PLASMA PROF 164 HQC

POWER SOURCE art. 954 +
STARTER UNIT HV18 art. 472 +
GAS CONSOLE PGC1-2 art. 477 +
PVC VALVE CONSOLE art. 478 +
TORCH CP250G art. 1236

SERVICE MANUAL

CONTENTS

1 - GENERAL INFORMATION

1.1 - Introduction.

The purpose of the present manual is to train personnel assigned to carry out maintenance on the Plasma PROF 164 HQC system for automated 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, and wait for the internal capacitors to discharge (1 minute) 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.

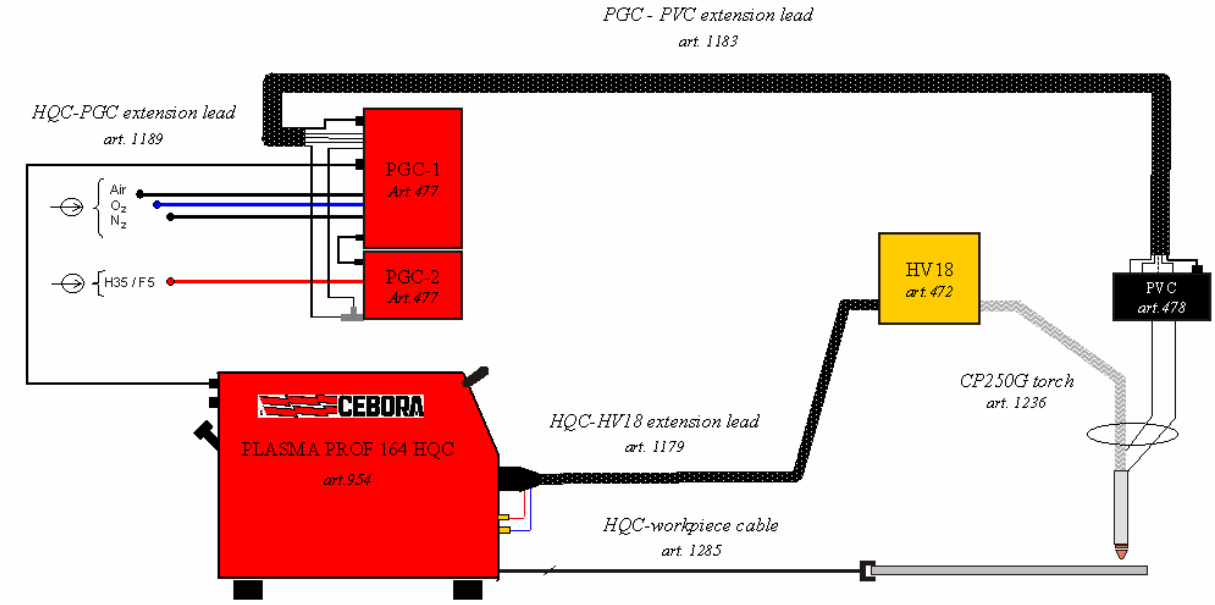
2 - SYSTEM DESCRIPTION

2.1 - Introduction.

The Plasma PROF 164 HQC is a system for cutting electrically conductive materials using a multigas plasma arc process, for mechanical systems.

It consists of an electronic Power Source (art. 954), a Starter Unit HV18 (art. 472), a Gas Console PGC1-2 (art. 477), a PVC Valve Console (art. 478), the Torch CP250G (art. 1236), and a series of accessories to adapt to automated systems (see list in the Sales Catalogue).

The units that make up the cutting system and the corresponding connections can be seen in fig. 2.1.1.



2.1.1 - Plasma PROF 164 HQC system.

2.2 - Technical specifications.

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

2.3 - Description of Plasma PROF 164 HQC system.

The cutting system is controlled by microprocessor-based circuits, which manage the functions for the plasma arc control and the interface with the operator and system.

Referring to fig. 2.1.1, electrical diagrams in par. 5, the drawings and tables in par. 4 you may identify the main blocks that make up the system.

Power Source and Gas Console contain the microprocessor-based circuits, which in addition to managing the functions of the groups that make up the system, communicate amongst themselves by CAN bus serial line, to collaborate smoothly with system operation.

Based on this architecture, one may identify the following units:

- MASTER microprocessor, in the control board (38) of the Power Source art. 954;
- SLAVE microprocessor, in the panel board (20) of the Gas Console art. 477.

Each microprocessor is programmed with a different program, which obviously must be compatible with that of the other microprocessor. To make it easier to insert and update these programs, a unique access system is present (the connector (34) (J) on the front panel of the Power Source for RS232 serial communication), which allows both microprocessors to be programmed in a single session.

This operation allows both programs to be entered simultaneously into the two microprocessors, and each automatically in its proper place.

Specifically, the new program is entered into the MASTER processor which, when programming is finished, checks whether the version resident in the SLAVE is compatible with its new program. If compatible, the system is ready for operation, with no need for further programming. If not compatible, the MASTER programs the SLAVE directly, using the data present in its own memory. This programming stage is highlighted by the shutting off of all indicators on the Gas Console panel, and may lasts approximately two minutes. During this phase, it is recommended that you not perform any operation, but wait for programming to be completed. This will be signaled by the appropriate lights on the Gas Console panel that return on.

The version of the programs entered can be seen on the start-up screen of display (C) of the Power Source control panel.

The updated MASTER and SLAVE programs are grouped together with the "Cebora Downloader" programming software into a single programming file, available along with instructions from the web site www.cebora.it..

2.4 - Description of Power Source art. 954.

Art. 954 is a direct current Power Source with controlled current, consisting of a three-phase rectifier bridge and a DC/DC igbt converter.

The cooling unit for the torch is located at the back, consisting of the tank, pump, radiator, filter and flow meter.

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

The switch (39) acts on the service transformer (50), which powers the electronic boards and internal services through the fuse board (50).

The power transformer (27) has the primary circuit consisting of six windings which, appropriately switched by the voltage change, allow the Power Source to work at 230, 400 or 440 Vac at 50/60 Hz. Near the main voltage change is also the voltage change of the service transformer (50).

The voltage, always at 230 Vac, is deliverable from one of the windings of the primary circuit for the fan (20) and pump (13) of the cooling unit.

The transformer (27) is powered through the contactor (44), which is controlled at closing by the control board (38), once the DC-capacitors, present on the pilot arc board (58), have been pre-charged and the transformer itself pre-magnetized.

The transformer (27) secondary circuit is connected to the rectifier bridge (23), which powers the pilot arc board (58), which contains the DC-capacitors, the igbt power module and the two Hall-effect current transducers to detect the pilot arc and cutting currents.

Inside the igbt module is the switching element, the igbt, and the freewheeling diode, connected in a "Chopper" configuration.

The RC board (48) mounted near the igbt module of the pilot arc board (58) contains the RC network to protect the igbt during switching.

The negative output (1) of the igbt module on the pilot arc board (58) is connected to the inductor (24), to level the arc current and thus the output (53) for the electrode potential, ready for connection to the Starter Unit HV18 (art. 472).

The terminal TP3 of the pilot arc board (58) corresponds to the positive output (3) of the igbt module, and constitutes the earth potential output ready to connect to the earth cable.

This connection, inside the pilot arc board (58), leads to the Hall-effect current transducer, which sends the cutting current signal to the settings board (54).

The terminal J5 of the pilot arc board (58) also corresponds to the positive output (3) of the igbt module. This is connected to the nozzle resistor (17), which facilitates switching from pilot arc to transfer arc, and the nozzle potential output ready for connection to the Unit HV18. This connection, inside the pilot arc board (58), also leads to the Hall-effect current transducer, which sends the pilot arc current signal to the settings board (54).

The settings board (54) constitutes the actual current regulator for the system.

It generates the igbt drive signal, calculating the waveform (duty cycle) by comparing the current reference signal from the control board (38) to the current feed-back signal from the current transducers on the pilot arc board (58).

The signals of the two current transducers are also used for switching between pilot arc and transfer arc. Specifically:

- when the Power Source output current (signal of the transducer on TP3) is equal to the pilot arc current (signal of the transducer on J5), the control activates operation in pilot arc mode.
- when the Power Source output current (signal of the transducer on TP3) is greater than the pilot arc current (signal of the transducer on J5), the control activates operation in transfer arc (cutting) mode.

This check is carried out by the control board (38), which analyzes the signals of the two current transducers appropriately handled by the settings board (54).

The connector (3) on the rear panel is ready to connect the Power Source to the Gas Console. It contains the supply voltages (24 Vac and 27 Vac) for the Gas Console and the CAN bus communication line for the exchange of information between the MASTER processor on the Power Source and the SLAVE processor on the Gas Console. The two supply voltages, 24 Vac and 27 Vac, of the Gas Console are generated by the service transformer (56), powered by the same voltage that powers the service transformer (50).

The connector (4) on the rear panel is ready to connect the Power Source to the system (pantograph or robot). It contains all of the signals necessary for the cutting system to dialogue with the plant.

These signals include:

- emergency stop (signal from the system to the Power Source);
- start Power Source (signal from the system to the Power Source);
- operating permission (pantograph or robot connected);
- arc voltage (signal from the Power Source to the system);
- arc lit (signal from the Power Source to the system).

The remote board (59) acts as an interface between the control board (38) of the Power Source and the system, and connects and affects all of the signals present on the connector (4).

The fuse board (50) contains the fuses for the following circuits:

- power supplies to the electronic boards;
- power supply to the DC-capacitors pre-charge circuit on pilot arc board (58);
- power supply of the line contactor (44).

The pre-charge board (45), controlled by the control board (38) acts:

- the pre-charge of DC-capacitors on pilot arc board (58); during this phase the voltage reached by the capacitors is checked, and the corresponding signal is sent to the control board (38);
- pre-magnetization of the power transformer (27), through the resistors R16, R17, R18 and relay RL3, present on the pre-charge board (45);
- power supply of the cooling unit pump (13) through the relay RL1.

The control board (38) contains the main microprocessor of the Power Source (MASTER).

It supervises management of the other boards, more specialized in their respective functions, controls the line contactor (44), processes the reference signal of the cutting current to be sent to the settings board (54), communicates with the microprocessor of the panel board on the Gas Console (SLAVE) to manage the solenoid valves of the gas circuits, and makes sure that proper operating conditions are always present.

The control board (38) also manages the user interface, which in this system is divided across two panels, one on the Power Source and the other on the Gas Console. The panel on the Power Source is managed directly by the panel board (38) on the Power Source; the one on the Gas Console is managed by the panel board (20) of the Gas Console, based on the information provided by the control board (38) via CAN bus line.

The panel on the Gas Console is the main system panel, and allows you to set all operating parameters. The panel on the Power Source summarizes the information displayed on the Gas Console panel, and does not allow the operating parameters to be set.

The Power Source control panel is made up of the panel board (38) mounted directly on the back of the control board (38). It includes:

- two displays to show error codes, the cutting current and nozzle hole diameter.
- a set of leds to indicate the operating status;
- an encoder (knob (I)) to adjust the cutting current.

The connector of the RS232 communication port is located on the front panel for connecting to a Personal Computer, through which it is possible to update the Power Source software.

The pilot arc board (58) receives the temperature signals from the thermostats located on the transformer (27) and igbt dissipater of the pilot arc board (58) itself.

Based on these signals, the Power Source is blocked for overtemperature, with the displays of the two control panels showing the corresponding error code.

The torch board (42) acts as an interface with the Power Source output; it receives and affects those signals particularly affected by disturbances, because they arrive from critical areas of the system.

These signals include:

- Power Source output voltage;
- pilot arc voltage;
- “carter open” signal on the Unit HV18.

The fan (20) to cool the power components of the Power Source is connected directly to the primary circuit of the transformer (27) (the same winding that powers the cooling unit). It is therefore sufficient to close the contactor (44) for it to be powered, always at 230 Vac.

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

2.5 - Description of Starter Unit HV18 art. 472.

The Starter Unit HV18 art. 472 is a high-voltage and high-frequency Power Source for arc striking in the torch CP250G.

For optimum yield it must be located near the torch, therefore we recommend connecting it directly to the prepared terminals of the torch cable without inserting other extensions. Using the extension art. 1179, included to connect the Power Source and HV18 Unit and supplied together with the cutting system, it is possible to position the Power Source away from the pantograph or robot (max. 12 m).

Referring to the electrical diagram in par. 5.1, the drawing in par. 4.1 and table 4.2, one may see the main elements that make up the Unit HV18.

It is essentially made up of the control box board (2), HF board (5) and HF transformer (7).

The control box board (2) connects the torch cable and extension cord from the Power Source, and applies the filters necessary to suppress disturbances.

The HF board (5), combined with the HF transformer (7), generates the high-voltage and high-frequency pulses to apply to the electrode and nozzle torch terminals, to strike the pilot arc.

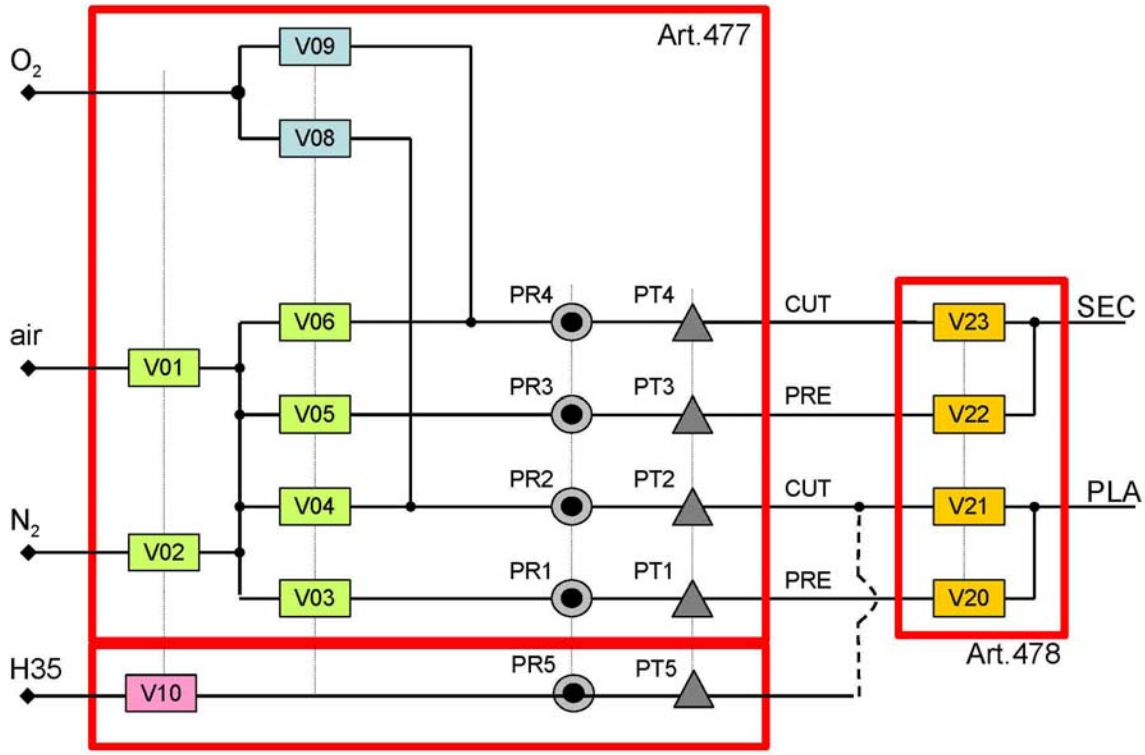
Its operation is conditioned by the value of the Power Source output voltage, measured between the positive output pole of the Power Source (nozzle potential) and terminal (53) downstream from the choke (24) (electrode potential). With a voltage greater than 200 Vdc, the circuit generates high-voltage and -frequency pulses; at lower voltages the circuit stops.

This system relies on the principle according to which the Power Source output voltage is greatest, approximately 260 Vdc, while with the pilot arc or transfer arc this voltage is determined by the cutting conditions (level of current, material to be cut, type of gas, etc.), thus significantly below 200 Vdc) (approximately 150 - 190 Vdc with pilot arc lit).

The pilot arc has a maximum duration of 1 s, after which if cutting has not begun, thus the control board (38) has not received from the settings board (58) the signals to switch to transfer arc, the pilot arc is interrupted until the next start command.

The Unit HV18 contains a microswitch that detects when the safety guard is closed. Its intervention stops the Power Source, displaying the corresponding error code on the control panels.

2.6 - Description of Gas Console PGC1-2 art. 477.



2.6.1 - Diagram of the Gas Console PGC1-2 art. 477 pneumatic system.

The PGC1-2 Gas Console is a control station to select the process parameters and select the gas types and flow.

It is divided into two units:

- PGC1 powered by air, nitrogen N2 and oxygen O2 gases;
- PGC2 powered by gas H35 (blend of 35% hydrogen H2 and 65% argon Ar) and F5 (blend of 5% hydrogen H2 and 95% nitrogen N2).

The Gas Console PGC1 is equipped with an operator panel, the main one in the system, which makes it possible to choose the type of process, set the operating parameters, enable the test functions and display the operating status of the system.

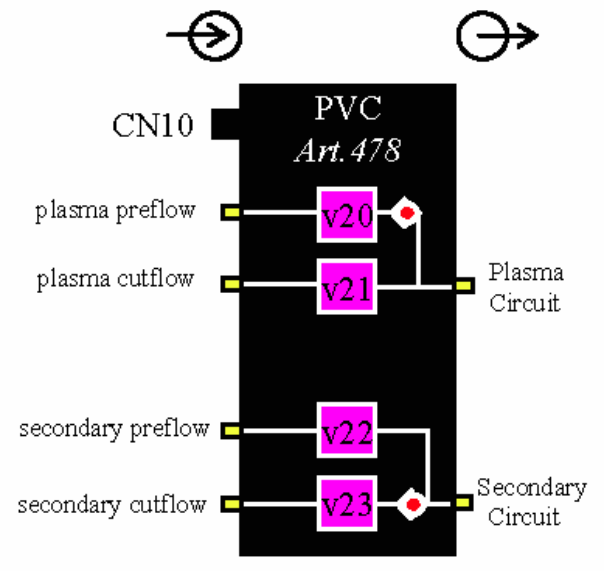
Inside are 4 pneumatic circuits configured as shown in the diagram in fig. 2.6.1, each of which is equipped with a solenoid valve to select the type of gas, pressure regulator to adjust the gas pressures, and flow detector to detect the gas flow in the circuits.

The PGC2 is essentially the replica of one of the 4 pneumatic circuits of the PGC1, with the difference that the devices used in this case are suitable for use in “high risk” environments since they work in contact with easily flammable gases.

Two boards are included to manage the PGC1-2 Gas Console:

- the solenoid valve board (2) receives power from the Power Source and gathers together the control circuits of the cutting system solenoid valves. It is controlled by the panel board (20).
- the panel board (20) is the main operator panel. It includes the displays and leds for the signals, commands to set the operating parameters, and is equipped with microprocessor (SLAVE) with which it communicates via CAN bus serial line with the Power Source control board (38).

2.7 - Description of PVC Valve Console art. 478.



2.7.1 - Diagram of PVC Valve Console art. 478 pneumatic system.

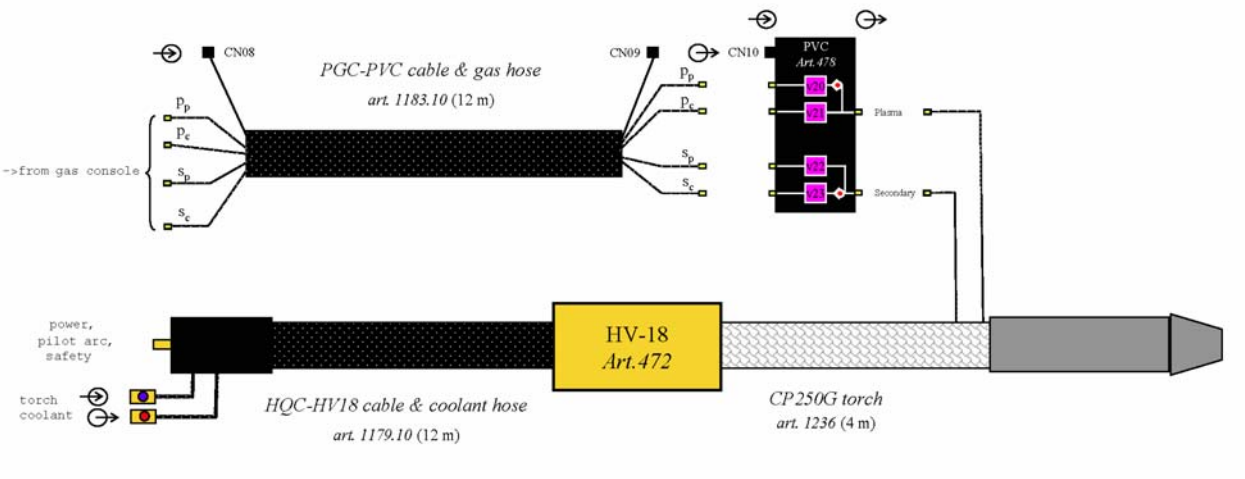
The PVC Valve Console is a control station to select the types of gas to use in the pilot arc and cutting phases. Inside are 2 pneumatic circuits with 4 solenoid valves connected as shown in the diagram in fig. 2.7.1.:

- a circuit, called “plasma,” conveys the plasma gas towards the torch to guide the arc through the nozzle.
- a circuit, called “secondary”, conveys the gas used to protect the torch from splatters and to protect the torch nozzle towards the torch.

Each circuit is switched on 2 different gas supply lines from the Gas Console PGC1-2, depending on the machining stage in progress (pilot arc or cutting). This ensures that each stage has the optimum adjustment and most appropriate type of gas for each circuit.

It is controlled by the boards in the Gas Console PGC1, to which it is connected via the extension art. 1183.

2.8 - Description of Torch CP250G art. 1236.



2.8.1 - Layout of torch CP250G art. 1236 circuits.

The torch CP250G is a multigas liquid-cooled torch for use on pantographs.

Inside are a coolant circuit, a pneumatic circuit for the plasma gas, and a secondary pneumatic circuit for the cooling and outer nozzle protection gas.

It is suitable for use with plasma gases such as air, nitrogen N2, oxygen O2, H35 blend (35% hydrogen H2 – 65% argon Ar) and F5 blend (5% hydrogen H2 – 95% nitrogen N2) and with secondary gases such as air, nitrogen N2, oxygen O2.

It has an electrical cable (4m long) already set up to connect to the Unit HV18, with built-in coolant lines.

The lines of the plasma gas and secondary circuits leave the torch body separately, and are deliberately shorter (approximately 1 m) to require the PVC Valve Console to be located near the torch, for the shortest possible delay in switching gas from the preflow to the cutflow phase.

3 - MAINTENANCE

WARNING

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

BEFORE BEGINNING MAINTENANCE OPERATIONS, UNPLUG THE MACHINE FROM THE MAINS AND WAIT FOR THE INTERNAL CAPACITORS TO DISCHARGE (1 MINUTE).

3.1 - Periodic inspection, cleaning.

Periodically remove dirt or 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 output terminals and power supply cables of the Power Source; replace if damaged.

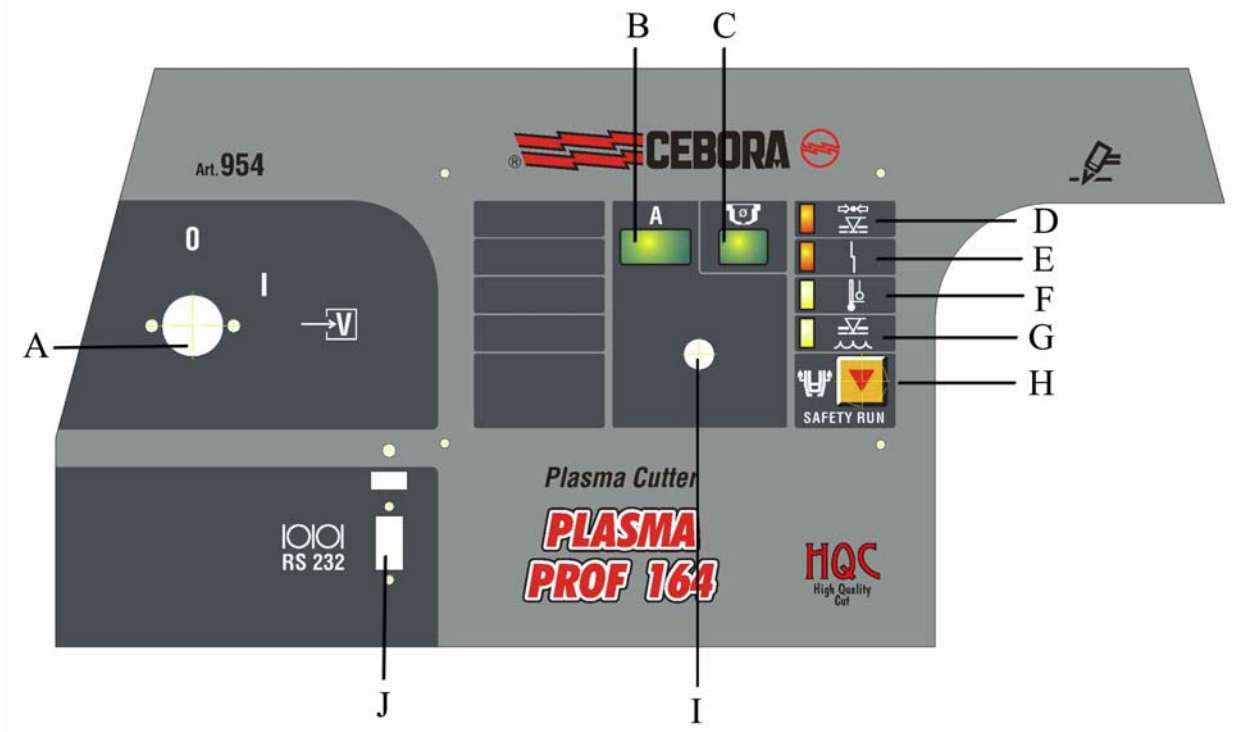
Check the condition of the internal power connections and connectors on the electronic boards; if you find “loose” connections, tighten or replace the connectors.

