PLASMA PROF 37

POWER SOURCE art. 961

SERVICE MANUAL

CONTENTS

1 - GENERAL INFORMATION

1.1 - Introduction.

The purpose of this manual is to train personnel assigned to carry out maintenance on the power source art. 961 for plasma cutting systems.

1.2 - General service policy.

It is the responsibility of the customer and/or operator to use the equipment appropriately, in accordance with the instructions in the Instruction Manual, as well as to maintain the equipment and related accessories in good working condition, in compliance with the instructions provided in the Service Manual.

Any internal inspection or repairs must be carried out by qualified personnel who are responsible for any intervention on the equipment.

It is forbidden to attempt to repair damaged electronic boards or modules; replace them with original Cebora spare parts.

1.3 - Safety information.

The safety notes provided in this manual are an integral part of those given in the Instruction Manual. Therefore, before working on the machine, please read the paragraph on safety instructions in the aforementioned manual.

Always disconnect the power cord from the mains before accessing the interior of the equipment.

Some internal parts, such as terminals and dissipaters, may be connected to mains or otherwise hazardous potentials. It is therefore forbidden to work with the safety guards removed from the machine unless strictly necessary. In this case, take special precautions such as wearing insulating gloves and footwear, and working in a perfectly dry environment with dry clothing.

1.4 - Electromagnetic compatibility.

Please read and observe the instructions provided in the paragraph “Electromagnetic compatibility” of the Instruction Manual.

2 - SYSTEM DESCRIPTION

2.1 - Introduction.

The PLASMA PROF 37 is a system for cutting electrically conductive materials using the plasma arc process. It is made up of an electromechanical power source, art. 961, with built-in torch, controlled by electronic circuit to manage the operative functions of the cutting system and the operator interface.

2.2 - Technical specifications.

To verify the technical specifications, see the machine plate, Instruction Manual, and Sales Catalogue.

2.3 - Description of power source art. 961.

Art. 961 is a direct current power source consisting of a three-phase transformer and a three-phase rectifier bridge.

Referring to the electrical diagram in par. 5.1, and drawing 4.1 and table 4.2, we can identify the main blocks that make up the power source.

The switch (40) powers the power transformer (38), the primary circuit of which consist of three windings, that connected in star or delta connection by the switch (40), allow the power source to operate at 230 or 400 Vac (for selection see Instruction Manual).

Voltage may be delivered (always at 230 Vac) from 2 terminals of one of the primary windings of the transformer (38), to power the lamp (22) (mains voltage presence), the control board (4) and thus auxiliary services (fan, contactors, solenoid valves).

The power transformer (38) secondary winding is connected to the contactor TLP (32), that when closed, supply the three-phase rectifier bridge (33) that rectifies the power source output voltage.

At the rectifier bridge (33) positive output is connected the pilot arc resistor (36), used for limiting pilot arc current and to facilitate the transferred arc operation.

The control board (4) manages the power source output voltage, by means of the input contactor TLP (32) and output contactor TLM (32), based on the signals present at its inputs.

With the switch (40) closed, the control board (4) is powered and awaiting the start signal from the torch button. The power source provides no output voltage.

When the start button on the torch is pressed, the control board (4):

- opens the gas solenoid valve EL1 (7);
- after the pre-gas time (approximately 500 msec., non adjustable) opens the solenoid valve ELT (6);
- after other 300 msec. closes input contactor TLP (32) and output contactor TLM (32).

The solenoid valve ELT (6), drives the pilot arc firing ram inside the torch, that, when under pressure, push in shot-circuit electrode and nozzle of the torch. Since solenoid valve ELT (6) remains opened only 400 msec., the momentary short-circuit between electrode and nozzle interrupts at the end of such time, when between the two terminals is present the power source output voltage, so that, inside the torch plasma chamber, strike the arc, due to short-circuit interruption with voltage applied, to light the pilot arc.

Obviously, with this system, we have only one tentative to light the pilot arc every time you press the torch start button.

If pilot arc doesn't start, control board (4), detecting a power source output voltage greater than 200 Vdc, set the power source at its resting state, with TLP (32) and TLM (32) opened. This system performs a safety function against electrical shock from contact. It eliminates the risk of electroshock that the operator would face by touching the ground contact and the torch, in the

event the torch is without nozzle or with pilot arc conductor interrupted, and the operator tries to light the pilot arc.

Once contactors TLP (32) and TLM (32) are opened, solenoid valve EL1 (7) remains opened for the post-gas time (60 sec. not adjustable).

When the torch approaches the work piece, with the pilot arc on, the arc current begins to circulate in the work piece, as this is the preferred path due to the voltage drop on resistor (36).

During cutting and pilot arc conditions, control board (4) detects the arc voltage to verify eventual power source output short-circuit. A voltage lower than 40 Vdc is considered not corrected to keep the arc light on, and so produces the power source block, with contactors TLP (32) and TLM (32) opened, and lamp G (39) flashing, indicating the block cause code (1 flash with 1 sec. pause).

When cutting ends the contactors TLP (32) and TLM (32) are deactivated, and solenoid valve EL1 (7) remains opened for the post-gas time to complete the torch cooling. Once this time has elapsed, the solenoid valves EL1 (7) is deactivated, and the power source returns to its initial resting state (power circuit not powered and no output voltage).

The fan (34) is supplied, through control board (4), at the same power source supply voltage, without any control from control board (4).

The pressure switch (8) inserted in the plasma gas line sends to the control board (4) the insufficient gas pressure signal, when the pressure is lower than 3,2 bar (minimum working pressure). Its normally closed contact also commands the lamp L (39) to signal the gas pressure error (lamp lit = pressure low).

The thermostat in reality is made by two thermostatic switches connected in series between them, located on two columns of the transformer (38) (temperature correct = contacts closed).

The intervention of one of the two thermostats is sufficient to produce the power source block, signaled by lamp G (39).

The signals processed by the electronic boards and present at their connectors are listed in the tables in chapter five of this manual.

3 - MAINTENANCE

WARNINGS

ANY INTERNAL INSPECTIONS OR REPAIRS MUST BE CARRIED OUT BY QUALIFIED PERSONNEL.

BEFORE BEGINNING MAINTENANCE OPERATIONS, UNPLUG THE POWER SOURCE FROM THE MAINS.

3.1 - Periodic inspection, cleaning.

Periodically remove dirt and dust from the internal parts of the power source, using a jet of low-pressure dry compressed air or a brush.

Check the condition of the power cables of the power source and torch; replace if aged or damaged.

Check the condition of the internal power connections and connectors on the electronic boards; if you find “loose” connections, tighten or replace the connectors.

3.2 - Operative sequence.

