PLASMA PROF 254 HQC

POWER SOURCE art. 955 +
STARTER UNIT HV19 art. 473 +
GAS CONSOLE PGC-2-3 art. 470 +
SECONDARY VALVE UNIT PVC-3 art. 468 +
PLASMA VALVE UNIT PVC-1 art. 475 +
TORCH CP251G art. 1237

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 254 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.

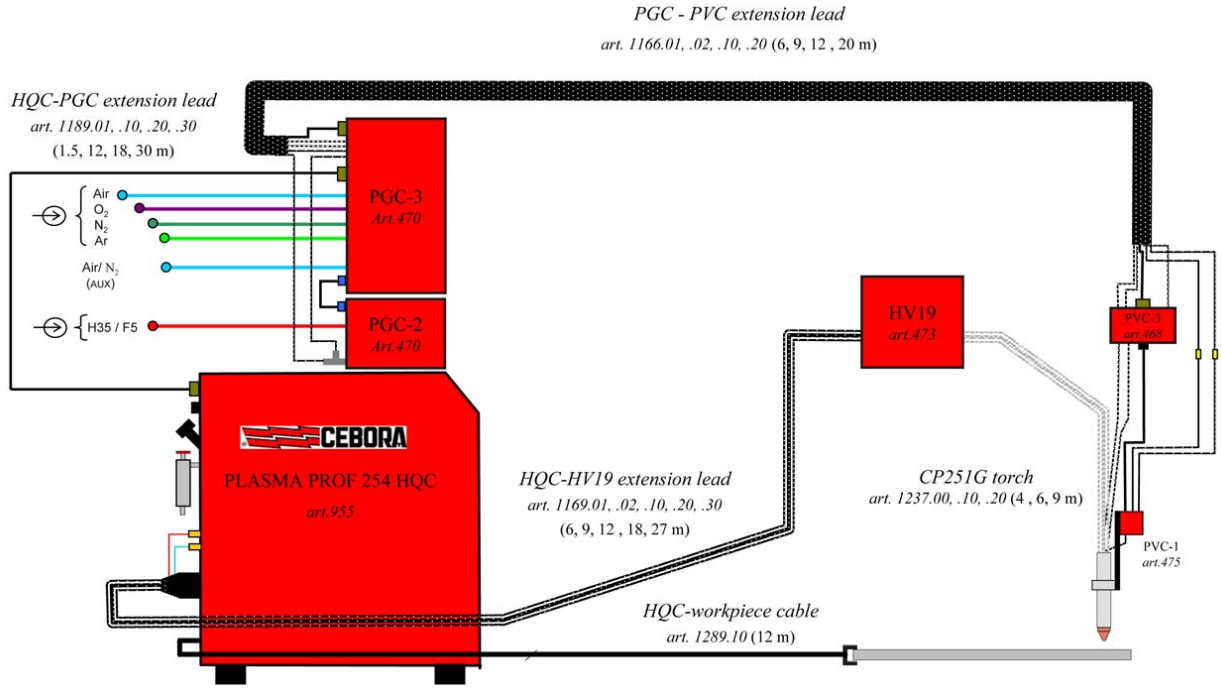
2 - SYSTEM DESCRIPTION

2.1 - Introduction.

The Plasma PROF 254 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. 955), a Starter Unit HV19 (art. 473), a Gas Console PGC-2-3 (art. 470), a Secondary Valve Unit PVC-3 (art. 468), a Plasma Valve Unit PVC-1 (art. 475), the Torch CP251G (art. 1237) 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 254 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 254 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, the drawings and tables in par. 4 and electrical diagrams in par. 5, 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 (62) of the Power Source art. 955;
- INTERFACE microprocessor, in the interface board (37) of the Power Source art. 955;
- PANEL microprocessor, in the panel board (23) of the Gas Console art. 470.

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 (52) (C) on the rear panel of the Power Source for RS232 serial communication), which allows all microprocessors to be programmed in a single session.

This operation allows the three programs to be entered simultaneously into the three 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 versions resident in the INTERFACE and in the PANEL are compatible with its new program. If compatible, the system is ready for operation, with no need for further programming. If not compatible, the MASTER directly programs the INTERFACE and PANEL, 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 signalled 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 displays (P) and (Q) of the Gas Console.

The updated MASTER, INTERFACE and PANEL 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..

In the web site the program "Cebora Device Manager" is available also, with relative instructions, necessary for the system programming.

2.4 - Description of Power Source art. 955.

Art. 955 is a direct current Power Source with controlled current, consisting of two three-phase rectifier bridges and two identical DC/DC igbt converter, parallel working.

The cooling unit for the torch is located at the right side, consisting of the tank, pump, radiator, filter and flowmeter.

Referring to the drawing and table in par. 4, electrical diagram in par. 5, we can identify the main blocks that make up the system.

The switch (31) acts on the service transformer (11), which powers the electronic boards and internal services through the fuse board (11).

The power transformer (22) has the primary circuit consisting of six windings which, appropriately switched by the voltage changer, allow the Power Source to work at 230, 400 or 440 Vac at 50/60 Hz. Near the main voltage changer is also the voltage changers of the service transformer (11) and auxiliary transformer (12).

The voltage, always at 230 Vac, is deliverable from one of the windings of the primary circuit for the "Auxiliary Circuits" of the precharge board (14) (connector 10).

Such services are:

- 2 fans (63) for the power transformer (22);
- 2 fans (46) in the igbt group (4) tunnels;
- 3 fans (46) for the cooling unit;
- the cooling unit pump (48).

These services are powered only when the contactor (72) is closed.

The transformer (22) is powered through the contactor (72), which is driven at closing by the control board (62) (through the RL3 rele on precharge board (14), connector J12), once the DC-capacitors, present on the power boards (4), have been pre-charged and the transformer itself pre-magnetized.

NOTE

In the present manual the two power boards (4) and the two driver boards (4) also are considered separately in the following way:

- power-1 board (4): located towards the external side of the Power Source;
- power-2 board (4): located towards the central side of the Power Source, to the whose power rectifier is connected the precharge-cond board (6).
- driver-1 board (4): installed on the power-1 board (4);
- driver-2 board (4): installed on the power-2 board (4).

The transformer (22) has two three-phase secondary winding (delta connected) that power the two power boards (4).

Each winding is connected to the rectifier bridge which powers the power board (4), which contains:

- the DC-capacitors;
- the igbt power module, with integrated freewheeling diode, connected in "chopper" configuration;
- the Hall-effect current transducers to detect the pilot arc and cutting currents;
- the pilot arc igbt.

The two power boards (4) are parallel connected between them and work so as to supply, in every job condition, each half of the Power Source output current.

The RC board (5), mounted closed the power boards (4), contains the RC network that constitutes an auxiliary energy tank useful to the stabilization of the d.c. voltage at the moment of the pilot arc ignition. The activation of such circuit happens only at the moment of the HF generation, and is ordered by the control board (62).

The TP7 terminals on the power boards (4) are connected to the inductors (23), to level the output current and to facilitate the current division between the two power boards (4). These inductors (23) make head to the terminal (-)(39), related to the electrode potential, ready for connection to the HV19 Unit.

The TP3 terminals on the power boards (4) correspond to the positive outputs of the power circuit and are collected to the (+)(39) terminal, ready for the earth cable connection.

On this connection, inside the power boards (4), are inserted the current transducers, that send, to the control board (62), the power board (4) output current. Always on this connection, but outside of the power boards (4), is placed the Hall-effect current transducer that supplies to the control board (62), the Power Source output current signal.

The J5 terminals on the power boards (4) correspond to the positive output of the power circuit (nozzle potential). These are connected to the nozzle resistor (33), that limits the pilot arc current and facilitates switching from pilot arc to transfer arc. This resistor makes head to the measure board (35) and to the nozzle potential output terminal, ready for connection to the Unit HV19.

The control board (62) constitutes the actual current regulator for the system.

It generates the on power boards (4) igbt drive signal, based on the current feed-back signals from the current transducers of the Power Sources. These signals are also used for switching between pilot arc and transfer arc.

Specifically:

- when the Power Source output current (signal of the transducer (8) on the ground cable) is nul, the control activates operation in pilot arc mode.
- when the Power Source output current (signal of the transducer (8) on the ground cable) is equal to sum of the power boards (4) output currents (signals of the current transducer on the power boards (4)), the control activates operation in transfer arc (cutting) mode.

The connector CN03 (53) 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 PANEL processor on the Gas Console.

The two supply voltages, 24 Vac and 27 Vac, of the Gas Console are generated by the service transformer (11).

The connector CNC (55) 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);
- Power Source start (signal from the system to the Power Source);
- spot mark (signal from the system to the Power Source);
- corner (signal from the system to the Power Source);
- arc voltage (signal from the Power Source to the system);
- arc lit (signal from the Power Source to the system).

The interface board (37) acts as interface between the control board (62) of the Power Source and the system, and connects and affects all of the signals present on the connector CNC (55).

The fuse board (11) contains the fuses for the following circuits:

- power supplies to the electronic boards;
- power supply to the power boards (4) DC-capacitors pre-charge circuit;
- power supply of the contactor (72);
- power supply of the Gas Console.

The precharge-cond board (6), controlled by the control board (62) acts:

- the relief and the adaptation of the signal relative to the three phase of the supply voltage of the power board-2 (4), that is relative to the output of one of the secondary windings of the power transformer. This signal comes used from the card control (62) in order to control if the voltage value is in the allowed operation limits.
- the pre-charge of DC-capacitors on power boards (4); during this phase the voltage reached by the capacitors is checked, and the corresponding signal is sent to the control board (62); the capacitor pre-charge is conditioned by the mains presence relays closing (on precharge-cond (6)) that are driven directly from auxiliary transformer (12).

The auxiliary transformer (12) is fed, through the precharge board (14), by two phases of the mains voltage, picked-up afterward of the contactor (72). Together to the signal supplied from the services transformer (11), that is fed with a phase different from those of auxiliary transformer (12), supplies the signal to the control board (62) in order to concur the monitoring of the mains three phases presence.

The precharge board (14), controlled by the control board (62) acts:

- power transformer (22) pre-magnetization, through the PTC groups and RL1 rele, located on the precharge board (14);
- power supply of the cooling unit pump (48) through the RL2 rele;
- power supply of the contactor (72), through the RL3 rele.

The power supply board (7) generates the supply voltages for the control board (62), with control on the state of the origin voltage. In this way, in case of abrupt lowering of the supply voltage, it is performed “the intelligent” stop of the Power Source, before that comes to lack the necessary energy for the corrected operation (Power Off function).

The control board (62) contains the main microprocessor of the Power Source (MASTER).

It supervises:

- management of the other boards, more specialized in their respective functions;
- controls the contactor (72);

- processes the driving signal to be sent to the power boards (4);
- communicates with the microprocessor of the interface board (37) on Power Source to manage information exchange with the plants
- communicates with the microprocessor of the panel board (23) on the Gas Console to manage the solenoid valves of the gas circuits;
- it manages the interface with the operator, than in this system is constituted by the front panel of the Gas Console. More precisely, this panel is managed from the panel board (23) on the Gas Console, on the base of the information arranged from the control board (62) via CAN bus line, and allows the formulation of all the operating parameters;
- it manages the diagnostic of the cutting system, conditioning or blocking, depending of the cases, the operation of the system, with the indication of the error codes on the panel of the Gas Console.

Located on the Power Source rear panel is the connector of the RS232 communication port for connecting to a Personal Computer, through which it is possible to update the Power Source Firmware.

The power boards (4) receive the temperature signals from the thermostats located on the power board (4) igbt heat sink.

These signals, together with the signal of the thermostat on the winding of power transformer (22) winding, arrive to the control board (62), which commands the block of the Power Source for overtemperature with indication, on the control panel, of the corresponding error code.

The measure board (35) acts as an interface toward 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 HV19 and Power Source.

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 HV19, art. 473.

The Starter Unit HV19, art. 473, is a high-voltage and high-frequency Power Source for arc striking in the torch CP251G.

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. 1169.xx, included to connect the Power Source and HV19 Unit and supplied together with the cutting system, it is possible to position the Power Source away from the pantograph or robot (up to max. 27 m).

Referring to the drawing and table in par. 4, electrical diagram in par. 5, one may see the main elements that make up the Unit HV19.

It is essentially made up of the HF board (8), the HF transformer (9) and the HF-2 filter board (13).

These devices are wired so as to offer the connections points for the cable of the Torch and the extension cable from the Power Source.

The HF board (8), combined with the HF transformer (9), 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 (31) downstream from the chokes (23) (electrode potential). With a voltage greater than 200 Vdc, the circuit generates high-voltage and high-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 280 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 (62) has not received from the current transducer (8) the signal to switch to transfer arc, the pilot arc is interrupted until the next start command.

The Unit HV19 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 PGC-3-2, art. 470.

The PGC-3-2 Gas Console is a control station to select the process parameters and select the gas types and flow.

It is divided into two units:

- PGC-3 powered by air, nitrogen N2 and oxygen O2 gases;
- PGC-2 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 PGC-3 is equipped with an operator panel, 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. 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 PGC-2 is essentially the replica of one of the 4 pneumatic circuits of the PGC-3, 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.

Four boards are included to manage the PGC-3-2 Gas Console:

- the solenoid valve board (3) 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 (23).
- the panel board (23) 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 PANEL with which it communicates via CAN bus serial line with the Power Source control board (62).
- the power supply-aux board (2) realizes the supply for fan (11) of the Gas Console and contains the command circuit for the proportional valve present on the Valve Console PVC-3. This valve regulates the flow of the “auxiliary” gas based on the duty cylcle of the command signal generated from the panel board (23) on the Gas Console.
- The connector board (13) represents the output of the commands of the solenoid valve presents on units PVC-3 and PVC-1, placed in proximity of the torch.

2.7 - Description of PVC-3 Valve Console art. 468.

The PVC-3 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 3 solenoid valves connected as shown in the diagram in fig. 6.1.:

- a circuit, called “auxiliary”, for the auxiliary cleaning gas during the breaking and the torch “shield” cooling.
- a circuit, called “secondary”, for the torch nozzle cleaning.

The two solenoid valve of the “secondary” circuit, opportunely driven from the solenoid valve board (3) of the Gas Console, convey towards the torch the gas used for the torch protection from the sprays and the safeguard of the torch nozzle and concur the management of the “secondary” gas in the Preflow and Cutflow phases.

2.8 - Description of PVC-1 Valve Console art. 475.

The PVC-1 Valve Console is a control station to manage the gas exchange to use in the pilot arc and cutting phases. Inside are 2 pneumatic circuits with 3 solenoid valves connected as shown in the diagram in fig. 6.1.:

The solenoid valve, opportunely driven from the solenoid valve board (3) of the Gas Console, convey towards the torch the plasma gas used for the arc guide through the nozzle and concur the management of the plasma gas in the Preflow and Cutflow phases.

2.9 - Description of Torch CP251G, art. 1237.

The torch CP251G is a multigas liquid-cooled torch for use on pantographs.

Inside are a coolant circuit, a pneumatic circuit for the plasma gas, a secondary pneumatic circuit for the cooling and outer nozzle protection gas and an auxiliary pneumatic circuit for the nozzle cleaning gas, during breaking.

It is suitable for use with plasma gases such as air, argon Ar, 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 HV19, with built-in coolant lines.

The lines of the plasma gas and secondary circuits leave the body torch separately, and are deliberately shorter (approximately 1 m long) to require the PVC-3 and PVC-1 Valve Consoles 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.

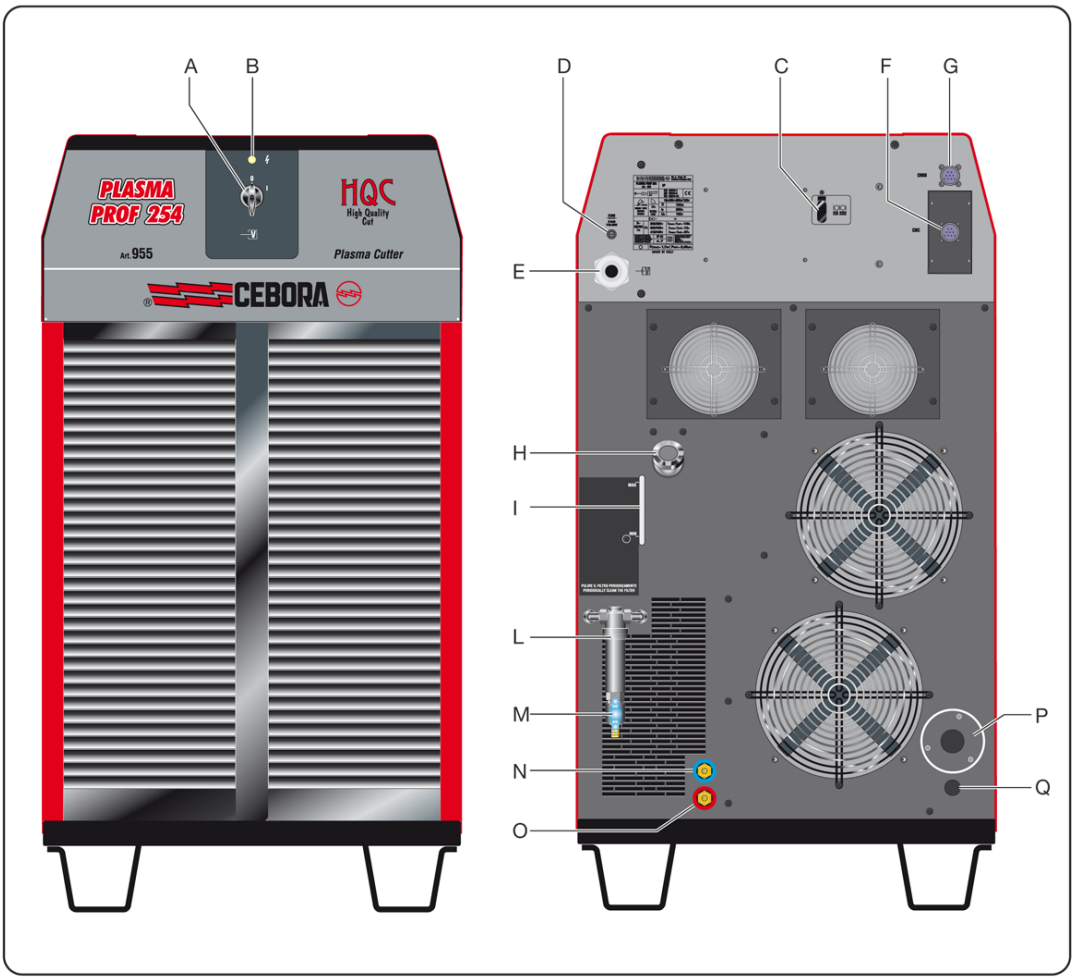
Check the condition of the internal power connections and connectors on the electronic boards; if you find “loose” connections, tighten or replace the connectors.

3.2 - Operating sequence.

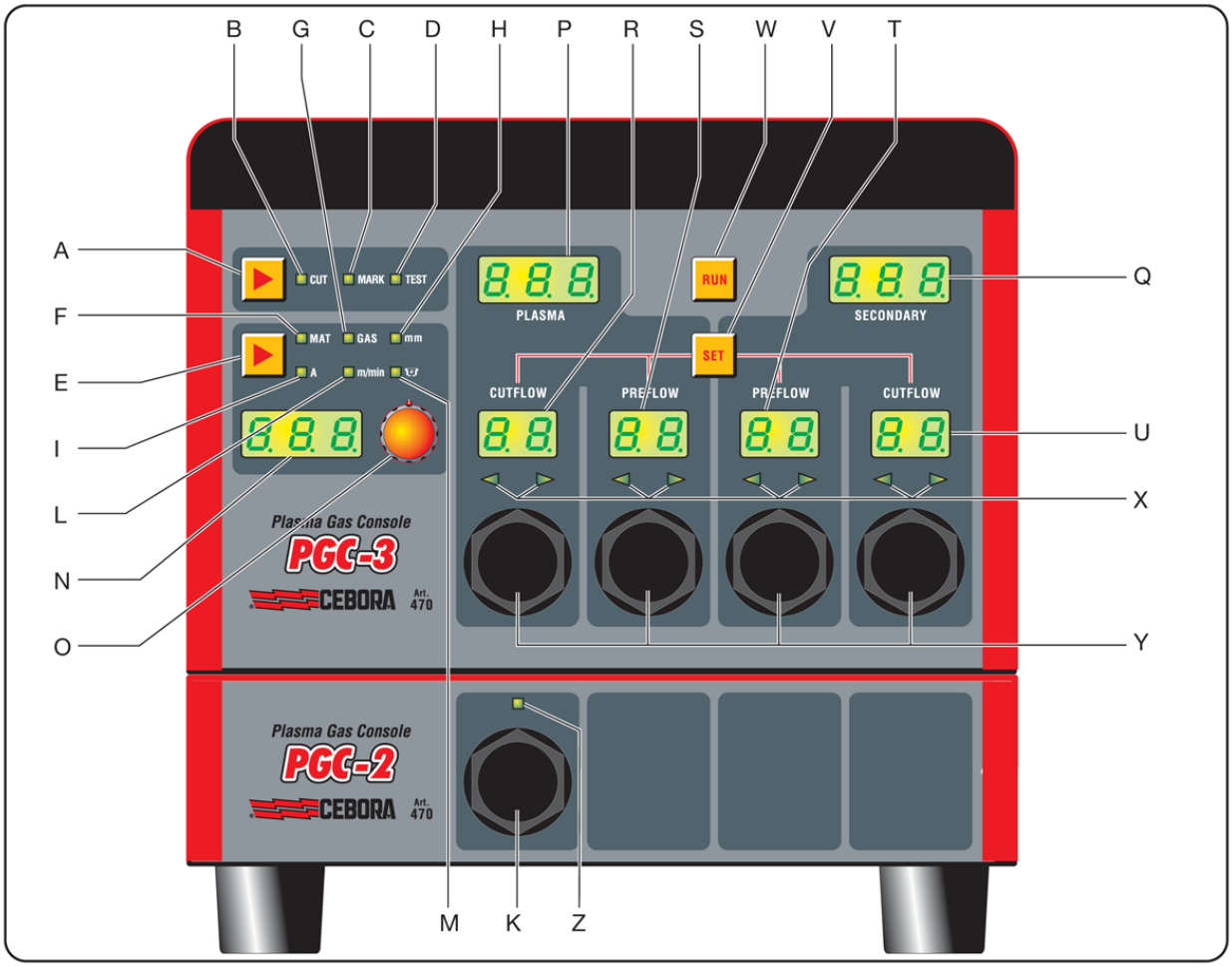
The following sequence reflects correct equipment operation. It may be used as a guiding procedure for troubleshooting.

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

3.2.1 - Power source commands and signalling.



3.2.2 - Gas Console commands and signalling.



3.2.3 - Power source operation.

WARNING

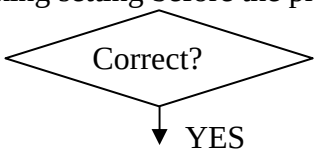
DURING THE FOLLOWING TESTS, DO NOT POINT THE TORCH AT PEOPLE OR PARTS OF THE BODY, BUT ALWAYS TOWARDS AN OPEN SPACE OR THE WORKPIECE.

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 HV19 Unit. For more details on the connections, follow the instructions provided in the Instruction Manual of the Plasma PROF 254 HQC.
- ❑ Connect the Unit HV19 to the Power Source using the supplied extension art. 1169. 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.

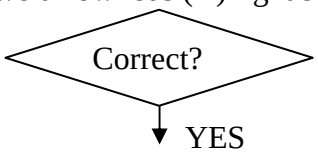
- ♦ System powered, lamp (B) on the Power Source lit. On Gas Console control panel two decimal point on displays (N) and (Q) flash rapidly.
- ♦ After one second, the Gas Console display (N) reads “HQC”, display (P) shows “PAN” and display (Q) shows “RDY”. At the same time on Power Source contactor (72) closes and fans (63) and (46) start working.
- ♦ After one second, the Gas Console display (P) shows the article code “955” and display (Q) the software version installed, e.g.,: “04”. At the same time Pump (48) of the Cooling Unit starts running.
- ♦ Afterwards 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.



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 (W) 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 (E) on the Gas Console several times to select the measure to adjust.
- ❑ Use knob (O) to assign the desired value to the measure selected by key (E).
- ❑ Press the key (V) 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 (V), 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 (B)(C)(D) light in sequence, to indicate the type of work to be performed.
  - ♦ Each time the key (E) is pressed, the leds (F)(G)(H)(I)(L) and (M) light in sequence and based on the type of work selected via the key (A), to indicate the measurement to be changed.
  - ♦ Display (N) shows the value assigned to the measure selected via the key (E), adjustable using the knob (O).
  - ♦ Each time the key (V) is pressed, the displays (R)(S)(T)(U) 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 (Y). When the pressure reaches the value deemed correct for the type of job selected, the two arrow leds (X) light simultaneously.



- ❑ Use the key (A) to select the TEST function, led (D) lit, to set the “gas circuit seal test”.
- ❑ Use the knob (O) to set the “ALL” function visible on display (N), to set the test for all gas circuits.
- ❑ Press the key (W) to activate the Test.

- ♦ Display (P) reads “RUN” and display (Q) indicates the type of gas in the circuit being tested.
- ♦ The gas circuit “emptying” and “filling” procedure begins.
- ♦ Display (N) 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 (P) and “LO” on display (Q)); if positive, display (N) 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 (P) = “OK” and (Q) = “GAS”.

Correct? NO (see 3.3.3, 3.3.5).

▼ YES

- ❑ Press the key (A) to select the CUT function. Led (B) lit.
- ❑ Press the key (W) 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 (S) and (T) remains constant.

Correct? NO (see 3.3.4, 3.3.5).

▼ YES

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

Correct? NO (see 3.3.6, 3.3.7, 3.3.8, 3.3.9).

▼ YES

- ❑ 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 key (E) and knob (O) on the Power Source to reach the current level suited to the cutting to be done.

Correct? NO (see 3.3.10).

▼ YES

- ❑ 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.

Correct? NO (see 3.3.5).

▼ YES

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

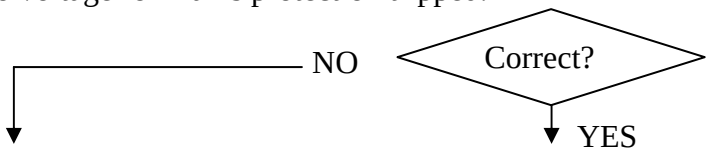
Items in **boldface** describe problems that may occur on the machine (symptoms).

- ❑ 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 panel on Gas Console off.

MAINS SUITABILITY TEST.

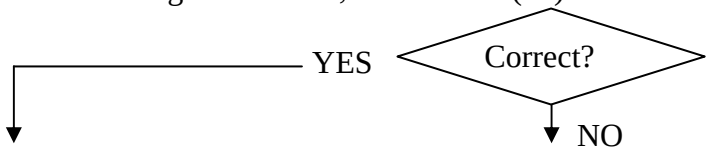
- ❑ No voltage for mains protection tripped.



- ♦ Correctly position the voltage changes.
- ♦ Remove any short-circuits on the transformer connections (22).
- ♦ Make sure that the rectifier bridges on power boards (4) are not short-circuited.
- ♦ Check the wiring between J6 and J7 of pre-charge board (14) (correspond to the "mains filter" sections of the pre-charge board (14)) and mains input terminals.
- ♦ Check the wiring between J3 of pre-charge board (14) and the terminals of the contactor (72) (voltage input side).
- ♦ Make sure the terminal J1 and J5 on pre-charge board (14) voltage = 400 Vac (or however equal to the mains voltage). If not corrected perform the SERVICES TRANSFORMER (11) POWER SUPPLY TEST and AUXILIARY TRANSFORMER (12) POWER SUPPLY TEST described of continuation in this paragraph.
- ♦ Make sure that the contactor (72) does not have its contacts stuck, or that it is not ordered to close before the DC-capacitors, on the power boards (4), have been pre-charged, and the transformer (22) pre-magnetized. If necessary, perform the checks listed in case of failure of the CAPACITOR PRE-CHARGE AND TRANSFORMER (22) PRE-MAGNETIZATION TEST, in par. 3.3.2.
- ♦ Mains not suitable to power the Power Source (ex.: insufficient installed power).

