TIG 2015 DC-HF

POWER SOURCE art. 168

SERVICE MANUAL

TABLE OF CONTENTS

1 - GENERAL INFORMATION

1.1 - Introduction.

This manual is intended to instruct maintenance personnel of the power source art. 168 for TIG and MMA welding systems.

1.2 - General assistance philosophy.

The customer and/or operator has the responsibility of appropriate use of the equipment in compliance with the requirements of the Instruction Manual and of the Safety Rules Manual. He is also responsible for keeping the appliance and relative accessories in good working conditions, in compliance with the requirements of the Service Manual.

Any internal inspection or repair must be carried out by qualified personnel who is responsible for interventions on the appliance.

It is forbidden to try to repair damaged circuit boards or electronic modules. Replace them with original Elettro CF spare parts.

1.3 - Safety information.

The following information regarding safety is an integral part of that provided in the Instruction Manual and the Safety Rules Manual. Therefore before operating on the machine, read the paragraph relative to the safety provisions in the above-mentioned manual.

Always disconnect the power cable from the mains and wait for the internal capacitors to discharge (2 minutes) before accessing the parts inside the equipment.

Some internal parts, such as terminal boards and heat sinks, can be connected to mains potentials and in any case are dangerous. Therefore do not operate without the protective covers on the equipment unless absolutely necessary. In that case, take special precautions such as wearing insulated gloves and footwear and operating in environments and wearing clothing which are perfectly dry.

1.4 - Electromagnetic compatibility.

Please read and follow the instructions in the paragraph “Electromagnetic compatibility” of the Safety Manual.

2 - DESCRIPTION OF SYSTEM

2.1 - Introduction.

The TIG 2015 AC/DC-HF INVERTER is a system for MMA and TIG welding, with both contact and high frequency arc ignition.

It consists of an electronic power source (art. 168), and a series of accessories to adapt it to different types of use.

The power source is controlled by microprocessor circuits which manage the operating functions of the welding system and the interface with the operator.

2.2 - Technical specifications.

Read the machine data plate and the Instruction Manual to verify the technical specifications.

2.3 - Description of power source art. 168.

Art. 168 is a direct voltage current-controlled power source, consisting of single-phase bridge rectifier, a PFC module, a DC/AC converter (inverter) and another bridge rectifier.

Furthermore, an additional DC/AC converter downstream of the second rectifier converts the welding current back to AC.

The main blocks making up the power source can be identified on the wiring diagram of par. 5.1 and on drawing of par. 4.1

The main switch (5) powers the service transformer (44) and the power circuit (14), which contains the filter for reducing conducted interferences reflected in the mains, the circuits for preload and the transformer for supplying the control circuits.

The power board (14) also supplies the fan (7) and the gas solenoid valve (23).

The power board (14) is the real power source, as it generates square wave alternating voltage for the power transformer. The welding current is adjusted by modulating this voltage.

The AC-inverter unit, made up of the AC board (38) and of the igbt (42), reverses the polarity of the power source output voltage in AC operating mode.

The four igbt (42) are connected in “H-bridge” configuration, so that the alternating closing of the four igbt provides once positive voltage and once negative voltage at the “+” (D) output of the power source, present on the output terminals of the inverter unit. These voltages obviously refer to the potential of the “-“ (F) terminal.

The AC-board (38) is the main board of the AC-inverter stage and contains the drive circuits for the igbts (42) and for the arc maintenance system. These commands come directly from the microprocessor placed on the power board (14).

The AC-board (38) also contains the “AC-capacitor”, having the purpose to store energy for the arc maintenance pulse during AC operation

The display board (18) gathers the display for viewing the welding parameters and the encoder for setting and programming operating parameters.

The display board (18) is fully managed by the power board microprocessor (14), which also powers it.

The connector board (28) is the interface for connecting the external control devices to the power source, such as the start button of the TIG torch, the potentiometer for external adjustment of welding current, the UP/DOWN buttons for digital current adjustment. These signals are appropriately filtered by components on the connector board (28), against conducted interferences coming from the welding field. The connector board (28) also has the task of preventing high-voltage pulses at high frequency generated by the HF transformer (33) from returning along the wiring into the power board (14), where they would cause malfunctions or failures.

The HF transformer (33) is connected to the power board output (14) for ignition of the welding arc, in ignitions without contact between electrode and workpiece. It is supplied by the

power board (14) which generates high-voltage pulses at high frequency for the transformer (33).

The fan (7), for cooling the power elements of the power source, is controlled by the microprocessor of the power board (14). Its operation depends on the selected welding mode:

- If the machine is on in MMA mode or it switches to MMA mode, the fan is always on.
- If the machine is on and used in the four TIG modes, the fan runs for the first 10 seconds, and reactivates when the torch button is pressed, again for 10 seconds, until the machine returns to the initial temperature condition when welding.

The signals processed by the circuit boards and present on the connectors are listed in the tables in chapter 5 of this manual.

3 - MAINTENANCE

WARNINGS

ANY INTERNAL INSPECTION OR REPAIR MUST BE CARRIED OUT BY QUALIFIED PERSONNEL.

BEFORE PERFORMING MAINTENANCE, DISCONNECT THE MACHINE FROM THE MAINS AND WAIT FOR THE INTERNAL CAPACITORS TO DISCHARGE (2 MINUTES)

3.1 - Periodical inspection, cleaning.

Periodically check the correct air inflow inside the ventilation tunnel.

Remove any filth or dust to guarantee appropriate heating of the internal parts of the power source.

Check the conditions of the output terminals, output and power cables of the power source; replace them if damaged.

Check the conditions of the internal power connections and connectors of the circuit boards; if any connections have been loosened, tighten them or replace the connectors.

3.2 - Operating sequence.

The following sequence reflects correct operation of the machine. It can be used as a guide procedure for troubleshooting.

At the end of every repair, it must be able to be carried out without running into any problems.

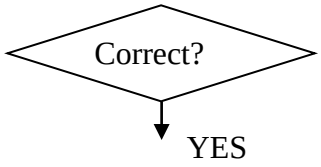
3.2.1 - Power source controls and signals.

NOTE

- ❑ Operations preceded by this symbol refer to actions of the operator.
- ♦ Operations preceded by this symbol refer to responses of the machine to the operation carried out by the operator.

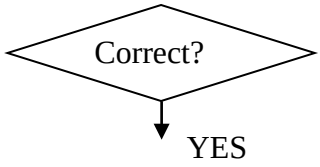
3.2.2 - Switching on power source.

- ❑ System off and disconnected.
- ❑ Connect the power source to the mains.
- ❑ Close the switch (5).
  - ♦ System powered, light on switch (5) on.
  - ♦ Display (B) on.
  - ♦ After a few seconds, the display views the last welding settings detected prior to the last switch off and the fan starts to run.



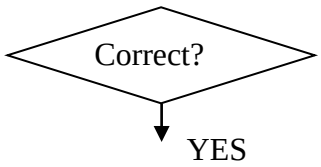
NO (see 3.3.1, 3.3.2, 3.3.3).

- ❑ Turning the encoder (A) selects the various welding functions (see machine instruction manual) which are displayed.



NO (see 3.3.3).

- ❑ Turn the encoder (A); by rotating anticlockwise, the indication on the display (B) decreases to a minimum of (005 in TIG, 010 in MMA); by rotating clockwise, the indication on the display (B) increases to a maximum of (200 in TIG, 160 in MMA) (these values are also affected by the position of the potentiometer on the torch and by the UP/DOWN buttons, if present).



NO (see 3.3.3).

REGULAR OPERATION.

3.2.3 - TIG operation.

NOTE

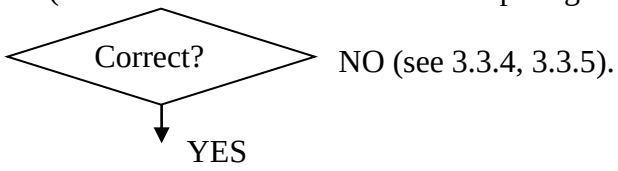
The TIG-AC operating sequence is described below, because it involves all of the internal power source units, including those for TIG-DC operation.

WARNINGS

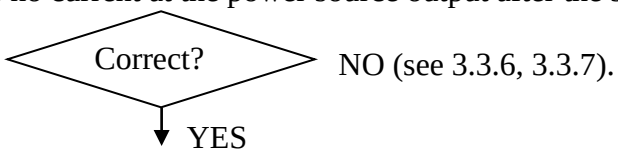
DURING THE FOLLOWING TESTS, DO NOT AIM THE TORCH TOWARDS PERSONS OR BODY PARTS BUT TOWARDS AN OPEN SPACE OR THE PIECE TO BE WELDED.

