Cod.988343

TELWIN

SUPERIOR PLASMA 90 HF

inverter

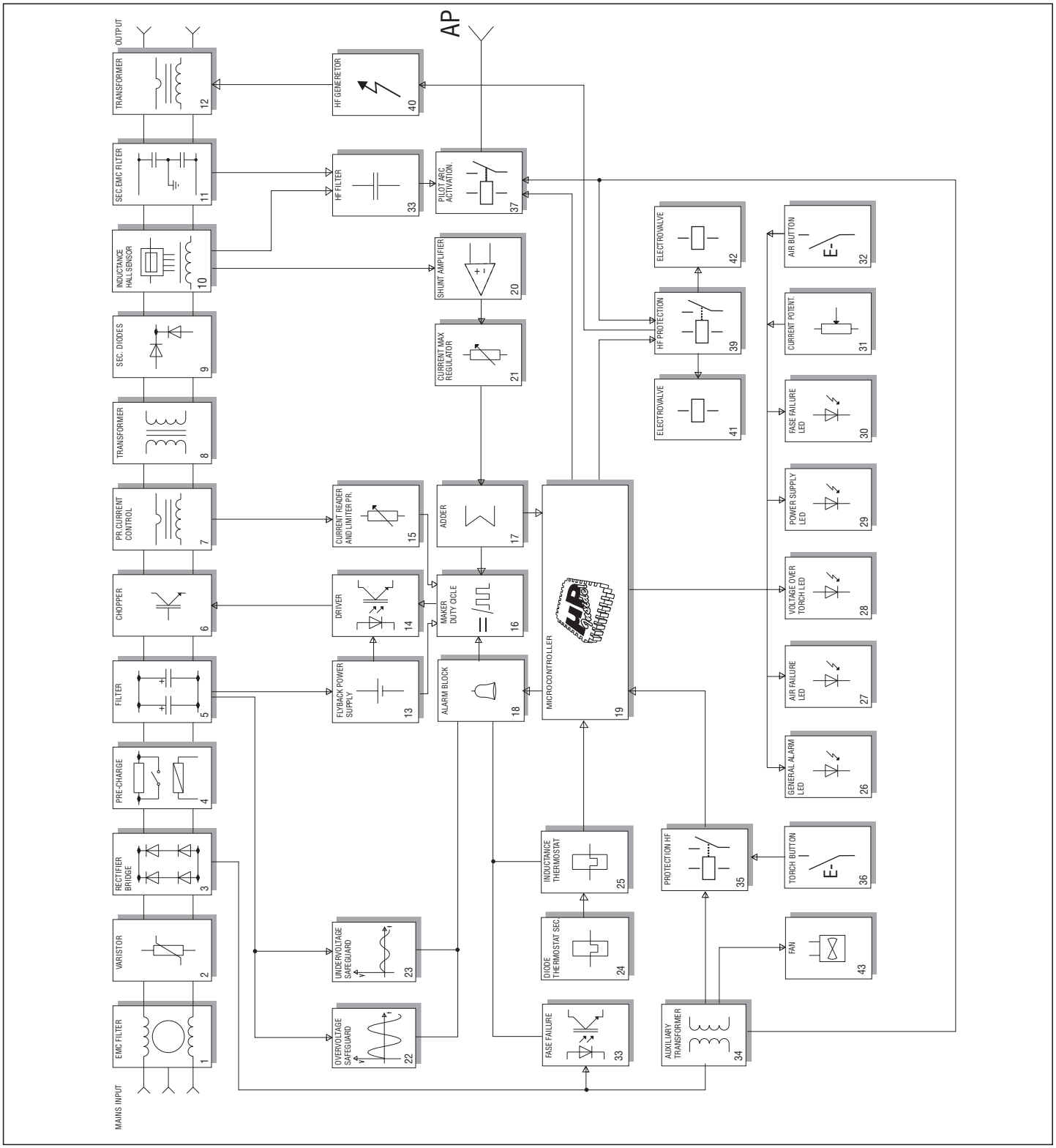
TROUBLESHOOTING AND REPAIR MANUAL

CONTENTS

"reparation no-problem"

OPERATION AND WIRING DIAGRAMS

BLOCK DIAGRAM



ANALYSIS OF THE BLOCK DIAGRAM

NOTE: Unless indicated otherwise, it should be assumed that the components are assembled on the primary board or machine.

Block 1

EMC Filter

Consisting of: C1, C2, C3, C4, C5, C6, C7, L1 (input filter board)
Prevents noise from the machine from being transmitted along the main power line and vice versa.

Block 2

Varistor

Consisting of: RV1, RV2, RV3 (input filter board)
Prevents spike noise from the mains, with amplitude greater than 400V, from entering the machine.

Block 3

Rectifier bridge

Consisting of: D1, D2, D3
Converts the mains alternating voltage into continuous pulsed voltage.

Block 4

Pre-charge

Consisting of: K1, K2, K3, R1, R2
Prevents the formation of high transitory currents that could damage the main power switch, the rectifier bridge and the electrolytic capacitors. When the power source is switched on relays K1, K2 and K3 are de-energised, capacitors C1, C2, C3, C4, C1A, C2A, C3A C4A and C39 are then charged by R1 and R2. When the capacitors are charged the relays will be energised.

Block 5

Filter

Consisting of: C1, C2, C3, C4, C1A, C2A, C3A C4A, C39
Converts the pulsed voltage from the rectifier bridge into continuous voltage.

Block 6

Chopper

Consisting of: IGBT 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Converts the continuous voltage from the filter into a high frequency square wav capable of piloting the power transformer. Regulates the power according to the required welding current/voltage.

Block 7

Current transformer

Consisting of: TA
The C.T. is used to measure the current circulating in the power transformer primary and transmit the information to block 14 (primary current reader and limiter).

Block 8

Power transformer

Consisting of: T1
Adapts the voltage and current to the values required for the welding procedure. Also forms galvanic separation of the primary from the secondary (welding circuit from the power supply line).

Block 9

Secondary diodes

Consisting of: D1, D2, D3, D4, D5 (secondary board)
D1 and D2 convert the current circulating in the transformer to a single direction, preventing saturation of the core.
D3, D4 and D5 recirculate the inductance output current (block 9) while the IGBT's are not conducting, bypassing the power transformer(block 8).

Block 10

Inductance and Hall sensors

Consisting of: L1, Hall1 and Hall2
The inductance levels the output current from the secondary board diodes making it practically direct. Hall1 sensor reads the current of the pilot arc, Hall2 sensor reads the current circulating in the inductance and sends it to block 20 (Hall sensor amplifiers) which will process the information.

Block 11

Secondary EMC Filter

Consisting of: C4, C5 (HF filter board)
Prevents noise from the power source from being transmitted through the welding cables and vice versa.

Block 12

HF Transformer

Consisting of: T2
The HF transformer boosts the signal from block 40 (hf power source), raising the voltage impulse in the secondary at the instant when arc strike is generated.
It also isolates the welding circuit from the primary circuit

Block 13

Flyback power supply

Consisting of: U4, Q6, T3, U1, U2, U3
Uses switching methods to transform and stabilise the voltage obtained from block 5 (filter) and supply 2 voltage values of 27V that enable block 14 (driver) to be powered correctly.The auxiliary power supply board, on the other hand, generates four further stabilised voltages (U2, U3, U4, U5) equal to a +12V, +5V, -12V and 5V which are mainly used to power the control board.

Block 14

Driver

Consisting of: U1 (opto-insulators board), Q7, Q8 and U2 (opto-insulators board), Q9, Q10.
Takes the signal from block 13 (flyback power supply) and, controlled by block 16 (duty cycle maker), makes the signal suitable for piloting block 6 (chopper).

Block 15

Primary current reader and limiter

Consisting of: D3, R1, R2, R3 and R9 and R16 (control board)
Detects and limits the signal from block 7 (current transformer) and sets the maximum allowed primary current. This signal is also scaled down so that it can be processed and compared in block 16 (duty cycle maker).

Block 16

Duty cycle maker

Consisting of: U1(control board)
Processes the information from block 18 (adder) and block 15 (primary current reader and limiter) and produces a square wave with variable duty cycle limiting the primary current to a maximum pre-set value under all circumstances.

Block 17

Adder

Consisting of: U4A, U4B (control board)
Collects all the information arriving from block 21 (maximum current control) and from block 19 (microcontroller), and sends it to block 16 (duty cycle maker).

Block 18

Alarm block

Consisting of: Q3, D12, D15 (control board)

When an alarm is detected, the block drastically limits machine output current by acting directly on and changing the reference signal obtained from block 16 (duty cycle maker), in the event of:

1) Triggering of thermostatic capsule on secondary board dissipator diodes.
2) Triggering of thermostatic capsule on power transformer.
3) Triggering due to undervoltage.
4) Triggering due to overvoltage.
5) Phase failure at input.
6) Short circuit at output (electrode holder clamp and earth cable connected to each other or electrode stuck to piece being welded).