MAINS CONNECTION TEST.

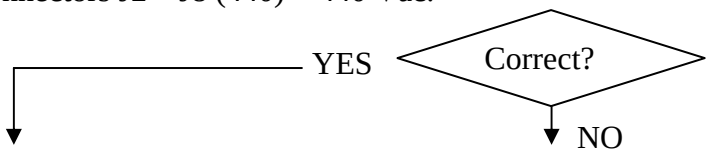
- Mains input terminal board (17), terminals U1, V1, W1 = 3 x 230/400/440 Vac according to the mains voltage conditions, with switch (31) closed.



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

SERVICE TRANSFORMER (11) POWER SUPPLY TEST.

- Fuse board (11), connectors J2 – J4 (230V) = 230 Vac; connectors J2 – J6 (400V) = 400 Vac; connectors J2 – J8 (440) = 440 Vac.



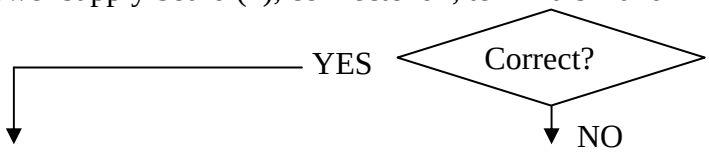
WARNING

SOME CIRCUITS OF THE PRE-CHARGE BOARD (14) ARE UNDER VOLTAGE ALSO WITH SWITCH (31) OFF. DISCONNECT THE POWER SOURCE FROM THE WALL SOCKET IN ORDER TO OPERATE IN ABSENCE OF DANGEROUS VOLTAGES.

- ♦ Check the wiring between mains input terminal board (17) mains filter three phase inductor (71), connector (72) terminals (voltage input side) and connector J3 pre-charge board (14).
- ♦ Check the wiring between J5 pre-charge board (14), switch (31), services transformer (11) voltage changer and connectors J2, J4, J6 and J8 of fuse board (11).
- ♦ Make sure the services transformer (11) voltage changer, located on the voltage change terminal board of the transformer (22), is correctly positioned.
- ♦ Check fuse F1 on pre-charge board (14); replace if broken, and make sure there is no short-circuit in the service transformer (11) or corresponding wiring.
- ♦ Make sure the primary service transformer (11) winding is not interrupted.
- ♦ Check switch (31); replace if defective.
- ♦ Replace pre-charge board (14).

POWER SUPPLY BOARD (7) POWER SUPPLY TEST.

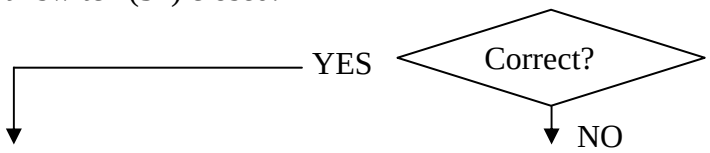
- Power supply board (7), connector J2, terminals 1 and 2 = 18 Vac, with switch (31) closed.



- ♦ Check the wiring between J2 power supply board (7) and terminals 1 – 4 of J7 fuse board (11).
- ♦ Check fuses F5 on fuse board (11); if broken, replace and make sure that terminals 1 - 2 of J2 on power supply board (7) are not short-circuited.
- ♦ Check 18 Vac voltage on terminals 0V and 18V (close to F5) of fuse board (11); if missing, check the wiring between the service transformer and fuse board (11), and if necessary replace the service transformer (11).

CONTROL BOARD (62) POWER SUPPLY TEST.

- Control board (62), connector J7, terminals 7 - 14 = 27 Vac;
- Control board (62), connector J2, terminals 1(+) and 2(-) = +15 Vdc;
- Control board (62), connector J2, terminals 3(+) and 2(-) = -15 Vdc,
- Control board (62), connector J2, terminals 4(+) and 2(-) = -15 Vdc;
- Control board (62), connector J2, terminals 5(+) and 6(-) = +8 Vdc, with switch (31) closed.

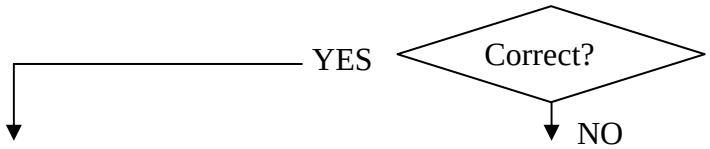


- ♦ Check the wiring between J7 control board (62) and J9 fuse board (11).
- ♦ Check fuse F10 on fuse board (11); if broken, replace and make sure that terminals 7 - 14 of J7 on control board (62) are not short-circuited.
- ♦ Make sure there is 27 Vac voltage on terminals 0V - 27V of fuse board (11); if missing, check the wiring between the service transformer and fuse board (11), and if necessary replace the service transformer (11).
- ♦ Check the wiring between J1 power supply board (7) and J2 control board (62).
- ♦ With Power Source off, temporarily disconnect J2 on control board (62) and check on J1 of power supply board (7):
  - terminals 1(+) and 2(-) = +15 Vdc;
  - terminals 3(+) and 2(-) = -15 Vdc;
  - terminals 4(+) and 2(-) = -15 Vdc;
  - terminals 5(+) and 6(-) = +8 Vdc.

  If correct, replace control board (62).
  If incorrect replace the power supply board (7), also making sure that terminals 1-2, 3-2, 4-2 and 5-6 of J2 on control board (62) are not short-circuited. If necessary, also replace the control board (62).

AUXILIARY TRANSFORMER (12) POWER SUPPLY TEST.

- Primary circuit terminal board of the auxiliary transformer (12), terminals 0 and 230 = 230 Vac, terminals 0 and 400 = 400 Vac, terminals 0 and 440 = 440 Vac also with switch (31) open.



WARNING

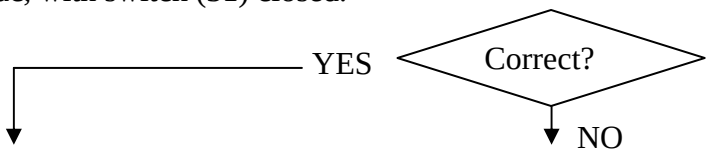
SOME CIRCUITS OF THE PRE-CHARGE BOARD (14) ARE UNDER VOLTAGE ALSO WITH SWITCH (31) OFF. DISCONNECT THE POWER SOURCE FROM THE WALL SOCKET IN ORDER TO OPERATE IN ABSENCE OF DANGEROUS VOLTAGES.

- ♦ Check the wiring between J1 pre-charge board (14), auxiliary transformer (12) voltage changer and auxiliary transformer (12) terminal board.
- ♦ Make sure the auxiliary transformer (12) voltage changer, located on the voltage change terminal board of the transformer (22), is correctly positioned.
- ♦ Check fuse F4 on pre-charge board (14) and on the terminal board of the auxiliary transformer (12). Replace if broken, and make sure there is no short-circuit in the auxiliary transformer (12) or corresponding wiring.
- ♦ Replace pre-charge board (14) and/or auxiliary transformer (12).

- Make sure the primary winding of auxiliary transformer (12) is not interrupted. Correct value of its resistance = 380 ohm, approximately, on the 400 Vac socket. If not corrected to replace auxiliary transformer (12).

GAS CONSOLE POWER SUPPLY TEST.

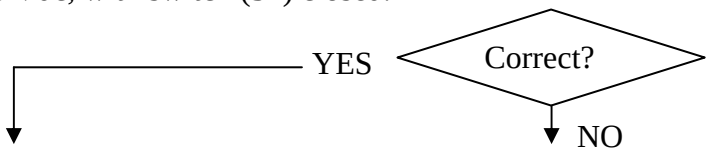
- Solenoid valve board (3), connector J2, terminals 1 and 2 = 24 Vac; terminals 4 and 5 = 27 Vac, with switch (31) closed.



  - Check the wiring between J2 of solenoid valve board (3), connector CN04 (12) on Gas Console, connector CN03 (53) on Power Source and connector J10 fuse board (11).
  - Check fuses F11 and F12 on fuse board (11); if interrupted, replace them being controlled preventively the resistance on terminals 1 - 2 and 4 - 5 of J2 on solenoid valve board (3). Correct values: >Mohm in both senses of measure; If not corrected replace solenoid valve board (3). Moreover verify the winding resistance of every solenoid valve on the Gas Consul. Correct value = 12 ohm approximately, for every solenoid valve. If not corrected replace the defective solenoid valve, verifying that the relative driving circuit on solenoid valve board (3) has not been damaged. In the event replace also solenoid valve (3).
  - Check 24 Vac and 27 Vac voltages on terminals 0V and 24V, 0V and 27V (close to F9 and F10) of fuse board (11); if missing, check the wiring between the service transformer and fuse board (11), and if necessary replace the service transformer (11).

PANEL BOARD (23) POWER SUPPLY TEST.

- Panel board (23), connector J9, terminals 1(+) and 3(-) = +18 Vdc; terminals 4(+) and 3(-) = +8 Vdc, with switch (31) closed.



  - Check the wiring between J9 panel board (23) and J1 solenoid valve board (3).
  - With Power Source off, temporarily disconnect J9 on panel board (23) and check on the path connector extracted from J9 of panel board (23), terminals 1(+) and 3(-) voltage = +18 Vdc and terminals 4(+) and 3(-) = +8 Vdc. If correct, replace the panel board (23). If incorrect, replace solenoid valve board (3), making sure that terminals 1 - 3 and 4 - 3 of J9 on panel board (23) have not been short-circuited. If necessary, also replace the panel board (23).

- Replace the control (62) and/or panel (23) boards.

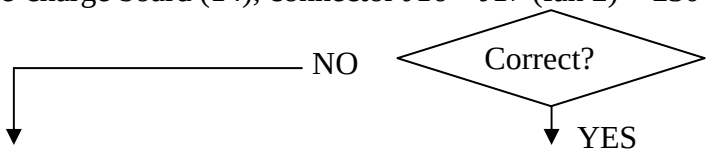
3.3.2 - Power source powered, operator panels on Gas Console on, fans (63) and (49) stopped.

WARNING

SOME CIRCUITS OF THE PRE-CHARGE BOARD (14) ARE UNDER VOLTAGE ALSO WITH SWITCH (31) OFF. DISCONNECT THE POWER SOURCE FROM THE WALL SOCKET IN ORDER TO OPERATE IN ABSENCE OF DANGEROUS VOLTAGES.

FAN (63) TEST.

- Pre-charge board (14), connector J13 – J14 (fan 1) = 230 Vac, after closing the contactor (72).
- Pre-charge board (14), connector J16 – J17 (fan 2) = 230 Vac, after closing the contactor (72).

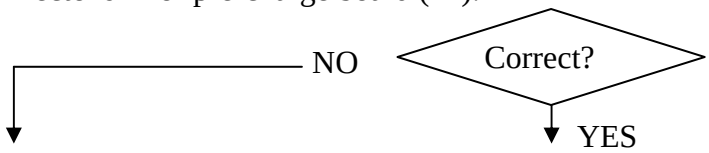


- ♦ Check the wiring between fans (63), starting capacitors and connectors J13, J14, J16 and J17 on pre-charge board (14).
- ♦ Make sure on terminal J13 and J15, voltage = 230 Vac; and between terminals J16 and J18, voltage = 230 Vac, after closing the contactor (72). If not correct replace pre-charge board (14).
- ♦ Replace starting capacitors.
- ♦ Make sure the windings of fans (63) are not interrupted. Correct value of their resistance = from 80 to 150 ohm, approximately depending of the measured winding. If not corrected replace fans (63).
- ♦ Replace the fans (63).

FAN (46) TEST.

- Pre-charge board (14), connector J11:
  - Terminals 1 – 7 (power-1 board (4) fan) = 230 Vac;
  - Terminals 2 – 8 (power-2 board (4) fan) = 230 Vac;
  - Terminals 3 – 9 (cooling unit fan-1) = 230 Vac;
  - Terminals 4 – 10 (cooling unit fan-2) = 230 Vac;
  - Terminals 5 – 11 (cooling unit fan-3) = 230 Vac;

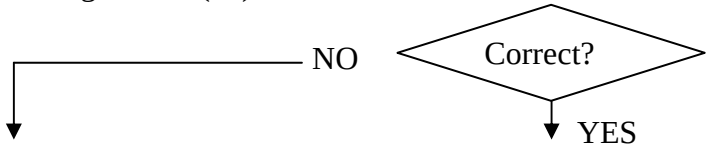
  after closing of contactor (72) (all these fans are parallel connected between them on connector J11 of pre-charge board (14).



- ♦ Check wiring between fans (46) and J11 of pre-charge board (14).
- ♦ Make sure the windings of fans (46) are not interrupted. Correct value of their resistance = 800 ohm, approximately. If not corrected replace fans (46).
- ♦ Replace the fans (46).

PRE-CHARGE BOARD (14) POWER SUPPLY TEST.

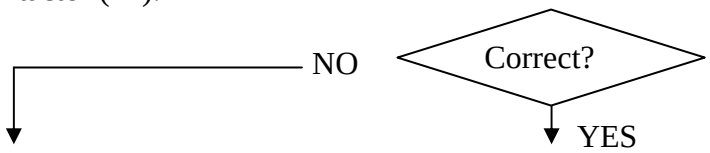
- Pre-charge board (14), connector J10 terminals 1 - 2 = 230 Vac, after closing contactor (72).



- ♦ Replace pre-charge board (14).

CAPACITOR PRE-CHARGE AND TRANSFORMER (22) PRE-MAGNETIZATION TEST.

- ❑ Power boards (4), connectors J1, terminals 1(+) and 2(-), voltage = >200 Vdc, after closing contactor (72).



- ♦ Check for the presence of the three power supply phases on the transformer (22) primary circuit.
- ♦ Make sure the transformer (22) voltage changer is correctly positioned.
- ♦ Check the wiring between J10 of pre-charge board (14) and terminal board of transformer (22) voltage changer.

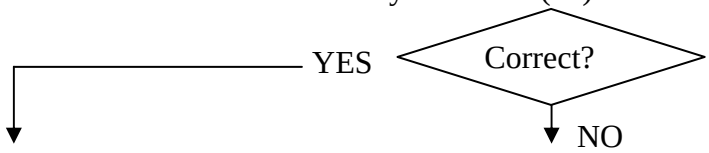
- ♦ Check the wiring between J1 power boards (4) and J3 precharge-cond board (6) (DC POWER SUPPLY LINE).
- ♦ Shut off the Power Source, wait for the capacitors to discharge (1 minute), temporarily disconnect connector J3 from precharge-cond board (6) and check the resistance between terminals 1 and 2 of J1 of both power boards (4). Correct value = diode junction in one direction and >Mohm with the instrument probes reversed. If >Mohm in both directions, replace the power board (4) defective. If 0 ohm (short-circuit), replace the power board (4) defective and precharge-cond board (6).
- ♦ Check the wiring between J1 precharge-cond board (6) and J1 of fuse board (11) (AC POWER SUPPLY LINE).
- ♦ Check on J1 of precharge-cond board (6), terminals 1 and 2 voltage = 180 Vac, and terminals 3 and 4 voltage 180 Vac, after closing switch (31) (CAPACITOR PRECHARGE SUPPLY LINE). If not corrected check the fuses F1 and F2 on fuse board (11). If interrupted replace them preventively controlling, with Power Source off and J1 disconnected from precharge-cond board (6), the resistance between terminals 1-2 and terminals 3-4 of J1 on precharge-cond board (6). Correct value = >Mohm in both senses. If 0 ohm (short circuit) to replace precharge-cond board (6).
- ♦ Check voltage 180 Vac on terminals 0V and 180V and terminals 0V and 180V (close to F1 and F2) of fuse board (11); if missing, check the wiring between the service transformer and fuse board (11), and if necessary replace the service transformer (11).
- ♦ Check the wiring between J2 – J4 of fuse board (11), J12 of pre-charge board (14) and contactor (72) coil (CONTACTOR SUPPLY LINE).
- ♦ On the coil terminals of the contactor (72), make sure voltage = 230 Vac with switch (31) closed. If incorrect, with Power Source off, temporarily disconnect connector J12 from pre-charge board (14) and check resistance between the terminals of the contactor (72) coil. Correct value = >Mohm in both measure sense. If 0 ohm (short-circuit), replace contactor (72) and pre-charge board (14). If correct, check voltage = 230 Vac on J2 and J4 of fuse board (11), and if necessary perform the SERVICE TRANSFORMER (11) POWER SUPPLY TEST. in par. 3.3.1.
- ♦ Check the wiring between J2 pre-charge board (14) and contactor (72) contact terminals (voltage output side) CONTACTOR COMMAND LINE).
- ♦ Check on J4 of pre-charge board (14) terminals 5 and 6 voltage = approximately 27 Vac, after closing contactor (72). If incorrect, with Power Source off, temporarily disconnect connector J4 from pre-charge board (14) and check the resistance between terminals 5 and 6 of J4 of pre-charge board (14). Correct value = approximately 75 ohm. If >Mohm replace pre-charge board (14). If 0 ohm (short-circuit), replace pre-charge board (14) and control board (62).

- Check the wiring between J4 pre-charge board (14) and J7 control board (62) (PRE-MAGNETIZATION RELE COMMAND LINE).
- Check on J4 of pre-charge board (14) terminals 1 and 2 voltage = approximately 27 Vac, after closing switch (31), for 1 sec. lasting time (PRE-MAGNETIZATION ACTIVE SIGNAL) During this period contactor (72) closes. If incorrect, with Power Source off, temporarily disconnect J4 from pre-charge board (14) and check the resistance between terminals 1 and 2 of J4 on pre-charge board (14). Correct value = approximately 60 ohm. If >Mohm replace pre-charge board (14). If 0 ohm (short-circuit), replace pre-charge board (14) and control board (62).
- Check the wiring between J5 precharge-cond board (6) and J7 control board (62) (CAPACITOR PRE-CHARGE RELE COMMAND LINE).
- Check on J5 of precharge-cond board (6) terminals 3-4 and terminals 5-6 voltage = approximately 27 Vac, after closing switch (31), for 2 sec. lasting time (CAPACITOR PRE-CHARGE ACTIVE SIGNAL). During this period contactor (72) closes. If incorrect, with Power Source off, temporarily disconnect J5 from precharge-cond board (6) and check the resistance between terminals 3-4 and terminals 5-6 of J5 on precharge-cond board (6). Correct value = approximately 320 ohm. If >Mohm replace precharge-cond board (6). If 0 ohm (short-circuit), replace precharge-cond board (6) and control board (62).
- Check the wiring between J5 precharge-cond board (6) and auxiliary transformer (12) (PHASE MISSING ENABLE LINE).
- Check on J5 of precharge-cond board (6), terminals 1-2 voltage = approximately 24 Vac, always present, also with switch (31) opened. If incorrect, with Power Source off, temporarily disconnect J5 from precharge-cond board (6) and check the resistance between terminals 1-2 of J5 on precharge-cond board (6). Correct value = approximately 180 ohm. If >Mohm replace precharge-cond board (6). If 0 ohm (short-circuit), replace precharge-cond board (6) and perform the AUXILIARY TRANSFORMER (12) POWER SUPPLY TEST of par. 3.3.1.
- Replace contactor (72) and/or pre-charge (14) and/or precharge-cond (6) and/or control (62) boards.

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

CAN-BUS COMMUNICATION TEST.

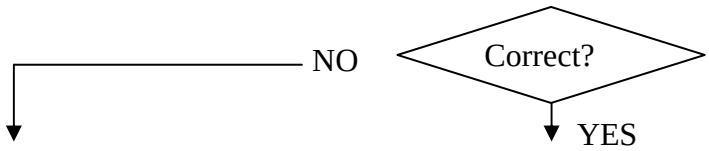
- Upon start-up on Gas Console operator panel two display decimal points flash rapidly. After one second, Gas Console display (N) reads “HQC”, display (P) reads “PAN” and display (Q) indicates “RDY”. Simultaneously contactor (72) closes.



  - ♦ Check the wiring between J5 control board (62), connector CN03 (53) on Power Source, connector CN04 (12) on Gas Console and J6 on panel board (23).
  - ♦ Check the supply voltages of the control (62) and panel (23) boards, performing if necessary the CONTROL BOARD (62) POWER SUPPLY TEST, GAS CONSOLE POWER SUPPLY TEST and PANEL BOARD (23) POWER SUPPLY TEST in par. 3.3.1.
  - ♦ Check on J6 of panel board (23), terminals 1(+) and 2(-) voltage = +8 Vdc (CAN bus line power supply). If incorrect, with Power Source off disconnect J5 from control board (62). Power up again and make sure, with J5 disconnected, voltage = +8 Vdc on J6 of panel board (23), terminals 1(+) and 2(-). If correct, replace control board (62). If incorrect, replace panel board (23).
  - ♦ Make sure that the correct programs are entered in the control (62) and panel (23) boards, performing if necessary the programming procedure available on the Cebora Web site (see par. 2.3).
  - ♦ Replace the control (62) and/or panel (23) boards.

ERROR CODE TEST.

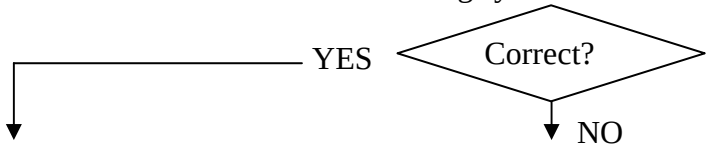
- When turned on, after the start-up phase, displays (P) and (Q) on the Gas Console indicate an alarm condition.



  - ♦ 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 Gas Console operator panel, allow all of the steps involved in selecting the “Job” and “Mode” as described in par. 3.2, and in the “Instruction Manual for Plasma cutting system” cod. 3.300.128.



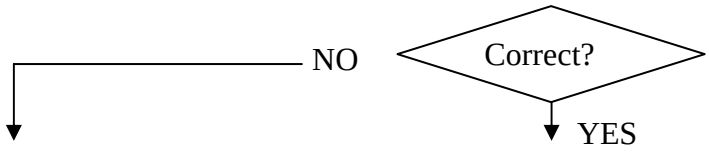
  - ♦ Check the supply voltages of the control (62) and panel (23) boards, performing if necessary the CONTROL BOARD (62) POWER SUPPLY TEST, GAS CONSOLE POWER SUPPLY TEST and PANEL BOARD (23) POWER SUPPLY TEST, in par. 3.3.1.
  - ♦ Replace the control (62) and panel (23) boards.

♦ Regular operation.

3.3.4 - The start command produces no effect.

ERROR CODE TEST.

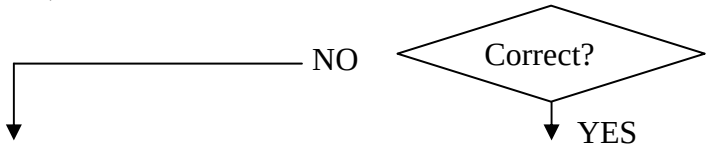
- When turned on, after the start-up phase, displays (P) and (Q) on Gas Console indicate an alarm situation.



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

START COMMAND TEST.

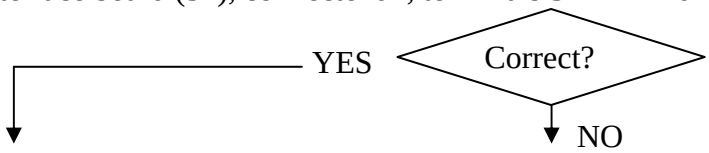
- Interface board (37), connector J10, terminals 1(+) and 2(-) = 0 Vdc with start command active; +24 Vdc with command not active.



  - ♦ Check the wiring between J6 interface board (37) and J4 control board (62).
  - ♦ Make sure on J6 of interface board (37), terminals 1(+) and 2(-) voltage = +7 Vdc (CAN bus supply line). If not corrected disconnect, with power source off, J4 from control board (62). Power up again and verify, with J4 disconnected, on J4 of control board (62), terminals 1(+) and 2(-) voltage = +8 Vdc. If corrected replace interface board (37). If not corrected disconnect, with power source off, J5 from control board (62). Power up again and verify, on the flying connector extracted from J5, terminals 1(+) and 2(-), voltage = +8 Vdc. If corrected replace control board (62). If not corrected replace panel board (23).
  - ♦ Make sure that the correct programs are entered in the control (62), interface (37) and panel (23) boards, performing if necessary the programming procedure available on the Cebora Web site (see par. 2.3).
  - ♦ Replace the control (62) and/or interface (37) and/or panel (23) boards.

INTERFACE BOARD (37) POWER SUPPLY TEST.

- Interface board (37), connector J1, terminals 3 - 4 = +20 Vac.



  - ♦ Check the wiring between J1 interface board (37) and connector J7, terminals 2 – 5 of fuse board (11).
  - ♦ Check the fuse F6 on fuse board (11). If interrupted replace it preventively controlling, that terminals 3-4 of J1 on interface board (37) are not short circuited. If non corrected replace interface board (37).
- ♦ Check the fuse F1 on interface board (37).
- ♦ Check the wiring between J10 interface board (37), connector CNC (55) on Power Source and the device actuator of the system start command.
- ♦ Replace the interface board (37).

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 40 seconds, to detect any gas leaks. Once this time has elapsed the circuit is discharged.

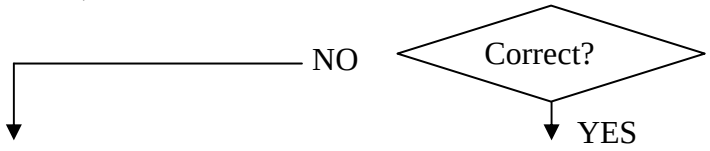
To obtain these functions the solenoid valves are activated at different times, based on the circuit to be tested (see fig. 6.1).

Phase	Function	Solenoid valves open (powered).
1	Discharge all of the circuits.	V12, V20, V21, V22, V23, VP1.
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).	V21, V23.
11	Circuit 4 load (H35).	V10.
12	Circuit 4 seal (H35).	-
13	Circuit 4 discharge (H35).	V21
14	Circuit 5 load (ar).	V07, V03, V04, V05, V06
15	Circuit 5 seal (ar).	-
16	Circuit 5 discharge (ar).	V20, V21, V22, V23.
17	Circuit 6 load (air).	V11
18	Circuit 6 seal (air).	-
19	Circuit 6 discharge (air).	VP1

Table 3.3.5 – Gas Test sequence.

SOLENOID VALVE TEST.

- With Power Source powered, set up the "Gas seal" test of all pneumatic circuits: press the key (W) on Gas Console to enter the set-up menu, press the key (A) to select "Test" (led (D) lit), turn knob (O) to show "ALL" on display (N).
- Press the key (W) to begin the test. The various phases are shown on the displays (P) and (Q) of the Gas Console.
- On each solenoid valve, check the coil terminals, voltage = 25 Vac when the solenoid valve is powered, see table 3.3.5.



- 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 254 HQC (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. 1166, the torch and Gas Console are not clogged, locating the circuit in question with the aid of the table 3.3.5 and fig. 6.1.
- With Power Source off, temporarily disconnect the connectors J4, J5, J6 and J7 from solenoid valve board (3) and check the resistance on the terminals of the solenoid valve coils. Correct value = 36 ohm for VP1 on PVC-3 Valve Unit, 27 ohm for V10 on Console PGC-2 and 12 ohm for all other valves. If >Mohm (circuit interrupted), replace the solenoid valve involved.
- Replace any defective solenoid valves, locating them with the aid of the table 3.3.5 and fig. 6.1.

- Check the wiring between the solenoid valves and the connectors J4, J5, J6 and J7 of solenoid valve board (3).
- Check the wiring between J3 of solenoid valve board (3) and J7 of panel board (23).
- 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 SERVICES TRANSFORMER (11) 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 (3) and check the resistance on the terminals of the solenoid valve coils. Correct value = 36 ohm for VP1 on PVC-3 Valve Unit, 27 ohm for V10 on Console PGC-2 and 12 ohm for all other valves. If 0 ohm, (short-circuit) replace the defective solenoid valve and solenoid valve board (3).
- Replace the solenoid (3) and/or panel (23) boards.

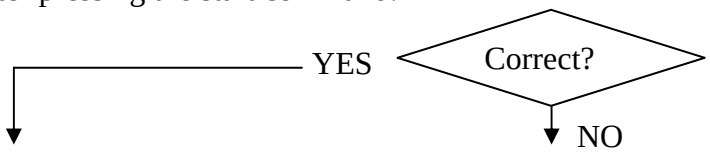
3.3.6 - Gas flows from the torch, the pilot arc does not light (nozzle voltage missing).

