THESE INSTRUCTIONS.

## 1 INTRODUCTION

This machine must be used for welding only. In any case, it is essential to pay special attention to the chapter on SAFETY PRECAUTIONS. The symbols next to certain paragraphs indicate points requiring extra attention, practical advice or simple information. This manual must be kept carefully in a place familiar to everyone involved in using the machine. It must be consulted whenever doubts arise and be kept for the entire life-span of the machine; it will also be used for ordering spare parts.

### 1.1 PLACEMENT

Unpack the machine and place it in an adequately ventilated area, dust-free if possible, taking care not to block the air intake and outlet from the cooling slots. CAUTION: REDUCED AIR CIRCULATION causes overheating and could damage internal parts. Keep at least 500 mm of free space around the device. Never place any filtering device over the air intake points of this welding machine. The warranty shall become void if any type of filtering device is used.

## 2 GENERAL DESCRIPTIONS

### 2.1 SPECIFICATIONS

This welding machine uses INVERTER technology to generate constant direct current and is designed to weld with coated electrodes (excluding the cellulosic type) or using the TIG process with both scratch and high frequency starting.

### 2.2 EXPLANATION OF TECHNICAL SPECIFICATIONS

N°		IEC 974-1 EN 60974-1			
		A / V - A / V			
	U <sub>0</sub>	X	%	%	%
	V PEAK	I <sub>2</sub>	A	A	A
		U <sub>2</sub>	V	V	V
U <sub>1</sub>	1x220V-50/60Hz	I <sub>1</sub>	A	A	A
		A / V - A / V			
	U <sub>0</sub>	X	%	%	%
	V PEAK	I <sub>2</sub>	A	A	A
		U <sub>2</sub>	V	V	V
U <sub>1</sub>	1x220V-50/60Hz	I <sub>1</sub>	A	A	A
<b>IP 23</b>					

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.

Single-phase static frequency converter-transformer-rectifier.

Drooping characteristic.

MMA Suitable for welding with coated electrodes.

TIG Suitable for TIG welding.

U<sub>0</sub> ..... Secondary no-load voltage (Peak value)

X ..... Duty cycle percentage  
The duty cycle expresses the percentage of 10 minutes in which the welding machine can operate at a determined current, without over heating.

I<sub>2</sub> ..... Welding current

U<sub>2</sub> ..... Secondary voltage with welding current I<sub>2</sub>

U<sub>1</sub> ..... Rated supply voltage

1~50/60Hz Single-phase supply 50 or 60 Hz

I<sub>1</sub> ..... Input current at the corresponding welding current I<sub>2</sub>.

IP23 ..... Grade of protection of frame  
Grade 3 as a second digit means that this unit is fit to work outside under the rain.

..... 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 Thermal protection

This unit is protected by a normally closed thermostat placed on the dissipator. When the thermostat opens, the machine stops supplying current, but the fan continues to work. The intervention of the thermostat is indicated by the led turning on (H) fig.2.

#### 2.3.2 Block protections

This welding machine is equipped with two types of block protections:

- 1) Red LED lit under the following conditions:
  - a) power voltage below 100 V
  - b) during warm-up
  - c) during cool-down

**After turning the machine off, wait for this LED to go off completely before turning it back on.**

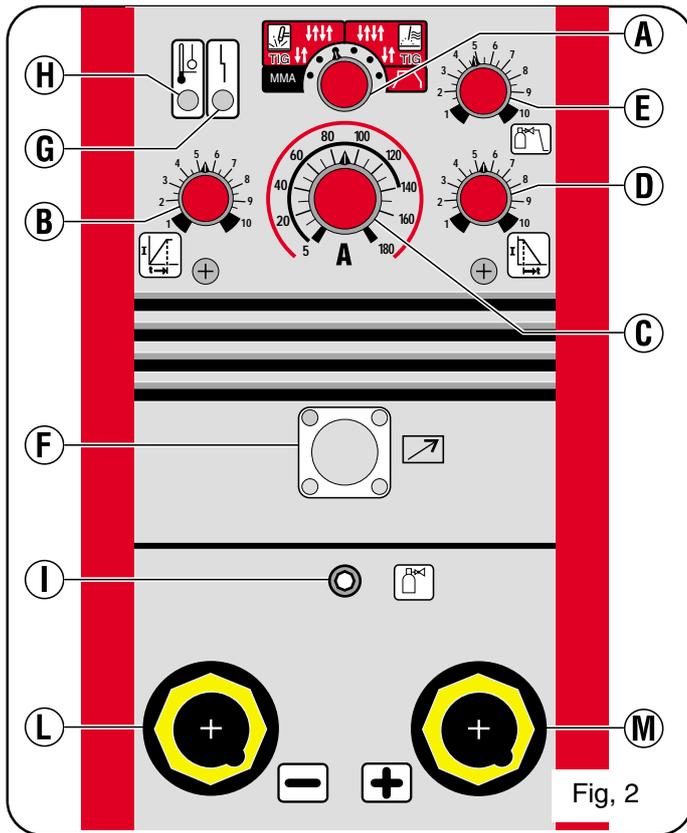
- 2) Red LED lit and yellow LED flashing under the following conditions:
  - a) error in the microcontroller memory
  - b) incorrect signal on the current sensor during warm-up
  - c) short-circuit on the welding clamps when the welding machine is turned on.
  - d) the machine is switched on while the torch trigger is operated.

