Cod.988633

TELWIN ENTERPRISE PLASMA 160 HF

chopper

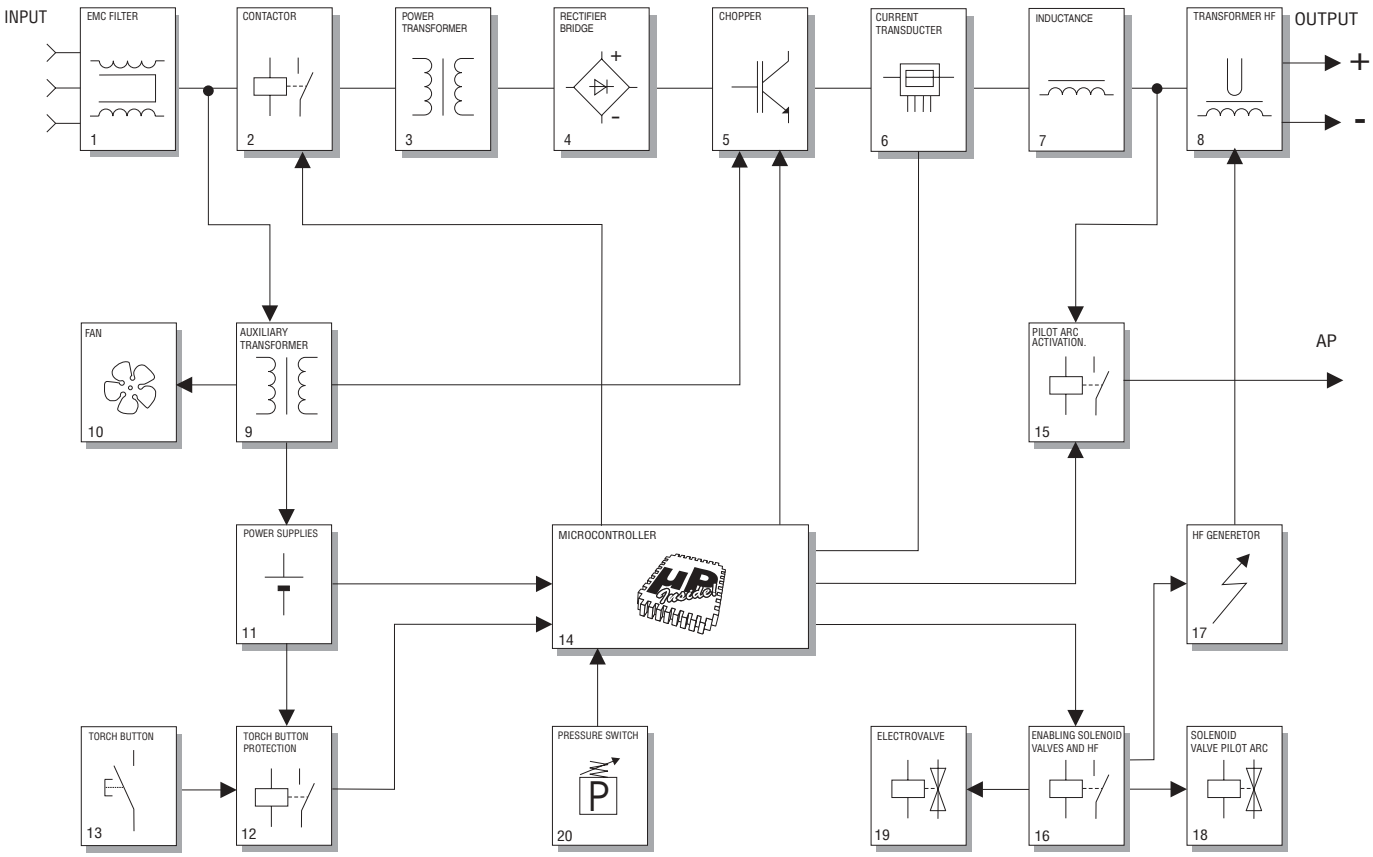
TROUBLESHOOTING AND REPAIR MANUAL

CONTENTS

"reparation no-problem"

OPERATION AND ELECTRICAL DIAGRAMS

BLOCK DIAGRAM



ANALYSIS OF THE BLOCK DIAGRAM

Block 1

EMC Filter

Consisting of: input filter board.

Prevents noise from the machine from being transmitted along the main power line and vice versa.

Block 2

Contactor

Consisting of: K1.

Separates the machine from the power supply when the main switch is OFF.

Block 3

Power transformer

Consisting of: T1.

Adjusts the voltage and current to values required for the cutting procedure. Also forms galvanic separation of the primary from the secondary (cutting circuit from the power supply line).

Block 4

Rectifier bridge

Consisting of: D1

Converts the alternating voltage, coming from the power transformer (block 2) into direct voltage.

Block 5

Chopper

Consisting of: CHOPPER MODULE

Device which, from a direct fixed input voltage, via appropriate control of the power components (IGBT's), supplies a direct output voltage with a variable average value.

Block 6

Current transducer

Consisting of: Hall probes.

Hall probe P detects and adjusts the cutting current in the power circuit. Hall probe T, on the other hand, allows the cutting arc to start off at the end of the pilot arc phase.

The values of both current measurements are sent to the control board (block 8) which will process the two signals separately.

Block 7

Inductance

Consisting of: L1.

The inductance levels the output current from the chopper module (block 4) making it practically direct.

Block 8

HF Transformer

Consisting of: T4.

The HF transformer boosts the signal from block 17 (hf power source), raising the voltage impulse in the secondary at the instant when arc strike is generated.

It also isolates the welding cut circuit from the primary circuit.

Block 9

Auxiliary transformers

Consisting of: T2, T3.

Their purpose is to supply the machine with alternating voltages at different levels.

Block 10

Fan

Consisting of: M1

Cools the power components and is powered at 230Vac.

Block 11

Power supplies

Consisting of: auxiliary power supply board

The voltage regulators present on the auxiliary power supply board transform and stabilise the voltage obtained from block 9 (auxiliary transformers) to supply voltage values that allow block 12 (control board) to be powered correctly.

Block 12

Torch Button Protection

Consisting of: K2 (HF filter board).

The Torch Button protection is powered by block 9 (auxiliary transformers). When the torch button is pressed (block 12) relay K2 sends the signal to block 8 (control board), which will process the information. The torch button protection also separates the control board from the high frequency so that the residual signal arriving from the torch button cables is unable to enter the board.

Block 13

Torch button

Consisting of: Plasma Torch.

When the torch button is pressed, at the beginning of the welding process, it sends a signal to block 11, which will process the information.

Block 14

Microcontroller

Consisting of: U7 (control board).

Via the microcontroller, controls all the machine devices, interacting with them to optimise the cut.

Block 15

Enabling pilot arc

Consisting of: K1 (HF filter board).

When the torch button is pressed block 14 (control board) sends a signal to block 15 which, aided by the secondary voltage, generates the pilot arc.

Block 16

Enabling solenoid valves and HF

Consisting of: K1, K2, K3 (auxiliary control board).

When the torch button is pressed block 14 (control board) sends 3 signals to block 16 which will adjust them so as to

pilot blocks 17 (HF generator), 18 (pilot arc solenoid valve) and 19 (solenoid valve for cutting).

Block 17

HF Generator

Consisting of: hf board.

By means of a signal from block 39 (hf solenoid valve activation) this block produces a high frequency signal that is then sent to block 12 (hf transformer).

Block 18

Solenoid valve pilot arc

Consisting of: Y2.

When the torch button is pressed solenoid valve Y1 is energised, causing air outfeed which will allow the pilot arc to strike.

Block 19

Solenoid valve cut

Consisting of: Y1.

Solenoid valve Y1 (Cut) is energised when the cutting arc is struck (solenoid valve Y2 remains energised), allowing increased airflow in the torch.

Block 20

Pressure switch

Consisting of: SP1.

Switch that signals to block 14 (microcontroller) when the air pressure in the torch is insufficient for cutting to take place correctly.