3.2 - Operating sequence.

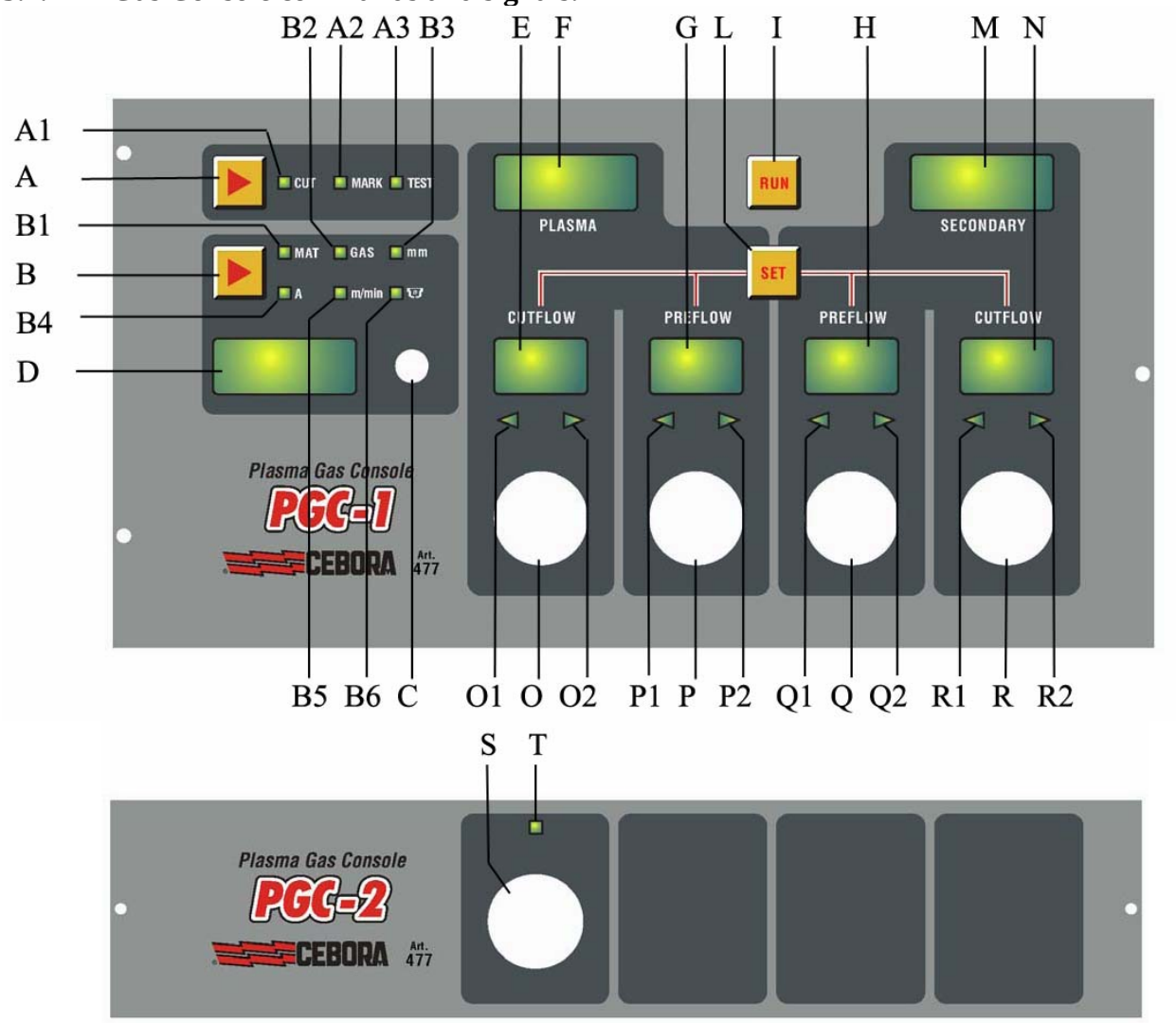
The following sequence reflects correct equipment operation. It may be used as a guiding procedure for troubleshooting.

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

3.2.1 - Power source commands and signals.



3.2.2 - Gas Console commands and signals.



3.2.3 - Power source operation.

WARNING

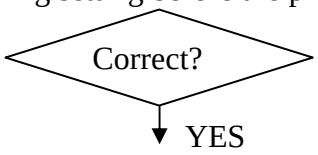
DURING THE FOLLOWING TESTS, DO NOT POINT THE TORCH AT PEOPLE OR PARTS OF THE BODY, BUT ALWAYS TOWARDS AN OPEN SPACE OR THE WORKPIECE.

NOTE

- ❑ Steps marked with this symbol refer to actions by the operator.
- ♦ The operations marked with this symbol refer to machine responses that must occur following an operator action.

- ❑ System shut off and disconnected from the mains.
- ❑ Complete the pneumatic gas circuit by connecting the Gas Console, Valve Console and Torch according to the diagram in fig. 2.1.1.
- ❑ Connect the Gas Console to the Power Source using extension art. 1189.
- ❑ Connect the Torch to the HV18 Unit. For more details on the connections, follow the instructions provided in the Instruction Manual of the Plasma PROF 164 HQC.
- ❑ Connect the Unit HV18 to the Power Source using the supplied extension art. 1179. This extension also incorporates the coolant liquid lines.

- Connect the cable of the positive pole of the Power Source to the workpiece.
- Connect the Power Source to the mains.
- Close the switch (A) on the Power Source.
    - ♦ System powered, on the Power Source panel led and display lit (lamp-test).
    - ♦ After one second, all of the leds and the displays are lit on the Gas Console panel as well (lamp-test); fan (20) starts running.
    - ♦ After one second, the Gas Console display (F) reads “Art,” and display (M) shows the article code “477”. Simultaneously, the Power Source display (B) indicates the article code, e.g.,: “954,” and display (C) the software version installed, e.g.,: “r1”. Pump (13) of the Cooling Unit starts running.
    - ♦ After one second, the Power Source display (B) indicates the value of the programmed current, and display (C) indicates the nozzle hole diameter set. Simultaneously the Gas Console begins the “emptying” and “filling” procedure of the gas circuits. When this procedure has been completed, the Gas Console panel displays the last working setting before the previous shutdown.

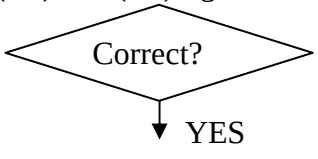


NO (see 3.3.1, 3.3.2, 3.3.3, 3.3.5, 3.3.11).

NOTE

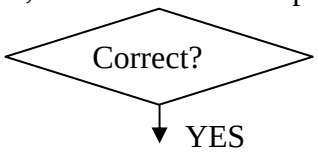
IN THE FOLLOWING SELECTIONS THE POSSIBLE CHOICES DEPEND ON THE MATERIALS AND/OR GASES SELECTED, THUS THE POSSIBLE COMBINATIONS MAY CHANGE AS THE OPERATING CONDITIONS VARY.

- Press the key (I) on the Gas Console to enter the set-up menu (PREFLOW and CUTFLOW displays off).
- Press the key (A) on the Gas Console several times to select the type of job.
- Press the key (B) on the Gas Console several times to select the measure to adjust.
- Use knob (C) to assign the desired value to the measure selected by key (B).
- Press the key (L) on the Gas Console several times to select the gas circuit to adjust.
- Turn the gas setting knob for the gas circuit selected with the key (L), for a pressure that allows both arrow leds to be lit simultaneously (meaning the situation is correct for the type of job selected).
    - ♦ Each time the key (A) is pressed, the leds (A1)(A2)(A3) light in sequence, to indicate the type of work to be performed.
    - ♦ Each time the key (B) is pressed, the leds (B1)(B2)(B3)(B4)(B5)(B6) light in sequence and based on the type of work selected via the key (A), to indicate the measurement to be changed.
    - ♦ Display (D) shows the value assigned to the measure selected via the key (B), adjustable using the knob (C).
    - ♦ Each time the key (L) is pressed, the displays (E)(G)(H)(N) light in sequence, to indicate the gas circuit whose pressure may be changed. Each display shows the pressure present in its circuit, which may be changed by turning one of the knobs (O)(P)(Q)(R). When the pressure reaches the value deemed correct for the type of job selected, the two arrow leds (O1) and (O2) or (P1) and (P2) or (Q1) and (Q2) or (R1) and (R2) light simultaneously.

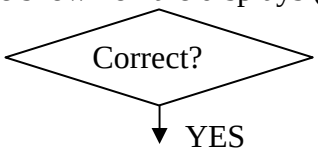


NO (see 3.3.3, 3.3.5).

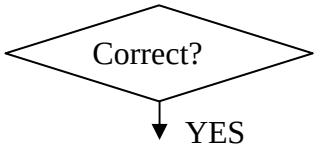
- Use the key (A) to select the TEST function, led (A3) lit, to set the “gas circuit seal test”.
- Use the knob (C) to set the “ALL” function visible on display (D), to set the test for all gas circuits.
- Press the key (I) to activate the Test.
  - Display (F) reads “RUN” and display (M) indicates the type of gas in the circuit being tested.
  - The gas circuit “emptying” and “filling” procedure begins.
  - Display (D) reads “T01” (test of circuit 1). After approximately 40 seconds (duration of the seal test), if the result is negative the error code is displayed (“Err” on display (F) and “LO” on display (E)); if positive, display (D) reads “T02” and the circuit 2 test begins. The sequence is repeated for the other circuits until the end of the test, as shown on the displays (F) “OK” and (M) “GAS”.



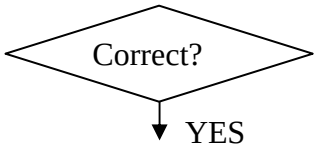
- Press the key (A) to select the CUT function. Led (A1) lit.
- Press the key (I) to exit the set-up menu (PREFLOW and CUTFLOW displays lit).
- Press the start command very briefly.
  - Gas escaping from the PREFLOW circuits from the torch for approximately 40 seconds. The pressure shown on the displays (G) and (H) remains constant.



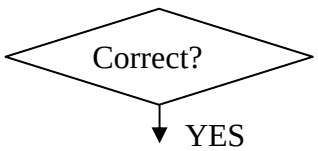
- Press the start command for approximately 5 seconds to turn on the pilot arc.
  - Pilot arc starts for the maximum time (1 sec). Gas flows out continuously for approximately 40 s after the start button is released.



- Place the torch on a pantograph or in any case a piece of equipment that allows cutting tests. Correctly adjust the position of the torch with respect to the workpiece (see Instruction Manual).
- Activate the start command.
  - Begin cutting. Adjust the knob (I) on the Power Source to reach the current level suited to the cutting to be done.



- Remove the start command from pantograph.
  - The arc shuts off immediately. Gas flows out continuously for approximately 40 s after the arc is shut off.



REGULAR OPERATION.

3.3 - Troubleshooting.

WARNING

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

THE SWITCH **(A)** IS A FUNCTION SWITCH, NOT A MAIN POWER SWITCH.
THIS IS WHY THERE IS HAZARDOUS VOLTAGE PRESENT INSIDE THE POWER SOURCE EVEN WHEN THE SWITCH IS SET TO "0".
BEFORE REMOVING THE PROTECTIVE GUARDS AND ACCESSING INTERNAL PARTS, DISCONNECT THE POWER SOURCE FROM THE MAINS AND WAIT FOR THE INTERNAL CAPACITORS TO DISCHARGE (1 MINUTE).

NOTE

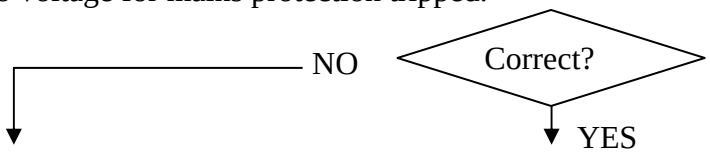
Items in **boldface** describe problems that may occur on the machine (symptoms).

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

3.3.1 - The Power Source does not start, operator panels on Power Source and Gas Console off.

MAINS SUITABILITY TEST.

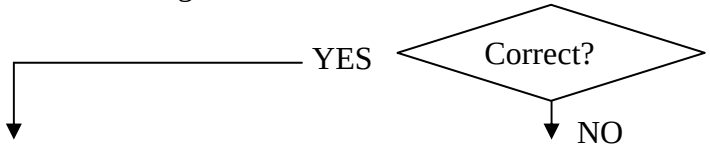
- ❑ No voltage for mains protection tripped.



- ♦ Correctly position the voltage changes.
- ♦ Remove any short-circuits on the transformer connections (27).
- ♦ Make sure that the bridge (23) is not short-circuited.
- ♦ Check the wiring between J5 pre-charge board (45) and mains input terminal board (55) and between J7 of pre-charge board (45) and the terminals of the contactor (44).
- ♦ Make sure that the terminals J5 and J7 on the pre-charge board (45) are not short-circuited. Replace pre-charge board (45) if necessary.
- ♦ Make sure that the contact (44) does not have its contacts stuck, or that it is not ordered to close before the DC-capacitors have been pre-charged on the pilot arc board (58), and the transformer (27) pre-magnetized. If necessary, perform the checks listed in case of failure of the CAPACITOR PRE-CHARGE AND TRANSFORMER (27) PRE-MAGNETIZATION TEST in par. 3.3.2.
- ♦ Mains not suitable to power the Power Source (ex.: insufficient installed power).

MAINS CONNECTION TEST.

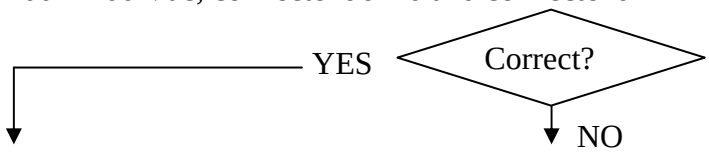
- ❑ Mains input terminal board (55), terminals U1, V1, W1 = 3 x 230/400/440 Vac according to the mains voltage conditions.



- ♦ Check power cable and plug and replace if necessary.
- ♦ Check the mains voltage conditions.

SERVICE TRANSFORMER (50) POWER SUPPLY TEST.

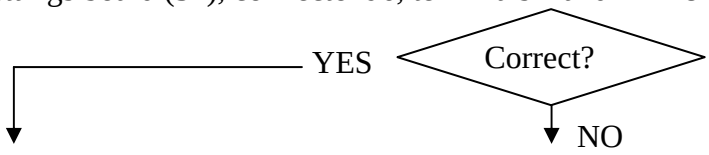
- ❑ Fuse board (50), connector J6, terminals 0 - 230 = 230 Vac; connector J6 – 0 and connector J7 – 400 = 400 Vac; connector J6 – 0 and connector J7 – 440 = 440 Vac.



- ♦ Check the wiring between mains input terminal board (55) and connector J5 pre-charge board (45), and between connector J6 pre-charge board (45), switch (39) and connectors J6 and J7 of fuse board (50).
- ♦ Make sure the service voltage change is correctly positioned, on the voltage change terminal board of the transformer (27).
- ♦ Check fuse F2 on pre-charge board (45); replace if broken, and make sure there is no short-circuit in the service transformer (50) or corresponding wiring.
- ♦ Make sure the primary service transformer winding (50) is not interrupted.
- ♦ Check switch (39); replace if defective.
- ♦ Replace pre-charge board (45).

SETTINGS BOARD (54) POWER SUPPLY TEST.

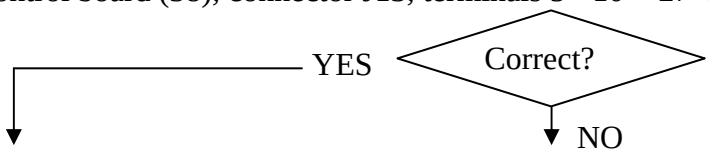
- ❑ Settings board (54), connector J6, terminals 1 and 2 = 18 Vac; terminals 5 and 6 = 20 Vac.



- ♦ Check the wiring between J6 settings board (54) and J4 fuse board (50).
- ♦ Check fuses F2 and F3 on fuse board (50); if broken, replace and make sure that terminals 1 - 2 and 5 - 6 of J6 on board (54) are not short-circuited.
- ♦ Check 18 Vac voltage on terminals TP3–18V and 20 Vac on terminals TP4-20V1 of fuse board (50); if missing, check the wiring between the service transformer and fuse board (50), and if necessary replace the service transformer (50).

CONTROL BOARD (38) POWER SUPPLY TEST.

- ❑ Control board (38), connector J4, terminals 1(+) and 2(-) = +8 Vdc.
- ❑ Control board (38), connector J13, terminals 5 - 10 = 27 Vac.

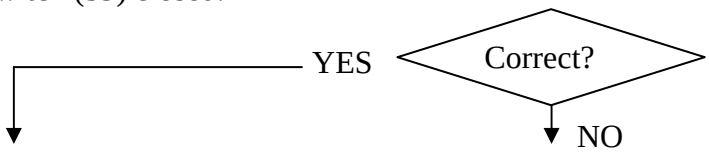


- ♦ Check the wiring between J4 control board (38) and J5 settings board (54).
- ♦ With Power Source off, temporarily disconnect J4 on control board (38) and check on J5 of settings board (54), terminals 1(+) and 2(-) voltage = +8 Vdc. If correct, replace control board (38). If incorrect replace the settings board (54), also making sure that terminals 1 and 2 of J4 on control board (38) are not short-circuited. If necessary, also replace the control board (38).
- ♦ Check the wiring between J13 control board (38) and J5 fuse board (50).
- ♦ Check fuse F7 on fuse board (50); if broken, replace and make sure that terminals 5 - 10 of J13 on control board (38) are not short-circuited.

- ♦ Make sure there is 27 Vac voltage on terminals TP2 - 27V of fuse board (50); if missing, check the wiring between the service transformer and fuse board (50), and if necessary replace the service transformer (50).

TRANSFORMER (56) POWER SUPPLY TEST.

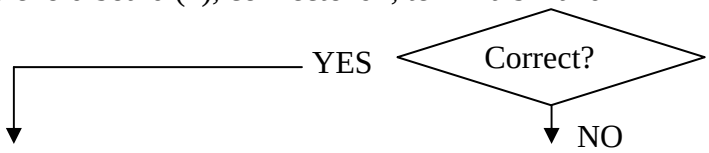
- ❑ Primary circuit terminal board of the transformer(56), terminals 0 and 230 = 230 Vac, with switch (39) closed.



- ♦ Check the wiring between transformer (56) primary circuit and service voltage change terminal board and switch (39).
- ♦ Check fuse on the terminal board of the transformer (56) on the primary side. Replace if interrupted, first checking the resistance of the primary circuit of the transformer (56). Correct value = approximately 7.5 ohm. If incorrect, replace transformer (56).

GAS CONSOLE POWER SUPPLY TEST.

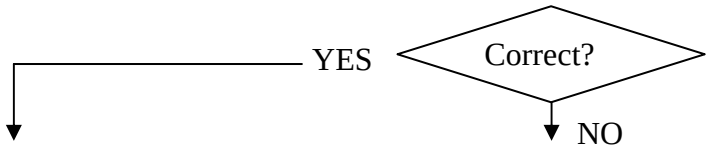
- ❑ Solenoid board (2), connector J2, terminals 1 and 2 = 24 Vac; terminals 4 and 5 = 27 Vac.



- ♦ Check the wiring between J2 of solenoid valve board (2), connector (16) on Gas Console, connector (3) on Power Source and transformer (56).
- ♦ Check fuses on the terminal board of the transformer (56) on the secondary circuit side; replace if broken, checking in advance the resistance on terminals 1 - 2 and 4 - 5 of J2 on solenoid valve board (2). Correct values: >Mohm in both measurement directions; If incorrect, replace solenoid valve board (2). Also check the resistance of the winding of each solenoid valve on the Gas Console. Correct value = approximately 12 ohm, for each solenoid valve. If incorrect replace the defective solenoid valve, making sure that the corresponding drive circuit on solenoid valve board (2) has not been damaged. If so, also replace solenoid valve board (2).

PANEL BOARD (20) POWER SUPPLY TEST.

- ❑ Panel board (20), connector J9, terminals 1(+) and 3(-) = +18 Vdc; terminals 4(+) and 3(-) = +8 Vdc.



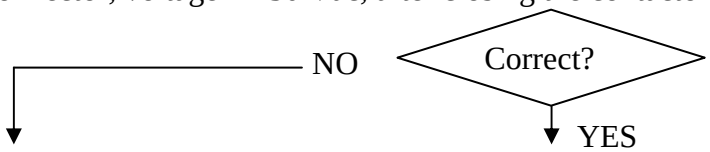
- ♦ Check the wiring between J9 panel board (20) and J1 solenoid valve board (2).
- ♦ With Power Source off, temporarily disconnect J9 on panel board (20) and check on J1 of solenoid valve board (2), terminals 1(+) and 3(-) voltage = +18 Vdc and terminals 4(+) and 3(-) = +8 Vdc. If correct, replace the panel board (20). If incorrect, replace solenoid valve board (2), making sure that terminals 1 - 3 and 4 - 3 of J9 on panel board (20) have not been short-circuited. If necessary, also replace the panel board (20).

- ♦ Make sure the panel board (38) is properly mounted on control board (38) on the Power Source.
- ♦ Replace the control (38) and/or panel (20) boards.

3.3.2 - Power source powered, operator panels on Power Source and Gas Console on, fan (20) stopped.

FAN (20) TEST.

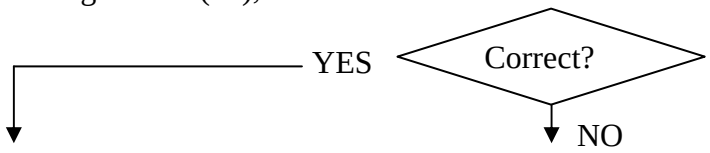
- ❑ Fan (20), terminals A (black wire on the capacitor (18)) – H (blue wire), on the fast-on patch connector, voltage = 230 Vac, after closing the contactor (44).



- ♦ Check the wiring between fan (20), starting capacitor (18) and power voltage change.
- ♦ Replace starting capacitor (18).
- ♦ Replace the fan (20).

PRE-CHARGE BOARD (45) POWER SUPPLY TEST.

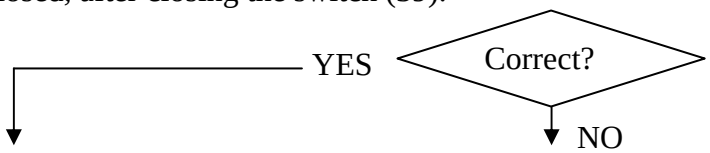
- ❑ Pre-charge board (45), connector J1 terminals 1 - 4 = 180 Vac.



- ♦ Check the wiring between connectors J1 of pre-charge board (45) and J2 of fuse board (50).
- ♦ Check fuse F1 on fuse board (50); if broken, replace and make sure that terminals 1 - 4 of J1 on pre-charge board (45) are not short-circuited.
- ♦ Make sure there is 180 Vac voltage on terminals TP1 - 180V of fuse board (50);if missing, check the wiring between the service transformer and fuse board (50), and if necessary replace the service transformer (50).

CAPACITOR PRE-CHARGE AND TRANSFORMER (27) PRE-MAGNETIZATION TEST.

- ❑ Pilot arc board (58), connector J1, terminals 1(+) and 2(-), voltage = >200 Vdc, contact (44) closed, after closing the switch (39).



- ♦ Check the wiring between J4 pre-charge board (45) and J1 pilot arc board (58).
- ♦ Check the wiring between J2 pre-charge board (45) and J10 control board (38).
- ♦ Check the wiring between J3 terminals 5 and 6 on pre-charge board (45) and terminals 3 and 8 of J13 on control board (38).
- ♦ Check the wiring between J3 terminals 3 and 4 on pre-charge board (45) and terminals 2 and 7 of J13 on control board (38).
- ♦ Check the wiring between contactor (44) coil terminals and terminals 1 and 6 of J13 on control board (38).