DO NOT TRY TO MEASURE OUTPUT VOLTAGE DURING THESE PHASES. THE PRESENCE OF HIGH FREQUENCY COULD DAMAGE THE INSTRUMENT OR THE POWER SOURCE ITSELF.

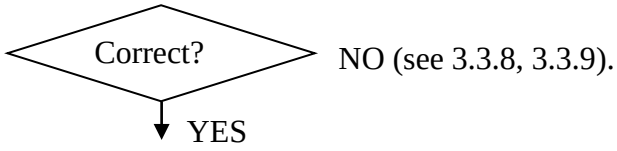
- Switch the power source off by using the switch (5).
- Connect the gas supply to the specific fitting (K) on the rear panel.
- Connect the TIG torch to the negative pole (F) of the power source, to the gas fitting (E) and to the connector of the controls (C) on the front panel.
- Connect the earth cable to the positive pole (D) of the power source and to the piece to be welded.
- Switch the power source back on by using the switch (5).
- Using the encoder (A), select “Process” and “Mode” TIG-CONTINUOUS with HF, icon  ,  , viewed on display (B)
- Quickly press the start button of the torch.
    - ♦ The pre-gas phase begins with gas coming out from the torch as long as the button is pressed.
    - ♦ After having released the torch start button, gas continues to come out the torch for the set post-gas time (see the Instruction Manual for the post-gas setting).



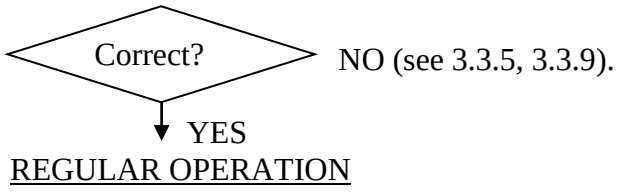
- Press and hold the start button for about 5 seconds.
    - ♦ The pre-gas phase begins, followed by generation of high frequency for arc ignition and generation of output voltage of the power source.
    - ♦ After approximately 2 seconds, generation of output voltage and of high frequency for arc ignition ends and the post-gas phase begins (TIG operation with HF is interrupted if there is no current at the power source output after the start).



- Approach the torch to the piece to be welded and press the start button.
    - ♦ Start welding. Turn the encoder (A) or the potentiometer on the torch to have the appropriate current level for the welding operation.
    - ♦ The display (B) indicates the welding current.

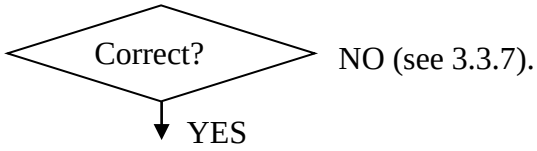


- Release the start button on the torch.
  - ♦ The arc switches off immediately (if long slope-down times are not set).
  - ♦ Gas continues to come out to protect the welding bath (post-gas).

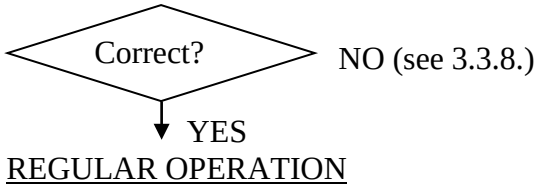


3.2.4 - MMA operation.

- Switch the power source off by using the switch (5).
- Connect the electrode clamp to the positive pole (D) of the power source.
- Connect the earth cable to the negative pole (F) of the power source and to the piece to be welded.
- Switch the power source back on by using the switch (5).
- After the display switches on, with the encoder (A), select MMA "Process" and "Mode", icon  viewed on the display (B).
  - ♦ Voltage generation begins at the power source output.
  - ♦ Display (B) indicates the programmed welding current.



- Set the current using the encoder (A) or the potentiometer on the remote control based on the electrode intended to be used.
- Approach the clamp with electrode to the piece to be welded.
  - ♦ Start welding. Adjust the encoder (A) or the potentiometer on the remote control to optimise welding quality.
  - ♦ Display (B) indicates the welding current.



3.3 - Troubleshooting.

WARNINGS

ANY INTERNAL INSPECTION OR REPAIR MUST BE CARRIED OUT BY QUALIFIED PERSONNEL.

DISCONNECT THE POWER SOURCE FROM THE MAINS AND WAIT FOR THE INTERNAL CAPACITORS TO DISCHARGE (2 MINUTES) BEFORE REMOVING THE PROTECTIVE COVERS AND ACCESSING THE INTERNAL PARTS.

NOTE

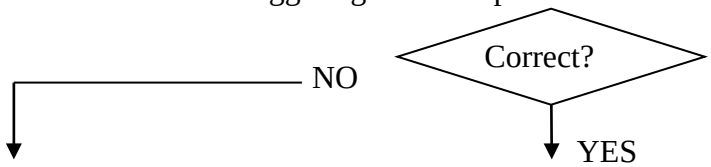
The problems which the machine could have (symptoms).are described in **boldface.**

- ❑ Operations preceded by this symbol refer to situations which the operator must check (causes).
- ♦ Operations preceded by this symbol refer to actions with the operator must carry out to resolve problems (remedies).

3.3.1 - The power source does not switch on, control panel off.

MAINS SUITABILITY TEST.

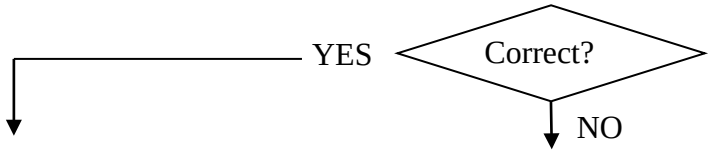
- ❑ Power failure due to triggering of mains protections.



- ♦ Eliminate any short circuits on connections between power cable (10), switch (5), power board (14) and fan (7).
- ♦ Check that the terminals J4 and J9 on the power board (14) are not short-circuited one with another or towards earth.
- ♦ Mains unsuitable to power the power source (e.g. insufficient power installed).

POWER BOARD (14) POWER SUPPLY TEST.

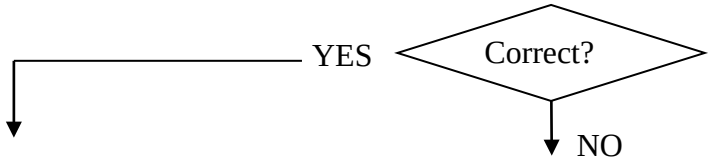
- ❑ Power board (14), terminals J4-J9 = 230 Vac



- ♦ Check wiring between power board (14) and switch (5).
- ♦ Check switch (5) and replace it if necessary.
- ♦ Check power cable (10) and replace it if necessary.

PANEL BOARD (18) POWER SUPPLY TEST.

- ❑ Panel board (18), connector J2, terminals 25 (+) – 24 (-) = +5 Vdc.



- ♦ Check wiring between J1 power board (14) and J2 panel board (18).
- ♦ With power source off, temporarily disconnect the connector J2 on panel board (18) and verify that the terminals 25 and 24 of J2 panel board (18) are not short-circuited. If necessary, replace panel board (18), and verify, while powering the power source with connector J2 disconnected, the presence of 5 Vdc on terminals 25 and 24 of the loose connector J1, left free. If missing, replace power board (14) as well.
- ♦ Check correct assembly of impedance (35) on terminals J8 and J16 of power board (14).

♦ Replace panel board (18) and/or power board (14).

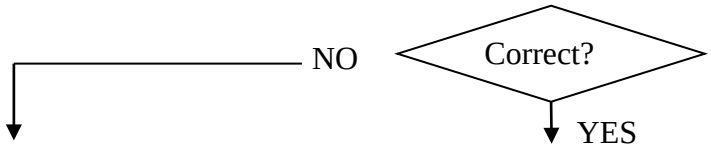
NOTE

The fan (7) on the power source is managed by the microprocessor of the power board (14) and its operation is subordinated to the conditions of the power board, as described in par. 2.3 - description of power source art. 168. **To perform the following tests, it is recommended to be set in MMA mode.**

3.3.2 - Power source supplied, fan (7) stopped.

FAN (7) TEST.

❑ Fast-on terminals of fan (7) = 230 Vac approximately, with switch (5) closed.



- ♦ Check that there are no mechanical obstructions blocking the fan.
- ♦ Replace fan (7).

♦ Check wiring between fan (7) and power board (14).