ILLUSTRATIONS

Figure 1

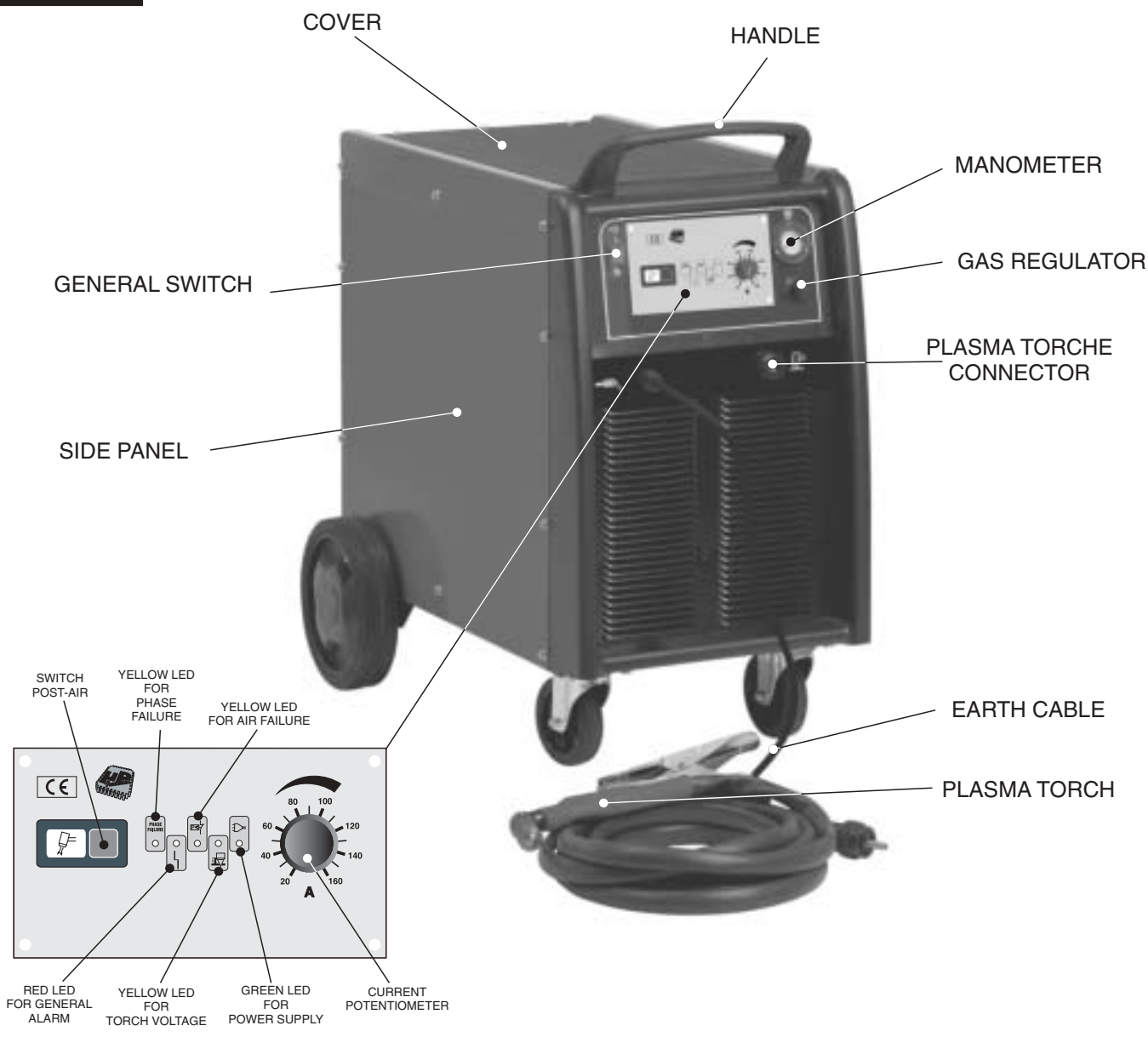


Figure 2

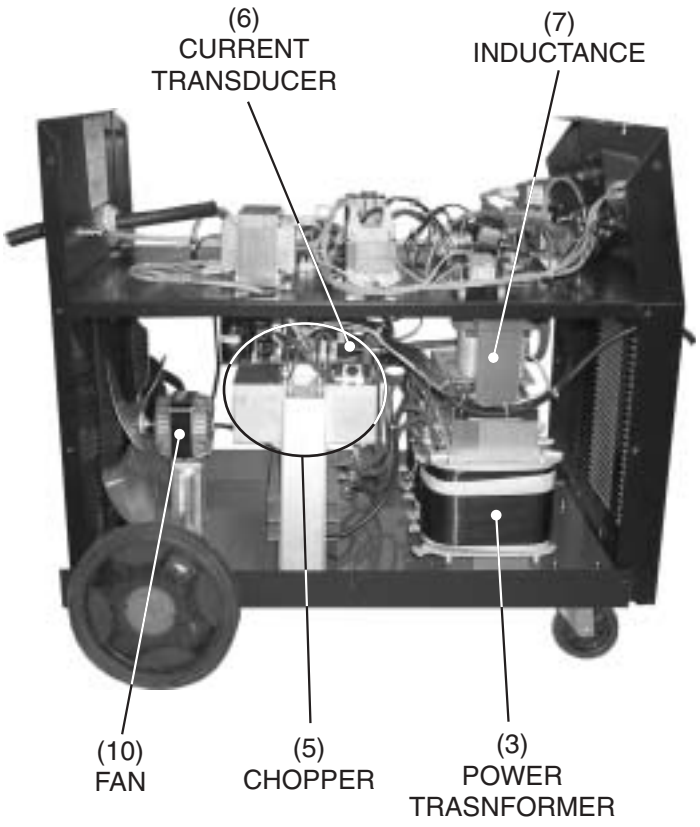


Figure 3

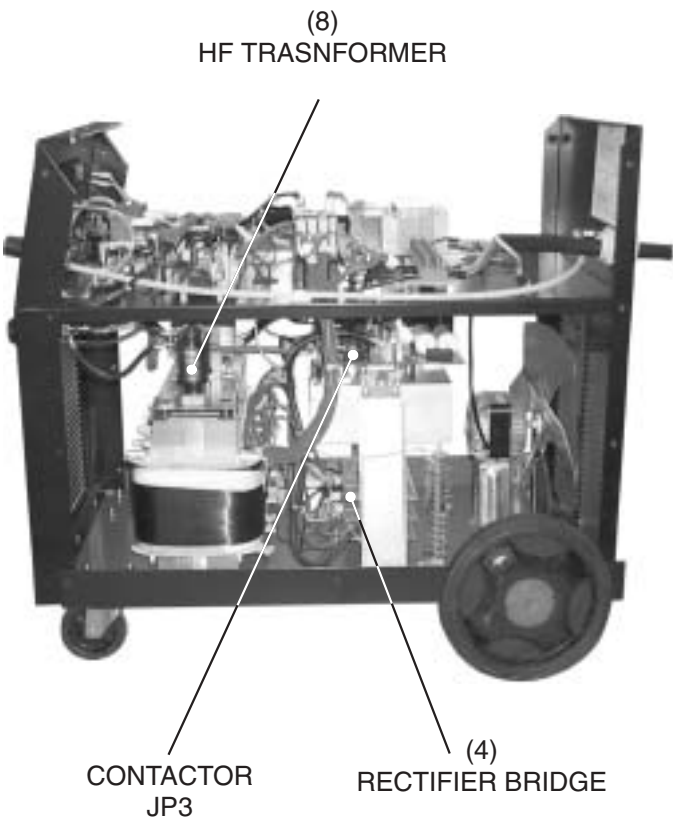
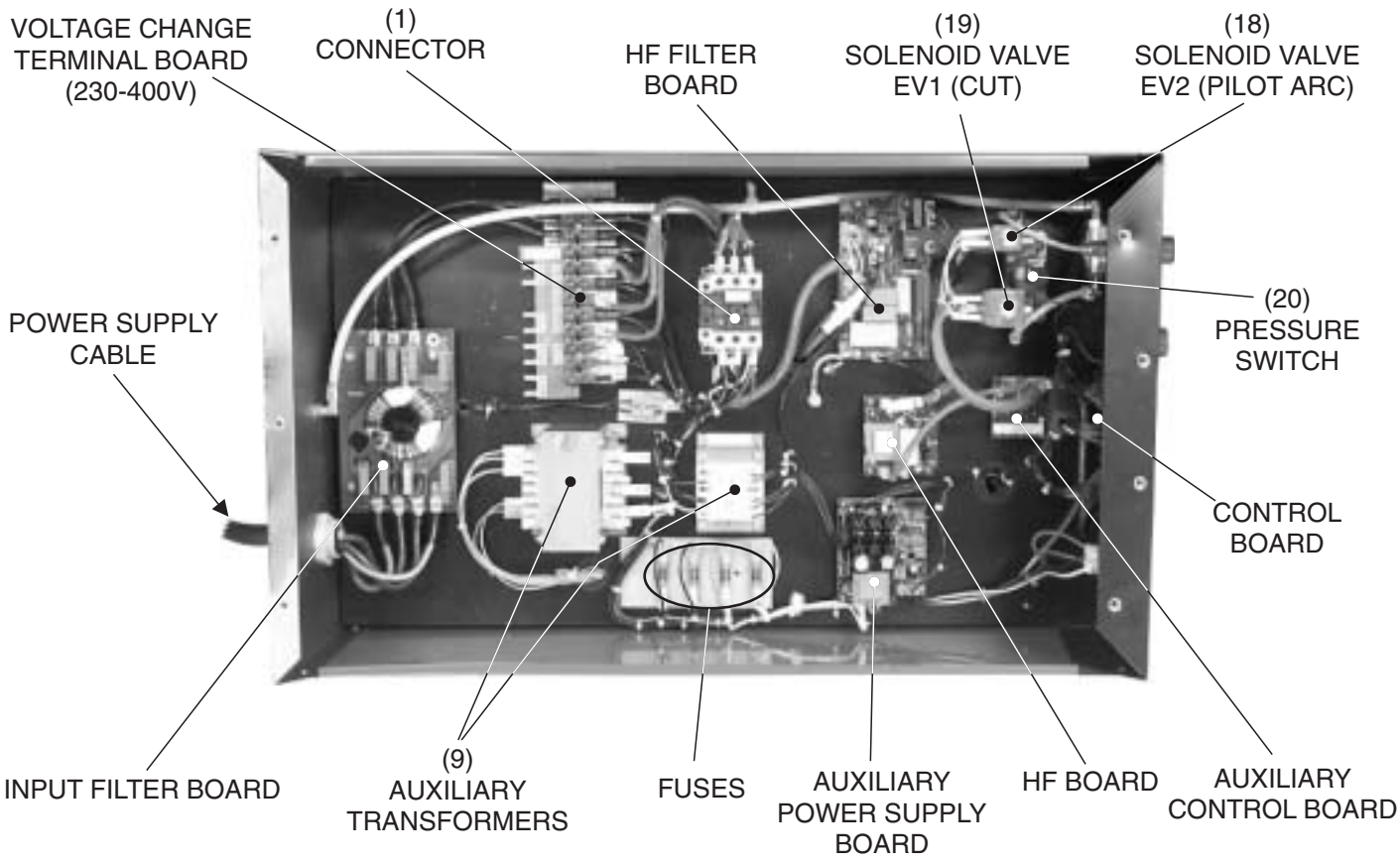
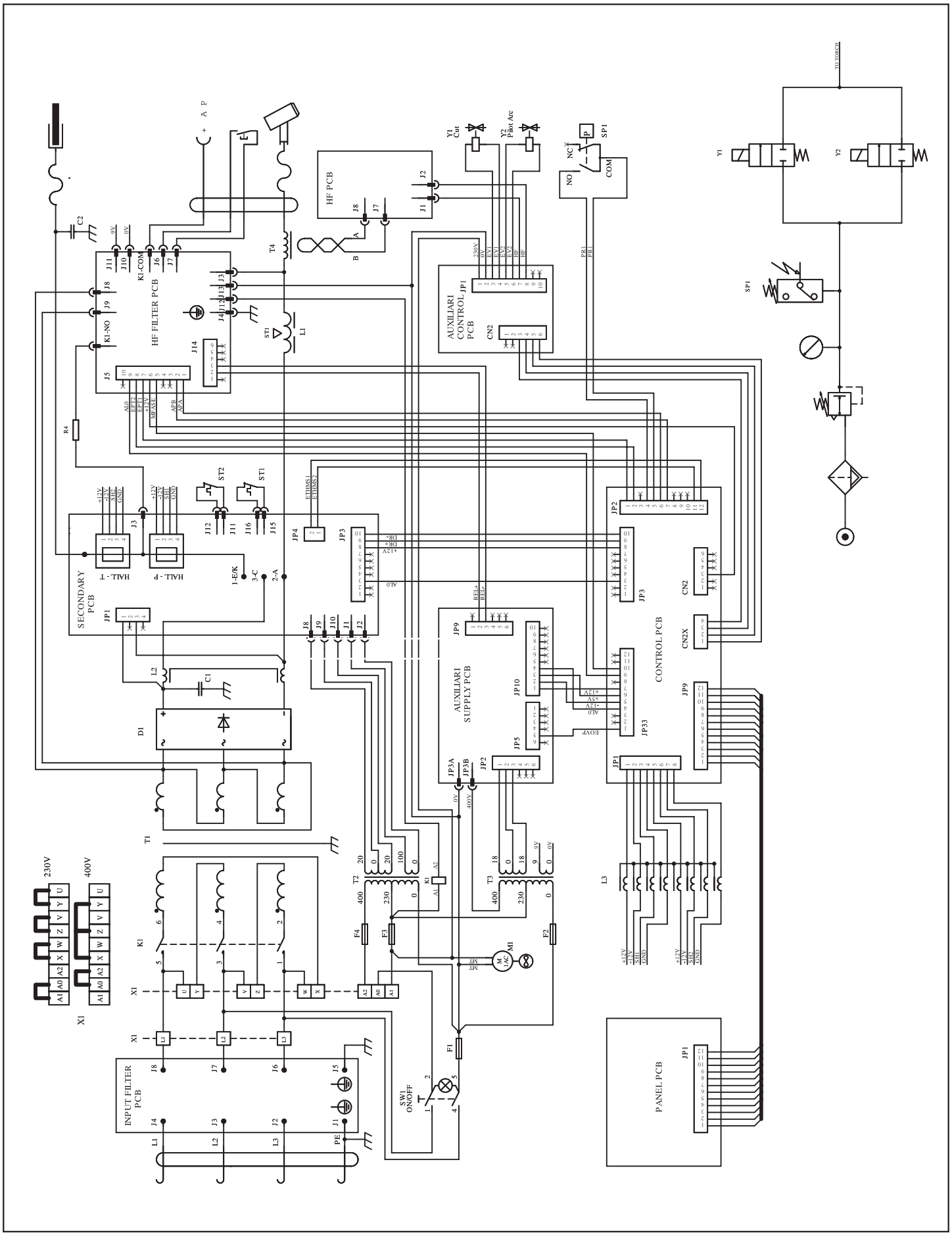


