

## INSTRUCTION MANUAL



**WARNING! BEFORE USING THE PLASMA CUTTING SYSTEM READ THE INSTRUCTION MANUAL CAREFULLY!**

### PLASMA CUTTING SYSTEMS DESIGNED FOR PROFESSIONAL AND INDUSTRIAL USE

#### 1. GENERAL SAFETY INSTRUCTIONS FOR PLASMA ARC CUTTING

The operator should be properly trained to use plasma cutting systems safely and should be informed about the risks related to arc welding procedures and associated techniques, about relevant safety measures and emergency procedures.

(Please refer to the applicable standard "EN 60974-9: Arc welding equipment. Part 9: Installation and Use).



- Prevent direct contact with the cutting circuit; the no-load voltage supplied by the plasma cutting system may be dangerous under certain circumstances.
- When the cutting circuit cables are being connected or checks and repairs are carried, the cutting system should be switched off and disconnected from the power supply.
- Switch off the plasma cutting system and disconnect it from the power supply before replacing worn torch parts.
- Make the electrical connections and installation according to the health and safety standards and legislation in force.
- The plasma cutting system should be connected only and exclusively to a power supply network with the neutral lead connected to earth.
- Make sure that the power supply plug is correctly connected to the earth protection outlet.
- Do not use the plasma cutting system in damp or wet places or in the rain.
- Do not use cables with worn insulation or loosened connections.



- Do not cut on containers, receptacles or piping that contains or has contained inflammable liquids or gases.
- Do not work on materials cleaned with chlorinated solvents or in the vicinity of such substances.
- Do not cut on containers under pressure.
- Remove all flammable materials (e.g. wood, paper, cloth etc.) from the working area.
- Provide adequate ventilation or facilities for the removal of fumes produced by plasma cutting work; a systematic approach is needed in evaluating the exposure limits for fumes produced by cutting work, which will depend on their composition, concentration and the length of exposure itself.



- Ensure there is adequate electrical insulation with regard to the plasma cutting torch nozzle, the workpiece and any (accessible) earthed metal parts in the vicinity. This is normally achieved by wearing gloves, shoes, head coverings and clothing designed for this purpose and by using insulating platforms or mats.
- Always protect your eyes with the relative filters, which must comply with UNI EN 169 or UNI EN 379, mounted on masks or use helmets that comply with UNI EN 175. Use the relative fire-resistant clothing (compliant with UNI EN 11611) and welding gloves (compliant with UNI EN 12477) without exposing the skin to the ultraviolet and infrared rays produced by the arc; the protection must extend to other people who are near the arc by way of screens or non-reflective sheets.
- Noise levels: if particularly intensive cutting operations cause daily personal noise exposure (LEPd) of 85 dBA or more, suitable personal protection equipment must be worn (Tab. 1).



- The flowing of cutting currents generates electromagnetic fields (EMF) around the cutting circuit.

Electromagnetic fields can interfere with certain medical equipment (e.g. Pace-makers, respiratory equipment, metallic prostheses etc.). Adequate protective measures must be adopted for persons with these types of medical apparatus. For example, they must be forbidden access to the area in which plasma cutting systems are in operation.

This plasma cutting system conforms to technical product standards for exclusive use in an industrial environment for professional purposes. It does not assure compliance with the basic limits relative to human exposure to electromagnetic fields in the domestic environment.

The operator must adopt the following procedures in order to reduce exposure to electromagnetic fields:

- Fasten the two cables as close together as possible.
- Keep head and trunk as far away as possible from the cutting circuit.
- Never wind cables around the body.
- Do not cut with the body within the cutting circuit. Keep both cables on the same side of the body.
- Connect the cutting current return cable to the piece being cut, as close as possible to the position of the cut itself.
- Do not cut while close to, sitting on or leaning against the plasma cutting system (keep at least 50 cm away from it).
- Do not leave objects in ferromagnetic material in proximity of the cutting circuit.
- Minimum distance  $d = 20$  cm (Fig. P).