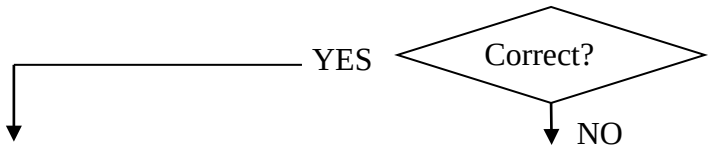
♦ Check conditions of the mains voltage.

♦ Replace power board (14).

3.3.3 - Power source supply, signals do not indicate correct values.

SIGNALS TEST.

❑ A few seconds after switch on, the display views the last welding settings detected prior to the last switch off. By acting on the encoder (A) you may perform all the steps described in par. 3.2.2 of the operating sequence.

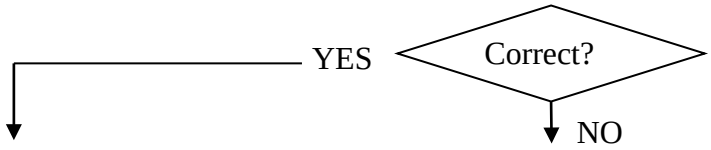


- ♦ Check wiring between J1 power board (14) and J2 panel board (18).
- ♦ Replace power board (14) and/or panel board (18).

EXTERNAL CURRENT REGULATION TEST (potentiometer or buttons on torch).

❑ Power board (14), connector J7, terminals 1(+) and 3(-) = 0 – +5 Vdc, by turning the potentiometer on the torch.

- Power board (14), connector J7, terminals 6(+) and 8(-) = 0 Vdc (UP command), with UP button pressed (+5 Vdc with button released).
- Power board (14), connector J7, terminals 5(+) and 8(-) = 0 Vdc (DOWN command), with DOWN button pressed (+5 Vdc with button released).

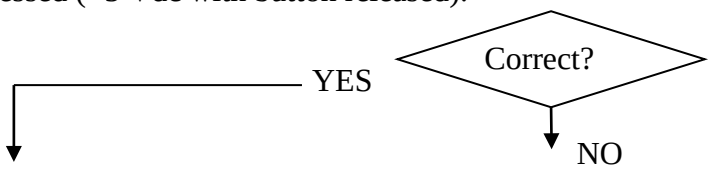


  - Check wiring between J7 power board (14) and J3 connector board (28).
  - Check remote control potentiometer and UP/DOWN buttons and replace them if faulty.
  - Check +5 Vdc terminals 7 (-) and 9 (+) of CN2 connector board (28) (potentiometer power supply). If missing, check same voltage on terminals 3 (-) and 1 (+) of J7 power board (14), check wiring between the two connectors or replace power board (14).
  - Replace connector board (28).
- Replace power board (14).

3.3.4 - In TIG mode, the start button has no effect.

START COMMAND TEST.

- Power board (14), connector J7, terminals 4(+) and 8(-) = 0 Vdc (start), with start button pressed (+5 Vdc with button released).

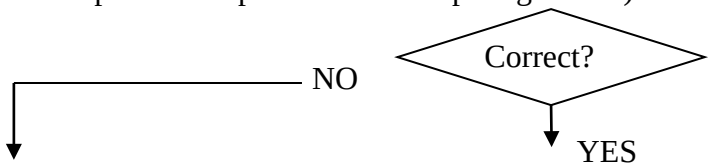


  - ♦ Check wiring between J7 power board (14) and J3 connector board (28).
  - ♦ Check correct insertion of connector of torch on connector (C).
  - ♦ Check torch cable and button. Replace them if faulty.
  - ♦ Replace connector board (28) and/or power board (14).
- ♦ Replace power board (14).

3.3.5 - In TIG mode, gas does not come out the torch.

SOLENOID VALVE TEST.

- Solenoid valve terminals (23) = 230 Vac with torch button pressed (the duration the solenoid valve is open also depends on the set post-gas time).



  - ♦ Check for gas at the specific fitting (K) on the rear panel and that pressure and flow rate in the supply duct comply with the specification values (see specifications in Instruction Manual).
  - ♦ Check that no gas pipe in the power source is obstructed.
  - ♦ With power source off and disconnected, check resistance on the solenoid valve terminals (23) = 2500 ohm. If >Mohm (winding interrupted), replace solenoid valve (23).
  - ♦ Replace solenoid valve (23).
- ♦ Check wiring of connector J5 of power board (14) and solenoid valve (23).
- ♦ Check operation of the start command, if necessary performing the START COMMAND TEST in par. 3.3.4.
- ♦ With power source off and disconnected, check resistance on the solenoid valve terminals (23) = 2500 ohm. If 0 ohm (short-circuit), replace solenoid valve (23).
- ♦ Replace power board (14).

3.3.6 - In TIG mode, gas comes out the torch but does not ignite the arc, high frequency missing.

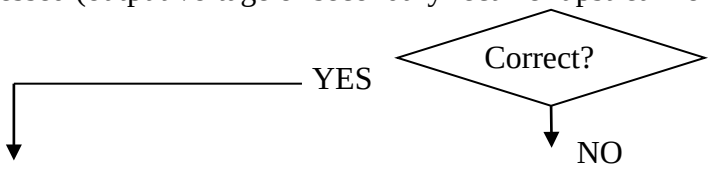
WARNING

DURING THE FOLLOWING TESTS, LEAVE THE NEGATIVE OUTPUT TERMINAL (F) OF THE POWER SOURCE FREE FROM CONNECTIONS AND **DO NOT TOUCH.**

THE PRESENCE OF HIGH VOLTAGE AND HIGH FREQUENCY IS DANGEROUS FOR THE OPERATOR AND COULD DAMAGE THE INSTRUMENTS OR THE POWER SOURCE

SECONDARY RECTIFIER OUTPUT VOLTAGE TEST.

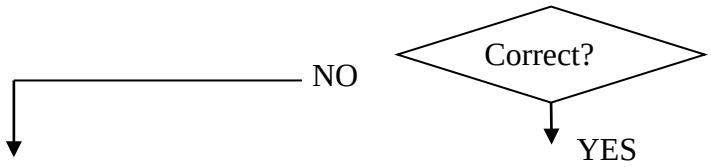
- Set TIG operation without high frequency.
- Terminal J20 (+) e J21 (-) on power board (14) = +96 Vdc approximately, with start button pressed (output voltage of secondary rectifier upstream of HF transformer (33).



- ♦ Check functioning of start command (see par. 3.3.4).
- ♦ Check conditions of mains voltage and, if necessary, perform tests in par. 3.3.1.
- ♦ Replace power board (14).

HF OSCILLATOR TEST.

- Set TIG operation with high frequency.
- Power board (14), surge arrester SC1 emits discharges at regular intervals, with start button pressed.



- ♦ With power source off, temporarily disconnect the wires from terminals J22 and J23 of power board (14) and make sure there is no short-circuit in connectors J22 and J23 of the power circuit (14).
- ♦ Check connections of the secondary HF transformer (33), spacer (32), AC-board (38) and output terminal "-" of the power source. If there are loose connections, tighten them or replace damaged components.
- ♦ Check cable and torch electrode; replace them if worn or damaged.
- ♦ Check that torch connection (Gifas) is not leaking, namely is not carrying high-voltage surface discharges. If so, replace it with a new one.
- ♦ Second the distance between the tips of the surge arrester SC1 (correct = 0.9 mm.).
- ♦ Replace HF transformer (33).
- ♦ Replace power board (14).

- ♦ Check proper insulation of the components of the HF power source circuit on the printed circuit of the power board (14), and remove any filth or dust which could short-circuit the components.
- ♦ Second the distance between the tips of the surge arrester SC1 (correct = 0.9 mm.).
- ♦ Replace power board (14).

3.3.7 - In no-load operation, the output voltage is not regular.

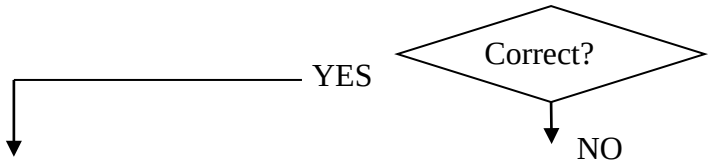
WARNING

FOR THE FOLLOWING TESTS, **DISCONNECT THE TERMINALS OF THE PRIMARY WINDING OF THE HF TRANSFORMER (33) FROM TERMINALS J22, J23 OF POWER BOARD (14)**, TO PREVENT GENERATION OF HIGH FREQUENCY

NO-LOAD OUTPUT VOLTAGE TEST.

- Output terminal (F) of power source (-) and output terminal (D) of power source (+) = voltages according to table.