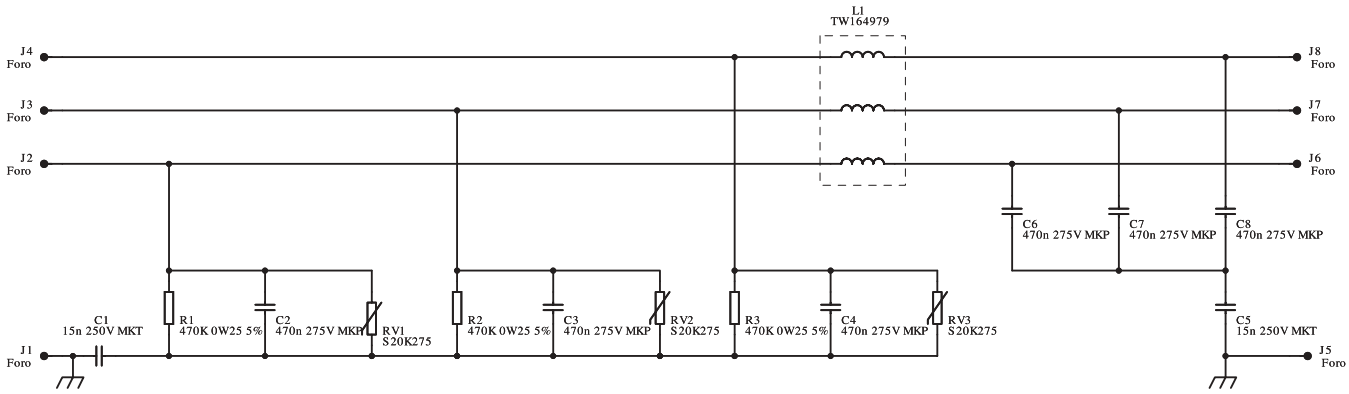
Figure 4



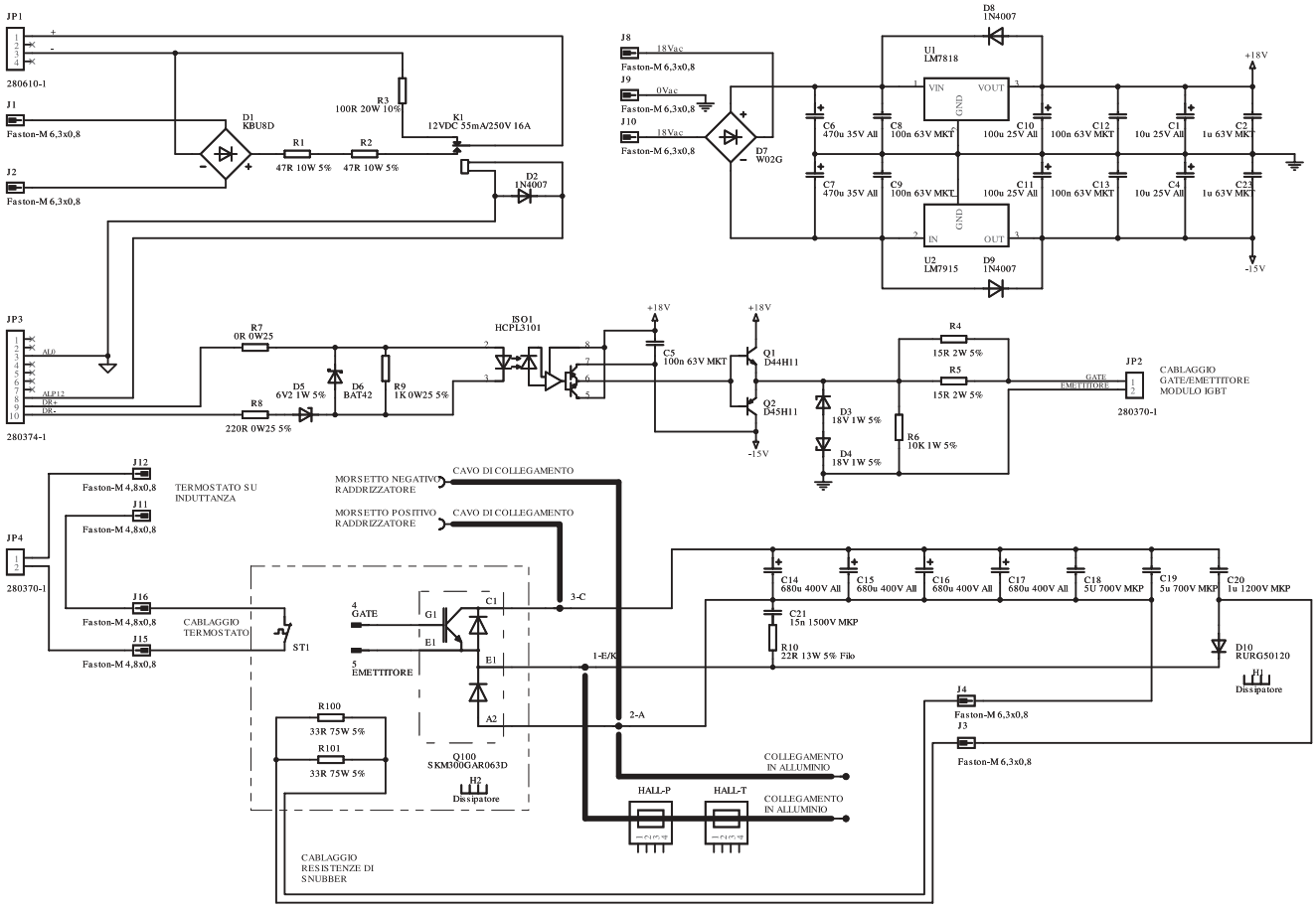
WIRING DIAGRAMS



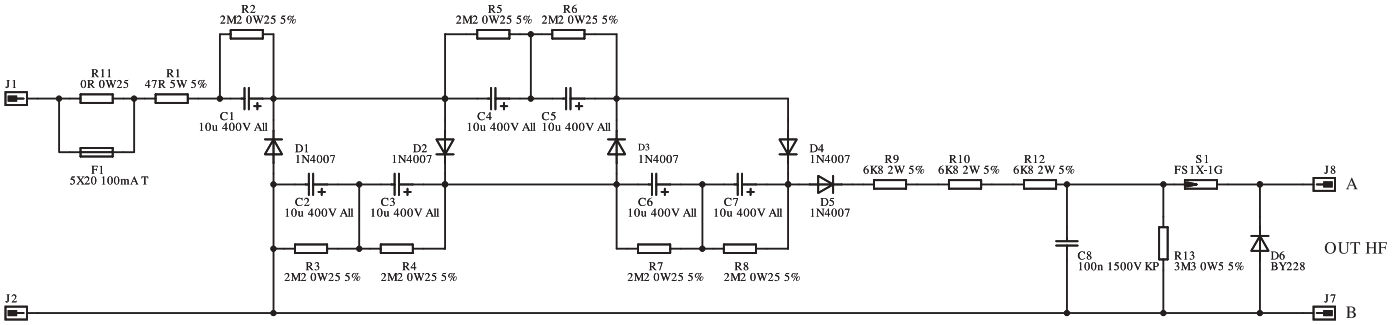
Wiring diagram input filter board



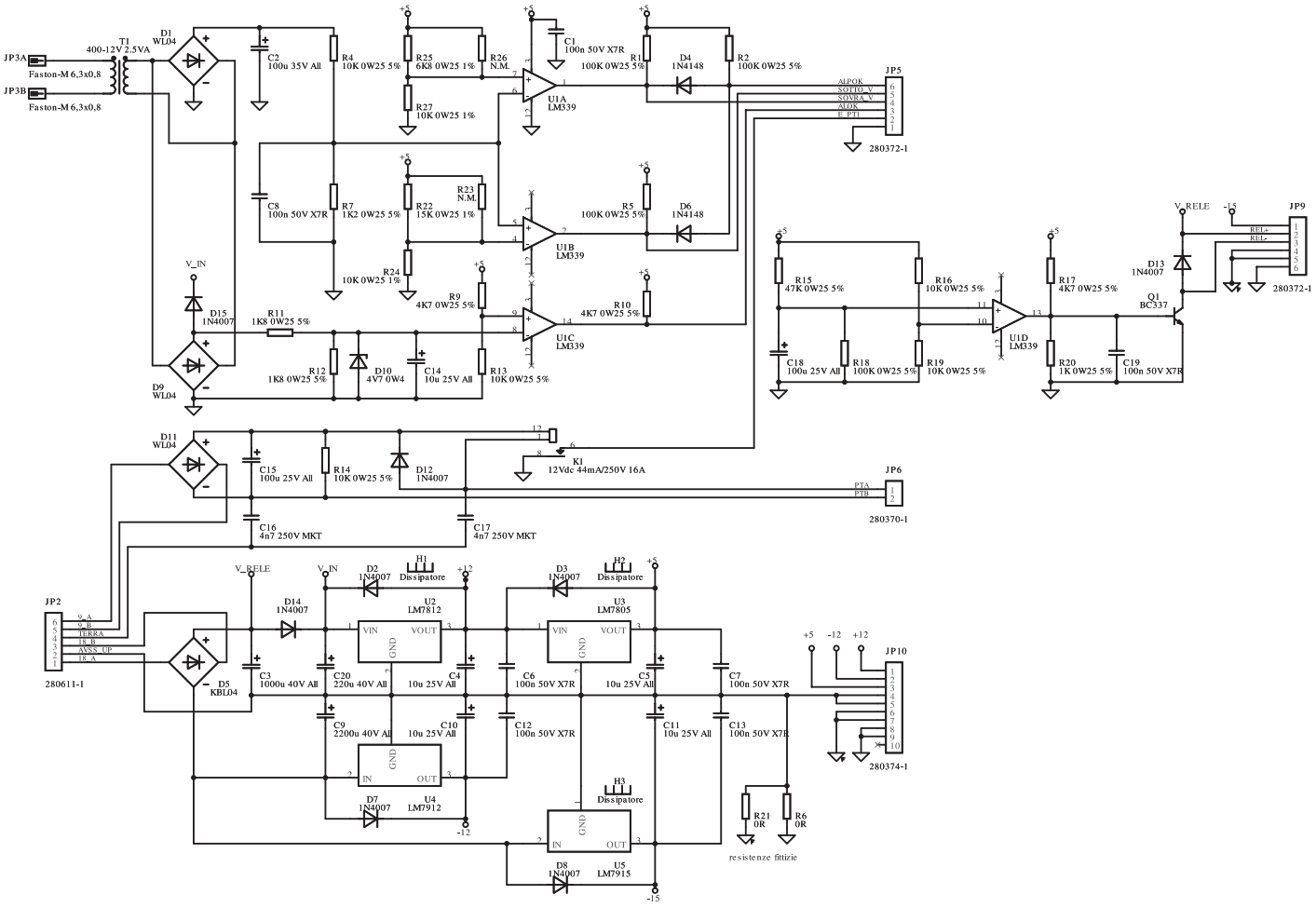
Wiring diagram chopper module



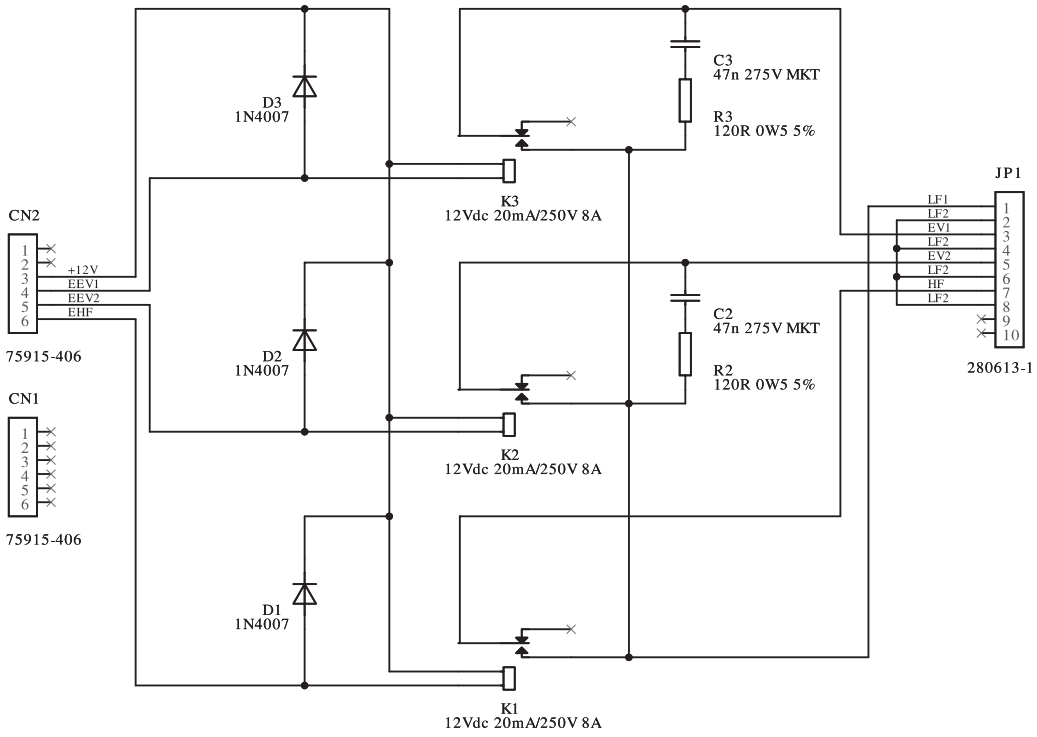
Wiring diagram hf board



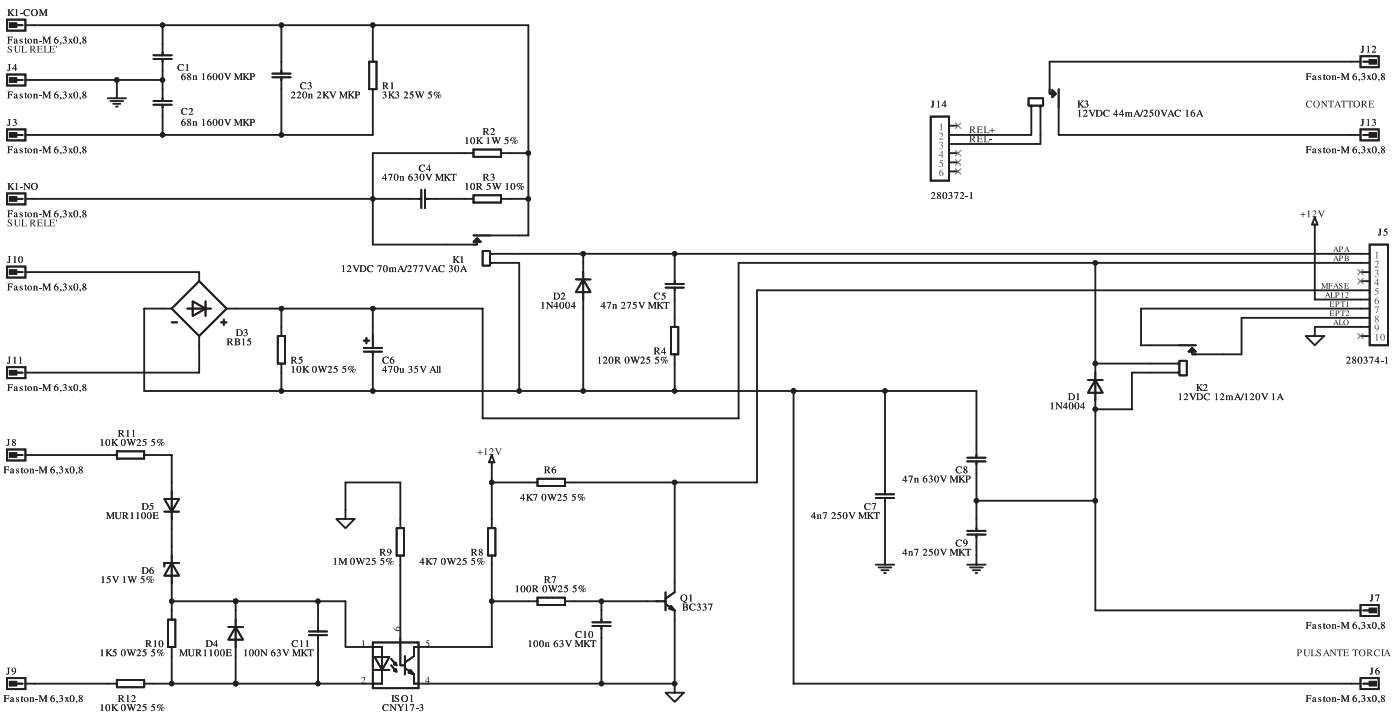
Wiring diagram auxiliary power supply board