WARNING

FOR THE RELIEFS OF THE WAVEFORMS OF THIS PARAGRAPH (FIG. 5.2.1. AND 5.2.2) WE SUGGEST TO USE A BATTERY OSCILLOSCOPE OR POWER SUPPLY ISOLATED FROM THE LINE, OR WITH ISOLATED PROBES.

POWER SOURCE OUTPUT VOLTAGE TEST.

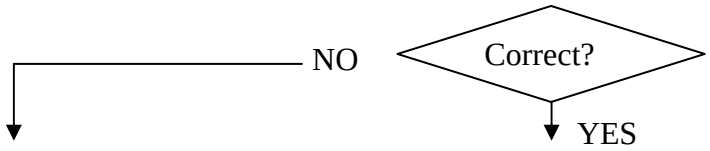
- Output terminal (+)(ground potential) and output terminal (-) (gnd) (electrode potential) of the Power Source (terminals for the connection of the extension cable 1169 for HV19 Unit) = fig. 5.2.1a, Power Source output voltage with pilot arc off, for maximum pilot arc time (1 second), after pressing the start command.



- ♦ Go to par. 3.3.8.

NOZZLE VOLTAGE TEST.

- Output terminal (+)(nozzle potential) and output terminal (-)(gnd) (electrode potential) of the Power Source (terminals for the connection of the extension cable 1169 for HV19 Unit) = fig. 5.2.2a, nozzle voltage with pilot arc off, for maximum pilot arc time (1 second), after pressing the start command.



- ♦ Regular working, go to par. 3.3.7.

NOTE

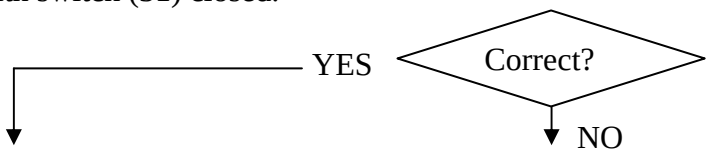
In the following paragraphs the two power boards (4) and the two driver boards (4) also are considered separately in the following way:

- power-1 board (4): located towards the external side of the Power Source;
- power-2 board (4): located towards the central side of the Power Source, to the whose power rectifier bridge is connected the precharge-cond board (6).
- driver-1 board (4): installed on the power-1 board;
- driver-2 board (4): installed on the power-2 board.

POWER BOARDS (4) POWER SUPPLY TEST.

- Power-1 board (4), connector J4, terminals 1 – 2 = 20 Vac;
- Power-2 board (4), connector J4, terminals 1 – 2 = 20 Vac;

with switch (31) closed.



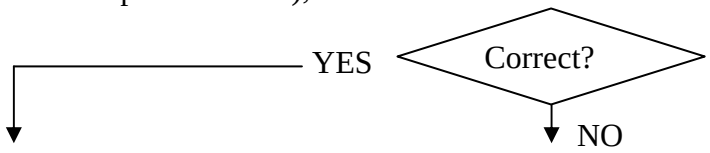
- ♦ Check the wiring between J4 of power board (4) and J3 of fuse board (11).
- ♦ Check fuse F3 and F4 on fuse board (11); if broken, replace them and make sure preventively the resistance between terminals 1 - 2 of J4 on power boards (4).

Correct value = >Mohm in both measure sense; if not correct replace the power board (4) defective.

- ♦ Check 20 Vac voltage on terminals 0V - 20V and terminals 0V – 20V close to J3 on fuse board (11); if missing, check the wiring between the service transformer and fuse board (11), and if necessary replace the service transformer (11).
- ♦ Replace the service transformer (11).

NOZZLE IGBT COMMAND TEST.

- ❑ Power-1 board (4), connector J4, terminals 4(+) – 5(-) = +3,6 Vdc approximately, for 1 sec. (maximum pilot arc time), with start command activated.
- ❑ Power-2 board (4), connector J4, terminals 4(+) – 5(-) = +3,6 Vdc approximately, for 1 sec. (maximum pilot arc time), with start command activated.



- ♦ Check the wiring between J4 power boards (4) and J3 control board (62).
- ♦ With Power Source off, temporarily disconnect J3 from control board (62) and check the resistance on terminals 4 and 5 of J4 on power boards (4). Correct value = approximately 10 Kohm. If different, replace the power board (4) defective. If short-circuited, also replace control board (62).
- ♦ Replace power (4) and/or control (62) boards.

- ♦ Check the wiring between output terminal (+) (nozzle terminal) of the Power Source and J7 on measure board (35). If you find loose connections, tighten and replace any damaged components.
- ♦ Check the wiring between J7 with J6 on measure board (35) (they are connected together on the board), nozzle resistor (33) and terminals J5 of both the power boards (4). If you find loose connections, tighten and replace any damaged components.
- ♦ Make sure continuity between terminals J7 and J6 on measure board (35). If interrupted restore the connection.
- ♦ Check the nozzle resistor (33). Correct value = 1,3 ohm. If not corrected, replace it.
- ♦ Check the wiring between Power Source output terminal (-) (electrode potential), inductors (23) and terminals TP7 of the power boards (4). If you find loose connections, tighten and replace any damaged components.
- ♦ Temporarily disconnect, with Power Source off, the cables of the extension art. 1169 from output terminal (-) and from nozzle terminal (+) of the Power Source and verify the isolation of the disconnected cables between them and towards ground. In this way it is possible to test the isolation of extension art. 1169, of the HV19 Unit and the torch. If a short circuit or low resistance is found, individuates and replace the defective device.

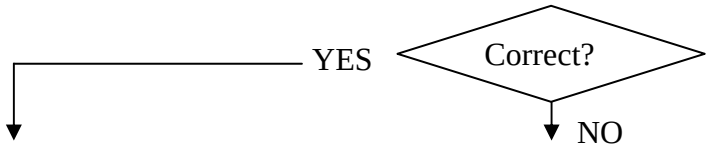
3.3.7 - Gas flows from the torch, the pilot arc does not light (high frequency missing).

WARNING

FOR THE RELIEFS OF THE WAVEFORMS OF THIS PARAGRAPH (FIG. 5.2.2) WE SUGGEST TO USE A BATTERY OSCILLOSCOPE OR POWER SUPPLY ISOLATED FROM THE LINE, OR WITH ISOLATED PROBES.

NOZZLE VOLTAGE TEST.

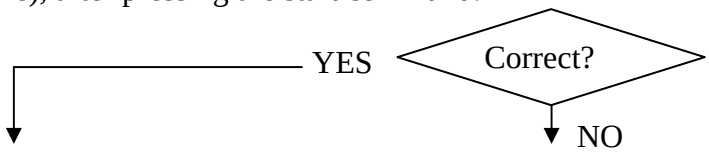
- Output terminal (+)(nozzle potential) and output terminal (-)(gnd) (electrode potential) of the Power Source (terminals for the connection of the extension cable 1169 for HV19 Unit) = fig. 5.2.2a, nozzle voltage with pilot arc off, for maximum pilot arc time (1 second), after pressing the start command.



  - Go to par. 3.3.6.

VOLTAGE PRESENCE TEST ON UNIT HV19.

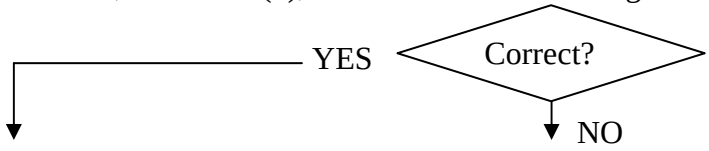
- HV19 unit, HF board (8), terminals CN2(+) and CN3(-) = >+200 Vdc (with pilot arc off) or from +150 to +190 Vdc (with pilot arc lit), for a duration of 1 second (maximum pilot arc time), after pressing the start command.



  - Check the wiring between terminals CN2 and CN3 of HF board (8), terminals TP3 and TP4 on filter-HF2 (13), terminals TP1 and TP2 of filter-HF2 board (13), extension art. 1169 and output terminals (-) (electrode potential) of the Power Source and J7 (nozzle potential) on measure board (35). If you find loose connections, tighten and replace any damaged components.
  - Temporarily disconnect, with Power Source off, the cables of the extension art. 1169 from output terminal (-) and from nozzle terminal (+) of the Power Source and verify the isolation of the disconnected cables between them and towards ground. In this way it is possible to test the isolation of extension art. 1169, of the HV19 Unit and the torch. If a short circuit or low resistance is found, individuates and replace the defective device.

HF OSCILLATOR TEST ON UNIT HV19.

- Unit HV19, HF board (8), scintillator SCI1 discharges at regular intervals.



  - Make sure that the connection between CN1 and CN4 of HF board (8) and the primary circuit of the HF transformer (9) is not interrupted.
  - Replace the HF board (8) and/or HF transformer (9).

- Check the wiring between the HF transformer (9) secondary terminal and torch electrode terminal.

- Make sure that there is no short-circuit between connectors CN1 and CN4 on HF board (8) or in the wiring of the HF transformer (9) 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 board (8) and/or HF transformer (9).

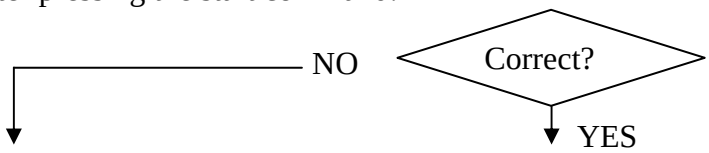
3.3.8 - In open circuit operation, the output voltage is not regular.

WARNING

FOR THE RELIEFS OF THE WAVEFORMS OF THIS PARAGRAPH (FIG. 5.2.1) WE SUGGEST TO USE A BATTERY OSCILLOSCOPE OR POWER SUPPLY ISOLATED FROM THE LINE, OR WITH ISOLATED PROBES.

POWER SOURCE OUTPUT VOLTAGE TEST.

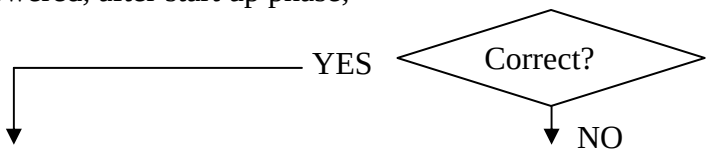
- Output terminal (+)(ground potential) and output terminal (-) (gnd) (electrode potential) of the Power Source (terminals for the connection of the extension cable 1169 for HV19 Unit) = fig. 5.2.1a, Power Source output voltage with pilot arc off, for maximum pilot arc time (1 second), after pressing the start command.



- ♦ Power source output voltage correct.

POWER BOARDS (4) POWER CIRCUIT POWER SUPPLY TEST.

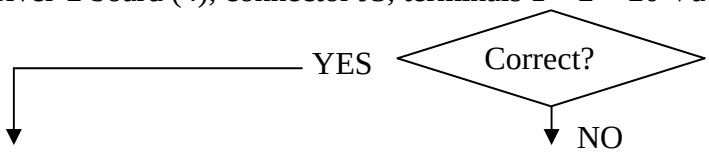
- Power-1 board (4), connector J1, terminals 1(+) – 2(-) = +330 Vdc, with Power Source powered, after start up phase;
- Power-2 board (4), connector J1, terminals 1(+) – 2(-) = +330 Vdc, with Power Source powered, after start up phase;



- ♦ Perform the CAPACITOR PRE-CHARGE AND TRANSFORMER (22) PRE-MAGNETIZATION TEST, in par. 3.3.2..

DRIVER BOARDS (4) POWER SUPPLY TEST.

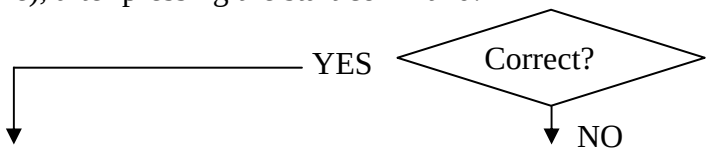
- Driver-1 board (4), connector J3, terminals 1 – 2 = 20 Vac, with switch (31) closed.
- Driver-2 board (4), connector J3, terminals 1 – 2 = 20 Vac, with switch (31) closed.



- ♦ Check the wiring between J3 driver boards (4) and J5 of fuse board (11).
- ♦ Check fuse F7 and F8 on fuse board (11); if broken, replace them and make sure preventively the resistance between terminals 1 - 2 of J3 on driver boards (4). Correct value = >Mohm in both measure sense; if not correct replace the driver board (4) defective.
- ♦ Check 20 Vac voltage on terminals 0V - 20V and terminals 0V – 20V (close to F7 and F8) on fuse board (11); if missing, check the wiring between the service transformer (11) and fuse board (11) and if necessary replace the service transformer (11).

DRIVER BOARDS (4) PWM TEST.

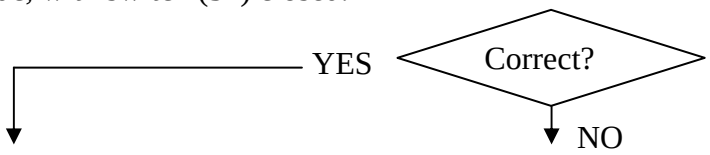
- Driver-1 (4), connector J3, terminals 5 – 4(gnd) = fig. 5.2.3 = (+5,4 Vdc, approx.) pilot arc current reference signal, with pilot arc lit, for a duration of 1 second (maximum pilot arc time), after pressing the start command.
- Driver-2 (4), connector J3, terminals 5 – 4(gnd) = fig. 5.2.3 = (+5,4 Vdc, approx.) pilot arc current reference signal, with pilot arc lit, for a duration of 1 second (maximum pilot arc time), after pressing the start command.



- ♦ Check the wiring between J3 driver boards (4) and J18 control board (62).
- ♦ With Power Source off, temporarily disconnect J18 from control board (62) and check the resistance on terminals 5 and 4 of each driver board (4). Correct value = 1,5 Kohm, approx. in both measure sense. If not correct, replace the driver board (4) defective.
- ♦ Check supply voltages of the control board (62), performing if necessary the CONTROL BOARD (62) POWER SUPPLY TEST in par. 3.3.1..
- ♦ Replace control board (62).

POWER SOURCE OUTPUT CURRENT TRANSDUCER POWER SUPPLY TEST.

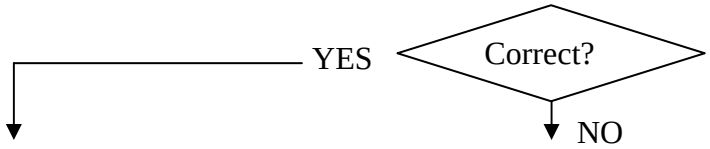
- Control board (62), connector J14, terminals 2(+) - 3(-) = +15 Vdc; terminals 4(+) - 3(-) = -15 Vdc, with switch (31) closed.



- ♦ Check the wiring between J14 control board (62) and current transducer (8).
- ♦ With Power Source off, temporarily disconnect the connector J14 from control board (62) and check the resistance between the terminals 2 and 4 of the patch connector disconnected from J14. Correct values = approximately 1,8 Kohm in both measure sense. If incorrect, replace current transducer (8).
- ♦ Power up the Power Source again, keeping J14 disconnected from control board (62), and check voltages on J14 of control board (62), terminals 2(+) and 3(-) = +15 Vdc; terminals 4(+) and 3(-) = -15 Vdc. If incorrect, replace control board (62).
- ♦ Check supply voltages of the control board (62), performing if necessary the CONTROL BOARD (62) POWER SUPPLY TEST in par. 3.3.1..
- ♦ Replace control (62) and/or current transducer (8).

POWER SOURCE OUTPUT CURRENT SIGNAL TEST.

- Control board (62), connector J14, terminals 1(+) - 3(-) = 0 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 J14 control board (62) and current transducer (8).
- ♦ With Power Source off, temporarily disconnect the connector J14 from control board (62) and check the resistance between terminals 1-4 and between terminals 2-4 of the patch connector disconnected from J14. Correct values = approximately 1,7 Kohm in both measure sense for each measure point. If incorrect, replace current transducer (8).
- ♦ Replace control board (62) and/or current transducer (8).

♦ Check the wiring between output terminal (+) (ground potential) of the Power Source and terminals TP3 of the power boards (4). If you find loose connections, tighten and replace any damaged components.

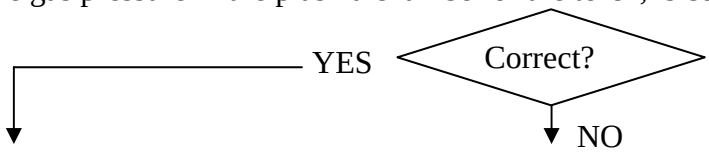
♦ Check the wiring between output terminal (-) (electrode potential) of the Power Source, inductors (23) and terminals TP7 of the power boards (4). If you find loose connections, tighten and replace any damaged components.

♦ Temporarily disconnect, with Power Source off, the cables of the extension art. 1169 from output terminal (-) and from nozzle terminal (+) of the Power Source and verify the isolation of the disconnected cables between them and towards ground. In this way it is possible to test the isolation of extension art. 1169, of the HV19 Unit and the torch. If a short circuit or low resistance is found, individuates and replace the defective device.

3.3.9 - Irregular pilot arc starts, unstable pilot arc.

PLASMA GAS PRESSURE TEST.

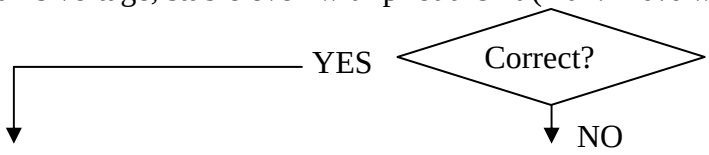
- The gas pressure in the plasma chamber of the torch, is corrected.



- ♦ 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 254 HQC (see specifications in the Instruction Manual).

HIGH VOLTAGE AT POWER BOARD (4) INPUT TEST.

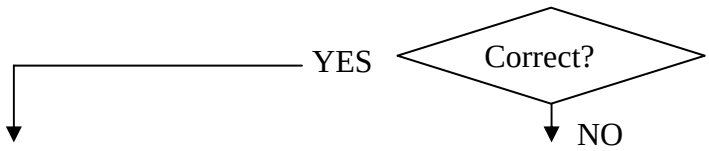
- Power-1 board (4), connector J1, terminals 1(+) – 2(-) = approximately +330 Vdc, with rated mains voltage, stable even with pilot arc lit (max. -10% with pilot arc lit).
- Power-2 board (4), connector J1, terminals 1(+) – 2(-) = approximately +330 Vdc, with rated mains voltage, stable even with pilot arc lit (max. -10% with pilot arc lit).



- ♦ Check 3 x 230 Vac, with rated mains voltage, on input terminals of rectifier bridge on power board (4), with switch (31) closed and after the start up phase. If not correct check transformer (22) connections, main voltage changer position, contactor (72) and mains voltage.
- ♦ Check rectifier bridges on power boards (4); replace if defective.
- ♦ If necessary perform the CAPACITOR PRE-CHARGE AND TRANSFORMER (22) PRE-MAGNETIZATION TEST, in par. 3.3.2.
- ♦ Replace the pre-charge (14) and/or control (62) boards.

PILOT ARC VOLTAGE TEST.

- Output terminal (+)(nozzle potential) and output terminal (-)(gnd) (electrode potential) of the Power Source (terminals for the connection of the extension cable 1169 for HV19 Unit) = fig. 5.2.2a, nozzle voltage with pilot arc off, for maximum pilot arc time (1 second), after pressing the start command.



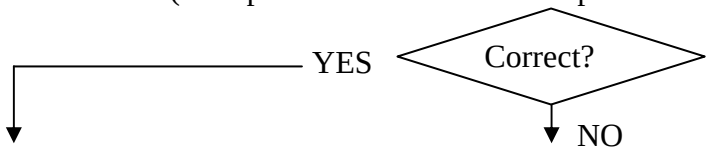
- ♦ Go to par. 3.3.6.

NOTE

THE FUNCTION VERIFIED WITH THE FOLLOWING TEST, IS ACTIVE ONLY IN PARTICULAR JOB CONDITIONS. IN ORDER TO SIMULATE SUCH CONDITIONS SET UP, TEMPORARYLY, THE FOLLOWING SET-UP PARAMETERS: MATERIAL = SS, THICKNESS = 30 MM, CURRENT = 250 A.

RC BOARD (5) TEST.

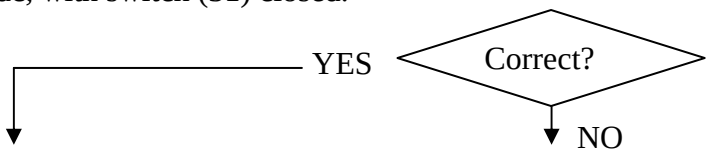
- RC board (5), connector J1, terminals 1 – 3 = 27 Vac for the duration of 1 second, after the start command (such period coincides with the pilot arc time).



- ♦ Check the wiring between J1 RC board (5) and J7 control board (62).
- ♦ With Power Source off, temporarily disconnect J1 from RC board (5) and check the resistance between terminals 1 and 2 on RC board (5). Correct value = 76 ohm approx. If >Mohm (circuit interrupted) replace RC board (5). If 0 ohm (short circuit) replace RC (5) and control (62) boards.
- ♦ Check supply voltages of the control board (62), performing if necessary the CONTROL BOARD (62) POWER SUPPLY TEST in par. 3.3.1..

POWER BOARDS (4) CURRENT TRANSDUCERS POWER SUPPLY TEST.

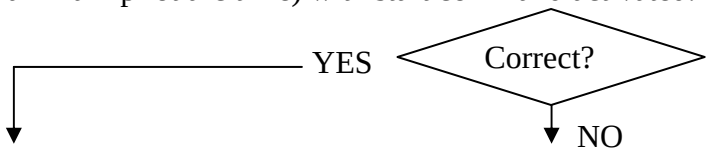
- Power-1 board (4), connector J3, terminals 2(+) – 3(-) = +15 Vdc; terminals 4(+) - 3(-) = -15 Vdc, with switch (31) closed.
- Power-2 board (4), connector J3, terminals 2(+) – 3(-) = +15 Vdc; terminals 4(+) - 3(-) = -15 Vdc, with switch (31) closed.



- ♦ Check the wiring between J3 power boards (4) and J18 control board (62).
- ♦ With Power Source off, temporarily disconnect the connector J3 from power boards (4) and check the resistance between the terminals 2 and 4 of J3 on power boards (4). Correct value = approximately 2,4 Kohm in both measure sense. If incorrect, replace the power board (4) defective.
- ♦ Power up the Power Source again, keeping J3 disconnected from power boards (4) and check voltages on the patch connector disconnected from J3 of the power boards (4), terminals 2(+) and 3(-) = +15 Vdc; terminals 4(+) and 3(-) = -15 Vdc. If incorrect, replace control board (62).
- ♦ Check supply voltages of the control board (62), performing if necessary the CONTROL BOARD (62) POWER SUPPLY TEST in par. 3.3.1..
- ♦ Replace control (62) and/or power (4) boards.

PILOT ARC CURRENT SIGNAL TEST.

- Power-1 board (4), connector J3, terminals 1 – 3(gnd) = fig. 5.2.4 (+0,4 Vdc approx.) power-1 board (4) pilot arc current feedback signal, with pilot arc lit, for a duration of 1 second (maximum pilot arc time) with start command activated.
- Power-2 board (4), connector J3, terminals 1 – 3(gnd) = fig. 5.2.4 (+0,4 Vdc approx.) power-2 board (4) pilot arc 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 J3 power boards (4) and J18 control board (62).
- ♦ With Power Source off, temporarily disconnect the connectors J3 from power boards (4) and check the resistance between terminals 1 and 3 of the patch connectors disconnected from J3 of power boards (4). Correct value = approximately 67 ohm. If incorrect, replace control board (62).
- ♦ With the Power Source off, check terminals TP3 and J5 of each power board (4) resistance = approximately 30 Kohm for each measurement point. If incorrect, perform the POWER BOARDS (4) POWER SUPPLY TEST and NOZZLE IGBT COMMAND TEST in par. 3.3.6, and replace power boards (4) if necessary.
- ♦ Replace control (62) and/or power (4) boards.

♦ Check the wiring between output terminal (+) (nozzle terminal) of the Power Source and J7 on measure board (35). If you find loose connections, tighten and replace any damaged components.

♦ Check the wiring between J7 with J6 on measure board (35) (they are connected together on the board), nozzle resistor (33) and terminals J5 of both the power boards (4). If you find loose connections, tighten and replace any damaged components.

♦ Make sure continuity between terminals J7 and J6 on measure board (35). If interrupted restore the connection.

♦ Check the nozzle resistor (33). Correct value = 1,3 ohm. If not corrected, replace it.

♦ Check the wiring between Power Source output terminal (-) (electrode potential), inductors (23) and terminals TP7 of the power boards (4). If you find loose connections, tighten and replace any damaged components.

♦ Check the wiring between TP2 of RC board (5) and J6 on power boards (4) and between TP1 of RC board (5) and inductors (23) common terminal.

♦ Check the wiring between CN2 and CN3 of HF board (8), terminals TP3 and TP4 of filter-HF2 board (13), terminals TP1 and TP2 of filter-HF2 (13) board, extension art. 1169 and output terminal (-) (electrode potential) of the Power Source and J7 (nozzle potential) on measure board (35). If you find loose connections, tighten and replace any damaged components.

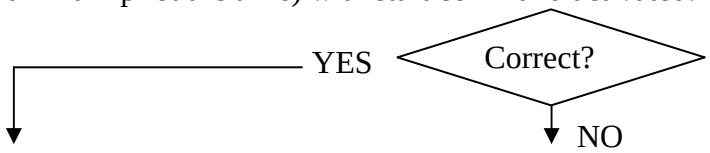
♦ Temporarily disconnect, with Power Source off, the cables of the extension art. 1169 from output terminal (-) and from nozzle terminal (+) of the Power Source and verify the isolation of the disconnected cables between them and towards ground. In this way it is possible to test the isolation of extension art. 1169, of the HV19 Unit and the torch. If a short circuit or low resistance is found, individuates and replace the defective device.

♦ Replace control (62) and/or power (4) and/or RC (5) boards.

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

PILOT ARC CURRENT SIGNAL TEST.

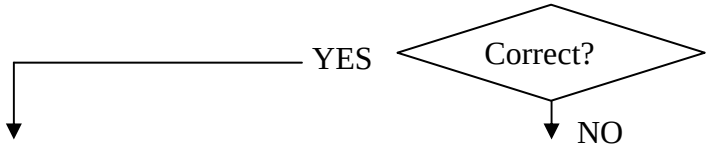
- Power-1 board (4), connector J3, terminals 1 – 3(gnd) = fig. 5.2.4 (+0,4 Vdc approx.) power-1 board (4) pilot arc current feedback signal, with pilot arc lit, for a duration of 1 second (maximum pilot arc time) with start command activated.
- Power-2 board (4), connector J3, terminals 1 – 3(gnd) = fig. 5.2.4 (+0,4 Vdc approx.) power-2 board (4) pilot arc current feedback signal, with pilot arc lit, for a duration of 1 second (maximum pilot arc time) with start command activated.



- ♦ Perform the test of par. 3.3.9.

POWER SOURCE OUTPUT CURRENT SIGNAL TEST.

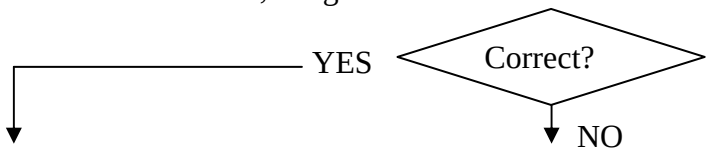
- Control board (62), connector J14, terminals 1(+) - 3(-) = 0 Vdc, (Power Source output current feedback signal with pilot arc lit), for a duration of 1 second (maximum pilot arc time) with start command activated.



- ♦ Perform the test of par. 3.3.8.

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. 5.2.4 (nozzle current) changes level and becomes continuous (cutting current / 2). The new signal level depends on the cutting current set, and remains there for the cutting duration.
  - the signal of the Power Source output current (current transducers (8) signal) take a value different than 0. The new signal level depends on the cutting current set, and remains there for the duration of cutting.
  - on the Gas Console, the gas circuits switch from Preflow to Cutflow.



