

# INSTRUCTION MANUAL FOR MIG WELDING MACHINES

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 INSTALLATION

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 replacement 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.

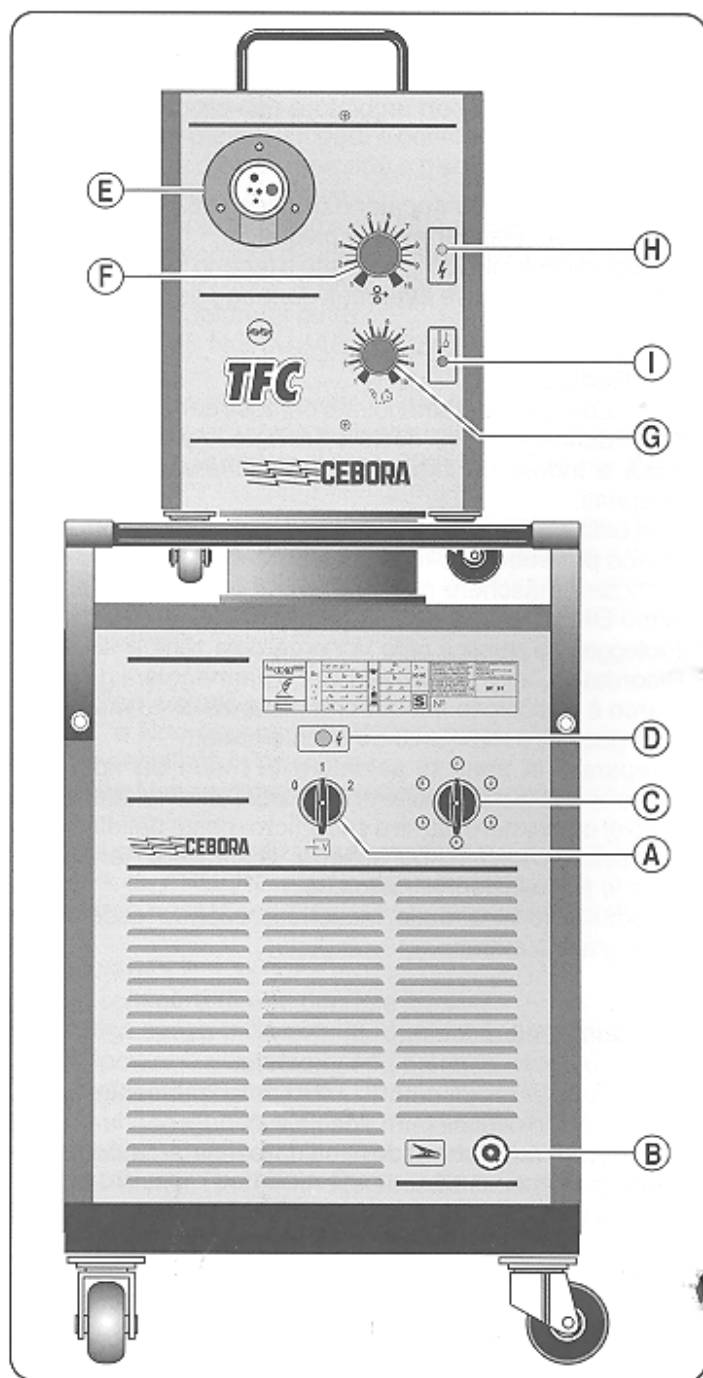
Never place any filtering device over the air intake points of this welding machine.

The warranty shall become void if any type of filtering device is used.