Process	Voltage	Condition
TIG-DC	+96 Vdc	Start button pressed
MMA	+83 Vdc	Power source supplied
TIG-AC	+96 Vac	Start button pressed

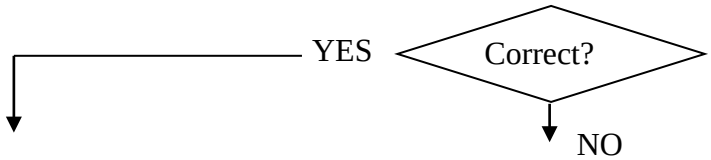


- ♦ Check connection between terminal J21 on power board (14), AC-board (38), insulator (32), HF transformer (33) and output terminal of power source, and connection between terminal J20 on power board (14), AC-board (38) and output terminal + of power source (D). If there are loose connections, tighten them or replace damaged terminals.
- ♦ In TIG mode, check functioning of start command (see par. 3.3.4).
- ♦ Check conditions of mains voltage and, if necessary, perform tests in par. 3.3.1.
- ♦ Check correct assembly of impedance (35) on terminals J6 and J16 of power board (14).
- ♦ Replace power board (14).

♦ Regular operation.

AC-BOARD (38) SERVICES POWER SUPPLY TEST.

- AC-board (38), connector CN2, terminals 1 (+) and 2 (-) = 27 Vac;



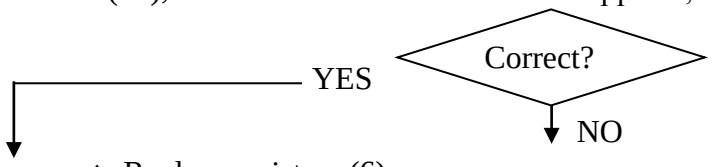
- ♦ Replace the service transformer (44).

♦ Check that between ~ and ~ terminals of AC board (38) you have approx. 95V (DC if you are in MMA or TIG DC mode, AC if you are in TIG AC mode) (in TIG mode with start button pressed or in MMA mode with power source powered).

♦ Replace the AC-board (38) and/or IGBT (42).

POWER RESISTOR (6) TEST

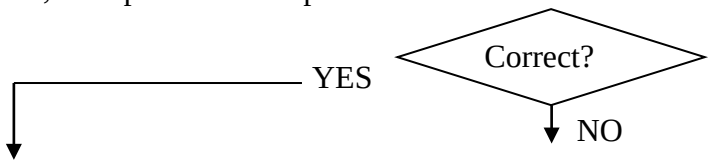
- AC-board (38), resistor connection CN8= 15 Ω approx.;



  - ♦ Replace resistors (6).
- ♦ Regular operation.

AC-BOARD (38) ENABLE TEST.

- AC-board (38), connector CN1, terminals 2(+) and 4(-) = +5 Vdc approximately, in TIG-DC and MMA mode, with power source powered.
- AC-board (38), connector CN1, terminals 3(+) and 4(-) = +5 Vdc approximately, in TIG-AC mode, with power source powered.
- AC-board (38), connector CN1, terminals 2(+) and 4(-) = +5 Vdc approximately, in TIG-AC mode, with power source powered.



  - ♦ Check the wiring between CN1 AC-board (38) and CN1 power board (14).
  - ♦ Replace the power board (14).
- ♦ Make sure the AC-board (38) is properly mounted on the igbt modules (42), especially that the holding screws that create the electrical connections between the AC-board (38) and igbt (42) are properly tightened. If you find short-circuits or deteriorated connections, restore the original connections, replacing any components with damaged terminals.
- ♦ Replace AC-board (38).
- ♦ Make sure the igbt (38) are intact, measuring with a digital multimeter in “diodes test” on the following terminals of the AC-board (38):

  + (+) and ~ (-) = >Mohm; + (-) and ~ (+) = junction of one diode.

  ~ (+) and - (-) = >Mohm; ~ (-) and - (+) = junction of one diode.

  If incorrect, replace the igbt module (42), along with the AC-board (38).

WARNING

In case of a fault on an igbt module (42), it is recommended to replace both the igbt module (42) and the AC-board (38), containing the igbt driver circuit, at the same time. A damaged igbt frequently damages the driver board to which it is connected. Similarly, a defective driver board frequently damages the igbt to which it is connected.

3.3.8 - In resistive load operation, the output voltage is not regular.

WARNING

FOR THE FOLLOWING TESTS, SET TIG OPERATION WITH HIGH FREQUENCY AND **DISCONNECT THE TERMINALS OF THE PRIMARY WINDING OF THE HF TRANSFORMER (33) FROM TERMINALS J22, J23 OF POWER BOARD (14)**, TO PREVENT GENERATION OF HIGH FREQUENCY.

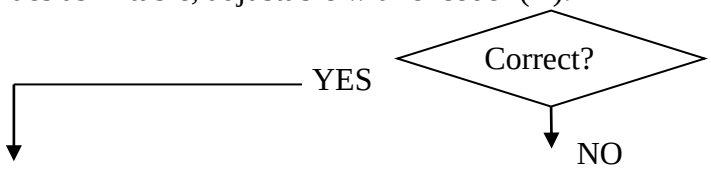
NOTE

For the following tests, use a resistive load capable of withstanding the maximum current of the power source. The suitable values are shown on the table.

Process	Resistive load resistance	Maximum output current	Power source output voltage	Condition
TIG-DC	0.090 ohm	200 A	+ 18 Vdc	Start button pressed
TIG-AC	0.090 ohm	200 A	18 Vac	Start button pressed
MMA	0.165 ohm	160 A	+ 26.4 Vdc	Power source powered

OUTPUT VOLTAGE ON RESISTIVE LOAD TEST.

- Set the maximum output current with the encoder (A).
- Output terminal (F) of power source (-) and output terminal (D) of power source (+) = voltage values as in table, adjustable with encoder (A).



- ♦ Check connection between terminal J21 on power board (14), AC-board (38), insulator (32), HF transformer (33), and output terminal – (F) of power source, and connection between terminal J20 of power board (14), AC-board (38) and output terminal "+" (D) of power source. If there are loose connections, tighten them or replace components of damaged terminals.
- ♦ Check wiring between J1 power board (14) and J2 panel board (18).
- ♦ In TIG mode, check functioning of start command (see par. 3.3.4).
- ♦ Check conditions of mains voltage and, if necessary, perform tests in par. 3.3.1.
- ♦ Replace power board (14) and/or panel board (18).
- ♦ Carry out AC-BOARD (38) SERVICES POWER SUPPLY TEST (par. 3.3.7).

♦ Regular operation.

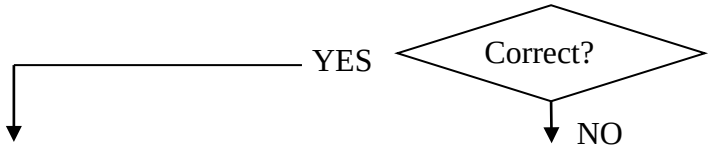
3.3.9 - In TIG mode, arc unstable, welding irregular.

NOTE

In TIG, welding quality might not be acceptable due to current instability. In this case, it is recommended to switch to MMA operation and to perform welding tests.

MMA WELDING QUALITY TEST

- Power source in MMA, welding tests = good welding quality.



- ♦ Perform "no-load operation" (par. 3.3.7) and "resistive load operation" tests (par. 3.3.8).
- ♦ Replace power board (14).

♦ Check conditions of the torch and of the electrode. If necessary, remake the tip of the electrode.

♦ Check presence and continuity of the gas flow (vibration of solenoid valve) exiting the torch (see par. 3.3.5).

♦ Replace power board (14) and/or panel board (18).

3.3.10 - In AC mode, arc unstable, welding irregular.

NOTE

In AC operation, the welding quality may not be acceptable due to current instability. We therefore recommend that you make sure the power source works properly in DC, by carrying

out welding tests in DC and, if necessary, the “open circuit operation” test (par. 3.3.7) and “operation on resistive load” test (par. 3.3.8).

3.4 - Error codes.

3.4.1 - Symbol  on display.

Temperature exceeded limit alarm.

The thermostat is placed on the power IGBT heat sink of the power board (14).

The power source does not provide current, but the fan keeps running; therefore, we recommend leaving the power source supplied in the event the over-temperature alarm is triggered.

Check the temperature of the power modules' heat sinks on the power board (14) and wait until they are completely cold, if required. If the alarm persists, replace the power board (14). If the alarm is restored, make sure that the fan is efficient, that the room temperature is not too high, and that the work cycle does not exceed that specified.