Block 19

Microcontroller

Consisting of: U7 (control board).

Control logic, which manages typical timing for the plasma cutting cycle. It also drastically limits power source output current when it detects an alarm. In the event of an alarm it has a direct effect on block 18 (alarm block), directly changing the reference signal obtained from block 31 (current potentiomenter).

Block 20

Hall sensor amplifiers

Consisting of: U3A, U3C, U4C, U4D and U5 (control board)

They amplify the signals arriving from block 10 (Hall sensors inductance) and the Hall sensors (Hall1 and Hall2) supplying two types of output signal:

- analogue signal: used to obtain a current-controlled cutting arc and pilot arc (signal arriving from the Hall1 sensor);
- digital signal: by means of two comparators placed downstream of the shunt amplifiers, it is used to obtain two signals (pilot arc presence and cutting arc presence) which are sent to the microcontroller (signal arriving from the Hall2 sensor).

Block 21

Maximum current control

Consisting of: R55 (control board)

Processes the information arriving from block 20 (shunt amplifiers) and uses R55 to adjust the maximum welding current that can be supplied by the power source.

Block 22

Overvoltage safeguard

Consisting of: U5A, R38, R40

If the main supply voltage exceeds the maximum value this safeguard triggers (a tolerance of approx. ±15% of the power supply voltage is allowed: outside this range the safeguard triggers).

Block 23

Undervoltage safeguard

Consisting of: U5B, R30, R32

If the main supply voltage falls below the minimum allowed value this safeguard triggers (a tolerance of approx. ±15% of the power supply voltage is allowed: outside this range the safeguard triggers).

Block 24

Secondary diodes thermostat

Consisting of: thermostatic capsule ST1 When the temperature of the secondary board dissipator reaches 70°C (approx.) this safeguard triggers. Reset is automatic when the cause for alarm is removed.

Block 25

Power transformer thermostat

Consisting of: thermostatic capsule ST2

When the temperature in the power transformer is too high this safeguard triggers. It is reset automatically when the alarm condition is no longer present.

Block 26

Red LED for general alarm

Consisting of: D2 (panel board)

Lights up following triggering of main supply overvoltage or under voltage or of thermostatic capsules.

Block 27

Yellow LED for air failure

Consisting of: D7 (panel board)

Lights up simultaneously with red LED D37 if the air pressure is insufficient or lacking.

Block 28

Yellow LED for torch voltage

Consisting of: D4 (panel board)

Lights up when the torch button is pressed, and shows the cutting circuit is activated.

Block 29

Green LED for power supply

Consisting of: D5 (panel board)

Lights up when the machine is powered and shows the machine is ready for operation.

Block 30

Yellow LED for phase failure

Consisting of: D1 (panel board)

Lights up simultaneously with red LED D37 if there is a power supply phase failure.

Block 31

Current Potentiometer

Consisting of: R1 (panel board)

Used to create the reference voltage needed to adjust the output current: varies the current from the minimum to the maximum value.

Block 32

Air button

Consisting of: S1 (panel board)

When this button is pressed, air will continue to flow from the torch for approx. 45 sec. It is usually used to cool the torch and to adjust the pressure on the pressure gauge.

Block 33

Phase failure

Consisting of: ISO2,ISO3 (opto-isolators board), UT (control board).

If one of the 3 phases of the main supply fails this safeguard triggers.

Block 34

Auxiliary transformer

Consisting of: T3

Its purpose is to supply the machine with two alternating voltages with different values:

- 230Vac to power block 43 (fan);
- 18Vac-0-18Vac to power the auxiliary power supply board;
- 9Vac to power block 35 (HF safeguard).

Block 35

HF safeguard

Consisting of: D3, K4, C9, C8 (hf filter board)

The HF safeguard is powered by block 34 (auxiliary transformer), at the instant when block 36 (torch button) is pressed relay K4 sends the signal to block 19 (microcontroller), which will process this information. The hf safeguard also separates the control board from the high frequency so as to prevent the residual signal from the torch button cables from entering the board.

Block 36

Torch button

Consisting of: plasma torch

Activating the plasma torch button will strike the pilot arc.

This signal is scaled down so that it can be processed and compared in block 17 (adder).

Block 37

Pilot arc activation

Consisting of: Q8, K1(control board) and K3 (hf filter board).

When the torch button is pressed block 19 (microcontroller) sends a signal to block 37 which, with the aid of block 38 (hf filter), generates the pilot arc.

Block 38

HF filter

Consisting of: R1, R2, C2, C2A, C3, C4 and C5 (hf filter board).

The signal arriving from block 10 (inductance shunt) is filtered and conveyed to block 37 (pilot arc activation).

Block 39

Solenoid valve 1, Solenoid valve 2 and hf activation.

Consisting of: Q8, Q7, Q6 (control board) and K1, K2, K3 (auxiliary control board)

When the torch button is pressed block 19 (microcontroller) sends 3 signals to block 39 which will adjust them for piloting blocks 40 (hf generator), 41(solenoid valve 1) and 42 (solenoid valve 2) .

Block 40

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 41

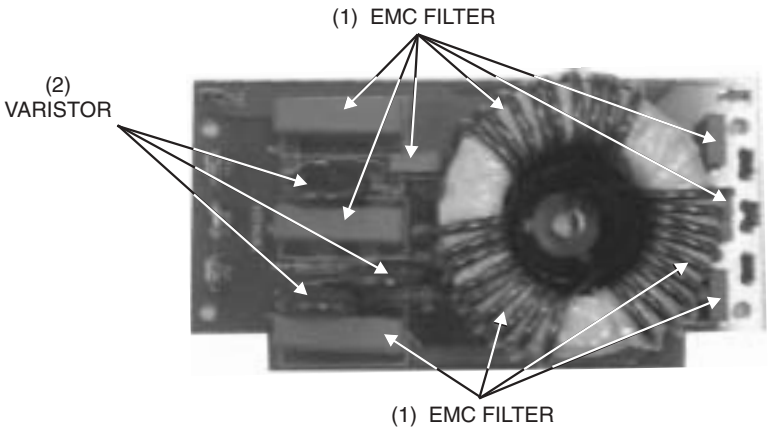
Solenoid valve 1

Consisting of:Y1

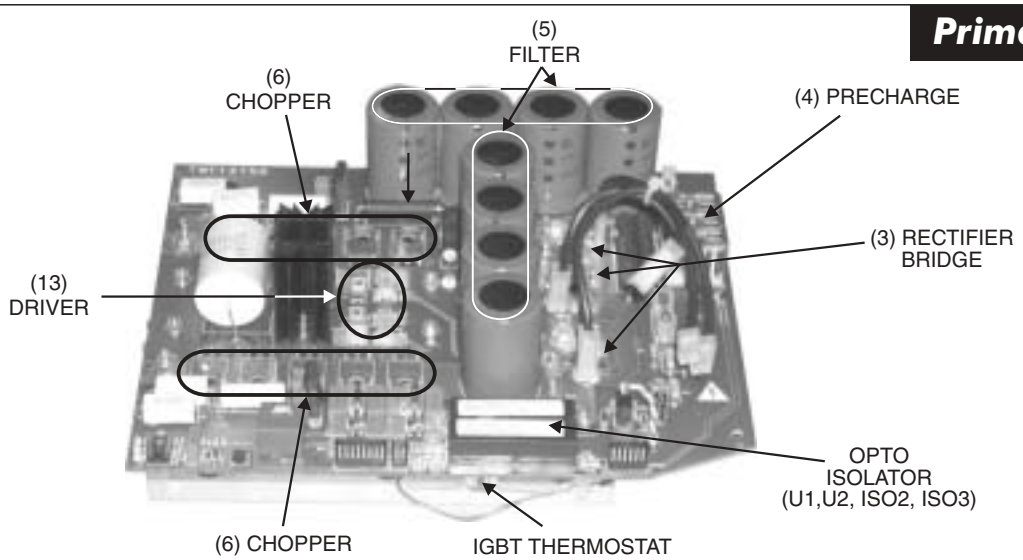
When the torch button is pressed solenoid valve Y1 is energised, causing air outfeed which will allow the pilot arc to

