

# INSTRUCTIONS FOR PLASMA ARC CUTTER

## BASIC SAFETY PRECAUTIONS

### Fumes



During cutting operations, harmful metal dust and fumes are produced. It is therefore recommended to use safety masks and to ensure that working areas are adequately ventilated to guarantee sufficient operator protection. In closed areas it is recommended to install air extractors underneath the cutting zone. Should halogen grease removers or solvents be present on the material to be cut, it is important that such material be cleaned prior to cutting operations in order to avoid the formation of toxic gases. Some chlorinated solvents are apt to decompose in the presence of radiations emitted by the arc, and generate phosgene gas. Plated metal or metals containing lead, graphite, cadmium, zinc, mercury or beryllium can produce toxic fumes during cutting.

### Ultraviolet rays



Rays created during cutting operations have the same effect as those produced by arc welding. To protect against such rays which are harmful to eyes and skin, welding gloves and safety goggles with closed sides and grade 4 or 5 safety lenses should be worn. It is recommended that safety precautions be extended to cover the entire operations area, persons included.

### Fire



Precautions should be taken against fire caused by sparks or hot slag:  
— all inflammable and combustible materials should be removed from the cutting zone;  
— cutting should not be carried out on fuel or lubricant containers, whether full or empty, or on parts with cavities filled with inflammable material;  
— fire-fighting equipment should be installed in the vicinity of work stations.

### Electric shock



The plasma arc cutter is required for spark starting and during cutting of dangerous voltages. The following safety regulations should therefore be observed:

- parts to be cut should not be directly supported by the operator or held by hand;
- operations should not be carried out in humid or wet areas;
- equipment should not be used should cables or torch parts present damage;
- equipment should always be switched off prior to any substitution of nozzle, electrode or diffuser;
- damaged parts of the torch and torch cables should always be substituted with original material;
- power to the equipment should be cut off prior to any intervention on the torch, cables or the internal part of the generator;
- the power feed line should be provided with an efficient earth plate;
- the work bench should be connected to an efficient earth plate;
- any eventual maintenance should be carried out by qualified personnel only, who are well aware of the risks due to the dangerous voltages required for the equipment to operate.

### Burns

The operator should be equipped with fire-proof shoes and clothing to protect against sparks and eventual material slag: normal precautions during any welding operation. The torch flame should not be directed towards persons or foreign bodies.

## PUBLICATIONS

The following publications provide additional information on safety precautions:

A) Bulletin No. C5.2-83 «Recommended Safe Practices for Plasma Arc Cutting»

B) American National Standard ANSI Z49.1-83 «Safety in Welding and Cutting»

Both are available from: American Welding Society Inc. - 2501 Northwest 7th Street - Miami, Florida 33125 - Telephone (305) 443-9353

C) OSHA Safety and Health Standards, 29CFR 1910, available from the U.S. Department of Labor, Washington, D.C. 20210.

## SAFETY DEVICES

The equipment is provided with the following safety devices:

**Thermic:** located on the transformer windings to avoid eventual overloads.

**Pneumatic:** located on torch feed to avoid insufficient air pressure.

**Electric:** located on torch body to avoid the presence of dangerous voltages in the event of removal of nozzle holder.

## INSTALLATION AND OPERATION

Mount wheels, support and handle according to the instructions indicated in Fig. 1.

