

# INSTRUCTION MANUAL FOR PLASMA CUTTER



**IMPORTANT:** BEFORE STARTING THE EQUIPMENT, READ THE CONTENTS OF THIS MANUAL, WHICH MUST BE STORED IN A PLACE FAMILIAR TO ALL USERS FOR THE ENTIRE OPERATIVE LIFE-SPAN OF THE MACHINE. THIS EQUIPMENT MUST BE USED SOLELY FOR WELDING OPERATIONS.

## 1 SAFETY PRECAUTIONS

WELDING AND ARC CUTTING CAN BE HARMFUL TO YOURSELF AND OTHERS. The user must therefore be educated against the hazards, summarized below, deriving from welding operations. For more detailed information, order the manual code 3.300.758

**ELECTRIC SHOCK** - May be fatal.



- Install and earth the welding machine according to the applicable regulations.
- Do not touch live electrical parts or electrodes with bare skin, gloves or wet clothing.
- Isolate yourselves from both the earth and the workpiece.
- Make sure your working position is safe.

**FUMES AND GASES** - May be hazardous to your health.



- Keep your head away from fumes.
- Work in the presence of adequate ventilation, and use ventilators around the arc to prevent gases from forming in the work area.

**ARC RAYS** - May injure the eyes and burn the skin.



- Protect your eyes with welding masks fitted with filtered lenses, and protect your body with appropriate safety garments.
- Protect others by installing adequate shields or curtains.

**RISK OF FIRE AND BURNS**



- Sparks (sprays) may cause fires and burn the skin; you should therefore make sure there are no flammable materials in the area, and wear appropriate protective garments.

**NOISE**



This machine does not directly produce noise exceeding 80dB. The plasma cutting/welding procedure may produce noise levels beyond said limit; users must therefore implement all precautions required by law.

**PACEMAKERS**

· The magnetic fields created by high currents may affect the operation of pacemakers. Wearers of vital electronic equipment (pacemakers) should consult their physician before beginning any arc welding, cutting, gouging or spot welding operations.

**EXPLOSIONS**



· Do not weld in the vicinity of containers under pressure, or in the presence of explosive dust, gases or fumes. · All cylinders and pressure regulators used in welding operations should be handled with care.

**ELECTROMAGNETIC COMPATIBILITY**

This machine is manufactured in compliance with the instruc-

tions contained in the harmonized standard EN50199, and must be used solely for professional purposes in an industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in non-industrial environments.

IN CASE OF MALFUNCTIONS, REQUEST ASSISTANCE FROM QUALIFIED PERSONNEL.

## 2 GENERAL DESCRIPTION

This machine is a constant direct current power source, designed for cutting electrically conductive materials (metals and alloys) using the plasma arc procedure. The plasma gas may be air or nitrogen.

### 2.1 DESCRIPTION OF DEVICES ON THE MACHINE

- A) Power cord
- B) Compressed air fitting (1/4" female gas thread)
- C) Mains power switch
- D) Mains power led
- E) Pressure regulator knob
- F) Pressure gauge
- G) Thermostat LED
- H) Grounding cord
- I) Water trap
- L) Low air pressure LED
- M) Cutting current regulator knob
- N) Blocked LED; lights when hazardous conditions arise.
- O) LED that lights when the "SELF-RESTART PILOT" function is active
- P) Push-button to activate and deactivate the "SELF-RESTART PILOT" function.
- O) Plasma torch.

### 2.2 SAFETY DEVICES

This system comes equipped with the following safety devices:

**Overload cutout:**



To avoid overload while cutting, The LED G (see fig 1) lights when active.

**Pneumatic:**



Located on the torch inlet to prevent low air pressure. The LED L lights when tripped (see fig.1).

**Electrical:**

- 1) In the event of a short-circuit between the nozzle and electrode during arc striking
- 2) In the event of a short-circuit between the contacts of the reed relay on circuit 22 (see exploded drawing).
- 3) When the electrode is worn to the point it must be replaced. These conditions block the machine, and are signalled by the lit LED N.
- 4) In addition, this machine is equipped with automatic selection of the supply voltage and the following protections:

A) 230V Power supply: during start-up, the machine remains blocked (LED N lit) if the voltage is below 200V.