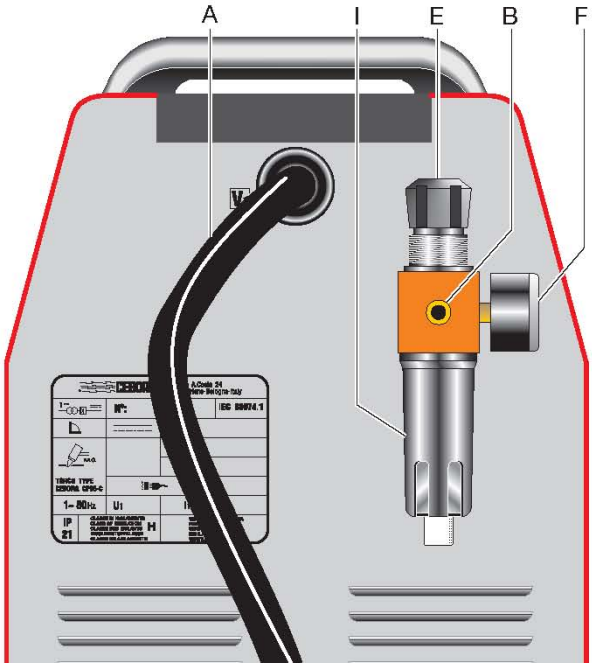
The following sequence represents correct functioning of the machine. It may be used as a guiding procedure for troubleshooting.

It must be carried out after each repair without any errors.

NOTE

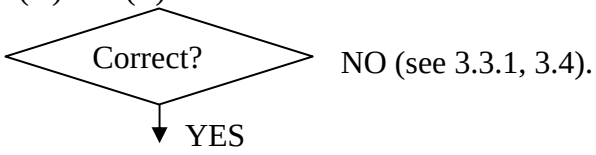
- ❑ Operations preceded by this symbol refer to operator actions.
- ♦ Operations preceded by this symbol refer to machine responses that must occur following an operator action.

3.2.1 - Power source commands and signals.



3.2.2 - Power source operation.

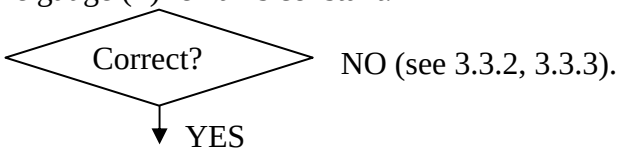
- System shut off and unplugged from the mains.
- Connect the gas intake to the fitting (B) on the rear panel.
- Turn the gas setting knob (E) to a pressure, as read on the pressure gauge (F), suited to the type of torch being used (see Instruction Manual).
- Connect the work clamp (H) to the work piece.
- Connect the power source to the mains.
- Close the switch (C) on the power source.
  - ♦ System powered, lamp (M) lit, fan (34) running.
  - ♦ On front panel, lamps (G) and (L) off.



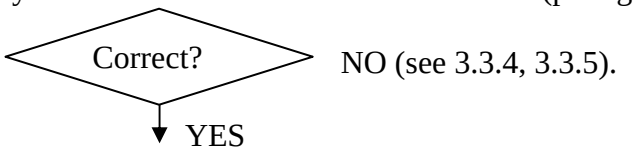
WARNING

DURING THE FOLLOWING TESTS, DO NOT POINT THE TORCH AT PEOPLE OR PARTS OF BODY, BUT ALWAYS TOWARDS AN OPEN SPACE OR THE WORK PIECE.

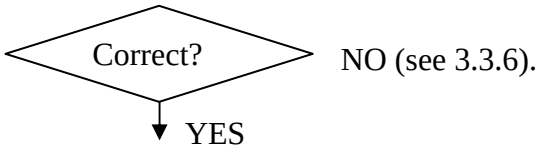
- Briefly press the torch start button.
  - ♦ Gas flows from the torch for approximately 60 sec. (post-gas). The pressure reading on the pressure gauge (F) remains constant.



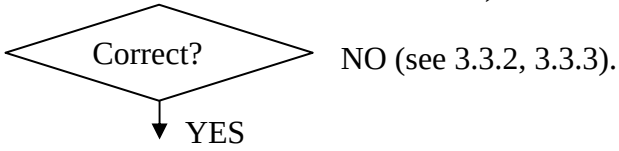
- Press the torch start button and hold it down for approximately 5 seconds to start the pilot arc.
  - ♦ Pilot arc lights for the pressure over start button lasting time. The gas continues to flow for approximately 60 sec. after the start button is released (post-gas).



- With pilot arc lit, place the torch near the work piece.
  - ♦ Begin cutting.



- Release the torch start button.
  - ♦ The arc shuts off immediately. The gas continues to flow for the post-gas time (approximately 60 seconds after the start button is released).



REGULAR OPERATION.

3.3 - Troubleshooting.

WARNINGS

ANY INTERNAL INSPECTIONS OR REPAIRS MUST BE CARRIED OUT BY QUALIFIED PERSONNEL.

BEFORE REMOVING THE PROTECTIVE GUARDS AND ACCESSING INTERNAL PARTS, DISCONNECT THE POWER SOURCE FROM THE MAINS.

NOTE

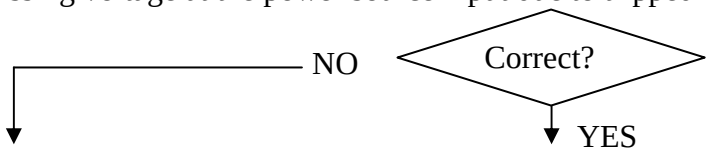
Items in **boldface** describe problems that may occur on the machine (symptoms).

- ❑ Operations preceded by this symbol refer to situations the operator must determine (causes).
- ♦ Operations preceded by this symbol refer to actions that the operator must perform in order to solve the problems (solutions).

3.3.1 - The power source does not start, lamp (22) off, fan (34) stopped.

MAINS SUITABILITY TEST.

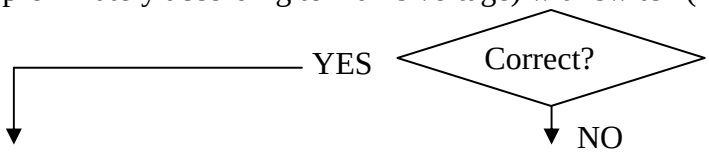
- ❑ Missing voltage at the power source input due to tripped mains protections.



- ♦ Eliminate any short-circuits or insulation leakage toward earth of the connections between power cable, switch (40), transformer (38) and control board (4).
- ♦ Check the insulation towards earth of the transformer (38) and fan (34). If leaking or short-circuited towards earth, replace.
- ♦ Mains not suited to power the power source (ex.: insufficient installed power).