## 2 DESCRIPTION OF THE MACHINE

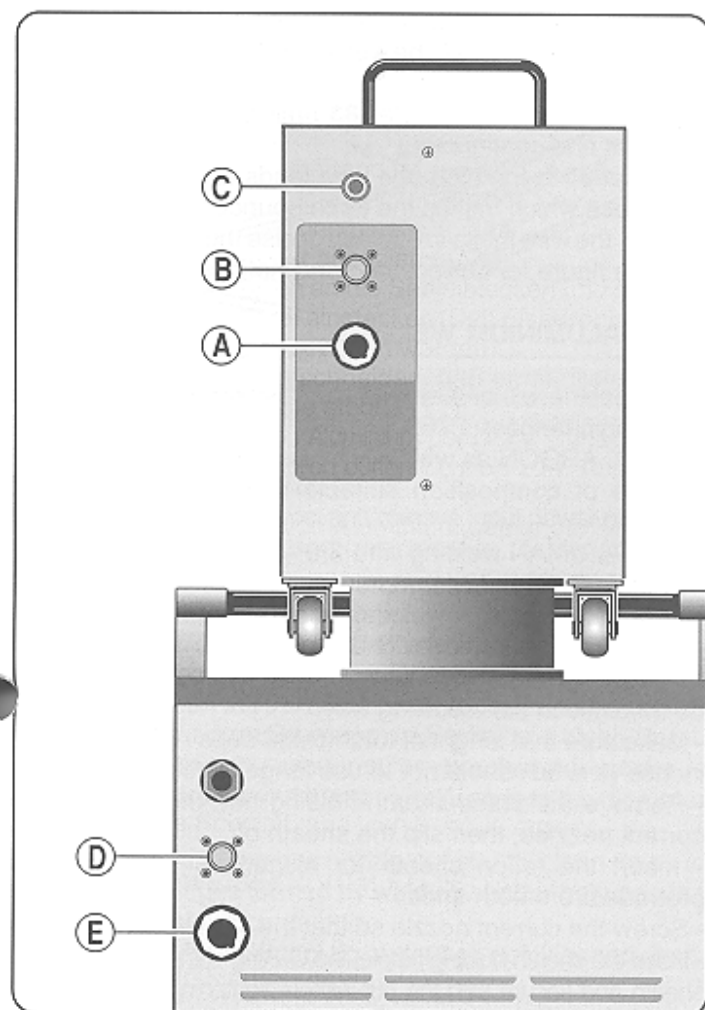
### 2.1 COMMANDS ON THE FRONT PANELS OF THE POWER SOURCE AND OF THE WIRE FEEDER

- A) **Switch**  
Turns the machine on and off, and also regulates the welding voltage range.
- B) **Earth socket**  
Socket to which the earth cable connector is attached.
- C) **Switch**  
For fine-tuning the welding voltage.
- D) **Clear pilot light**  
Indicates that the machine is turned on.
- E) **Central connector**  
Connector to which the welding torch is to be attached.
- F) **Setting knob**  
This knob serves to adjust the speed of the welding wire feed.
- G) **Spot welding timer knob**  
This knob adjusts the spot welding time. By pressing the torch trigger, the machine begins welding for the time set on the knob. The torch trigger must be released and pressed again in order to re-start the cycle.
- H) **Green LED**  
Indicates that the machine is turned on.
- I) **Yellow LED**  
Lights only when the thermostat is tripped and interrupts the machine operation.



### 2.2 CONNECTIONS ON THE BACK PANELS OF THE POWER SOURCE AND OF THE WIRE FEEDER

- A) **Plug**  
Plug to which the welding power connector of the extension is connected (pole +).
- B) **6-pole connector**  
Female connector to which the 6-pole male connector of the extension is connected.
- C) **Gas hose fitting**  
To which the gas hose of the extension is connected.
- D) **6-pole connector**  
Female connector to which the 6-pole male connector of the extension is connected.
- E) **Socket**  
Socket to which the welding power connector of the extension is connected (pole +).



### 3 GENERAL DESCRIPTION

#### 3.1 SPECIFICATIONS

This welding machine is a semiautomatic, constant voltage generator. It is possible to weld mild steel, stainless steel, and aluminium.

#### 3.2 EXPLANATION OF TECHNICAL SPECIFICATIONS

N° Serial number which must be stated when asking for information or servicing related to this machine.

Single-phase Transformer - Rectifier

Three-phase Transformer - Rectifier

External characteristics of the unit.

Secondary no-load voltage.

X The duty-cycle expresses the percentage of 10 minutes during which the welding machine can operate

at a determined current level without overheating:

e.g. X = 60% at  $I_2 = 100$  A.

This means that the welding machine can weld with a current  $I_2 = 100$  A for 6 minutes out of 10, i.e. 60%.

Welding current

Secondary voltage with welding current I

Nominal supply voltage at the rated frequency.

Input current at the corresponding welding current I

Grade of protection of the case.

Grade 1 as a second digit means that this unit is not fit for working in the rain.

Fit for working in high-risk areas.

#### 2.3 DESCRIPTION OF PROTECTION

This unit is protected by a normally closed thermostat placed on the power transformer.

When the thermostat intervenes, the machine stops welding, while the motor-driven fan continues to work.

Wait a few minutes to allow the generator to cool down.

#### 4 START-UP

The machine must be installed by skilled personnel. All connections must be made in compliance with current regulations and in full respect of safety laws (see standard CENELEC HD 427).

Assemble the parts supplied with the welding machine.