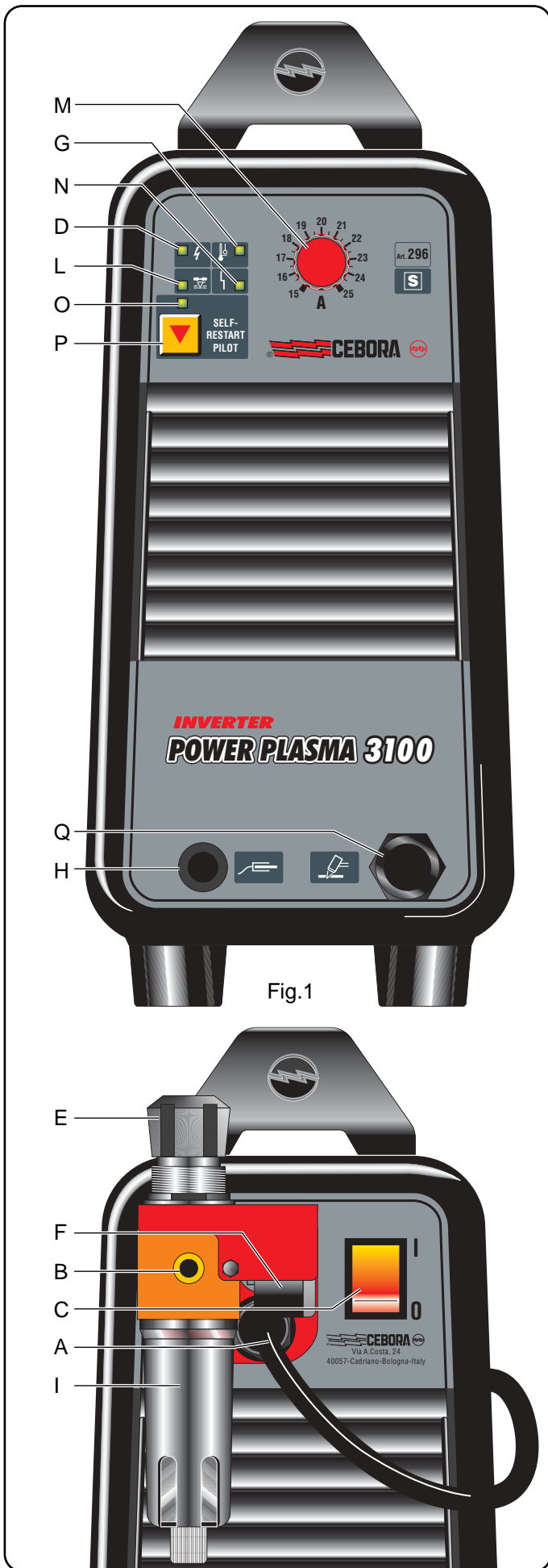


Fig.1

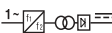
After start-up, the machine runs at as low as 180V.  
 B) 115V Power supply: during start-up, the machine remains blocked (LED N lit) if the voltage is below 100V. After start-up, the machine runs at as low as 90V.


- Do not remove or short-circuit the safety devices.
- Use only original spare parts.
- Always replace any damaged parts of the machine with original materials.
- Use only CEBORA torches type CP40.
- Do not run the machine without its housings. This would be dangerous to the operator and anyone else in the work area, and would prevent the machine from being cooled properly.

### 2.3 EXPLANATION OF TECHNICAL SPECIFICATIONS

EN 60974.1 The machine has been built according to this European standards.  
 EN 50199  
 EN 50192

N°..... Serial number.  
 Always indicate this for any request regarding the machine.

 ..... Single-phase static transformer-rectifier frequency converter.

 ..... Drooping characteristic.

 ..... Suitable for plasma cutting.