MAINS CONNECTION TEST.

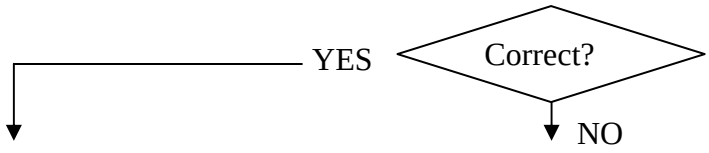
- ❑ Terminals U, V and W of switch (40) = 3 x 400 Vac approximately (or 3 x 230 Vac approximately according to mains voltage) with switch (40) closed.



- ♦ Check power cable and plug and replace if necessary.
- ♦ Check switch (40) and replace if defective.
- ♦ Check the mains voltage conditions, and especially that none of the three power supply phases is missing.

CONTROL BOARD (4) POWER SUPPLY TEST.

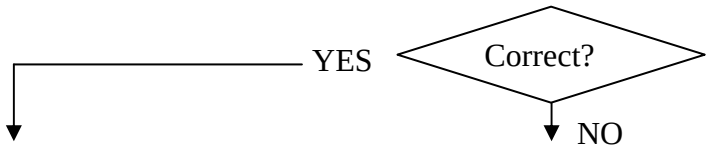
- ❑ Control board (4), connector J3, terminals 3 and 6 = 230 Vac approximately, both with mains at 230 and at 400 Vac.
- ❑ Control board (4), connector J6, terminals 1 and 2 = 24 Vac approximately.
- ❑ Control board (4), connector J7, terminals 4(-) and D1 diode cathode (+) = +15 Vdc approximately; connector J7, terminals 4(-) and D1 diode anode (+) = +5 Vdc approximately. All with switch (40) closed and both with mains at 230 and at 400 Vac.



- ♦ Check the wiring between switch (40) and control board (4).
- ♦ Check integrity of fuses on control board (4), considering that:
  - F1 is inserted in the supply circuits for control board (4) service transformer, contactors (32), solenoid valves (6) and (7), and fan (34).
    For checking performs:
    CONTACTOR TLP (32) COMMAND TEST, par. 3.3.4;
    CONTACTOR TLM (32) COMMAND TEST, par. 3.3.6;
    PILOT ARC EL1 (7) SOLENOID VALVE TEST, par. 3.3.3;
    PILOT ARC FIRING SOLENOID VALVE ELT (6) TEST, par. 3.3.4;
    FAN (34) TEST, par. 3.3.1.
  - F2 is inserted in the insulated supply circuit for torch start button.
    For checking performs START COMMAND TEST, par. 3.3.2.
  - F3 is inserted in the control board (4) supply circuit. In this case replace control board (4).
- ♦ Check the mains voltage conditions.
- ♦ Replace control board (4).

FAN (34) TEST.

- ❑ Control board (4), terminals J1 and J2 = approximately 230 Vac, with switch (40) closed and both with mains at 230 and at 400 Vac.



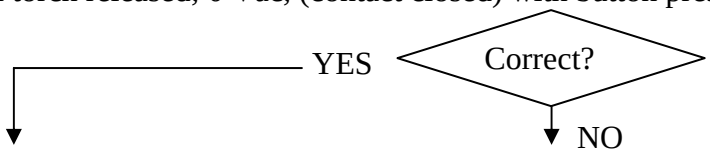
- ♦ Check the wiring between terminals J1 and J2 of control board (4) and fan (34).
- ♦ Check the wired bridge between terminals 1 and 2 of J3 on control board (4).
- ♦ Make sure the control board (4) supply voltage presence, performing, if necessary, the CONTROL BOARD (4) POWER SUPPLY TEST, par. 3.3.1.
- ♦ Disconnect temporarily, with power source off, the wires of fan (34) from J1 and J2 of control board (4), and make sure the resistance of the fan (34) terminals. Corrected value = 60 ohm approximately. If 0 ohm, short-circuit, replace fan (34) and fuse F1 on the control board (4).
- ♦ Replace control board (4).

- ♦ Make sure that there are no mechanical impediments blocking the fan (34).
- ♦ Disconnect temporarily, with power source off, the wires of fan (34) from J1 and J2 of control board (4), and make sure the resistance of the fan (34) terminals. Corrected value = 60 ohm approximately. If >Mohm, circuit interrupted, replace fan (34).
- ♦ Replace fan (34).
- ♦ Replace lamp (22).
- ♦ Replace control board (4).

3.3.2 - The start button produces no effect.

START COMMAND TEST.

- Control board (4), connector J6 terminals 1 and 2 = approximately 24 Vac, with start button on torch released; 0 Vac, (contact closed) with button pressed.



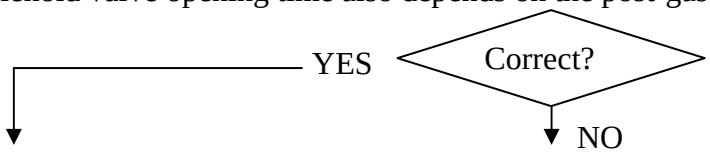
  - ♦ Check the wiring between J6 control board (4), terminal board (31), torch cable, nozzle guard on the torch and start button.
  - ♦ Make sure the nozzle protection and torch button are correctly assembled and in good working order. If defective or showing signs of wear, replace them.
  - ♦ Check integrity of fuse F2 on control board (4). If interrupted, replace it and make sure that there is perfect isolation between the conductors of the start button and those of the electrode and nozzle in the torch cable. If isolation is reduced, replace the torch cable or the complete torch. Any loss of isolation between the torch cable conductors may damage the control board (4).
  - ♦ Perform CONTROL BOARD (4) POWER SUPPLY TEST, par. 3.3.1.
  - ♦ Replace control board (4).

- ♦ Perform CONTROL BOARD (4) POWER SUPPLY TEST, par. 3.3.1.
- ♦ Replace control board (4).

3.3.3 - No gas flows from the torch.

PILOT ARC EL1 (7) SOLENOID VALVE TEST.

- Solenoid valve EL1 (7) terminals = approximately 230 Vac, with torch button pressed. The solenoid valve opening time also depends on the post-gas time.