Wiring diagram auxiliary control

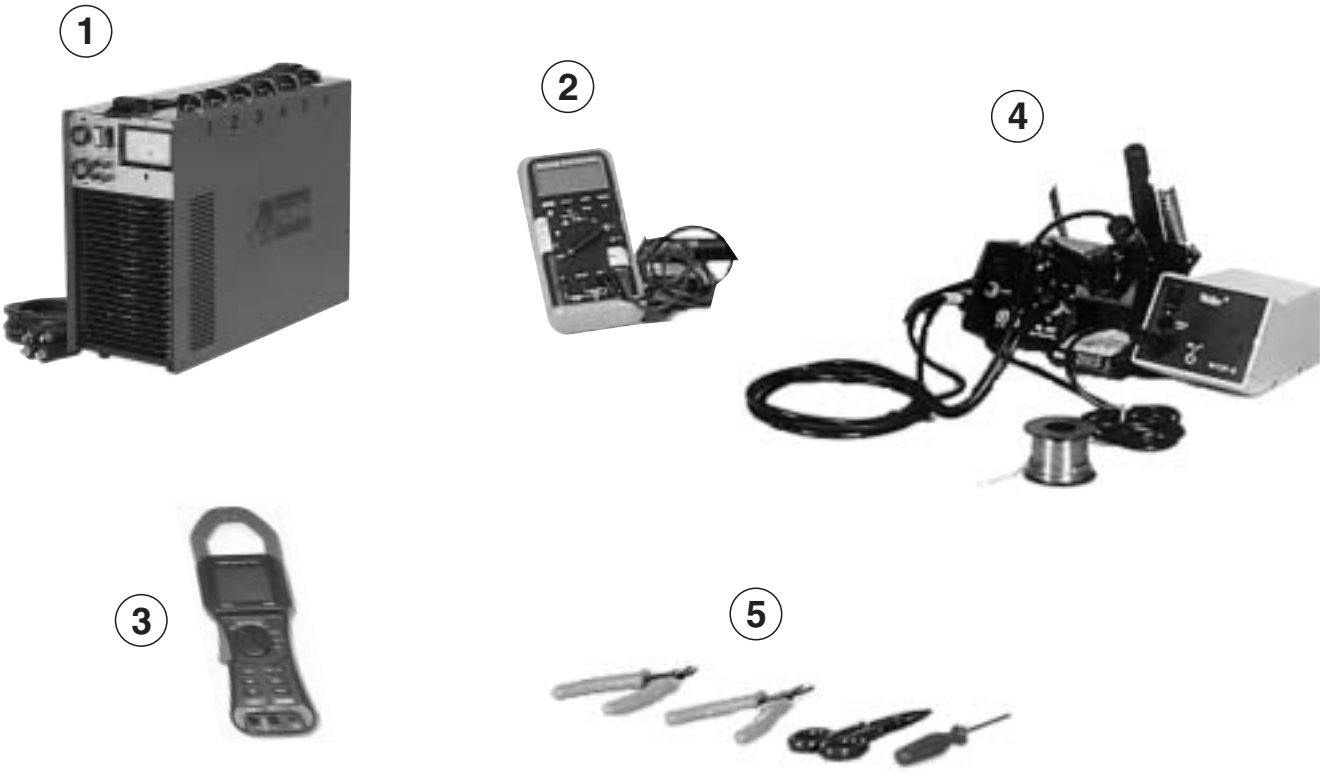


Wiring diagram hf filter board



REPAIR GUIDE

EQUIPMENT REQUIRED



ESSENTIAL INSTRUMENTS

1 Dummy load ***cod. 802111*** *(*)*
2 Digital multimeter
3 Ammeter clamp

USEFUL INSTRUMENTS

4 Unsoldering station
5 Miscellaneous tools

(*) The instruments with codes can be supplied by Telwin. The sale price is available on request!