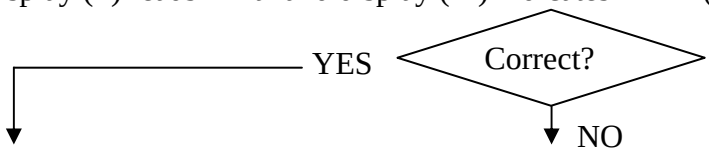
- ♦ Shut off the Power Source, wait for the capacitors to discharge (1 minute), temporarily disconnect connector J4 from pre-charge board (45) and check the resistance between terminals 1 and 2 of J1 of pilot arc board (58). Correct value = diode junction in one direction and >Mohm with the instrument probes reversed. If >Mohm in both directions, replace pilot arc board (58). If 0 ohm (short-circuit), replace pilot arc board (58) and pre-charge board (45).
- ♦ Check on J3 of pre-charge board (45), terminals 5 and 6 voltage = 25 Vac with switch (39) closed. If incorrect, with Power Source off, temporarily disconnect connector J3 from pre-charge board (45) and check the resistance between terminals 5 and 6 of J3 of pre-charge board (45). Correct value = approximately 300 ohm. If >Mohm replace pre-charge board (45). If 0 ohm (short-circuit), replace pre-charge board (45) and control board (38). If correct, check the power supply of the control board (38) by performing the CONTROL BOARD (38) POWER SUPPLY TEST in par. 3.3.1.
- ♦ Check on J3 of pre-charge board (45) terminals 3 and 4 voltage = approximately 25 Vac, for a duration of 1 sec., starting 1 sec. after closing switch (39). If incorrect, with Power Source off, temporarily disconnect connector J3 from pre-charge board (45) and check the resistance between terminals 3 and 4 of J3 of pre-charge board (45). Correct value = approximately 60 ohm. If >Mohm replace pre-charge board (45). If 0 ohm (short-circuit), replace pre-charge board (45) and control board (38). If correct, check the power supply of the control board (38) by performing the CONTROL BOARD (38) POWER SUPPLY TEST in par. 3.3.1.
- ♦ On the coil terminals of the contactor (44), make sure voltage = 25 Vac with switch (39) closed, after the pre-charging the DC-capacitors and pre-magnetizing the transformer (27). If incorrect, with Power Source off, temporarily disconnect connector J13 from control board (38) and check resistance between the terminals of the contactor (44) coil. Correct value = approximately 3.7 ohm. If >Mohm replace contactor (44). If 0 ohm (short-circuit), replace contactor (44) and control board (38). If correct, check the power supply of the control board (38) by performing the CONTROL BOARD (38) POWER SUPPLY TEST in par. 3.3.1.
- ♦ Replace contactor (44) and/or pre-charge (45) and/or control (38) boards.

- ♦ Check the wiring between fan (20), starting capacitor (18) and power voltage change.
- ♦ Make sure the power voltage change is correctly positioned.
- ♦ Check for the presence of the three power supply phases on the transformer (27) primary circuit.

3.3.3 - Power source powered, display and signals does not indicate the correct values.

CAN-BUS COMMUNICATION TEST.

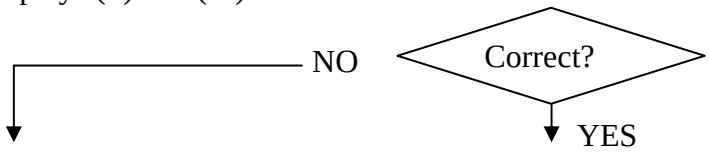
- Upon start-up all leds and displays on (lamp-test) on the operator panels of both the Power Source and Gas Console. After one second, Power Source display (B) reads “954” and display (C) shows the software version installed (e.g., r1). Simultaneously, on Gas Console, display (F) reads “Art” and display (M) indicates “477” (start-up).



  - ♦ Check the wiring between connector J18 of control board (38), connector (3) on Power Source, connector (16) on Gas Console and J6 on panel board (20).
  - ♦ Check the supply voltages of the control (38) and panel (20) boards, performing if necessary the CONTROL BOARD (38) POWER SUPPLY TEST, GAS CONSOLE POWER SUPPLY TEST, PANEL BOARD (20) POWER SUPPLY TEST in par. 3.3.1.
  - ♦ Check on J6 of panel board (20), terminals 1(+) and 2(-) voltage = +8 Vdc (CAN bus line power supply). If incorrect, with Power Source off disconnect J18 from control board (38). Power up again and make sure, with J18 disconnected, that voltage = +8 Vdc on J6 of panel board (20) terminals 1(+) and 2(-). If correct, replace control board (38). If incorrect, replace panel board (20).
  - ♦ Make sure that the correct programs are entered in the control (38) and panel (20) boards, performing if necessary the programming procedure available on the Cebora Web site (see par. 2.3).
  - ♦ Replace the control (38) and/or panel (20) boards.

ERROR CODE TEST.

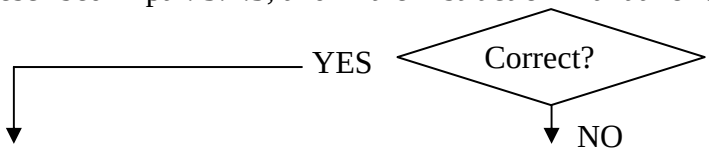
- When turned on, after the start-up phase, displays (B) and (C) on the Power Source and displays (F) and (M) on the Gas Console indicate an alarm condition.



  - ♦ See Error codes and alarm signals, par. 3.4.

COMMANDS AND SIGNALS TEST.

- When turned on, after the start-up phase, the keys on the operator panels of the Power Source and Gas Console allow all of the steps involved in selecting the “Job” and “Mode” as described in par. 3.2.3, and in the Instruction Manual of the Plasma PROF 164 HQC.



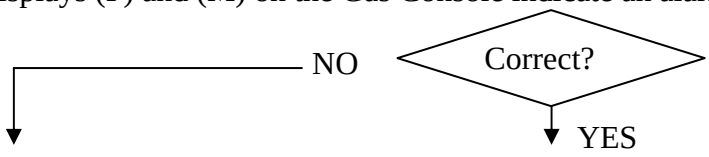
  - ♦ Check the supply voltages of the control (38) and panel (20) boards, performing if necessary the CONTROL BOARD (38) POWER SUPPLY TEST, GAS CONSOLE POWER SUPPLY TEST, PANEL BOARD (20) POWER SUPPLY TEST in par. 3.3.1.
  - ♦ Replace the control (38) and panel (20) boards.

♦ Regular operation.

3.3.4 - The start command produces no effect.

ERROR CODE TEST.

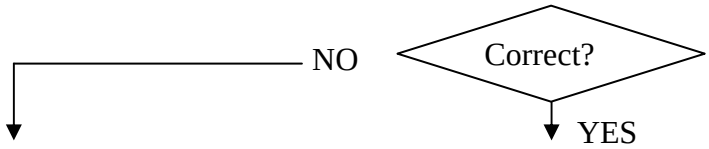
- When turned on, after the start-up phase, displays (B) and (C) on the Power Source and displays (F) and (M) on the Gas Console indicate an alarm situation.



- ♦ See Error codes and alarm signals, par. 3.4.

START COMMAND TEST.

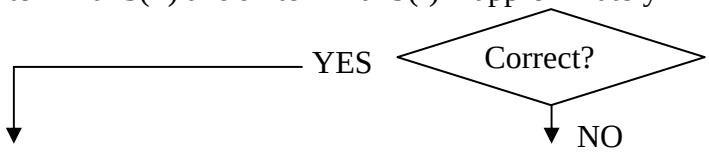
- Remote board (59), connector J2, terminals 1(+) and 9(-) = 0 Vdc with start command active; +24 Vdc with command not active.



- ♦ Check the wiring between J3 remote board (59) and J1 control board (38).
- ♦ Check on control board (38), connector J1, terminals 9(+) - 10(-) voltage = +1 Vdc with start command active (0 Vdc with start command not active). If incorrect, with Power Source off temporarily disconnect connector J1 on control board (38) and check the resistance on terminals 9 and 10 of J1 on control board (38). Correct value = coupling of 2 diodes in both measurement directions. If incorrect, replace control board (38). If correct, replace remote board (59).
- ♦ Replace the remote (59) and/or control (38) boards.

REMOTE BOARD (59) POWER SUPPLY TEST.

- With Power Source off, temporarily disconnect connector J1 on control board (38).
- Power up the Power Source again and check for the following voltages on remote board (59):
- J3 terminal 9(+) and J2 terminal 9(-) = approximately +25 Vdc;
- J3 terminal 3(+) and J2 terminal 9(-) = approximately +12 Vdc.



- ♦ Check the wiring between J5 remote board (59), and service transformer (56).
- ♦ Make sure on remote board (59), connector J5, terminals 1 and 2 = 230 Vac. If incorrect check the wiring between J5 remote board (59), service transformer (56) service voltage change terminal board and switch (39). If correct, replace remote board (59).

- ♦ Check the wiring between J2 remote board (59) and connector (4) on the Power Source.
- ♦ Check the wiring between J3 remote board (59) and J1 control board (38).
- ♦ Check the wiring between connector (4) on the Power Source and the device actuator of the start command (switch, relay, etc. of the system).
- ♦ Replace the remote board (59).

3.3.5 - No gas flows from the torch.

NOTE

To check the efficiency of the pneumatic circuits, we recommend performing the "Gas seal" test, (see Instruction Manual).

During the test the pneumatic circuits are individually charged and discharged with gas. The gas discharge takes place through the torch nozzles.

The test consists of three phases that are repeated in the sequence described in the table:

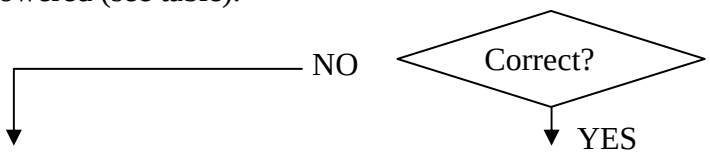
- DISCHARGE - pneumatic circuits are discharged from the gas present in the Gas Console;
- CHARGE - the circuits are placed under pressure one at a time;
- SEAL - the circuit is kept under pressure for 1 minute, to detect any gas leaks. Once this time has elapsed the circuit is discharged.

To obtain these functions the solenoid valves are activated at different times, based on the circuit to be tested (see fig. 2.6.1).

Phase	Function	Solenoid valves open (powered).
1	Discharge all of the circuits.	V20, V21, V22, V23.
2	Circuit 1 load (air).	V01, V03, V04, V05, V06.
3	Circuit 1 seal (air).	-
4	Circuit 1 discharge (air).	V20, V21, V22, V23.
5	Circuit 2 load (N2).	V02, V03, V04, V05, V06.
6	Circuit 2 seal (N2).	-
7	Circuit 2 discharge (N2).	V20, V21, V22, V23.
8	Circuit 3 load (O2).	V08, V09.
9	Circuit 3 seal (O2).	-
10	Circuit 3 discharge (O2).	V20, V21, V22, V23.
11	Circuit 4 load (H35).	V10.
12	Circuit 4 seal (H35).	-
13	Circuit 4 discharge (H35).	V20, V21, V22, V23.

SOLENOID VALVE TEST.

- With Power Source powered, set up the "Gas seal" test of all pneumatic circuits: press the key (I) on Gas Console to enter the set-up menu, press the key (A) to select "Test" (led (A3) lit), turn knob (C) to show "ALL" on display (D).
- Press the key (I) to begin the test. The various phases are shown on the displays (D)(F) and (M) of the Gas Console.
- On each solenoid valve, check the coil terminals, voltage = 25 Vac when the solenoid valve is powered (see table).



- ♦ Make sure gas is present at the inlet fittings of the Gas Console, and that pressure and flow rate in the supply lines meet the specification values for the Plasma PROF 164 (see specifications in the Instruction Manual).
- ♦ Check operation of the pressure regulator and pressure transducers; replace if defective.
- ♦ Make sure that the gas lines of the extension art. 1183, the torch and Gas Console are not clogged, locating the circuit in question with the aid of the table and fig. 2.6.1.

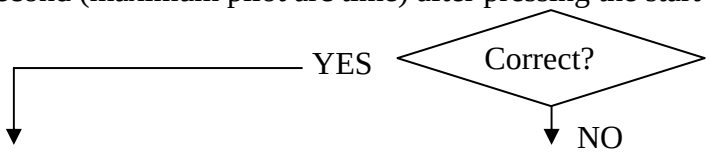
- With Power Source off, temporarily disconnect the connectors J4, J5, J6 and J7 from solenoid valve board (2) and check the resistance on the terminals of the solenoid valve coils. Correct value = approximately 12 ohm (27 ohm for V10 on Console FPGC-2). If >Mohm (circuit interrupted), replace the solenoid valve involved.
- Replace any defective solenoid valves, locating them with the aid of the table and fig. 2.6.1.

- Check the wiring between the solenoid valves and the connectors J4, J5, J6 and J7 of solenoid valve board (2).
- Check the wiring between J3 of solenoid valve board (2) and J7 of panel board (20).
- Make sure communication between Power Source and Gas Console, performing if necessary the tests in par. 3.3.3..
- Check the Gas Console power supply, performing if necessary the TRANSFORMER (56) POWER SUPPLY TEST and GAS CONSOLE POWER SUPPLY TEST in par. 3.3.1.
- With Power Source off, temporarily disconnect the connectors J4, J5, J6 and J7 from solenoid valve board (2) and check the resistance on the terminals of the solenoid valve coils. Correct value = approximately 12 ohm (27 ohm for V10 on Console FPGC-2). If 0 ohm, (short-circuit) replace the defective solenoid valve and solenoid valve board (2).
- Replace the solenoid (2) and/or panel (20) boards.

3.3.6 - Gas flows from the torch, the pilot arc does not light (nozzle voltage missing).

POWER SOURCE OUTPUT VOLTAGE TEST.

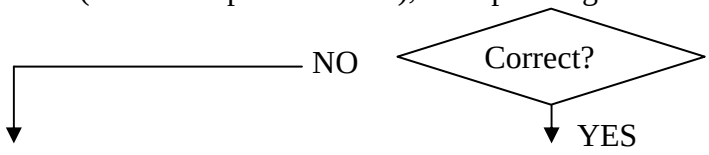
- Pilot arc board (58), terminals TP3(+) – TP7(-) = approximately +280 Vdc, for a duration of 1 second (maximum pilot arc time) after pressing the start command.



- ♦ Go to par. 3.3.8.

NOZZLE VOLTAGE TEST.

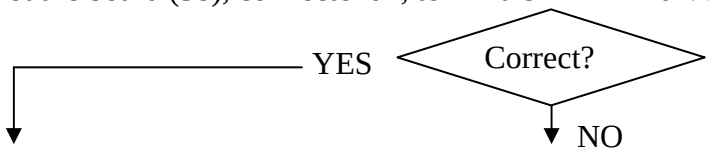
- Pilot arc board (58), terminals J5(+) – TP7(-) = approximately +280 Vdc, for a duration of 1 second (maximum pilot arc time), after pressing the start command.



- ♦ Go to par. 3.3.7.

PILOT ARC BOARD (58) POWER SUPPLY TEST.

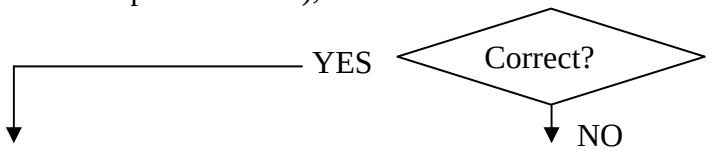
- Pilot arc board (58), connector J4, terminals 1 – 2 = 20 Vac.



- ♦ Check the wiring between J4 of pilot arc board (58) and J1 of fuse board (50).
- ♦ Check fuse F6 on fuse board (50); if broken, replace and make sure that terminals 1 - 2 of J4 on pilot arc board (58) are not short-circuited.
- ♦ Check 20 Vac voltage on terminals TP7 - 20V of fuse board (50); if missing, check the wiring between the service transformer and fuse board (50), and if necessary replace the service transformer (50).

NOZZLE IGBT COMMAND TEST.

- Pilot arc board (58), connector J4, terminals 4(+) - 5(-) = approximately +3.7 Vdc, for 1 sec. (maximum pilot arc time), with start command activated.



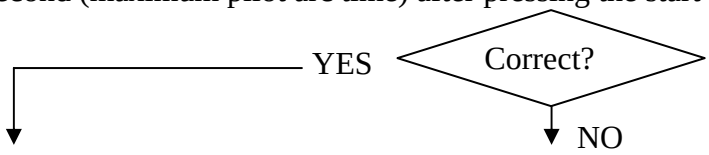
- ♦ Check the wiring between J4 pilot arc board (58) and J15 control board (38).
- ♦ With Power Source off, temporarily disconnect J15 from control board (38) and check the resistance on terminals 4 and 5 of J4 on pilot arc board (58). Correct value = approximately 10 Kohm. If different, replace pilot arc board (58). If short-circuited, also replace control board (38).
- ♦ Replace pilot arc (58) and/or control (38) boards.

♦ Replace the pilot arc board (58).

3.3.7 - Gas flows from the torch, the pilot arc does not light (high frequency missing).

NOZZLE VOLTAGE TEST.

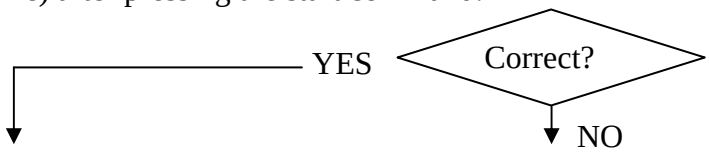
- Pilot arc board (58), terminals J5(+) – TP7(-) = approximately +280 Vdc, for a duration of 1 second (maximum pilot arc time) after pressing the start command.



- ♦ Go to par. 3.3.6.

VOLTAGE PRESENCE TEST ON MODULE HV18.

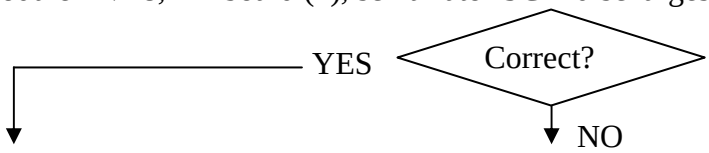
- Module HV18, HF board (2) terminals CN2(+) and CN3(-) = >+200 Vdc (with pilot arc off) or from +150 to +190 Vdc (with pilot arc lit), for a duration of 1 second (maximum pilot arc time) after pressing the start command.



- ♦ Check the wiring between terminals TP3 and J3 of control box board (5) on module HV18, extension art. 1179 and terminals (53)(-) of the Power Source and J5(+) on torch board (42). If you find loose connections, tighten and replace any damaged components.
- ♦ Make sure the extension art. 1179 is intact.
- ♦ Check the wiring between terminals TP7 of pilot arc board (58), inductor (24) and terminal (53) of the Power Source, and between J5 pilot arc board (58), nozzle resistor (17) and terminal J6 on torch board (42). If you find loose connections, tighten and replace any damaged components.
- ♦ Check the continuity between terminals J5 and J6 on torch board (42). If interrupted, reset the connection.
- ♦ Check resistor (17). Correct value = 1.3 ohm. Replace if incorrect.
- ♦ With Power Source off, temporarily disconnect the cables of the extension art. 1179 from the Power Source terminals (53) and J5 of torch board (42), and check the isolation between the disconnected cables and towards earth. This makes it possible to test the isolation of extension art. 1197, module HV18 and the torch. If you find a short-circuit or low resistance, locate and replace the defective component.

HF OSCILLATOR TEST ON MODULE HV18.

- Module HV18, HF board (2), scintillator SCI1 discharges at regular intervals.



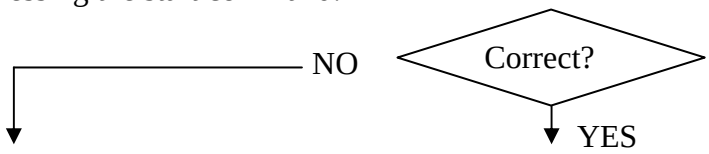
- ♦ Check connections between HF (2) and control box(5) boards in the module HV18.
- ♦ Make sure that the connection between CN1 and CN4 of HF board (2) and the primary circuit of the HF transformer (7) is not interrupted.
- ♦ Replace the HF (2) and/or control box board (5).
- ♦ Replace HF transformer (7).

- ♦ Check the wiring between the terminal of the HF transformer (7) secondary circuit, TP3 on control box board (5), and the torch electrode terminal. If you find loose connections, tighten and replace any damaged components.
- ♦ Make sure that there is no short-circuit between connectors CN1 and CN4 on HF board (2) or in the wiring of the HF transformer (7) primary circuit.
- ♦ Check the distance between the tips of the scintillator SCI1 (correct distance = 0.95 mm).
- ♦ Check torch cable. If aged and cracked or leaking isolation, replace.
- ♦ Check electrode and torch nozzle. Replace if worn or damaged.
- ♦ Make sure that the gas pressure in the torch plasma chamber is not too high (see Instruction Manual).
- ♦ Replace the HF (2) and/or control box (5) boards in the module HV18.
- ♦ Replace HF transformer (7).

3.3.8 - In open circuit operation, the output voltage is not regular.

POWER SOURCE OUTPUT VOLTAGE TEST.

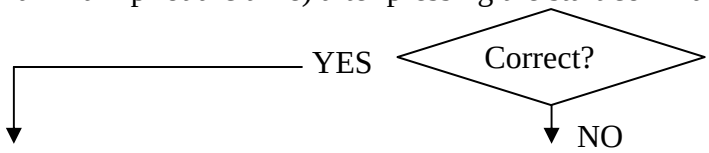
- ❑ Pilot arc board (58), terminals TP3(+) – TP7(-) = approximately +280 Vdc (if pilot arc off) or +150 Vdc (with pilot arc lit), for a duration of 1 second (maximum pilot arc time) after pressing the start command.



- ♦ Power source output voltage correct.

SETTINGS BOARD (54) ENABLE TEST.

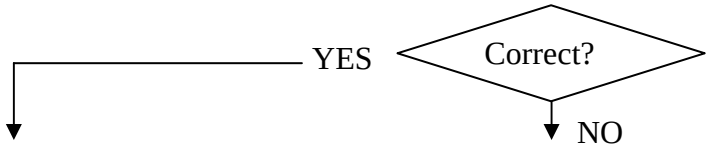
- ❑ Settings board (54), connector J3, terminals 4(+) – 7(-) = +5 Vdc, for a duration of 1 second (maximum pilot arc time) after pressing the start command.



- ♦ Check the wiring between J3 settings board (54) and J7 of control board (38).
- ♦ With Power Source off, temporarily disconnect J7 from control board (38) and check the resistance on terminals 4 and 7 of settings board (54). Correct value = approximately 10 Kohm. If incorrect, replace control board (54).
- ♦ Check supply voltages of the settings (54) and control (38) boards, performing if necessary the SETTINGS BOARD (54) POWER SUPPLY TEST and CONTROL BOARD (38) POWER SUPPLY TEST in par. 3.3.1..
- ♦ Replace the control board (38).

PILOT ARC CURRENT REFERENCE TEST.

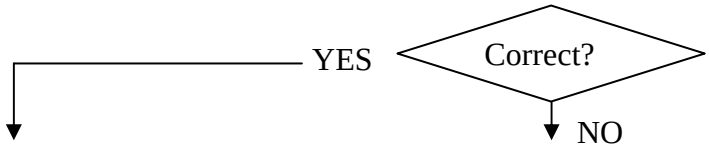
- ❑ Settings board (54), connector J3, terminals 3(+) – 7(-) = fig. 5.2.1 = +4 Vdc (pilot arc current reference signal) for a duration of 1 second (maximum pilot arc time), after pressing the start command; (+5 Vdc with the Start command resting).



- ♦ Check the wiring between J3 settings board (54) and J7 of control board (38).
- ♦ With Power Source off, temporarily disconnect J7 from control board (38) and check the resistance on terminals 3 and 7 of settings board (54). Correct value = >Mohm. If short-circuited or low-resistance, replace the settings board (54).
- ♦ Replace control board (38).

POWER SOURCE OUTPUT CURRENT TRANSDUCER POWER SUPPLY TEST.

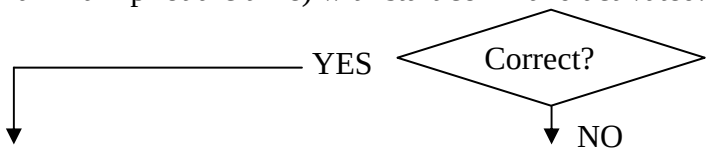
- ❑ Settings board (54), connector J2, terminals 3(+) - 2(-) = +15 Vdc; terminals 1(+) - 2(-) = -15 Vdc.



- ♦ Check the wiring between J2 settings board (54) and current transducer on pilot arc board (58).
- ♦ With Power Source off, temporarily disconnect the connector J2 from settings board (54) and check the resistance between the terminals 3-2 and 1-2 of the patch connector disconnected from J2. Correct values = approximately 47 Kohm (terminals 3-2) and approximately 17 Kohm (terminals 1-2). If incorrect, replace pilot arc board (58).
- ♦ Power up the Power Source again, keeping J2 disconnected from settings board (54), and check voltages on J2 of settings board (54), terminals 3(+) and 2(-) = +15 Vdc; terminals 1(+) and 2(-) = -15 Vdc. If incorrect, replace settings board (54).
- ♦ Check supply voltages of the settings board (54), performing if necessary the SETTINGS BOARD (54) POWER SUPPLY TEST in par. 3.3.1..
- ♦ Replace settings (54) and/or pilot arc (58) boards.

POWER SOURCE OUTPUT CURRENT SIGNAL TEST.

- ❑ Settings board (54), connector J2 terminal 4(+) – 2(-) = fig. 5.2.2 = approximately +0.5 Vdc (Power Source output current feedback signal with pilot arc lit), for a duration of 1 second (maximum pilot arc time) with start command activated.