- Class A equipment:

This plasma cutting system conforms to the technical product standards for exclusive use in an industrial environment and for professional purposes. It does not assure compliance with electromagnetic compatibility in domestic dwellings and in premises directly connected to a low-voltage power supply system feeding buildings for domestic use.



#### EXTRA PRECAUTIONS

##### PLASMA CUTTING OPERATIONS

- In environments with heightened risk of electric shock;
- In confined spaces;
- In the presence of inflammable or explosive materials; MUST be evaluated in advance by an "Expert supervisor" and must always be carried out in the presence of others who have been taught how to intervene in emergencies. All protective technical measures MUST be taken as provided in 7.10; A.8; A.10 of the applicable standard EN 60974-9: Arc welding equipment. Part 9: Installation and Use".
- Cutting operations MUST BE PROHIBITED if the operator is supporting the weight of the power source (using slings for example).
- The operator MUST NEVER BE ALLOWED to carry out cutting operations if above ground level, unless safety platforms are used.
- **WARNING! USING THE PLASMA CUTTING SYSTEM SAFELY.** The safeguards provided by the manufacturer (interlocking system) can only be guaranteed to work properly if the torch model and corresponding power source as indicated in the "TECHNICAL DATA" are used.
- DO NOT USE non-original torches or consumable parts.
- DO NOT ATTEMPT TO USE THE POWER SOURCE with torches that are made for cutting or WELDING procedures but are not contemplated in this instruction manual.
- FAILURE TO COMPLY WITH THESE RULES may give rise to a SERIOUS safety hazard for the user and may also damage the apparatus.



#### RESIDUAL RISKS

- **TIPPING:** place the plasma cutting power source on a horizontal surface with adequate load-bearing capacity; otherwise (e.g. sloping or uneven floor etc.) the apparatus is in danger of tipping

over.

- **IMPROPER USE: it is dangerous to use the plasma cutting system for any work other than that for which has been designed.**
- **Never lift the plasma cutting system without first disconnecting and removing all interconnection and power supply cables and piping.**
- **Do not use the handle to hang the plasma cutting system.**

## 2. INTRODUCTION AND GENERAL DESCRIPTION

Plasma cutting system with compressed air mono-phase, with fan. Used for fast cutting without deformation on steel, stainless steel, galvanized steel, aluminium, copper, brass etc.

The cutting cycle is started by a pilot arc, which is established between the mobile electrode and the nozzle/hood of the torch by the short circuit current between these two elements: this technology also enables, other than continuous cutting, cutting of grids and/or perforated sheet metal. Furthermore, adjustment of the current from the minimum to maximum allows you to ensure a high quality cut as the thickness and type of metal varies.

### MAIN CHARACTERISTICS

- Torch voltage control device.
- Air pressure, torch short-circuit control device.
- Thermostatic safeguard.
- No air protection (where applicable).
- Overvoltage, undervoltage.
- Air pressure display (where applicable).
- Torch cooling command (where applicable).
- Internal air compressor (where planned).

### STANDARD ACCESSORIES

- Plasma cutting torch.
- Fitting for compressed air connection (where applicable).
- Earth cable

### OPTIONAL ACCESSORIES

- Spare electrodes-nozzles kit.
- High current powered cutting torch (where planned).
- Spare electrodes-nozzles kit for high current powered torch (where applicable).
- Gouging kit (where applicable).