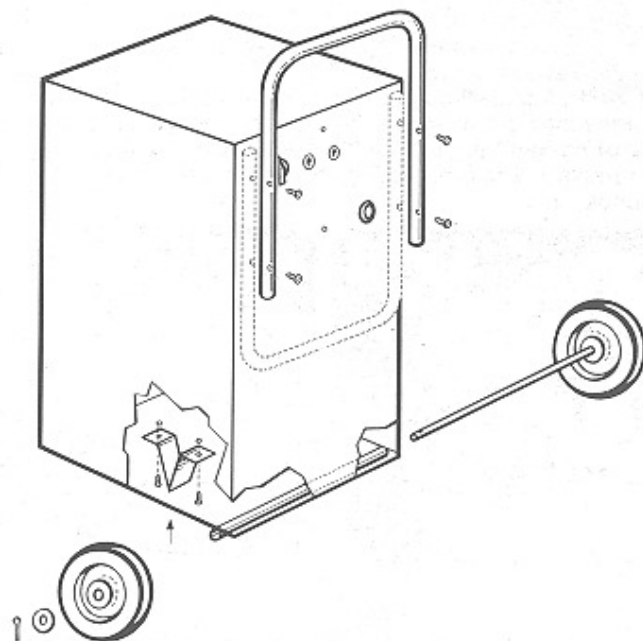


Fig. 1

Install the equipment in an adequately ventilated area, taking care that there be no obstruction to the input and output of air from the cooling slots.

Connect power cable **A** to socket provided with an efficient earth wire. Eventual extension leads should be of adequate sections.

Connect air feed to connector **B** and ensure that pressure be at least 90 PSI with a minimum yield of 250 SCFH.

Lift the pressure regulator knob **E** up and adjust the pressure, shown by the gauge **F**, to approx. 80-88 PSI (5.5-6 bar). Turn the device on by acting on network switch **C**; the light **D** will signal this operation. Set knob **G** to 1 or 2 according to cutting requirements.

**This operation is never to be made during the cutting phase or when the torch button is pressed.**

The emission of the compressed air flow is controlled by pressing the torch button. Make sure that at this stage pressure shown

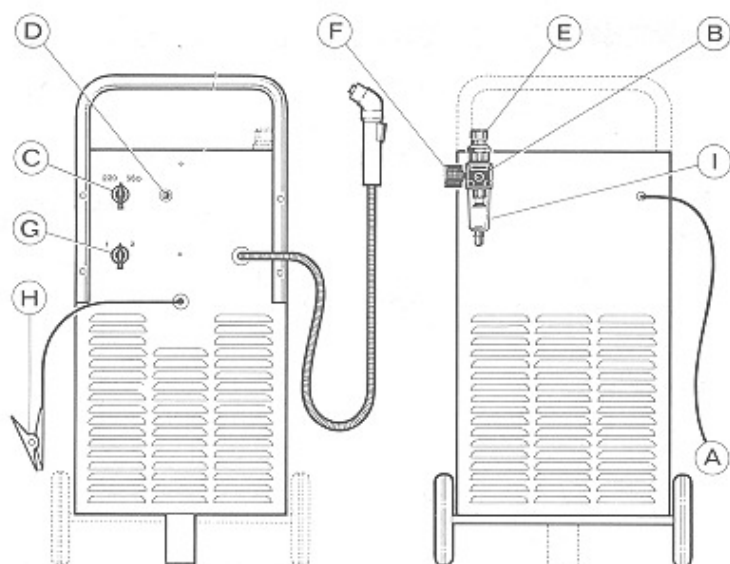


Fig. 2

by the gauge **F** is between 60 and 70 PSI (4 and 4,7 bar); if not, adjust the pressure by means of the pressure regulator knob **E** and then lock the knob by pressing it downwards.

Connect earth clamp **H** to part to be cut, ensuring that there be a good electrical contact, especially in the case of painted or oxidized sheet metal or sheet metal with insulation coatings.

Bring the nozzle against the workpiece to be cut and exert a firm pressure (**A**) on the torch while pressing (Fig. 3) the push button. Keeping the push button pressed, immediately release the pressure (**B**) by a quick movement without however moving the nozzle away from the workpiece.

