

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 precau-

tions 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:

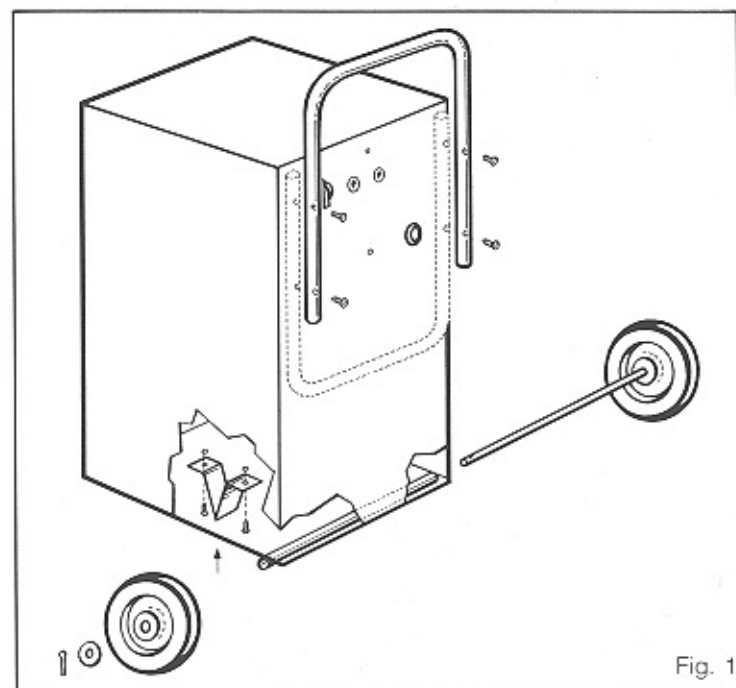
Thermic: located on the transformer windings to avoid eventual overloads.

Pneumatic: located on torch feed to avoid insufficient air pressure and signalled by display light L (fig. 2).

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.



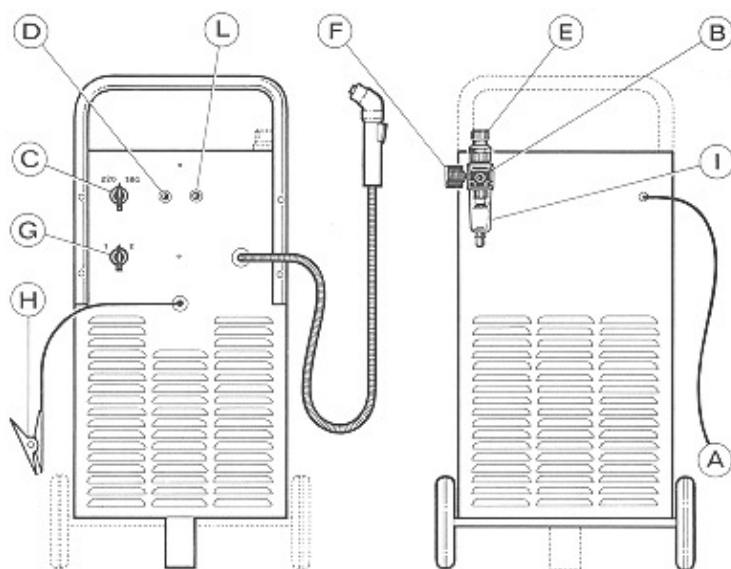


Fig. 2

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.

Should the unit be suitable for working with different voltages, set the voltage-adjusting disk, placed under the knob **C**, according to the line voltage.

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). Switch the unit on by turning the mains-switch knob **C** to the required voltage; the light **D** will signal this operation.

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

Set knob **G** to 1 or 2 according to cutting requirements:

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 (**B**). Keeping the push button pressed, immediately release the pressure (**B**) by a quick movement without however moving the nozzle away from the workpiece.

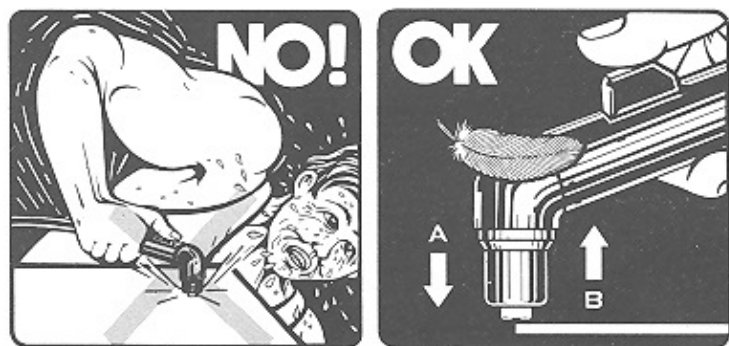


Fig. 3

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).