## 3. TECHNICAL INFORMATION


### DATA PLATE

The most important information regarding use and performance of the plasma cutting system is summarised on the rating plate and has the following meanings:

Fig. A

- 1- EUROPEAN standard of reference, for safety and construction of arc welding and plasma cutting machines.
- 2- Symbol referring to the internal structure of the machine.
- 3- Symbol referring to plasma cutting procedure.
- 4- S symbol: indicates that cutting operations may be carried out in environments with heightened risk of electric shock (e.g. close to large metal masses).
- 5- Symbol indicating the main power supply:  
1~: single phase alternating voltage  
3~: 3-phase alternating voltage
- 6- Casing protection rating.
- 7- Technical specifications for main power supply:
  - $U_1$  : Alternating voltage and frequency of power supply to the machine (allowed limits  $\pm 10\%$ );
  - $I_{Tmax}$  : Maximum current absorbed by the line.
  - $I_{Teff}$  : Effective current supplied
- 8- Performance of cutting circuit:
  - $U_0$  : maximum no-load voltage (open cutting circuit).
  - $I_2/U_2$  : Current and corresponding normalized voltage that the machine is able to supply during cutting.
  - X : Duty cycle: indicates the time for which the machine is able to supply the corresponding current (same column). It is expressed in %, based on a 10 min. cycle (e.g. 60% = 6 minutes work, 4 minutes pause; and so on).If the usage factors (on the plate, referring to a 40°C environment) are exceeded the thermal cutout will trigger (the machine will remain in standby until its temperature

returns within the allowed limits).

- A/V-A/V: indicates the range over which the cutting current may be adjusted (minimum - maximum) at the corresponding arc voltage.
- 9- Machine serial number (indispensable identification when asking for technical assistance, ordering spare parts or discovering the origin of the product).
- 10-  : Size of delayed action fuses to be provided to protect the power line.
- 11- Symbols referring to safety standards, the meaning of which is explained in chapter 1 "General safety instructions for plasma arc cutting".

Note: The data plate shown here is an example for explaining the meaning of the symbols and figures; the exact values of the technical specifications for your plasma cutting system must be read directly on the rating plate of the machine itself.

### OTHER TECHNICAL INFORMATION:

- **POWER SOURCE: see table 1 (TAB.1)**
- **TORCH: see table 2 (TAB.2)**
- The weight of the machine is given in table 1 (TAB. 1).**

## 4. DESCRIPTION OF THE PLASMA CUTTING SYSTEM

The machine consists essentially of power modules built on PCB's and optimised for maximum reliability and minimum maintenance.

(Fig. B)



- 1- Single phase power supply line, rectifier assembly and levelling capacitors.
- 2- Transistor (IGBT) switching bridge and drivers ; converts the rectified mains voltage into high frequency alternating voltage and adjusts the power according to the required cutting current/voltage.
- 3- High frequency transformer: the primary winding is powered by the voltage that has been converted by block 2; its function is to adapt voltage and current to the values required for the cutting procedure and at the same time to perform galvanic isolation of the cutting circuit from the main power supply.
- 4- Secondary rectifier bridge with levelling inductance: converts the alternating voltage/current supplied by the secondary winding into direct current/voltage with very low ripple.
- 5- Control and adjustment electronics: controls cutting current value instantaneously and compares it with the operator's setting; modulates IGBT driver control pulses that make the adjustment. Determines the dynamic current response during cutting and oversees the safety systems.

## CONTROL, ADJUSTMENT AND CONNECTION DEVICES

### Front panel (Fig. C)

- 1- **Torch with direct or control panel connection.**
  - The torch button is the only control device that can be used to start and stop cutting operations.
  - When the button is released the cycle will cease instantaneously, whatever stage it is at, and only the cooling air (post-air) will be kept on.
  - **Accidental manoeuvres:** the cycle will only be allowed to start if the button is pressed for a preset minimum interval of time.
  - **Electrical safety:** button operation is disabled if the insulating nozzle-holder is NOT fitted to the head of the torch, or if it is not fitted correctly.
- 2- **Return cable.**
- 3- **Control panel.**

### CONTROL PANEL (Fig. C1)


- 1- **Adjustment knob:**  
In any mode, it allows continuous current adjustment.
- 2-  **Red led** signalling compressed air internal circuit inhibition (where planned).  
When on, it indicates overheating of the electric motor windings on the air compressor.
- 3-  **Yellow led** signalling a general or warning alarm of torch consumables.  
When on and fixed, it indicates overheating of some power circuit components, or a malfunction on the inlet power supply voltage (over or undervoltage).  
OVER or UNDERVOLTAGE: blocks the machine if the power supply voltage is out of range +/- 15% compared to the plate value.