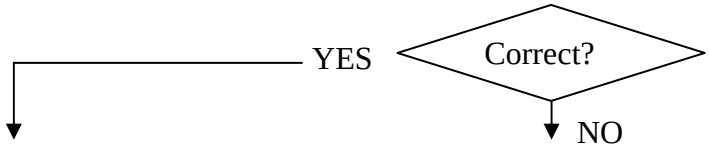
  - Check the wiring between solenoid valve EL1 (7) and terminals 6 and 12 of J4 on control board (4).
  - With power source off, check the resistance between terminals of solenoid valve EL1 (7) = approximately 2500 ohm. If 0 ohm (short-circuit), replace solenoid valve EL1 (7) and control board (4).
  - Perform the CONTROL BOARD (4) POWER SUPPLY TEST, par. 3.3.1.
  - Check the wired bridge between terminals 1 and 2 of J3 on control board (4). All auxiliary services, contactors and solenoid valves, are connected under such wired bridge and fuse F1.
  - Replace control board (4).

- With power source off, check the resistance between the terminals of solenoid valve EL1 (7) = approximately 2500 ohm. If >Mohm (winding broken) replace solenoid valve EL1 (7).
- Make sure there are no occlusions in the gas hoses of the power source.
- Check the presence of the gas at the inlet fitting (B) and that the pressure and flow rate in the intake conduit meet the specification values (see Instruction Manual).
- Make sure that the pressure regulator (E) and pressure gauge (F) are working properly.
- Make sure that the air fitting (B) inserted in the pressure regulator (E) has a threaded part no longer than 6 - 8 mm (1/4” - 5/16”), to avoid a possible regulator (E) malfunction.
- Replace solenoid valve EL1 (7).

3.3.4 - Gas flows from the torch, the pilot arc does not light.

CONTACTOR TLP (32) COMMAND TEST.

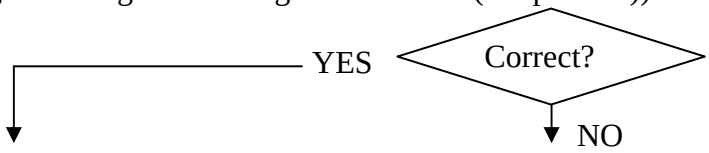
- Contactors TLP (32) = closed (230 Vac on coil terminals), with start button pressed, for the pressure over start button lasting time, in normal conditions, or for a brief period in case of pilot arc doesn't start.



  - ♦ Check the wiring between contactor TLP (32) coil and terminals 2 and 8 of J4 on control board (4).
  - ♦ With power source off, check the resistance between terminals of contactor TLP (32) coil. Corrected value = approximately 500 ohm. If 0 ohm (short-circuit), replace contactor TLP (32) and control board (4).
  - ♦ Check the wired bridge between terminals 1 and 2 of J3 on control board (4). All auxiliary services, contactors and solenoid valves, are connected under such wired bridge and fuse F1.
  - ♦ Perform the CONTROL BOARD (4) POWER SUPPLY TEST, par. 3.3.1.
  - ♦ Replace control board (4).
- ♦ With power source off, check the resistance between terminals of contactor TLP (32) coil. Corrected value = approximately 500 ohm. If >Mohm (coil interrupted), replace contactor TLP (32).

POWER SOURCE OPEN CIRCUIT OUTPUT VOLTAGE TEST.

- Torch terminal board (31), nozzle and electrode (gnd) terminals = fig. 5.2.1, with start button pressed. Power source output voltage interrupted for missing pilot arc light on (safety function against dangerous voltage on the torch (see par. 2.3)).



  - ♦ Check the wiring between J7 of control board (4) and torch cable electrode and nozzle terminals on terminal board (31).
  - ♦ Check the wiring between rectifier (33) negative terminal, and torch cable electrode terminal on terminal board (31), and between rectifier (33) positive terminal, resistor (36) and torch cable nozzle terminal on terminal board (31). If you find loose connections, tighten them and replace any components with damaged terminals.
  - ♦ With power source off, check the resistance of resistor (36). Corrected value = 1,4 ohm. If not correct replace resistor (36).
  - ♦ With the power source off and disconnected from the mains, check the efficiency of the contacts of contactor TLP (32), manually activating it, and make sure that the resistance on each contact is approximately 0 ohm. If you find burnt contacts or interference in moving the parts, replace the TLP (32).
  - ♦ With the power source on, check on contactor TLP (32) power terminals voltage = 3 x 190 Vac approximately, both with mains at 230 or 400 Vac..
  - ♦ Check the condition of the windings of transformer (38), especially making sure that there are no signs of overheating or dents in the winding columns that may lead to partial short-circuits in the turns. If necessary, replace the transformer (38).

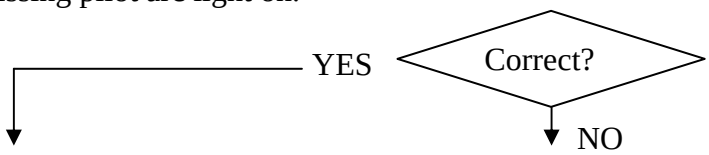
- ♦ Check the condition of the torch cable and torch, especially making sure there are no short-circuits or isolation leaks between the conductors, and that electrode, nozzle, nozzle holder and diffuser are not to be replaced.

PILOT ARC FIRING SOLENOID VALVE ELT (6) TEST.

NOTE

All auxiliary services, contactors, solenoid valves, fan, are supplied directly at mains potential, so that detecting the following waveform use a battery scope or a scope with insulating probe.

- ❑ Solenoid valve ELT (6) terminals = fig. 5.2.2, 230 Vac approximately, with torch button pressed. Solenoid valve ELT (6) voltage supply, interrupted after 400 msec. approximately for missing pilot arc light on.



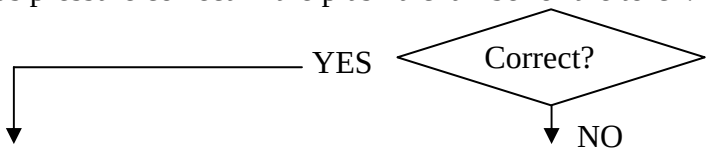
- ♦ Check the wiring between solenoid valve ELT (6) and terminals 4 and 10 of J4 on control board (4).
- ♦ With power source off, check the resistance between terminals of solenoid valve ELT (6) = approximately 2 Kohm. If 0 ohm (short-circuit), replace solenoid valve ELT (6) and control board (4).
- ♦ Check the wired bridge between terminals 1 and 2 of J3 on control board (4). All auxiliary services, contactors and solenoid valves, are connected under such wired bridge and fuse F1.
- ♦ Perform the CONTROL BOARD (4) POWER SUPPLY TEST, par. 3.3.1.
- ♦ Replace control board (4).