⚠ WARNING:

BEFORE PROCEEDING WITH REPAIRS TO THE MACHINE READ THE INSTRUCTION MANUAL CAREFULLY.

⚠ WARNING:

EXTRAORDINARY MAINTENANCE OPERATIONS SHOULD BE CARRIED OUT ONLY AND EXCLUSIVELY BY EXPERT OR SKILLED ELECTRICAL-MECHANICAL PERSONNEL.

⚠ WARNING:

IF CHECKS ARE MADE INSIDE THE MACHINE WHILE IT IS LIVE, THIS MAY CAUSE SERIOUS ELECTRIC SHOCK DUE TO DIRECT CONTACT WITH LIVE PARTS AND/OR INJURY DUE TO DIRECT CONTACT WITH MOVING PARTS.

GENERAL REPAIR INSTRUCTIONS

The following is a list of practical rules which must be strictly adhered to if repairs are to be carried out correctly.

A) When handling the active electronic components, in particular IGBT's and power DIODES, take elementary precautions for electrostatic protection (such as wearing antistatic wristbands or footwear, using antistatic working surfaces etc.).

B) To ensure the heat flow between the electronic components and the dissipator, always place a thin layer of thermo-conductive grease (e.g. COMPOUND GREASIL MS12) between the contact zones.

C) The power resistors (should they require replacement) should always be soldered at least 3 mm above the board.

D) If silicone is removed from some points on the boards it should be re-applied.
N.B. Use only non-conducting neutral or oximic reticulating silicones (e.g. DOW CORNING 7093). Otherwise, silicone that is placed in contact with points at different potential (rheofores, IGBT's etc.) should be left to reticulate before the machine is tested.

E) The semiconductor devices should be soldered keeping below the maximum temperature limits (usually 300°C for no more than 10 seconds).

F) It is essential to take the greatest care at each disassembly and assembly stage of the various machine parts.

G) Keep the small parts and other pieces that are dismantled from the machine so as to be able to replace them in the reverse order when re-assembling (damaged parts should never be omitted but should be replaced, referring to the spare parts list given at the end of this manual).

H) The boards (repaired when necessary) and the machine wiring should never be modified without prior authorisation from Telwin.

I) For further information on machine specifications and operation see the Instruction Manual.

TROUBLESHOOTING AND REMEDIES

1.0 Disassembling the power source

WARNING! Every operation should be carried out in complete safety with the power supply cable disconnected from the mains outlet and should be done by expert, skilled electrical-mechanical personnel.

- Undo the 4 screws on the handle fastened to the top cover (fig. 1).
- Undo the 9 screws fastening the top cover to the power source structure (fig. 1).
- Undo the 14 screws fastening the two side panels (7 each) to the structure (fig. 1).

N.B. After completing the repairs, proceed in the reverse order to re-assemble the power source.

2.0 Cleaning inside the Power Source

Using suitably dried compressed air, carefully clean the components of the power source since dirt is a danger to parts subjected to high voltages. To clean the electronic boards we advise reducing the air pressure to prevent damage to the components. It is important to be particularly careful when cleaning the following parts:
Warning! before proceeding to repair the power source it is necessary to make sure that the voltage over the positive (+) and negative (-) terminals of the rectifier bridge (fig. 3) is equal to 0V; if not the fault is probably in the discharge resistor R3 on the chopper module (fig. 2);
N.B. to replace resistor R3 we recommend first discharging the electrolytic capacitors on the chopper module, by connecting a resistance of 1Kohm 4W between the positive (+) and negative (-) terminals of the rectifier bridge (discharge time approx. 10 sec.).

Fan inlet fastened to the back (Fig.2)
Check whether dirt has been deposited on the front/back air vents, damaging correct rotation of the blades; if there is still damage after cleaning replace the fan.

Rectifier bridge (Fig. 3)
Make sure there is no dirt, iron dust in particular, on the aluminium plates of the rectifier.

Chopper (Fig. 2)
Make sure there is no dirt inside the dissipator or on the boards, as this could adversely affect operation of the chopper.

Power transformer and inductance (Fig. 2)
Make sure there is no dirt inside the windings as this could adversely affect operation of the transformer (e.g. short circuit).

Parts fastened to the diaphragm (Fig. 3):
- input filter board;
- control board;
- auxiliary power supply board;
- auxiliary control board;
- HF filter board;

- HF board;
- auxiliary transformers;
- contactor;
- fuses;
- voltage change terminal board.
- air unit assembly;

3.0 Visual inspection of the Power source

Make sure there is no mechanical deformation, dent, or damaged and/or disconnected connector. Make sure that the power supply cable has not been damaged or disconnected internally. Inspect the components and cables for signs of burning or breaks that may adversely affect operation of the power source.
Check the parts indicated below with the multimeter in ohm mode:

Main power supply switch (Fig. 1)

Use the multimeter to check whether the contacts are stuck together or open. *Probable cause:*
- mechanical or electrical shock.

Contactor (Fig. 4)

Use the multimeter to check whether the contacts are stuck together or open. *Probable cause:*
- mechanical or electrical shock. **N.B.** if the contactor contacts are stuck together or dirty, do not attempt to separate or clean them, just replace the contactor itself.

Fuses F1, F2, F3, F4 (Fig.4)

Make sure the fuses are inserted properly in the fuse holder and that they have not blown (typically, blackened). Use the multimeter to check whether the fuses have blown. *Probable cause:*
- excessive current absorption from the main supply; with the power source disconnected from the main power supply use the multimeter to check the continuity of: the auxiliary transformer windings; the solenoid valve coils; the contactor coils; which should be approx 0 Ohms; also make sure the voltage change header faces the correct direction.

IGBT Module (fig. 2)

Use the multimeter to make sure that, between the positive terminal of the rectifier bridge and the aluminium connection of the Hall probes, the resistance shown is not 0 Ohms; if not the fault is probably in the IGBT module.
Probable cause:
excessive current absorption from power circuit; make sure that relay K1 on the HF filter board (fig. 4) is intact and that the contact is not stuck.

Hall Probe (Fig. 2)

Make sure the electrical connection is complete.
Probable cause:
- loosening of the connector caused by vibration.

Power transformer and inductance (Fig. 2)

Inspect the windings for colour changes.
Probable causes:
- power source connected to a higher voltage than 400Vac;
- ageing after a substantial number of working hours;
- excessive overheating related to faulty operation.

Plasma Torch (Fig. 1)

Maintenance status, referring to the instructions given in the operator's instruction manual. Condition of parts not subject to wear on the connecting cable between torch and power source (insulation).

4.0 Checking power and signal wiring

It is important to make sure that all the connections are in good condition and that the connectors are inserted and/or attached correctly. To do this, take the cables between finger and thumb (as close as possible to the fastons or connectors) and pull outwards gently: the cables should not come away from the fastons or connectors. Also make sure the power cables are attached properly. **N.B.** if the power cables are not tight enough this could cause dangerous overheating. In particular, on the diaphragm (fig. 3) it is necessary to make sure all the wiring is inserted correctly into the corresponding connectors or fastons.

5.0 Electrical measurements with the power source in operation

WARNING! Before proceeding with troubleshooting, we should remind you that during these tests the power source is powered and therefore the operator is exposed to the danger of electric shock.
The tests described below can be used to check the power and control parts of the power source, with the wire feeder disconnected.

5.1 Preparation for testing

WARNING! make sure that the voltage change header is positioned to correspond to the power supply line specifications (400Vac or 230Vac). Connect the power supply cable to the 3-phase power outlet, as described in the instruction manual.
Set up a multimeter in Volt mode. Do not connect the compressed air source to the power source.

5.2 Testing the control circuit

Disconnect fastons J8 and J7 from the HF board (fig. 4) and isolate them from each other. Set up the power source in "***Test mode***", by first pressing the air button on the front panel and then closing the main switch (ON). Keep the air button pressed for more than 6 sec, after which the yellow air failure LED will start to flash (this status will remain until the power source is switched off). **N.B.** test mode is necessary to disable the high frequency (HF) which would cause permanent damage to any instrument connected to the power source.
Check the following points:
A) Check the terminal board voltage as follows (power supply voltage 400Vac) (Figure 4):
- voltage over terminals L1 and L2 is equal to 400Vac ±5%;
- voltage over terminals L1 and L3 is equal to 400Vac ±5%;
- voltage over terminals L2 and L3 is equal to 400Vac ±5%;

N.B. if a 230Vac power supply is used, make sure the terminal board voltage is equal to 230Vac ±5%.
B) Make sure the main switch pilot light is on;
C) Check the primary and secondary voltage over the auxiliary transformers; Compare the reading with the data shown on the label or printed on the transformer itself (Figure 4).
D) On the auxiliary power supply board check the voltages on connector JP10 as follows (fig. 4):
- voltage over pins 4 (-) and 1 (+) is equal to +12Vdc ±10%;
- voltage over pins 4 (-) and 2 (+) is equal to a +12Vdc ±10%;

- voltage over pins 4 (-) and 3 (+) is equal to a +5Vdc ±10%;

E) On the secondary board make sure that the voltage over pins pin 3 (-) and 8 (+) on connector JP3 is equal to +12Vdc ±5% (Figure 3).