Resetting is automatic (switching off the yellow led) after one of the malfunctions among those indicated above returns within the permitted limits.

When the led is intermittent it indicates the consumables are malfunctioning and the causes can be:

- worn consumables;
- consumables assembled incorrectly or missing;
- faulty torch;
- air pressure too low or no air in torch.

Signalling disappears after a correct cutting cycle.

4 -  **Yellow led** signalling voltage present in torch.

When on, it indicates the cutting circuit is enabled (machine outlet energised):

Pilot Arc or Cutting Arc "ON".

Output is powered when the torch button is pressed and there is no alarm status.


The machine output is not powered in the following cases:

- when the torch button is NOT activated (standby status with low energy consumption);
- during POST AIR cooling phase;
- if the pilot arc is not transferred to the piece within a maximum of 2 seconds;
- if the cutting arc shuts off due to excessive piece torch distance;
- for excessive wear of the electrode or forced distancing of the torch from the piece;
- if a SAFETY system or an ALARM activates.

5 -  **Green led** signalling presence of mains voltage and auxiliary circuits powered.  
The control and service circuits are powered.

### CONTROL PANEL (Fig. C2)

1 - **Adjustment knob:**  
In any mode, it allows continuous current adjustment.

2 -  **Yellow led** signalling a general or warning alarm of consumables.

When on and fixed, it indicates overheating of some power circuit components, or a malfunction on the inlet power supply voltage (over or undervoltage).


OVER or UNDERVOLTAGE: blocks the machine if the power supply voltage is out of range +/- 15% compared to the plate value.

Resetting is automatic (switching off the yellow led) after one of the malfunctions among those indicated above returns within the permitted limits.

When the led is intermittent it indicates the consumables are malfunctioning and the causes can be:

- worn consumables;
- consumables assembled incorrectly or missing;
- faulty torch;
- air pressure too low or no air in torch;

Signalling disappears after a correct cutting cycle.

3 -  **Yellow led** signalling air malfunction or no air.

When on, it indicates a malfunction on the compressed air circuit. This condition is not necessarily due to internal sealing issues. It may regard connection or source of origin.

4 -  **Yellow led** signalling voltage present in torch.

When on, it indicates the cutting circuit is enabled (machine outlet energised):

Pilot Arc or Cutting Arc "ON".

Output is powered when the torch button is pressed and there is no alarm status.

The machine output is not powered in the following cases:

- when the torch button is NOT activated (standby status with low energy consumption);
- during POST AIR cooling phase;
- if the pilot arc is not transferred to the piece within a maximum of 2 seconds;
- if the cutting arc shuts off due to excessive piece torch distance;
- excessive wear of the electrode or forced distancing of the torch from the piece;
- if a SAFETY system or an ALARM activates.

5 -  **Green led** signalling presence of mains voltage and auxiliary

circuits powered.

The control and service circuits are powered.

### 6 - MODE selecting knob

Allows selection of the following operating modes:



Metal continuous cutting mode.



Maintained arc cutting mode also when not transferred to the piece (cutting grids or discontinuous sheet metal).



Gouging mode, suitable for use with the torch with GOUGING consumables (removal, modelling of metal by melting).

### 7 - Display leds for digital gauge air pressure



In real time, it indicates the measured pressure (optimal pressure central green leds, poor or excess pressure yellow leds).

### 8 - AIR key



Pressing this key, the air continues to exit the torch for a pre-established time of approx. 20 sec (allows cooling of the torch and/or air adjustment within the optimal range).

### REAR PANEL (Fig. D)

1 - **Power cable.**

2 - **Main switch O - I**

I (ON) Generator ready for operation.

3 - **Manual pressure regulator** (plasma compressed air) with gauge, where applicable.