- ♦ With power source off, check the resistance between the terminals of solenoid valve ELT (6) = approximately 2 Kohm. If >Mohm (winding broken) replace solenoid valve ELT (6).
- ♦ Make sure there are no occlusions in the gas hoses of the power source, especially in the conduit between ELT (6) and the pilot arc firing ram inside the torch.
- ♦ With power source off, make sure the pilot arc firing ram inside the torch is working properly, by manually supplying the ELT (6) air conduit. If you find a firing ram in defective working conditions replace it or replace the complete torch.
- ♦ Make sure that the pressure in the torch plasma chamber is not excessive, and regulator (E) and pressure gauge (F) are working properly.
- ♦ Check the condition of the torch cable and torch, especially making sure there are no short-circuits or isolation leaks between the conductors and that electrode, nozzle, nozzle holder and diffuser are not to be replaced (see Instruction Manual).
- ♦ Replace solenoid valve ELT (6).
- ♦ Replace the complete torch.
- ♦ Replace control board (4).

3.3.5 - Irregular pilot arc starts, unstable pilot arc.

PLASMA GAS PRESSURE TEST.

- Gas pressure correct in the plasma chamber of the torch.

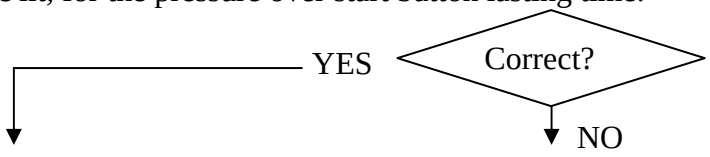


  - ♦ Make sure that solenoid valve EL1 (7) = opened, during the pilot arc.
  - ♦ Check for the presence of gas at the intake fitting (B) and make sure that the pressure and flow rate in the intake line meet specifications (see Instruction Manual and Sales Catalog).
  - ♦ Make sure that the air fitting (B) inserted in the pressure regulator (E) has a threaded part no longer than 6 - 8 mm (1/4” - 5/16”), to avoid a possible regulator (E) malfunction.
  - ♦ Make sure that the pressure regulator (E) and pressure gauge (F) are working properly; replace if defective.
  - ♦ Make sure there are no occlusions in the gas hoses of the power source.
- ♦ With power source off, check the resistance of resistor (36). Corrected value = 1,4 ohm. If not correct replace resistor (36).
- ♦ Make sure the internal parts of the torch are properly isolated, including the cables, and if in doubt replace the entire torch.
- ♦ Check the electrode, swirl ring and torch nozzle; replace if worn or damaged.
- ♦ With power source off, make sure the pilot arc firing ram inside the torch is working properly, by manually supplying the ELT (6) air conduit. If you find a firing ram in defective working conditions replace it or replace the complete torch.

3.3.6 - Transfer arc does not take place or is too weak for cutting.

CONTACTOR TLM (32) COMMAND TEST.

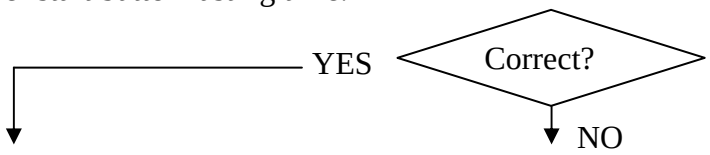
- Contactor TLM (32) = closed (230 Vac on coil terminals), with start button pressed and pilot arc lit, for the pressure over start button lasting time.



  - ♦ Check the wiring between contactor TLM (32) coil and terminals 1 and 7 of J4 on control board (4).
  - ♦ With power source off, check the resistance between terminals of contactor TLM (32) coil. Corrected value = approximately 500 ohm. If 0 ohm (short-circuit), replace contactor TLM (32) and control board (4).
  - ♦ Replace control board (4).
- ♦ With power source off, check the resistance between terminals of contactor TLM (32) coil. Corrected value = approximately 500 ohm. If >Mohm (coil interrupted), replace contactor TLM (32).

POWER SOURCE OUTPUT VOLTAGE WITH PILOT ARC LIT TEST.

- Electrode terminal on terminal board (31) (-) and power source output terminal (H)(51) (+) = approximately +100 - +180 Vdc, with start button pressed and pilot arc lit, for the pressure over start button lasting time.



  - ♦ Check connections between positive terminal of rectifier (33), contactor TLM (32) and output terminal (H)(51) of the power source. If any defective connections are found, restore them and replace any components with damaged terminals.
  - ♦ With the power source off, check the efficiency of the contacts of contactor TLM (32), by manually activating it, and make sure that the resistance on each contact is approximately 0 ohm. If you find burnt contacts or interference in moving the parts, replace the TLM (32) contactor.
- ♦ Check connections between torch cable and negative terminal of the rectifier (33), and between work cable, contactor TLM (32) and positive terminal of the rectifier (33). If you find any deteriorated connections, reset them and replace any damaged components.
- ♦ Check connections between work cable and workpiece.
- ♦ Make sure that the gas lines in the power source are not partially clocked, so that the gas throughput is enough for the pilot arc but not for the transfer arc.
- ♦ Make sure that the air fitting (B) inserted in the pressure regulator (E) has a threaded part no longer than 6 - 8 mm (1/4” - 5/16”), to avoid a possible malfunction of the regulator (E).
- ♦ Check the condition of electrode, nozzle, nozzle holder and diffuser of the torch.
- ♦ Check the wiring between J7 of control board (4) and electrode and nozzle torch cable terminals on terminal board (31).
- ♦ Replace control board (4).

3.4 - Alarm signals.

3.4.1 - Lamp (G) (39) lit, with fix light = transformer (38) temperature above the limit.

Power source remains in block with contactors TLP (32) and TLM (32) opened.

We recommend not to shut off the power source, to keep the fan (34) running and thus allow rapid cooling.

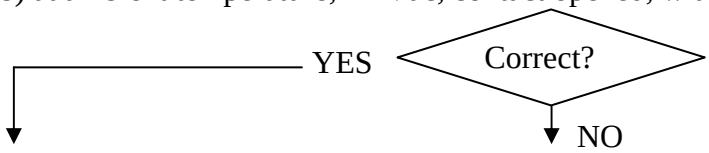
This is reset automatically when the temperature returns within the allowed limits.

Thermostat in reality is made by two thermostatic switches connected in series between them, located on two columns of the transformer (38).

To analyze the problem perform the following test.

THERMOSTAT ON TRANSFORMER (38) TEST.

- Control board (4), connector J6, terminals 6 and 7 = 0 Vac, contact closed, with transformer (38) at ambient temperature; 24 Vac, contact opened, with temperature excessive.