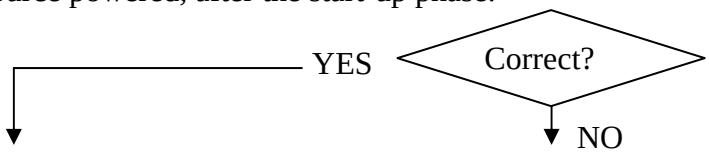
- ♦ Check the wiring between output terminal (+) (ground potential) of the Power Source and terminals TP3 of the power boards (4), verifying the corrected passage of cables in the current transducer (8) hole. If you find loose connections, tighten and replace any damaged components.
- ♦ Replace control board (62) and/or current transducer (8).

- ♦ Check there are not occlusions in the tubes of Cutflow gases circuits, and if necessary perform the SOLENOID VALVE TEST in par. 3.3.5.
- ♦ Check the conditions of the torch, and the wear status of the electrode, diffusers and nozzle.

3.3.11 - Cooling unit does not work correctly.

PUMP (48) TEST.

- Pre-charge board (14), connector J9, terminals 1 - 2 = approximately 230 Vac, with Power Source powered, after the start-up phase.

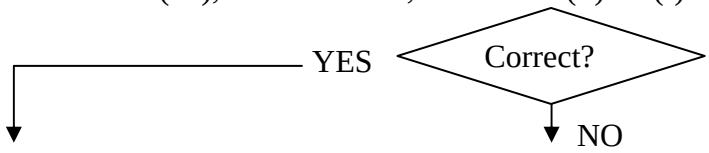


  - ♦ Check the wiring between pump (48) and J9 of pre-charge board (14).
  - ♦ Check the wiring between J8 of pre-charge board (14) and fuse in the rear panel of the Power Source.
  - ♦ Check the fuse on the rear panel of the Power Source. If interrupted, replace and check the resistance on the terminals of pump (48). Correct value = approximately 16 ohm. If incorrect, replace pump (48).
  - ♦ Verify on J10 of pre-charge board (14) voltage = 230 Vac with Power Source powered and after the start-up phase. If not corrected check wiring between J10 pre-charge board (14) and power voltage changer.
  - ♦ Check the wiring between J4 pre-charge board (14) and J7 control board (62).
  - ♦ With Power Source off, temporarily disconnect connector J4 on pre-charge board (14) and check the resistance on terminals 3 and 4 of J4 on pre-charge board (14). Correct value = approximately 300 ohm. If incorrect, replace pre-charge board (14). If you detect a short-circuit, replace the pre-charge (14) and control (62) boards.

- ♦ Check the wiring between pump (48) and J9 of pre-charge board (14).
- ♦ Make sure the starting capacitor of the pump (48), located inside the motor terminals box, is intact and correctly connected. Replace if necessary.
- ♦ Make sure the pump (48) is rotating in the corrected direction.
- ♦ Make sure there are no mechanical obstacles blocking the pump (48).
- ♦ Replace pump (48).

FLOW METER (42) POWER SUPPLY TEST.

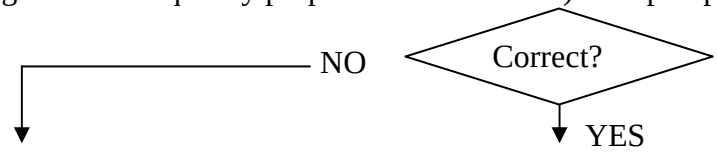
- Control board (62), connector J13, terminals 1(+) – 3(-) = +5 Vdc.



  - ♦ Check the wiring between J13 control board (62) and flow meter (42).
  - ♦ With Power Source off, temporarily disconnect J13 from control board (62), and make sure the resistance between terminals 1 and 3 of the patch connector disconnected from J13 of control board (62). Corrected value = >Mohm in both measure sense. If incorrect, replace flow meter (42). If in short circuit replace also control board (62).
  - ♦ Power up the Power Source keeping J13 disconnected from control board (62) and check, on J13 of control board (62), terminals 1(+) and 3(-), voltage = +5 Vdc. If incorrect, replace control board (62).

FLOW METER (42) SIGNAL TEST.

- Control board (62), connector J13, terminals 2(+) – 3(-) = fig. 5.2.5 = (square waveform signal with frequency proportional to the flux) with pump (48) running.



  - Corrected operation.

- Check the wiring between J13 control board (62) and flow meter (42).
- Make sure the presence of a jumper between terminals 1 and 2 of the strip J16 on control board (62) (it is necessary to send the flow meter (42) signal to the control board (62) microprocessor).
- With Power Source off, temporarily disconnect J13 from control board (62), and make sure the resistance between terminals 2 and 3 of the patch connector disconnected from J13 of control board (62). Corrected value = >Mohm in both measure sense. If incorrect, replace flow meter (42).
- Power up the Power Source keeping J13 disconnected from control board (62) and check, on J13 of control board (62), terminals 2(+) and 3(-), voltage = +5 Vdc. If incorrect, replace control board (62).
- 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 (48) and replace if defective.
- Check the level of the cooling liquid in the tank (50). Top up the tank if below minimum level.
- Replace the control board (62) and/or flow meter (42).

3.4 - Error codes and alarm signals.

3.4.1 - 02 - EEPROM error.

Block due to user data memory writing error. Replace control board (62).

3.4.2 - 06 - Communication error detected by MASTER control.

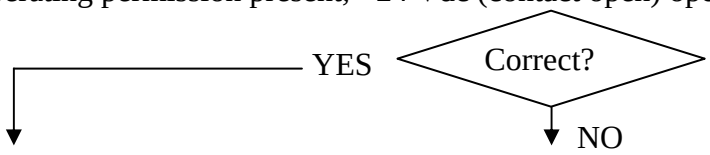
Communication error between MASTER microprocessor and PANEL microprocessor, detected by MASTER control, on control board (62). Perform the tests indicated in case of failure of the CAN BUS COMMUNICATION TEST in par. 3.3.3.

3.4.3 - 07 - "rob" flashing on displays (P) on Gas Console. Communication error : the MASTER doesn't communicate with the plant.

This alarm indicates that the enable signal, originating from the system (pantograph or robot) needed to operate the Power Source is missing.

OPERATING PERMISSION FROM SYSTEM TEST.

- Interface board (37), connector J10, terminals 4(+) and 3(-) = 0 Vdc, (contact closed) operating permission present, +24 Vdc (contact open) operating permission missing.



  - ♦ Check the wiring between connector CNC (55) of the Power Source and the actuator of the signal to allows system operation (pantograph or robot).
  - ♦ Check the wiring between J10 interface board (37) and connector CNC (55) on the Power Source.
  - ♦ Check the wiring between J6 interface board (37) and J4 control board (62).
  - ♦ Make sure the interface board (37) power supply is correct, performing if necessary the INTERFACE BOARD (37) POWER SUPPLY TEST in par. 3.3.4.
  - ♦ Replace the interface (37) and/or control (62) boards.
- ♦ Replace the interface (37) and/or control (62) boards.

3.4.4 - 09 - Communication error detected by PANEL control.

Communication error between PANEL microprocessor and MASTER microprocessor, detected by PANEL control, on Gas Console. Perform the tests indicated in case of failure of the CAN BUS COMMUNICATION TEST in par. 3.3.3.

3.4.5 - 15 - Direct current voltage at precharge-cond board (6) output below minimum permitted value (for power-1 board (4)).

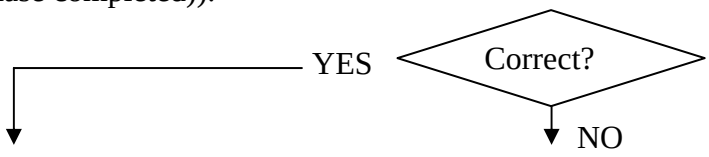
3.4.6 - 16 - Direct current voltage at precharge-cond board (6) output below minimum permitted value (for power-2 board (4)).

The direct current voltage on the DC-capacitors on power boards (4) is lower than the minimum value to allow the precharge rele and contactor (72) closing.

This alarm may be due to the interruption of the supply lines of the precharge circuits (180 Vac from fuse board (11)) or to a strong absorption or short circuit of the DC-capacitors or igbt on power boards (4).

CAPACITORS PRECHARGE SIGNAL TEST.

- Control board (62), connector J22, terminals 1 - 2 = terminals 3 - 4 = fig. 5.2.6, with switch (31) closed and before the contactor (72) closing (DC-capacitors voltage signal suitable for the precharge phase completion, signal that disappears when contactor (72) closes (precharge phase completed)).



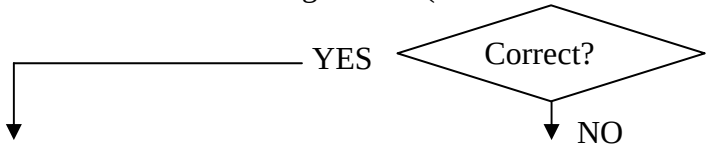
  - Check the wiring between J1 precharge-cond board (6) and J1 fuse board (11).
  - Check on J1 of precharge-cond (6) terminals 1 and 2 voltage = 180 Vac approximately, terminals 3 and 4 voltage = 180 Vac with switch (31) closed (CAPACITOR-DC PRECHARGE SUPPLY). If not corrected check fuses F1 and F2 on fuse board (11). If interrupted replace them preventively controlling, with Power Source off and J1 disconnected from precharge-cond board (6), the resistance between terminals 1-2 and terminals 3-4 of J1 on precharge-cond board (6). Correct value = >Mohm in both measure senses. If 0 ohm (short circuit) replace precharge-cond board (6).
  - Check 180 Vac voltage on terminals 0V - 180V and terminals 0V – 180V (close to F1 and F2) on fuse board (11); if missing, check the wiring between the service transformer (11) and fuse board (11) and if necessary replace the service transformer (11).
  - Check the wiring between J2 precharge-cond board (6) and J22 control board (62).
  - With Power Source off, temporarily disconnect J22 from control board (62) and check the resistance on terminals 1-2 and terminals 3-4 of J22 on control board (62). Correct value = 4,7 Kohm, approx. in both measure senses, for each measure point. If not correct, replace the control board (62).
  - Replace precharge-cond (6) and/or control (62) boards.
- Replace control board (62).

3.4.7 - 30 - Power board-1 (4) minimum current signal error (current transducer offset).
3.4.8 - 31 - Power board-2 (4) minimum current signal error (current transducer offset).

These alarms are introduced when is detected a current signal greater than 0 with Power Source powered but without start command.

CURRENT TRANSDUCERS OFFSET TEST.

- Control board (62), connector J18, terminal 1(+) - 7(-) = <0,1 Vdc, with Power Source powered but not delivering current (current transducer on power-1 board (4)).
- Control board (62), connector J18, terminal 5(+) - 11(-) = <0,1 Vdc, with Power Source powered but not delivering current (current transducer on power-2 board (4)).



  - Check the wiring between J18 control board (62) and J3 power boards (4).
  - With power source off, temporarily disconnect J18 from control board (62) and check the resistance on terminals 1-7 and terminals 5-11 of J18 on control board (62). Corrected value = 67 ohm. If incorrect, replace control board (62).

- ♦ With power source off, temporarily disconnect J3 from power boards (4) and check the resistance on terminals 2 and 4 of J3 on power boards (4). Corrected value = 2,4 Kohm approx. in both measure senses. If incorrect, replace the power board (4) defective.
- ♦ Check supply voltages of the power boards (4) current transducers by performing the POWER BOARDS (4) CURRENT TRANSDUCERS POWER SUPPLY TEST, in par. 3.3.9.
- ♦ Replace power (4) and/or control (62) boards.

♦ Replace control board (62).

3.4.9 - 35 - Missing output current at the power-1 board (4).

3.4.10 - 36 - Missing output current at the power-2 board (4).

These codes signal that, during operation in “transfer arc” (cutting), one of the power boards (4) does not deliver current.

In both “pilot arc” and “transfer arc” modes the two power boards (4), which are parallel connected, must each deliver 50% of the output current of the Power Source.

The control of the current generation of both power boards (4) is not carried out during the pilot arc operation.

For an analysis of the problem, perform the tests in par. 3.3.8, 3.3.9 and 3.3.10, considering also that the problem could be due to an error of the current transducers installed in the power boards (4) and therefore see also par. 3.4.7, 3.4.8.

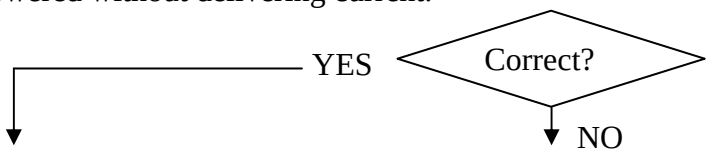
3.4.11 - 39 - Cutting current transducer reading error.

This error indicates that the current signal delivered from the cutting current transducer is greater than 0 with Power Source powered but without start command.

This check is carried out only with Power Source powered but without start command.

CUTTING CURRENT TRANSDUCER (8) OFFSET TEST.

❑ Control board (62), connector J14, terminals 1(+) – 3(-) = <0,1 Vdc, with Power Source powered without delivering current.



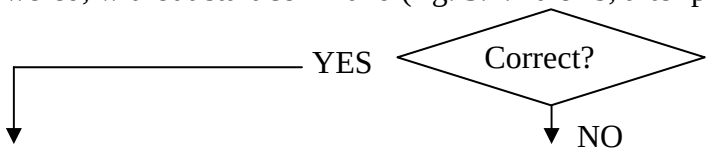
- ♦ Check the wiring between J14 control board (62) and current transducer (8).
- ♦ With Power Source off, temporarily disconnect the connector J14 from control board (62) and check the resistance between terminals 1-3 of J14 on control board (62). Correct value = approximately 33 ohm. If incorrect, replace control board (62).
- ♦ Check supply voltages of the cutting current transducer (8) by performing the POWER SOURCE OUTPUT CURRENT TRANSDUCER POWER SUPPLY TEST, in par. 3.3.8.
- ♦ Replace the control board (62) and/or current transducer (8).

♦ Replace the control board (62).

3.4.12 - 40 - Hazardous voltage.

HAZARDOUS VOLTAGE PRESENCE TEST.

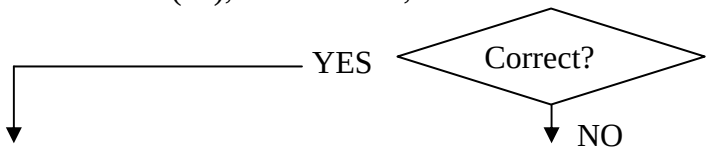
- Measure board (35), connector J4, terminals 4(+) - 1(-)(gnd) = 0 Vdc, with Power Source powered, without start command (fig. 5.2.1 a or b, after pressing the start command).



  - ♦ Check the wiring between connector J4 of measure board (35) and terminal (+) (ground terminal) and output terminal (-) (electrode potential) of the Power Source (terminals fitted for extension art. 1169 for HV19 unit).
  - ♦ Make sure output voltage is being generated, performing if necessary the tests in par. 3.3.6..

MEASURE BOARD (35) POWER SUPPLY TEST.

- Measure board (35), connector J2, terminals 1 and 2 = 8 Vac.



  - ♦ Check the wiring between J2 measure board (35) and J7, terminals 3 – 6 of fuse board (11).
  - ♦ Check fuse F9 on fuse board (11); if broken, replace and make sure that terminals 1 - 2 of J2 on measure board (35) are not short-circuited. If incorrect, replace measure board (35).
  - ♦ Check 8 Vac voltage on terminals 0V - 8V (close to F9) on fuse board (11); if missing, check the wiring between the service transformer (11) and fuse board (11) and if necessary replace the service transformer (11).

- ♦ With Power Source off, temporarily disconnect J4 from measure board (35) and check the resistance on terminals 1 and 4 of J4 on measure board (35). Correct value = 170 Kohm approx.. If incorrect, replace measure board (35).
- ♦ Check the wiring between J5 measure board (35) and J9 control board (62).
- ♦ With Power Source off, temporarily disconnect J9 from control board (62) and check the resistance on terminals 1-2 and terminals 4-5 of J9 control board (62). Correct value = junction of two diodes in one direction and 4,7 Kohm with the instrument probes reversed, in each measure point. If incorrect, replace control board (62).
- ♦ Replace the measure (35) and/or control (62) boards.

3.4.13 - 49 - Nozzle current during cutting.

When cutting begins, the nozzle current must become null.

In the Power Source art. the 955 the nozzle current during the cutting is obtained from the difference between the current total (delivered from the current transducer (8)) and the sum of the power boards (4) currents (delivered from the current transducers on power boards (4)).

Therefore this alarm can indicate both the real nozzle current circulation or the misalignment of one of the current transducers.

For the problem analysis it is advised to verify which of the two hypotheses is at the origin of the error. As an example, if it is possible, to measure with one external instrument the real nozzle current during the cut. In alternative perform the tests of par. 3.3.8, 3.3.9 and 3.3.10, the CURRENT TRANSDUCERS OFFSET TEST, in par. 3.4.7 and CUTTING CURRENT TRANSDUCER (8) OFFSET TEST, in par. 3.4.11.

3.4.14 - 53 - "trG" on display (P) of the Gas Console. Start command present while resetting the operating mode.

Some alarms, such as "low gas pressure" or "high temperature," stop the Power Source with corresponding indication, 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.

3.4.15 - 55 - Electrode finished.

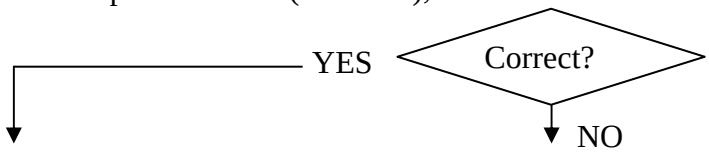
NOTE

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.

- Measure board (35), terminal J6(+) (nozzle potential) and connector J4, terminal 1(-) (electrode potential) = fig 5.2.2b (or voltage from +150 to +190 Vdc) with pilot arc lit, for a maximum pilot arc time (1 second), after activated the start command.



  - Check the wiring between J6 measure board (35) and nozzle resistor (33).
  - Check the wiring between terminal 1 of J4 on measure board (35) and output terminal (-) (electrode potential) 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 J4 from measure board (35) and check the resistance on terminals J6 and 1 of J4 on measure board (35). Correct value = 40 Kohm approx. If incorrect, replace measure board (35).
- Check the measure board (35) supply voltage, performing if necessary the MEASURE BOARD (35) POWER SUPPLY TEST, in par. 3.4.12.
- Check the wiring between J5 measure board (35) and J9 control board (62).
- With Power Source off, temporarily disconnect J9 from control board (62) and check the resistance on terminals 1-2 and terminals 4-5 of J9 control board (62). Correct value = junction of two diodes in one direction and 4,7 Kohm with the instrument probes reversed, in each measure point. If incorrect, replace control board (62).
- 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 measure (35) and/or control (62) boards.

3.4.16 - 58 - Alignment error between the Cebora firmware versions.

This alarm indicates that the MASTER, INTERFACE and PANEL programs are in incompatible versions. This may occur for a software updating error or for control board (62) failure.

Perform the programming procedure for the welding system (see par. 2.3).

Replace the control board (62).

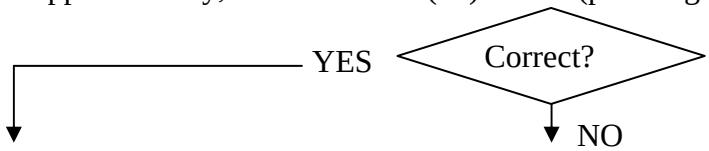
3.4.17 - 61 - Mains voltage phase L1 below minimum allowed.
3.4.18 - 62 - Mains voltage phase L1 above maximum allowed.
3.4.19 - 63 - Mains voltage phase L2 below minimum allowed.
3.4.20 - 64 - Mains voltage phase L2 above maximum allowed.

The precharge-cond board (6) contains the mains voltage relief circuits, whose signals are used from the control board (62) to check the presence and corrected value of the mains voltage three phases supply, estimating when such values exit from the allowed limits.

The mains voltage is picked up from the rectifier bridge terminals of the power-2 board (4), so that the analysis of the mains is carried out only when the contactor (72) is closed (after the precharge phase).

MAINS VOLTAGE SIGNAL TEST.

- Control board (62), connector J22, terminals 7(+) and 8(-) = terminals 9(+) and 10(-) = +3,5 Vdc approximately, with contactor (72) closed (precharge phase completed).



  - Check the wiring between J4, J6 and J7 precharge-cond board (6) and rectifier bridge terminal of power-2 board (4).
  - With Power Source off, temporarily disconnect, connectors J4, J6 and J7 from precharge-cond board (6) and check the resistance between terminals J4-J6 and between terminals J7-J6 on precharge-cond board (6), resistance = 1,8 Kohm approx. If incorrect, replace precharge-cond board (6).
  - Check the wiring between J2 precharge-cond (6) board and J22 control board (62).
  - With Power Source off, temporarily disconnect J22 from control board (62) and check the resistance on terminals 7-8 and terminals 9-10 of J22 control board (62). Correct value = junction of two diodes in one direction and >Mohm with the instrument probes reversed. If incorrect, replace control board (62).
  - Check the presence and corrected value of the mains voltage three phases supply, performing, if necessary, the TEST of par. 3.3.1.
  - Replace the precharge-cond (6) and/or control (62) boards.
- Replace the control board (62).

3.4.21 - 73 - "TH""0" on displays (P) (Q) of the Gas Console. High temperature of the transformer (22).

3.4.22 - 74 - "TH""1" on displays (P) (Q) of the Gas Console. High temperature of the igbt group on power-1 board (4).

3.4.23 - 77 - "TH""2" on displays (P) (Q) of the Gas Console. High temperature of the igbt group on power-2 board (4).

With these alarms 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 fans (63) and (46) are operating correctly, performing if necessary the tests of par. 3.3.2..
- Make sure the air is flowing properly and that there no dust or obstacles are blocking the cooling ducts inside the Power Source and tunnels.
- Make sure that the working conditions comply with the specified values, especially observing the "duty cycle".
- Check the wiring between J8 power boards (4), and the thermostats on the igbt dissipaters of the power boards (4).
- Make sure the thermostat mounted on the igbt dissipater of power boards (4) is properly mounted and operating; its contact must be closed at ambient temperature.
- Check the wiring between J7 power boards (4) and J17 of control board (62).
- With Power Source off, temporarily disconnect J7 on power boards (4). Power up the Power Source again and check on the patch connector removed from J7 voltage = 27 Vac, with switch (31) closed, (alarm condition). If incorrect, replace control board (62).
- Check the wiring between thermostat on transformer (22) and J17 of control board (62).
- With Power Source off, temporarily disconnect the thermostat on transformer (22). Power up the Power Source again and check on the patch connectors removed from the thermostat (22) voltage = 27 Vac, with switch (31) closed, (alarm condition). If incorrect, replace control board (62).
- Replace the control board (62).

3.4.24 - 75 - "H2O" on display (P) of the Gas Console. Insufficient flux of the cooling liquid.

The liquid flux in the cooling circuit is detected by the flow meter (42).

To analyze the corresponding circuit, perform the tests of par. 3.3.11.

3.4.25 - 78 - Gas pressure low.

3.4.26 - 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. 6.1), whose signals are analyzed by the panel board (23).

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 (23).

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 zero (0 Vdc on connectors J1, J2, J3, J4 and J5 of panel board (23)), the test stops operation due to error (79).

The alarm circuit is indicated on the Gas Console by the flashing corresponding display(R, S, T or U) while the displays (P) and (Q) 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.

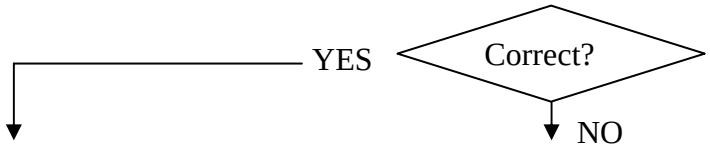
The test for the pressure detector PT1 is described below. Since the pressure detection circuits are identical to one another, the same procedure may also be applied to the other pressure detectors, replacing PT1 with the other detectors (PT2, PT3, PT4, PT5) which are connected to connectors J2, J3, J4 and J5 of panel board (23) respectively.

PRESSURE DETECTOR ON THE GAS CIRCUIT TEST.

The displays (R), (S), (T) and (U) 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 (R), (S), (T) and (U)	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 (W) on Gas Console to enter the set-up menu, press the key (A) to select “Test” (led (D) lit), turn knob (O) to show “ALL” on display (N).
- Press the key (W) to begin the test. The various phases are shown on the displays (N)(P) and (Q) of the Gas Console.
- Panel board (23), connector J1, terminals 3(+) and 4(-) = voltage between 0 and the value set by the regulators (Y), expressed in Vdc, based on the phase performed during the “Gas Seal” test.

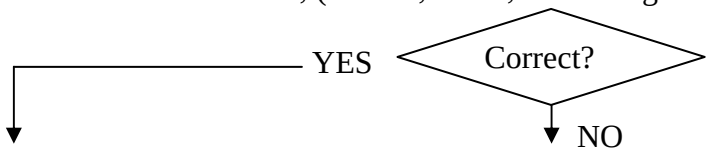


  - ♦ Check the wiring between connector J1 of panel board (23) and the pressure detector PT1.
  - ♦ Check on J1 of panel board (23), terminals 1(+) and 4(-) voltage = +18 Vdc (pressure detector power supply). If incorrect, with Power Source off temporarily disconnect J1 from panel board (23), restart the Power Source and check the voltage again on terminals 1(+) and 4(-) of J1, panel board (23) = +18 Vdc. If incorrect, replace panel board (23).
  - ♦ 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 (23).
- ♦ Replace the panel board (23).

3.4.27 - 80 - "OPn" on display (P) of the Gas Console. Guard on Power Source or HV19 Unit open.

SAFETY GUARD TEST.

- Measure board (35), connector J1, terminals 3 and 4 = 0 Vac, with guard on Power Source and on HV19 Unit closed; (27 Vac, alarm, with one guard open).



  - ♦ Check the wiring between J1 measure board (35) and J17 control board (62).
  - ♦ With Power Source off, temporarily disconnect, the wires from terminals 3 and 4 of J1 on measure board (35). Power up the Power Source and check on the wires disconnected from J1, voltage = 27 Vac, with switch (31) closed (alarm condition). If incorrect, replace control board (62).
  - ♦ Check the wiring between terminals 5 – 6 of J1 measure board (35) and switch (9) on the Power Source protection carter.
  - ♦ Check the wiring between terminals 7 – 8 of J1 measure board (35), torch terminal board (40) on the Power Source, extension art. 1169 and switch (6) on HV19 Unit.
  - ♦ Make sure the switches (9) on the Power Source protection carter and (6) on the safety guard of the HV19 Unit, are intact and properly mounted. If incorrectly positioned, correct the position; replace if defective.
  - ♦ Replace the measure board (35).
- ♦ Replace the control board (62).

3.4.28 - 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.

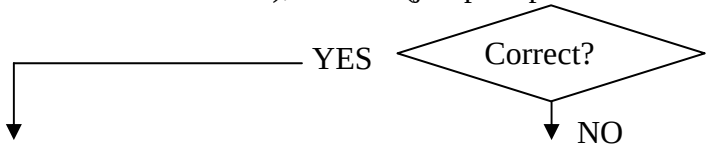
3.4.29 - 82 - PGC-2 Gas Console (ATEX) not connected.

This alarm is active only when a type of gas is selected that requires the use of the PGC-2 Console (e.g., "H35"). It may initially appear with the message "H35" flashing on display (P) of the Gas Console PGC-3, which upon start-up ((W) button on Gas Console pressed) changes in the message "ERR""82".

The "PGC-2 Gas Console connected" signal is provided by a jumper between terminals 8 and 9 of the connector CN07 (31) on the PGC-2 Gas Console.

PGC-2 GAS CONSOLE CONNECTED TEST.

- Panel board (23), connector J12, terminals 2(+) and 1(-) = 0 Vdc, (jumper closed = PGC-2 Gas Console connected); +5 Vdc (jumper open = PGC-2 Gas Console not connected).