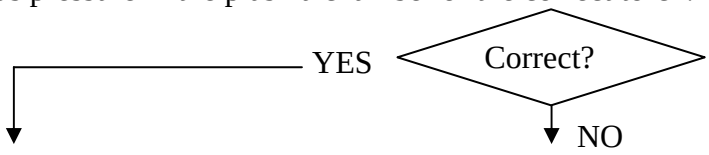
- ♦ Check the wiring between J2 settings board (54) and current transducer on pilot arc board (58).
- ♦ With Power Source off, temporarily disconnect the connector J2 from settings board (54) and check the resistance between terminals 4 and 2 of J2 on settings board (54). Correct value = approximately 10 Kohm. If incorrect, replace settings board (54).
- ♦ Replace settings (54) and/or pilot arc(58) boards.

♦ Replace settings (54) and/or control (38) and/or pilot arc (58) boards.

3.3.9 - Irregular pilot arc starts, unstable pilot arc.

PLASMA GAS PRESSURE TEST.

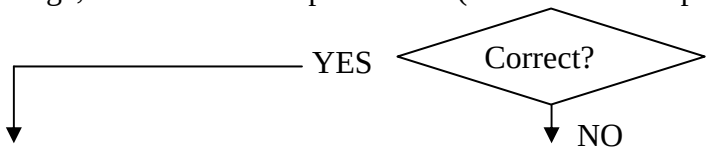
- Gas pressure in the plasma chamber of the correct torch.



- ♦ Check operation of the Gas Console and gas circuits, performing if necessary the tests in par. 3.3.5.
- ♦ Make sure that pressure and flow rate in the gas supply lines meet the specified values for the Plasma PROF 164 (see specifications in the Instruction Manual).

HIGH VOLTAGE AT PILOT ARC BOARD (58) INPUT TEST.

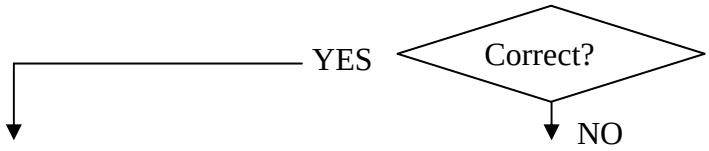
- Pilot arc board (58) terminals TP3(+) – TP8(-) = approximately +280 Vdc, with rated mains voltage, stable even with pilot arc lit (max. -10% with pilot arc lit).



- ♦ Check 3 x 200 Vac, with rated mains voltage, on input terminals of rectifier bridge (23); if not correct check transformer (27) connections, main voltage change, contactor (44) and mains voltage.
- ♦ Check rectifier bridge (23); replace if defective.
- ♦ Replace the pre-charge (45) and/or control (38) boards.

PILOT ARC VOLTAGE TEST.

- Pilot arc board (58), terminals J5(+) – TP7(-) = >+200 Vdc (if pilot arc off) or +150 Vdc (with pilot arc lit), for a duration of 1 second (maximum pilot arc time) after pressing the start command.



- ♦ Go to par. 3.3.6.

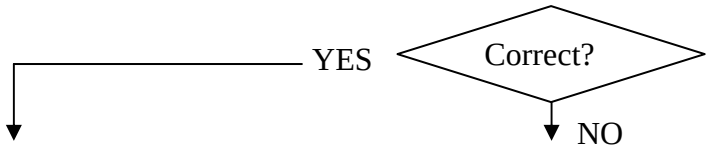
- ♦ Check the wiring between terminals TP7 of pilot arc board (58), inductor (24) and terminal (53) of the Power Source, and between J5 pilot arc board (58), nozzle resistor (17) and terminal J6 on torch board (42). If you find loose connections, tighten and replace any damaged components.
- ♦ Check the wiring between terminals TP3 and J3 of control box board (5) on module HV18, extension art. 1179 and terminals (53)(-) of the Power Source and J5(+) on torch board (42). If you find loose connections, tighten and replace any damaged components.
- ♦ Check resistor (17). Correct value = 1.3 ohm. Replace if incorrect.
- ♦ Check the continuity between terminals J5 and J6 on torch board (42). If interrupted, reset the connection.
- ♦ Check the wiring between CN2 and CN3 of HF board (2) and TP1 and TP2 of control box board (5) on module HV18.
- ♦ Make sure the extension art. 1179 is intact.

- With Power Source off, temporarily disconnect the cables of the extension art. 1179 from the Power Source terminals (53) and J5 of torch board (42), and check the isolation between the disconnected cables and towards earth. This makes it possible to test the isolation of extension art. 1197, module HV18 and the torch. If you find a short-circuit or low resistance, locate and replace the defective component.
- Carry out the test in par. 3.3.8.

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

NOZZLE CURRENT TRANSDUCER POWER SUPPLY TEST.

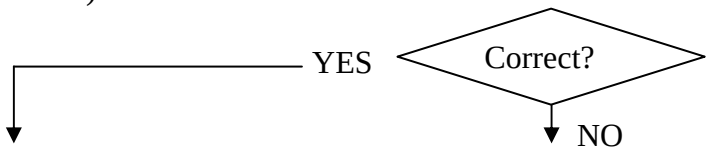
- Pilot arc board (58), connector J2 terminals 2(+) – 3(-) = +15 Vdc; terminals 4(+) - 3(-) = -15 Vdc.



- Check the wiring between J2 pilot arc board (58) and J1 settings board (54).
- With Power Source off, temporarily disconnect the connector J1 from settings board (54) and check the resistance between the terminals 2-3 and 4-3 of the patch connector disconnected from J1. Correct value = approximately 22 Kohm, for each measurement point. If incorrect, replace pilot arc board (58).
- Power up the Power Source again, keeping J1 disconnected from settings board (54), and check voltages on J1 of settings board (54), terminals 2(+) and 3(-) = +15 Vdc; terminals 4(+) and 3(-) = -15 Vdc. If incorrect, replace settings board (54).
- Check supply voltages of the settings board (54), performing if necessary the SETTINGS BOARD (54) POWER SUPPLY TEST in par. 3.3.1..
- Replace settings (54) and/or pilot arc (58) boards.

NOZZLE CURRENT SIGNAL TEST.

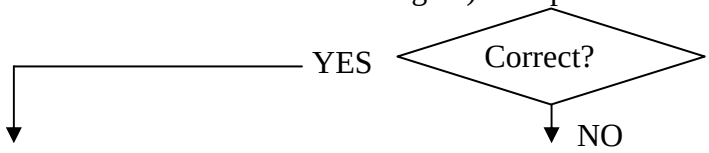
- Settings board (54), connector J1, terminals 1(+) – 3(-) = fig. 5.2.3 = +5 Vdc approximately (nozzle current feedback signal with pilot arc lit), for a duration of 1 second (maximum pilot arc time) with start command activated.



- Check the wiring between J2 pilot arc board (58) and J1 settings board (54).
- With Power Source off, temporarily disconnect the connector J1 from settings board (54) and check the resistance between terminals 1 and 3 of J1 on settings board (54). Correct value = approximately 22 Kohm. If incorrect, replace settings board (54).
- With the Power Source off, on pilot arc board (58) check terminals TP3 and J5 resistance = approximately >Mohm for each measurement point. If incorrect, perform the PILOT ARC BOARD (58) POWER SUPPLY TEST and NOZZLE IGBT COMMAND TEST in par. 3.3.6, and replace pilot arc board (58) if necessary.
- Replace the pilot arc board (58).

CURRENT MEASUREMENT SIGNALS TEST.

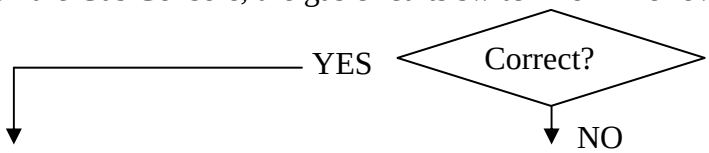
- Control board (38), connector J7, terminals 5(+) and 1(-) = approximately +0.7 Vdc (“Power Source output current measurement” signal); terminals 2(+) and 1(-) = approximately +2 Vdc (“nozzle current measurement” signal) with pilot arc lit.



  - ♦ Check the wiring between J7 control board (38) and J3 settings board (54).
  - ♦ With Power Source off, temporarily disconnect the connector J7 from control board (38) and check the resistance between the terminals 5-1 and between terminals 2-1 of J7 on control board (38). Correct value = approximately >1 Mohm, for each measurement point. If incorrect, replace control board (38).
  - ♦ Make sure the circuits to detect the Power Source output current are working properly, performing if necessary the POWER SOURCE OUTPUT CURRENT TRANSDUCER POWER SUPPLY TEST and the POWER SOURCE OUTPUT CURRENT SIGNAL TEST in par. 3.3.8.
  - ♦ Replace the control (38) and/or settings (54) boards.

TRANSFER ARC SWITCHING TEST.

- Move the torch with pilot arc lit near the workpiece. Switching in transfer arc takes place, thus:
- - the signal in fig. 5.2.3 (nozzle current) becomes 0 Vdc and remains such for the duration of cutting (pilot arc current during cutting = 0).
- - the signal in fig. 5.2.2 (Power Source output current) changes level. The new current level depends on the cutting current set, and remains there for the duration of cutting.
- - the signal in fig. 5.2.1 (current reference) changes level, from pilot arc current reference to transfer arc reference, and remains such for the duration of cutting.
- - on the Gas Console, the gas circuits switch from Preflow to Cutflow.

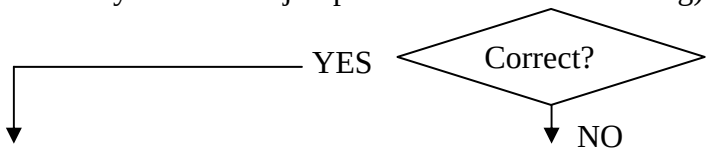


  - ♦ Replace control (38) and/or settings (54) and/or pilot arc (58) boards.
- ♦ Make sure that the gas lines of the Cutflow circuits are not clogged. If necessary, perform the SOLENOID VALVE TEST in par. 3.3.5..
- ♦ Check the pressure and flow of the Cutflow gas when the Gas Console activates cutting.
- ♦ Check the conditions of the torch, and the wear status of the electrode, diffusers and nozzle.
- ♦ Check the wiring between TP7 pilot arc board (58), inductor (24), terminal (53) on Power Source, and between J5 pilot arc board (58), nozzle resistor (17), terminal J6 torch board (42). If you find loose connections, tighten and replace any damaged components.
- ♦ Check the wiring between TP3 on pilot arc board (58), “gifas” output terminal (+) on the Power Source front panel, earth cable and workpiece or pantograph terminal. If you find loose connections, tighten and replace any damaged components.
- ♦ With Power Source off, temporarily disconnect the cables of the extension art. 1179 from the Power Source terminals (53) and J5 of torch board (42), and check the isolation between the disconnected cables and towards earth. This makes it possible to test the isolation of extension art. 1197, module HV18 and the torch. If you find a short-circuit or low resistance, locate and replace the defective component.

3.3.11 - Cooling unit does not work correctly.

COOLING UNIT ENABLE TEST.

- Control board (38), connector J20, terminals 2 - 4 = 0 Vac, contact closed, unit connected (27 Vac, contact open, unit not connected) with Power Source powered (this signal is actually disabled by means of a jumper in the flow meter wiring).

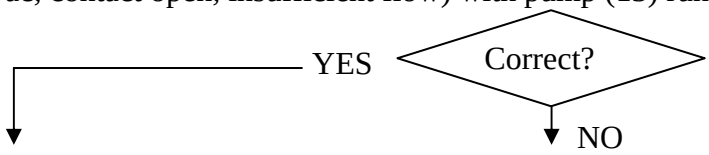


  - ♦ Check the wiring between connector J20 control board (38) and flow meter (12).
  - ♦ Make sure there is a jumper in the wiring of the flow meter (12) that puts terminals 2 and 4 of the patch connector in contact on J20 of control board (38).
  - ♦ With Power Source off, temporarily disconnect J20 from control board (38), and make sure that when the Power Source is turned back on, on terminals 2 and 4 of J20 on control board (38) voltage = 27 Vac. If incorrect, replace control board (38).
  - ♦ Replace the control board (38).

- ♦ Replace the control board (38).

FLOW METER (12) TEST.

- Control board (38), connector J20, terminals 3 - 4 = 0 Vac, contact closed, flow correct (27 Vac, contact open, insufficient flow) with pump (13) running.

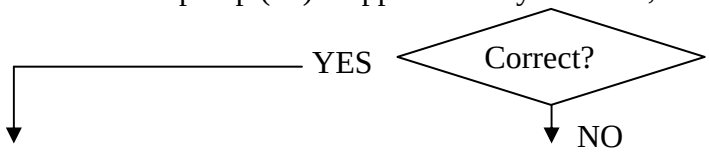


  - ♦ Check the wiring between connector J20 control board (38) and flow meter (12).
  - ♦ Make sure that the lines of the cooling circuit are not clogged.
  - ♦ Make sure that the hydraulic circuit is under pressure. If not, check the pump (13) and replace if defective (see test below).
  - ♦ Check the level of the cooling liquid in the tank (10). Top up the tank if below minimum level.
  - ♦ With Power Source off, temporarily disconnect J20 from control board (38), and power up the Power Source again to check, on terminals 3 and 4 of J20 on control board (38) voltage = 27 Vac. If incorrect, replace control board (38).
  - ♦ Make sure the flow meter(12) is functioning. If defective, replace.
  - ♦ Replace the control board (38).

- ♦ Replace the control board (38).

PUMP (13) TEST.

- Terminal of the pump (13) = approximately 230 Vac, with Power Source powered.



  - ♦ Check the wiring between terminals J8-A and J8-B of pre-charge board (45), fuse in the rear panel of the Power Source, terminals of the pump (13) and fast-on patch terminals from the voltage change of the transformer (27).

- ♦ Check fuse on the rear panel of the Power Source. If interrupted, replace and check the resistance on the terminals of pump (13). Correct value = approximately 9 ohm. If incorrect, replace pump (13).
- ♦ Check the wiring between J3 pre-charge board (45) and J13 control board (38).
- ♦ With Power Source off, temporarily disconnect connector J3 on pre-charge board (45), and check the resistance on terminals 1 and 2 of J3 on pre-charge board (45). Correct value = approximately 300 ohm. If incorrect, replace pre-charge board (45). If you detect a short-circuit, replace the pre-charge (45) and control (38) boards.
- ♦ Replace the control (38) and/or pre-charge (45) boards.

♦ Make sure the starting capacitor of the pump (13) is intact and connected. Replace if necessary.
♦ Make sure the pump (13) is rotating in the right direction.
♦ Make sure there are no mechanical obstacles blocking the pump (13).
♦ Replace pump (13).

3.4 - Error codes and alarm signals.

3.4.1 - 02 - Hardware lockup.

Power source lockup due to software error. Replace the control board (38).

3.4.2 - 06 - Communication error on CAN bus.

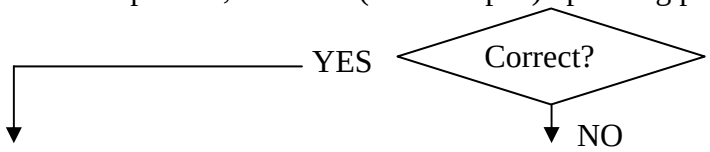
Communication error between control board (38) and panel board (20) on Gas Console, detected by Master control on control board (38). Perform the tests indicated in case of failure of the CAN BUS COMMUNICATION TEST in par. 3.3.3.

3.4.3 - 07 - "rob" "int" flashing on displays (B) (C) of the Power Source and (F) (M) on Gas Console. Operating permission from system (interlock).

This alarm indicates that the "interlock" signal originating from the system (pantograph or robot) needed to operate the Power Source is missing. The interlock signal may also be interpreted as "pantograph or robot connected" to the Power Source.

OPERATING PERMISSION FROM SYSTEM TEST.

- Remote board (59), connector J2, terminals 3(+) and 11(-) = 0 Vdc, (contact closed) operating permission present, +24 Vdc (contact open) operating permission missing.



  - ♦ Check the wiring between connector (4) of the Power Source and the actuator of the signal to allows system operation (pantograph or robot).
  - ♦ Check the wiring between J2 remote board (59) and connector (4) on the Power Source.
  - ♦ Check the wiring between J3 remote board (59) and J1 control board (38).
  - ♦ Make sure the remote board (59) power supply is correct, performing if necessary the REMOTE BOARD (59) POWER SUPPLY TEST in par. 3.3.4.
  - ♦ With Power Source off temporarily disconnect connector J1 on control board (38) and check the resistance on terminals 5 and 6 of J1 on control board (38). Correct value = diode junction in both measurement directions. If incorrect, replace control board (38).
  - ♦ Replace the remote (59) and/or control (38) boards.

- ♦ Replace the remote (59) and/or control (38) boards.

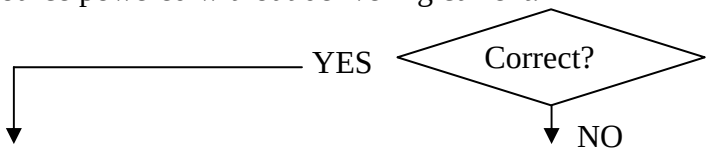
3.4.4 - 09 - Communication error on CAN bus.

Communication error between control board (38) and panel board (20) on Gas Console, detected by Slave control on panel board (20). Perform the tests indicated in case of failure of the CAN BUS COMMUNICATION TEST in par. 3.3.3.

3.4.5 - 39 - Nozzle current transducer reading error.

NOZZLE CURRENT TRANSDUCER TEST.

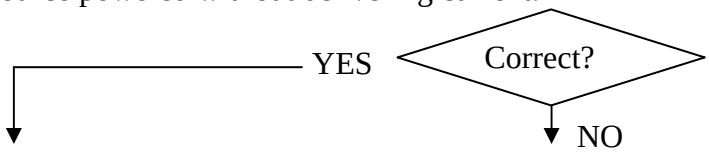
- Settings board (54), connector J1, terminals 1(+) – 3(-) = approximately 0 Vdc, with Power Source powered without delivering current.



- ♦ Check the wiring between J1 settings board (54) and J2 pilot arc board (58).
- ♦ With Power Source off, temporarily disconnect the connector J1 from settings board (54) and check the resistance between terminals 1 and 3 of J1 on settings board (54). Correct value = approximately 22 Kohm. If incorrect, replace settings board (54).
- ♦ Check supply voltages of the pilot arc current transducer by performing the NOZZLE CURRENT TRANSDUCER POWER SUPPLY TEST, in par. 3.3.10.
- ♦ Replace the pilot arc board (58).

NOZZLE CURRENT SIGNAL TEST.

- Control board (38), connector J7, terminals 2(+) – 1(-) = approximately 0 Vdc, with Power Source powered without delivering current.



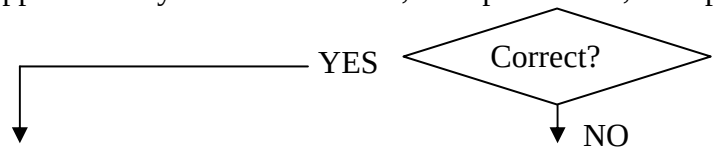
- ♦ Check the wiring between J7 control board (38) and J3 settings board (54).
- ♦ With Power Source off, temporarily disconnect the connector J7 from control board (38) and check the resistance between the terminals 2-1 of J7 on control board (38). Correct value = >1 Mohm. If incorrect, replace control board (38).
- ♦ Replace the settings board (54).

♦ Replace the control board (38).

3.4.6 - 40 - Hazardous voltage.

HAZARDOUS VOLTAGE PRESENCE TEST.

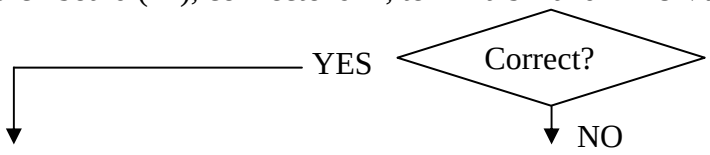
- Torch board (42), connector J8, terminals 4(+) - 1(-) = approximately 0 Vdc, with Power Source powered, without start command (approximately +280 Vdc, with pilot arc off, or approximately +150 - +190 Vdc, with pilot arc lit, after pressing the start command).



- ♦ Check the wiring between connector J8 of torch board (42) and terminal (53)(-) of the Power Source, and output terminal (+) of the Power Source (Gifas).
- ♦ Make sure output voltage is being generated, performing if necessary the tests in par. 3.3.6..

TORCH BOARD (42) POWER SUPPLY TEST.

- Torch board (42), connector J11, terminals 1 and 2 = 8 Vac.



- ♦ Check the wiring between J11 torch board (42) and J3 fuse board (50).
- ♦ Check fuse F5 fuse board (50); if broken, replace and make sure that terminals 1 - 2 of J11 on torch board (42) are not short-circuited.
- ♦ Check 8 Vac voltage on terminals TP6 - 8V of fuse board (50);if missing, check the wiring between the service transformer and fuse board (50), and if necessary replace the service transformer (50).

♦ With Power Source off, temporarily disconnect J8 from torch board (42) and check the resistance on terminals 1 and 4 of J8 on torch board (42). Correct value = approximately 170 Kohm. If incorrect replace torch board (42).

♦ Check the wiring between J13 torch board (42) and J14 control board (38).

♦ With Power Source off, temporarily disconnect J14 from control board (38) and check the resistance on terminals 1 and 2 of J14 on pilot arc board (38). Correct value = coupling of two diodes in one direction and 4.7 Kohm with the instrument probes reversed. If incorrect, replace control board (38).

♦ Replace the torch (42) and/or control (38) boards.

3.4.7 - 49 - Nozzle current during cutting.

When cutting begins, the nozzle current must become null. If this does not occur, there may be problems with the torch and poor cutting quality, and thus this situation is signaled as error 49. For an analysis of the problem, perform the tests in par. 3.3.10.

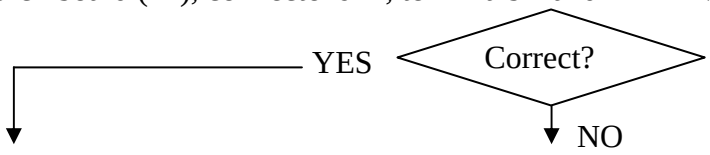
3.4.8 - 50 - Torch adapter protection not inserted.

NOTE

On Plasma PROF 164 the torch adapter and corresponding protection are not present on the Power Source. The protection presence signal is replaced by the dipswitch DIP1-D on torch board (42).

TORCH BOARD (42) 24V POWER SUPPLY TEST.

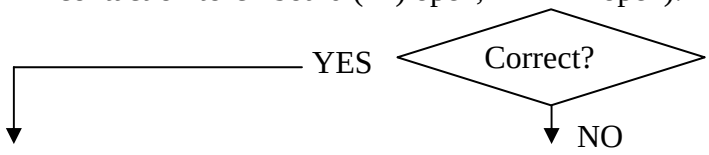
- Torch board (42), connector J12, terminals 1 and 2 = 24 Vac.



- ♦ Check the wiring between J12 torch board (42) and J3 fuse board (50).
- ♦ Check fuse F4 on fuse board (50); if interrupted, replace and check the resistance on terminals 1 and 2 of J12 on torch board (42). Correct values = approximately 300 ohm, with the circuit breakers on the Power Source safety guard and module HV18 open; 150 ohm with the circuit breakers on the guard closed. If incorrect replace torch board (42).
- ♦ Make sure there is 24 Vac voltage on terminals TP5 - 24V of fuse board (50); if missing, check the wiring between the service transformer and fuse board (50), and if necessary replace the service transformer (50).

TORCH ADAPTER PROTECTION SIGNAL TEST.

- Control board (38), connector J2, terminals 11(+) and 12(-) = 0 Vdc with protection engaged (RL2 contact on torch board (42) closed, DIP1-D closed); +5 Vdc with protection disengaged (RL2 contact on torch board (42) open, DIP1-D open).



  - Check the wiring between J7 torch board (42) and J2 control board (38).
  - With Power Source off, temporarily disconnect J2 from control board (38) and check on terminals 11(+) and 12(-) of J2 on control board (38) voltage = +5 Vdc. If incorrect, replace control board (38); if correct replace the torch board (42).
  - Replace the torch board (42).
- Replace the control board (38).

3.4.9 - 51 - Torch not recognized.

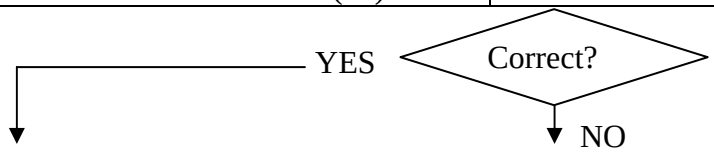
NOTE

On Plasma PROF 164 it is currently possible to install only the torch CP 250 art. 1236, which does not have an automatic recognition system. The Power Source must however be equally ready to operate with the torch CP250 and may be obtained by the dipswitches DIP1-A, DIP1-B and DIP1-C on torch board (42).

TORCH CP250 RECOGNITION SIGNAL TEST.

- Control board (38), connector J2, terminals 1, 2, 3 – 4 = signals according to table below.