ILLUSTRATIONS

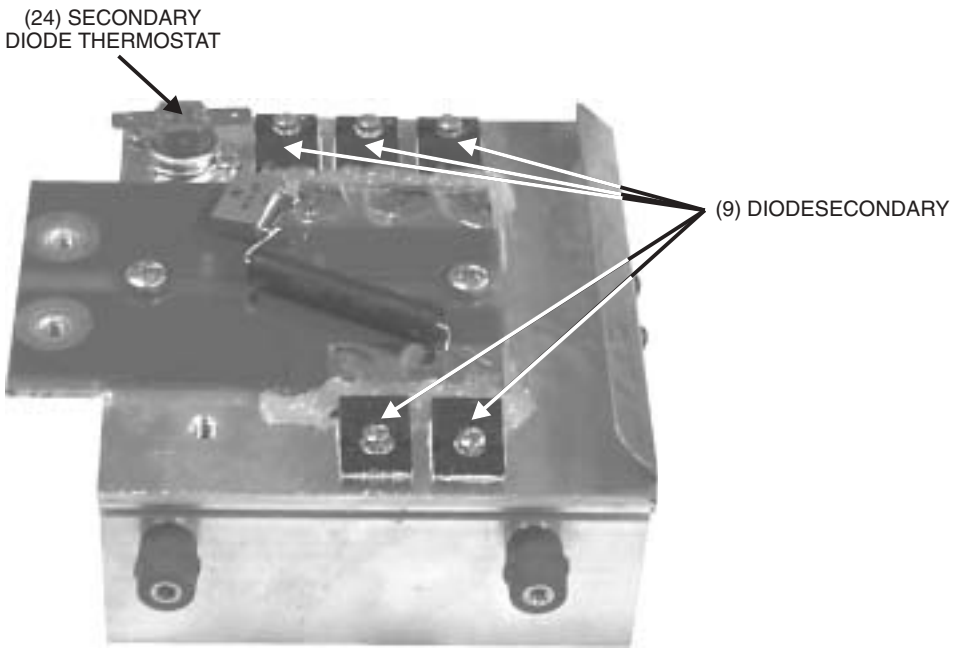
Input filter board



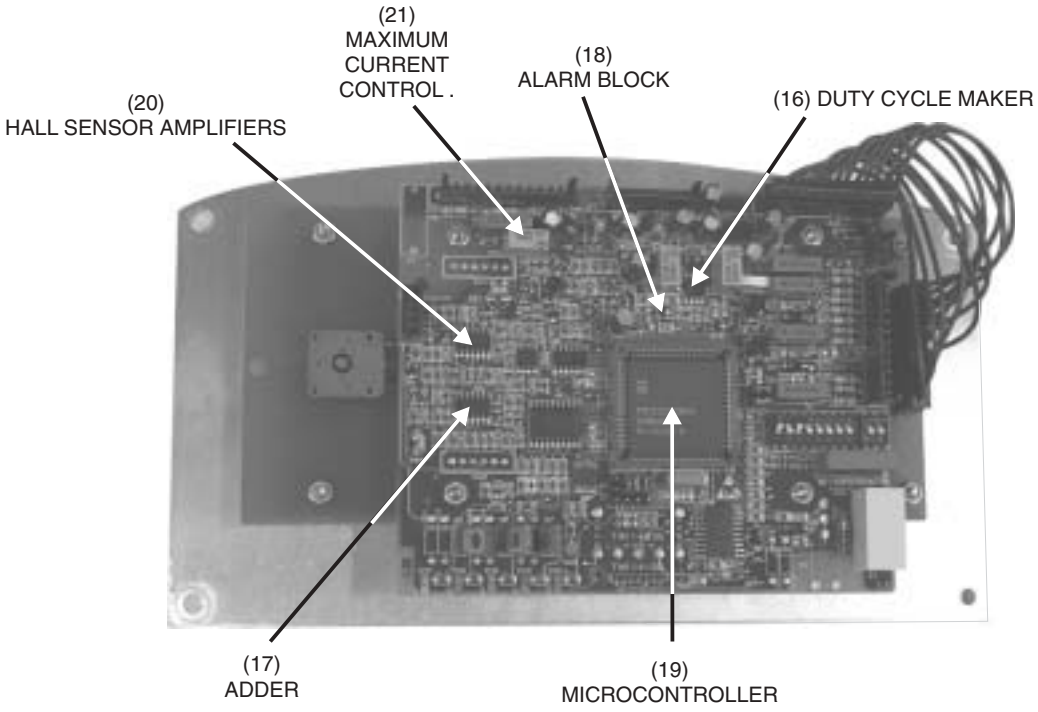
Primary board



Secondary board

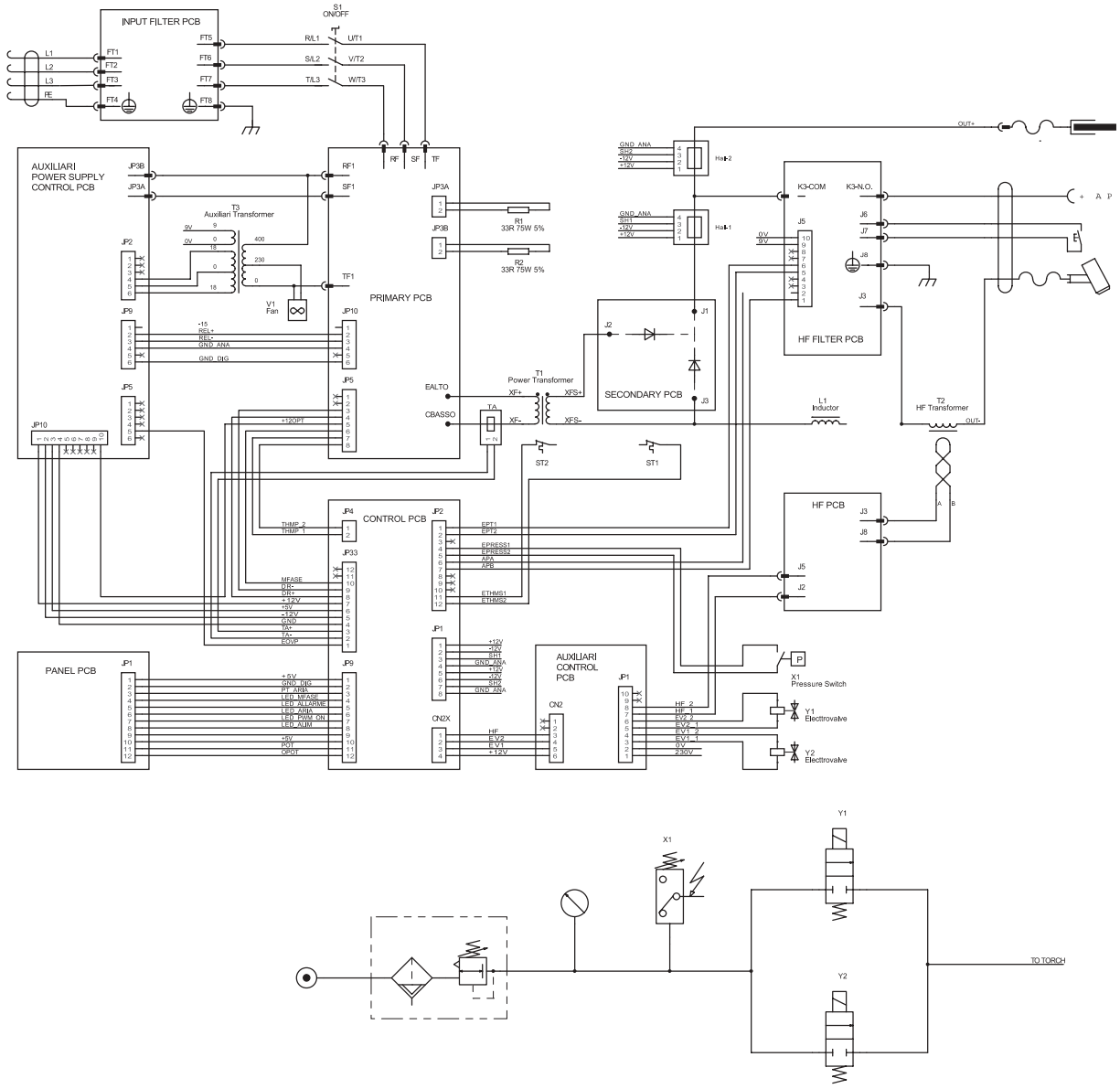


Control board

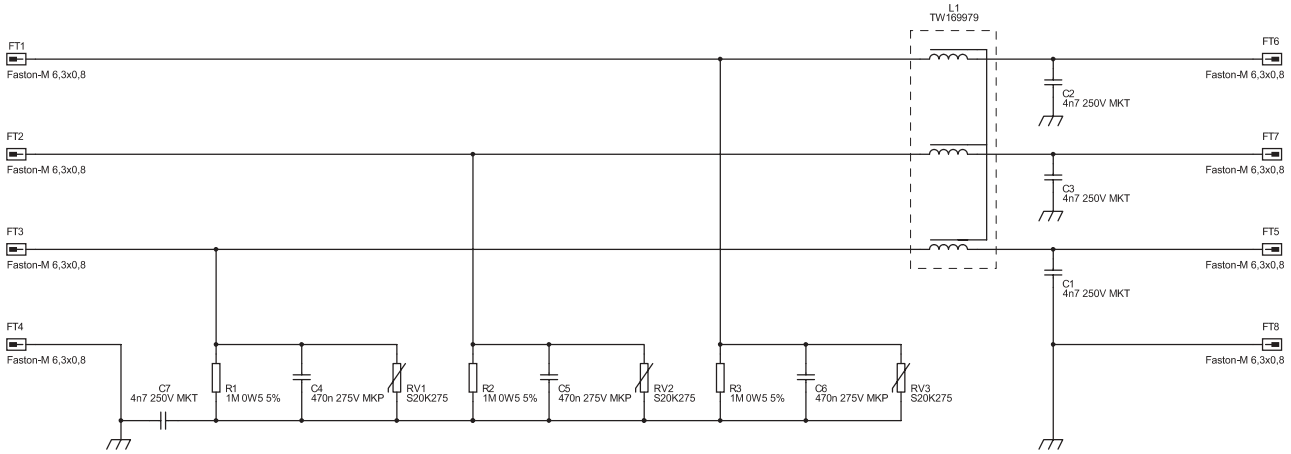


WIRING DIAGRAMS

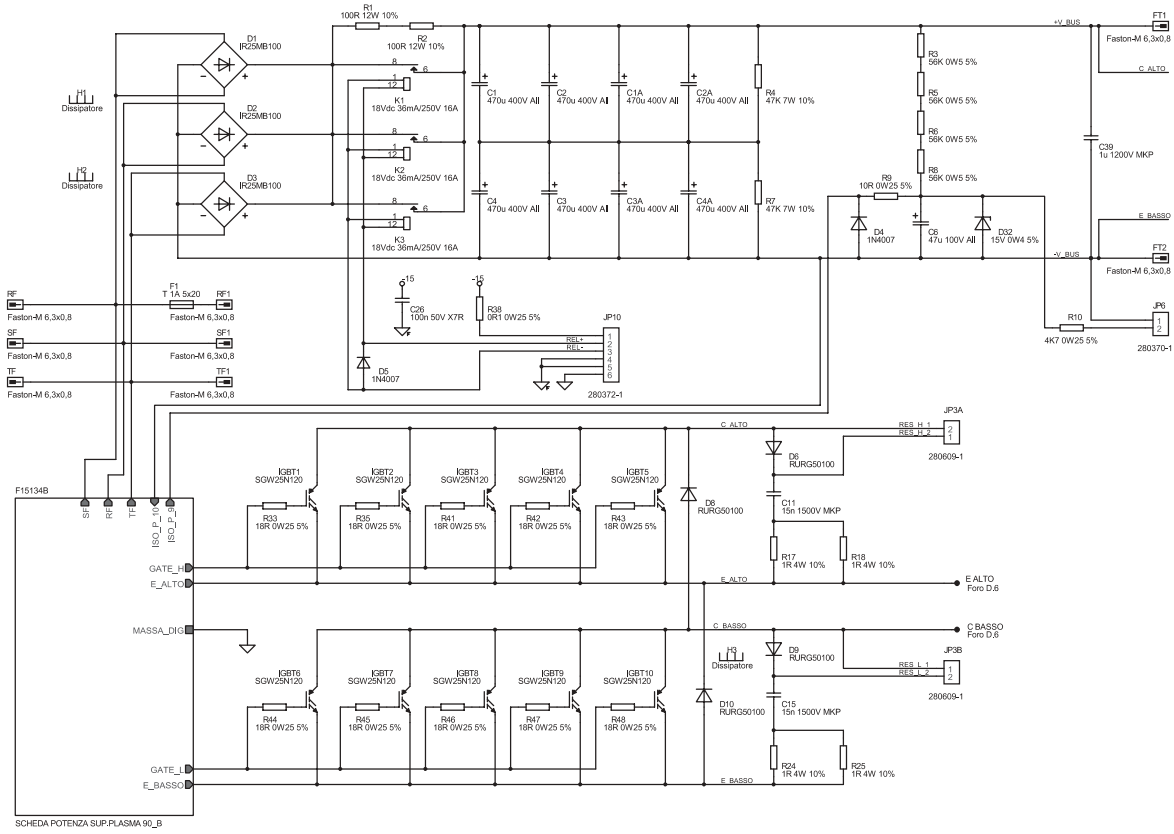
General wiring diagram



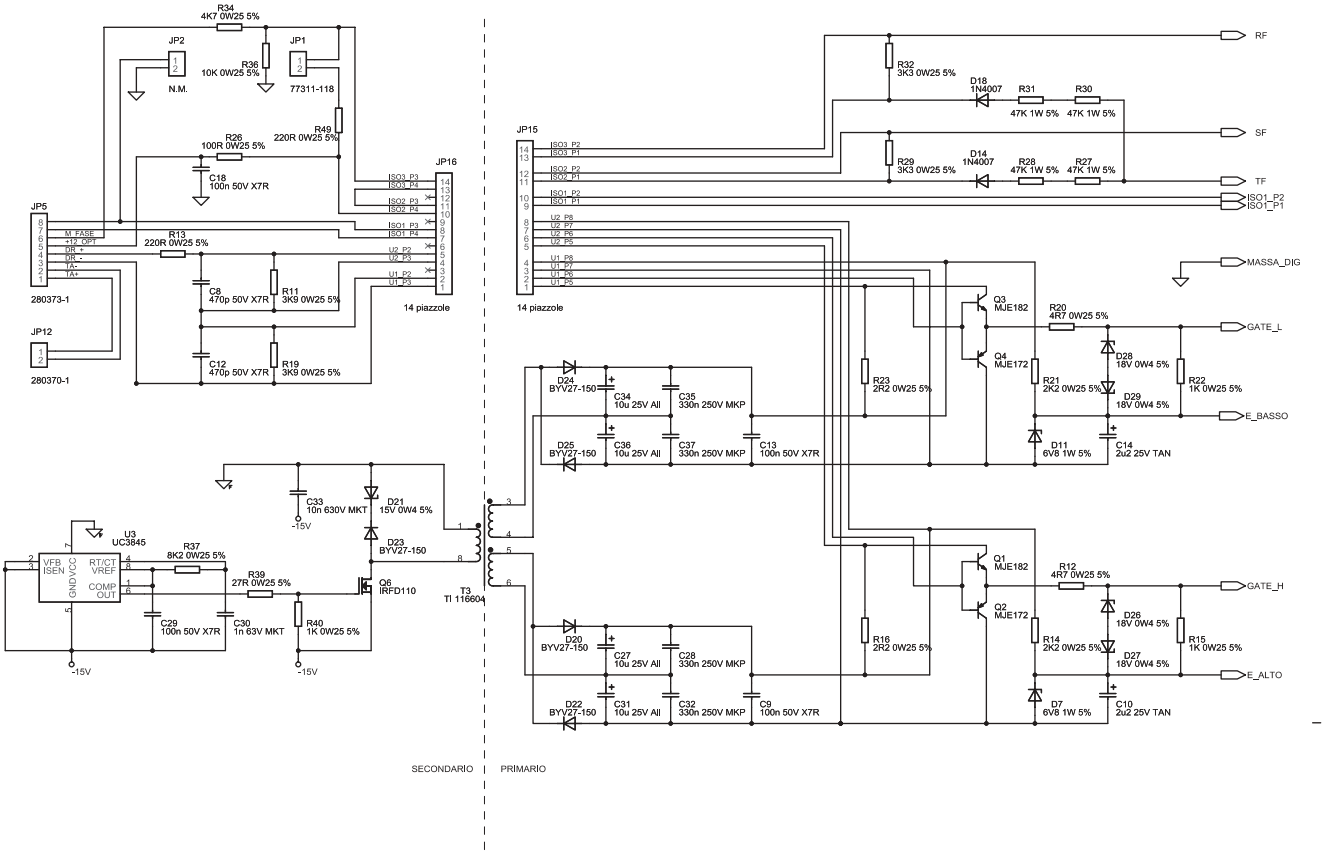
Wiring diagram input filter board



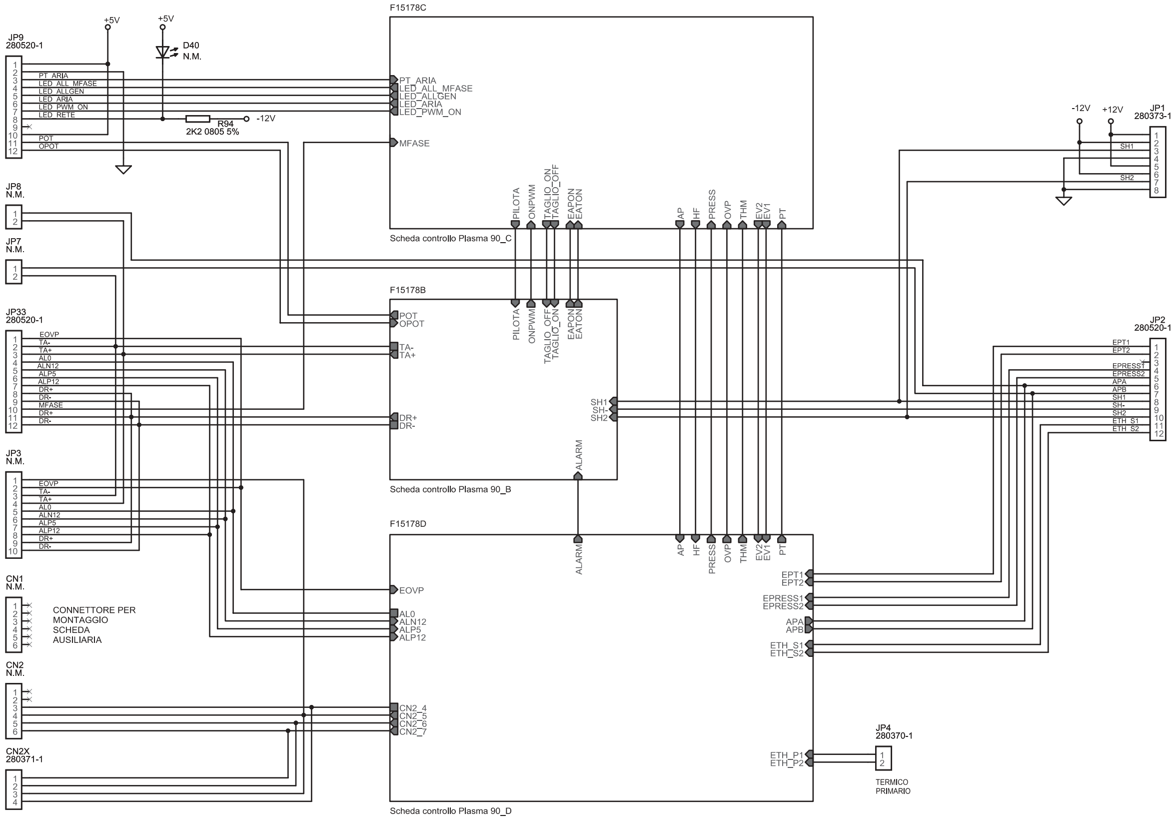
Wiring diagram primary board - power



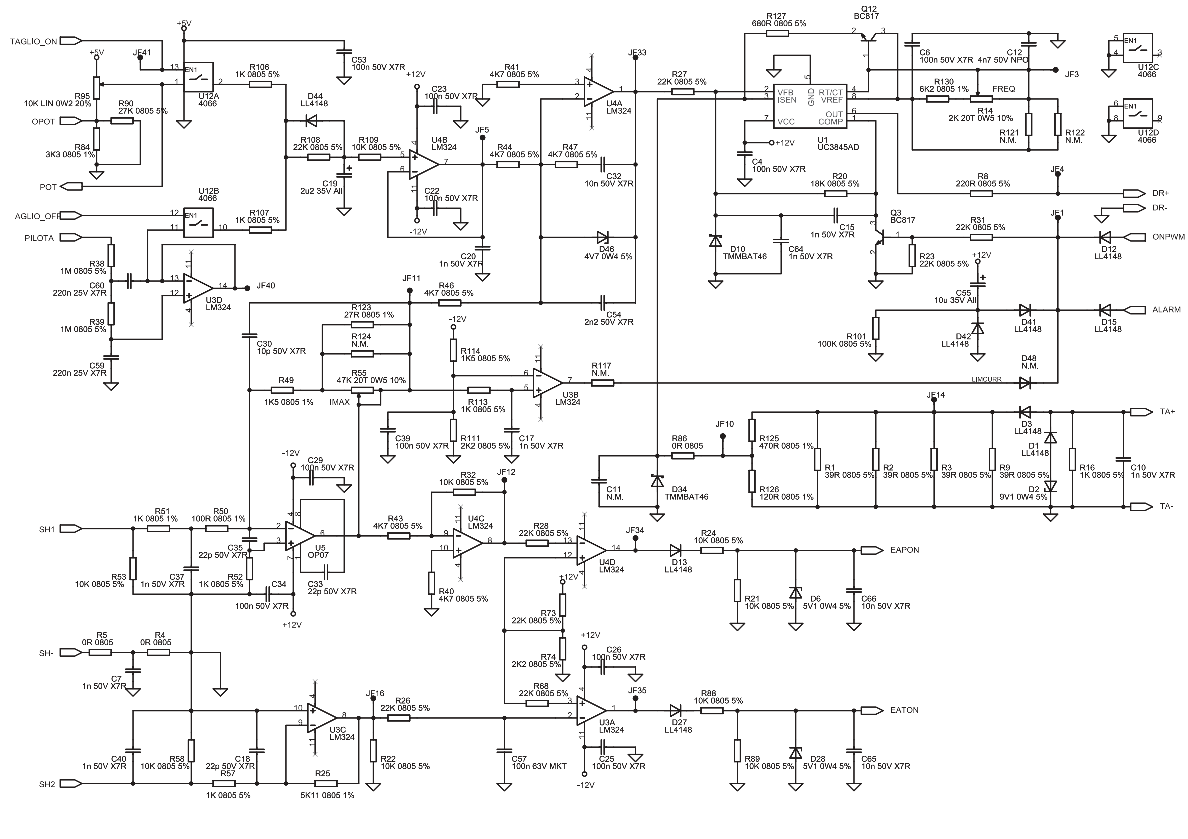
Wiring diagram primary board - driver



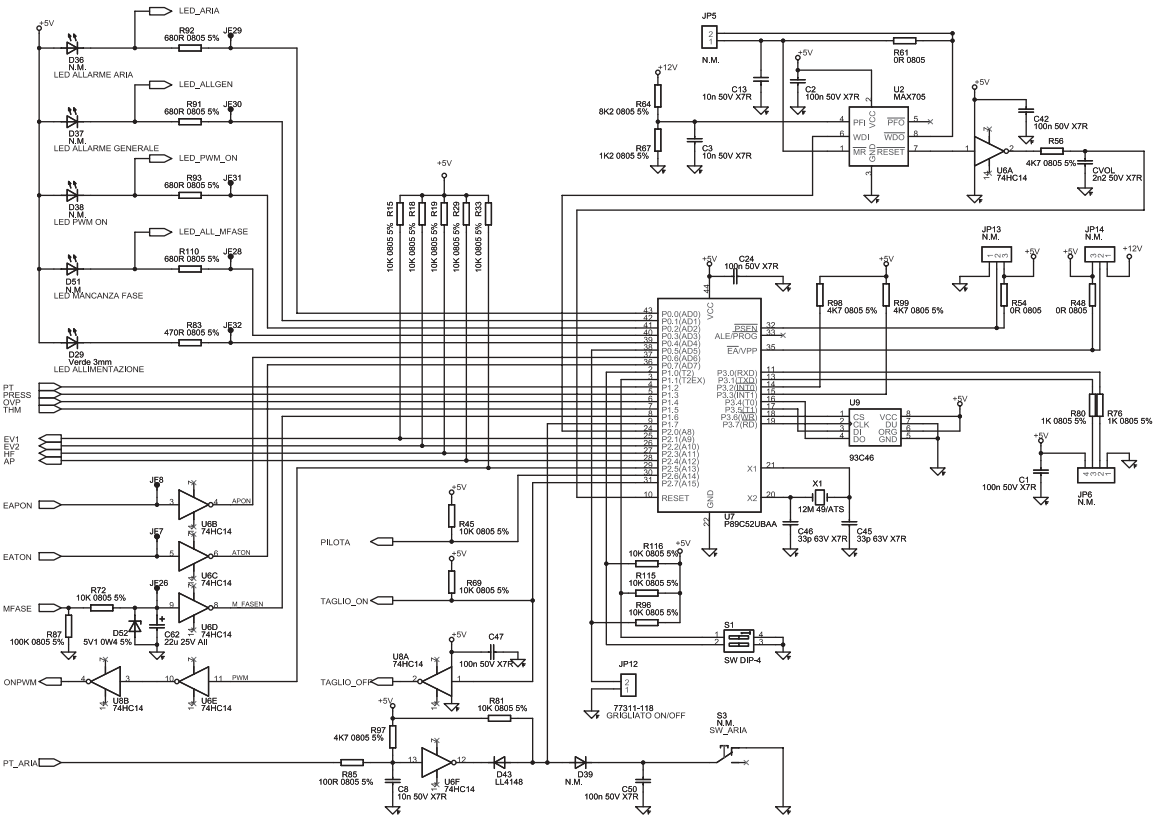
Wiring diagram control board - A



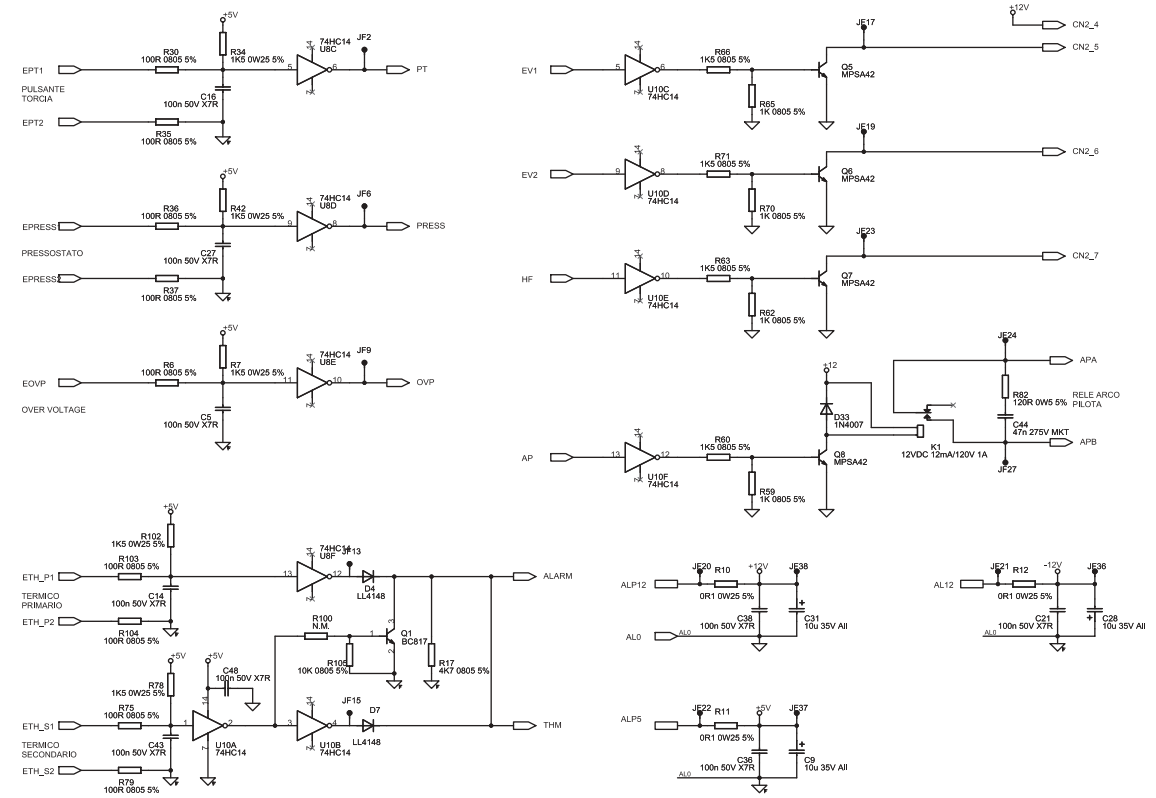
Wiring diagram control board - B



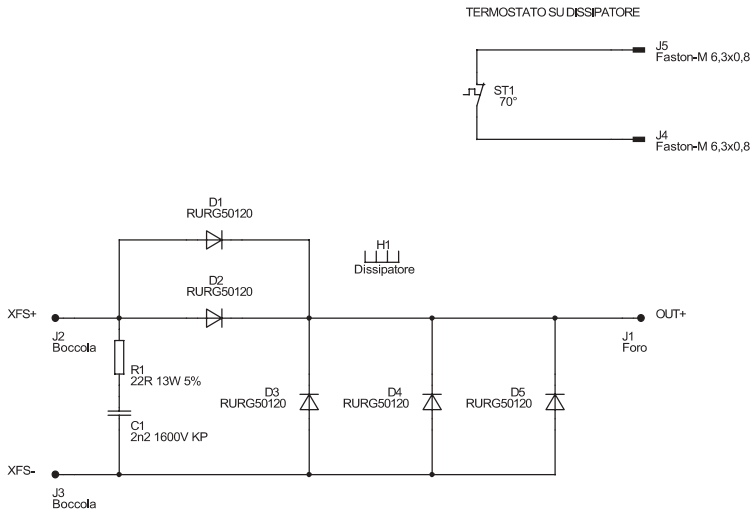
Wiring diagram control board - C



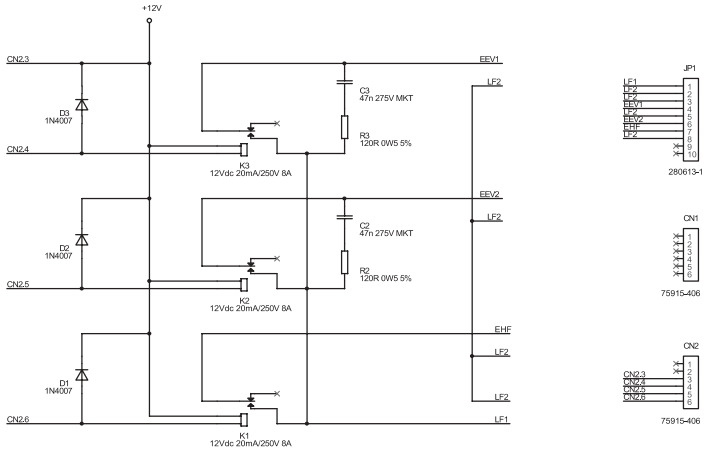
Wiring diagram control board - D



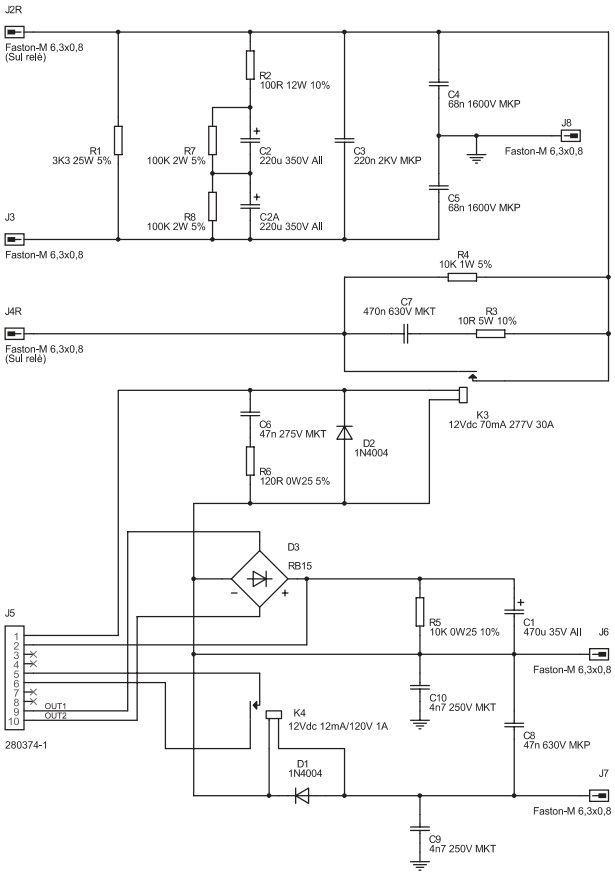
Wiring diagram secondary board



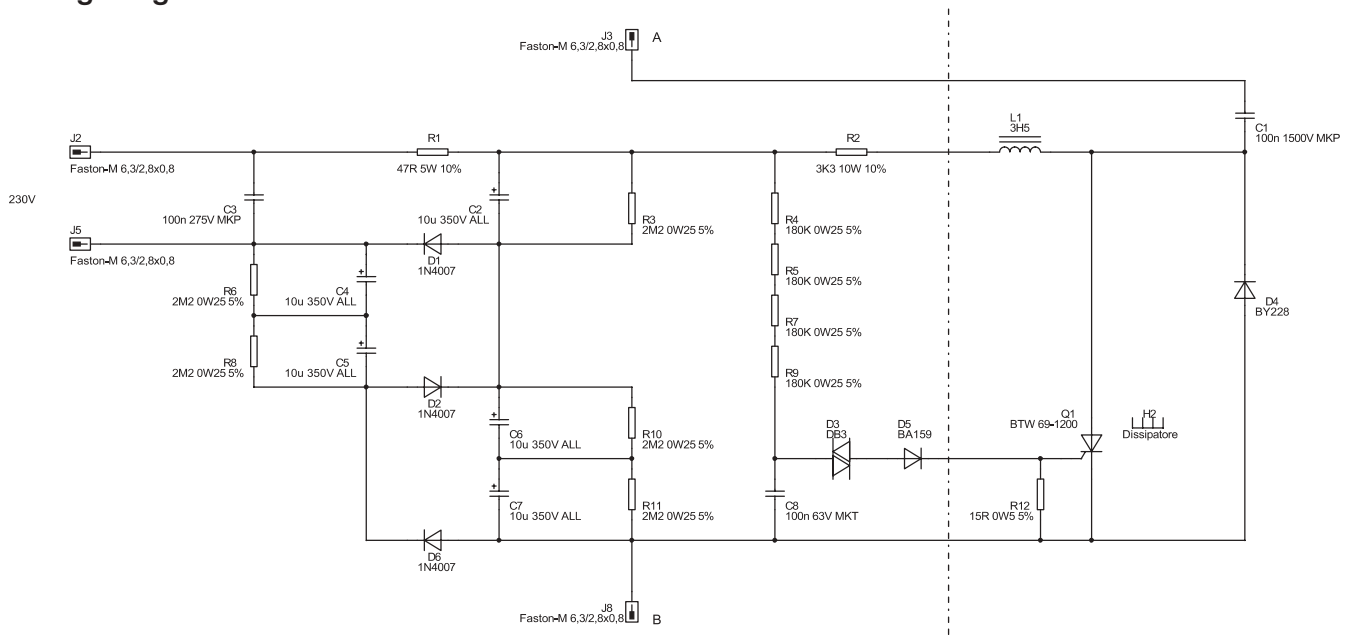
Wiring diagram auxiliary control



Wiring diagram HF filter board



Wiring diagram HF filter board



REPAIR GUIDE

EQUIPMENT REQUIRED

ESSENTIAL INSTRUMENTS

1 Dual trace oscilloscope	***802401 (*)***
2 Static load generator	***802111 (*)***
3 Variac 0 - 500V 4500VA	***802440 (*)***
4 Digital multimeter	
5 Hall probe	***802406 (*)***

USEFUL INSTRUMENTS

6 Unsoldering station

MISCELLANEOUS

7 Flat jaw pincers
8 Cutting nippers

(*) 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:

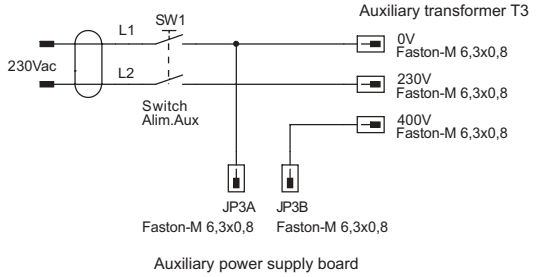
IF CHECKS ARE MADE INSIDE THE MACHINE WHILE IT IS LIVE, THIS MAY CAUSE SERIOUS ELECTRIC SHOCK DUE TO DIRECT CONTACT WITH LIVE PARTS AND/OR INJURY DUE TO DIRECT CONTACT WITH MOVING PARTS.

WIRING NEEDED FOR TESTING

To carry out the low voltage tests on the machine, it is necessary to use two special sets of test wiring that allow a 230Vac supply to power the auxiliary transformer and by force some alarm signals between the primary board and control board.
Follow the two electrical diagrams below to make the two sets of wiring in figures A and B:

Wiring for Aux Transf/Power supply/Aux Board

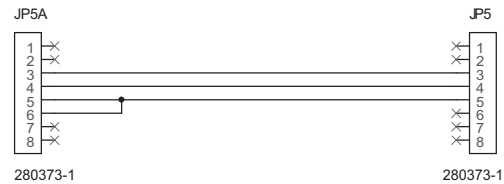
Figure A



Auxiliary power supply board

Figure B

Auxiliary control wiring



Wiring control side

Wiring auxiliary board side

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 machine

Every operation should be carried out in complete safety with the power supply cable disconnected from the mains outlet.

- undo the 12 screws fastening the 2 plastic shells (6 each) to the front and back (**fig. 1A**). **NOTE:** to extract the front plastic shell it is necessary to disconnect all connectors on the control board assembly. Fasten the control board assembly to the metal front piece using its 4 screws and reconnect all the connectors;
- undo the 2 screws on the handle fastened to the top cover (**fig. 1A)**;
- undo the 14 screws fastening the top cover to the structure (**fig. 1B**);