  - ♦ Check the wiring between J12 panel board (23), connector CN06 (14) on Gas Console PGC-3 and connector CN07 (31) on PGC-2 Gas Console.
  - ♦ Make sure there is a jumper between terminals 8 and 9 of connector CN07 (31) on PGC-2 Gas Console.

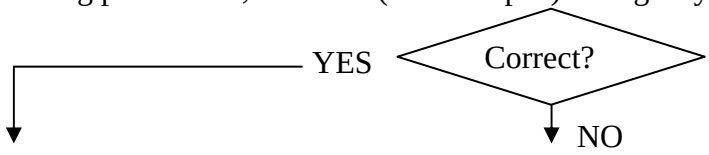
- ♦ With Power Source off, temporarily disconnect J12 from panel board (23), and check, after restarting the Power Source, on terminals 2(+) and 1(-) of J12 on panel board (23), voltage = +5 Vdc. If incorrect, replace panel board (23).
- ♦ Replace panel board (23).

♦ Replace panel board (23).

3.4.30 - 90 - "rob" flashing on display (P) on Gas Console. Emergency stop originating from the system (pantograph or robot).

EMERGENCY STOP FROM SYSTEM TEST.

❑ Interface board (37), connector J10, terminals 4(+) and 3(-) = 0 Vdc, (contact closed) operating permission; +24 Vdc (contact open) emergency stop.



- ♦ Check the wiring between connector CNC (55) of the Power Source and the actuator of the emergency stop signal on pantograph or robot.
- ♦ Check the wiring between J10 interface board (37) and connector CNC (55) on the Power Source.
- ♦ Make sure the interface board (37) power supply is correct, performing if necessary the INTERFACE BOARD (37) POWER SUPPLY TEST in par. 3.3.4.
- ♦ Replace the interface (37) and/or control (62) boards.

♦ Check the wiring between J6 interface board (37) and J4 control board (62).

♦ Check on J6 of interface board (37), terminals 1(+) and 2(-), voltage = +7 Vdc (CAN bus line supply). If not corrected disconnect, with Power Source off, J4 from control board (62). Power on the Power Source and verify, with J4 disconnected, on J4 of control board (62) terminals 1(+) and 2(-), voltage = +8 Vdc. If corrected replace interface board (37). If not corrected disconnect, with Power Source off, J5 from control board (62). Power on the Power Source and verify, on the flying connector extracted from J5, terminals 1(+) and 2(-), voltage = +8 Vdc. If corrected to replace control board (62). If not corrected replace panel board (23).

♦ Replace the interface (37) and/or control (62) boards.

3.4.31 - 99 - "OFF" on display (N) on Gas Console. Incorrect mains voltage (machine shutdown).

This message appears normally, and briefly, each time the Power Source is shut off.

When mains voltage is missing, for example after opening the switch (31), all control circuits remain powered for a few seconds due to the effects of charging the capacitors in the various boards power supplies.

The power supply board (7) detects the lack of mains voltage, and notifies the to control board (62) ("UV" signal on the flying connector welded on OP12 on control board (62)), which stops the power source with "OFF" indication on the display (N).

The "UV" signal may be tested on J3 of power supply board (7), on terminals 2(+) and 1(-): 0 Vdc = mains not suitable; -1 Vdc = mains suitable.

Carry out the tests of par. 3.3.1 and replace the power supply board (7) if necessary.

4 - COMPONENTS LIST

4.1 - Plasma PROF 254 HQC : see file ESP254.pdf enclosed at the end of the manual.
4.2 - Components table : see file ESP254.pdf enclosed at the end of the manual.

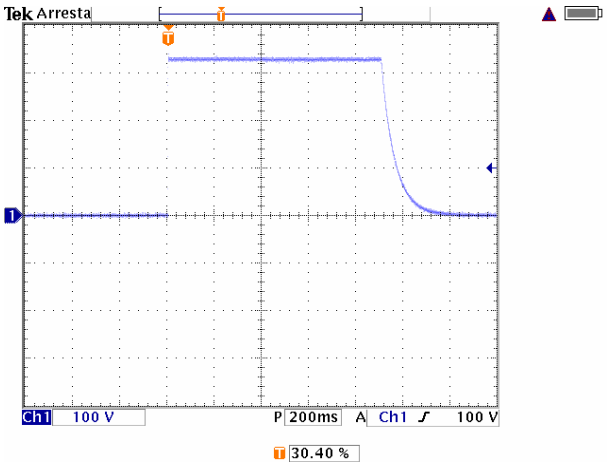
5 - ELECTRICAL DIAGRAMS

5.1 - Plasma PROF 254 HQC : see file SCHE254.pdf enclosed at the end of the manual.

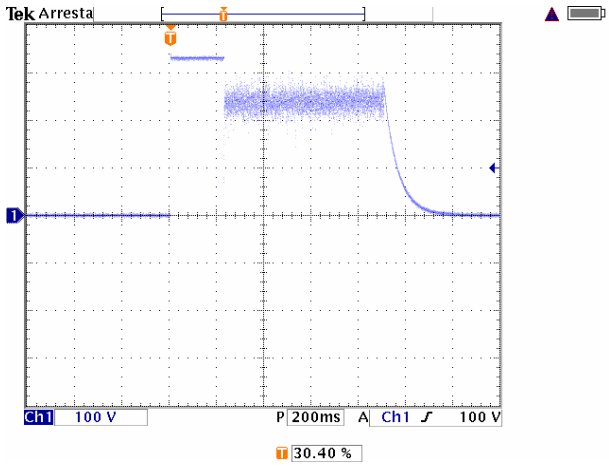
5.2 - Waveforms.

WARNING

FOR THE RELIEFS OF THE WAVEFORMS FIG. 5.2.1. AND 5.2.2 WE SUGGEST TO USE A BATTERY OSCILLOSCOPE OR POWER SUPPLY ISOLATED FROM THE LINE, OR WITH ISOLATED PROBES.

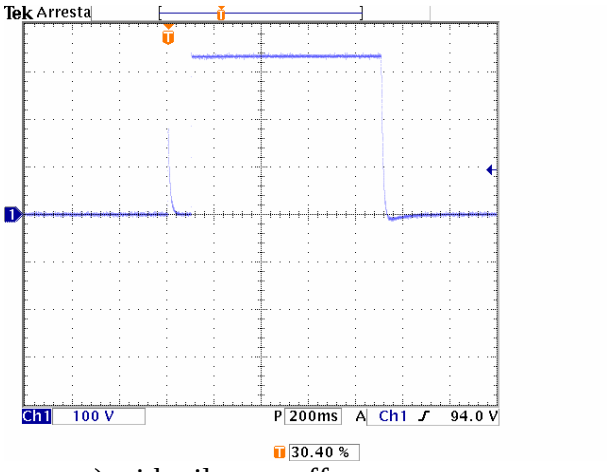


a) with pilot arc off

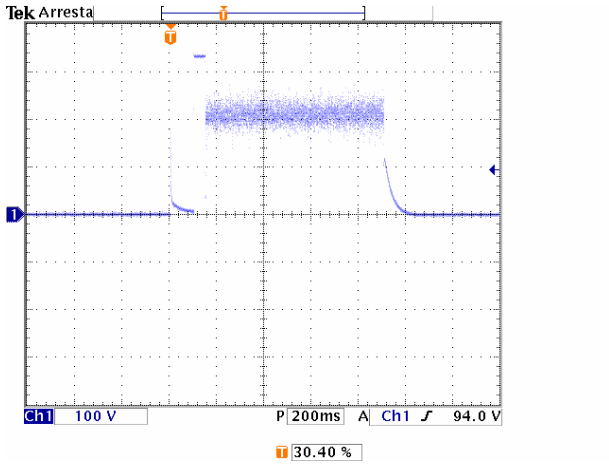


b) with pilot arc lit

5.2.1 - Power Source output voltage (par. 3.3.6, 3.3.8).

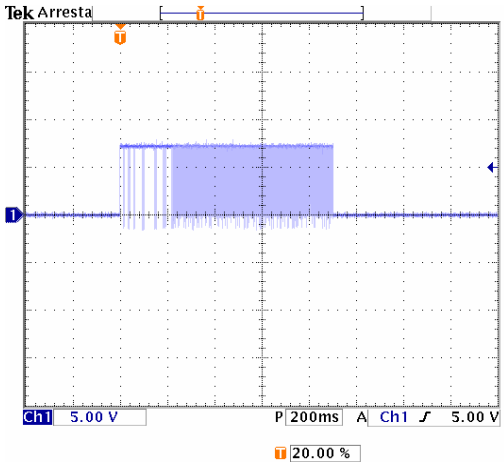


a) with pilot arc off

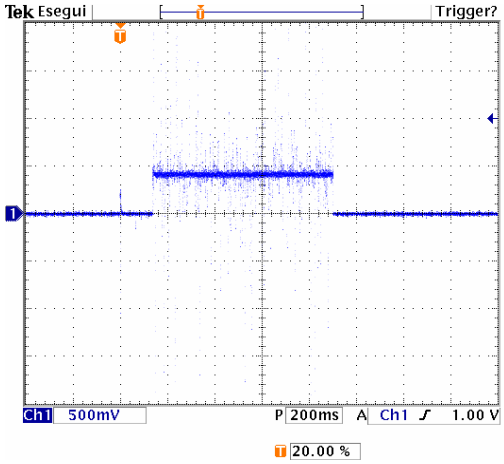


b) with pilot arc lit

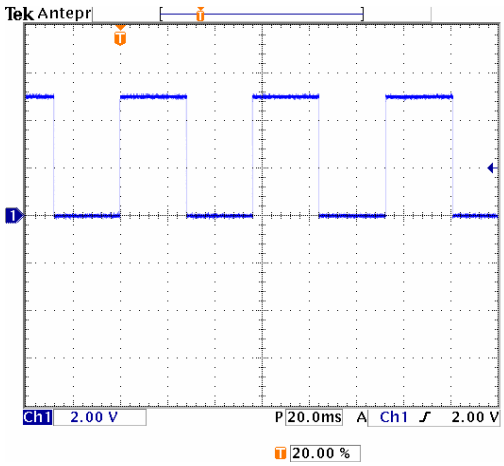
5.2.2 - Nozzle output voltage (par. 3.3.6, 3.3.7).



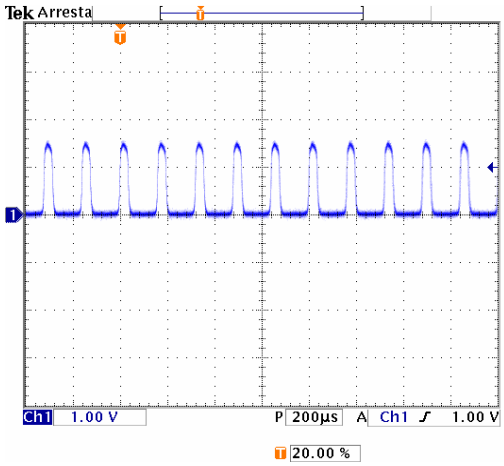
5.2.3 - Pilot arc current reference signal, with pilot arc lit (par. 3.3.8).



5.2.4 - Pilot arc current feedback signal, with pilot arc lit, (par. 3.3.9).



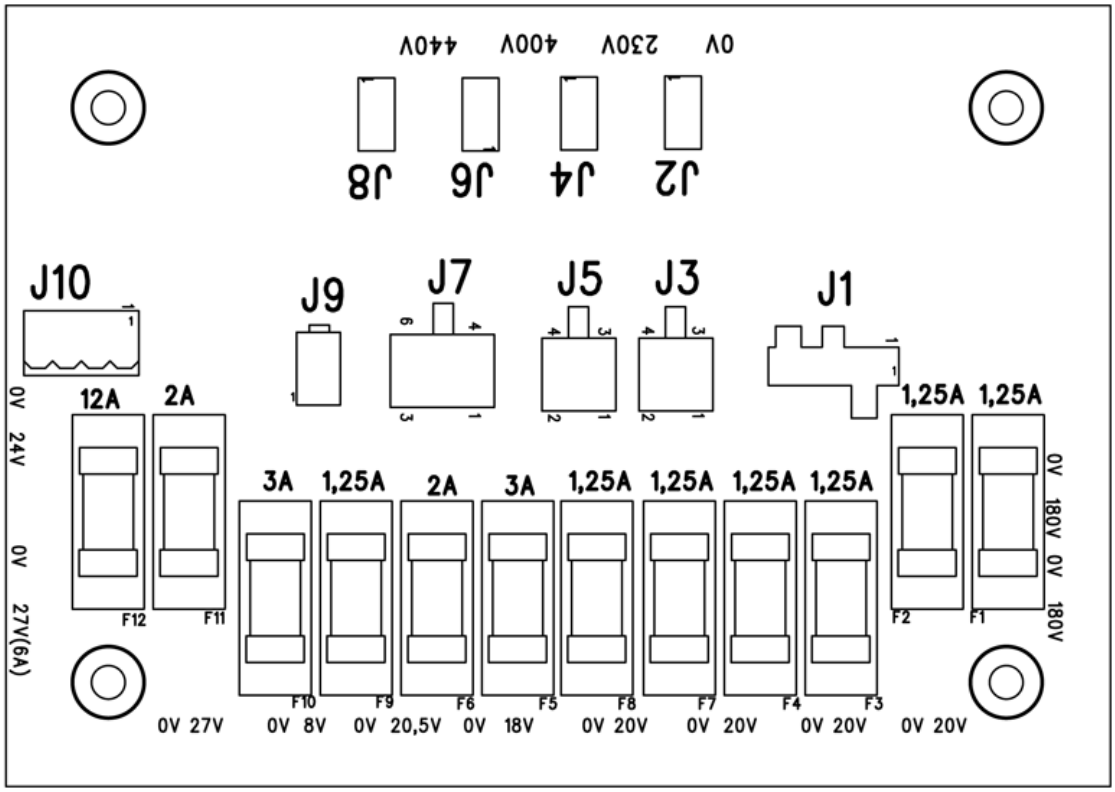
5.2.5 - Cooling Unit flow gauge (42) signal (par. 3.3.11).



5.2.6 - DC-capacitors voltage signal suitable for the precharge phase completion, (par. 3.4.5, 3.4.6).

5.3 - Fuse board (11), code 5.602.305/A.

5.3.1 - Topographical drawing.

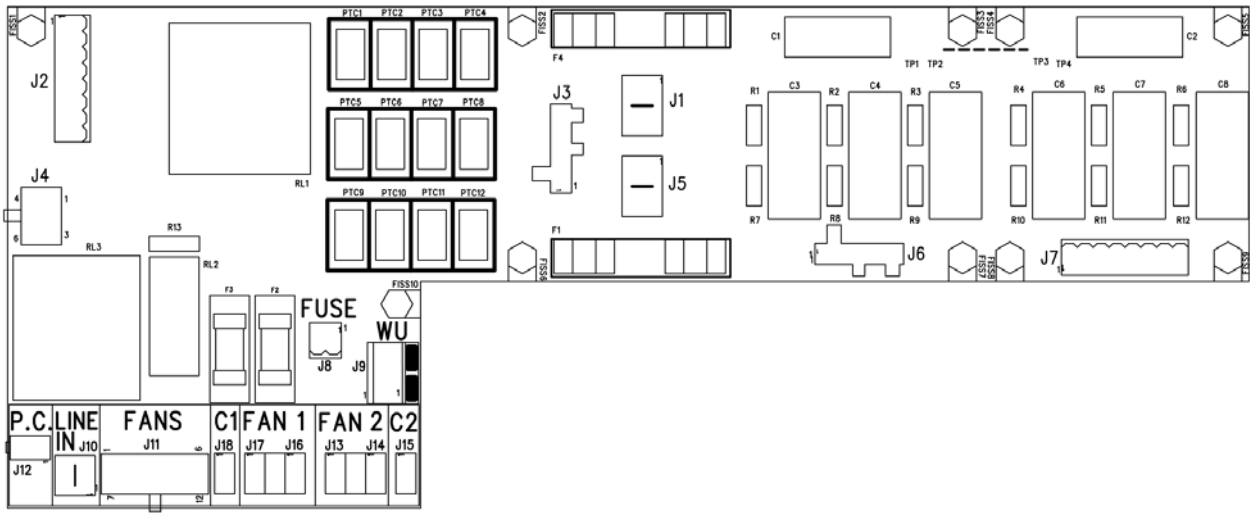


5.3.2 - Connector and fuse table.

Conn.	Terminals	Fuse	Value	Function
J1	1 - 2	F1	1.25 A	180 Vac output for precharge DC-capacitors on power-2 board (4).
J1	3 - 4	F2	1.25 A	180 Vac output for precharge DC-capacitors on power-1 board (4).
J2	-	-	-	0 Vac input for service transformer (11) power supply.
J3	1 - 3	F3	1.25 A	20 Vac output for power-2 board (4) power supply.
J3	2 - 4	F4	1.25 A	20 Vac output for power-1 board (4) power supply.
J4	-	-	-	230 Vac input for service transformer (11) power supply.
J5	1 - 3	F7	1.25 A	20 Vac output for driver-1 board (4) power supply.
J5	2 - 4	F8	1.25 A	20 Vac output for power-2 board (4) power supply.
J6	-	-	-	400 Vac input for service transformer (11) power supply.
J7	1 - 4	F5	3 A	18 Vac output for power supply board (7) power supply.
J7	2 - 5	F6	2 A	20.5 Vac output for interface board (37) power supply.
J7	3 - 6	F9	1.25 A	8 Vac output for measure board (35) power supply.
J8	-	-	-	440 Vac input for service transformer (11) power supply.
J9	1 - 2	F10	3 A	27 Vac output for control board (62) power supply.
J10	1 - 2	F12	12 A	27 Vac output for Gas Console power supply.
J10	3 - 4	F11	2 A	24 Vac output for Gas Console power supply.

5.4 - Pre-charge board (14), code 5.602.342/A.

5.4.1 - Topographical drawing.



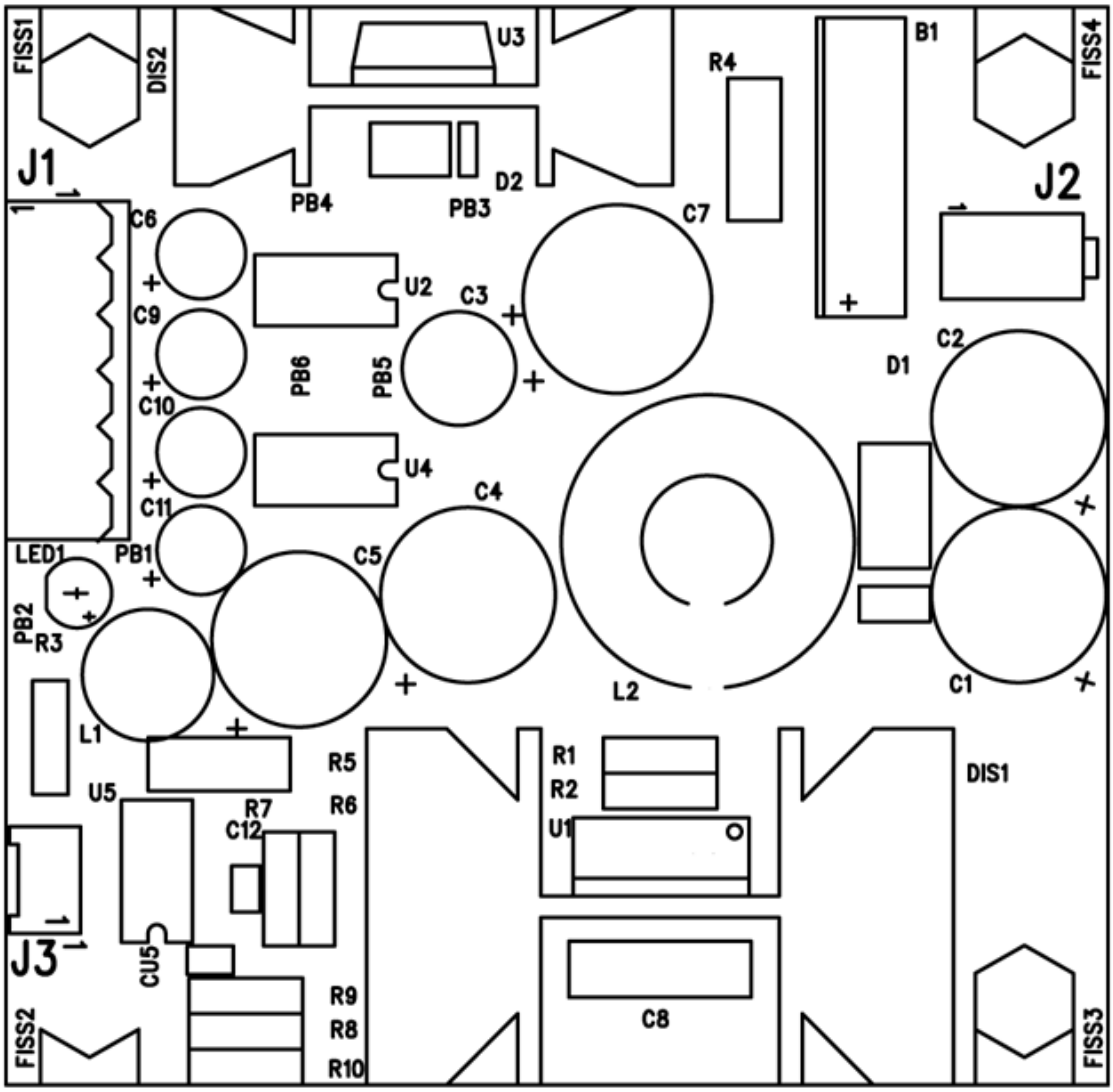
5.4.2 - Connector and fuse table.

Conn.	Terminals	Function
J1	A - B	line voltage output for auxiliary transformer (12) power supply.
J2	1-4-7	line voltage output for transformer (22) pre-magnetizing.
J3	1-3-5	line voltage input for transformer (22) pre-magnetizing.
J4	1 - 2	transformer (22) pre-magnetization relay command input.
J4	3 - 4	cooling unit power supply relay command input.
J4	5 - 6	contactor (72) power supply relay command input.
J5	A - B	line voltage output for service transformer (11) power supply.
J6	1-3-5	line voltage input on mains filter on pre-charge board (14).
J7	1-4-7	line voltage input on second mains filter on pre-charge board (14).
J8	1 - 2	connection for fuse on Power Source rear panel.
J9	1 - 2	power supply output for pump on cooling unit.
J10	A - B	230 Vac voltage input for services and fans.
J11	1 - 7	230 Vac voltage output for fan (46) inside power-1 board (4) tunnel.
J11	2 - 8	230 Vac voltage output for fan (46) inside power-2 board (4) tunnel.
J11	3 - 9	230 Vac voltage output for cooling unit fan (46).
J11	4 - 10	230 Vac voltage output for cooling unit fan (46).
J11	5 - 11	230 Vac voltage output for cooling unit fan (46).
J12	1 - 2	contactor (72) command output.
J13-J14	-	230 Vac output for Power Source fan-1 (63).
J15	-	Power Source fan-1 (63) starting capacitor connection.
J16-J17	-	230 Vac output for Power Source fan-2 (63).
J18	-	Power Source fan-2 (63) starting capacitor connection.

Fuse	Value	Function
F1	5 A	service transformer (11) power supply.
F2	5 A	fan-1 (63) power supply.
F3	5 A	fan-2 (63) power supply.
F4	5 A	auxiliary transformer (12) power supply.

5.5 - Power supply board (7), code 5.602.299/B.

5.5.1 - Topographical drawing.

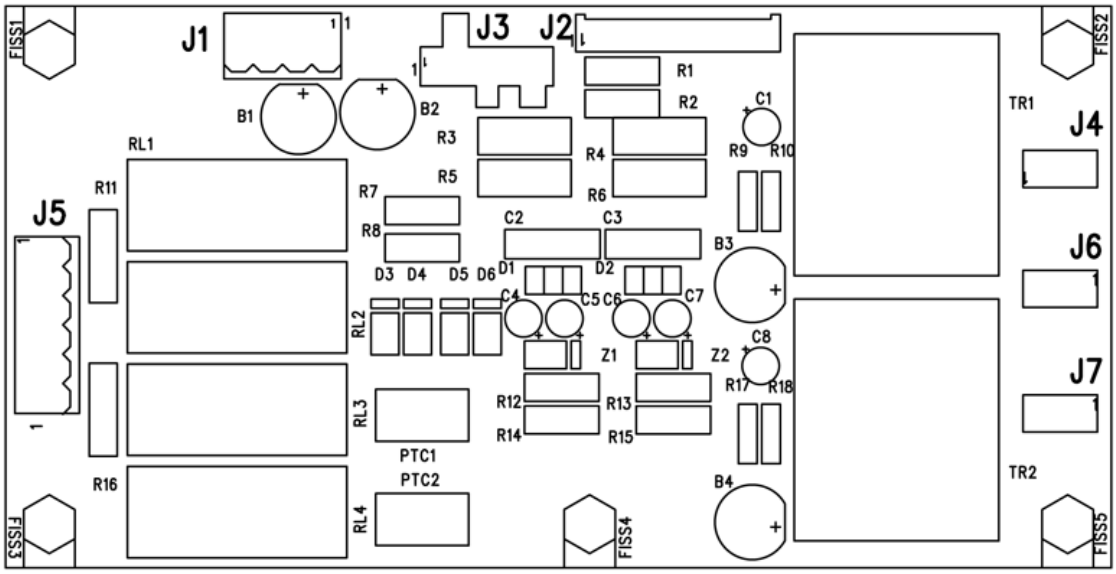


5.5.2 - Connector table.

Conn.	Terminals	Function
J1	1(+) - 2(-)	+15 Vdc output for control board (62) power supply.
J1	3(+) - 2(-)	-15 Vdc-1 output for control board (62) power supply.
J1	4(+) - 2(-)	-15 Vdc-2 output for control board (62) power supply.
J1	5(+) - 6(-)	+8 Vdc output for control board (62) power supply.
J2	1 - 2	18 Vac input for power supply board (7) power supply.
J3	1 - 2	“Under Voltage” signal output for control board (62).

5.6 - Precharge-cond board (6), code 5.602.302.

5.6.1 - Topographical drawing.

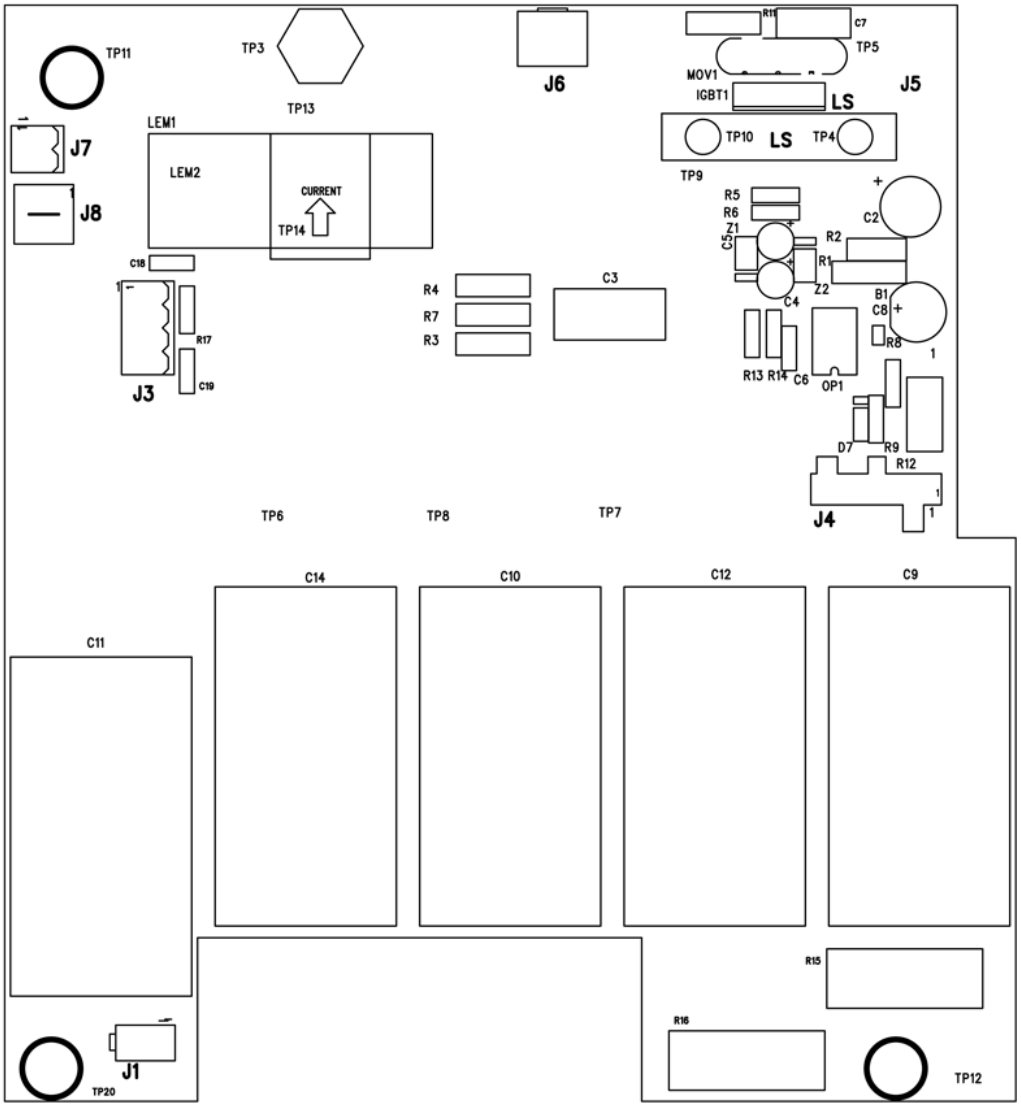


5.6.2 - Connector table.