3.4.2 - Symbol  on display.

This icon lights up in the following situations:

High supply voltage alarm (over 290 Vac approximately) at ignition and during operation.

The power source does not supply current.

This system also protects the power source against accidental power at 400 Vac. Both the electronic circuits and the fan are protected under this condition.

To restore operation, switch off the power source and supply it with the correct voltage.

3.4.3 - Error E01

Fault in internal power supply circuits of power board (14). The power source does not supply current. To restore operation, switch the power source off, wait until the internal capacitors discharge completely (4 minutes) and then switch the power source on with rated voltage. If the E1 code appears again, it means that the power board (14) is faulty and must be replaced.

3.4.4. - Error E02

Power board anomaly (14). Generally, a phenomenon has occurred that may damage the power source if it keeps running. To restore operation, switch the power source off, wait until the internal capacitors discharge completely (4 minutes) and then switch the power source on with rated voltage. If the E2 code appears again, replace the power board (14).

4 - LIST OF COMPONENTS

4.1 - POWER SOURCE art. 168: see diagram on page 26

4.2 – Components table: see table on page 24

4.3 – Spare parts list.

Essential spare parts.

Ref.	Description	Q.ty
18	display board	1
28	connector board	1
14	power board	1
38	AC-board	1

Recommended spare parts.

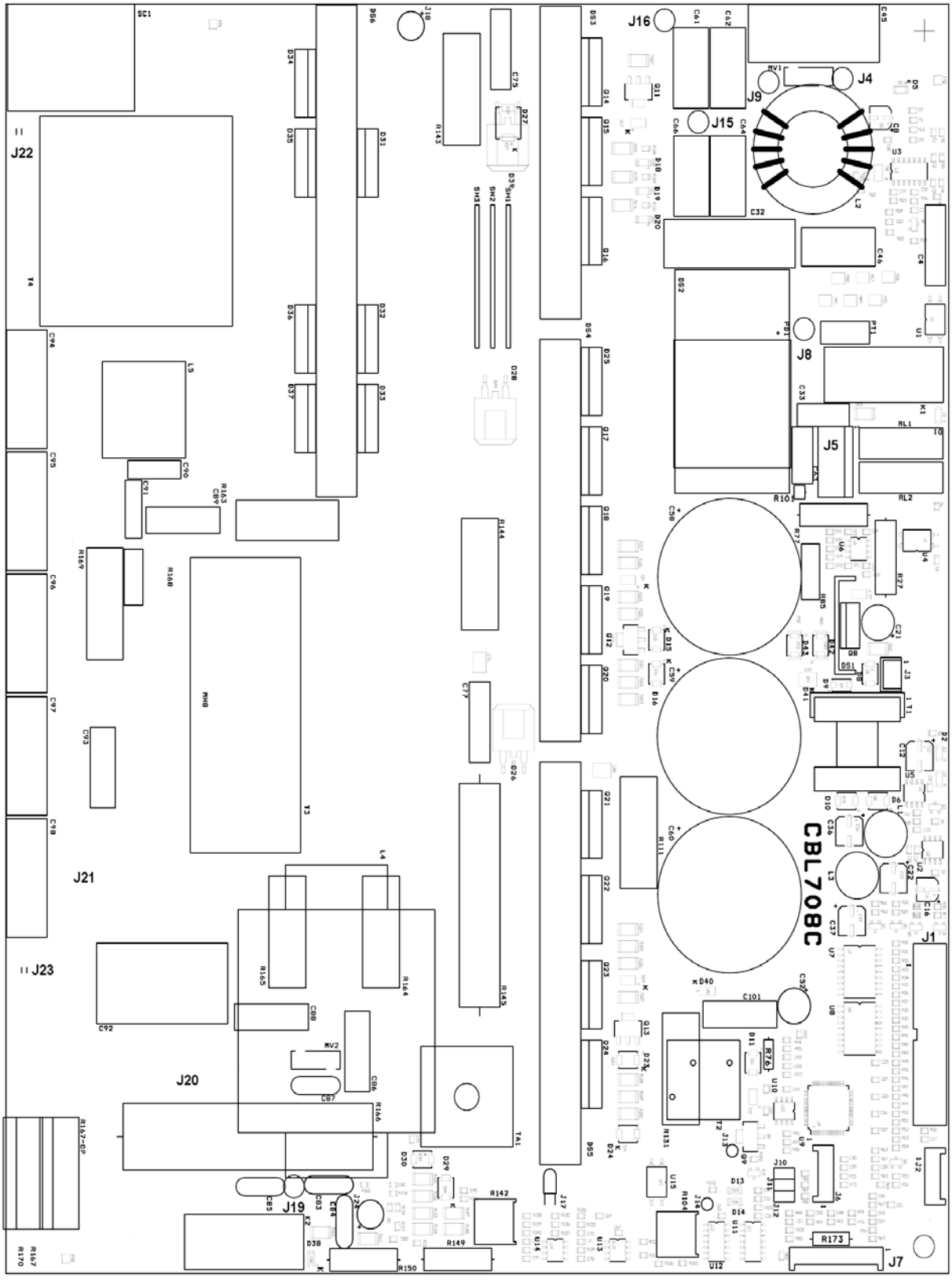
Ref.	Description	Q.ty
5	switch	1
07	fan	1
42	IGBT	4

5 - WIRING DIAGRAMS

5.1 - Power source art. 168: see diagram on page 26

5.2 - Power board (14)

5.2.1 - Topographic drawing.

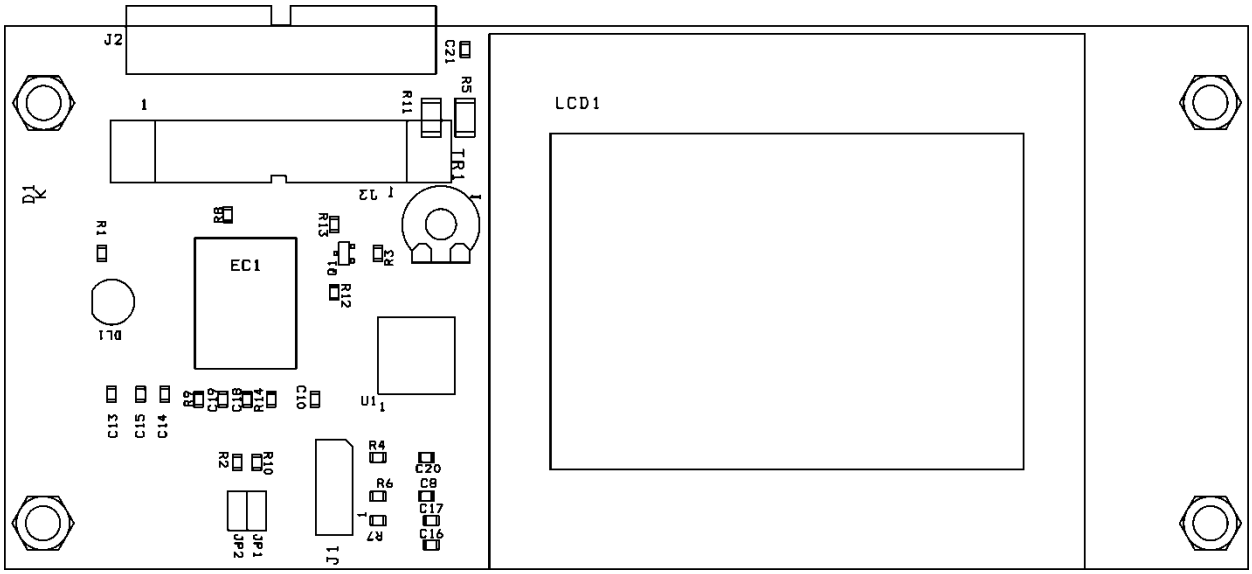


5.2.2 - Connectors table.

Conn.	Terminals	Function
J5	1-2	solenoid valve (23) 230 Vac power supply output.
J5	3-4	fan (7) 230 Vac power supply output.
J7	1	NU
J7	3	output"–" for torch potentiometer
J7	5	"DOWN" signal input.
J7	4	"START" signal input.
J7	8	"common" output for signals from/through connector board (28).
J7	7	NU.
J7	2	torch potentiometer cursor input.
J7	6	"UP" signal input.
J1	24	0 Vdc power supply output for display board (18).
J1	25	+5 Vdc power supply output for display board (18).
J2	1-2-3-4	output to enable AC-board (38).
J25	1 – 2	suitable pressure from cooling unit signal input
CNE	1	+14,5V output for connector circuit (28).
CNE	2	power source output voltage reading signal input
CNE	3	NU.
CNE	4	"common" signal output for connector circuit (28).
-	J4 – J9	power circuit 230 Vac power supply input of power board (14).
-	J20– J21	power circuit output of power board (14)
-	J8 – J16	PF inductance output
-	J22– J23	HF transformer (33) primary winding power supply.