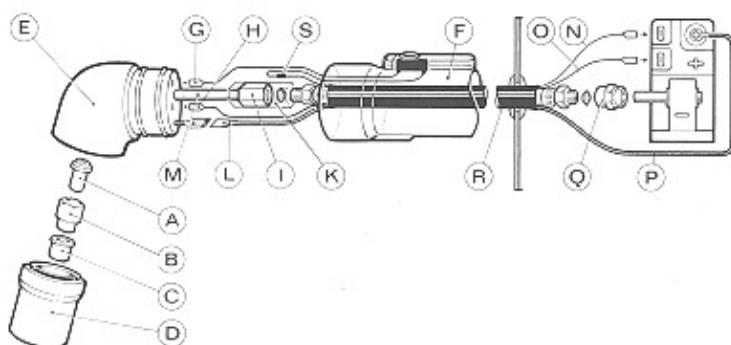


Fig. 4

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).

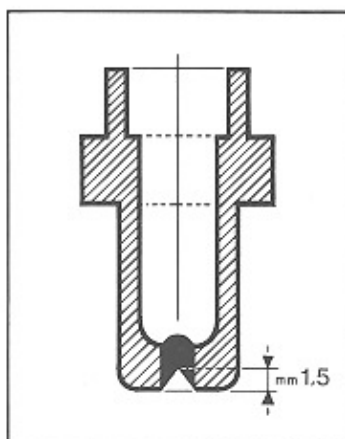


Fig. 5

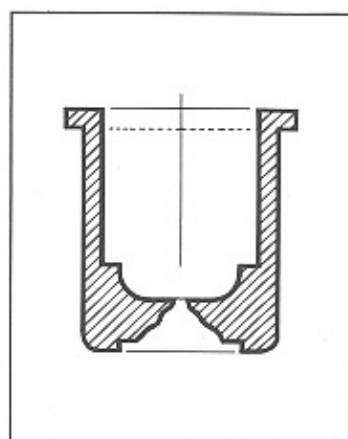


Fig. 6

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. When the electrode is replaced, it must be tightened to avoid loosenings during the working as in this way it may be seriously damaged; moreover you must pay attention to not 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) Replacement of the torch body E (see Fig. 4)

Extract the handgrip F from the body and let the handgrip itself swing paying attention not to tear the push-button wires when separating the two particulars. Take the conductors out of safety contacts G and H. Extract connection L. Unscrew the union 1 after having cut the insulating tube K and extract the tube M from the torch body. Assemble the new torch body by carrying out all previous operations backwards. The insulation of connection I is obtained by letting the insulating thermoshrink tube K adhere to the union. That is possible through the heating by means of a small heat source (i.e. a lighter). Before grasping the handgrip be sure that the wires are distant each other and that the connections are tight.

3) Replacement of the complete torch (see Fig. 4)

Bring the side machine cover away. Disconnect the two «faston» contacts N and O and the red wire P from the terminal board. Unscrew the union Q. Extract the torch. Assemble the new torch by executing all previous operations backwards.

4) Replacement of wire R (see Fig. 4)

For the replacement of the wire, follow all operations shown at points 2 and 3 and furthermore execute the connection S.

N.B.: Connection S must be carefully insulated

5) Replacement of handgrip with push-button

To replace the handgrip follow the operations shown at point 2 and carefully insulate the connection S after having assembled the new handgrip.

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).
- 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.