F) Make sure the contactor closes (with a delay of approx. 2 sec), if not make sure the voltage over the ends of the coil (A1 and A2) is 230Vac ±5%; (Figure 4).

Possible faults in the control circuit

Referring to the tests described in section 5.2, the main causes of faults in the control circuit are described as follows, with the remedies as relevant.

WARNING! Before proceeding with troubleshooting switch off the power source and disconnect the power supply cable from the mains outlet.

POINT A) If one of the indicated tests is negative make sure the power supply cable is correctly connected to the plug and terminal board.

POINT B) The pilot light for the main switch does not light up in the ON position. After checking the connections to the switch, replace it.

POINT C) One of the auxiliary transformers does not show the rated voltage values. Make sure all the fuses and connections are working properly. If the fault persists one or more of the windings is probably burnt out and it is therefore necessary to replace the transformer.

POINT D) If one of the recommended tests fails make sure all the fuses and connections are working properly. If the fault persists the auxiliary power supply board is probably defective and should therefore be replaced.

POINT E) If the recommended test fails make sure all the fuses and connections are working properly. If the fault persists repeat the test described in POINT D).

POINT F) The contactor does not close.

Check the following points:

- voltage over coil: check whether the contactor has been subjected to mechanical shock (contacts stuck together or dirty); if the contacts are damaged replace the contactor;
- no voltage over coil: on the auxiliary power supply board (fig. 4) make sure the voltage over pin 2 and pin 3 on connector JP9 is equal to +24Vdc ±10%; if not replace the auxiliary power supply board. Make sure that relay K3 on the HF filter board (fig. 4) is closed; if it does not close replace the relay itself; otherwise replace the HF filter board.

5.3 Testing the power circuit

With the power source connected to the mains, position the main switch to ON make the following checks:

G) Check the voltage on the voltage change terminal board as follows (power supply voltage 400Vac) (Figure 4):

- voltage over terminals U and Y is equal to 400Vac ±5%;
- voltage over terminals V and Z is equal to 400Vac ±5%;
- voltage over terminals W and X is equal to 400Vac ±5%;

N.B: if a 230Vac power supply is used, check the voltage on the voltage change terminal board as follows:

- voltage over terminals U and Y is equal to 230Vac ±5%;
- voltage over terminals Y and W is equal to 230Vac ±5%;
- voltage over terminals W and U is equal to 230Vac ±5%;

H) Check the voltage over the power transformer secondary:

- phase-phase voltage over the windings is equal to 180Vac ±10% (Figure 3);

I) Check the voltage downstream of the rectifier bridge:

- voltage over positive terminal (+) and negative terminal (-) is equal to +260Vdc ±10% (Figure 3);

N.B. to make the following live tests it is necessary to connect the plasma torch to the power source. **WARNING!** during testing do not form a contact with the metal part of the torch because of the presence of high voltages that are hazardous to the operator.

J) Press the torch button and make sure that:

- on the panel board the yellow LED, indicating voltage presence in the torch, stays on for approx. 2 sec (figure 1)

K) Check the voltage downstream of the chopper module:

- press the torch button and make sure the voltage over inductance input (-) and the earth cable (+) is equal to +260Vdc ±10% (figure 2);

L) Check the voltage over the output dinse terminals:

- press the torch button and make sure the voltage over the HF transformer output (-) and the earth cable (+) is equal to +260Vdc ±10% (figure 3);

Possible faults in the power circuit

Referring to the tests described in section 5.3, the main causes of faults in the control circuit are described as follows, with the remedies as relevant.

WARNING! Before proceeding with troubleshooting switch off the power source and disconnect the power supply cable from the mains outlet.

POINT G) If one of the tests indicated in point G) fails, check the continuity and wiring connections to the terminal board, the voltage change header and the power supply cable and then repeat section 5.2 F).

POINT H) Voltage failure or voltage values different from the rated secondary voltage over the power transformer. Check the electrical connections to the primaries and secondaries and the phase-phase continuity if necessary. Replace the power transformer if the tests fail.

POINT I) Voltage failure or voltage values different from rated value at rectifier bridge output. Probably some of the diodes are burnt out, creating different voltage values. Replace the rectifier bridge without further intervention.

WARNING! tests with the power source powered.

POINT J) If the yellow LED does not light up make the following checks:

- the button on the plasma torch works correctly.
- on the HF filter board HF (fig. 4) the voltage over the anode (-) and cathode (+) of diode D1 should be equal to 0V for approx. 2sec. and then return to the value of +12Vdc ±10%; if not there is probably a fault in the HF filter board.
- on the HF filter board (fig. 4) the voltage over the anode (-) and cathode (+) of diode D2 should be equal to +12Vdc ±10% for approx. 2sec. and then return to the value of 0V; if not there is probably a fault in the control board.

POINT K) Voltage failure at chopper module output. Make sure the wiring between the control board (JP3) and the chopper module (JP3) is intact and then check whether:

- the voltage over pin 10 (-) and pin 9 (+) on connector JP3 (chopper module) is equal to approx. +9Vdc ±20% (fig. 3); if there is no voltage in connector JP3 the fault is probably in the control board; if voltage is present on connector JP3

but the voltage downstream of the chopper module is incorrect, the fault is probably in the chopper module;

POINT L) There is no voltage over the output of the HF transformer (-) and the earth cable (+). Disconnect the inductance and the HF transformer from the power circuit and use a multimeter set on Ohms to make sure there is continuity between the beginning and the end of both windings. If the test fails replace the faulty winding.

5.5 Display of general alarms on the front panel

When an alarm event occurs the LED's on the front panel have the following meanings (see also the Instruction Manual) (Figure 1):

- **Alarm LED (red):** general alarm. Power source immobilised;
- **Phase failure LED (yellow) :** causes the power source to stop because of a phase failure in the power supply.
- **Air failure LED (yellow):** shuts down the power source when an air failure prevents correct torch operation;

6.0 Repairs, replacing the boards

Each board is distinguished by a 6-digit code (printed in white on the component side after the initials TW). This code should be used for reference if ordering replacements: Telwin reserves the right to supply boards that are compatible but with different codes.

Warning: before replacing a new board check it carefully for damage that may have occurred during transit. When we supply a board it has already been tested and so if the fault is still present after correct replacement check the other machine parts.

Some of the parts must be handled with particular care during disassembly and assembly to prevent further pointless breakages. Follow the instructions below meticulously:

6.1 Removing the Chopper Module (Fig. 2)

If the fault is in the chopper module we strongly advise replacing it without further intervention. To replace it, it is necessary to:

- disconnect the connectors and fastons from the board;
- undo the 4 screws locking the chopper module;
- undo the 4 screws connecting the power cables;
- take out the chopper module;

N.B. to assemble the new chopper module proceed in the reverse order, taking care not to invert the (+) and (-) power cables.

6.2 Removing the Rectifier Bridge (Fig. 3)

If the fault is in the rectifier bridge we strongly advise replacing it without further intervention. To replace it, it is first necessary to remove the chopper module (see section 6.2):

- undo all the power cables;
- unscrew the 2 nuts locking the rectifier bridge to the base.

N.B. to assemble the rectifier bridge proceed in the reverse order, taking care not to invert the (+) and (-) power cables.

6.3 Removing the Control Board Assembly (Fig. 4)

If the fault is in the control board we strongly advise replacing it without further intervention. To replace it, it is necessary to:

- remove all the connectors ;
- undo the 4 screws fastening the front panel;
- take out the control board assembly;

N.B. to assemble the new control board proceed in the reverse order, taking care not to invert the connectors.

7.0 Load tests

Load tests should be carried out on the assembled, closed power source before closing the top cover.During tests never ever commute the selectors or operatep the ohmic load contactor with the machine in operation.

7.1 Preparation for testing

Connect the power source to the static load generator using cables fitted with the torch button simulator and appropriate connectors. Set up an ammeter clamp in DC with full scale 100A on the earth cable with the arrow pointing out from the earth cable. Connect the power supply cable to the 3-phase power outlet, as described in the instruction manual. Switch on the power source in “test mode” (see section 5.2).

7.2 Scheduled tests

A) Minimum load test:

- Set up the static load generator with the switch settings as in table 1;
- On the front panel turn the welding current potentiometer to minimum; **WARNING!** Never ever increase the cutting current (it will irreparably damage the static load generator):
- Press the torch button simulator, start the static load generator and make sure the current and voltage correspond to the values shown in **table 1:**

TABLE 1

1	2	3	4	5	6	Switch Number
0	0	0	1	2	2	Switch Position

Load current: +23Adc ±10%
Voltage over ends of load: +88Vdc ±10%

B) Testing operation of pilot arc solenoid valve:

- Press the torch button simulator and make sure that solenoid valve EV2 is energised (air in torch) and the voltage over the ends of the coil is equal to 230Vac ±5% (fig. 4);

C) Testing operation of solenoid valve for cutting:

- Press the torch button simulator, start the static load generator and make sure that after approx 2 sec. solenoid valve EV1 is energised and the voltage over the ends of the coil is equal to 230Vac ±5% (fig. 4);

Possible faults during operation

Referring to the tests described in section 7.1, the main causes of faults in the control circuit are listed as follows, with the remedies as relevant.

WARNING! Before proceeding with troubleshooting switch off the power source and disconnect the power supply cable from the mains outlet.

POINT A) If the power source does not show the values given in the table make sure the two Hall probes are working correctly.

PT. B) If the solenoid valve for the pilot arc EV2 does not

work correctly check the following points:
- the solenoid valve does not work but there is voltage over the ends of the coil; check whether the solenoid valve has been subjected to mechanical shock; the solenoid valve should be replaced.
- the solenoid valve does not work and there is no voltage over the ends of the coil; make sure the relay K2 on the auxiliary control board (fig.4) closes; if it does not close replace either the relay itself or the board; otherwise replace the control board and make sure the fuses are working.

POINT C) If the solenoid valve for cutting EV1 does not work correctly check the following points:
- the solenoid valve does not work but there is voltage over the ends of the coil; check whether the solenoid valve has been subjected to mechanical shock; the solenoid valve should be replaced.
- the solenoid valve does not work and there is no voltage over the ends of the coil; make sure the relay K3 on the auxiliary control board (fig.4) closes; if it does not close replace either the relay itself or the board; otherwise replace the control board and make sure the fuses are working.

8.0 Cutting test

Cutting tests should be carried out on the assembled power source with the respective top covers closed. **WARNING!** During the cutting tests it is essential to carefully read the instructions in the operator's manual.