## 3 INSTALLATION

### 3.1 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. (CENELEC HD 427).

### 3.2 DESCRIPTION OF THE MACHINE



Fig, 2

#### A) Mode selector.



This selector must be set according to the task to be performed, based on the following guidelines:

- 1) MMA Welding of all covered electrodes except cellulose. In this position, only knob **C** is enabled, to adjust the welding current.
- 2) CONTINUOUS TIG welding, with manual strike (scratch) start. To light the arc, press the torch trigger and touch the part briefly. To end welding, release the trigger.
- 3) CONTINUOUS TIG welding with automatic strike (scratch) start. To light the arc, press and release the torch trigger and touch the part briefly. To end welding, press and release the trigger.
- 4) CONTINUOUS TIG welding, started by means of a high voltage/frequency device and automatic command. To light the arc, press and release the torch trigger. To end welding, press and release the trigger.
- 5) CONTINUOUS TIG welding, started by means of a high voltage/frequency device and manual command. To light the arc, press the torch trigger. Release the trigger to end welding.
- 6) CONTINUOUS TIG welding, started by means of a high voltage/frequency device with manual program. To light the arc, press the torch trigger; the current begins to slope up at fixed increments

(regardless of the position of knob **B**). If the trigger is released, the current instantly rises to the maximum value set on knob **C**. To end welding, press the trigger; the current begins to slope down at fixed decrements (regardless of the position of knob **D**). If the trigger is released, the current immediately returns to zero.

- B) **Knob to set current slope up time (0-10 sec.)**
- C) **Knob to adjust the welding current. The current is adjusted up to 140A in MMA mode, up to 180A in all other TIG modes.**
- D) **Knob to set current slope down time (0-10 sec.)**
- E) **“Gas-delay” knob**  
Adjusts the gas outlet time when welding is finished. The setting field ranges from 0.3 sec. to 30 sec.
- F) **Connector for TIG torch trigger**  
The torch trigger wires (normally open) must correspond to pins 1 and 5.
- G) **Block LED** (see 2.3.2)
- H) **Thermostat LED.**  
This lights when the operator exceeds the service or intermittent percentage factor allowed for the machine, and simultaneously cuts off all current distribution.

**NOTE: In this condition, the fan continues to cool the generator.**

- I) **Fitting (1/4 GAS).**  
Used to connect the gas hose of the TIG welding torch.
- L) **Negative outlet clamp (-).**
- M) **Positive outlet clamp (+).**

### 3.3 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.

### 3.4 COATED ELECTRODE WELDING

- This welding machine is fit to weld all types of electrodes except the cellulose type (AWS 6010)
- Use electrode holder clamps in compliance with the safety standards and without projecting tightening screws.
- Make sure that switch located on the back panel is in 0 (off) position, then connect welding cables in accordance with polarity demanded by the electrode manufacturer which you will be using.  
Connect the earth cable clamp to the workpiece.
- Welding circuit should not be deliberately placed in direct or indirect contact with protection wire if not in the workpiece.
- 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.

- Check to see that power supply voltage corresponds to voltage indicated on the welding machine technical specification tag.
- Connect the power cord to a plug with a sufficient capacity, making sure that the yellow/green conductor of the power cord is connected to the grounding pin.
- The capacity of magnetothermic switch or fuses in series with mains supply should be more than or equal to current  $I_1$  absorbed by the unit.
- Input current  $I_1$  is determined by reading the technical specifications on unit i.e. power supply voltage  $U_1$  available.
- Any extensions should have adequate sections for input current  $I_1$ .
- Turn the machine on with the main switch.
- Do not touch live electric parts.
- Do not touch weld output terminals when unit is energized.
- Do not touch torch or electrode holder and ground clamp at the same time.
- Regulate current based on the diameter of the electrode, welding position and type of joint to be carried out.

**When finished welding, always remember to turn unit off, and to remove electrode from electrode holder.**

### 3.5 TIG WELDING

- This welding machine is fit for welding with TIG procedure: stainless steel, iron, and copper.
- Connect ground cable wire to positive (+) pole of welding machine and connect clamp to work piece as close as possible to welding machine, making sure there is a good electrical contact.
- The welding machine circuit should not be deliberately in direct or indirect contact with protection conductor if not in the workpiece.
- 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.
- Use TIG torch suitable for the welding current and connect power wire to negative pole (-) of welding machine.
- Connect torch connector to welding machine connector **F**.
- Connect the torch gas tube fitting to the welder fitting **I**, and the gas hose from the cylinder pressure reducer to the gas fitting located on the rear panel.