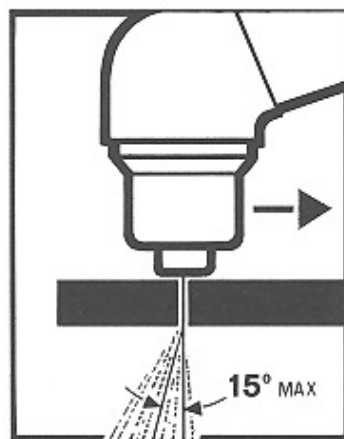


Fig. 7

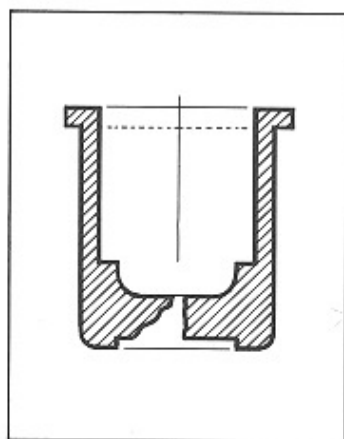


Fig. 8

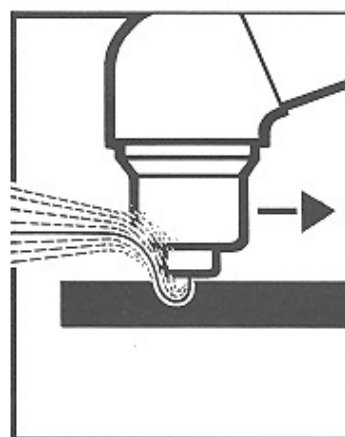


Fig. 9

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).

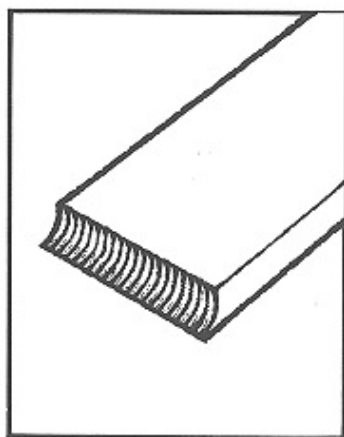


Fig. 10

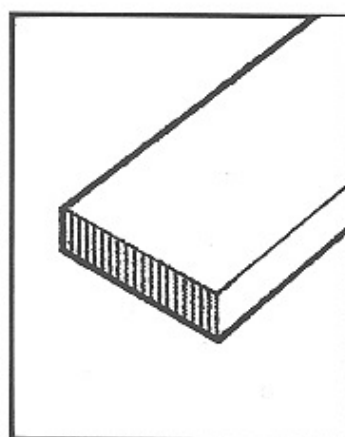


Fig. 11

4) Troubleshooting

The possible troubles here below listed refer to tests with machine in position ON and with the compressed air pipe connected. Possible checks must be always carried out with the supply wire disconnected from the network.

a) Pressing the push-button no air comes out.

Check:

- that the air pressure in the equipment is sufficient;
- that the thermostat on transformer is not momentarily open because of machine overload or is interrupted because of failure;
- the efficiency of the thermostat;
- the correct working of the solenoid valve on air circuit;
- the efficiency of the push-button and of safety contacts on the torch;
- the efficiency of the electronic card;
- the possible black-out of the electric circuit.

b) Pressing the push-button air comes out from the torch but it is not possible to light the cutting arc.

Check:

- that the electrode and the nozzle are not oxidized preventing in this way the striking of an arc;

- the efficiency of the power main contactor;
- the efficiency of rectifier;
- the efficiency of the switch G of Fig. 2;
- the efficiency of the electronic card;
- the efficiency of the connection L of Fig. 4 on the torch;
- the possible black-out of the electric circuit.

c) Cutting power is insufficient

After having checked that the trouble does not fall within the ones shown in the paragraph «Cutting problems» check:

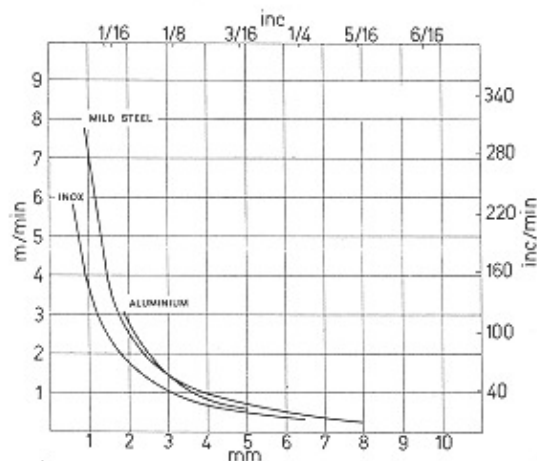
- the efficiency of the main contactor on the ground wire H and its efficiency with the cutting arc ON.
- the efficiency of the electronic card.

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.