**The ignition of cutting arc must occur within about 2 seconds from the moment in which the torch pushbutton is pressed; in case of no-ignition you will have to let the pushbutton go and then press it again repeating the operation in the following 2 seconds.**

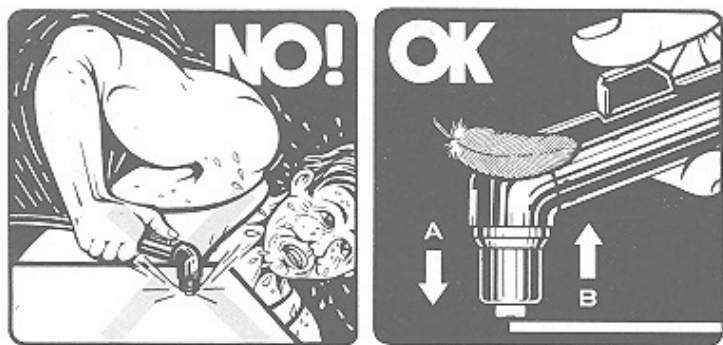


Fig. 3

Carry out the cutting by sliding the nozzle on the workpiece. The air flow to the torch stops after about 20 sec. since the button for cooling the torch is released.

The unit can be only switched off after the flow stops.

**Flowability of the nozzle holder should be checked manually every time the machine is used. Of course this operation must be carried out when the machine is switched off.**

**N.B.** Avoid arc switched on while in the air to avoid useless consumption of electrode, nozzle and diffuser.

Should the air in the system contain considerable quantities of humidity or oil, we suggest to use a special drier to avoid excessive wear of consumable parts and damage to the torch.

## TORCH MAINTENANCE

Power to the equipment should be cut off prior to any intervention on the torch.

### 1) Substitution of consumable parts (fig. 4).

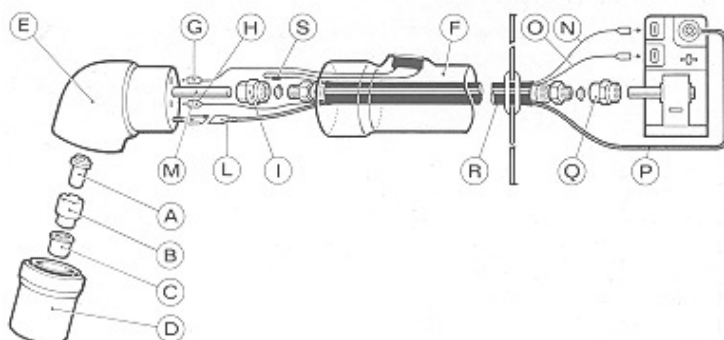


Fig. 4

Parts subject to wear are the electrode **A**, the diffuser **B** and the nozzle **C**. Nozzle holder **D** must first be unscrewed before any of these parts can be substituted.

The electrode **A** must be replaced when it has a crater in the middle approx. 1,5 mm. deep (see fig. 5). The nozzle **C** must be replaced when the central hole is too large compared to that of the new or worn out workpiece (see fig. 6).

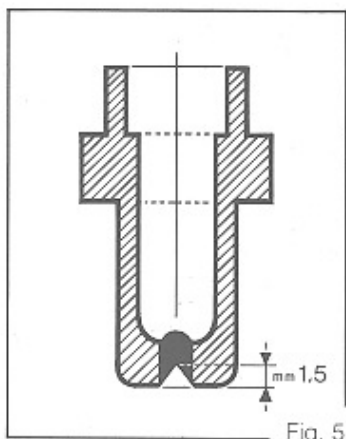


Fig. 5

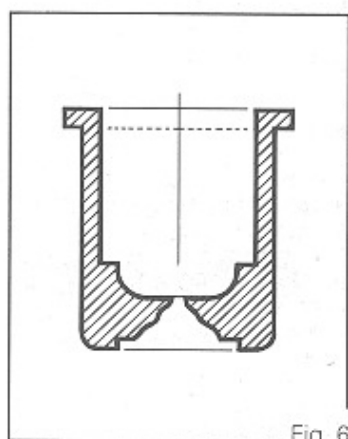


Fig. 6

When the electrode is worn out the nozzle wears very rapidly. When the electrode is worn out the machine loses its cutting power.