  - Check the wiring between thermostats on transformer (38) and terminals 6 and 7 of J6 on control board (4), considering that in reality thermostatic switches are two, series connected between them.
  - Make sure that the two thermostatic switches are intact and properly positioned on the windings of the transformer (38).
  - If the alarm occurs while cutting, and the transformer (38) is evenly heated, make sure that the duty-cycle is not greater than indicated in the power source specifications.
  - If the alarm occurs while cutting, and only some of the windings of the transformer (38) are heated, one may infer that the transformer (38) is partially short-circuited, and must therefore be replaced.
  - Replace thermostat on transformer (38).
- Replace control board (4).

3.4.2 - Lamp (G) (39) flashing (one flash with one second pause) = arc voltage lower than working minimum threshold.

Usually is due to a short-circuit or excessive load at the power source output, so that the output voltage falls down 40 Vdc. Control board (4) detects such signal (connector J7, terminals 1(+) and 4(-)) and commands power source block, with contactors TLP (32) and TLM (32) opened.

This is reset by turning off the power source.

At the origin of the problem you can hypothesize that the electrode and nozzle short-circuit lasts to much, caused by firing ram in the torch blocked in extended position, or electrode and nozzle attachment, or short-circuit in the torch cable, or else an overload during cutting caused by a wrong use of the torch over the work piece.

Check the wiring between J7 on control board (4) and electrode and nozzle torch cable terminals on terminal board (31). An eventual interruption of this connection may cause this alarm.

3.4.3 - Lamp (G) (39) flashing (two flashes with one second pause) = start button pressed during power source start-up.

If at the start up the start button on the torch is detected closed, the power source remains in block with contactors TLP (32) and TLM (32) opened, without output voltage and with lamp (G) (39) flashing.

The reset is automatic when the start button is released.

For the problem analysis perform the START COMMAND TEST, par. 3.3.2.

3.4.4 - Lamp (L) (39) lit, with fix light = low gas pressure.

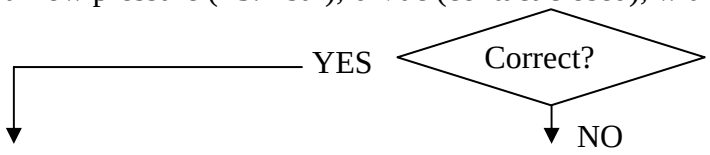
With this alarm the power source remains in block with contactors TLP (32) and TLM (32) opened, without output voltage.

This is automatically reset when the pressure returns within the allowed limits, but to restart pilot arc you need a new start command by torch start button.

To analyze the problem perform the following test.

PRESSURE SWITCH (8) TEST.

- Control board (4), connector J6, terminals 3 and 5 (NC contact) = 0 Vac (contact closed), with low pressure (<3.2 bar); 24 Vac (contact opened), with suitable pressure.
- Control board (4), connector J6, terminals 3 and 4 (NO contact) = 24 Vac (contact opened), with low pressure (<3.2 bar); 0 Vac (contact closed), with suitable pressure.



  - Check the wiring between pressure switch (8) and terminals 3, 4 and 5 of J6 on control board (4).
  - Check for the presence of gas at the intake fitting (B) and make sure the pressure and flow rate in the in feed line meet specifications (see Instruction Manual).
  - Make sure that the pressure regulator (E) and pressure gauge (F) are working properly.
  - Make sure that the air fitting (B) inserted in the pressure regulator (E) has a threaded part no longer than 6 - 8 mm (1/4” - 5/16”), to avoid a possible malfunction of the regulator (E).
  - Make sure there are no occlusions in the gas hoses of the power source.
  - Replace the pressure switch (8).
  - Replace the control board (4).
- Proper operation of the pressure switch (8).
- Replace control board (4).

4 - COMPONENTS LIST

4.1 - Power source art. 961 : see file ESP961.pdf enclosed at the end of the manual.

4.2 - Components table: see file ESP961.pdf enclosed at the end of the manual.

4.3 - List of spare parts.

Essential spare parts.

Ref.	Code	Description	Qty.
4	5602146	control circuit	1
6	3160196	solenoid valve	1
7	3160179	solenoid valve	1
8	5710129	pressure switch	1
11	3160166	pressure gauge	1
33	3200320	rectifier bridge	1
40	3190128	switch	1

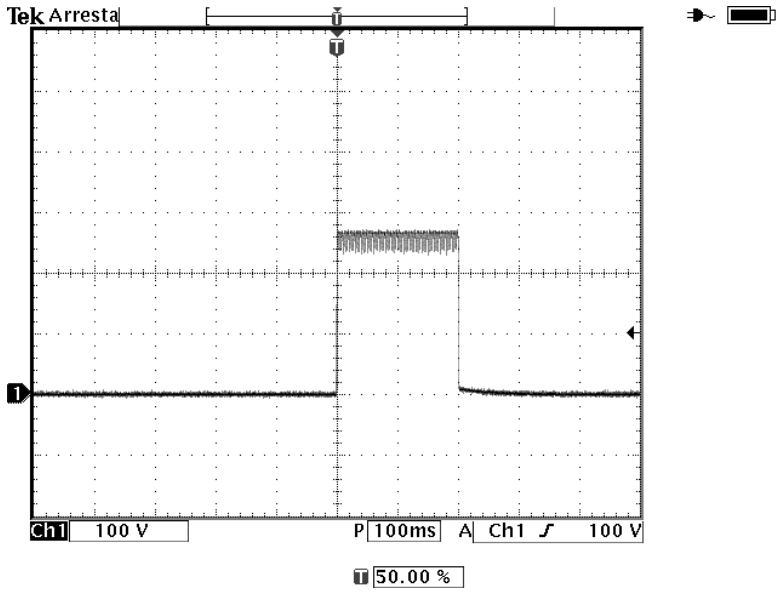
Recommended spare parts.

Ref.	Code	Description	Qty.
10	3160167	reducer	1
32	3190275	contactor	1
36	3205054	resistor	1

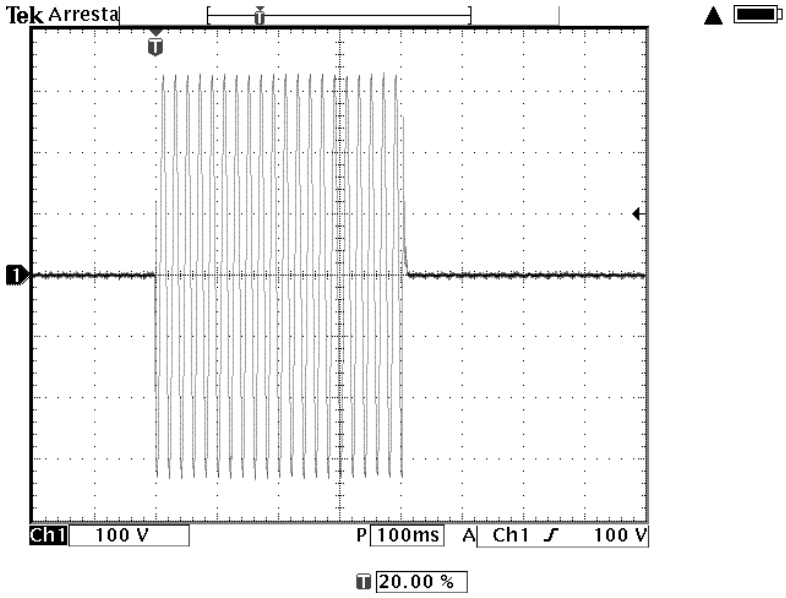
5 - ELECTRICAL DIAGRAMS

5.1 - Power source art. 961 : see file SCHE961.pdf enclosed at the end of the manual.