Conn.	Terminals	Function
J1	1 - 2	180 Vac input for precharge DC-capacitors on power-2 board (4).
J1	3 - 4	180 Vac input for precharge DC-capacitors on power-1 board (4).
J2	1 - 2	“power-1 board (4) precharge DC-capacitors completed” signal output.
J2	3 - 4	“power-2 board (4) precharge DC-capacitors completed” signal output.
J2	5 - 6	NU.
J2	7 - 8	line voltage signal output (phase R-S) for control board (62).
J2	9 - 10	line voltage signal output (phase T-S) for control board (62).
J3	1(+) - 2(-)	330 Vdc output for precharge DC-capacitors on power-2 board (4).
J3	3(+) - 4(-)	330 Vdc output for precharge DC-capacitors on power-1 board (4).
J4	-	line voltage input, phase T.
J5	1 - 2	precharge DC-capacitors on power board (4) enable rele command input.
J5	3 - 4	precharge DC-capacitors on power-1 board (4) rele command input.
J5	5 - 6	precharge DC-capacitors on power-2 board (4) rele command input.
J6	-	line voltage input, phase S.
J7	-	line voltage input, phase R.

5.7 - Power board (4), code 5.602.301/A.

5.7.1 - Topographical drawing.

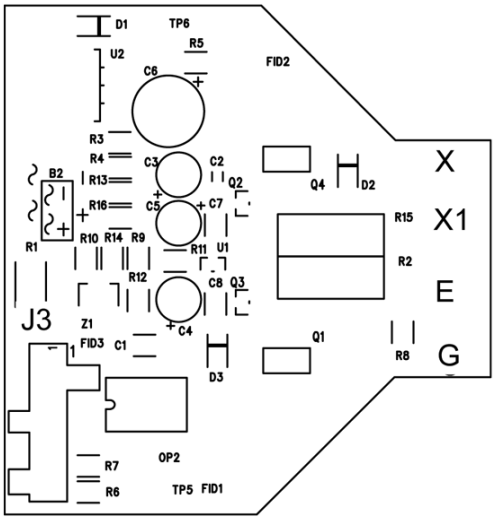


5.7.2 - Connector table.

Conn.	Terminals	Function
J1	1(+) - 2(-)	330 Vdc input for precharge DC-capacitors on power board (4).
J2	-	NU.
J3	1	power board (4), output current signal output.
J3	2(+) - 3(-)	+15 Vdc input for current transducer power supply.
J3	4(+) - 3(-)	-15 Vdc input for current transducer power supply.
J4	1 - 2	20 Vac input for power board (4) power supply.
J4	4 - 5	power board (4) igbt command input.
J5	-	output voltage output, nozzle (+) potential.
J6	-	output voltage output, ground potential, for RC (5) board.
J7	1 - 2	power board (4) thermo switch temperature signal output.
J8	A - B	power board (4) thermo switch temperature signal input.
-	TP3	output voltage output, ground potential (+).
-	TP7	output voltage output, electrode potential (-).

5.8 - Driver board (4), code 5.602.300/B.

5.8.1 - Topographical drawing.

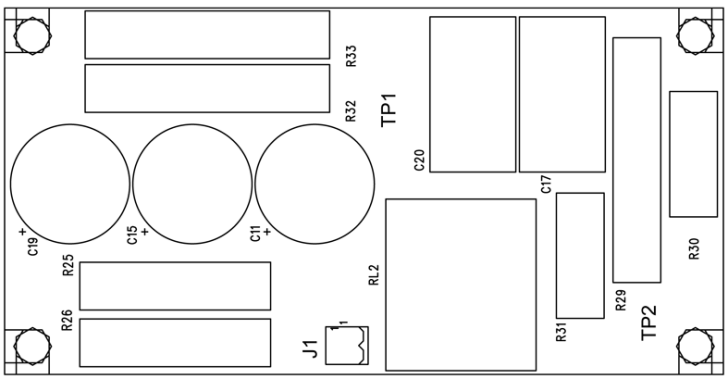


5.8.2 - Connector table.

Conn.	Terminals	Function
J3	1 - 3	20 Vac input for driver board (4) power supply.
J3	4 - 5	power board (4) igbt command input.
-	G	output for power board (4) igbt gate terminal.
-	E	output for power board (4) igbt emitter terminal.
-	X - X1	NU.

5.9 - RC board (5), code 5.602.345.

5.9.1 - Topographical drawing.

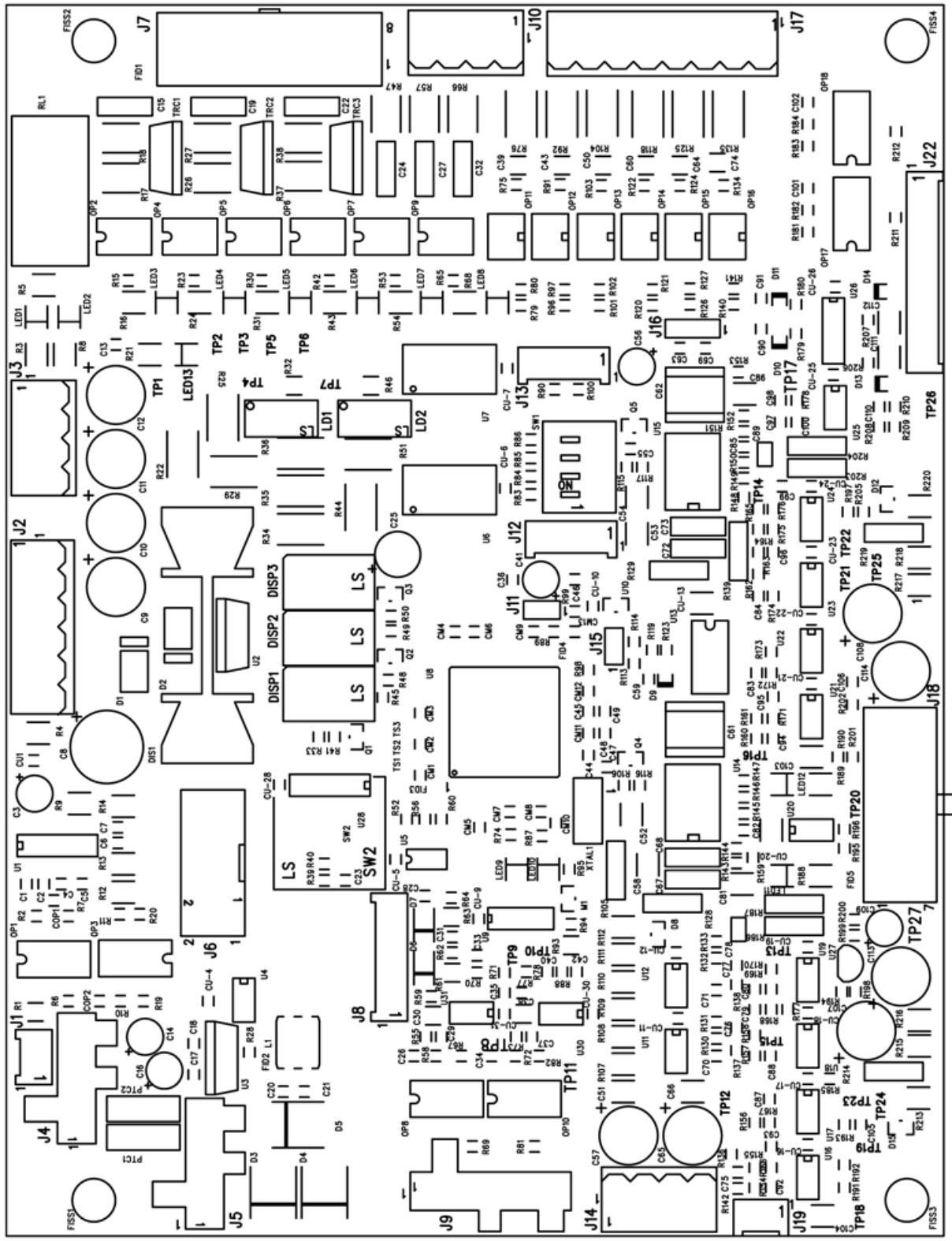


5.9.2 - Connector table.

Conn.	Terminals	Function
J1	1 - 2	input command for pilot arc relay on RC board (5).
-	TP1	output voltage input, electrode potential.
-	TP2	output voltage input, ground potential.

5.10 - Control board (62), code 5.602.298/A.

5.10.1 - Topographical drawing.

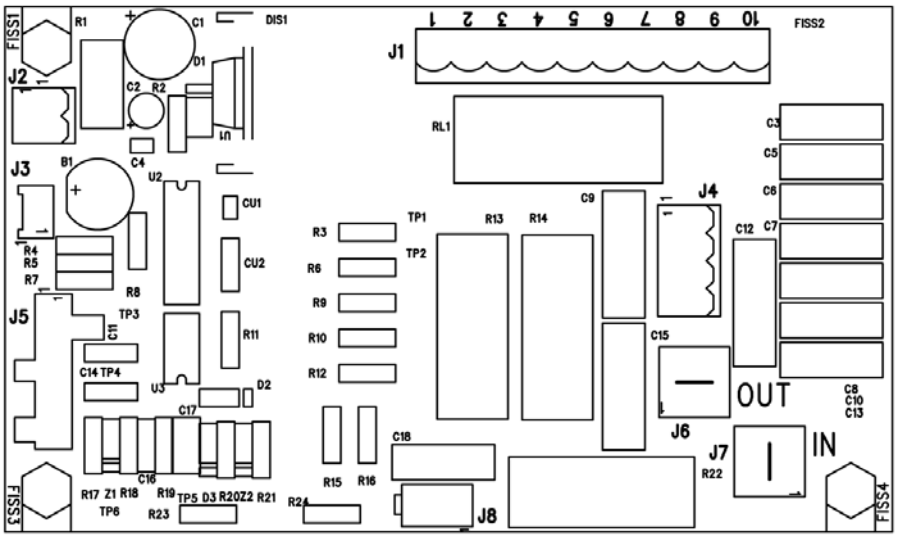


5.10.2 - Connector table.

Conn.	Terminals	Function
J1	-	NU.
J2	1(+) - 2(-)	+15 Vdc input for control board (62) power supply.
J2	3(+) - 2(-)	-15 Vdc-1 input for control board (62) power supply.
J2	4(+) - 2(-)	-15 Vdc-2 input for control board (62) power supply.
J2	5(+) - 6(-)	+8 Vdc input for control board (62) power supply.
J3	1 - 2	power-2 board (4) nozzle igbt command output.
J3	3 - 4	power-1 board (4) nozzle igbt command output.
J4	1(+) - 2(-)	+8 Vdc output for power supply CAN bus communication line.
J4	3 - 4	CAN bus communication line signals.
J5	1(+) - 2(-)	+8 Vdc input for power supply CAN bus communication line.
J5	3 - 4	CAN bus communication line signals.
J6	-	Plasma Prof 254 cutting system programming connector.
J7	1 - 8	cooling unit power supply relay command output.
J7	2 - 9	precharge DC-capacitors on power-2 board (4) relay command output.
J7	3 - 10	precharge DC-capacitors on power-1 board (4) relay command output.
J7	4 - 11	transformer (22) pre-magnetization relay command output.
J7	5 - 12	contactor (72) power supply relay command output.
J7	6 - 13	output command for pilot arc relay on RC board (5).
J7	7 - 14	27 Vac voltage input for services power supply.
J8	-	NU.
J9	1(+) - 2(-)	“arc voltage” digital signal input.
J9	4(+) -5(-)	“nozzle voltage” digital signal input.
J10	-	NU.
J11	-	NU.
J12	-	NU.
J13	1(+) - 3(-)	+5Vdc voltage output for flu-switch on cooling unit.
J13	2	“cooling liquid flow” signal input.
J14	1	Power Source output current signal input.
J14	2(+) - 3(-)	+15 Vdc output for output current transducer power supply.
J14	4(+) - 3(-)	-15 Vdc output for output current transducer power supply.
J15	-	NU.
J16	1 - 2	jumper for flow switch reading signal configuration.
J17	1 - 2	temperature signal input from thermostat on power-1 board (4).
J17	3 - 4	temperature signal input from thermostat on power-2 board (4).
J17	5 - 6	temperature signal input from thermostat on transformer (22).
J17	7 - 8	“guard open” signal input, on Power Source and HV19 Unit.
J18	1	power-1 board (4), output current signal input.
J18	2(+) - 7(-)	+15 Vdc output for power-1 board (4), current transducer power supply.
J18	8(+) - 7(-)	-15 Vdc output for power-1 board (4), current transducer power supply.
J18	5	power-2 board (4), output current signal input.
J18	6(+) - 11(-)	+15 Vdc output for power-2 board (4), current transducer power supply.
J18	12(+) - 11(-)	-15 Vdc output for power-2 board (4), current transducer power supply.
J18	3 - 9	PWM-1 signal output for driver-1 board (4).
J18	4 - 10	PWM-2 signal output for driver-2 board (4).
J19	1 - 2	NU. (must be jumpered).
J20	-	NU.
J21	-	NU.
J22	1 - 2	“power-1 board (4) DC-capacitors precharge completed” signal input.
J22	3 - 4	“power-2 board (4) DC-capacitors precharge completed” signal input.
J22	5 - 6	NU.
J22	7 - 8	line voltage signal input (phase R-S).
J22	9 - 10	line voltage signal input (phase T-S).

5.11 - Measure board (35), code 5.602.343.

5.11.1 - Topographical drawing.

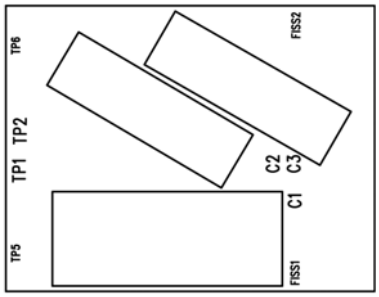


5.11.2 - Connector table.

Conn.	Terminals	Function
J1	1 - 2	NU.
J1	3 - 4	“guard open” signal output, on Power Source and HV19 Unit.
J1	5 - 6	“Power Source guard open” signal input.
J1	7 - 8	HV19 Unit “guard open” signal input.
J1	9 - 10	NU.
J2	1 - 2	8 Vac input for measure board (35) power supply.
J3	-	NU.
J4	4(+) - 1(-)	“Power Source output voltage” signal input.
J5	1(+) - 2(-)	“arc voltage” digital signal output.
J5	4(+) -5(-)	“nozzle voltage” digital signal output.
J6	A	output voltage input, nozzle (+) potential.
J7	A	output voltage output, nozzle (+) potential.
J8	1(+) - 2(-)	“arc voltage” signal output for plant (pantograph or robot).

5.12 - HF filter board (73), code 5.602.359.

5.12.1 - Topographical drawing.

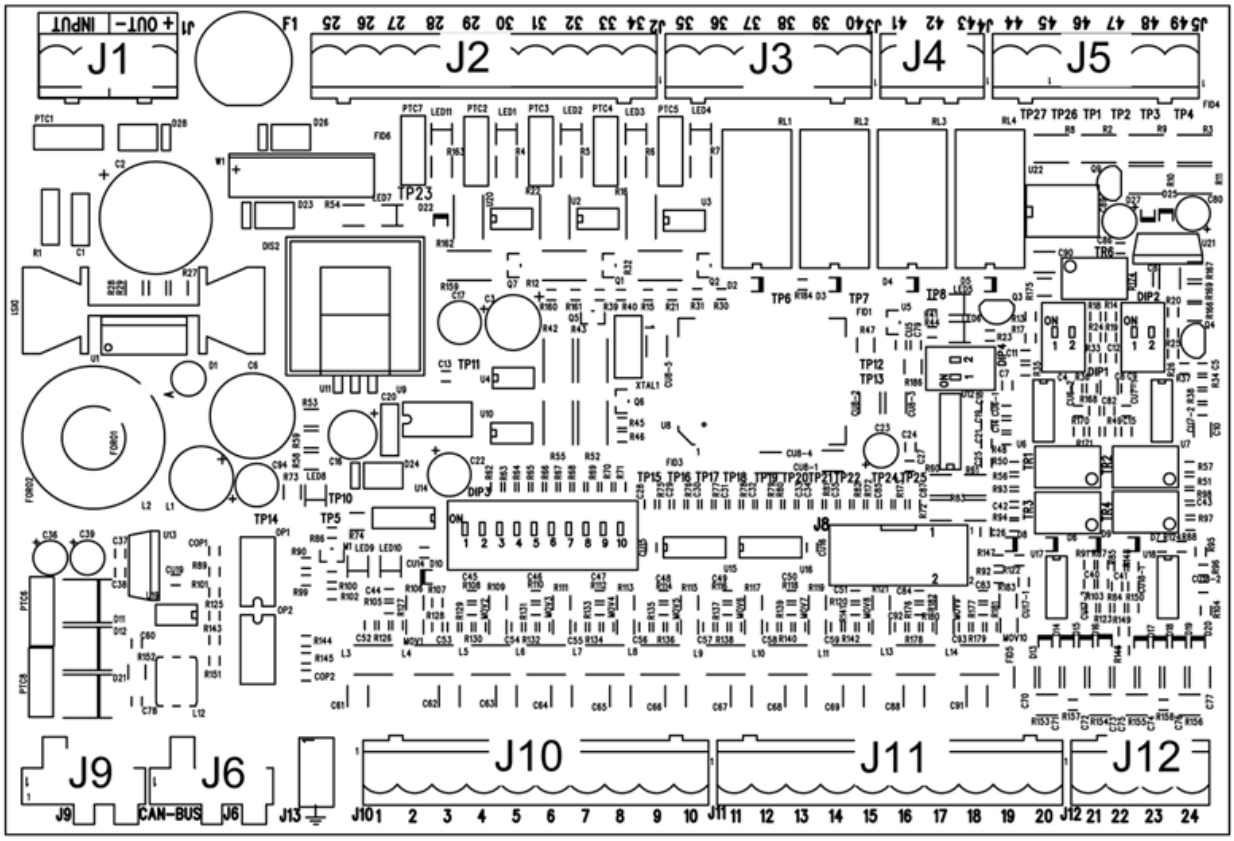


5.12.2 - Connector table.

Conn.	Terminals	Function
-	TP1	connection to Power Source output terminal (+) (ground potential).
-	TP2	connection to Power Source output terminal (-) (electrode potential).

5.13 - Interface board (37), code 5.602.281/A.

5.13.1 - Topographical drawing.

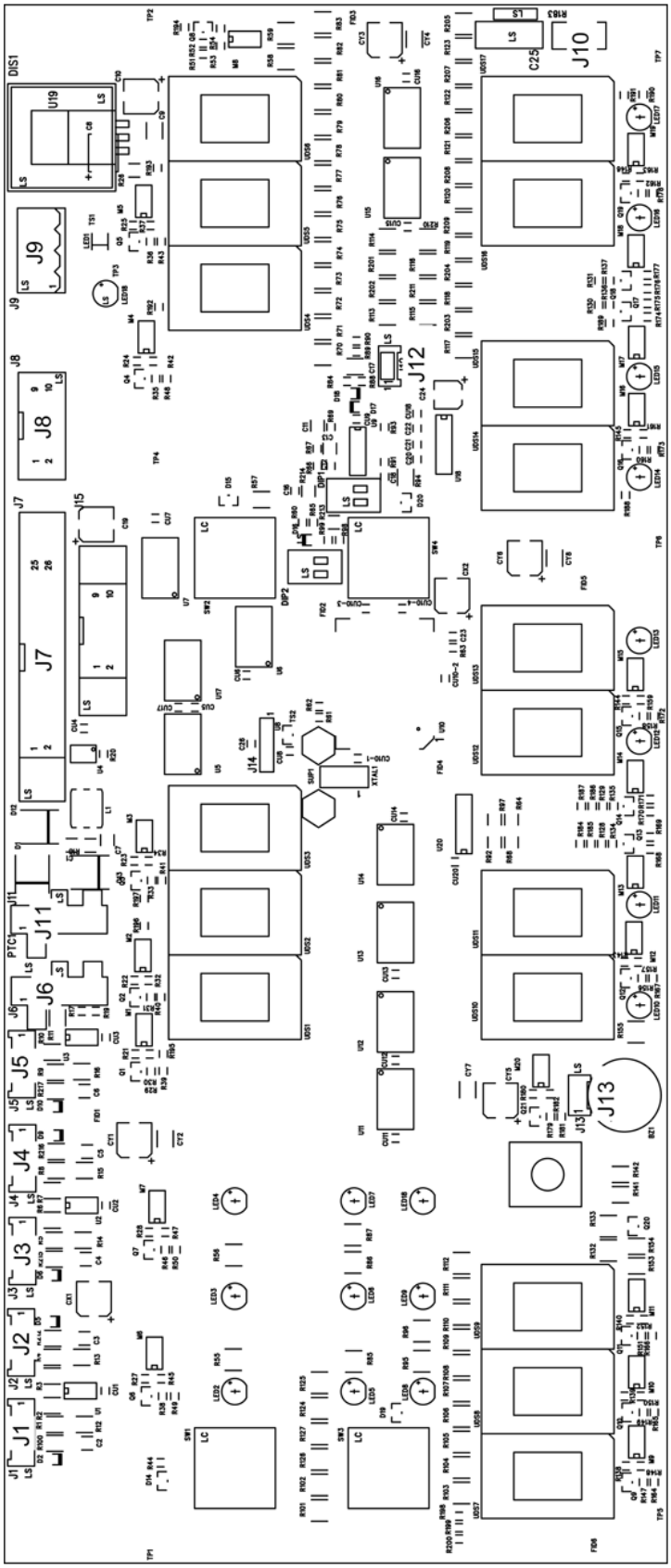


5.13.2 - Connector table.

Conn.	Terminals	Function
J1	1 - 2	NU.
J1	3 - 4	20,5 Vac input for interface board (37) power supply.
J2	-	NU.
J3	-	NU.
J4	-	NU.
J5	1 - 2	NU.
J5	3 - 4	“arc voltage /25-50” signal output for plant.
J5	5 - 6	NU.
J6	1(+) - 2(-)	+8 Vdc input for power supply CAN bus communication line.
J6	3 - 4	CAN bus communication line signals.
J8	-	NU.
J9	-	NU.
J10	1 - 2	“operation enable” signal input, from plant.
J10	3 - 4	“start” signal input from plant.
J11	-	NU.
J12	-	NU.
J13	-	GND.

5.14 - Panel board (23), code 5.602.354 (on Gas Console).

5.14.1 - Topographical drawing.

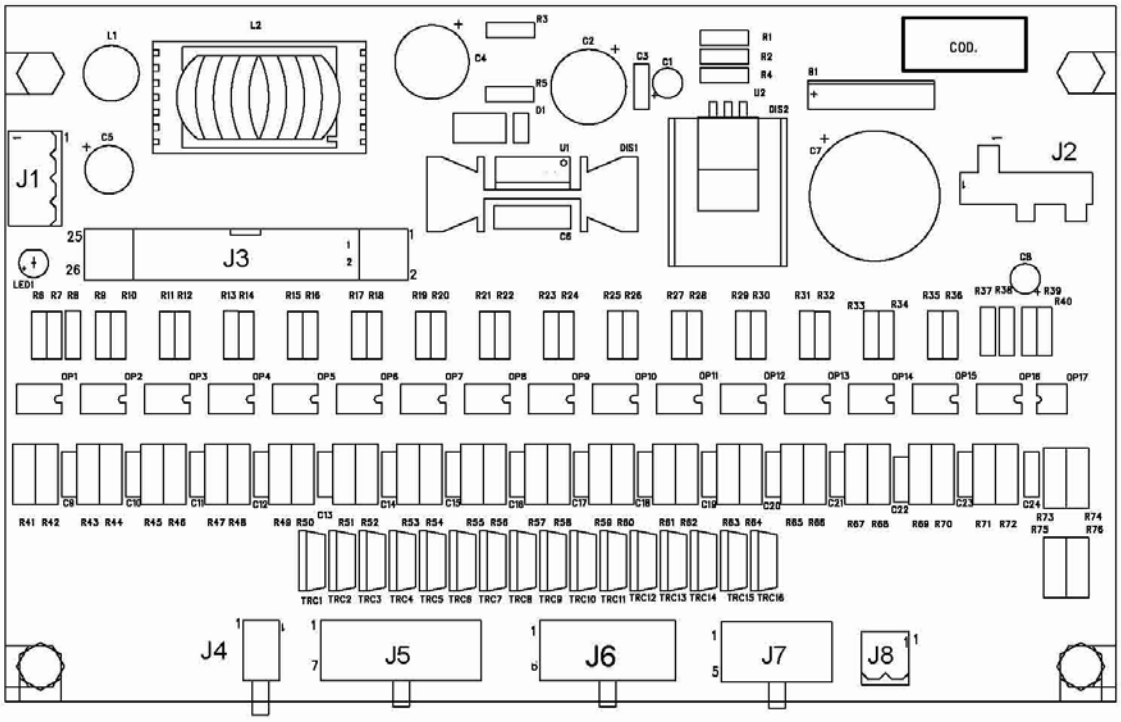


5.14.2 - Connector table.

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 PGC-2 Gas 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 (3).
J7	3	solenoid valve “V7” control signal output.
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	solenoid valve “V11” control signal output.
J7	16	solenoid valve “V12” 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	22-23-24	NU.
J8	-	NU.
J9	1(+) - 3(-)	+18 Vdc input for panel board (23) power supply.
J9	4(+) - 3(-)	+8 Vdc input for panel board (23) power supply.
J10	-	NU.
J11	-	NU.
J12	1 - 2	“PGC-2 Gas Console connected” signal input.
J13	2(+) - 1(-)	command output for warning led on PGC-2 Gas Console.
J14	-	NU.
J15	1(+) - 10(-)	“PWM-0” signal output for VP1 proportional solenoid valve on PVC-3 Valve Unit.

5.15 - Solenoid valve board (3), code 5.602.245/B (on Gas Console).

5.15.1 - Topographical drawing.



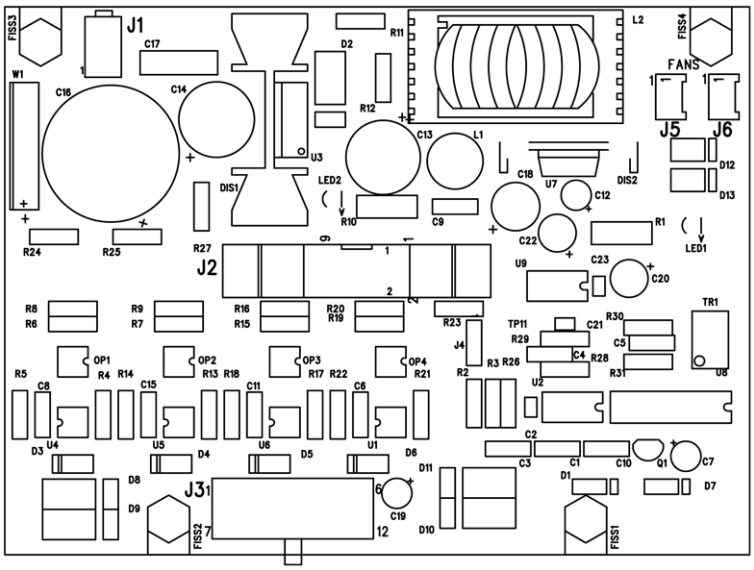
5.15.2 - Connector table.