A delayed replacement of electrode and nozzle causes an excessive overheating of parts such as to jeopardize life of diffuser **B**. Electrode **A** is fixed by screw. Pay attention not to engrave it during the assembly.

Nozzle holder **D** should be sufficiently tightened after such substitution and a manual check be done to ensure that nozzle **C** not rotate.

### 2) Substitution of torch body **E** (fig. 4).

Extract the handgrip **F** from the body **E** by swinging the handgrip. During this operation make sure not to tear the button wires off. Remove leads from safety contacts **G** and **H**. Remove the connection **L**. Unscrew union **I** and remove tube **M** from torch body. Mount new torch body, carrying out previous operations in reverse order.

Before inserting handgrip, ensure that cables be well separated and connections well tightened.

### 3) Substitution of complete torch (fig. 4).

Remove side covering from equipment. Remove the two faston contacts **N** and **O**. Remove red lead **P** from terminal board. Unscrew union **Q**. Remove torch. Mount new torch, carrying out previous operations in reverse order.

### 4) Substitution of cable **R** (fig. 4).

Substitution of the cable may be carried out by following the operations indicated in 2) and 3) and carrying out connection **S**.

**N.B.:** Connection **S** must be carefully insulated.

### 5) Replacement of the handgrip with button when replacing.

The handgrip with button both the operations stated at point 2 and 4 must be carried out.

## CUTTING PROBLEMS

### 1) Insufficient penetration

This problem may be caused by:

- high speed. Always ensure that arc fully goes through the workpiece to be cut and that its inclination is never higher than  $10 \div 15^\circ$  (see fig. 7). This will prevent misuse of nozzle (see fig. 8) as well as burnings to nozzle holder (see fig. 9).

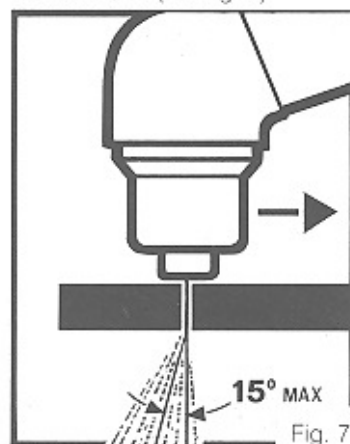


Fig. 7

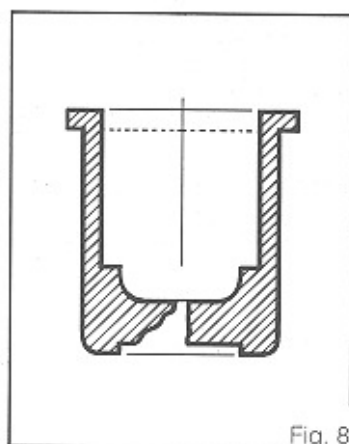


Fig. 8

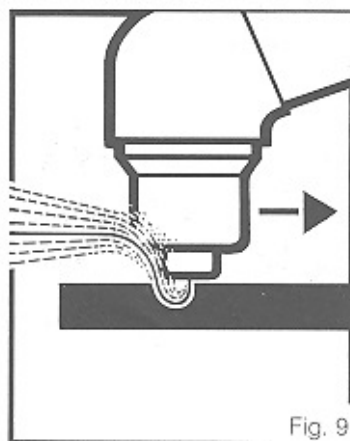


Fig. 9

- excessive thickness of part;
- knob **G** (Fig. 2) on **1** instead of **2**;
- low power voltage;
- earth clamp **H** not in good electrical contact with part.

**N.B.:** When arc does not cut, molten metal slag obstructs nozzle.

### 2) Cutting arc is extinguished

This problem may be caused by:

- worn nozzle, electrode or diffuser;
- excessive air pressure.