8.1 Preparation for cutting tests

Connect the power supply cable to the 3-phase power outlet, as described in the instruction manual. Set up an ammeter clamp in DC with full scale 300A on the earth cable with the arrow pointing out from the earth cable. Reconnect fastons J7 and J8 to the HF board (fig. 4) and power the power source (not in test mode). **WARNING!** high frequency is present in the following tests.

8.2 Cutting test

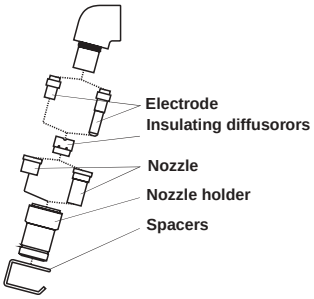
Make a short cut and monitor the dynamic behaviour of the power source. Make sure that when the potentiometer knob on the front panel is turned the current reading on the ammeter indicates the same current as the setting on the panel 10%.
If it is difficult or even impossible to strike the pilot arc check the following points:
A) Plasma torch operation.
B) High frequency (HF) operation.

Possible faults during operation

Referring to the tests described in section 8.2, the main causes of faults in the control circuit are listed as follows, with the remedies as relevant.
WARNING! Before proceeding with troubleshooting switch off the power source and disconnect the power supply cable from the mains outlet.

POINT A) If the arc strike is difficult or even impossible, the fault could be located in the torch. Check electrical continuity in the torch with the torch mounted on the machine (table 2):
- OUT-:
  between the central part of the torch (the nozzle-holder should be unscrewed to allow access to the inside) and the HF transformer output (OUT-);
- OUT AP:
  between the outer threaded part of the torch (the nozzle-holder should be unscrewed to allow access to the inside) and the output faston OUT AP connected to K1-COM on the HF filter board.

TABLE 2

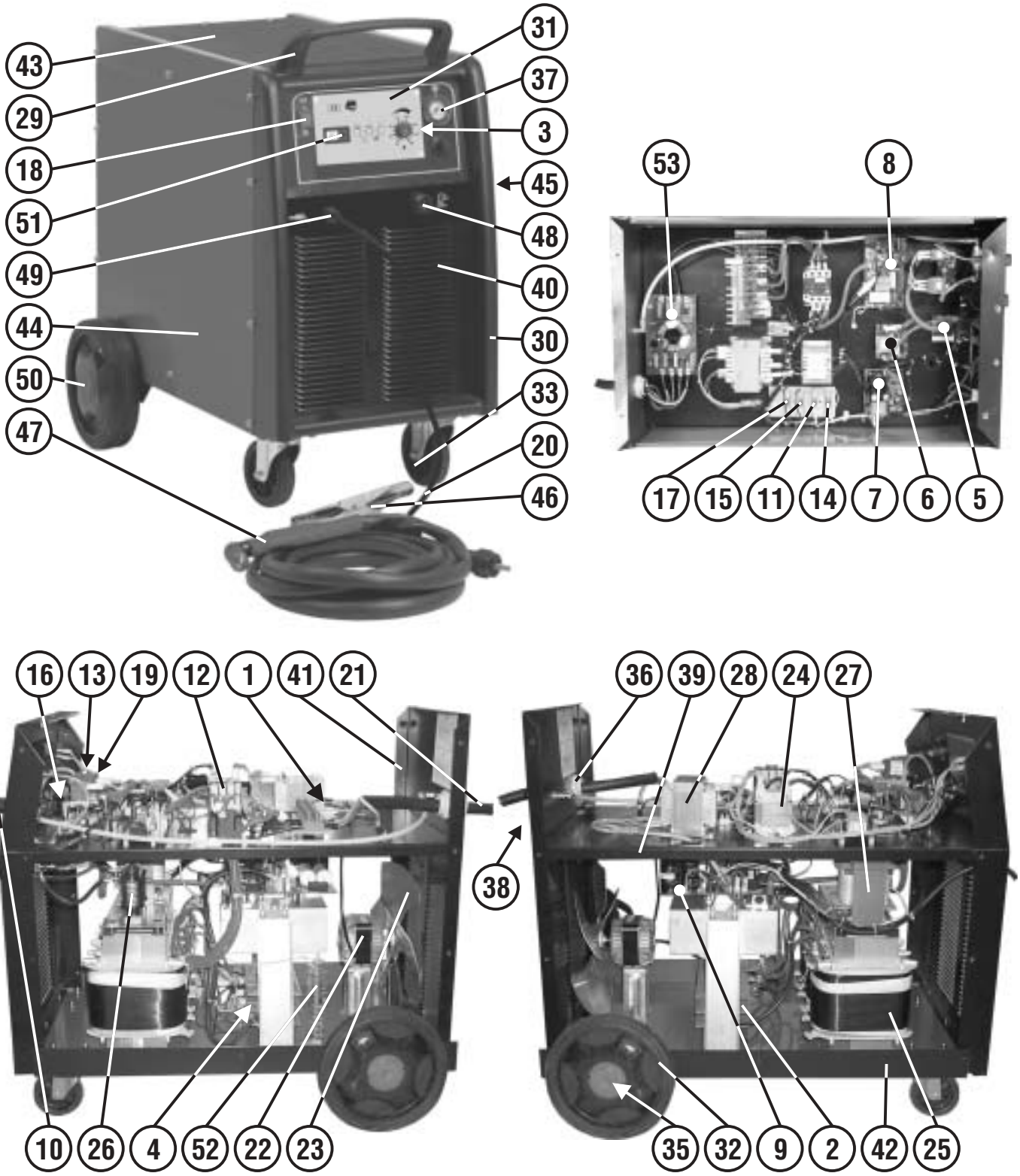


WARNING! tests with the power source powered.
POINT B) If pilot arc strike is difficult or even impossible, the fault could be located in the HF board. **N.B.** to check the operation of the HF it is necessary to disconnect faston NO from the pressure switch and connect it to faston NC on the same pressure switch. In this way the air alarm is bypassed. Disconnect fastons J1 and J2 from the HF board, switch on the power source for normal use (not test mode) and make sure that when the torch button is pressed the voltage over the fastons is equal to 230Vac ±5%;
- if voltage is present over the ends of fastons J1 and J2 the fault is probably in the HF board;
- if there is no voltage over the ends of fastons J1 and J2, make sure that relay K1 on the auxiliary control board (fig. 3) closes; if it does not close replace either the relay itself or the board; otherwise replace the control board and make sure the fuses are working correctly.

ENTERPRISE PLASMA 160 HF

ELENCO PEZZI DI RICAMBIO
LISTE PIECES DETACHEES
SPARE PARTS LIST
ERSATZTEILLISTE
PIEZAS DE REPUESTO

Esploso macchina, Dessin appareil, Machine drawing, Explosions Zeichnung des Geräts, Diseño seccionado maquina.



Per richiedere i pezzi di ricambio senza codice precisare: codice del modello; il numero di matricola; numero di riferimento del particolare sull'elenco ricambi.
Pour avoir les pieces detachees, dont manque la reference, il faudra preciser: modele, logo et tension de l'appareil; denomination de la piece; numero de matricule.
When requesting spare parts without any reference, pls specify: model-brand and voltage of machine; list reference number of the item; registration number.
Wenn Sie einen Ersatzteil, der ohne Artikel Nummer ist, benoetigen, bestimmen Sie bitte Folgendes: Modell-zeichen und Spannung des Geraetes; Teilliste Nuemmer; Registriernummer.
Por pedir una pieza de repuesto sin referencia precisar: modelo-marca e tension de la maquina; numero di riferimento de lista; numero di matricula.

ENTERPRISE PLASMA 160 HF

TELWIN

	ELENCO PEZZI DI RICAMBIO PIECES DETACHEES SPARE PARTS LIST ERSATZTEILLISTE
1	Basetta Cambio Tensione Platine Pour Change Tension Changing Voltage Card Wechselspannungkarte Base Cambio Tension
2	Raddrizzatore Redresseur Rectifier Gleichrichter Rectificador
3	Potenziometro Potentiometre Potentiometer Potentiometer Potenciometro
4	Varistore Varistor Varistor Varistor Varistor
5	Scheda Ausiliario Di Controllo Platine De Reglage Auxiliare Auxiliary Control Pcb Hilfsteuerungskarte Circuito Ausiliario De Control
6	Scheda H.f. Platine H.f. H.f. Card H.f. Karte Tarjeta H.f.
7	Scheda Ausiliario Platine Auxiliare Auxiliary Pcb Hilfskarte Circuito Ausiliario
8	Scheda Filtro Platine Filtre Filter Card Filterkarte Tarjeta Filtro
9	Scheda Secondario Fiche Secondaire Secundary Pcb Sekundaertrafokarte Tarjeta Secundario
10	Riduttore Pressione Reducteur De Pression Gas Regulator Druckminderer Reductor De Presion
11	Fusibile Fusible Fuse Sicherung Fusible
12	Contattore Contacteur Contactor Kontaktgeber Contactor
13	Elettrovalvola Electrovanne Electro-valve Elektroventil Electrovalvola
14	Fusibile Fusible Fuse Sicherung Fusible
15	Fusibile Fusible Fuse Sicherung Fusible
16	Pressostato Pressostat Pressure Switch Druckanzeige Presostato
17	Fusibile Fusible Fuse Sicherung Fusible
18	Interruttore Interrupteur Switch Schalter Interruptor
19	Elettrovalvola Electrovanne Electrovalve Elektroventil Electrovalvula
20	Cavo Cable Cable Kabel Cable
21	Cavo Alim. Cable Alim. Mains Cable Netzkabel Cable Alim.