4 - **Pressure reducer knob** (where applicable).

5 - **Fitting** to couple to compressed air source (where applicable).

### 5. INSTALLATION



**ATTENTION! CARRY OUT ALL THE INSTALLATION OPERATIONS WITH THE PLASMA CUTTING SYSTEM STRICTLY OFF AND DISCONNECTED FROM THE POWER MAINS.**

**THE ELECTRICAL CONNECTIONS MUST ONLY BE CARRIED OUT BY EXPERT OR QUALIFIED TECHNICIANS.**

### PREPARATION

Unpack the machine, assemble the detached parts contained in the packaging.

Assembling the return cable-earth clamp (Fig. E)

### LIFTING MODE OF THE MACHINE

All the machines described in this manual must be suspended using the handle or the strap supplied if applicable for the model.

Strap assembly mode (FIG. F).

### MACHINE POSITIONING

Identify the installation location of the machine so there are no obstacles on inlet and outlet opening of the cooling air; at the same time ensure no conductive dust, corrosive vapours, humidity, etc. are sucked in.

Keep at least 250mm of free space around the machine.



**ATTENTION! Position the machine on a flat surface of adequate capacity for the weight to avoid dangerous turning over or movements.**

### CUTTING CIRCUIT CONNECTIONS

Prepare a compressed air distribution line with a working pressure and minimum capacity indicated in table 2 (TAB. 2).

Assembly, connection of the pressure reducer (Fig. G).

### IMPORTANT!

Do not exceed the maximum input pressure of 8 bar. Air containing large quantities of humidity or oil can cause excessive wear of consumable parts or damage the torch. If in doubt concerning the quality of the compressed air available, it is recommended to use an air dryer to be installed downstream of the inlet filter. Use a hose to connect the compressed air line to the machine, using the fitting supplied for assembly on the air intake filter.

### Connecting the cutting current return cable.

Table 1 (TAB. 1) gives the recommended values for the return cable (in

mm<sup>2</sup>) according to the maximum energy supplied by the machine.

Connect the cutting current return cable to the piece to be cut or the metal support bench taking the following precautions:

- Check that a good electric contact is established especially when cutting sheet metal with insulating, oxidised coatings etc.
- Connect the mass as close as possible to the cutting point.
- Do not use metal structures that are not part of the workpiece as a cutting current return conductor; this can endanger safety and give unsatisfactory cutting results.
- Do not connect the mass on the section of the piece to be removed.

#### Connecting the plasma cutting torch (Fig. H) (where applicable).

Insert the male end of the torch in the central connector on the front panel of the machine, making sure the polarisation key is aligned. Fully tighten the locking ring nut clockwise to guarantee there are no leaks in the air and current flows.

In some models, the torch is supplied already connected to the current source.

#### IMPORTANT!

Before commencing cutting operations, check the consumable parts are assembled correctly, inspecting the torch head as indicated in the "TORCH MAINTENANCE" chapter.



#### ATTENTION!

#### USING THE PLASMA CUTTING SYSTEM SAFELY.


**Only the torch model as envisaged, coupled with the corresponding power source as indicated in TAB. 2, are able to guarantee effective protection by the safety system provided by the manufacturer (interlocking system).**

- **DO NOT USE other makes of torch and related consumable parts.**
- **DO NOT ATTEMPT TO COUPLE THE POWER SOURCE with torches built for cutting or welding procedures that are not contemplated in these instructions.**

**Failure to comply with these rules may cause serious hazards, endangering the physical safety of the user and damaging the apparatus.**

#### CONNECTION TO THE MAINS

- Before making any electrical connection, check the rating plate on the source of current corresponds to the mains voltage and frequency available in the installation location.
- The source of current must only be connected to a power supply system with neutral conductor connected to earth.
- To guarantee protection against indirect contact, use the differential switches type:

Type A () for mono-phase machines.