- pull gently outwards and slide out the top cover (**fig.1B**);
- undo the 4 screws fastening the base to the structure (**fig. 1B**);
- separate the top metal structure from the base and place it on the work bench. **NOTE:** the base should be removed if it is necessary to reach the internal boards.

After completing the repairs, proceed in the reverse order to re-assemble the machine and fasten the top cover and shells.

2.0 Cleaning inside the machine

Using compressed air, carefully clean the power source components since dirt is a danger to parts subjected to high voltages and adversely affects the galvanic separation between the primary and secondary boards. 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:

Air inlet fan fastened to the back (fig. 2B)
Check whether dirt is adversely affecting correct rotation of the blades; if there is still damage after cleaning replace the fan.
Primary board (fig. 6):
- rheofores of IGBT's 1 , 2, 3, 4, 5, 6, 7, 8, 9, 10;
- rheofores of recirculating diodes D8, D10;
- rheofores of snubber network diodes D6, D9;
- zone for connection with the black box (contains the board to which the opto-isolators of the driver circuit are attached).

Auxiliary power supply board (fig. 3)
Auxiliary transformer (fig. 3)
To get at the inside of the metal structure undo the 4 screws (2 on each side) that fasten the presspan insulator to the structure.
Secondary board (fig. 5):
- power diodes D1, D2, D3, D4, D5;
- thermostatic capsule on dissipator;