5.3 - Display board (18)

5.3.1 - Topographic drawing.

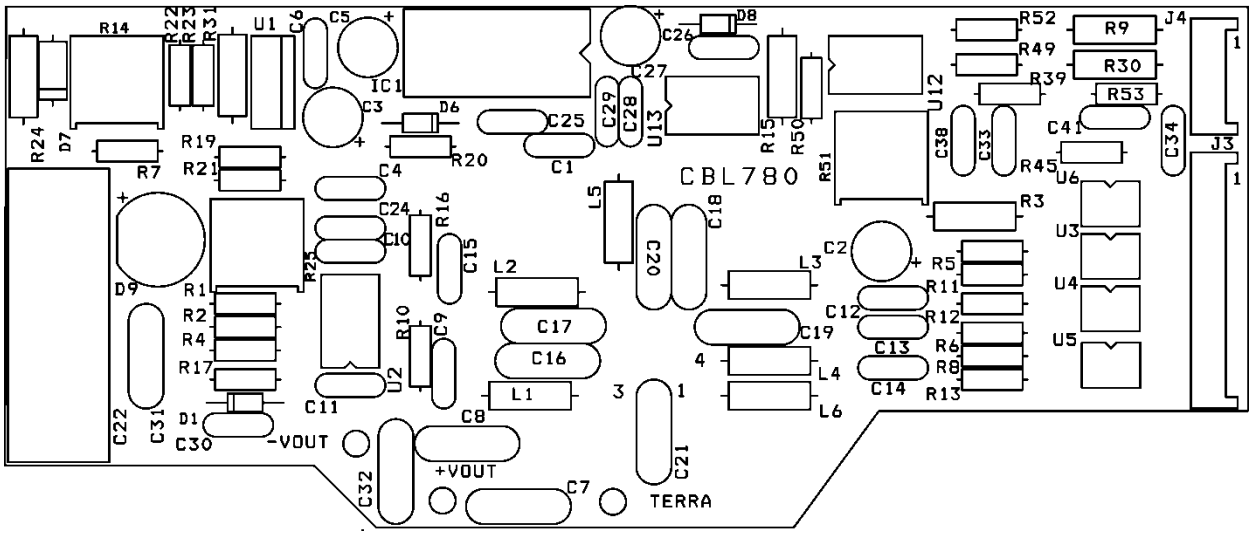


5.3.2 - Connectors table.

Conn.	Terminals	Function
J1	24	0 Vdc power supply input for display board (18).
J1	25	+5 Vdc power supply input for display board (18).

5.4 - Connector board (28)

5.4.1 - Topographic drawing.

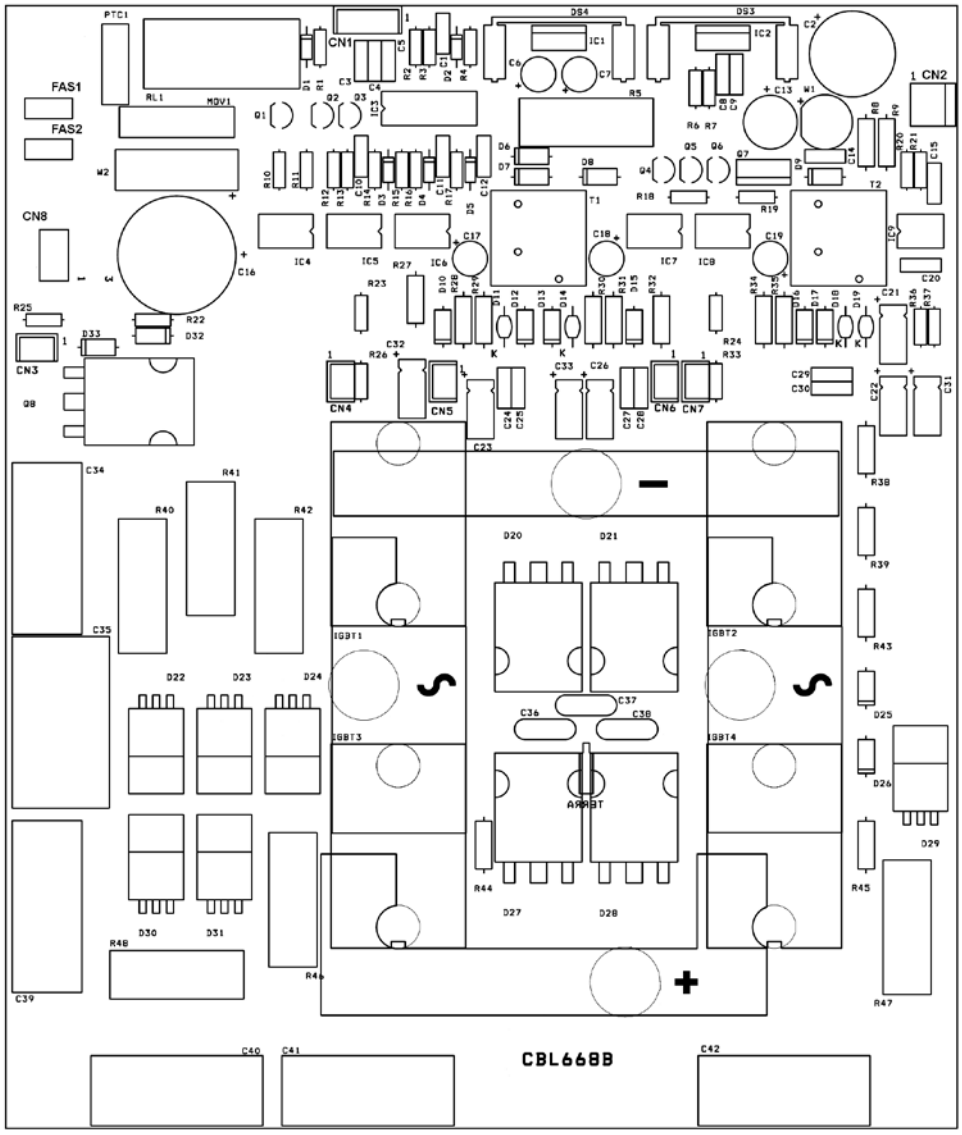


5.4.2 - Connectors table.

Conn.	Terminals	Function
J3	1	NU
J3	8	“common” input for external signals.
J3	2	torch potentiometer cursor output.
J3	4	“START” signal output.
J3	6	“UP” signal output.
J3	5	“DOWN” signal output.
J3	3	input “-“ for torch potentiometer.
J3	7	NU
J3	9	NU.
J3	10	NU.
J4	1	+14.5V input from power circuit (14)
J4	2	power source output voltage reading signal output, for power circuit (14).
J4	3	NU.
J4	4	“common” signal input from power circuit (14)
CN2	1	“START” signal input.
CN2	9	output“+“ for torch potentiometer
CN2	4	“DOWN” signal input.
CN2	5	GND.
CN2	7	output “-“ for torch potentiometer.
CN2	8	“UP” signal input.
CN2	2	“common” output for external signals.
CN2	10	torch potentiometer cursor input.

5.5 – AC-board (38)

5.5.1 - Topographical drawing.