- To meet the requirements of the standard EN 61000-3-11 (Flicker), you are advised to connect the source of current to the interface points of the power mains with an impedance under table 1 (TAB.1).
- The plasma cutting system is not within the requirements of standard IEC/EN 61000-3-12.

If it is connected to a public power mains, the installation technician or user is responsible for checking the plasma cutting system can be connected (if necessary, consult the mains provider).

#### Plug and socket.

Connect a standard plug (3P + E) to the power supply cable with adequate capacity and use a mains socket equipped with fuses or an automatic switch; the specific earth lug must be connected to the earth conductor (yellow-green) of the power supply line.

Table 1 (TAB. 1) provides the recommended values in amperes of the line slow blow fuses chosen based on the maximum nominal current supplied by the source of current, and at the power supply nominal voltage.



**ATTENTION! Failure to comply with the above rules renders the safety system (class I) ineffective, with resulting serious risks for people (e.g. electric shock) and for property (e.g. fire).**

#### 6. PLASMA CUTTING: PROCESS DESCRIPTION

##### The plasma arc and plasma cutting application principle.

Plasma is a gas heated to an extremely high temperature and ionised so that it becomes an electrical conductor.

This cutting procedure uses plasma to transfer the electric arc to the metal piece that is melted by the heat and separated.

The torch uses compressed air supplied by a single source, both for plasma gas and for cooling and protection gas.

##### Starting the pilot arc.

The cycle is started by a pilot current that flows between the electrode

(polarity -) and the torch nozzle (polarity +) and by activation of the air flow which opens the short circuit of these two elements.

Then, approaching the torch to the piece to be cut, connected to the current source polarity (+), the pilot arc is transferred and creates a plasma arc between the electrode (-) and the piece itself (cutting arc). The pilot arc is excluded as soon as the cutting arc is established between the electrode and the piece.

The maintenance time of the pilot arc set in the factory is 2sec (4 seconds in GOUGING mode).

If the arc transfer to the piece is not carried out within this time, the cycle is automatically blocked, except maintenance of the cooling air.

To start the cycle again, release the torch button and press it again.

#### Preliminary procedures.

Before starting the cutting operations, check correct assembly of the consumable parts by inspecting the torch head, as indicated in the "TORCH MAINTENANCE" paragraph.

- Turn on the current supply and set the cutting current (Fig. C1-1 and C2-1) according to the thickness and type of metal material to be cut.
- Where planned, press the air button (Fig. C-2) to start the air flow.
- Adjust the air pressure to the pressure value required for the type of torch being used (TAB. 2).
- Turn the knob: pull upwards to release and turn to adjust the pressure to the value indicated in the TORCH TECHNICAL DATA.
- Read the required value on the pressure gauge and then press the knob to lock the setting.
- Allow the air flow to end spontaneously to make it easier to remove any condensate accumulated in the torch.

**In the absence of the air button** this adjustment phase should be carried out by pressing and releasing the torch button to allow air flow.

#### Cutting operation (Fig. I).

- Keeping the torch perpendicular to the material to cut, bring the nozzle of the torch in contact with the piece.
- Press the torch button, after approx. 1 second the pilot arc starts.
- If the distance is suitable, the pilot arc is immediately transferred to the piece giving rise to the cutting arc.
- Move the torch on the surface of the piece along the ideal cutting line at a regular pace.
- Adjust the cutting rate according to the thickness and selected current, checking that the arc exiting the lower surface of the piece is inclined by approx. 15° in relation to the vertical line, in the opposite direction to the operating direction.

#### Perforation (Fig. L).

To perform this operation or start cutting from the piece centre.

Start with the torch inclined approx. 30° and move it progressively to a perpendicular position to the material to cut.

This procedure prevents the arc or smelted particles returns from ruining the nozzle hole which will rapidly compromise its performance.

Perforation of pieces with a thickness of up to 25% of the maximum foreseen for the range of use can be performed directly.

#### Grid cutting procedure (where applicable).

This function may be useful to cut perforated sheet metal or grids.