- HALL-1 and HALL-2 sensors.

Power transformer and inductance assembly (fig. 3)
HF transformer (fig. 5)
In this case it is necessary to remove the primary board, or else it is possible to clean the part superficially from the sides of the metal structure.
Parts fastened to the base (fig. 4)
If the base is removed, carefully clean all the components attached to the structure:
- air unit assembly;
- input filter board;
- HF board;
- HF filter board;
- auxiliary control board.

3.0 Visual inspection of the machine

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 and that the fan operates when the machine is switched on. Inspect the components and cables listed below for signs of burning or breaks that may adversely affect operation of the power source. Check the following parts:
Main power supply switch (fig. 2B)
Use the multimeter to check whether the contacts are stuck together or open. Probable cause:
- mechanical or electrical shock (e.g. rectifier bridge or IGBT's shorted, handling under load).

Current potentiometer control board R1 *(**fig. 2A**)*
Probable cause:
- mechanical shock.

Post-air button *control board assembly S1* ***(fig. 2A)***
Probable cause:
- mechanical shock.

Relays K1, K2 on primary board (fig. 6)
Probable cause:
- see the power supply switch; **N.B.** If the relay contacts are stuck together or dirty, do not attempt to separate or clean them, just replace the relay.

Electrolytic capacitors C1, C2, C1A, C2A, C4, C5, C4A, C5A on primary board (fig. 6)