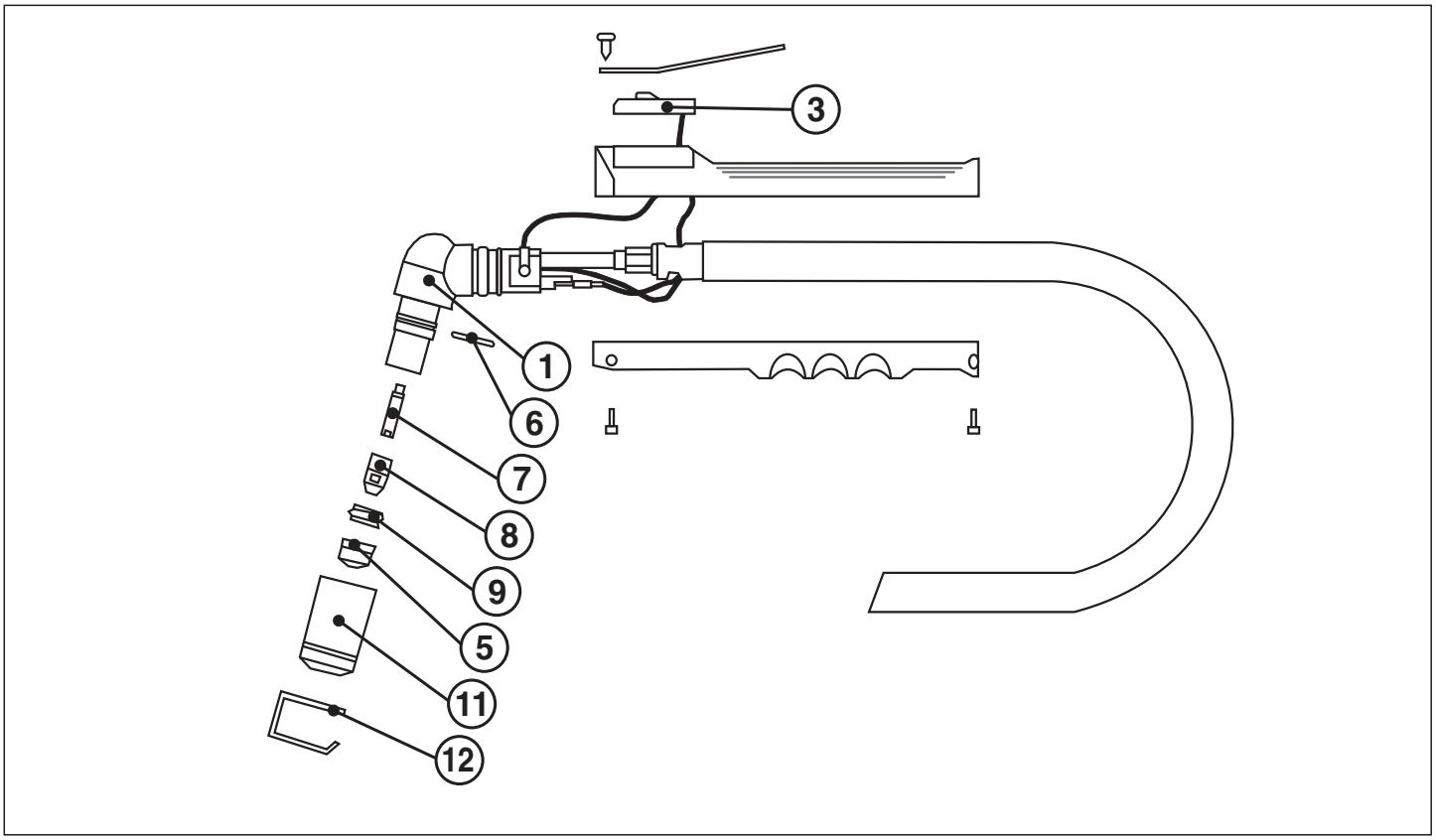
	ELENCO PEZZI DI RICAMBIO PIECES DETACHEES SPARE PARTS LIST ERSATZTEILLISTE
22	Motore Moteur Motor Motor Motor
23	Ventola Helice Fan Blade Fluegelrad Aventador
24	Trasformatore Ausiliario Transformateur Auxiliaire Auxiliary Transformer Hilfstransformator Transformador Auxiliar
25	Trasformatore Transformateur Transformer Transformator Transformador
26	Trasformatore Hf Transformateur Hf Hf Transformer Hf Transformator Transformador Hf
27	Induttanza Inductance Inductance Drossel Induccion
28	Trasformatore Ausiliario Transformateur Auxiliaire Auxiliary Transformer Hilfstransformator Transformador Auxiliar
29	Manico Poignee Handle Handgriff Manija
30	Cornice Cadre Frame Rahmen Marco
31	Assieme Pannello-scheda Frontal + Platine Set Front Panel + Module Set Geraetefront + Karte Set Frontal + Tarjeta
32	Ruota Fissa Roue Fixe Fixed Wheel Fixes Rad Rueda Firme
33	Ruota Con Supporto Roue + Support Tournant Wheel + Swivel Support Rad + Drehbarerhalter Rueda + Sosten Giratorio
35	Asse Per Ruote Axe Roues Wheels Axle Radachse Eje Ruedas
36	Kit Pressacavo Kit Presse Cable Cable Bushing Kit Kabeldurchgang Kit Kit Prensa Cable
37	Manometro Manometre Manometer Manometer Manometro
38	Filtro Aria Filtre D'air Air Filter Luftfilter Filtro Aire
39	Diaframma Diaphragme Diaphragm Diaphragma Diafragma
40	Frontale Partie Frontal Front Panel Geraetefront Frontal
41	Retro Partie Arriere Back Panel Rueckseite Trasera
42	Fondo Chassis Bottom Bodenteil Fondo
43	Mantello Capot Cover Deckel Panel De Cobertura

	ELENCO PEZZI DI RICAMBIO PIECES DETACHEES SPARE PARTS LIST ERSATZTEILLISTE
44	Fianco Destro Partie Lateral Droite Right Side Panel Rechte Seite Flanco Derecho
45	Fianco Sinistro Partie Laterale Gauche Left Side Linke Seite Flanco Izquierdo
46	Pinza Di Massa Borne De Masse Work Clamp Masseklemme Borne De Masa
47	Torcia Plasma Torche Plasma Plasma Torch Plasma Brenner Antorcha Plasma
48	Attacco Torcia Attelage Torche Torch Connection Brenneranschluss Enganche Soplete
49	Kit Pressacavo + Ghiera Kit Presse Cable + Embout Kit Cable Bushing + Ring Nut Kit Kabelhalter + Nutmutter Kit Prensa Cable + Virola
50	Tappo Per Ruota Bouchon Roue Wheel Cap Radsperrestopfen Tapon Rueda
52	Resistenza Resistance Resistor Wiederstand Resistencia
53	Scheda Filtro Platine Filtre Filter Card Filterkarte Tarjeta Filtro

	ELENCO PEZZI DI RICAMBIO PIECES DETACHEES SPARE PARTS LIST ERSATZTEILLISTE

ENTERPRISE PLASMA 160 HF

Esploso torcia, Dessin torche, Torch drawing, Schlauchpaket - Explosionszeichnung, Diseño seccionado antorcha.



REF.	ELENCO PEZZI RICAMBIO TORCIA LISTE PIECES DETACHEES TORCHE SPARE PARTS LIST TORCH ERSATZTEILLISTE SCLAUCHPAKET PIEZAS DE REPUESTO ANTORCHA	CODE CODICE KODE
1	Corpo Torcia Corpus Torche Torch Body Schlauchpaketgriff Cabezera Antorcha	722480
3	Pulsante Torcia Poussoir Torche Torch Pushbutton Brennerdruckknopf Pulsador Antorcha	722711
4	Estrattore Per Torcia Extracteur Pour Torche Extractor For Torch Extraktor Fuer Brenner Extractor Para Antorcha	722779
5	Kit 5 Ugelli Prolungati Kit 5 Buses Prolongees Kit 5 Long Nozzles Kit 5 VerlÄngerte DÜse Kit 5 Contactos Prolungados	802083
5	Kit 5 Ugelli Kit 5 Buses Kit 5 Nozzles Kit 5 DÜsen Kit 5 Inyectores	802119
5	Kit 5 Ugelli D.1,6 Kit 5 Buses D.1,6 Kit 5 Nozzles D.1,6 Kit 5 DÜsen D.1,6 Kit 5 Inyectores D.1,6	802124
6	Kit 10 Anelli Or Kit 10 Anneau Or Kit 10 Or Rings Kit 10 Or Ring Kit 10 Tornillos Or	802120
7	Kit 5 Diffusori Ottone Kit 5 Diffuseurs Laiton Kit 5 Brass Diffusors Kit 5 Messing Diffusoren Kit 5 Diffusores Loton	802121

REF.	ELENCO PEZZI RICAMBIO TORCIA LISTE PIECES DETACHEES TORCHE SPARE PARTS LIST TORCH ERSATZTEILLISTE SCLAUCHPAKET PIEZAS DE REPUESTO ANTORCHA	CODE CODICE KODE
8	Kit 5 Elettrodi Prolungati Kit 5 Electrodes Prolongees Kit 5 Long Electrodes Kit 5 VerlÄngerte Elektroden Kit 5 Electrodos Prolongados	802082
8	Kit 5 Elettrodi Kit 5 Electrodes Kit 5 Electrodes Kit 5 Elektroden Kit 5 Electrodos	802122
9	Kit 5 Diffusori Isolanti Kit 5 Diffuseurs Isolants Kit 5 Insulating Diffusers Kit 5 Diffusor Isolierteil Kit 5 Diffusor Aislador	802123
11	Kit 2 Portaugelli Kit 2 Portebuses Kit 2 Nozzle-holders Kit 2 DÜsenhalter Kit 2 Puntales	802126
12	Kit 5 Distanziali Kit 5 Entretoises Kit 5 Spacers Kit 5 DistanzstÜck Kit 5 Espaciadores	802127
-	Torcia 6m Torche 6m Torch 6m Brenner 6m Antorcha 6m	722332
-	Torcia 12m Torche 12m Torch 12m Brenner 12m Antorcha 12m	722333
-	Torcia 12m Dritta Torche 12m Droit Torch 12m Straight Brenner 12m Gerade Antorcha 12m Recta	722334

REF.	ELENCO PEZZI RICAMBIO TORCIA LISTE PIECES DETACHEES TORCHE SPARE PARTS LIST TORCH ERSATZTEILLISTE SCLAUCHPAKET PIEZAS DE REPUESTO ANTORCHA	CODE CODICE KODE

TECHNICAL REPAIR CARD.

In order to improve the service, each servicing centre is requested to fill in the technical card on the following page at the end of every repair job. Please fill in this sheet as accurately as possible and send it to Telwin. Thank you in advance for your co-operation!

Official servicing centers Repairing card

Date: _____

Inverter model: _____

Serial number: _____

Company: _____

Technician: _____

In which place has the inverter been used?

☐ *Building yard*

☐ *Workshop*

☐ *Others:* _____

Supply:

☐ *Power supply*

☐ *From mains without extension*

☐ *From mains with extension m:* _____

Mechanichal stresses the machine has undergone to

Description: _____

Dirty grade

Dirty inside the machine

Description: _____

Kind of failure	Component ref.
Rectifier bridge	
Electrolytic capacitors	
Relais	
In-rush limiter resistance	
IGBT	
Snubber	
Secondary diodes	
Potentiometer	
Others	

Substitution of primary circuit board: *yes* ☐ *no* ☐

Substitution of primary control board: *yes* ☐ *no* ☐

Troubles evinced during repair :

_____

_____

_____

_____

_____

_____

_____

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