Attach the wire feeder support 80 to the generator and the rotating cylinder 81 under the wire feeder, using the screws provided.

Position the wire feeder on the generator, connecting the two parts electrically via 54.

Assemble the welding torch 18.

Make sure that the wire diameter corresponds to the one indicated on the wire feed roller, and load the wire reel. Make sure that the welding wire passes through the groove in the wire feeder roller 29.

Before connecting the mains cable 58, make sure that the supply voltage corresponds to that of the welding machine, and that the earth socket functions properly.

Connect the earth clamp 74 to the part to be welded.

Turn the machine on using the switch 75.

Remove the tapered gas nozzle 10 by turning it clockwise.

Unscrew the contact tip 9.

Press the torch trigger and release it only when the welding wire comes out.

**Welding wire can cause puncture wounds.**

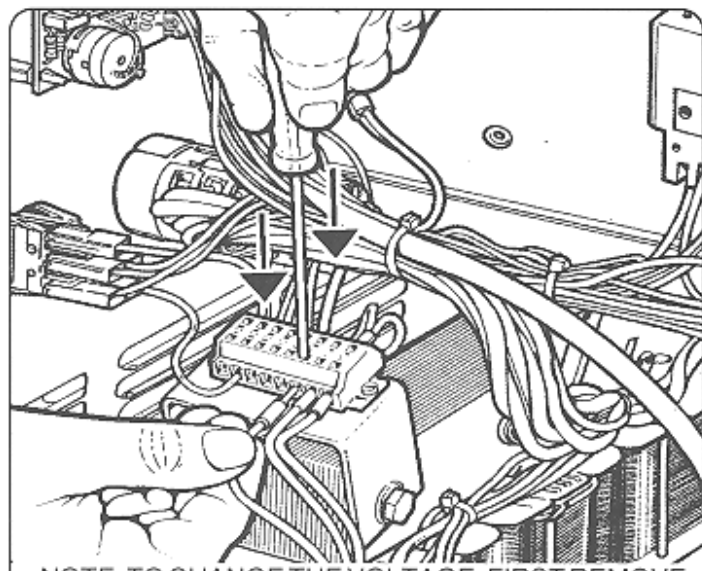
Never aim the torch at parts of the body, other people or metals when loading the welding wire.

Screw the contact tip back on, making sure that the hole diameter corresponds to the wire used.

Slide the tapered gas welding nozzle on, always turning clockwise.

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For machines with three-phase power supply, the connection voltage can be changed by following the instructions given in the figure below.



NOTE: TO CHANGE THE VOLTAGE, FIRST REMOVE THE GUARD PLATE (59).

IMPORTANT: BEFORE CHANGING THE VOLTAGE, MAKE SURE THAT THE MACHINE IS UNPLUGGED FROM THE POWER SOCKET.

Never touch the welding output clamps while the machine is turned on.

CAUTION: The yellow-green wire of the welding machine mains lead must always be connected to the protection conductor (grounding system). The yellow-green wire must NEVER be connected to a phase wire to carry current.

#### 4.1 CONNECTING THE GAS HOSE

##### WARNING!!

CYLINDERS CAN EXPLODE IF DAMAGED

- Keep the cylinders in an upright position by chaining them to their support.
- Keep the cylinders in a place where they cannot be damaged.
- Do not lift the machine with the cylinder on its support.
- Never touch the cylinder with the welding wire.
- Keep the cylinder away from the welding area and uninsulated electric circuits.
- Cylinders containing inert gas have to be equipped with a regulator and a flowmeter.
- After having positioned the cylinder, connect the gas hose that comes out from the rear of machine to the pressure regulator. Turn the gas cylinder on and adjust the flowmeter to approx. 8-10 litre/min.

ATTENTION: Make sure that the gas used is compatible with the material to be welded.

#### 4.2 GENERAL NOTES

Before using this welding machine, carefully read the regulations CEI 26/9 or CENELEC HD 407 and CEI 26/11 or CENELEC HD 433. Also make sure that the insulation on cables, torch and earth cable is intact.

Adjust the welding voltage with switch **73** and **75**.

— Approach the point to be welded and press the torch push button.

— Adjust the potentiometer **83** until the welding noise is constant and continuous.

If the speed is too high, the wire tends to get stuck on the workpiece which makes the torch bounce back. If speed is too low, the wire melts irregularly or else the arc switches off. See the figure for correct torch inclination.