Probable cause:
- mechanical shock;
- machine connected to a much higher voltage than 400Vac;
- rheofore of one or more capacitor broken: any that remain will be subjected to excessive stress and will be damaged by overheating;
- ageing after a substantial number of working hours;
- overheating due to failed operation of the thermostatic capsules.

IGBT's 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 (fig. 6)
Probable cause:
- break in snubber network;
- control circuit failure (driver);
- poor thermal contact between IGBT's and dissipator (e.g. loosened fastening screws: check);
- excessive overheating related to faulty operation.

Primary diodes D6, D8, D9, D10 (fig. 6)
Probable cause:
- excessive overheating related to faulty operation.

Secondary diodes D1, D2, D3, D4, D5 (fig. 5)
Probable cause:
- break in snubber network;
- poor dissipator-diodes thermal contact (e.g. loosened fastening screws: check);
- faulty conditions at machine output.

Hall-1 and Hall-2 sensors (fig. 5)
Check them for colour changes. Probable cause:
- overheating due to loosening of the screws connecting the shunts to the secondary circuits.

Power transformer and filter inductance (fig. 3)
Inspect the windings for colour changes.
- ageing after a substantial number of working hours;
- excessive overheating related to faulty operation.

Input filter board varistors RV1, RV2, RV3 (fig. 4)
Probable cause:
- power supply voltage much greater than 400Vac.