Conn.	Terminals	Function
J1	1(+) - 3(-)	+18 Vdc output, for panel board (23) power supply.
J1	4(+) - 3(-)	+8 Vdc output, for panel board (23) power supply.
J2	1 - 2	24 Vac input, for solenoid valve board (3) 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 (23).
J3	3	solenoid valve “V7” control command signal input.
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	solenoid valve “V11” control command signal input.
J3	16	solenoid valve “V12” 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	22-23-24	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	solenoid valve V11 command output.
J5	11 - 12	solenoid valve V10 command output.
J6	1 - 2	solenoid valve V12 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	solenoid valve V7 command output.
J7	7 - 8	solenoid valve V6 command output.
J8	-	NU.

5.16 - Auxiliary supply (2), code 5.602.344.

5.16.1 - Topographical drawing.

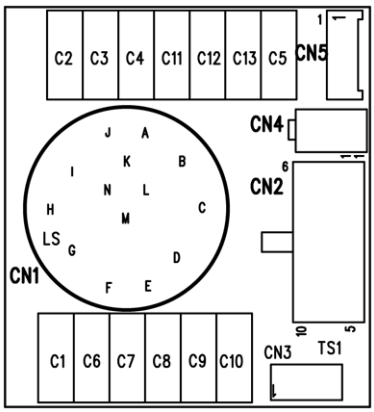


5.16.2 - Connector table.

Conn.	Terminals	Function
J1	1 - 2	27 Vac input, for auxiliary supply board (2) power supply.
J2	1(+) - 10(-)	“PWM-0” signal input for VP1 proportional solenoid valve on PVC-3 Valve Unit.
J3	4(+) - 12(-)	command output for VP1 proportional solenoid valve on PVC-3 Valve Unit.
J4	-	NU.
J5	-	NU.
J6	1(+) - 2(-)	command output for PGC-3 Gas Console fan.

5.17 - Connector board (13), code 5.602.312/A.

5.17.1 - Topographical drawing.

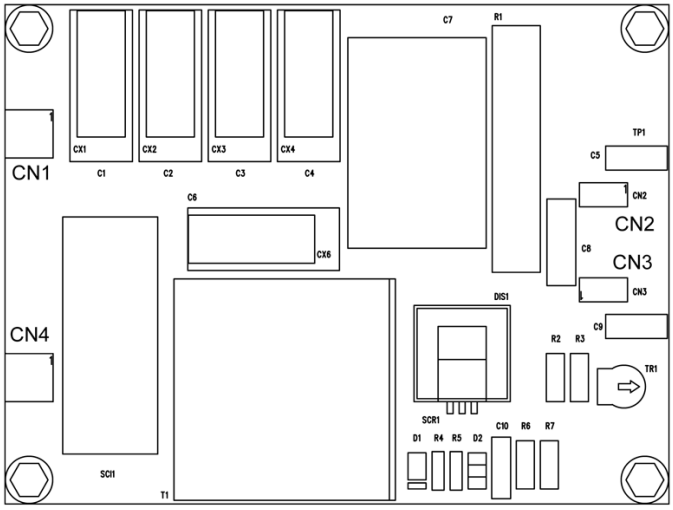


5.17.2 - Connector tables.

Conn.	Terminals	Function
J1	1 - 2	solenoid valve V12 command output.
J1	3 - 4	solenoid valve V23 command output.
J1	5 - 6	solenoid valve V22 command output.
J1	7 - 8	solenoid valve V21 command output.
J1	9 - 12	solenoid valve V20 command output.
J1	10	GND.
J1	11	NU.
J1	13 - 14	command output for VP1 proportional solenoid valve on PVC-3 Valve Unit.
J2	1 - 2	solenoid valve V12 command input.
J2	3 - 4	solenoid valve V23 command input.
J2	5 - 6	solenoid valve V22 command input.
J2	7 - 8	solenoid valve V21 command input.
J2	9 - 10	solenoid valve V20 command input.
J3	-	GND.
J4	1(+) - 2(-)	command input for VP1 proportional solenoid valve on PVC-3 Valve Unit.
J5	-	NU.

5.18 - HF board (8), code 5.602.363 (on HV19 Unit).

5.18.1 - Topographical drawing.

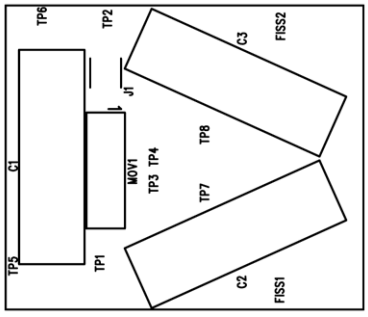


5.18.2 - Connector table.

Conn.	Terminals	Function
-	CN1 - CN4	output for HF transformer (9) primary circuit, on HV19 Unit.
-	CN2	output voltage input, nozzle potential, from Power Source.
-	CN3	output voltage input, electrode potential, from Power Source.

5.19 - HF-2-filter board (13), code 5.602.349 (on HV19 Unit).

5.19.1 - Topographical drawing.

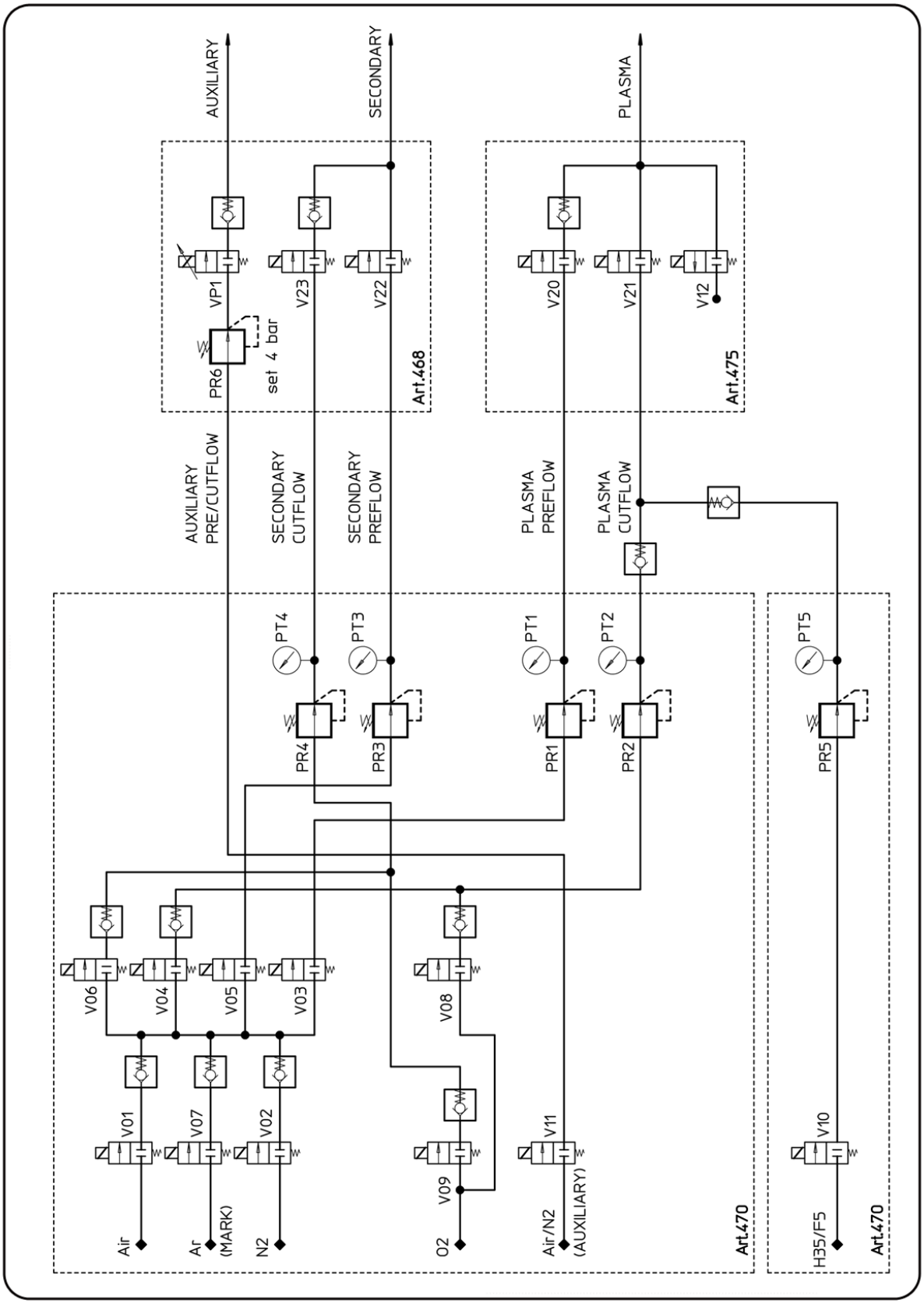


5.19.2 - Connector table.

Conn.	Terminals	Function
J1	A	NU.
-	TP1	output voltage input, nozzle potential.
-	TP2	output voltage input, electrode potential.
-	TP3	output voltage output, nozzle potential, for HF board (8).
-	TP4	output voltage output, electrode potential, for HF board (8).

6 - PNEUMATIC DIAGRAM.

6.1 - Pneumatic circuit functional diagram.

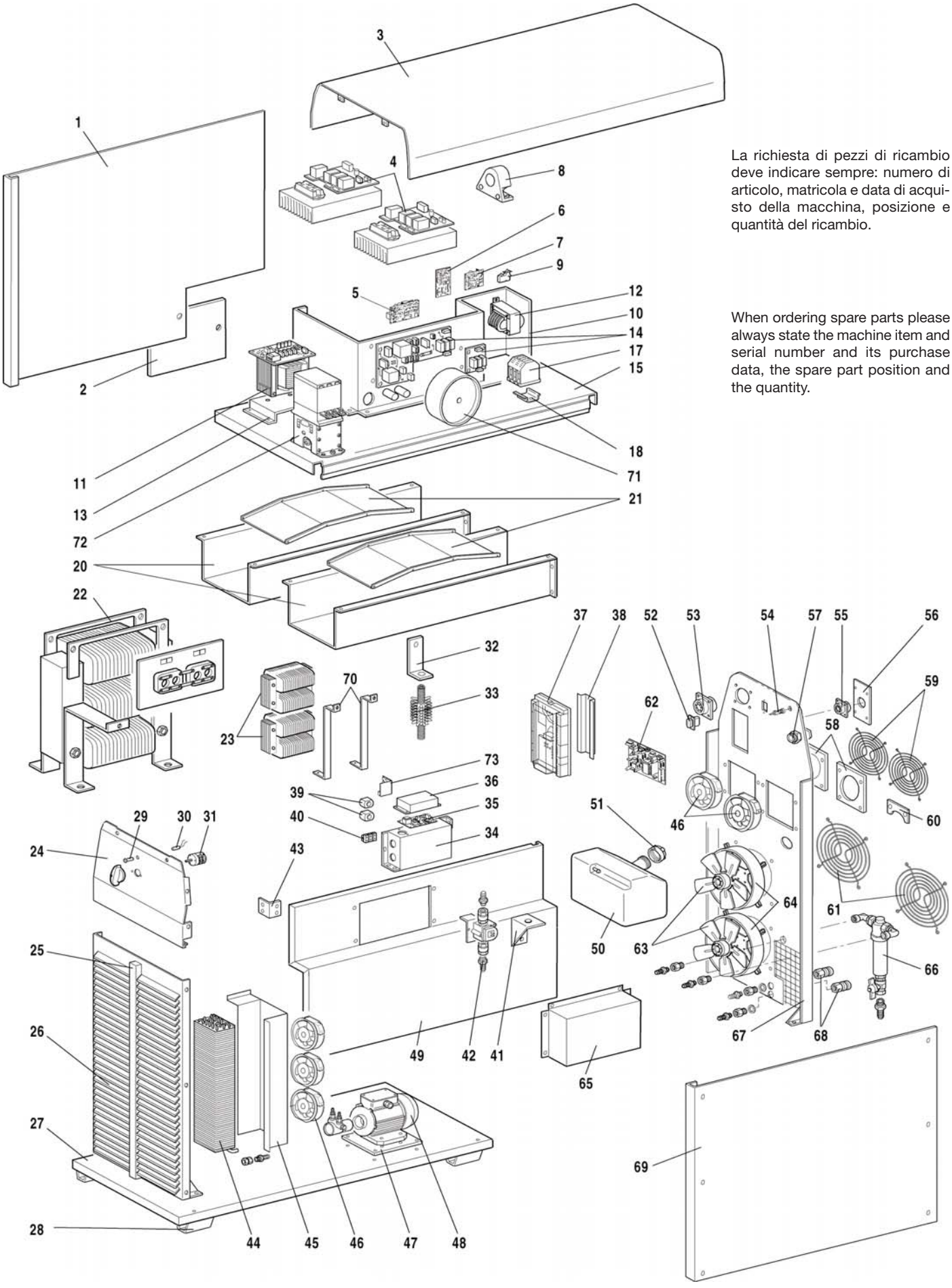


ART. 955

pos	DESCRIZIONE	DESCRIPTION
01	LATERALE SINISTRO	LEFT SIDE PANEL
02	PANNELLO CHIUSURA	LATERAL CLOSING PANEL
03	COPERCHIO	COVER
04	GRUPPO IGBT	IGBT UNIT
05	CIRCUITO R.C.	RC CIRCUIT
06	CIRCUITO PRECARICA	PRECHARGE CIRCUIT
07	CIRCUITO ALIMENTAZ.	POWER SUPPLY CIRCUIT
08	TRASDUTTORE	TRANSDUCER
09	PULSANTE SICUREZZA	SAFETY SWITCH
10	PIANO INTERMEDIO	INSIDE BAFFLE
11	TRASFORMATORE DI SERVIZIO	SERVICE TRANSFORMER
12	TRASFORMATORE AUSILIARIO	AUXILIARY TRANSFORMER
13	SUPPORTO TRASFORMATORE	TRANSFORMER SUPPORT
14	CIRCUITO PRECARICA + FILTRO RETE	PRECHARGE CIRCUIT + MAINS FILTER
15	PIANO INTERMEDIO	INSIDE BAFFLE
17	MORSETTIERA	TERMINAL BOARD
18	SUPPORTO MORSET-TIERA	TERMINAL BOARD MAINS SUPPORT
20	TUNNEL GRUPPO DI POTENZA	POWER UNIT TUNNEL
21	CONVOGLIATORE ARIA	AIR CONVEYOR
22	TRASFOR. DI POTENZA	POWER TRANSFORMER
23	IMPEDENZA COMPLETA	COMPLETE CHOKE
24	PANNELLO COMANDI	CONTROL PANEL
25	PANNELLO CHIUSURA	CLOSING PANEL
26	PANNELLO ANTERIORE	FRONT PANEL
27	FONDO	BOTTOM
28	SUPPORTO MACCHINA	MACHINE FOOT
29	PORTALAMPADA	LAMP HOLDER
30	LAMPADA	LAMP
31	INTERRUTTORE	SWITCH
32	SUPP. RESISTENZA	RESISTOR SUPPORT
33	RESISTENZA	RESISTOR
34	SUPPORTO MORSETTIERA	TERMINAL BOARD SUPPORT
35	CIRCUITO TORCIA + MISURA	TORCH+MEASURE CIRCUIT
36	PROTEZIONE CIRCUITO	CIRCUIT PROTECTION
37	CIRCUITO INTERFACCIA	INTERFACE CIRCUIT
38	SUPPORTO CIRCUITO ITERFACCIA	INTARFACE CIRCUIT SUPPORT

pos	DESCRIZIONE	DESCRIPTION
39	SUPPORTO ISOLANTE	ISOLATED SUPPORT
40	MORSETTIERA	TERMINAL BOARD
41	SUPPORTO SERBATOIO	TANK SUPPORT
42	GRUPPO FLUSSIMETRO	FLOWMETER UNIT
43	RINFORZO PIANO INTERMEDIO	REINFORCEMENT INSIDE BAFFLE
44	RADIATORE	RADIATOR
45	SUPPORTO RADIATORE	RADIATOR SUPPORT
46	MOTOVENTOLA	MOTOR-FAN
47	SUPPORTO MOTOPOMPA	MOTORPUMP SUPPORT
48	MOTORE + POMPA	MOTORPUMP
49	PIANO INTERMEDIO	INSIDE BAFFLE
50	SERBATOIO	TANK
51	TAPPO SERBATOIO	CAP
52	PROTEZIONE CONNETTORE	CONNECTOR PROTECTION
53	CONNESSIONE CON CONNETTORE 10 VIE	10 POLES CONNECTOR
54	POTRAFUSIBILE	FUSE HOLDER
55	CONNESSIONE CON CONNETTORE 14 VIE	14 POLES CONNECTOR
56	SUPPORTO CONNETTORE	CONNECTOR SUPPORT
57	PRESSACAVO	STRAIN RELIEF
58	SUPP. MOTOVENTOLA	MOTOR-FAN SUPPORT
59	PROTEZIONE MOTOVENTOLA	MOTOR-FUN PROTECTION GRID
60	PIASTRA CHIUSURA SERBATOIO	CLOSING TANK PLATE
61	PROTEZIONE MOTORE	MOTOR PROTECTION GRID
62	CIRCUITO CONTROLLO	CONTROL CIRCUIT
63	MOTORE + VENTOLA	MOTOR + FAN
64	TUNNEL + SUPPORTO	TUNNEL + SUPPORT
65	PROTEZIONE MORSETTIERA	TERMINAL BOARD PROTECTION
66	FILTRO AUTOPULENTE	SELF-CLEANING FILTER
67	PANNELLO POSTER.	BACK PANEL
68	RACCORDO TUBO ACQUA	WATER HOSE FITTING
69	LATERALE DESTRO	RIGHT SIDE PANEL
70	SUPPORTO IMPEDENZA	CHOKE SUPPORT
71	INDUTTANZA DI FILTRO RETE	MAINS FILTER
72	TELERUTTORE	CONTACTOR
73	CIRCUITO FILTRO	FILTER CIRCUIT

ART. 955



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

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

ART. 470

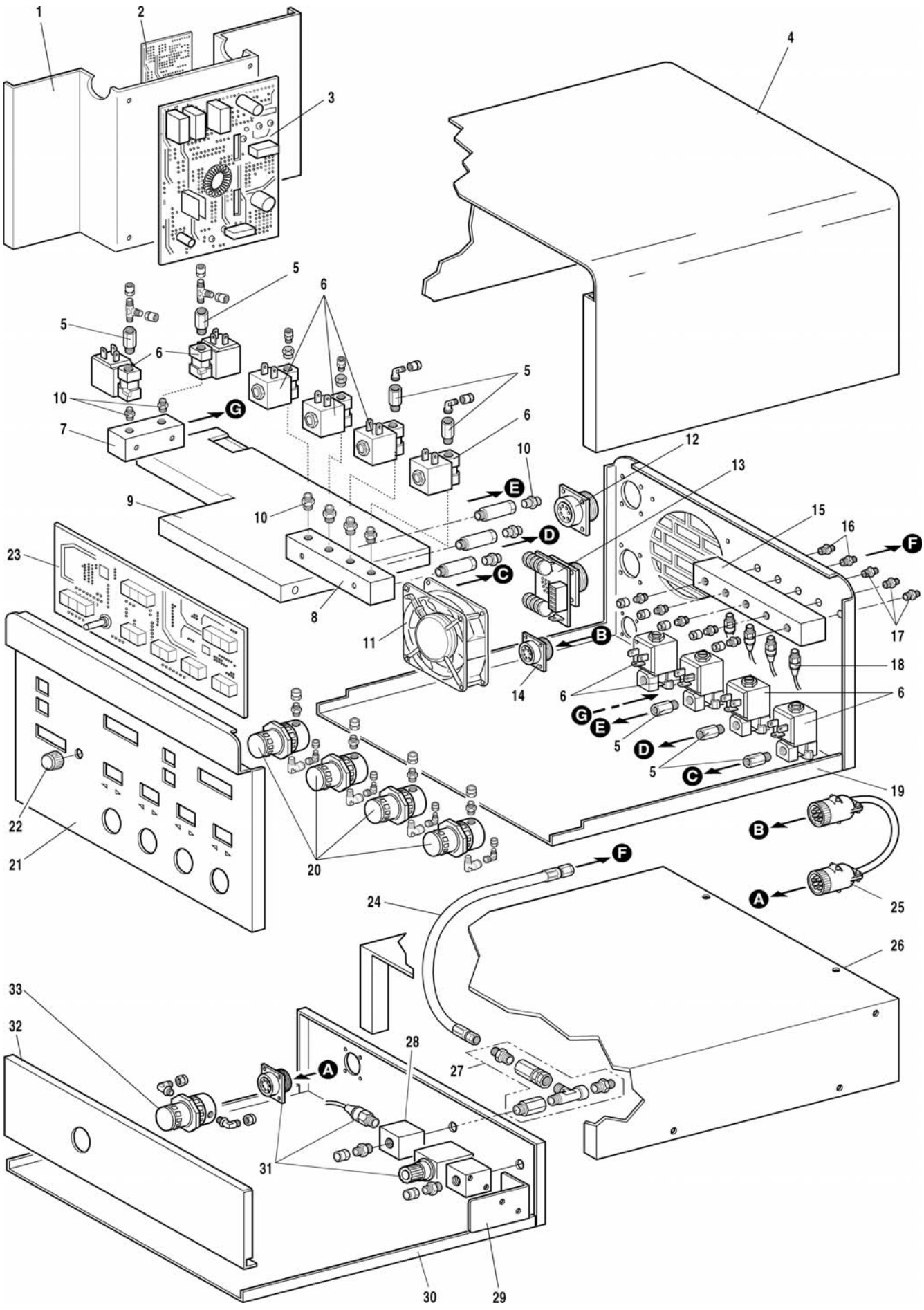
pos	DESCRIZIONE	DESCRIPTION
01	SUPPORTO CIRCUITO	BOARD SUPPORT
02	CIRCUITO ALIMENTA-ZIONE+SERVIZI AUX	SUPPLY CIRCUIT+ AUX SERVICE
03	CIRCUITO ALIMENTA-ZIONE+SERVIZI	SUPPLY CIRCUIT+ SERVICE
04	FASCIONE	HOUSING
05	RACCORDO	FITTING
06	ELETTROVALVOLA	SOLENOID VALVE
07	RACCORDO PRESE MULTIPLE	FITTING
08	RACCORDO PRESE MULTIPLE	FITTING
09	PIANO INTERMEDIO	INSIDE BAFFLE
10	NIPPLO	NIPPLE
11	MOTOVENTOLA	MOTOR-FAN
12	CONNESSIONE CON CONNETTORE	CONNECTO
13	CIRCUITO CONNETTO.	CONNECTOR BOARD
14	CONNESSIONE CON CONNETTORE	CONNECTOR
15	RACCORDO PRESE MULTIPLE	FITTING
16	RACCORDO	FITTING

pos	DESCRIZIONE	DESCRIPTION
17	RACCORDO	FITTING
18	CONNESSIONE TRASDUTTORE	TRANSDUCERS CONNECTOR
19	FONDO+ PANNELLO POSTERIORE	BOTTOM+BACK PANEL
20	GRUPPO RIDUTTORE DI PRESSIONE	PRESSURE REGULATOR
21	PANNELLO ANTERIORE	FRONT PANEL
22	MANOPOLA	KNOB
23	CIRCUITO PANNELLO	PANEL BOARD
24	TUBO GAS	GAS LEAD
25	CONNESSIONE	CONNECTION
26	FASCIONE	HOUSING
27	GRUPPO PLASMA CUTFLOW	PLASMA CUTFLOW LEAD
28	RACCORDO PRESE MULTIPLE	FITTING
29	SUPPORTO VALVOLA	VALVE SUPPORT
30	FONDO + PANNELLO POSTERIORE	BOTTOM+BACK PANEL
31	CONNESSIONE CON CONNETTORE	CONNECTOR
32	PANNELLO ANTERIORE	FRONT PANEL
33	RIDUTTORE	PRESSURE REGULATOR

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

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

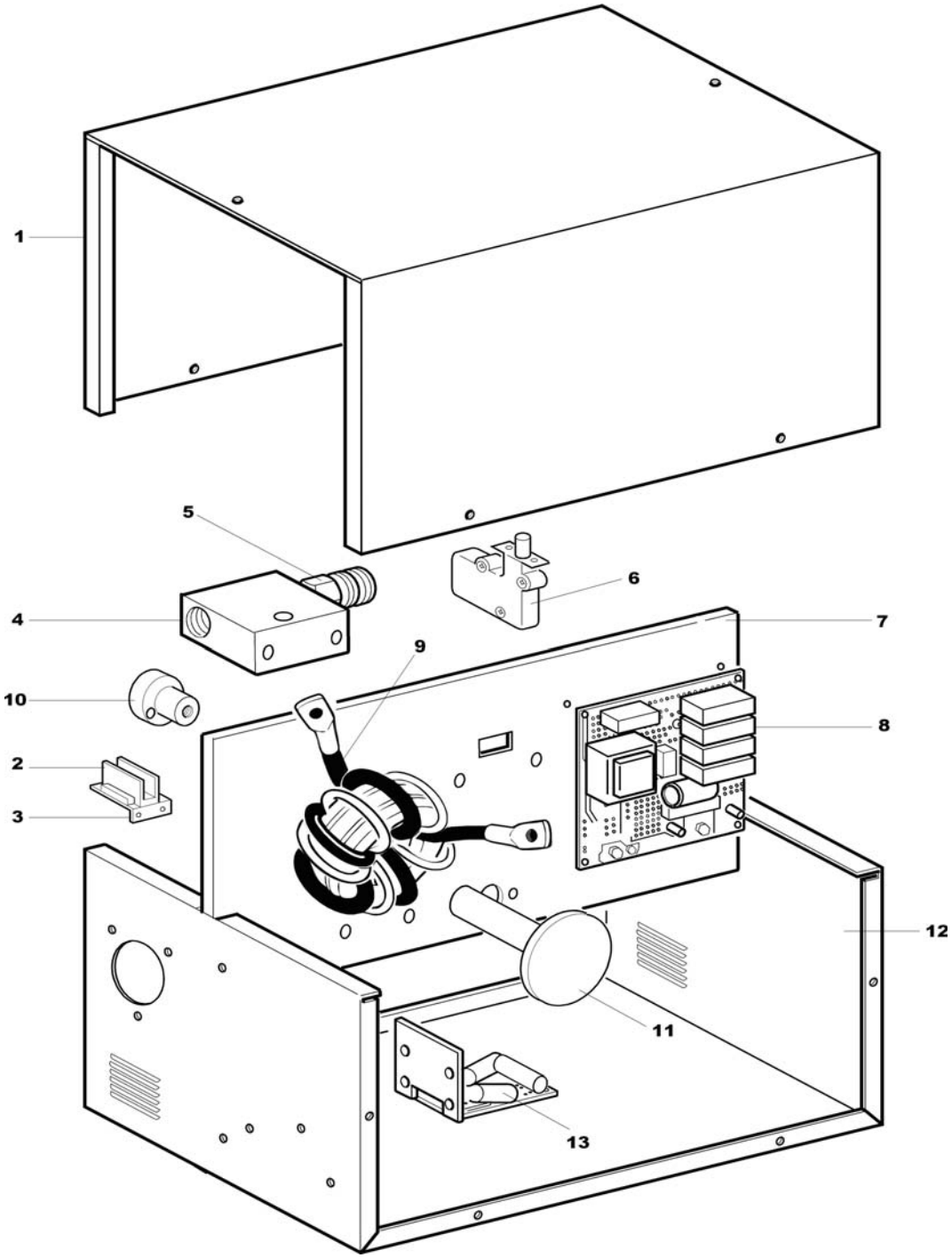
ART. 470


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
A
B
C
D
E
F
G

ART.473

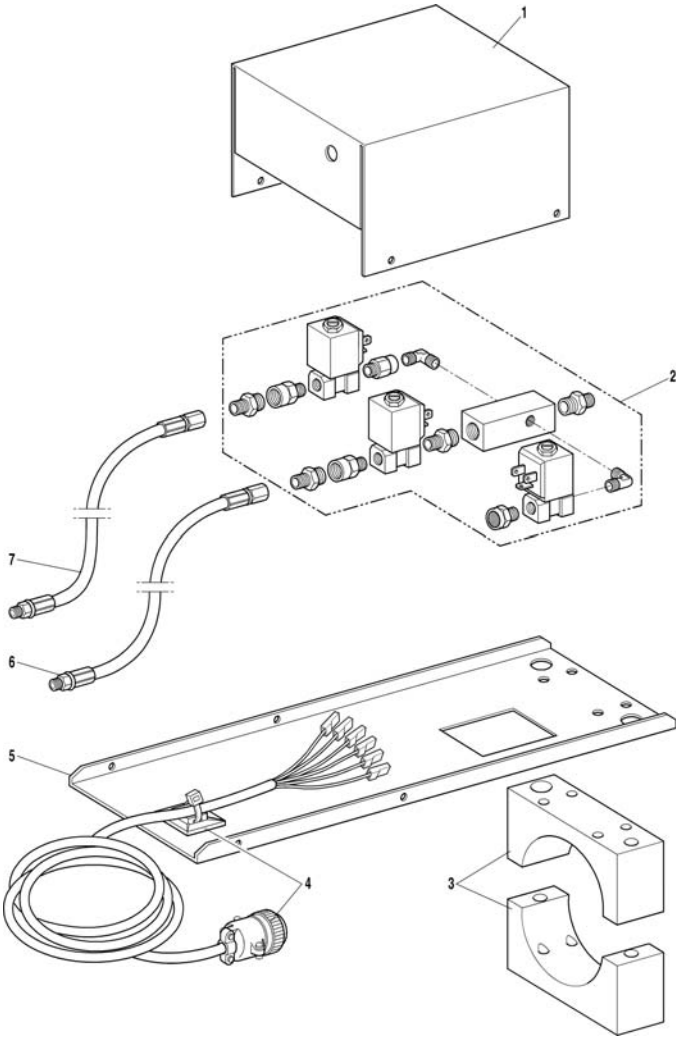
pos	DESCRIZIONE	DESCRIPTION
01	FASCIONE	HOUSING
02	MORSETTIERA	TERMINAL BOARD
03	SUPPORTO MORSETTIERA	TERMINAL BOARD SUPPORT
04	SUPPORTO ATTACCO TORCIA	TORCH SUPPORT
05	RACCORDO ACQUA	WATER HOSE FITTING
06	PULSANTE SICUREZZA	SAFETY SWITCH

pos	DESCRIZIONE	DESCRIPTION
07	ISOLAMENTO PVC.	PVC INSULATION
08	CIRCUITO ALTA FREQUENZA	HIGH FREQUENCY CIRCUIT
09	TRASFORMATORE ALTA FREQUENZA	HIGH FREQUENCY TRANSFORMER
10	ATTACCO CAVI	CABLES CONNECTION
11	BLOCCAGGIO	CLAMP
12	FONDO + PANNELLO	BOTTOM+PANEL
13	CIRCUITO FILTRO HF	FILTER CIRCUIT HF