J2 terminals on control board (38).	1 - 4	2 - 4	3 - 4
Signals on the J2 terminals.	24 Vac	0 Vac	24 Vac
Dip-switches on torch board (42).	DIP1-A closed	DIP1-B open	DIP1-C closed



  - Check the wiring between J7 torch board (42) and J2 control board (38).
  - Check the torch board (42) supply voltage, performing if necessary the TORCH BOARD (42) 24V POWER SUPPLY TEST in par. 3.4.8.
  - With Power Source off, temporarily disconnect J7 from torch board (42) and check the resistance between terminals 1-4, 2-4 and 3-4. Correct value = approximately 7 Kohm. If incorrect, replace control board (38); if correct replace the torch board (42).
  - Replace the torch board (42).
- Replace the control board (38).

3.4.10 - 52 - "trG" on display (B) of the Power Source and (F) of the Gas Console. Start button pressed at Power Source start-up.

Perform the START COMMAND TEST and REMOTE BOARD (59) POWER SUPPLY TEST in par. 3.3.4.

3.4.11 - 53 - "trG" on display (B) of the Power Source and (F) of the Gas Console. Start button pressed while resetting the operating mode.

Some alarms, such as "low gas pressure" or "high temperature," stop the Power Source when the corresponding indicator is lit, but are not saved and are automatically reset when the conditions return to within the allowed limits. On automated systems, the system may be reset when the start command has not yet been removed, since before the stop occurred. To prevent the Power Source from starting suddenly due to such a random reset, this situation is detected and causes a saved block of the Power Source, indicating error "trG".

To restore proper operation, shut off the Power Source, remove the start command and restart the Power Source.

3.4.12 - 55 - Electrode finished.

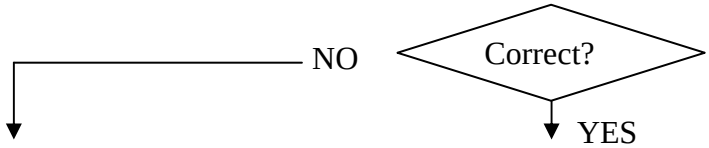
NOTE

This function is controlled only during cutting (transfer arc).

This alarm indicates that the electrode is not in condition to ensure correct operation of the Power Source, and thus it may be difficult to achieve good quality cutting. To solve this problem, we recommend performing the following checks.

NOZZLE VOLTAGE PRESENCE TEST.

- Torch board (42), terminal J6(+) and connector J8, terminal 1(-), voltage = from +150 to +190 Vdc (with pilot arc lit), for a duration of 1 second (maximum pilot arc time), after pressing the start command.



  - ♦ Check the wiring between J13 torch board (42) and J14 control board (38).
  - ♦ With Power Source off, temporarily disconnect J14 from control board (38) and check the resistance on terminals 4 and 5 of J14 on pilot arc board (38). Correct value = junctions of two diodes in one direction and 4.7 Kohm with the instrument probes reversed. If incorrect, replace control board (38).
  - ♦ Replace the control (38) and/or torch (42) boards.

- ♦ Check the wiring between connector J6 and J8 of torch board (42), resistor (17), terminal (53)(-) of the Power Source.
- ♦ Make sure output voltage is being generated, performing if necessary the tests in par. 3.3.6..
- ♦ With Power Source off, temporarily disconnect J6 and J8 from torch board (42) and check the resistance on terminals J6 and 1 of J8 on torch board (42). Correct value = approximately 40 Kohm. If different, replace the torch board (42).
- ♦ Check the torch board (42) supply voltage, performing if necessary the TORCH BOARD (42) POWER SUPPLY TEST in par. 3.4.6.
- ♦ Check electrode and torch nozzle; replace if worn or damaged.
- ♦ Make sure the internal parts of the torch are properly insulated, including cables; if in doubt, replace the entire torch.
- ♦ Replace the torch (42) and/or control (38) boards.

3.4.13 - 74 - "TH""1" on displays (B) (C) of the Power Source and (F) (M) of the Gas Console. High temperature of the igbt group on pilot arc board (58) or of the transformer (27).

With this alarm we recommend not shutting off the Power Source, to keep the fan running and thus allow rapid cooling. Normal operation is restored automatically as soon as the temperature returns within the allowed limits.

- Make sure the fan (20) is operating correctly.
- Make sure the air is flowing properly and that there no dust or obstacles are blocking the cooling ducts inside the Power Source.
- Make sure that the working conditions comply with the specified values, especially observing the "duty cycle".
- Check the wiring between J8 pilot arc board (58), and the thermostat on the dissipater of the pilot arc board (58) igbt.
- Make sure the thermostat mounted on the dissipater of pilot arc board (58) is properly mounted and operating; its contact must be closed at ambient temperature.
- Check the wiring between J7 torch board (42) and J19 control board (38).
- With Power Source off, temporarily disconnect J7 on pilot arc board (58). Power up the Power Source again and check on the patch connector removed from J7 voltage = 27 Vac (alarm condition). If incorrect, replace control board (38).
- Replace the control board (38).

3.4.14 - 75 - "H2O" on display (B) of the Power Source and display (F) of the Gas Console. Insufficient flow of the cooling liquid.

The flow of liquid in the cooling circuit is detected by the flow meter (12).

To analyze the corresponding circuit, see FLOW METER (12) TEST, par. 3.3.11.

3.4.15 - 76 - "H2O""n.c." on displays (B) (C) of the Power Source and (F) (M) of the Gas Console. Cooling unit not connected.

The "cooling unit connected" signal is provided by a jumper between terminals 2 and 4 of the patch connector inserted in J20 of control board (38). To analyze the corresponding circuit, see COOLING UNIT ENABLE TEST, par. 3.3.11.

3.4.16 - 78 - Gas pressure low.

3.4.17 - 79 - Gas pressure high.

These alarms indicate that the pressure in a gas circuit is below the minimum or above the maximum allowed for the operation.

The signals are provided by the 5 pressure detectors in the Gas Console (PT1…PT5 see fig. 2.6.1), whose signals are analyzed from the panel board (20).

The low pressure alarm check is active only during cutting, and affects only the two CUT circuits (PT2 and PT4). The alarm threshold is set via software to approximately 60% of the correct value.

The high pressure alarm test is active for all 5 channels, while cutting, while the system is emptying upon system start-up, during the "Gas Seal" test. The high pressure alarm threshold is set via software at approximately 9 Bar, corresponding to the approximately 9 Vdc detectable on connectors J1, J2, J3, J4 and J5 of panel board (20).

During discharge, the check waits for the pressure to reach zero in all circuits before beginning to fill the circuits. If one of the pressure switches does not provide the signal corresponding to a pressure of zero (0 Vdc on connectors J1, J2, J3, J4 and J5 of panel board (20), the test stops operation due to error (79).

The alarm circuit is indicated on the Gas Console by the flashing corresponding display, while the displays (F) and (M) of the Gas Console read “GAS” “LO” or “err” “79”.

NOTE

Since operation of the 5 gas pressure detection circuits is checked during the “Gas Seal” test, this test may be used in troubleshooting these alarms.

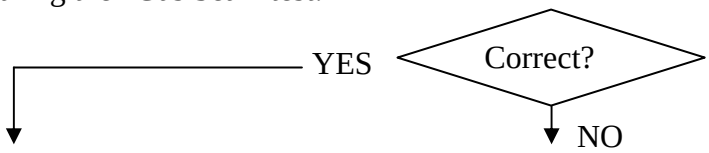
The test for the pressure detector PT1 is described below. Since the pressure detection circuits are identical to one another, the same procedure may also be applied to the other pressure detectors, replacing PT1 with the other detectors (PT2, PT3, PT4, PT5) which are connected to connectors J2, J3, J4 and J5, respectively.

PRESSURE DETECTOR ON THE GAS CIRCUIT TEST.

The displays (E), (G), (H) and (N) on Gas Console indicate the pressure expressed in tenths of bar. A bar corresponds to a voltage of 1 Vdc on connectors J1, J2, J3, J4 and J5 (see example in the table).

Displays (E), (G), (H) and (N)	Pressure	Voltage on connectors J1, J2, J3, J4 and J5
54	5.4 bar	5.4 Vdc

- With Power Source powered, set up the “Gas seal” test of all pneumatic circuits: press the key (I) on Gas Console to enter the set-up menu, press the key (A) to select “Test” (led (A3) lit), turn knob (C) to show “ALL” on display (D).
- Press the key (I) to begin the test. The various phases are shown on the displays (D)(F) and (M) of the Gas Console.
- Panel board (20), connector J1, terminals 3(+) and 4(-) = voltage between 0 and the value set by the regulators (O), (P), (Q), (R) and (T) expressed in Vdc, based on the phase performed during the “Gas Seal” test.



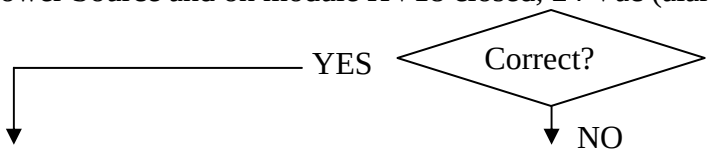
  - ♦ Check the wiring between connector J1 of panel board (20) and the pressure detector PT1.
  - ♦ Check on J1 of panel board (20), terminals 1(+) and 4(-) voltage = +18 Vdc (pressure detection power supply). If incorrect, with Power Source off temporarily disconnect J1 from panel board (20), restart the Power Source and check the voltage again on terminals 1(+) and 4(-) of J1, panel board (20) = +18 Vdc. If incorrect, replace panel board (20).
  - ♦ Make sure the pressure detector PT1 is intact; replace if defective.
  - ♦ Make sure that the gas lines on which the pressure detector PT1 is inserted are not clogged.
  - ♦ Replace pressure detector PT1 and/or panel board (20).

♦ Replace the panel board (20).

3.4.18 - 80 - “OPn” on display (B) of the Power Source and display (F) of the Gas Console. Guard on Power Source or HV18 module open.

SAFETY GUARD TEST.

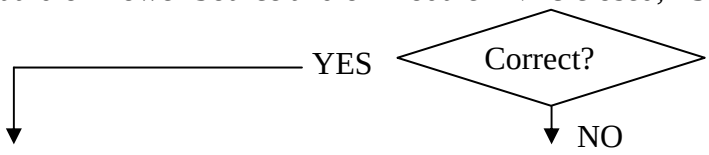
- Torch board (42), connector J3, terminals A and B = 0 Vac (correct condition), with guard on Power Source and on module HV18 closed; 24 Vac (alarm), with guards open.



- ♦ Check the wiring between J3 torch board (42), terminal board to connect the torch to the Power Source, switch (46) on the Power Source safety guard, extension art. 1179, connector J2 on control box board (5) of the module HV18 and switch (11) on the safety guard of the module HV18.
- ♦ Make sure there is a jumper on terminals A and B of J1 and on terminals 1 and 2 of J5 on control box board (5) of the module HV18.
- ♦ Make sure the switches (46) on the Power Source and (11) on the safety guard of the module HV18 are intact and properly mounted. If incorrectly positioned, correct the position; replace if defective.
- ♦ Check the torch board (42) supply voltage, performing if necessary the TORCH BOARD (42) 24V POWER SUPPLY TEST in par. 3.4.8.
- ♦ Replace the torch board (42).

SAFETY GUARD SIGNAL TEST.

- ❑ Control board (38), connector J2, terminals 9(+) and 10(-) = 0 Vdc (correct condition), with guard on Power Source and on module HV18 closed; +5 Vdc (alarm), with guards open.



- ♦ Check the wiring between J7 torch board (42) and J2 control board (38).
- ♦ With Power Source off, temporarily disconnect, J2 from control board (38) and check on terminals 9(+) and 10(-) of J2 on control board (38) voltage = +5 Vdc. If incorrect, replace control board (38).
- ♦ Replace the torch board (42).

♦ Replace the control board (38).

3.4.19 - 81 - Gas console not connected.

This alarm is not currently active. Recognition of the Gas Console connected is built into the CAN bus communication line.

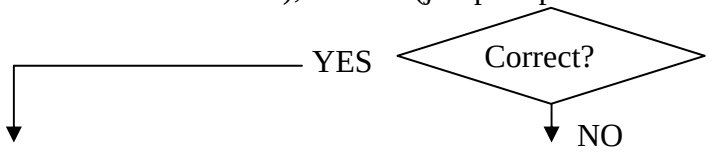
3.4.20 - 82 - ATEX Gas Console not connected.

This alarm is active only when a type of gas is selected that requires the use of the ATEX Console (e.g., "H35"). It may initially appear with the message "H35" flashing on display (F) of the Gas Console, which upon start-up ((I) button on Gas Console pressed) changes to the message "Err""82".

The "ATEX Gas Console connected" signal is provided by a jumper between terminals 8 and 9 of the connector (27) on the ATEX Gas Console.

ATEX GAS CONSOLE CONNECTED TEST.

- ❑ Panel board (20), connector J12, terminals 2(+) and 1(-) = 0 Vdc, (jumper closed = ATEX Gas Console connected); +5 Vdc (jumper open = ATEX Gas Console not connected).



- ♦ Check the wiring between J12 panel board (20), connector (17) on Gas Console and connector (27) on ATEX Gas Console.
- ♦ Make sure there is a jumper between terminals 8 and 9 of connector (27) on ATEX Gas Console.

- ♦ With Power Source off, temporarily disconnect J12 from panel board (20), and check, after restarting the Power Source, on terminals 2(+) and 1(-) of J12 on panel board (20), voltage = +5 Vdc. If incorrect, replace panel board (20).
- ♦ Replace panel board (20).

♦ Replace panel board (20).

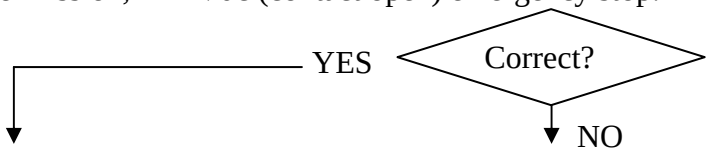
3.4.21 - 83 - Nozzle protection or torch disconnected.

Function inactive.

3.4.22 - 90 - "rob" flashing on display (B) of the Power Source and display (F) on Gas Console. Emergency stop originating from the system (pantograph or robot).

EMERGENCY STOP FROM SYSTEM TEST.

❑ Remote board (59), connector J2, terminals 2(+) and 10(-) = 0 Vdc, (contact closed) operating permission, +24 Vdc (contact open) emergency stop.



- ♦ Check the wiring between connector (4) of the Power Source and the actuator of the emergency stop signal on pantograph or robot.
- ♦ Check the wiring between J2 remote board (59) and connector (4) on the Power Source.
- ♦ Check the wiring between J3 remote board (59) and J1 control board (38).
- ♦ Make sure the remote board (59) power supply is correct, performing if necessary the REMOTE BOARD (59) POWER SUPPLY TEST in par. 3.3.4.
- ♦ With Power Source off temporarily disconnect connector J1 on control board (38) and check the resistance on terminals 7 and 8 of J1 on control board (38). Correct value = diode junction in both measurement directions. If incorrect, replace control board (38).
- ♦ Replace the remote (59) and/or control (38) boards.

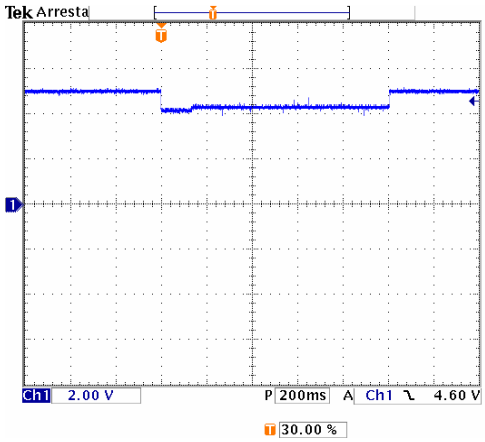
♦ Replace the remote (59) and/or control (38) boards.

4 - COMPONENTS LIST

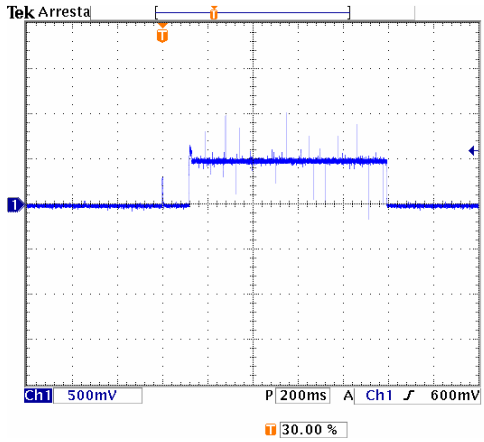
4.1 - Plasma PROF 164 HQC : see file ESP164.pdf enclosed at the end of the manual.
4.2 - Components table : see file ESP164.pdf enclosed at the end of the manual.

5 - ELECTRICAL DIAGRAMS

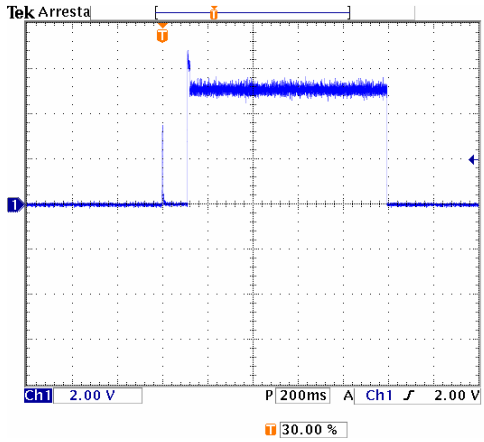
5.1 - Plasma PROF 164 HQC : see file SCHE164.pdf enclosed at the end of the manual.
5.2 - Waveforms.



5.2.1 - Reference signal for pilot arc current (par. 3.3.8).



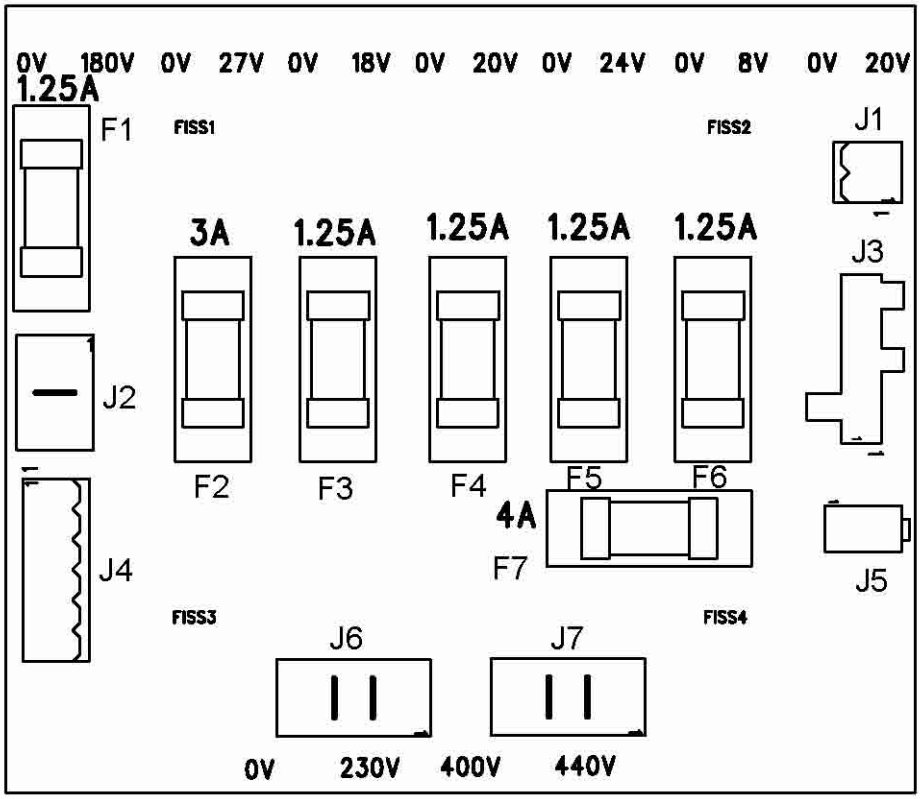
5.2.2 - Feedback signal of the Power Source output current (par. 3.3.8).



5.2.3 - Feedback signal of the nozzle current (par. 3.3.10).

5.3 - Fuse board (50), code 5.602.257.

5.3.1 - Topographical drawing.

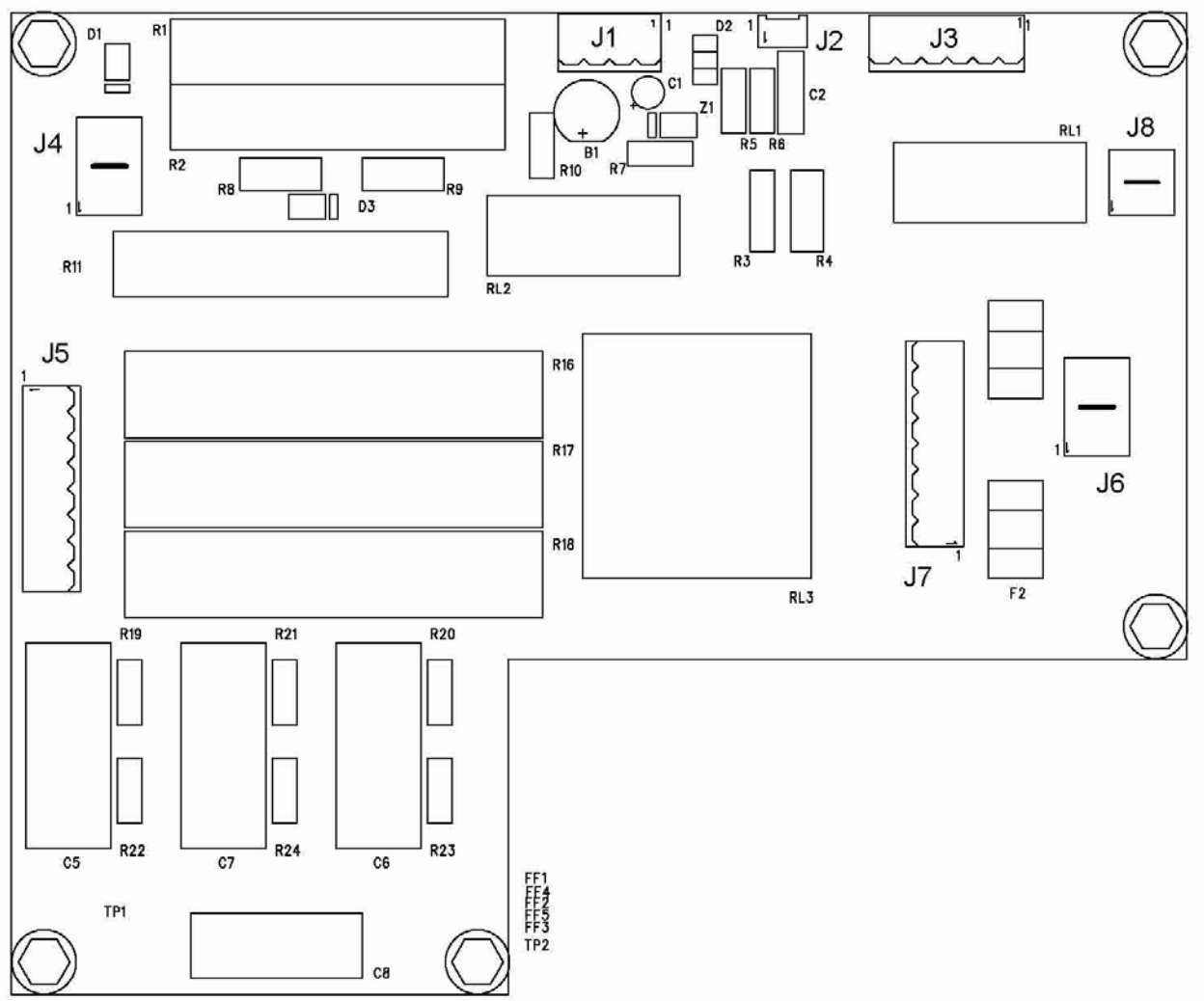


5.3.2 - Connector and fuse table.

Conn.	Terminals	Fuse	Value	Function
J1	1 - 2	F6	1.25 A	20 Vac output for pilot arc board (58) power supply.
J2	A - B	F1	1.25 A	180 Vac output to pre-charge DC-capacitors on pilot arc board (58).
J3	1 - 2	F4	1.25 A	24 Vac output for torch board (42) power supply.
J3	4 - 5	F5	1.25 A	8 Vac output for torch board (42) power supply.
J4	1 - 2	F2	3 A	18 Vac output for settings board (54) power supply.
J4	5 - 6	F3	1.25 A	20 Vac output for settings board (54) power supply.
J5	1 - 2	F7	4 A	27 Vac output for control board (38) power supply.
J6	B	-	-	service transformer (50) power supply 0 Vac input.
J6	A	-	-	service transformer (50) power supply 230 Vac input.
J7	B	-	-	service transformer (50) power supply 400 Vac input.
J7	A	-	-	service transformer (50) power supply 440 Vac input.

5.4 - Pre-charge board (45), code 5.602.242.

5.4.1 - Topographical drawing.