TORCH TYPE..... Type of torch that may be used with this machine.

$U_0$  PEAK..... Secondary open-circuit voltage. Peak value.

X..... Percentage duty cycle.  
 The duty cycle expresses the percentage of 10 minutes for which the machine may work at a certain current  $I_2$  and voltage  $U_2$  without overheating.

$I_2$ ..... Cutting current.

$U_2$ ..... Secondary voltage at cutting current  $I_2$ .  
 This voltage is measured when cutting with the gas nozzle in contact with the workpiece.


**If this distance increases, the cutting voltage also increases and the duty cycle X% may drop.**

$U_1$ ..... Rated supply voltage

1~ 50/60Hz..... 50- or 60-Hz single-phase power supply.  
 The machine is equipped with automatic voltage change.

$I_1$ ..... at the corresponding cutting current  $I_2$  and voltage  $U_2$ .

IP23..... Housing protection rating.  
 Class 3 as the second digit means that this machine is suitable for working out doors in the rain.

 ..... Suitable for working in hazardous environments.

NOTE: The machine has also been designed for use in environments with a pollution rating of 3. (See IEC 664).

### 2.4 START-UP

**The machine must be installed by qualified personnel. All connections must be made in compliance with cur-**

rent safety standards and full observance of safety regulations (see CEI 26-10 CENELEC HD427).

Connect the air supply to the fitting **B**.

- If the system air contains a considerable amount of moisture and oil, it is best to use a drying filter to avoid excessive oxidation and wear of the consumer parts, damaging the torch and reducing the cutting speed and quality.

If the air supply comes from a pressure regulator of a compressor or centralized system, the regulator must be set to an output pressure of no more than 8 bar (0.8 Mpa). If the air supply comes from a compressed air cylinder, the cylinder must be equipped with a pressure regulator.

**Never connect a compressed air cylinder directly to the regulator on the machine! The pressure could exceed the capacity of the regulator, which might explode!**

Connect the power cord **A**: the yellow-green cable wire must be connected to an efficient grounding socket on the system. The remaining wires must be connected to the power supply line by means of a switch placed as close as possible to the cutting area, to allow it to be shut off quickly in case of emergency.

The capacity of the cut-out switch or fuses installed in series with the switch must be equal to the current  $I_1$  absorbed by the machine.

The absorbed current  $I_1$  may be determined by reading the technical specifications shown on the machine under the available supply voltage  $U_1$ .

Any extension cords must be sized appropriately for the absorbed current  $I_1$ .

### 3 USE

Read the standards CEI 26/9 - CENELEC HD 407 and CEI 26.11 - CENELEC HD 433 carefully before using the equipment, and make sure the cable insulation is fully intact. Make sure the trigger has not been pressed.

Turn the machine on using the switch **C**. The warning lamp **D** will light to indicate that the machine is on.

Press the torch trigger briefly to open the flow of compressed air. Since the arc is not lit, air leaves the torch for only 5 sec. Now adjust the pressure, shown on the pressure gauge **F**, to 3.5 bar (0.35 MPA) using the knob **E** on the regulator, then lock the knob by pressing it downward. Connect the grounding clamp to the workpiece.

The cutting circuit must not be deliberately placed in direct or indirect contact with the protective wire except in the workpiece.

If the workpiece is deliberately grounded using the protective conductor, the connection must be as direct as possible and use a wire of at least the same size as the cutting current return wire, and connected to the workpiece at the same point as the return wire using the return wire clamp or a second grounding clamp placed in the immediate vicinity. Every precaution must be taken to avoid stray currents. Use the knob **M** to select the cutting current.

Make sure that the grounding clamp and workpiece have a good electrical contact, especially with painted, oxidized or insulated sheet metal.

Do not connect the grounding clamp to the part of the material that is to be removed.

Press the torch trigger to strike the pilot arc.