ART.475

pos	DESCRIZIONE	DESCRIPTION
01	COPERCHIO	HOUSING
02	GRUPPO PLASMA	PLASMA UNIT
03	BLOCCAGGIO	PRE-CUT FLOW CLAMP
04	CONNESSIONE ALI-MENTAZIONE VALVOLE	CONNECTOR FOR VALVES
05	SUPPORTO VALVOLE	VALVE SUPPORT
06	TUBO PLASMA CUT	PLASMA CUT HOSE
06	TUBO PLASMA PRE	PLASMA PRE HOSE

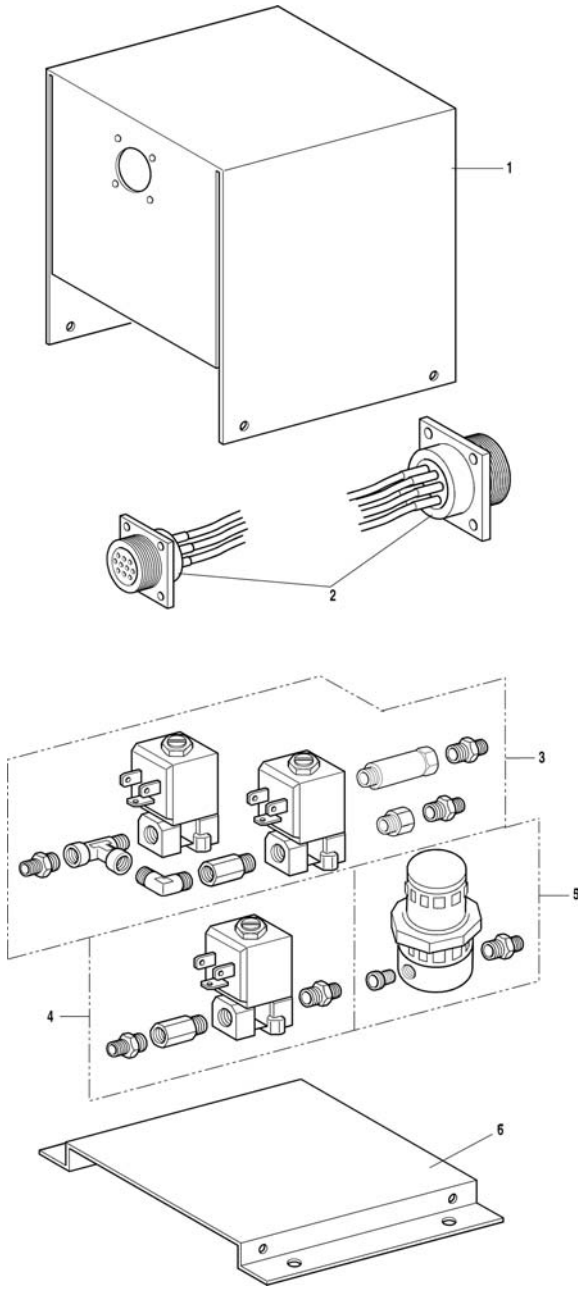


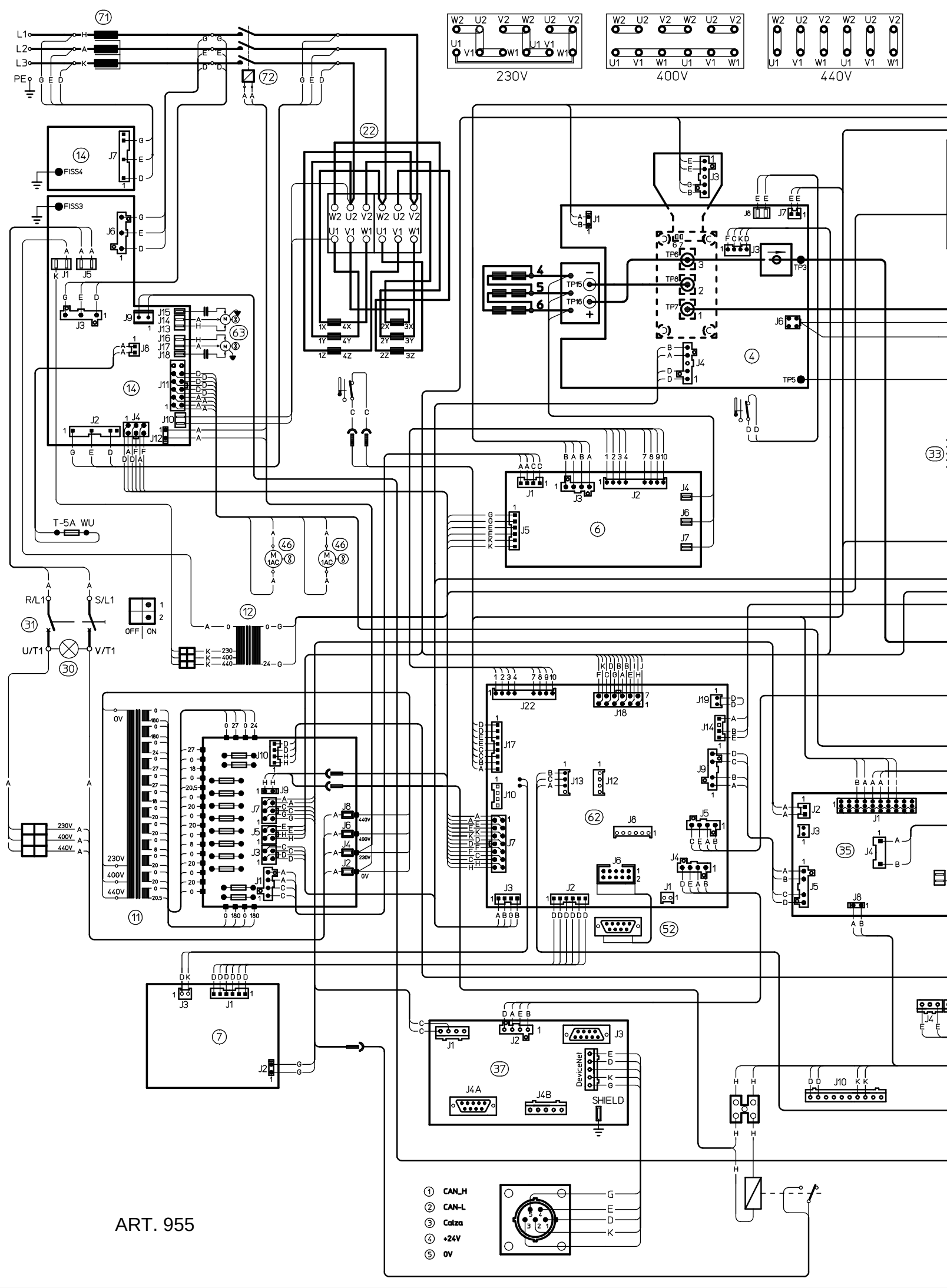
La richiesta di pezzi di ricambio deve indicare sempre: numero di articolo, matricola e data di acquisto della macchina, posizione e quantità del ricambio.

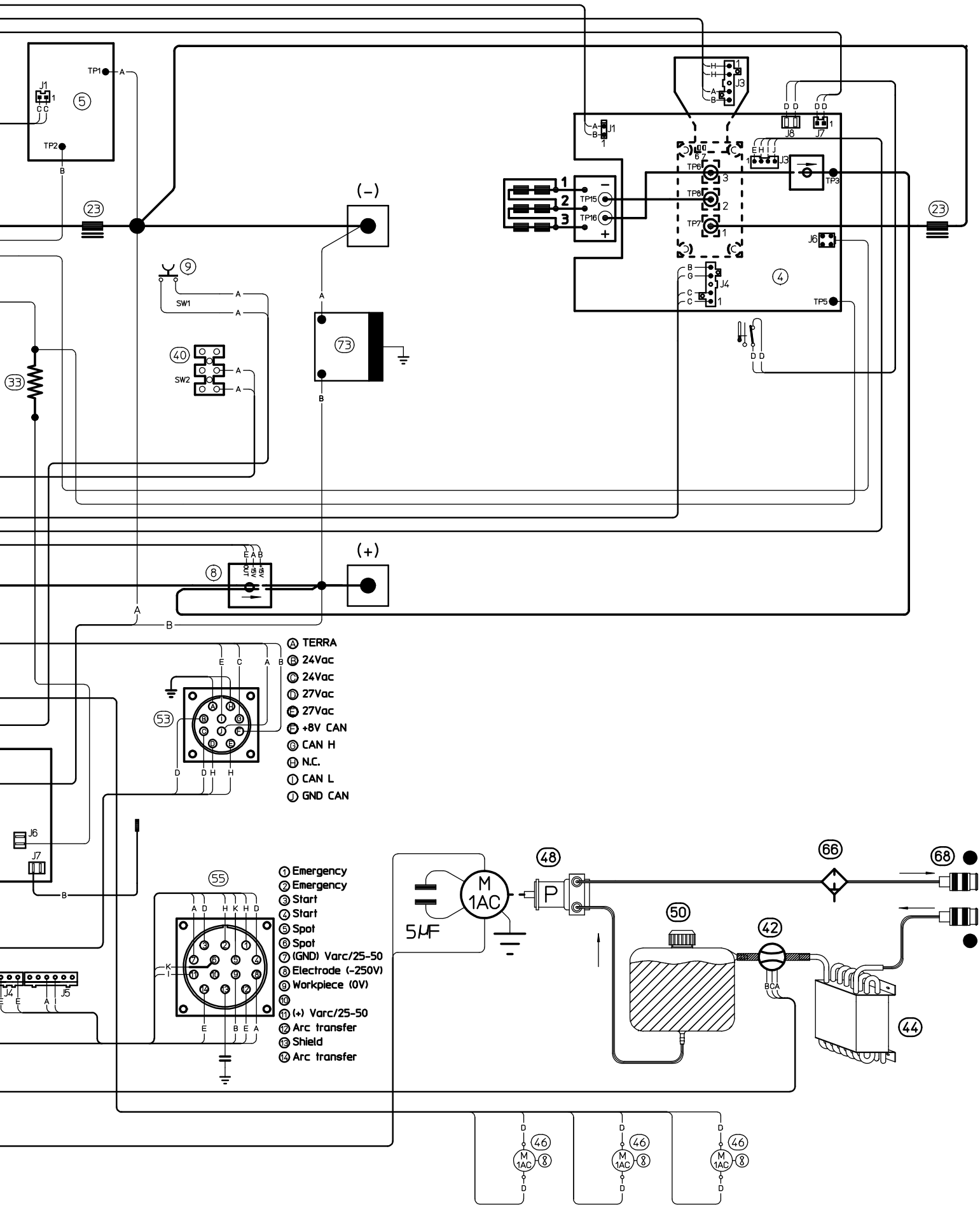
When ordering spare parts please always state the machine item and serial number and its purchase data, the spare part position and the quantity.

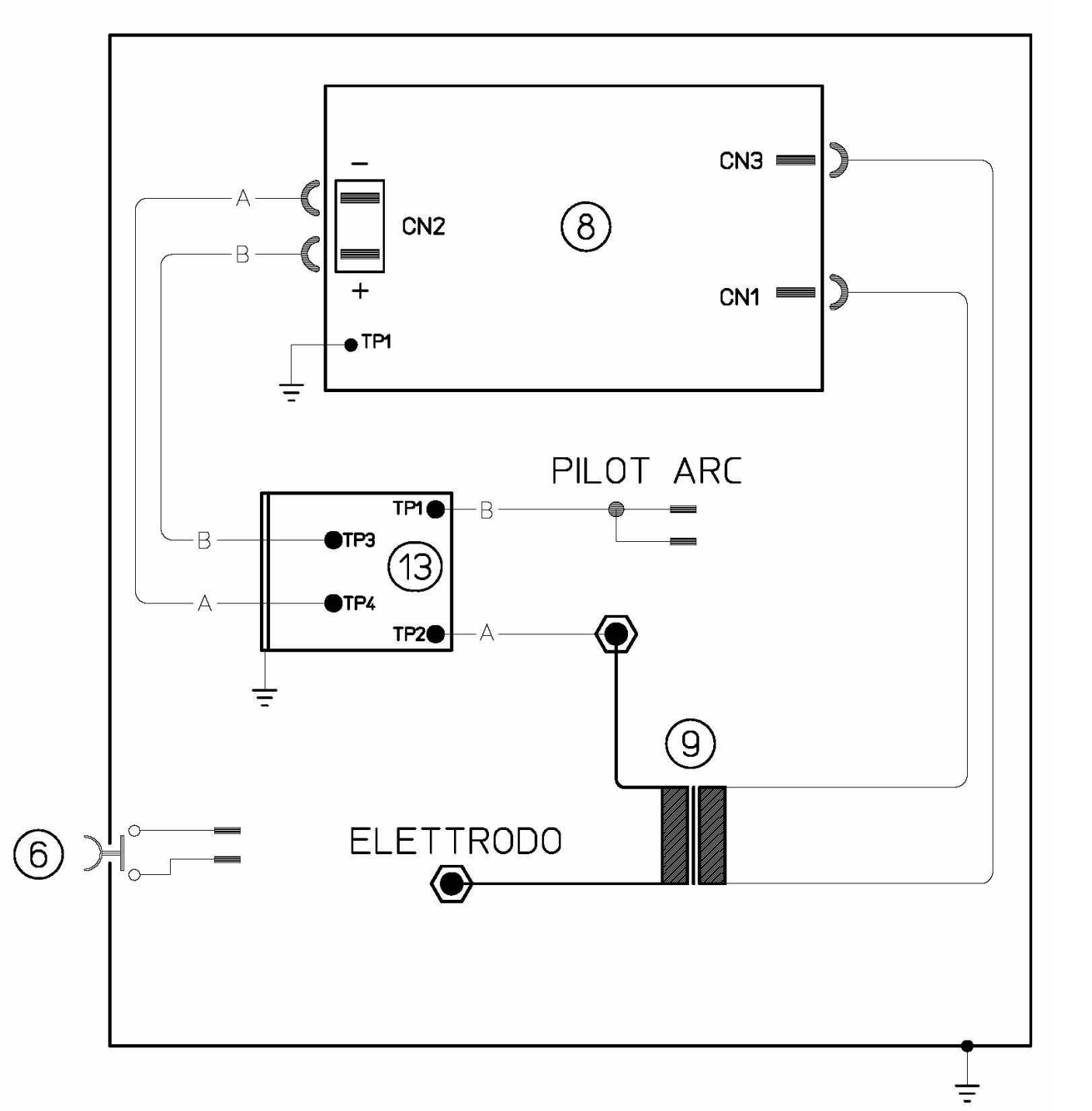
ART.468

pos	DESCRIZIONE	DESCRIPTION
01	FASCIONE COMPLETO	HOUSING
02	CONNESSIONE CON CONNETTORE	CONNECTOR
03	GRUPPO SECONDARIO	SECONDARY UNIT
04	GRUPPO AUSILIARIO PRE-CUTFLOW	PRE-CUTFLOW AUXILIARY UNIT
05	GRUPPO RIDUTTORE PRESSIONE AUSILIARIO	AUXILIARY PRESSURE REGULATOR UNIT
06	FONDO	BOTTOM

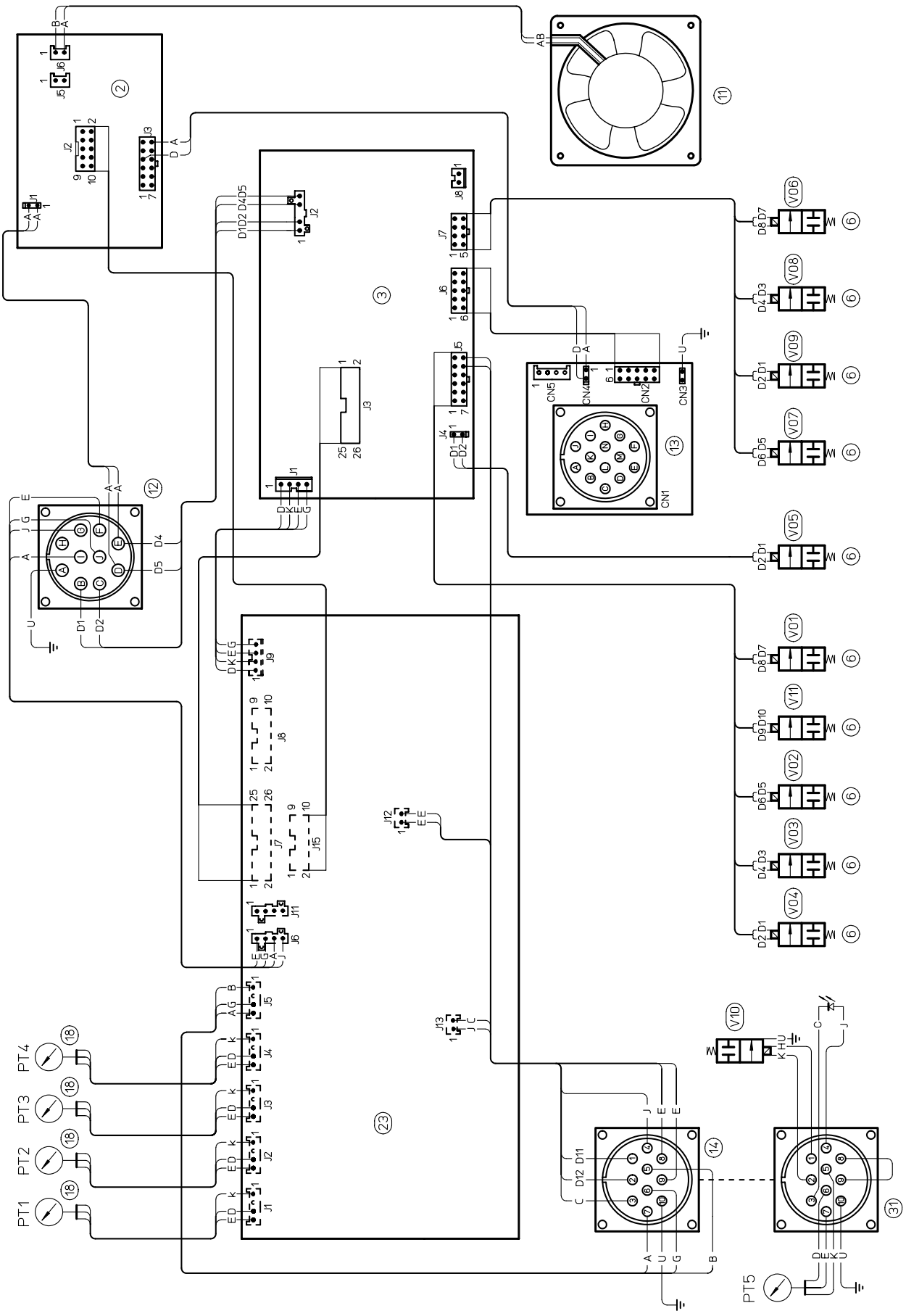



L1
L2
L3
PE
230V
400V
440V
FISS4
FISS3
T-5A WU
R/L1
S/L1
U/T1
V/T1
OFF
ON
0V
CAN_H
CAN-L
Calza
+24V
0V
DeviceNet
SHIELD
J4A
J4B
ART. 955

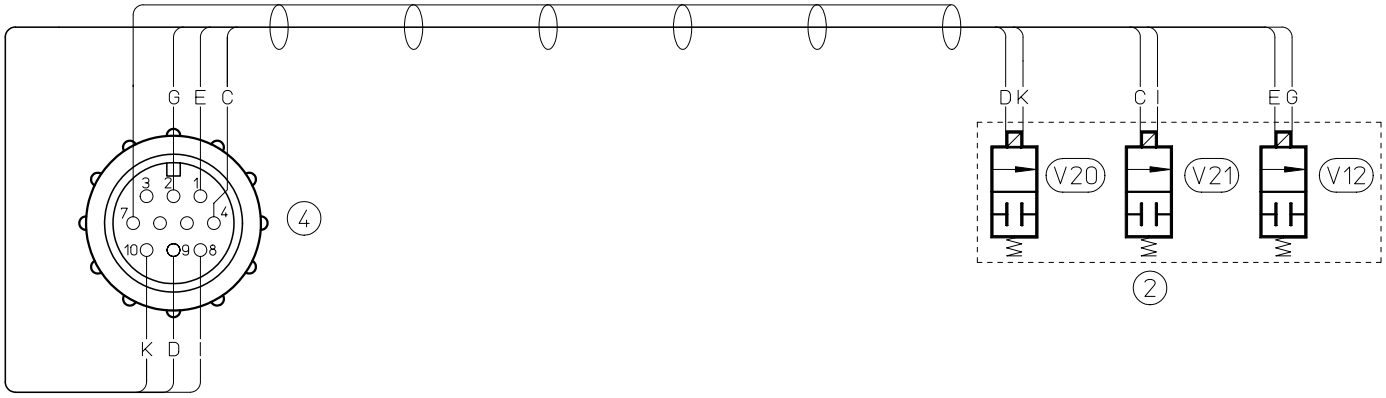

TP1
TP2
J1
5
23
(-)
(+)
9
SW1
40
SW2
33
73
8
J3
J1
J8
J7
J6
J4
TP3
TP5
TP6
TP8
TP7
TP15
TP16
4
A TERRA
B 24Vac
C 24Vac
D 27Vac
E 27Vac
F +8V CAN
G CAN H
H N.C.
I CAN L
J GND CAN
53
55
1 Emergency
2 Emergency
3 Start
4 Start
5 Spot
6 Spot
7 (GND) Varc/25-50
8 Electrode (-250V)
9 Workpiece (0V)
10
11 (+) Varc/25-50
12 Arc transfer
13 Shield
14 Arc transfer
J4
J5
5µF
M 1AC
48
P
66
68
50
42
44
46


CN3
CN2
8
CN1
A
B
TP1
PILOT ARC
TP3
13
TP4
TP2
9
6
ELETTRODO

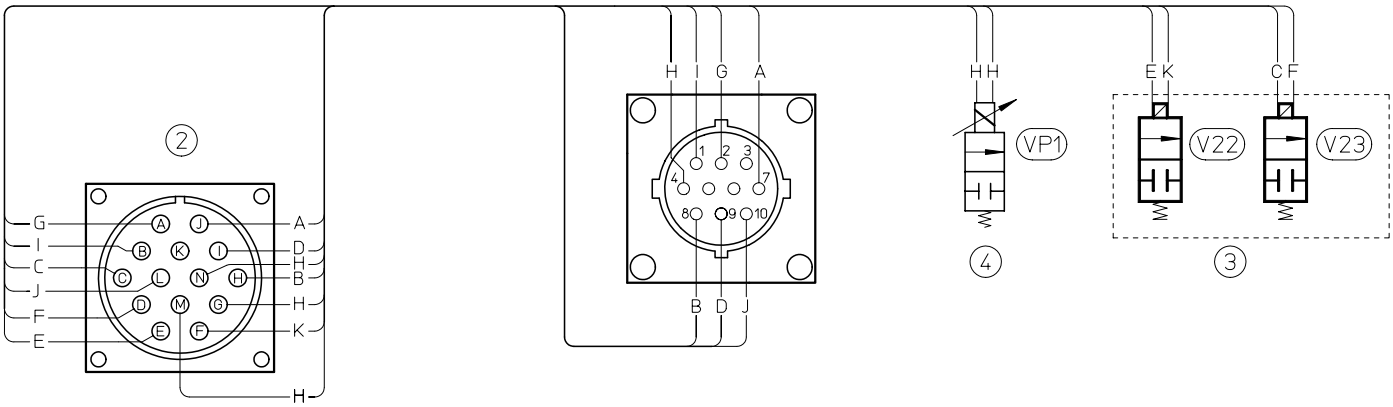
ART. 470


PT1
PT2
PT3
PT4
PT5
CN1
CN2
CN3
CN4
CN5
V01
V02
V03
V04
V05
V06
V07
V08
V09
V10
V11

ART. 475



ART. 468



CODIFICA COLORI CABLAGGIO ELETTRICO - WIRING DIAGRAM COLOUR CODE									
A	NERO	BLACK	K	MARRONE	BROWN	Q	BIANCO-ROSSO	WHITE-RED
B	ROSSO	RED	J	ARANCIO	ORANGE	R	GRIGIO-ROSSO	GREY-RED
C	GRIGIO	GREY	I	ROSA	PINK	S	BIANCO-BLU	WHITE-BLUE
D	BIANCO	WHITE	L	ROSA-NERO	PINK-BLACK	T	NERO-BLU	BLACK-BLUE
E	VERDE	GREEN	M	GRIGIO-VIOLA	GREY-PURPLE	U	GIALLO-VERDE	YELLOW-GREEN
F	VIOLA	PURPLE	N	BIANCO-VIOLA	WHITE-PURPLE	V	AZZURRO	BLUE
G	GIALLO	YELLOW	O	BIANCO-NERO	WHITE-BLACK			
H	BLU	BLUE	P	GRIGIO-BLU	GREY-BLUE			