Using knob **A** select scratch start  or high frequency start  and the manual mode  or the automatic mode .

- 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.
- The most commonly used shielding 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).

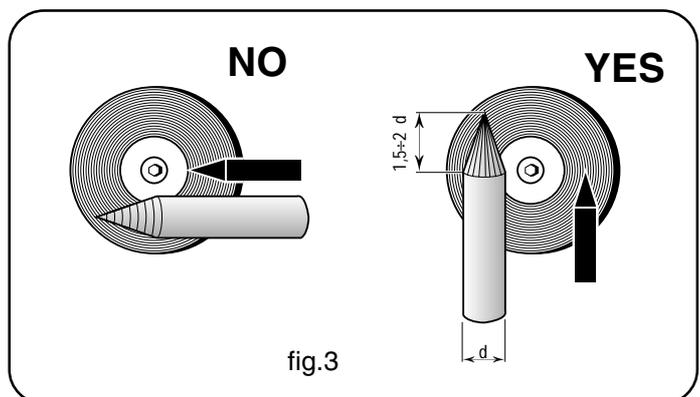
- Use protection lenses with shades D.I.N. 10 for up to 75A and D.I.N. 11 for 75A and above.
- Use a 2% thoriated tungsten electrode chosen according to table 2 and prepared according to that indicated in point 3.6.1.

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

- Check to see that power supply voltage corresponds to voltage indicated on the welding machine technical specification tag.
- Connect the power cord to a plug with a sufficient capacity, making sure that the yellow/green conductor of the power cord is connected to the grounding pin.
- The capacity of magnetothermic switch or fuses in series with mains supply should be more than or equal to current  $I_1$  absorbed by the unit.
- Any extensions should have adequate sections for absorbed current  $I_1$ .
- Turn machine on with the main switch.
- 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.
- **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.



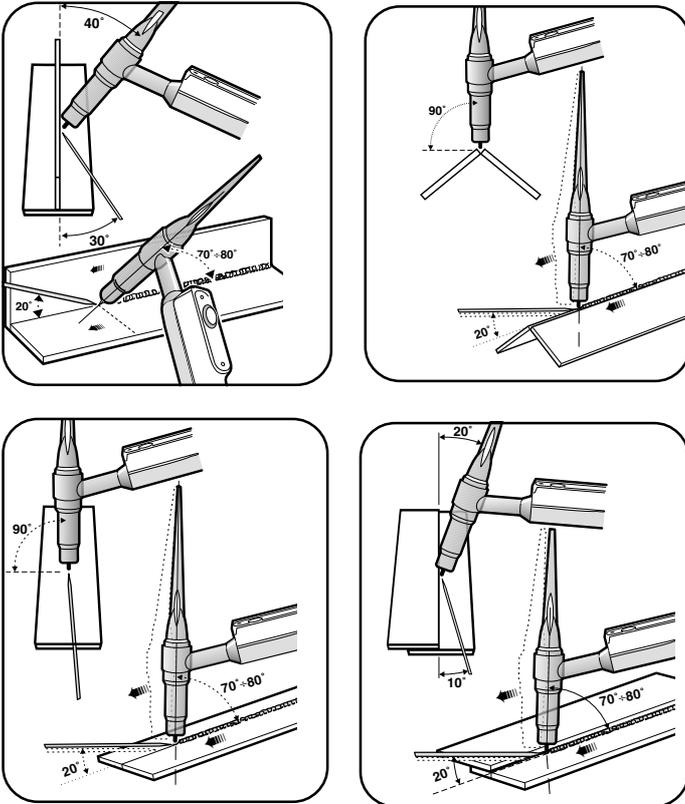
**CAUTION. HOT FLYING METAL PARTICLES** can injure personnel, start fires, and damage equipment: **TUNGSTEN CONTAMINATION** can lower weld quality.

- 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.

### 3.6.2 Recommended welding positions.



## 4 MAINTENANCE AND SERVICE

### 4.1 GENERAL NOTES

- Do not touch live electrical parts.
- Turn off welding power source and remove input power plug from socket 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.

### 4.2 WELDING MACHINE MAINTENANCE

**All servicing and repair must be done by qualified personnel.**

#### 4.2.1 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 replacing cover.
- Following any repair work, great care must be taken when refitting cables and wires to ensure safe and proper insulation between the primary and secondary sides of the machine. When refitting wires and cables, ensure that wires

cannot come into contact with moving parts or those parts which heat up during operation. Refit clips and straps in their original position and in such a way that any accidental cable breakage or disconnection will not lead to a dangerous contact between the primary and secondary circuits.

## 5 GENERAL PRECAUTIONS

### 5.1 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.

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. These must be carefully cleaned before being welded.
- 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.

### 5.2 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.

### 5.3 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.

#### 5.4 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.

#### 5.5 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.

#### 5.6 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.

- Make sure that bench and the workpiece are connected to efficient earth point.

- 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.

#### 5.7 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.