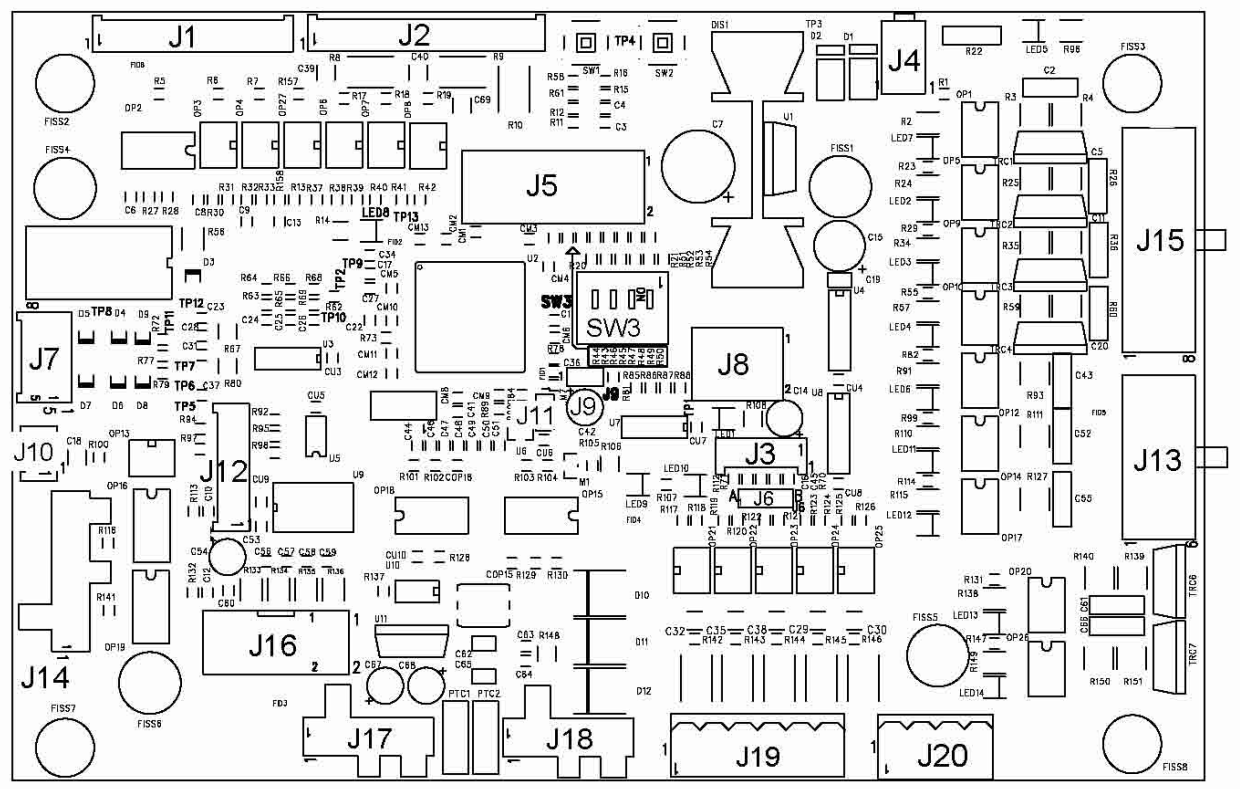
5.4.2 - Connector and fuse table.

Conn.	Terminals	Function
J1	1 - 4	180 Vac input for DC-capacitors pre-charge on pilot arc board (58).
J2	1 - 2	“DC-capacitors pre-charge complete” signal output.
J3	1 - 2	cooling unit power supply relay command input.
J3	3 - 4	transformer (27) pre-magnetization relay command input.
J3	5 - 6	command input for DC-capacitors pre-charge relay on pilot arc board (58).
J4	B(+) - A(-)	+250 Vdc output for DC-capacitors pre-charge on pilot arc board (58).
J5	1-4-7	power supply input for transformer (27) pre-magnetizing.
J6	A - B	voltage output for service transformer (50) power supply.
J7	1-4-7	power supply output for transformer (27) pre-magnetizing.
J8	A - B	cooling unit command output.

Fuse	Value	Function
F2	5 A	service transformer (50) power supply.

5.5 - Control board (38), code 5.602.239.

5.5.1 - Topographical drawing.

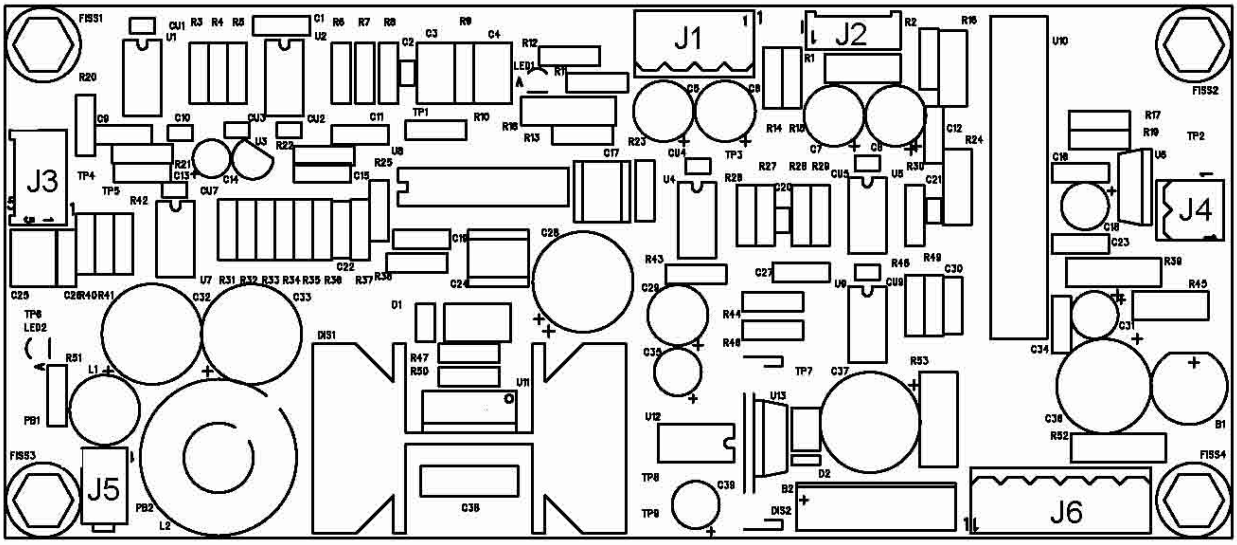


5.5.2 - Connector table.

Conn.	Terminals	Function
J1	1 - 2	“transfer arc” output signal.
J1	3(+) - 4(-)	current external digital reference input.
J1	5 - 6	“operating permission” (interlock) signal input, from system.
J1	7 - 8	“emergency stop” signal input, from system.
J1	9 - 10	“start” signal input.
J2	1-2-3 / 4	input signals for torch recognition.
J2	5 - 6	NU.
J2	7(+) - 8(-)	“nozzle protection” signal input.
J2	9(+) - 10(-)	“guard open” signal input, on Power Source and module HV18.
J2	11(+) - 12(-)	“torch adapter protection” signal input.
J3	-	NU.
J4	1(+) - 2(-)	+8 Vdc input for control board (38) power supply.
J5	-	signals bus with panel board (38), on Power Source.
J6	-	NU.
J7	1	GND.
J7	2	“fast nozzle current” signal input.
J7	3	current reference output.
J7	4	start command output for settings board (54).
J7	5	“fast Power Source output current” signal input.
J7	6	“slow Power Source output current” signal input.
J7	7	GND.
J7	8	NU.
J8	1-3-5-7-9-	+8 Vdc power supply input for Power Source panel board.
J8	2-4-6-8-10	0 Vdc power supply output for Power Source panel board.
J9	-	NU.
J10	1 - 2	“DC-capacitors pre-charging complete on pilot arc board (58)” signal input.
J11	-	NU.
J12	-	NU.
J13	1 - 6	contactor (44) command output.
J13	2 - 7	transformer (27) pre-magnetization relay command output.
J13	3 - 8	DC-capacitors pre-charge relay command output, on pilot arc board (58).
J13	4 - 9	cooling unit power supply relay command output.
J13	5 - 10	27 Vac input for service power supply.
J14	1(+) - 2(-)	“arc voltage” digital signal input.
J14	4(+) -5(-)	“nozzle voltage” digital signal input.
J15	1 - 8	NU.
J15	2 - 9	NU.
J15	3 - 10	NU.
J15	4 - 11	NU.
J15	5 - 12	pilot arc relay output command, on RC board (48).
J15	6 - 13	NU.
J15	7 - 14	igbt nozzle output command, on pilot arc board (58).
J16	-	connector for programming Plasma Prof 164 cutting system.
J17	-	NU. (CAN bus auxiliary communication line).
J18	1(+) - 2(-)	+8 Vdc input for power supply CAN bus communication line.
J18	3 - 4	CAN bus communication line signals.
J19	1 - 2	temperature signal input from thermostat on pilot arc board (58).
J19	3 - 4	NU.
J19	5 - 6	NU.
J20	1 - 2	“cooling unit connected” signal input.
J20	3 - 4	“correct coolant flow” signal input.

5.6 - Settings board (54), code 5.602.237.

5.6.1 - Topographical drawing.

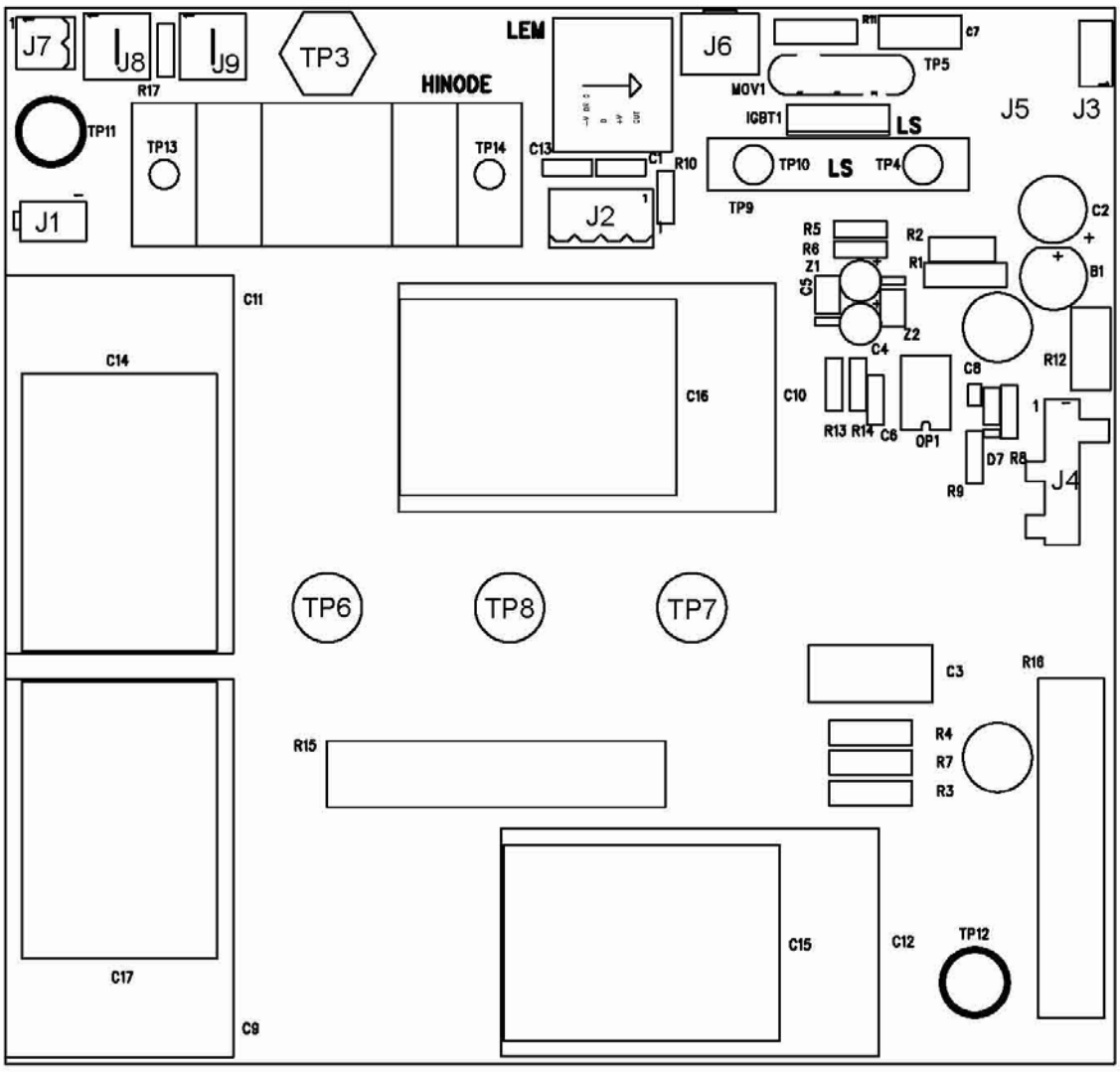


5.6.2 - Connector table.

Conn.	Terminals	Function
J1	1	“nozzle current” signal input.
J1	2(+) - 3(-)	+15 Vdc output to nozzle current transducer power supply.
J1	4(+) - 3(-)	-15 Vdc output to nozzle current transducer power supply.
J2	3(+) - 2(-)	+15 Vdc output to output current transducer power supply.
J2	1(+) - 2(-)	-15 Vdc output to output current transducer power supply.
J2	4	“Power Source output current” signal input.
J3	1	GND.
J3	2	“fast nozzle current” signal output.
J3	3	current reference input.
J3	4	start command input for settings board (54).
J3	5	“fast Power Source output current” signal output.
J3	6	“slow Power Source output current” signal output.
J3	7	GND.
J3	8	NU.
J4	1 - 2	igbt output command, on pilot arc board (58).
J5	1(+) - 2(-)	+8 Vdc output for control board (38) power supply.
J6	1 - 2	18 Vac input for settings board (54) power supply.
J6	5 - 6	20 Vac input for settings board (54) power supply.

5.7 - Pilot arc board (58), code 5.602.255.

5.7.1 - Topographical drawing.



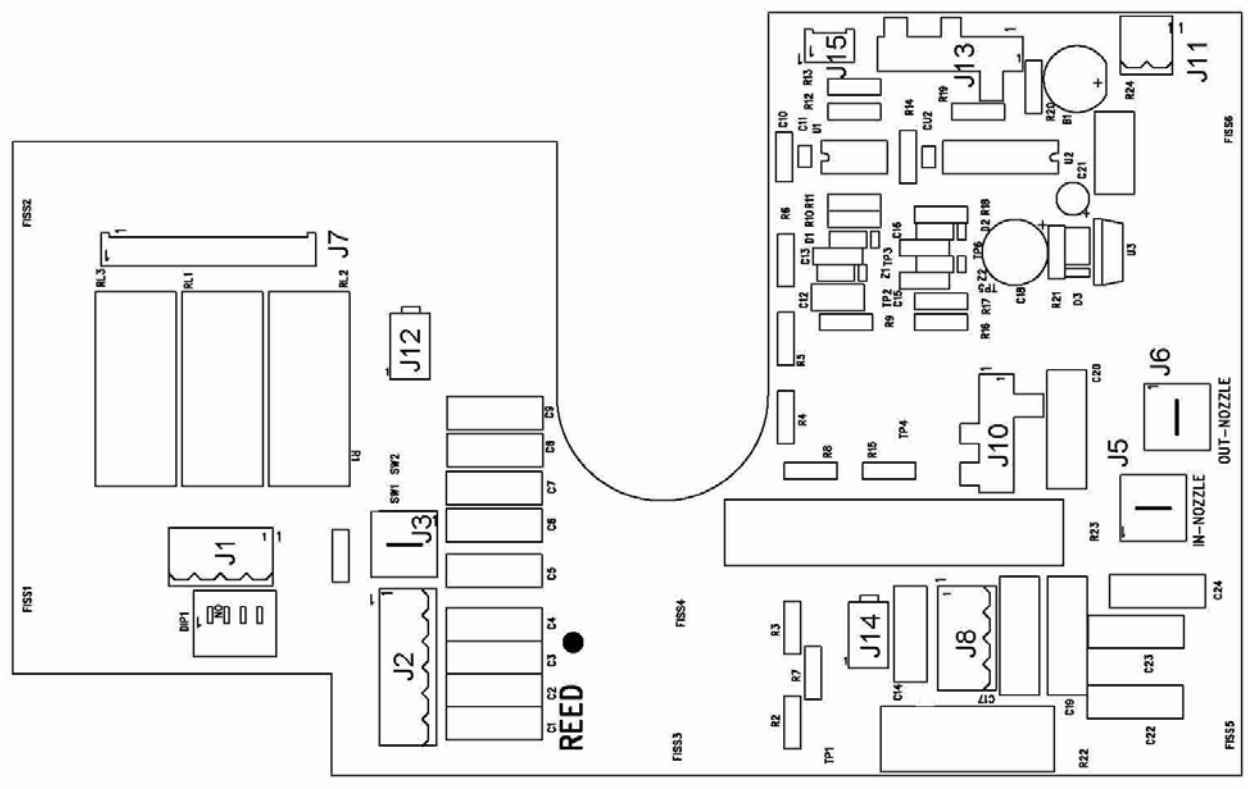
E

5.7.2 - Connector table.

Conn.	Terminals	Function
J1	1(+) - 2(-)	+250 Vdc input for DC-capacitors pre-charging, on pilot arc board (58).
J2	1	"nozzle current" signal output.
J2	2(+) - 3(-)	+15 Vdc input for nozzle current transducer power supply.
J2	4(+) - 3(-)	-15 Vdc input for nozzle current transducer power supply.
J3	-	NU.
J4	1 - 2	20 Vac pilot arc board (58) power supply input.
J4	4 - 5	nozzle igbt command input, on pilot arc board (58).
J5	-	output voltage output, nozzle potential (+).
J6	-	output voltage output, earth potential, for RC board (48).
J7	1 - 2	temperature signal output, from thermostat on pilot arc board (58).
J8	A - B	temperature signal input, from pilot arc board (58) thermostat and thermostat on transformer (27).
J9	A - B	NU.
-	TP3	output voltage output, earth potential (+).
-	TP7	output voltage output, electrode potential (-).

5.8 - Torch board (42), code 5.602.266.

5.8.1 - Topographical drawing.

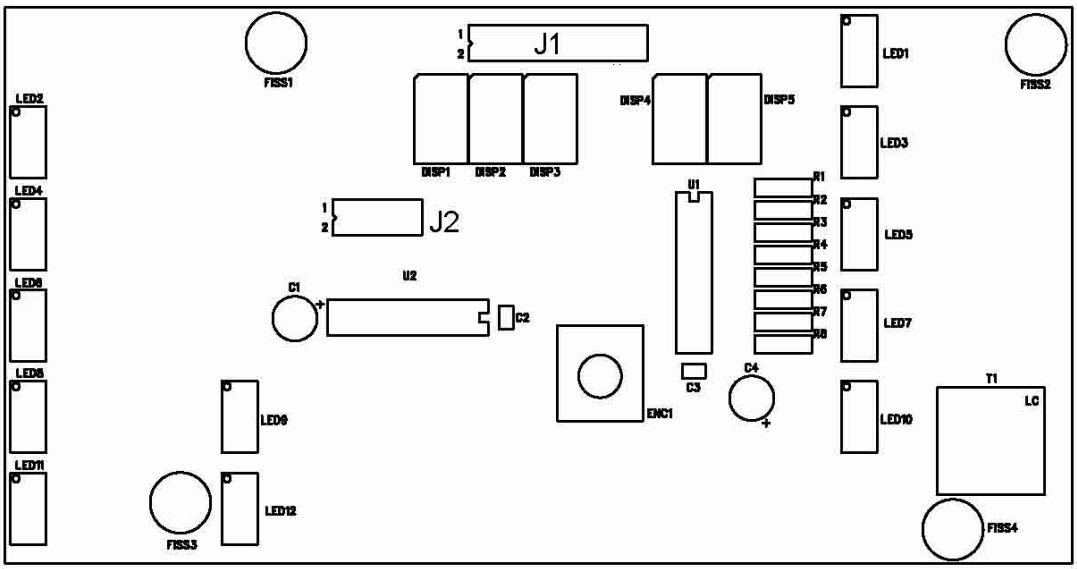


5.8.2 - Connector table.

Conn.	Terminals	Function
J1	-	NU.
J2	-	NU (torch recognition).
J3	A - B	“guard open” signal input, on Power Source and module HV18.
J4	-	NU.
J5	A-B	output voltage output, nozzle potential.
J6	A-B	output voltage input, nozzle potential.
J7	1-2-3 / 4	output signals for torch recognition.
J7	5 - 6	NU.
J7	7(+) - 8(-)	“nozzle protection” output signal.
J7	9(+) - 10(-)	“guards open” signal output, on Power Source and module HV18.
J7	11(+) - 12(-)	“torch adapter protection” signal input.
J8	4(+) - 1(-)	“Power Source output voltage” signal input.
J9	-	NU.
J10	-	NU.
J11	1 - 2	8 Vac torch board (42) power supply input.
J12	1 - 2	24 Vac torch board (42) power supply input.
J13	1(+) - 2(-)	“arc voltage” digital signal output.
J13	4(+) - 5(-)	“nozzle voltage” digital signal output.
J14	1(+) - 2(-)	“arc voltage” signal output, for remote board (59).
J15	1(+) - 2(-)	“auxiliary arc voltage” digital signal output.

5.9 - Panel board (38), code 5.602.240.

5.9.1 - Topographical drawing.

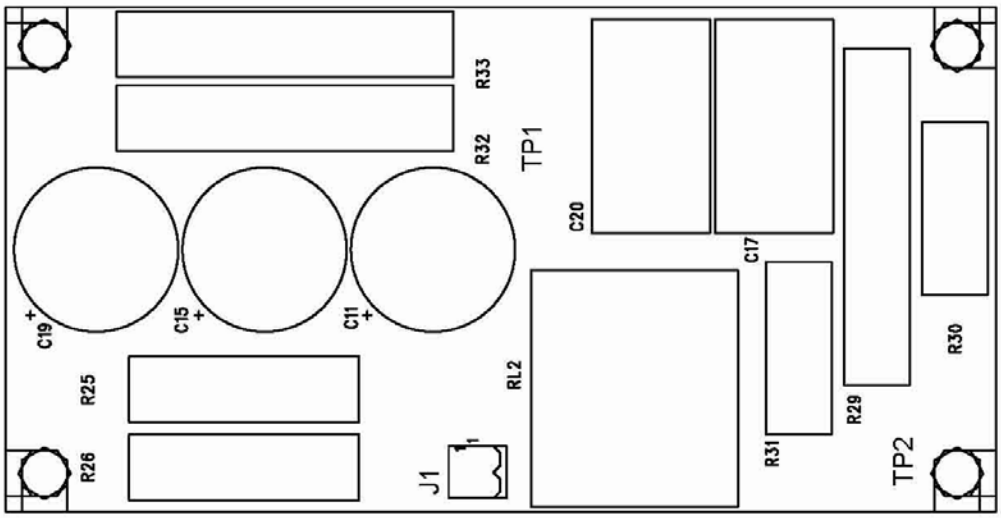


5.9.2 - Connector table.

Conn.	Terminals	Function
J1	-	signals bus with control board (38).
J2	1-3-5-7-9	+8 Vdc power supply input, for Power Source panel board.
J2	2-4-6-8-10	0 Vdc power supply input, for Power Source panel board.

5.10 - RC board (48), code 5.602.251.

5.10.1 - Topographical drawing.

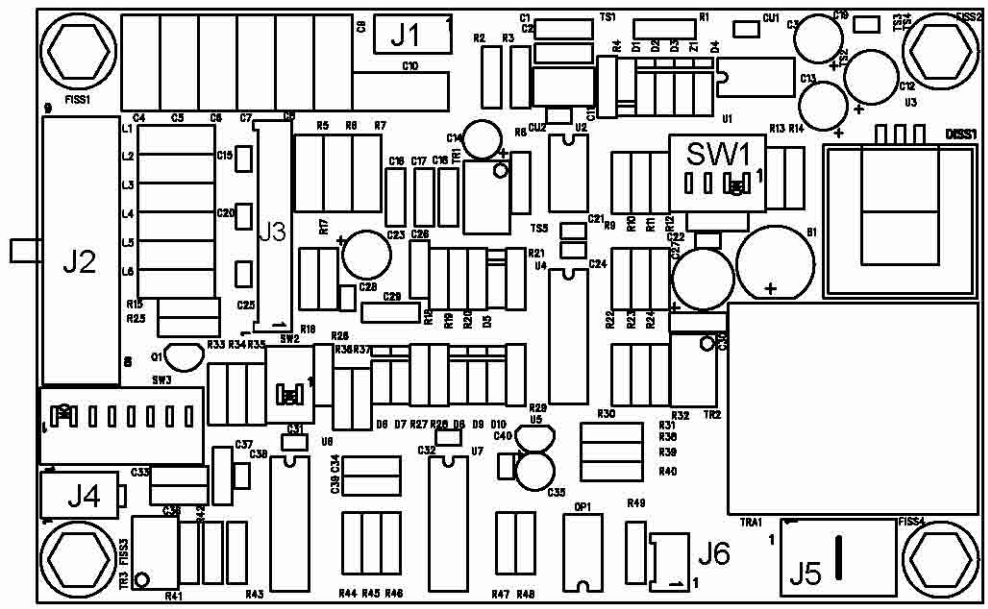


5.10.2 - Connector table.