#### 5.2 ALUMINIUM WELDING

The machine will be set up as for mild steel except for the following changes:

1. 100% ARGON as welding protection gas.
2. Wire of composition suitable for the material to be welded.
  - For ALUMAN welding wire 3%5% silicon.
  - For ANTICORODAL welding wire 3%5% silicon.
  - For PERALUMAN welding wire 5% magnesium.
  - For ERGAL welding wire 5% magnesium.

NOTE: If you only have a torch for steel wires, the same shall be modified in the following way:

- Make sure that length of torch cable does not exceed 118 inches (it is advisable not to use longer torches).
  - Remove the brass sheath-holding nut, the gas and the current nozzles, then slip the sheath off.
  - Insert the teflon sheath for aluminium and ensure it protrudes from both ends.
  - Screw the current nozzle so that the sheath adheres to it.
  - Insert the sheath holding nipple, the O-Ring in the free end of the sheath and secure with the nut without tightening too much.
  - Slip the brass tube on the sheath and insert both into the adapter (after removing the iron tube which was fitted inside the adapter).
  - Cut the sheath diagonally so that it stays as close as possible to the wire slide roller.
  - Use drive rolls that are suitable for aluminium wire. The drive rolls, when being installed, must be tightened as tight as possible.
  - Use contact tips that are suitable for aluminium wire and make sure that the diameter of the contact tip hole corresponds to the wire diameter that is going to be used.
  - Use abrasive grinders and tool brushes specifically designed for aluminium. Never use these tools on other materials.
- REMEMBER that cleanliness equals quality.  
The wire spools must be stored in plastic bags with a dehumidifier.  
See Figure for the correct torch inclination.

#### 5.3 STAINLESS STEEL WELDING

The machine will be set-up as for mild-steel welding except for following changes:

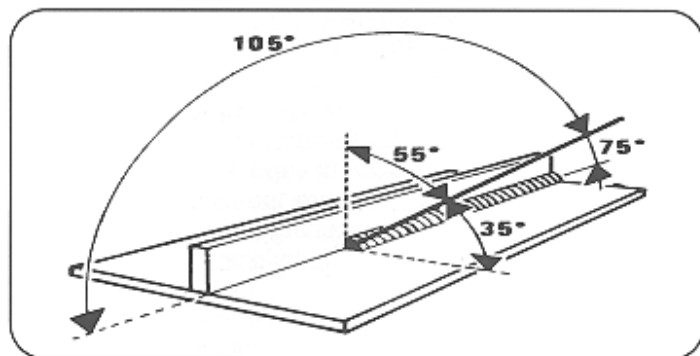
- Stainless steel wire compatible with the composition of steel to be welded.
- Cylinder containing a mixture of 98% ARGON + 2% O<sub>2</sub> (recommended mixture).

NOTE: Recommended torch inclination and welding direction are shown in the figure.

### 5 WELDING GUIDELINES

#### 5.1 CONTINUOUS MILD-STEEL WELDING

75% ARGON + 25% CO<sub>2</sub> or 100% CO<sub>2</sub> can be used for mild steel welding.



## 6 MAINTENANCE AND CHECK UP

All servicing and repair must be done by qualified personnel.

### 6.1 GENERAL NOTES

● Turn off the power source, and remove input power plug from receptacle before inspection, maintenance, or servicing. MOVING PARTS can cause serious injury.

● Keep away from moving parts.

HOT SURFACES can cause severe burns.

● Allow cooling period before servicing.

● Periodically clean the transformer or diodes from any dust or foreign bodies; for this purpose, use a dry and clean air jet. When reinstalling the drive roll, ensure that the groove is aligned with the wire and that it corresponds to the diameter of the wire used.

Keep the inside of the gas nozzle constantly clean so as to avoid metal bridges formed by welding spatter between the gas nozzle and the contact tip.

Make sure that the contact tip outlet has not widened, if so, replace it.

The torch must not be banged or violently knocked.

### 6.2 WELDING MACHINE SERVICING

Experience has shown that many fatal accidents originated

from servicing improperly 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 producers can be protected from being held responsible for defects stemming from repairs not carried out by the manufacturer.

#### 6.2.1 Prescriptions to follow for servicing

● After rewinding the transformer or the inductance, the welding machine must pass the applied-voltage test in accordance with indications in table 2 of 6.1.3 of the EN 60974.1 standard (CEI 26.13).

Conformity must be checked as specified in 6.1.3.

● If no rewinding is done, a welding machine which has been cleaned and/or reconditioned must pass an applied-voltage test with voltage values equal to 50% of the values given in table 2 of 6.1.3. Conformity must be checked as specified in 6.1.3.