If cutting does not begin within 2 seconds, the pilot arc

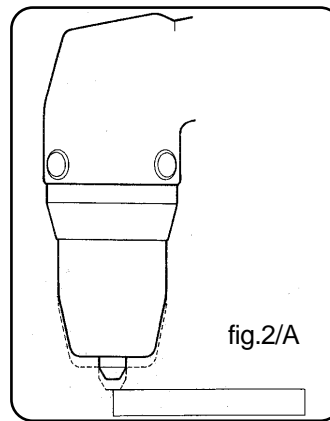


fig.2/A

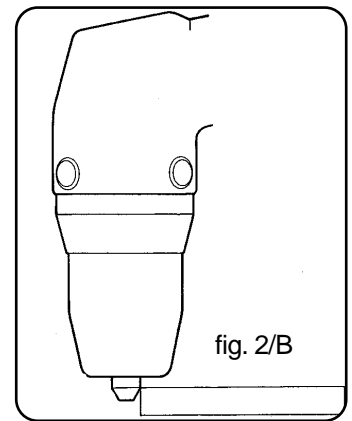


fig. 2/B

goes out; press the trigger again to re-strike it.

Begin cutting as shown in fig. 2a, avoid starting as shown in fig. 2b

Hold the torch upright while cutting.

When you have finished cutting and released the trigger, air will continue to leave the torch for approximately 40 seconds to allow the torch to cool down.

**It is best not to turn the machine off until this cool-down period is complete.**

To cut perforated or grid metal, activate the "Pilot self restart" function using the push-button **P** (LED  $\circ$  lit).

When you have finished cutting, holding this push-button down will cause the pilot arc to restart automatically.

**Use this function only if necessary to avoid unnecessary wear on the electrode and nozzle.**

Should you need to make holes or begin cutting from the center of the workpiece, you must hold the torch at an angle and slowly straighten it so that the nozzle does not spray molten metal (see fig. 3). This must be done when making holes in pieces more than 3 mm thick.

**Turn the machine off when the task is completed.**

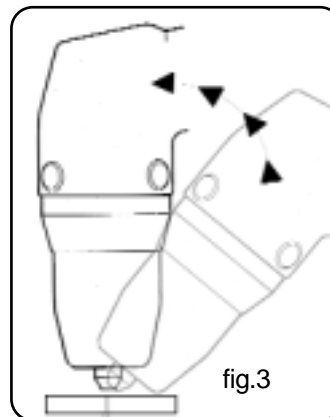


fig.3

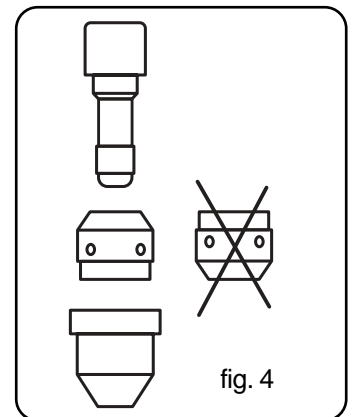


fig. 4

#### 3.1 REPLACING CONSUMER PARTS

**Always shut off the machine before replacing consumer parts.**

- The electrode must be replaced when it has a crater in the center approximately 1 mm deep.
- The gas nozzle must be replaced when the hole is no longer smooth and the cutting capacity is diminished.
- The diffuser must be replaced when some areas are blackened. Due to its small size, it is very important to position it correctly during assembly (see fig. 4).
- The nozzle holder must be replaced when the

insulating part is deteriorated

**Make sure that the electrode T, the diffuser U and the gas nozzle V are mounted correctly, and that the nozzle holder W is firmly tightened.**

**If any of these parts are missing, this will interfere with smooth operation of the machine and, especially, jeopardize operator safety**

## 4 CUTTING ERRORS

### 4.1 INSUFFICIENT PENETRATION

This error may be caused by the following:

- high speed. Always make sure that the arc fully penetrates the workpiece and is never held at a forward angle of more than 10 -15°. This will avoid incorrect consumption of the nozzle and burns to the nozzle holder.
- Excessively thick workpiece (see cutting speed diagrams, fig. 5).