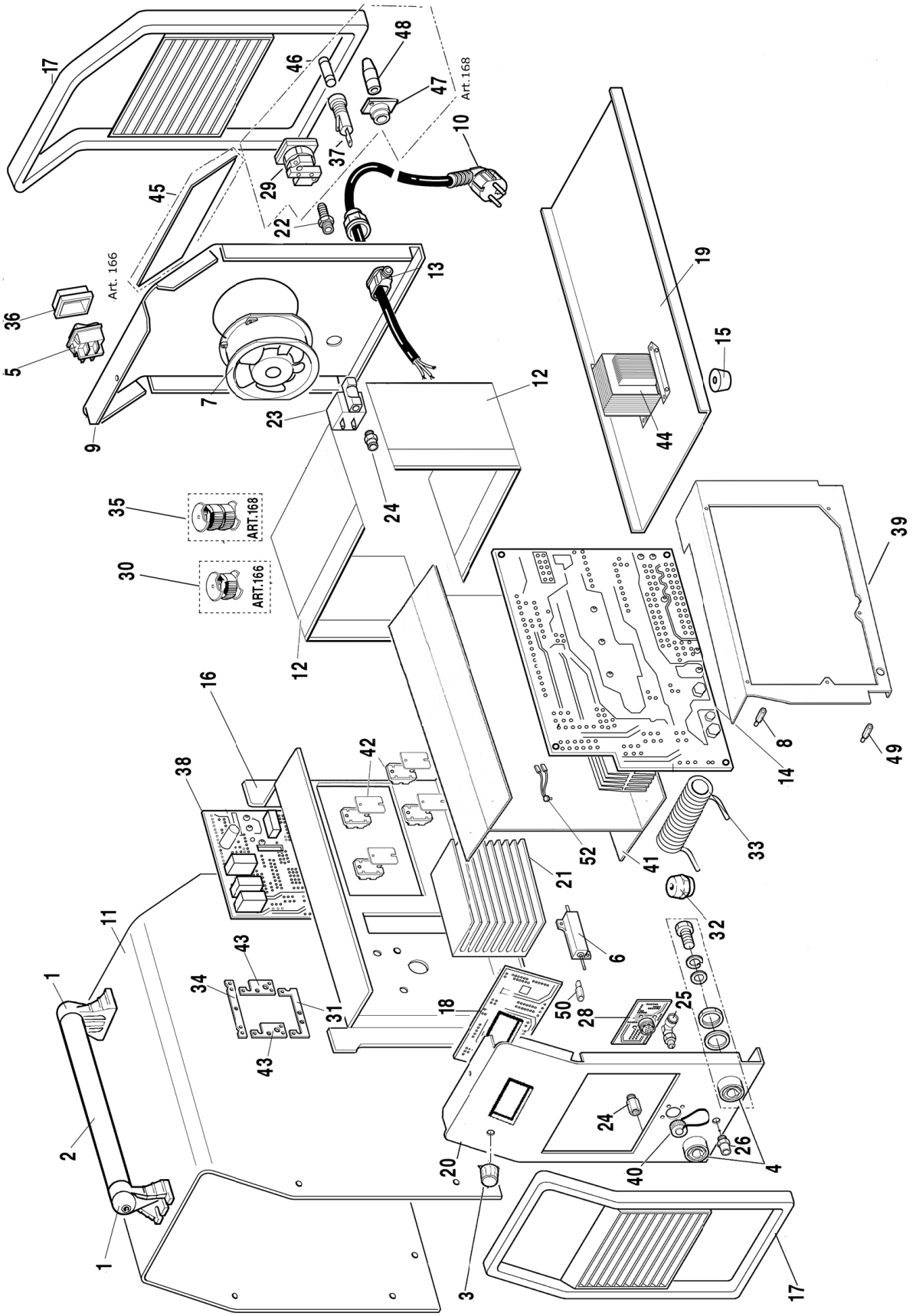


5.5.2 - Connectors table.

Connector	Terminals	Function
CN1	1 - 2 - 3 - 4	input to enable AC board (38).
CN2	1 - 2	27 Vac input for AC board (38).
CN8	1 - 2	260 Vac input.
-	FAS1 – FAS2	connection to resistances. (6)
-	+	"+" power circuit input.
-	-	"-" power circuit input.
-	~	AC power circuit output.
-	~	AC power circuit output.

POS.	DESCRIZIONE	DESCRIPTION	BESCHREIBUNG	DESCRIPTION	DENOMINACIÓN	*DESCRIÇÃO*	*OMSCHRIJVING*
1	SUPPORTO MANICO	HANDLE SUPPORT	GRIFFHALTERUNG	SUPPORT POIGNEE	SOPORTE EMPUÑADURA	SUPORTE CABO	HANDVATHOUDER
2	MANICO	HANDLE	GRIFF	POIGNEE	EMPUÑADURA	CABO	HANDVAT
3	MANOPOLA	KNOB	REGLER	BOUTON	MANECILLA	MANÍPULO	KNOP
4	INNESTO TEXAS	TEXAS CONNECTION	TEXAS-KUPPLUNG	CONNEXION TEXAS	ACOPLAMIENTO TEXAS	CONECTOR TEXAS	DINZE CONNECTIE
5	INTERRUTTORE	SWITCH	SCHALTER	INTERRUPTEUR	INTERRUPTOR	INTERRUPTOR	SCHAKELAAR
6	RESISTENZA	RESISTANCE	WIDERSTAND	RESISTANCE	RESISTENCIA	RESISTÊNCIA	WEERSTAND
7	VENTILATORE	MOTOR WITH FAN	LÜFTER	VENTILATEUR	VENTILADOR	VENTILADOR	VENTILATOR
8	DISTANZIALE	SPACER	DISTANZSTÜCK	ENTRETOISE	PIEZA DE ESPESOR	SEPARADOR	TUSSENSTUK
9	PANNELLO POSTERIORE	BACK PANEL	RÜCKWAND	PANNEAU POSTERIEUR	PANEL TRASERO	PAINEL POSTERIOR	ACHTERPANEEL
10	CAVO RETE	SUPPLY INPUT CABLE	NETZKABEL	CABLE RESEAU	CABLE RED	CABO REDE	NETKABEL
11	FASCIONE	HOUSING	GEHÄUSE	CARROSSERIE	ABRAZADERA	ABRAÇADEIRA	OMHULSEL
12	SEMICONVOGLIATORE ARIA	HALF AIR CONVEYOR	HALBLUFT-BEFÖRDERER	SEMI-CONVOYEUR AIR	SEMI-CANALIZADOR AIRE	SEMI-CANALIZADOR DE AR	SEMI-LUCHTKANAAL
13	PASSACAVO E GHIERA	FAIRLEAD AND RING NUT	LEITÖSE UND NUTMUTTER	PASSE-CABLE ET BAGUE	PASA-CABLES Y VIROLA	PASSA CABO E VIROLA	KABELLEIDING EN RINGMOER
14	CIRCUITO DI POTENZA	POWER BOARD	LEISTUNGSPLATINE	CIRCUIT DE PUISSANCE	CIRCUITO DE POTENCIA	CIRCUITO DE POTÊNCIA	STROOMKRING
15	PIEDINO	FOOT	FUSS	SUPPORT	PIE	PÉ	VOET
16	TUNNEL	TUNNEL	TUNNEL	TUNNEL	TUNNEL	TUNNEL	TUNNEL
17	CORNICE	FRAME	RAHMEN	CADRE	MARCO	ESTRUTURA	MACHINEKAST
18	CIRCUITO PANNELLO	PANEL CIRCUIT	PLATTEN-PLATINE	CIRCUIT PANNEAU	CIRCUITO PANEL	CIRCUITO PAINEL	STUURPRINT
19	FONDO	BOTTOM	BODEN	FOND	FONDO	FUNDO	BODEM
20	PANNELLO ANTERIORE	FRONT PANEL	FRONTPLATTE	PANNEAU ANTERIEUR	PANEL DELANTERO	PAINEL ANTERIOR	VOORPANEEL
21	DISSIPATORE	DISSIPATOR	KÜHLKÖRPER	DISSIPATEUR	DISIPADOR	DISSIPADOR	AFLEIDER
22	RACCORDO	FITTING	ANSCHLUSS	RACCORD	UNIÓN	CONEXÃO	VERBINDINGSSTUK
23	ELETTROVALVOLA	SOLENOID VALVE	MAGNETVENTIL	SOUPAPE ELECTRIQUE	ELECTRO VÁLVULA	ELECTROVÁLVULA	ELEKTROMAGNETISCH VENTIEL
24	RACCORDO	FITTING	ANSCHLUSS	RACCORD	UNIÓN	CONEXÃO	VERBINDINGSSTUK
25	RACCORDO CURVO	BENT FITTING	GEBOGENER ANSCHLUSS	RACCORD COURBE	UNIÓN CURVADA	CONEXÃO CURVA	GEBOGEN VERBINDING
26	NIPPLO	NIPPLE	NIPPEL	NIPPLE	NIPPLE	NIPPLE	NIPPEL
27	SUPPORTO VENTILATORE	FAN SUPPORT	LÜFTER HALTER	SUPPORT VENTILATEUR	SOPORTE VENTILADOR	SUPORTE VENTILADOR	VENTILATORHOUDER
28	CIRCUITO CONNETTORE	CONNECTOR BOARD	STECKDOSEN-PLATINE	CIRCUIT CONNECTEUR	CIRCUITO CONECTOR	CIRCUITO CONECTOR	CONNECTORSTROOM-KRING
29	PRESA	SOCKET	STECKDOSE	PRISE	TOMA	TOMADA	STOPCONTACT
30	INDUTTANZA PFC	PFC CHOKE	PFC INDUKTIVITÄT	INDUCTANCE PFC	INDUCTANCIA PFC	INDUTÂNCIA PFC	PFC INDUCTIE
31	CAVALLOTTO CU POSITIVO	POSITIVE COPPER U BAR	POSITIVER KUPFERBÜGEL	BARRE CU EN FORME DE “U” POSITIVE	EMPALME CU EN FORMA DE “U” POSITIVO	UNIÃO CU EM “U” POSITIVA	U-VORMIGE CU STAAF POSITIEF
32	DISTANZIALE ISOLANTE	INSULATING SPACER	ISOLIERDISTANZ-STÜCK	ENTRETOISE ISOLANTE	PIEZA DE ESPESOR AISLANTE	SEPARADOR ISOLANTE	ISOLERENDE TUSSENSTUK
33	TRASFORMATORE ALTA FREQUENZA	HIGH-FREQUENCY TRANSFORMER	HF-TRANSFORMATOR	TRANSFORMATEUR HAUTE FREQUENCE	TRANSFORMADOR ALTA FRECUENCIA	TRANSFORMADOR DE ALTA FREQUÊNCIA	TRANSFORMATOR VAN HOOGFREQUENT
34	CAVALLOTTO CU NEGATIVO	NEGATIVE COPPER U BAR	NEGATIVER KUPFERBÜGEL	BARRE EN CUIVRE EN FORME DE “U” NEGATIVE	EMPALME EN FORMA DE “U” CU NEGATIVO	UNIÃO EM “U” CU NEGATIVA	U-VORMIGE CU STAAF NEGATIEF
35	INDUTTANZA PFC	PFC CHOKE	PFC INDUKTIVITÄT	INDUCTANCE PFC	INDUCTANCIA PFC	INDUTÂNCIA PFC	PFC INDUCTIE
36	PROTEZIONE INTERRUTTORE	SWITCH COVER	SCHALTERSCHUTZ	PROTECTION POUR INTERRUPTEUR	PROTECCIÓN INTERRUPTOR	PROTECÇÃO INTERRUPTOR	SCHAKELAARDOOSJE
37	PORTAFUSIBILE	FUSE HOLDER	SICHERUNGSHALTER	PORTE FUSIBLE	PORTA-FUSIBLE	PORTA-FUSÍVEL	ZEKERINGHOUDER
38	CIRCUITO AC	AC BOARD	AC PLATINE	CIRCUIT AC	CIRCUITO AC	CIRCUITO AC	AC KRING
39	SUPPORTO SCHEDA	CIRCUIT HOLDER	KREISHALTERUNG	SUPPORT CIRCUIT	CIRCUITO INFERIOR	SUPORTE CIRCUITO	KRINGHOUNDER
40	TAPPO	CAP	VERSCHLUSSKAPPE	BOUCHON	TAPÓN	TAMPA	DOP
41	TUNNEL AC	AC TUNNEL	AC TUNNEL	TUNNEL AC	TUNNEL AC	TUNNEL AC	AC TUNNEL
42	IGBT	IGBT	IGBT	IGBT	IGBT	IGBT	IGBT
43	CAVALLOTTO CU AC	AC COPPER U BAR	AC KUPFERBÜGEL	BARRE EN CUIVRE EN FORME DE “U” AC	EMPALME CU EN FORMA DE “U” AC	UNIÃO CU EM “U” AC	CU U-VORMIGE STAAF AC
44	TRASFORMATORE DI SERVIZIO	AUXILIARY TRANSFORMER	STEUER-TRANSFORMATOR	TRANSFORMATEUR AUXILIAIRE	TRANSFORMADOR DE SERVICIO	TRANSFORMADOR DE SERVIÇO	HULPTRANSFORMATOR
45	PIASTRA	PLATE	PLATTE	PANNEAU	PANEL	PAINEL	PANEEL
46	FUSIBILE	FUSE	SICHERUNG	FUSIBLE	FUSIBLE	FUSÍVEL	ZEKERING
47	PRESA	SOCKET	STECKDOSE	PRISE	TOMA	TOMADA	STOPCONTACT
48	CONNESSIONE	CONNECTION	ANSCHLUSS-STECKER	CONNEXION	CONEXIÓN	CONEXÃO	VERBINDING
49	DISTANZIALE	SPACER	DISTANZSTÜCK	ENTRETOISE	PIEZA DE ESPESOR	SEPARADOR	TUSSENSTUK
50	DISTANZIALE	SPACER	DISTANZSTÜCK	ENTRETOISE	PIEZA DE ESPESOR	SEPARADOR	TUSSENSTUK
51	DISTANZIALE	SPACER	DISTANZSTÜCK	ENTRETOISE	PIEZA DE ESPESOR	SEPARADOR	TUSSENSTUK
52	TERMOSTATO	THERMOSTAT	THERMOSTAT	THERMOSTAT	TERMOSTATO	TERMÓSTATO	THERMOSTAAT