5.2 - Waveforms.



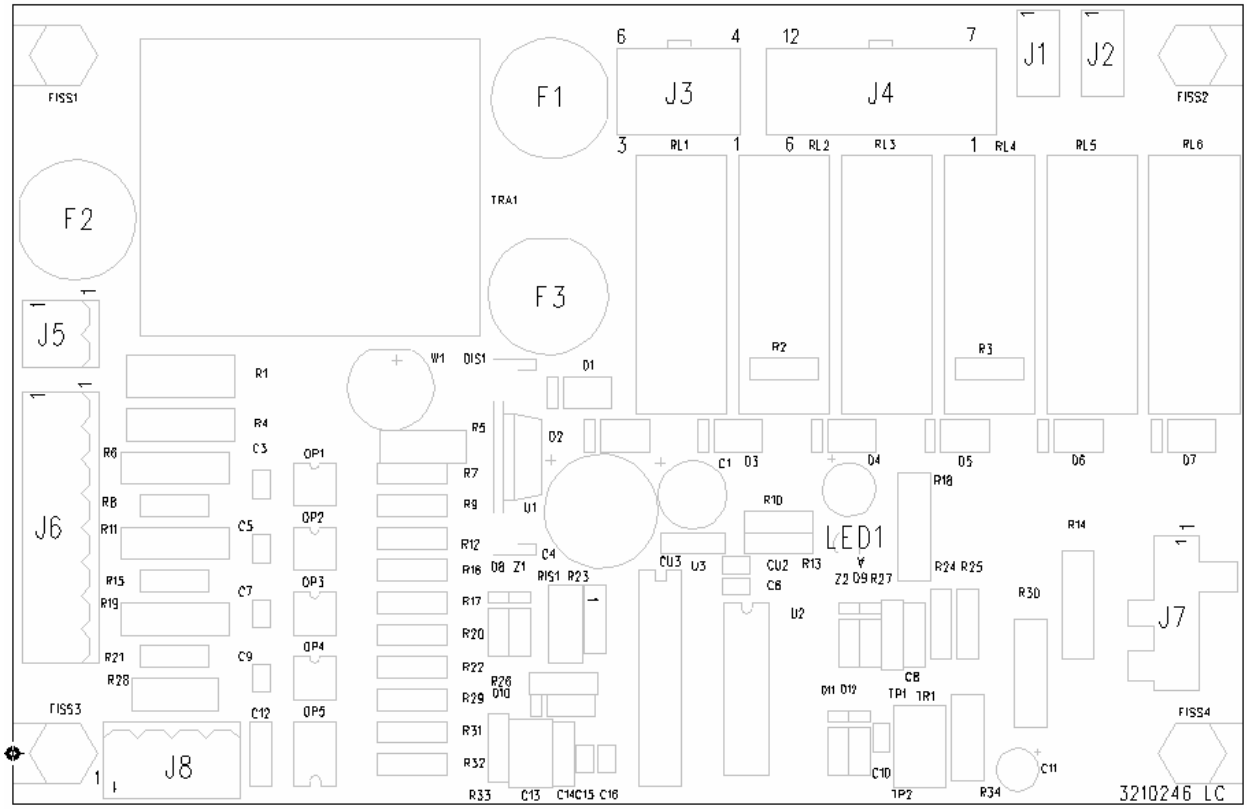
5.2.1 - Power source output voltage, interrupted for missing pilot arc light on (par. 3.3.4).



5.2.2 - Solenoid valve ELT (6) voltage supply, interrupted after 400 msec. approximately for missing pilot arc light on (par. 3.3.4).

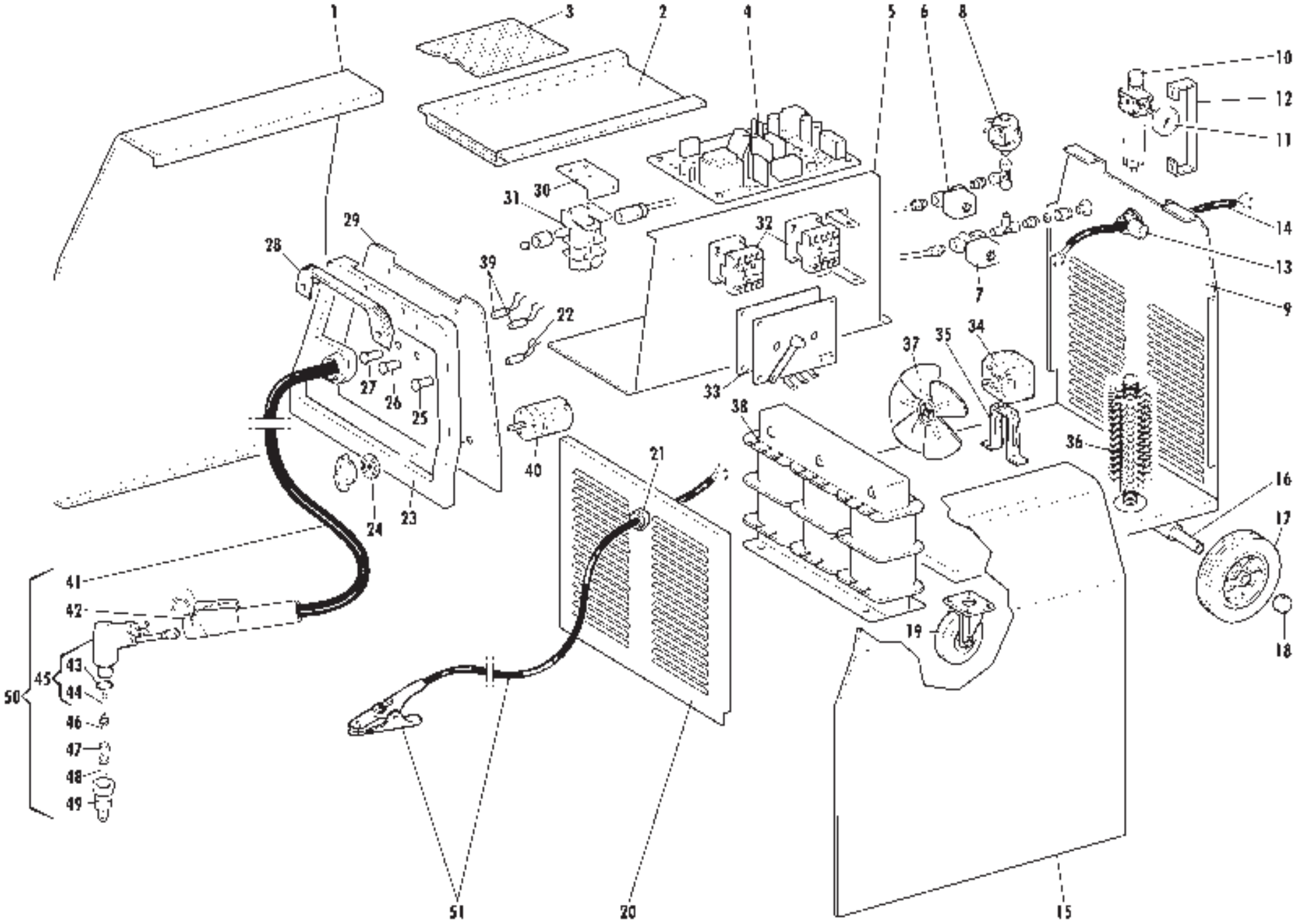
5.3 - Control board (4) code 5.602.146.