Use the "select mode" knob (Fig. C-2) to select the grid cutting mode.

On completing the cutting cycle, keeping the torch button pressed, the pilot arc will restart automatically.

Only use this function when required to avoid unnecessary use of the electrode and nozzle.



**ATTENTION! In this mode you are advised to use standard sized electrodes and nozzles. In particular conditions, using elongated electrodes and nozzles could cause interruption of the cutting arc.**

#### 7. MAINTENANCE

**WARNING! BEFORE CARRYING OUT MAINTENANCE OPERATIONS, MAKE SURE THAT THE PLASMA CUTTING SYSTEM IS SWITCHED OFF AND DISCONNECTED FROM THE MAIN POWER SUPPLY.**



#### ROUTINE MAINTENANCE

**ROUTINE MAINTENANCE CAN BE CARRIED OUT BY THE OPERATOR.**

#### TORCH (Fig. M)

Check the wear level of the torch parts used by the plasma arc regularly, depending on the level of use.

The replacement frequency of the consumables depends on various

factors: as indicated in the paragraph "MOST COMMON CUTTING DEFECTS".

#### 1 - Nozzle holder.

Unscrew it from the torch head by hand. Clean thoroughly or replace it if damaged (burns, deformation or cracks). Check the condition of the upper metal section (torch safety actuator).

#### 2 - Nozzle / Hood.

Check the wear level of the plasma arc flow hole and the internal and external surfaces. Replace the nozzle if the hole has widened compared to the original diameter or is deformed. If the surfaces are particularly oxidised, clean them with very fine sandpaper (FIG. N).

#### 3 - Air distributor ring / diffuser.

Check there are no burns or cracks and that the airflow holes are not blocked. Replace immediately if damaged.

#### 4 - Electrode.

Replace the electrode when the depth of the crater that forms on the emission surface reaches about 1.5 mm (FIG. O).

#### 5 - Torch body, handgrip and cable.

Normally these components do not require any particular maintenance except periodic inspection and thorough cleaning without using solvents of any nature. If the insulation is damaged showing cracks or burns or the electric conductors are loose, the torch can no longer be used due to lack of conformity with the required safety conditions.

In this case, repairs (extraordinary maintenance) can not be performed on-site, as they must be performed by an authorised service centre capable of conducting the special tests after the repair. To maintain the torch in good working condition, some fundamental precautions must be taken:

- Do not bring the torch or cable in contact with hot or scorching parts.
- Do not apply excessive strain on the cable.
- Do not lay the cable on sharp corners, points or abrasive surfaces.
- Wind the cable into regular coils if it is longer than required.
- Do not allow any vehicle to drive over the cable and do not tread on it.



**WARNING! Before carrying out any work on the torch leave it to cool for at least the complete "post air" time**

- Except in special cases, we recommend changing the electrode and nozzle at the same time.
- Assemble the torch components in the correct order (the reverse of the order for dismantling).
- Make sure that the distributor ring is fitted the right way round.
- When re-assembling the nozzle holder, screw it down manually, forcing it slightly.
- Never ever fit the nozzle holder before you assemble the electrode, distributor ring and nozzle.
- Do not keep the pilot arc struck in air for no reason as this will increase electrode, diffuser and nozzle wear.
- Do not tighten the electrode too much as this could damage the torch.
- Prompt, correct inspection procedures for the consumable parts of the torch are essential for safe, correct operation of the cutting system.
- If the insulation is damaged, with breakages, cracks or burns etc., or if the electric leads are loose, the torch may not be used because it does not satisfy safety requirements. In this case repairs (extraordinary maintenance) cannot be done on the spot and the torch must be sent to an authorised service centre, which will be able to carry out the special tests needed after the repair has been done.

#### Compressed air filter (Fig. G).

- The filter has an automatic condensate exhaust that is activated every time it is disconnected from the compressed air supply.
- Inspect the filter regularly; if there is any water in the glass, try bleeding it manually pushing the exhaust fitting upwards.
- If the filter cartridge is particularly dirty, it must be replaced to avoid excessive load losses.