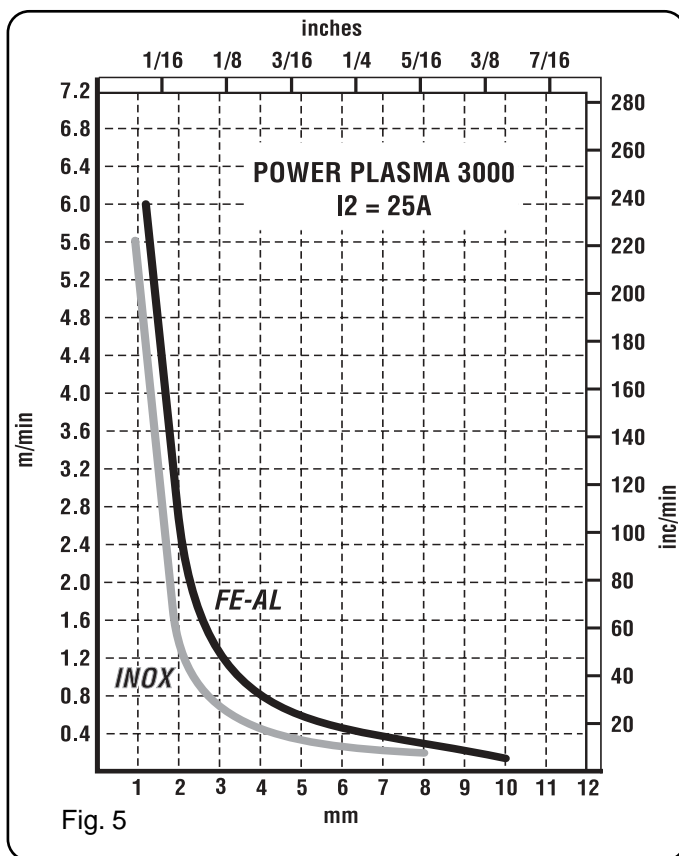


Fig. 5

- Grounding clamp not in good electrical contact with the workpiece.
- Worn nozzle and electrode.
- Cutting current too low.

NOTE: When the arc does not penetrate, the molten metal scraps obstruct the nozzle.

### 4.2 THE CUTTING ARC GOES OFF

This error may be caused by:

- worn nozzle, electrode or swirl ring.
- air pressure too high.

- supply voltage too low.

## 4.3 SHORTER LIFE OF CONSUMER PARTS

This error may be caused by:

- oil or dirt in the arc intake,
- unnecessarily long pilot arc,
- low arc pressure.

## 5 HELPFUL HINTS

- If the system air contains considerable amounts of moisture and oil, it is best to use a drying filter to avoid excessive oxidation and wear on consumer parts, damage to the torch and a reduction in the speed and quality of the cutting.
- Make sure that the new electrode and nozzle to be mounted are thoroughly clean and degreased.
- **Always use original spare parts to avoid damaging the torch.**

## 6 MAINTENANCE

Always cut off the power supply to the machine before any operation, which must always be carried out by qualified personnel.

### 6.1 GENERATOR MAINTENANCE

In the case of maintenance inside the machine, make sure that the switch **C** is in position "O" and that the **power cord is disconnected from the mains.**

Even though the machine is equipped with an automatic condensation drainage device that is tripped each time the air supply is closed, it is good practice to periodically make sure that there is no condensation accumulated in the water trap I (fig.1).

It is also necessary to periodically clean the interior of the machine from the accumulated metal dust, using compressed air.

### 6.2 PRECAUTIONS AFTER REPAIRS.

After making repairs, take care to organize the wiring so that there is secure insulation between the primary and secondary sides of the machine. In particular, make sure that the casing 50 is mounted (see exploded drawing). Do not allow the wires to come into contact with moving parts or those that heat up during operation. Reassemble all clamps as they were on the original machine, to prevent a connection from occurring between the primary and secondary circuits should a wire accidentally break or be disconnected.

Also mount the screws with geared washers as on the original machine.