### 3) Inclined cut.

Should the cut be inclined (see fig. 10) loosen the nozzle holder **D** and rotate nozzle **C** one fourth of a turn, then tighten it. Repeat this operation until the cut is straight (see fig. 11).

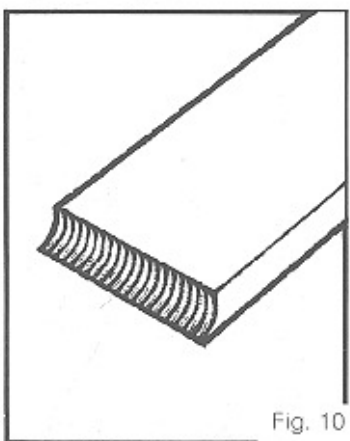


Fig. 10

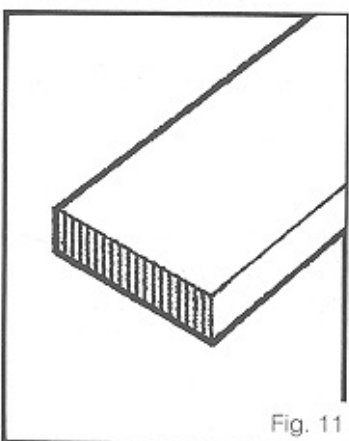


Fig. 11

## 4) Information about possible faults

The possible faults here below listed, refer to tests on a lit machine and with the compressed air pipe connected. Possible checks must always be carried out with the supply wire disconnected from the network.

### A) Pushing the button no air comes out from the torch.

Verify:

- that there is pressure in the air supply system
- the efficiency of pushbutton and of safety-contacts on the torch
- the correct working of the solenoid valve on air circuit
- the efficiency of the printed circuit board.

### B) Pushing the button air comes out from the torch but you cannot light the cutting arc.

Verify:

- that air pressure is sufficient
- the efficiency of the pressure switch
- the efficiency of the power main contactor
- the efficiency of the rectifier
- that the thermostat on transformer is not momentarily open because of machine overload or is interrupted because of a fault.
- the efficiency of the printed circuit board
- that condensers do not present any anomalous swelling
- the possible electric circuit cutoff

### C) Cutting power is insufficient

After having checked that the trouble does not depend from a cause listed in paragraph «Cutting problems», verify:

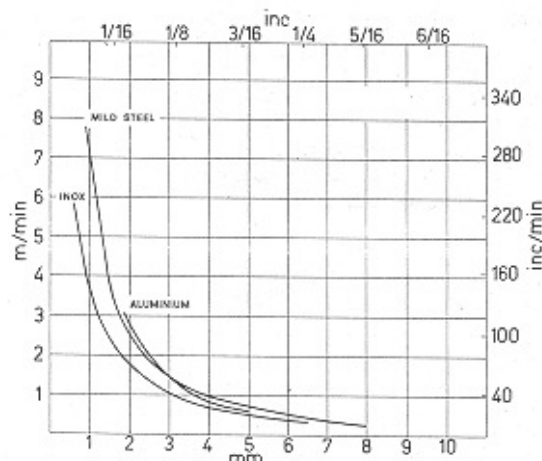
- the efficiency of the main contactor on ground return wire **H** and its working with a lit cutting arc
- the efficiency of the printed circuit board
- that one condenser does not present any anomalous swelling.

## MAINTENANCE AND CHECK-UP

Any slags must be removed from the nozzle; for this operation simply use a steel brush. Pointed bodies should not be used as they could cause damage to nozzle hole.

Although the equipment is provided with an automatic device for the discharge of condensate, which functions whenever air feed is shut off, it is recommended that periodical check that no condensate is in the container **I** (Fig. 2) of the pressure regulator.

From time to time the unit must be cleaned inside from the steel dust which can accumulate, simply by using compressed air. Before carrying out this operation, remove the power supply cable from the socket.



Cutting speed diagram

Remember: correct operation and good maintenance of your **PLASMA** will ensure best results.