#### EXTRAORDINARY MAINTENANCE

**EXTRAORDINARY MAINTENANCE OPERATIONS SHOULD BE CARRIED OUT ONLY AND EXCLUSIVELY BY SKILLED OR AUTHORISED ELECTRICAL-MECHANICAL TECHNICIANS AND IN COMPLIANCE WITH THE TECHNICAL STANDARD IEC/EN 60974-4.**



**WARNING! BEFORE REMOVING THE MACHINE PANELS AND WORKING INSIDE IT MAKE SURE THAT IT HAS BEEN SWITCHED OFF AND DISCONNECTED FROM THE MAIN POWER SUPPLY.**

**If checks are carried out inside the machine while it is live, this may cause serious electric shock due to direct contact with live parts.**

- Inspect the inside of the machine regularly, with a frequency depending on the amount of use and dust in the environment, and remove dust that has deposited on the transformer, rectifier, inductance and resistors, using a jet of dry compressed air (max 10 bar).
- Do not direct the jet of compressed air onto the electronic boards; these can be cleaned with a very soft brush or suitable solvents.
- Take the opportunity to make sure the electrical connections are tight and there is no damage to the wiring insulation.
- Make sure the compressed air circuit hoses and connections are intact and leak-free.
- When these operations have been completed, re-assemble the panels on the machine and tighten the fastening screws right down.
- Never ever carry out cutting operations with the machine open.
- After having carried out maintenance or repairs, restore the connections and wiring as they were before, making sure they do not come into contact with moving parts or parts that can reach high temperatures. Tie all the wires as they were before, being careful to keep the high voltage connections of the primary transformer separate from the low voltage ones of the secondary transformer.
- Use all the original washers and screws when closing the casing.

#### 8. TROUBLESHOOTING

IF OPERATION IS UNSATISFACTORY, AND BEFORE CARRYING OUT MORE SYSTEMATIC CHECKS OR CONTACTING OUR SUPPORT CENTRE, CHECK:

- The led is not on, signalling intervention of the safety thermal switch for over or undervoltage or short circuit.
- Ensure you have observed the nominal duty cycle ratio; in the event of intervention of the thermostatic protection, wait for the machine to cool naturally, check the fan is working.
- Check the line voltage: if the value is too high or too low, the machine remains blocked.
- Check there is no short circuit on machine output: in this case, proceed to eliminate the problem.
- The cutting circuit connections are carried out correctly, particularly the earth cable clamp is actually connected to the piece and without inter-positioning insulating materials (e.g. paint).

#### MOST COMMONLY OCCURRING CUTTING DEFECTS

During cutting operations it is possible that defects occur, which are not normally caused by operating faults in the system but by other operational matters such as:

##### a - Insufficient penetration or excessive slag formation:

- Cutting rate too high.
- Over-inclined torch.
- Piece too thick or cutting current too low.
- Inappropriate compressed air pressure-flow.
- Worn electrode and torch nozzle.
- Inappropriate nozzle-holder tip.

##### b - Arc transfer failure:

- Worn electrode.
- Poor contact of the return cable terminal clamp.

##### c - Interrupted cutting arc:

- Cutting rate too low.
- Torch-piece distance too high.
- Worn electrode.
- A safeguard has triggered.

##### d - Inclined cut (not perpendicular):

- Incorrect torch position.
- Asymmetric wear on nozzle hole and/or incorrect assembly of torch components.
- Inappropriate air pressure.

##### e - Excessive nozzle and electrode wear:

- Excessively low air pressure.
- Contaminated air (humidity, oil or other contaminants).
- Nozzle holder damaged.
- Excessive pilot arc start in air.
- Excessive speed with smelted particles return on the torch components.
- The average length of the cut.
- The air quality (presence of oil, humidity or other contaminants).
- Perforation of the metal or cut starting from the edge.
- The torch-piece distance is not appropriate when cutting.