La richiesta di pezzi di ricambio deve indicare sempre: l' art. e la data d'acquisto della macchina, la posizione e la quantità dei pezzi di ricambio.
In case spare parts are required please always indicate: item ref. no. and purchase date of the machine, spare part position no. and quantity.
Bei der Ersatzteilanfrage müssen immer Art. und Kaufdatum der Maschine, Ersatzteil-Nr. und Menge angegeben werden.
En cas de demande de pièces de rechange, toujours indiquer: l'article et la date d'achat de la machine, la position et la quantité des pièces.
Los pedidos de piezas de repuesto deben indicar siempre: el numero de articulo y la fecha de adquisición del aparato, la posición y la cantidad de las piezas.
O pedido de peças deve indicar sempre o modelo da máquina em causa e a data de aquisição da mesma, a posição e a quantidade de peças pedidas.
Indien u reserveonderdelen wilt bestellen, gelieve steeds het referentienummer van het artikel te geven, alsook de aankoopdatum van het toestel, het positienummer van het reserveonderdeel en de hoeveelheid.


Art. 166
Art.168
ART.168
ART.166

	Codifica colori cablaggio elettrico	Wiring diagram colour code	Farben-Codierung elektrische Schaltplan	Codification couleurs schéma électrique	Codificación colores cableado eléctrico	Codificação cores conjunto eléctrico de cabos
A	Nero	Black	Schwarz	Noir	Negro	Negro
B	Rosso	Red	Rot	Rouge	Rojo	Vermelho
C	Grigio	Grey	Grau	Gris	Gris	Cinzento
D	Bianco	White	Weiss	Blanc	Blanco	Branco
E	Verde	Green	Gruen	Vert	Verde	Verde
F	Viola	Purple	Violett	Violet	Violeta	Violeta
G	Giallo	Yellow	Gelb	Jaune	Amarillo	Amarelo
H	Blu	Blue	Blau	Bleu	Azul	Azul
K	Marrone	Brown	Braun	Marron	Marron	Castanho
J	Arancione	Orange	Orange	Orange	Nardnja	Alaranjado
I	Rosa	Pink	Rosa	Rose	Rosa	Rosa
L	Rosa-nero	Pink-black	Rosa-schwarz	Rose-noir	Rosa-negro	Rosa-negro
M	Grigio-viola	Grey-purple	Grau-violett	Gris-violet	Gris-violeta	Cinzento-violeta
N	Bianco-viola	White-purple	Weiss-violett	Blanc-violet	Blanco-violeta	Branco-violeta
O	Bianco-nero	White-black	Weiss-schwarz	Blanc-noir	Blanco-negro	Branco-negro
P	Grigio-blu	Grey-blue	Grau-blau	Gris-bleu	Gris-azul	Cinzento-azul
Q	Bianco-rosso	White-red	Weiss-rot	Blanc-rouge	Blanco-rojo	Branco-vermelho
R	Grigio-rosso	Grey-red	Grau-rot	Gris-rouge	Gris-rojo	Cinzento-vermelho
S	Bianco-blu	White-blue	Weiss-blau	Blanc-bleu	Blanco-azul	Branco-azul
T	Nero-blu	Black-blue	Schwarz-blau	Noir-bleu	Negro-azul	Negro-azul
U	Giallo-verde	Yellow-green	Gelb-gruen	Jaune-vert	Amarillo-verde	Amarelo-verde

Art. 166-168: SCHEMA ELETTRICO - WIRING DIAGRAM - ELEKTRISCHER SCHALTPLAN - SCHEMA ELECTRIQUE - ESQUEMA ELECTRICO