● After rewinding and/or the replacement the no-load voltage shall not exceed the values given in 10.1 of EN 60974.1.

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

● After making repairs, take care to re-order the cables so that there is sure to be insulation between the primary and secondary sides of the machine. Make sure that the wires cannot come into contact with moving parts or parts that heat during operation. Replace all clamps in their original positions on the machine, to prevent a connection between the primary and secondary circuits if a conductor accidentally breaks or disconnects.

### 6.3 TROUBLESHOOTING GUIDE

TROUBLE	PROBABLE CAUSE	REMEDY
The welding machine supplies limited current	Line fuse blown	Replace line fuse
	Burnt out diode or diodes	Replace
	Burnt out electronic board	Replace
	Loosened torch or earth connections or any other electrical power connections	Tighten all connections
Welding with a lot of metal spatter	Voltage adjustment switch has a loose contact	Replace the switch
	Improper adjustment of welding parameters	Select the correct parameters through the welding-voltage potentiometer and the wire-speed adjustment potentiometer
	Insufficient grounding	Check grounding connections
The wire jams or entangles between the drive rolls and the torch infeed wire guide	Contact tip with wrong diameter	Replace
	Misalignment of the drive roll groove	Realign
	Inlet wire guide out of position	Position it as close as possible to the drive roll.
	Obstructed or clogged liner	Remove and clean

TROUBLE	PROBABLE CAUSE	REMEDY
No wire feed or irregular wire feed	Drive roll with too large a groove	Replace the drive roll
	Obstructed or clogged liner	Remove and clean
	Wire holding roller not completely tightened	Tighten all the way
	Spool holder clutch too tight	Loosen the clutch through the adjustment
	Clogged contact tip	Replace
Porosity in the welding seam	Insufficient shielding gas	Increase gas delivery
	Excess oxidation of the edges to be welded	Thoroughly clean the edges with a metal brush
	Gas nozzle partially or completely clogged by spatter	Remove and clean or replace being careful not to clog the gas outlets



## 7 SAFETY PRECAUTIONS

### 7.1 Fire



- Avoid causing fire because of sparks, slag, hot metal or pieces.

- Make sure that suitable fire-fighting equipment is available close to welding area.

- Remove all flammable and combustible material from the welding area and its surrounding (32 ft minimum).

- 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.

### 7.2 Burns

- Wear fire-proof clothing all over your body in order to protect your skin against burns caused by ultraviolet 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 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 or cut.

### 7.3 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.

- 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, mercury or beryllium, 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.

### 7.4 Explosions



- Do not weld above or near containers under pressure.

- Do not weld in environments containing explosive dusts, gases or vapours.

This welding machine uses inert gases such as CO<sub>2</sub>, ARGON, or a mixture of ARGON + CO<sub>2</sub> for the protection of the arc, thus you should take special precautions:

#### A) CYLINDERS

- Do not directly connect cylinder to the machine gas hose 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 use cylinders whose content has not been clearly identified.

- 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 flame.

- Do not tamper with the cylinder valves.

- Do not try to loosen tight valves by means of hammers, keys, or any other object.

- **NEVER DEFACE** or alter name, number, or other markings on a cylinder. It is illegal and hazardous.

- 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 a cylinder.

- Never refill any cylinder.

- Cylinder fittings should never be modified or exchanged.

#### 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.

### 7.5 Radiations



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 or DIN 11 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.

## 7.6 Electric shock



Electric shock can kill.

All electric shocks are potentially fatal.

- Do not touch live parts.
- Insulate yourself from the piece to be cut 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 touching the piece to be welded.
- 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.
- Always fit an automatic wall switch with adequate power, possibly close to the machine, allowing you to immediately switch the machine off in case of an emergency.
- Frequently inspect the power supply 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 disconnect unit safety devices.
- 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.

## 7.7 Pace maker

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

## 7.8. Caution!

**Welding wire can cause puncture wounds.**

- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, other people, or any metal when threading welding wire.

## 7.9. Moving parts can cause injury.

Moving parts, such as fans, can cut fingers and hands and catch loose clothing.

- Keep all doors, panels, covers, and guards closed and securely in place.
- Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.
- Keep hands, hair, loose clothing, and tools away from moving parts.
- Reinstall panels or guards and close doors when servicing is finished and before starting the machine.

## 7.10 Noise



These power source alone do not produce noise levels exceeding 80 dB. The welding procedure, however, may produce noise levels in excess of 80 dB. In which case the machine operator must take the necessary safety precautions as prescribed by the national safety regulation.