Conn.	Terminals	Function
J1	1 - 2	pilot arc relay command input, on RC board (48).
-	TP1	output voltage input, electrode potential.
-	TP2	output voltage input, earth potential.

5.11 - Remote board (59), code 5.602.252.

5.11.1 - Topographical drawing.

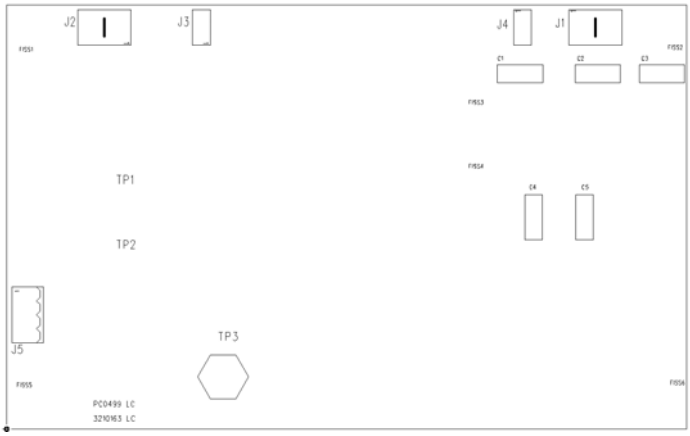


5.11.2 - Connector table.

Conn.	Terminals	Function
J1	-	GND.
J2	1 - 9	“start” signal input.
J2	2 - 10	“emergency stop” signal input, from system.
J2	3 - 11	“operating permission” (interlock) signal input, from system.
J2	4 - 12	“transfer arc” signal output.
J2	5(+) - 13(-)	external analog current reference input.
J2	6(+) - 8(-)	“isolated arc voltage” signal output.
J2	16(+) - 8(-)	“not isolated arc voltage” signal output.
J3	1 - 2	“transfer arc” signal input.
J3	3(+) - 4(-)	external digital current reference output.
J3	5(+) - 6(-)	“operating permission” (interlock) signal output, from system.
J3	7(+) - 8(-)	“emergency stop” signal output, from system.
J3	9(+) - 10(-)	“start” signal output.
J4	1(+) - 2(-)	“arc voltage” signal input, for remote board (59).
J5	1 - 2	230 Vac input, for remote board (59) power supply.
J6	1(+) - 2(-)	“auxiliary arc voltage” digital signal input.

5.12 - Control box board (5), code 5.602.033 (on module HV18).

5.12.1 - Topographical drawing.

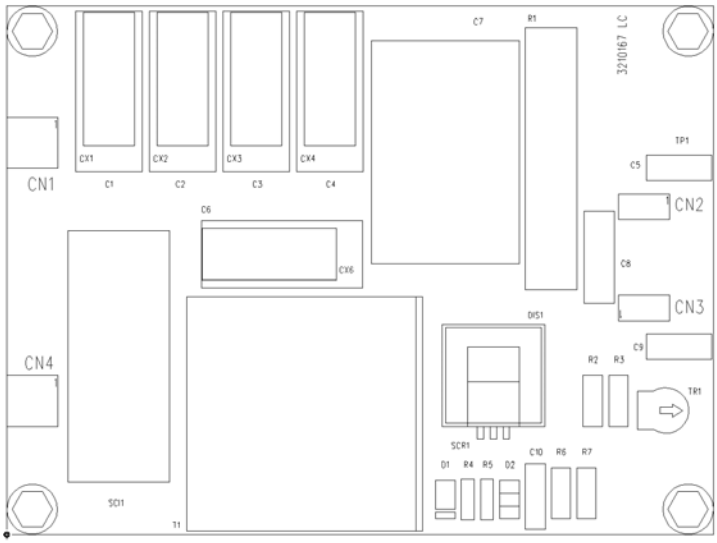


5.12.2 - Connector tables.

Conn.	Terminals	Function
J1	A - B	NU. (start input from torch button).
J2	A - B	"guard open" signal output, on module HV18.
J3	-	Power Source output voltage input, nozzle potential.
J4	-	output voltage output for torch, nozzle potential.
J5	1 - 2	NU.
J5	3 - 4	"guard open" signal input, on module HV18.
	TP1	output voltage output, nozzle potential, for HF board (2).
	TP2	output voltage output, electrode potential, for HF board (2).
	TP3	output voltage input, from Power Source, electrode potential.

5.13 - HF board (2), code 5.602.034 (on module HV18).

5.13.1 - Topographical drawing.

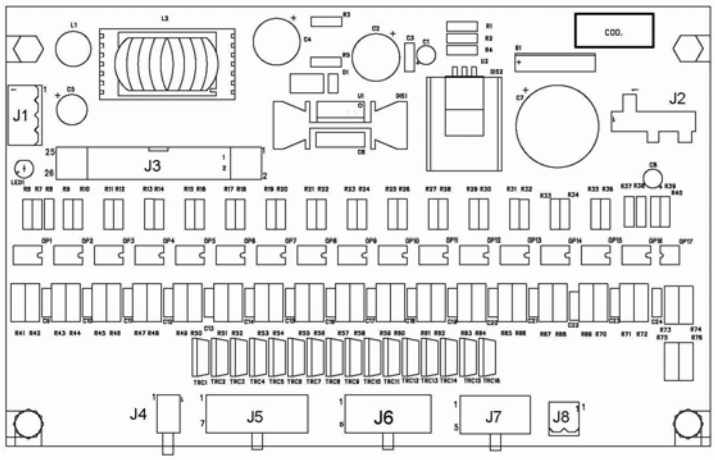


5.13.2 - Connector table.

Conn.	Terminals	Function
-	CN1 - CN4	output for HF transformer (7) primary circuit, on module HV18.
-	CN2	output voltage input, nozzle potential, from control box board (5).
-	CN3	output voltage input, electrode potential, from control box board (5).

5.14 - Solenoid valve board (2), code 5.602.245 (on Gas Console).

5.14.1 - Topographical drawing.

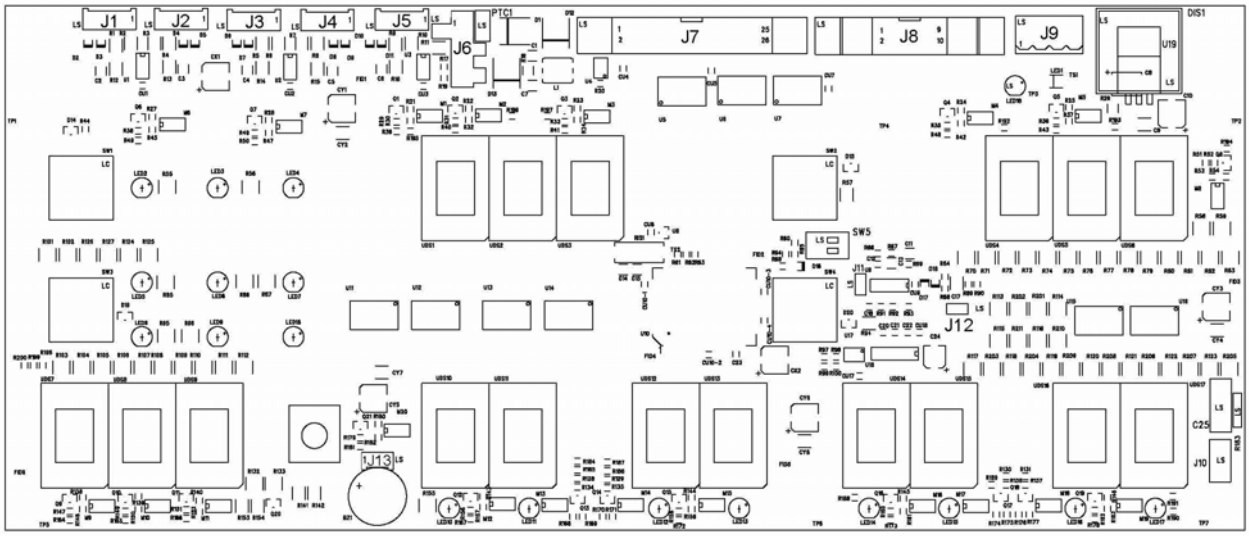


5.14.2 - Connector table.

Conn.	Terminals	Function
J1	1(+) - 3(-)	+18 Vdc output, for panel board (20) power supply.
J1	4(+) - 3(-)	+8 Vdc output, for panel board (20) power supply.
J2	1 - 2	24 Vac input, for solenoid valve board (2) power supply.
J2	5 - 6	27 Vac input for solenoid valve power supply, on Gas Console.
J3	1-2-7-12	
	18-25-26	0 Vdc reference for signals with panel board (20).
J3	3	NU (signal input to control solenoid valve “V7”).
J3	4	solenoid valve “V8” control command signal input.
J3	5	solenoid valve “V9” control command signal input.
J3	6	solenoid valve “V1” control command signal input.
J3	8	solenoid valve “V2” control command signal input.
J3	9	solenoid valve “V3” control command signal input.
J3	10	solenoid valve “V4” control command signal input.
J3	11	solenoid valve “V5” control command signal input.
J3	13	solenoid valve “V6” control command signal input.
J3	14	solenoid valve “V10” control command signal input.
J3	15	NU (solenoid valve “V11” control command signal input).
J3	16	NU (solenoid valve “V12-V24” control command signal input).
J3	17	solenoid valve “V20” control command signal input
J3	19	solenoid valve “V21” control command signal input.
J3	20	solenoid valve “V22” control command signal input.
J3	21	solenoid valve “V23” control command signal input.
J3	22	NU.
J3	23-24	NU.
J4	1 - 2	solenoid valve V5 command output.
J5	1 - 2	solenoid valve V4 command output.
J5	3 - 4	solenoid valve V3 command output.
J5	5 - 6	solenoid valve V2 command output.
J5	7 - 8	solenoid valve V1 command output.
J5	9 - 10	NU (solenoid valve V11 command output).
J5	11 - 12	solenoid valve V10 command output.
J6	1 - 2	NU (solenoid valve V12-V24 command output).
J6	3 - 4	solenoid valve V23 command output.
J6	5 - 6	solenoid valve V22 command output.
J6	7 - 8	solenoid valve V21 command output.
J6	9 - 10	solenoid valve V20 command output.
J7	1 - 2	solenoid valve V9 command output.
J7	3 - 4	solenoid valve V8 command output.
J7	5 - 6	NU (solenoid valve V7 command output).
J7	7 - 8	solenoid valve V6 command output.
J8	-	NU.

5.15 - Panel board (20), code 5.602.244 (on Gas Console).

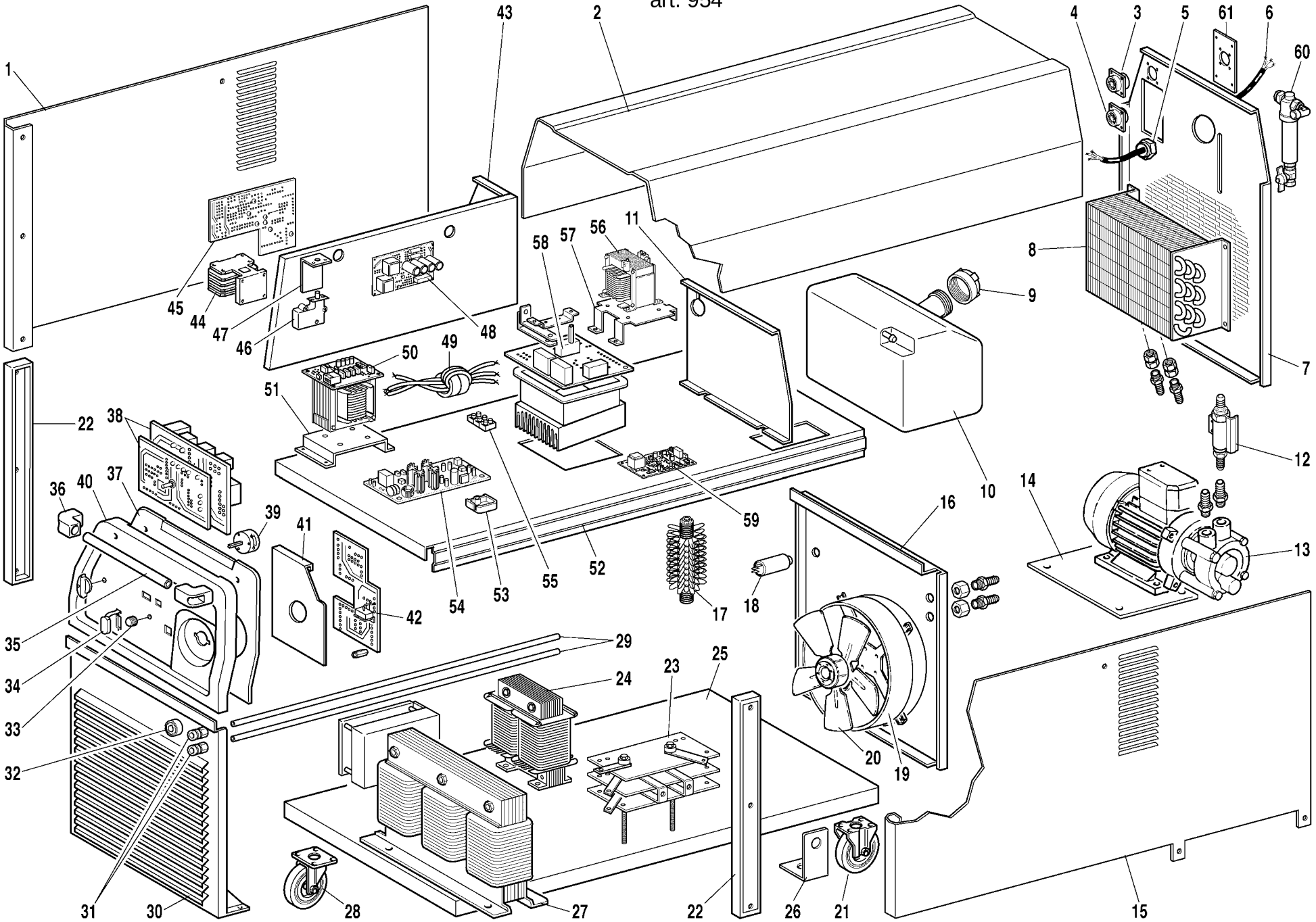
5.15.1 - Topographical drawing.



5.15.2 - Connector table.

Conn.	Terminals	Function
J1	1(+) - 4(-)	+18 Vdc flow gauge PT1 power supply output.
J1	3	gas flow signal input, in the “Plasma PreFlow” circuit.
J2	1(+) - 4(-)	+18 Vdc flow gauge PT2 power supply output.
J2	3	gas flow signal input, in the “Plasma CutFlow” circuit.
J3	1(+) - 4(-)	+18 Vdc flow gauge PT3 power supply output.
J3	3	gas flow signal input in the “Secondary PreFlow” circuit.
J4	1(+) - 4(-)	+18 Vdc flow gauge PT4 power supply output.
J4	3	gas flow signal input in the “Secondary CutFlow” circuit.
J5	1(+) - 4(-)	+18 Vdc flow gauge PT5 power supply output.
J5	3	gas flow signal input in the “Plasma CutFlow” circuit of PVC Valve Console.
J6	1(+) - 2(-)	+8 Vdc power supply output of CAN bus communication line.
J6	3 - 4	CAN bus communication line signals.
J7	1-2-7-12	
	18-25-26	0 Vdc reference for signals with solenoid valve board (2).
J7	3	NU (signal output to control solenoid valve “V7”).
J7	4	solenoid valve “V8” control signal output.
J7	5	solenoid valve “V9” control signal output.
J7	6	solenoid valve “V1” control signal output.
J7	8	solenoid valve “V2” control signal output.
J7	9	solenoid valve “V3” control signal output.
J7	10	solenoid valve “V4” control signal output.
J7	11	solenoid valve “V5” control signal output.
J7	13	solenoid valve “V6” control signal output.
J7	14	solenoid valve “V10” control signal output.
J7	15	NU (solenoid valve “V11” control signal output).
J7	16	NU (solenoid valve “V12-V24” control signal output).
J7	17	solenoid valve “V20” control signal output.
J7	19	solenoid valve “V21” control signal output.
J7	20	solenoid valve “V22” control signal output.
J7	21	solenoid valve “V23” control signal output.
J7	22	NU.
J8	-	NU.
J9	1(+) - 3(-)	+18 Vdc input for panel board (20) power supply.
J9	4(+) - 3(-)	+8 Vdc input for panel board (20) power supply.
J10	-	NU.
J11	-	NU.
J12	1 - 2	“PVC Valve Console connected” signal input.
J13	2(+) - 1(-)	command output for warning led on PVC Valve Console.

art. 954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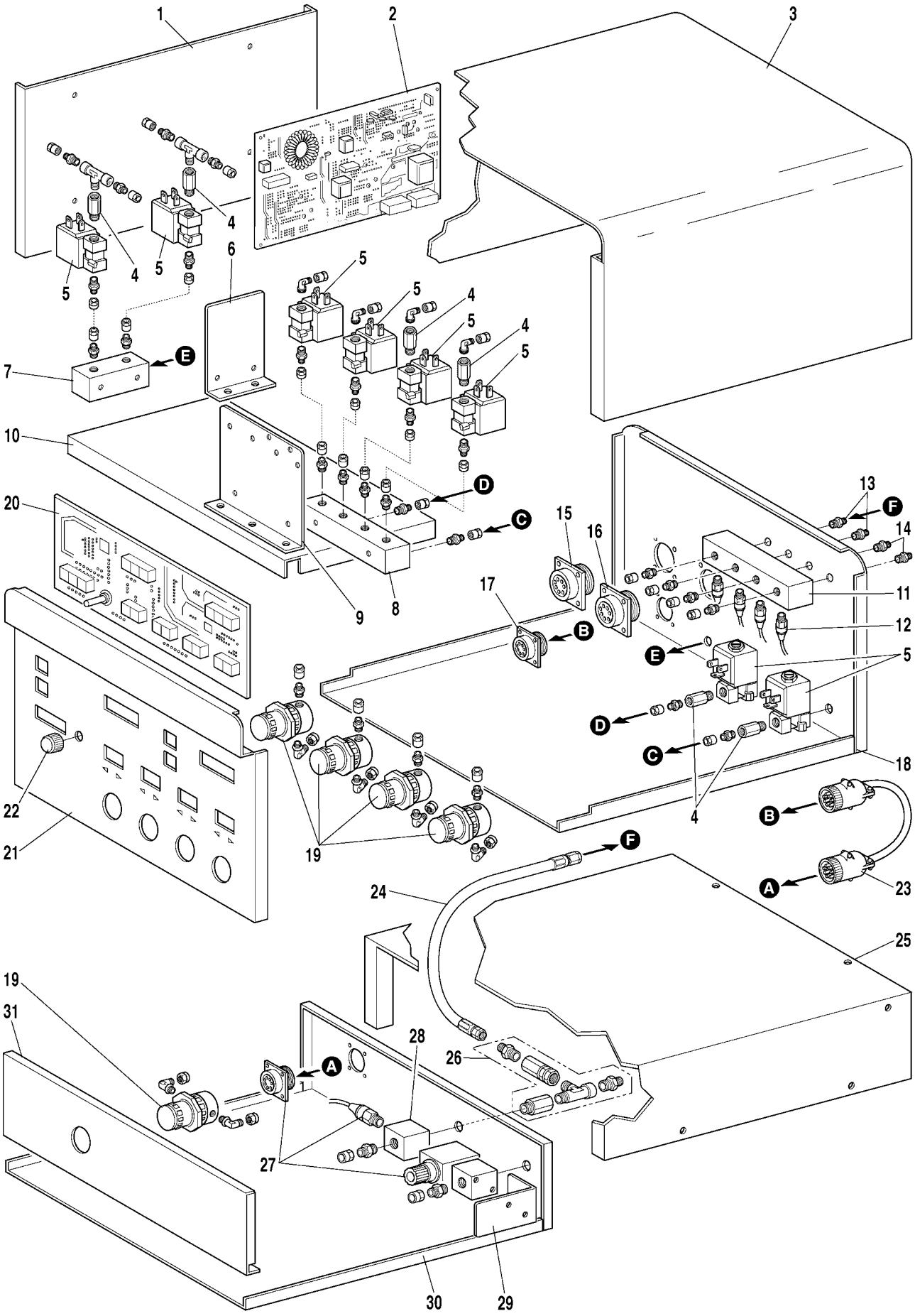
art. 954

N	DESCRIZIONE	N	DESCRIZIONE
1	LATERALE SX	32	PRESA GIFAS
2	COPERCHIO	33	MANOPOLA
3	CONNESSIONE	34	PROTEZIONE CONNETTORE
4	CONNESSIONE	35	MANICO
5	PRESSACAVO	36	SUPPORTO MANICO
6	CAVO RETE	37	PANNELLO COMANDO
7	PANNELLO POSTERIORE	38	CIRCUITO CONTROLLO
8	RADIATORE	39	INTERRUTTORE
9	TAPPO SERBATOIO	40	CORNICE PANNELLO
10	SERBATOIO	41	SUPPORTO CIRCUITO
11	PIANO INTERMEDIO	42	CIRCUITO TORCIA+MISURA
12	FLUSSOSTATO	43	PIANO INTERMEDIO VERT
13	MOTOPOMPA	44	TELERUTTORE
14	PIASTRA PER MOTOPOMPA	45	CIRUITO PRECARICA+FILTRO
15	LATERALE DX	46	PULSANTE SICUREZZA
16	PANNELLO POSTERIORE INT	47	SUPPORTO MICRO
17	RESISTENZA	48	CIRCUITO RC
18	PORTAFUSIBILE	49	CONNESSIONE CON FERRITE
19	TUNNEL	50	TRASFORMATORE SERVIZI
20	MOTORE + VENTOLA	51	SUPP. TRASFORMATORE SERVIZI
21	RUOTA FISSA	52	PIANO INTERMEDIO
22	RINFORZO LATERALE	53	MORSETTIERA
23	RADDRIZZATORE	54	CIRCUITO REGOLAZIONE
24	IMPEDENZA	55	MORSETTIERA
25	FONDO	56	TRASFORMATORE SERVIZI CONSOLE
26	ATTACCO SOLLEVAMENTO	57	SUPPORTO TRASFORMATORE
27	TRASFORMATORE POTENZA	58	GRUPPO IGBT
28	RUOTA PIROETTANTE	59	CIRCUITO REMOTE
29	TUBO PER ACQUA	60	FILTRO
30	PANNELLO ANTERIORE	61	SUPPORTO CONNETTORE
31	RACCORDO TUBO ACQUA		

art. 954

N	DESCRIZIONE	N	DESCRIZIONE
1	LEFT SIDE PANEL	32	GIFAS SOCKET
2	COVER	33	KNOB
3	CONNECTOR	34	CONNECTOR PROTECTION
4	CONNECTOR	35	HANDLE
5	STRAIN RELIEF	36	HANDLE SUPPORT
6	POWER CORD	37	CONTROL PANEL
7	BACK PANEL	38	CONTROL CIRCUIT
8	RADIATOR	39	SWITCH
9	CAP	40	PANEL FRAME
10	TANK	41	CIRCUIT SUPPORT
11	INSIDE BAFFLE	42	TORCH+MEASURE CIRCUIT
12	FLOW CONTROL	43	VERTICAL INSIDE BAFFLE
13	MOTORPUMP	44	CONTACTOR
14	MOTORPUMP SUPPORT	45	PRECHARGE CIRCUIT+FILTER
15	RIGHT SIDE PANEL	46	SAFETY SWITCH
16	INTERNAL BACK PANEL	47	MICRO SUPPORT
17	RESISTANCE	48	RC CIRCUIT
18	FUSE HOLDER	49	CONNECTOR WITH FERRITE
19	COOLING TUNNEL	50	AUXILIARY TRANSFORMER
20	MOTOR WITH FAN	51	AUXILIARY TRANSFORMER SUPPORT
21	FIXED WHEEL	52	INSIDE BAFFLE
22	REINFORCEMENT	53	TERMINAL BOARD
23	RECTIFIER	54	REGULATION CIRCUIT
24	CHOKE	55	TERMINAL BOARD
25	BOTTOM	56	CONSOLE AUX TRANSFORMER
26	LIFTING BRACKET	57	TRANSFORMER SUPPORT
27	POWER TRANSFORMER	58	IGBT UNIT
28	WHEEL	59	REMOTE CIRCUIT
29	WATER HOSE	60	FILTER
30	FRONT PANEL	61	CONNECTOR SUPPORT
31	WATER HOSE FITTING		