5.3.1 - Topographical drawing.



5.3.2 - Connector table.

Connector	Terminals	Function
-	J1 – J2	230 Vac output for fan (34) power supply.
J3	1 – 2	wired bridge for fan (34), solenoid valves and contactors power supply.
J3	4 – 5	NU.
J3	3 – 6	230 Vac input for control board (4), fan (34), solenoid valves and contactors power supply.
J4	1 – 7	contactor TLM (32) command output.
J4	2 – 8	contactor TLP (32) command output.
J4	3 – 9	NU.
J4	4 – 10	solenoid valve ELT (6) command output.
J4	5 – 11	NU.
J4	6 – 12	solenoid valve EL1 (7) command output.
J5	-	NU.
J6	1 – 2	start signal input from torch button.
J6	3 – 4 – 5	pressure signal input from pressure switch (8).
J6	6 – 7	temperature signal input from thermostats on transformer (38).
J7	1(+) – 4(-)	power source output voltage signal input.
J8	1 – 2	lamp L (39) command output (pressure insufficient).
J8	3 – 4	lamp G (39) command output (overtemperature and code alarms).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pos	DESCRIZIONE	DESCRIPTION
01	LATERALE SINISTRO	LEFT SIDE PANEL
02	COPERCHIO	COVER
03	COPERTURA GOMMA	RUBBER MAT
04	CIRCUITO DI CONTROLLO	CONTROL CIRCUIT
05	PIANO INTERMEDIO	INSIDE BAFFLE
06	ELETTROVALVOLA	SOLENOID VALVE
07	ELETTROVALVOLA	SOLENOID VALVE
08	PRESSOSTATO	PRESSURE SWITCH
09	FONDO	BOTTOM
10	RIDUTTORE	REGULATOR
11	MANOMETRO	GAUGE
12	PROTEZIONE	PROTECTION
13	PRESSACAVO	STRAIN RELIEF
14	CAVO RETE	POWER CORD
15	LATERALE DESTRO	RIGHT SIDE PANEL
16	ASSALE	AXLE
17	RUOTA FISSA	FIXED WHEEL
18	TAPPO	CAP
19	RUOTA PIROETTANTE	SWIVELING CASTOR
20	PANNELLO ANTERIORE	FRONT PANEL
21	PRESSACAVO	STRAIN RELIEF
22	LAMPADA SPIA	LIGHT
23	CORNICE	FRAME
24	DISCO CAMBIATENSIONE	LOCKING DISC
25	PORTA LAMPADA	LAMP HOLDER
26	PORTA LAMPADA	LAMP HOLDER
27	PORTA LAMPADA	LAMP HOLDER

pos	DESCRIZIONE	DESCRIPTION
28	MANICO	HANDLE
29	PANNELLO COMANDI COMP.	COMPLETE CONTROL PANEL
30	SUPPORTO MORSETTIERA	TERMINAL BOARD SUPPORT
31	MORSETTIERA	TERMINAL BOARD
32	TELERUTTORE	CONTACTOR
33	RADDRIZZATORE	RECTIFIER
34	MOTORE	MOTOR
35	SUPPORTO MOTORE	MOTOR SUPPORT
36	RESISTENZA	RESISTANCE
37	VENTOLA	FAN
38	TRASFORMAT. DI POTENZA	POWER TRANSFORMER
39	CONNESSIONE	CONNECTION
40	COMMUTATORE	SWITCH
41	CAVO TORCIA	TORCH CABLE
42	IMPUGNATURA CON PULSANTE	HANDGRIP WITH PUSHBUT TON
43	ANELLO O.R.	O.RING
44	DIFFUSORE	DIFFUSER
45	CORPO TORCIA (TESTINA)	TORCH BODY (HEAD)
46	ELETTRODO (CONF. DA 5 PZ.)	ELECTRODE (PACK. 5 PCS.)
47	DIFFUSORE ISOLANTE (CONF. DA 2 PZ.)	SWIRL RING (PACK 2 PCS.)
48	UGELLO (CONF. DA 10 PZ.)	NOZZLE (PACK. 10 PCS.)
49	PORTAUGELLO	NOZZLE HOLDER
50	TORCIA COMPLETA	COMPLETE TORCHE
51	MORSETTO + CAVO	SCREW KNOB + CABLE
52	CONDENSATORE	CAPACITOR
52	CONDENSATORE	CAPACITOR

La richiesta di pezzi di ricambio deve indicare sempre: numero di articolo, matricola e data di acquisto della macchina, posizione e quantità del ricambio.

When ordering spare parts please always state the machine item and serial number and its purchase data, the spare part position and the quantity.

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L2
L3
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U/T1
Z/T9
SL/2
V/T2
X/T7
TL/3
W/T3
Y/T8
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6
7
8
40
22
38
TLP
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33
1.4 Ω
36
31
50
51
TLM
34
M
1AC
7
EL1
6
ELT
J3
J4
J1
J2
J6
J7
J8
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NO
C
L
G
ON OFF ON
ARIA
AIR
LUFT
AIRE
ART. 961
3x230/400V 50Hz