art. 477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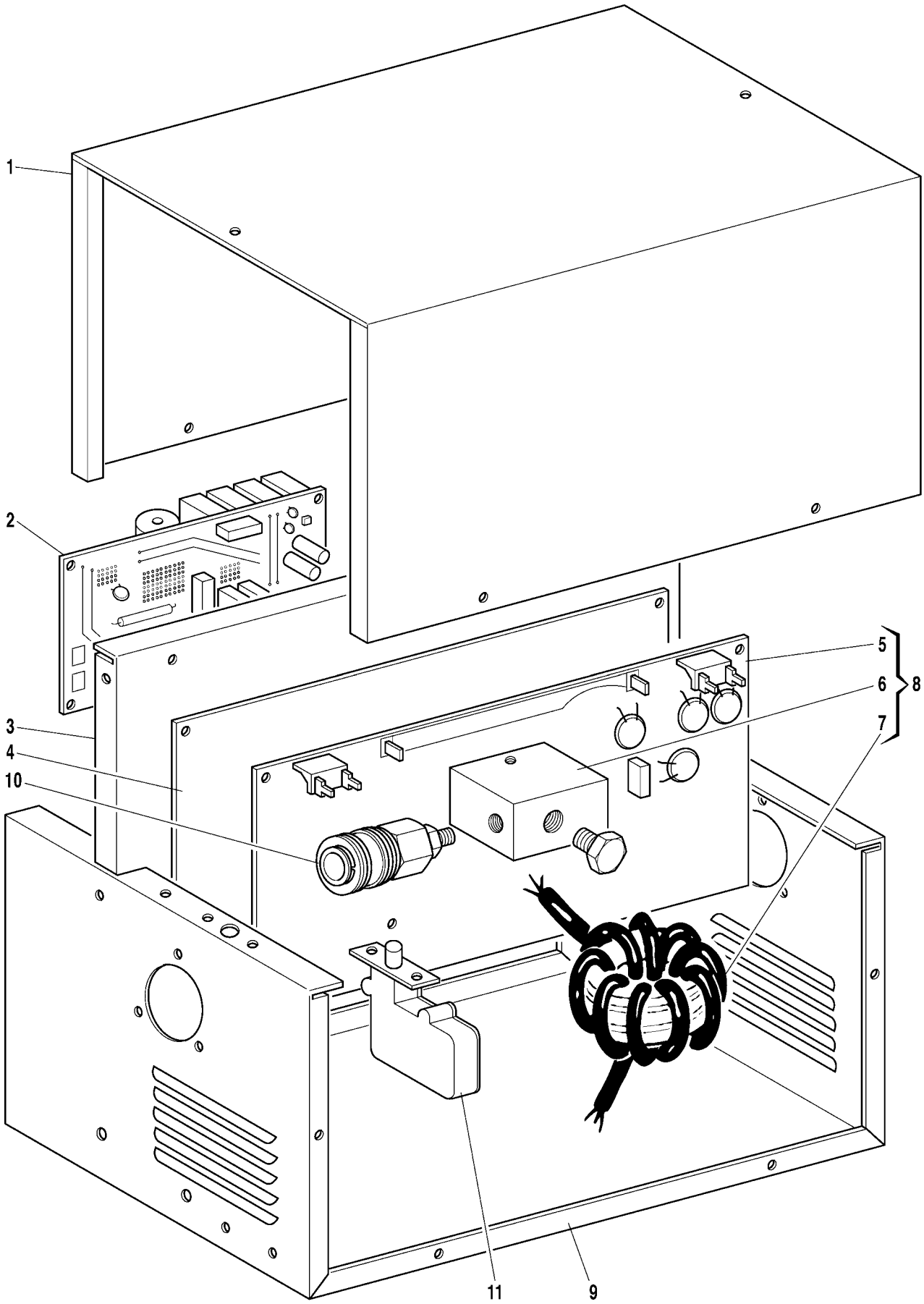
F

art. 477

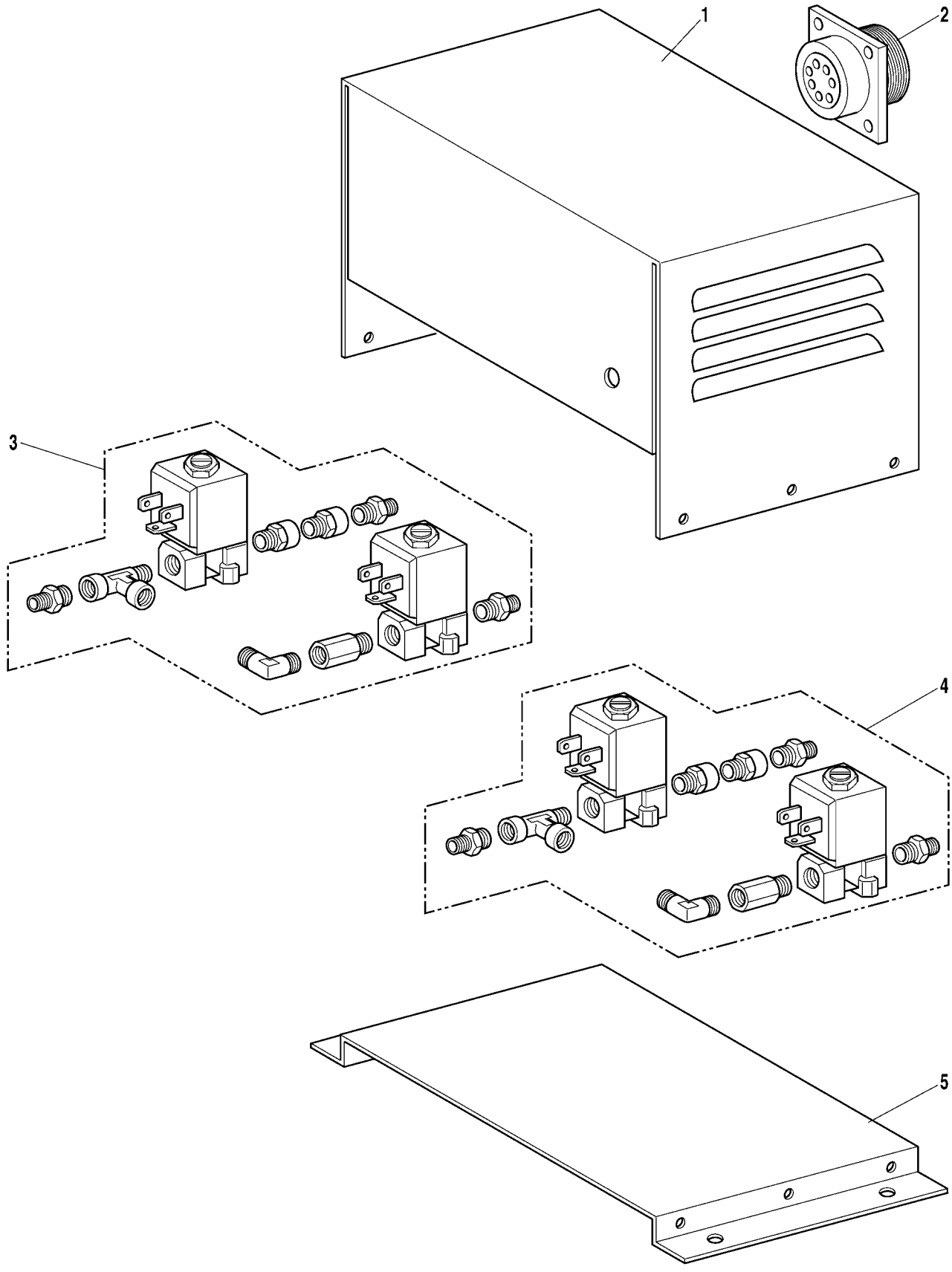
N	DESCRIZIONE
1	SUPPORTO SCHEDA
2	CIRCUITO ALIMENTATORE+SERVIZI
3	FASCIONE
4	RACCORDO
5	ELETTROVALVOLA
6	SUPPORTO VALVOLE
7	RACCORDO PRESE MULTIPLE
8	RACCORDO PRESE MULTIPLE
9	SUPPORTO VALVOLE
10	PIANO INTERMEDIO
11	RACCORDO PRESE MULTIPLE
12	CONNESSIONE TRASDUTTORE
13	RACCORDO
14	RACCORDO
15	CONNESSIONE CON CONNETTORE
16	CONNESSIONE CON CONNETTORE
17	CONNESSIONE CON CONNETTORE
18	FONDO + PANNELLO POSTERIORE
19	RIDUTTORE
20	CIRCUITO PANNELLO
21	PANNELLO ANTERIORE COMPLETO
22	MANOPOLA
23	CONNESSIONE
24	TUBO COLLEGAMENTO GAS
25	FASCIONE
26	GRUPPO PLASMA CUTFLOW
27	CONNESSIONE CON CONNETTORE
28	RACCORDO PRESE MULTIPLE
29	SUPPORTO VALVOLE
30	FONDO+ PANNELLO POSTERIORE
31	PANNELLO ANTERIORE COMPLETO

N	DESCRIZIONE
1	BOARD SUPPORT
2	SUPPLY CIRCUIT+AUX
3	HOUSING
4	FITTING
5	SOLENOID VALVE
6	VALVE SUPPORT
7	FITTING
8	FITTING
9	VALVE SUPPORT
10	INSIDE BAFFLE
11	FITTING
12	TRANSDUCERS CONNECTOR
13	FITTING
14	FITTING
15	CONNECTOR
16	CONNECTOR
17	CONNECTOR
18	BOTTOM+BACK PANEL
19	REGULATOR
20	PANEL CIRCUIT
21	COMPLETE FRONT PANEL
22	KNOB
23	CONNECTOR
24	GAS LEAD
25	HOUSING
26	PLASMA CUTFLOW UNIT
27	CONNECTOR
28	FITTING
29	VALVE SUPPORT
30	BOTTOM+BACK PANEL
31	COMPLETE FRONT PANEL

art. 472



art. 478



art. 472

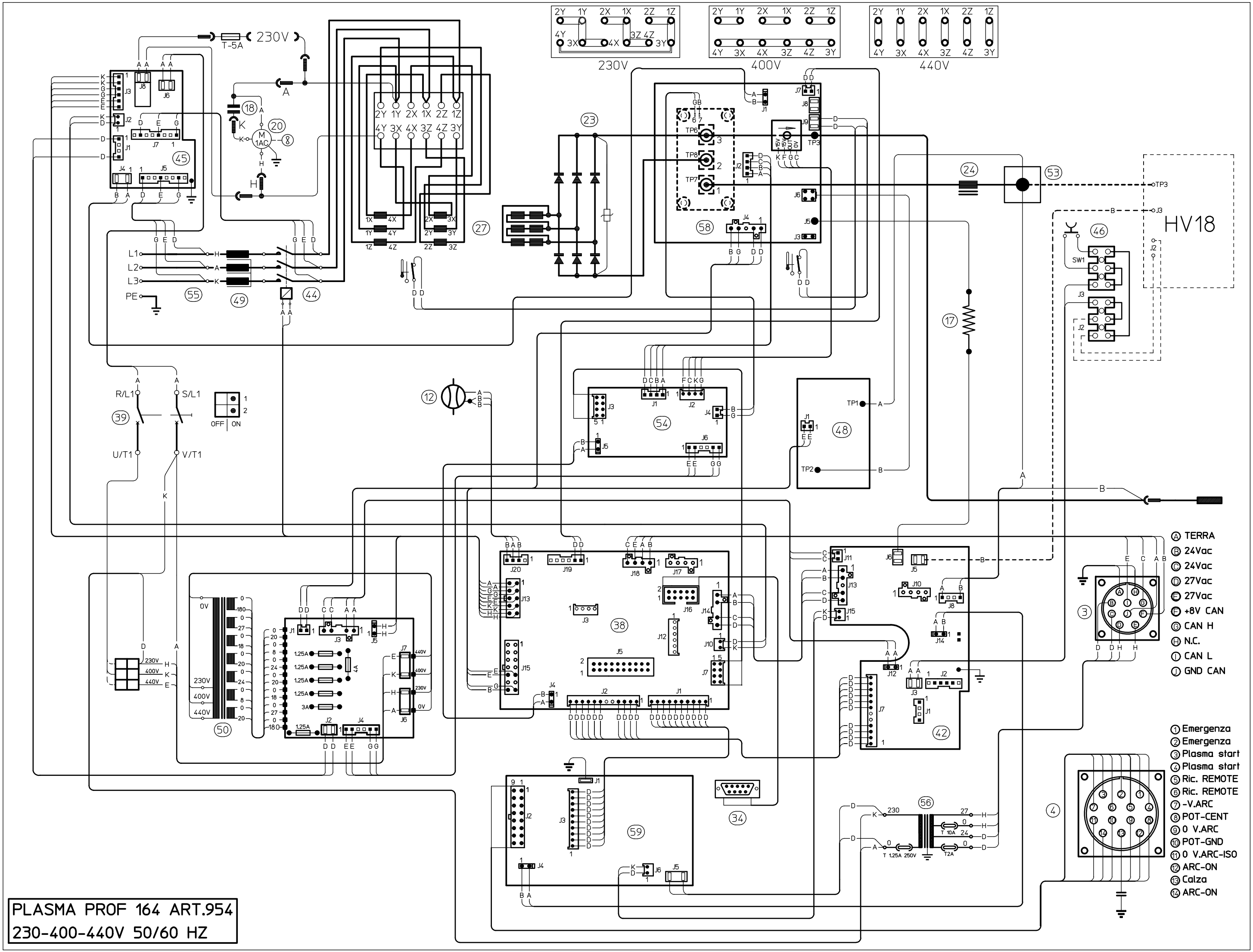
N	DESCRIZIONE
1	FASCIONE
2	CIRCUITO HF
3	PIANO INTERMEDIO
4	ISOLAMENTO
5	CIRCUITO COMANDI
6	SUPPORTO ATTACCO TORCIA
7	TRASFORMATORE HF
8	CIRCUITO COMANDI COMPLETO
9	FONDO + PANNELLO
10	RACCORDO TUBO ACQUA
11	PULSANTE SICUREZZA

N	DESCRIZIONE
1	HOUSING
2	HIGH FREQUENCY CIRCUIT
3	INSIDE BAFFLE
4	INSULATION
5	CIRCUIT BOARD
6	TORCH SUPPORT
7	HIGH FREQUENCY TRANSFORMER
8	CIRCUITO COMANDI COMPLETO
9	BOTTOM+PANEL
10	WATER HOSE FITTING
11	SAFETY SWITCH

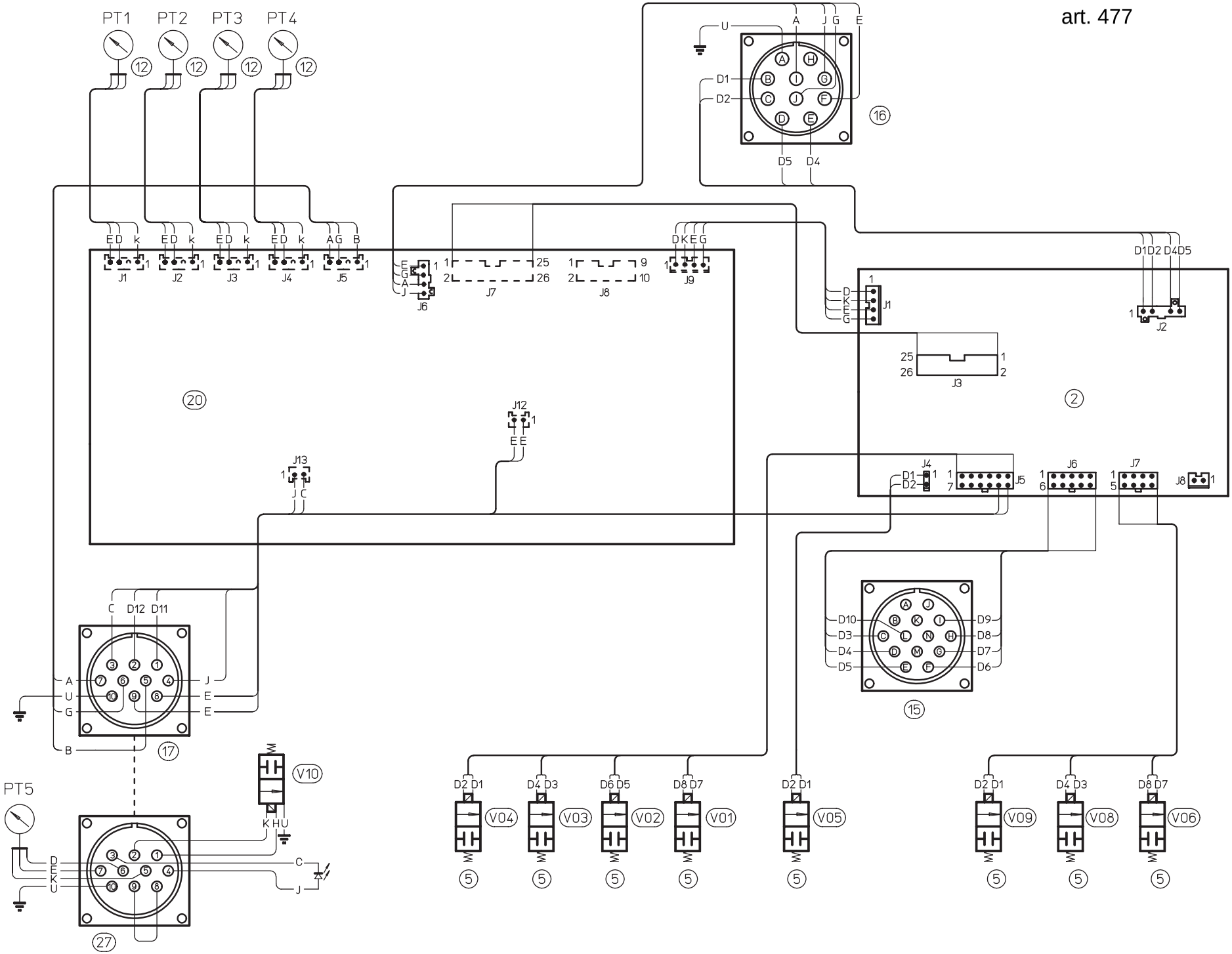
art. 478

N	DESCRIZIONE
1	FASCIONE
2	CONNESSIONE CON CONNETTORE
3	GRUPPO PLASMA PRE-CUT FLOW
4	GRUPPO SECONDARY PRE-CUT FLOW
5	FONDO

N	DESCRIZIONE
1	HOUSING
2	CONNECTOR
3	PRE-CUT FLOW PLASMA UNIT
4	PRE-CUT FLOW SECONDARY UNIT
5	BOTTOM


230V
T-5A
400V
440V
L1
L2
L3
PE
R/L1
S/L1
U/T1
V/T1
OFF ON
HV18
TP1
TP2
TP3
TP6
TP7
TP8
SW1
A TERRA
B 24Vac
C 24Vac
D 27Vac
E 27Vac
F +8V CAN
G CAN H
H N.C.
I CAN L
J GND CAN
1 Emergenza
2 Emergenza
3 Plasma start
4 Plasma start
5 Ric. REMOTE
6 Ric. REMOTE
7 -V.ARC
8 POT-CENT
9 0 V.ARC
10 POT-GND
11 0 V.ARC-ISO
12 ARC-ON
13 Calza
14 ARC-ON
PLASMA PROF 164 ART.954
230-400-440V 50/60 HZ

art. 477


PT1
PT2
PT3
PT4
PT5
12
E D k
A G B
J1
J2
J3
J4
J5
J6
J7
J8
J9
D K E G
20
J12
E E
J13
J C
U A J G E
D1
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16
D5 D4
D1 D2 D4 D5
J1
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D
K
E
G
25
26
J3
2
J4
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J6
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C D12 D11
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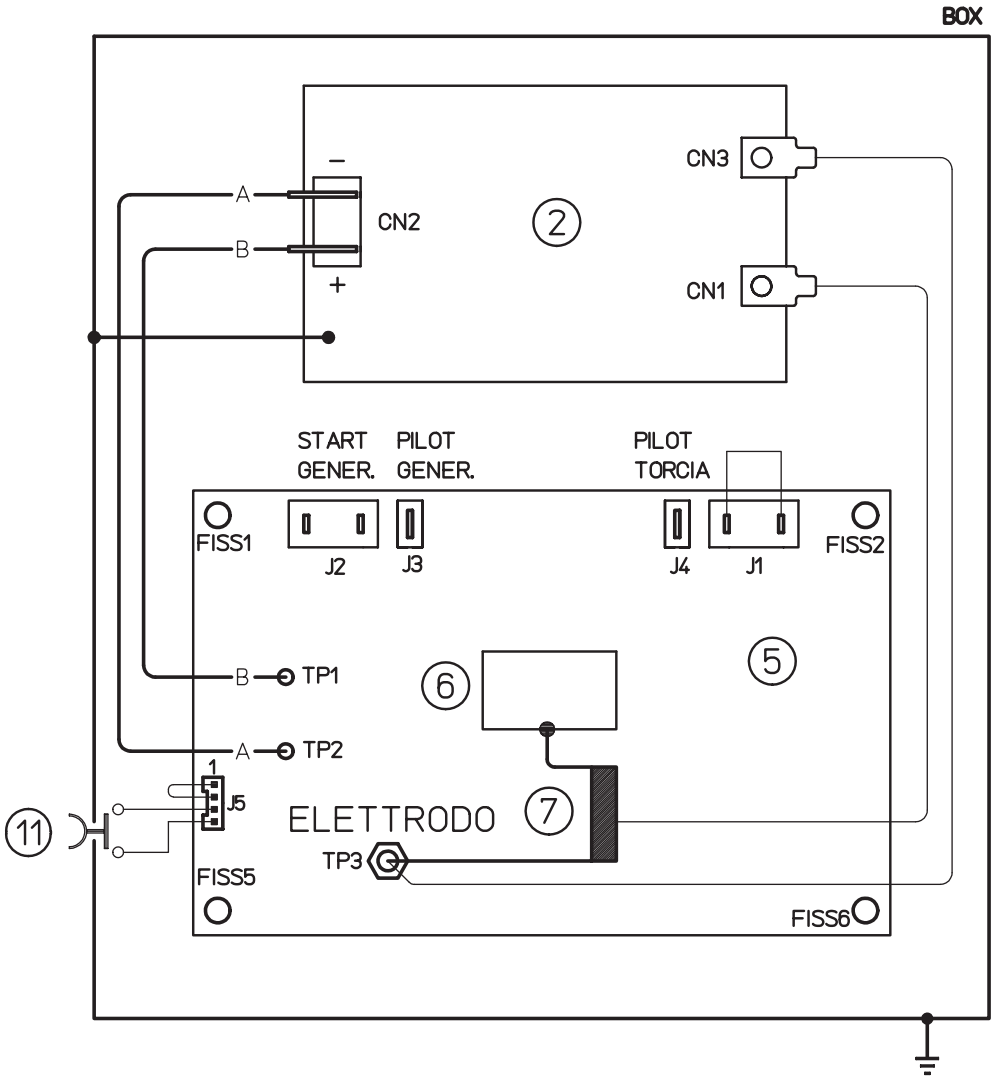
D6
15
D2 D1
D4 D3
D6 D5
D8 D7
V04
V03
V02
V01
V05
V09
V08
V06
5

art. 472


BOX
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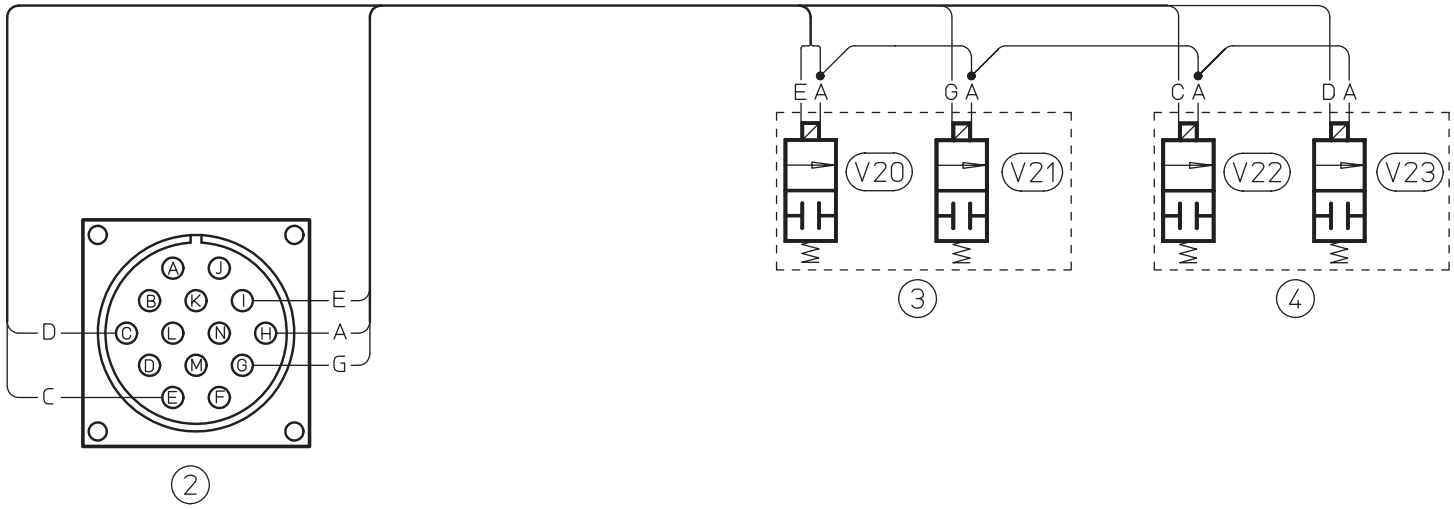
+
A
B
CN2
2
CN3
CN1
START
GENER.
PILOT
GENER.
PILOT
TORCIA
FISS1
J2
J3
J4
J1
FISS2
B
TP1
6
5
A
TP2
1
J5
11
ELETTRODO
7
TP3
FISS5
FISS6

art. 478



Gruppo Raffreddamento

Water Cooling Unit