Relays K1, K2 and K3 on auxiliary control board (fig. 3)
Probable cause:
- see the main power supply switch ; **N.B.** If the contacts are stuck together or dirty, do not attempt to separate or clean them, just replace the relay.

R*elays K3 and K4 on HF filter board (fig.4)*
Probable cause:
- see the main power supply switch. **N.B.** If the relay contacts are stuck together or dirty, do not attempt to separate or clean them, just replace the relay.

HF transformer (fig. 5)
Probable cause:
- see the power transformer;

Air unit assembly (fig. 4)
Inspect the operation of the following components:
- pressure gauge;
- pressure switch;
- solenoid valves;
- torch connector;
- miscellaneous connecting pipes and hookups.

Torch (fig. 1A)
Maintenance status, referring to the instructions given in the instruction manual. Condition of parts not subject to wear of the connecting cable between torch and machine (insulation).

4.0 Checking the 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. **N.B.** If the power cables are not tight enough this could cause dangerous overheating. In particular it is necessary to make the following checks on the **control board (fig. 7)**:
- wiring (JP3) towards primary board (JP5), auxiliary control board (JP10 and JP5) and ammeter shunt (TA);
- wiring (CN2X) towards auxiliary control board (CN2);
- wiring (JP2) towards the thermostatic capsules, pressure switch and HF filter board (J5).

In particular, it is necessary to make the following checks on the **primary board (fig. 3)**:
- connections RF, SF, TF of the 3 phases to the main switch and downstream of the switch itself: input filter board and power supply cable;
- the 2 connections between primary board and power

transformer (E ALTO and C BASSO);
- the connections of the auxiliary transformer and to the auxiliary board;
- the connections of the armoured resistors R1 and R2 to JP3A and JP3B.

In particular it is necessary to make the following checks on the **secondary board (fig. 5)**:
- connections between the power transformer and the 2 bushes on the secondary board;
- correct connection of the output levelling inductance (between secondary board bush and HF transformer bush);
- the connections of Hall-1 and Hall-2 sensors to connector (JP1) on the control board;
- wiring of the secondary dissipator thermostatic capsules and power transformer (in series with one another).

Other checks:
- correct connection of the HF transformer (between end of the inductance and OUT- dinse socket on the machine);
- correct connection of the HF transformer (J3-A, J8-B) to the HF board;
- correct connections of the auxiliary board to the solenoid valves and from the control board to the pressure switch.

5.0 Electrical measurements with the machine switched off

A) With the digital multimeter set on **diode testing** check the following components (joint voltages not less than 0.2V):
- rectifier bridges D1, D2, D3 (**fig. 6**);
- IGBT's 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 (no short circuits between collector - gate and collector - emitter **fig. 6**);
- diodes D1, D2, D3, D4, D5 on secondary board between anode and cathode (**fig. 5**).

B) With the digital multimeter set on ohms check the following components:
- resistors R1, R2: 100ohm 12W ±5% (preload **fig. 6**);
- resistors R17, R18, R24, R25: 1ohm 4W ±10% (primary snubber **fig. 6**);
- resistor R1: 22ohm 13W ±5% (secondary snubber **fig. 5**);
- thermostatic capsule continuity test on power transformer and secondary dissipator: disconnect the fastons (so that the thermostatic capsules are connected in series) and measure the resistance over their ends, it should be approx 0 ohm.

6.0 Electrical measurements with the machine 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 operation of the power and control parts of the machine.

6.1 Preparation for testing

A) From the primary board disconnect the E ALTO and C BASSO eyelets of the power transformer (**fig. 3**).

B) Set up the oscilloscope with the voltage probe x10 connected between the collector of Q6 (probe) and the rheofore towards the outside of resistor R38 (earth) on the primary board (**fig. 6**).

C) From the auxiliary control board disconnect fastons JP3A and JP3B and from the primary board disconnect faston TF1. Connect the wiring shown in **fig. A**.

D) Disconnect connector JP5 from the primary board and join the wiring shown in fig. B between the wiring and the board.

E) Connect the torch button simulator to the machine.

F) Connect the power supply cable of the machine to a 3-phase variac with variable output 0-500Vac.

WARNING! during testing prevent body contact with the metal part of the torch because of the presence of high voltages that are hazardous to the operator.

6.2 Scheduled tests

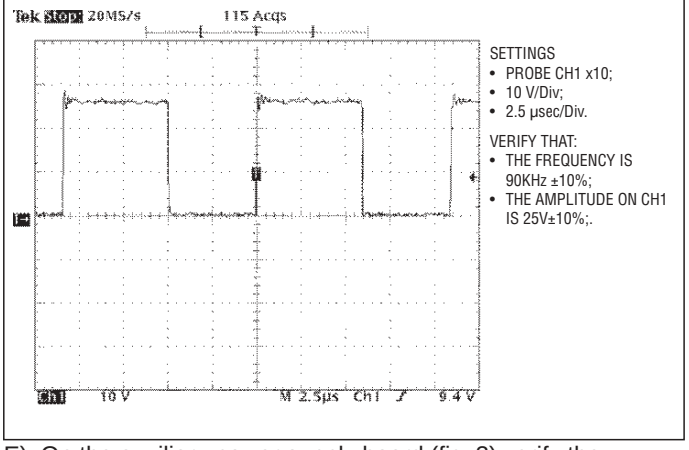
A) Switch on switch SW1 of the wiring in **fig.A** (auxiliary power supply) and verify that:
- with a slight delay, preload relays K1, K2 and K3 on the primary board close (**fig. 6**);
- the power supply green LED D5 (control board) lights up;
- the red machine alarm LED D2 (control board) lights up;
- the yellow air alarm LED D3 (control board) lights up after about 5 seconds; **N.B.** If the power source remains permanently in alarm status this could be due to a control board failure (in any case proceed to make further tests).

B) Open switch SW1 (OFF).

C) Set the machine in **"test mode",** by first pressing the air button on the front panel and then closing switch SW1 (ON) of the wiring in **fig. A.** Keep the air button pressed for more than 6 sec, after which diode D3 will start to flash (this status will remain until the machine is switched off). **N.B.** In this mode we disable HF (which is lethal to any instrument connected to the machine) and air input. Before continuing with testing make sure the machine is in test mode.

D) Use the oscilloscope to make sure the waveform between the collector of Q6 (probe) and the rheophore towards the outside of resistance R38 (earth), resembles the one shown in **fig. C.**

FIGURA C



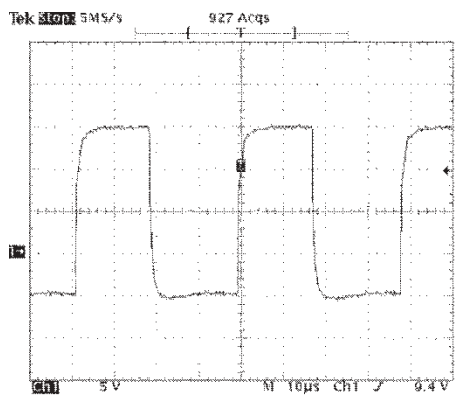
E) On the auxiliary power supply board (fig. 3) verify the following power supply voltage values:
- between the anode of D2 and case of U2 equal to +12Vdc ±5%;
- between the anode of D3 and case of U3 equal to +5Vdc ±5%;
- between the cathode of D7 and pin 1 of U4 equal to -12Vdc ±5%;
- between the cathode of D8 and pin 1 of U5 equal to -5V ±5%.

F) Set up the single trace oscilloscope (CH1 x10), press the torch button simulator and verify that:
- between the anode of D22 and cathode of D20 the voltage is equal to +25Vdc ±5%;
- between the anode of D25 and cathode of D24 the voltage is equal to +25Vdc ±5%.

G) Set up the oscilloscope with the probe x10 connected between resistor R15 (rheofore towards D8, probe) and the cathode of diode D7 (earth) on the primary board (**fig. 5**). Press the torch button simulator (button in fig. A) and verify that:
- the yellow voltage over torch LED, D4, goes off after about 2 seconds;
- the waveform on the display resembles that in **fig. D**;
- the operating frequency is equal to 25KHz ±5%;
- if the frequency reading on the oscilloscope is not 25KHz ±5%, adjust the frequency using the trimmer R55 on the control board (**fig. 7**).

N.B. To obtain the waveform it is necessary to press the torch button simulator several times, because the machine remains switched on for a maximum of about 2 seconds.

FIGURE D



- repeat this test with the differential probe connected between resistor R20 (rheofore towards D10) and the earth on the cathode of diode D11 (check bottom branch).

N.B. If the signal is not present and/or the machine is in alarm status (yellow LED on) the fault could be in the control board (in which case we recommend replacing it) or in the IGBT driver circuit (**fig. 6**).

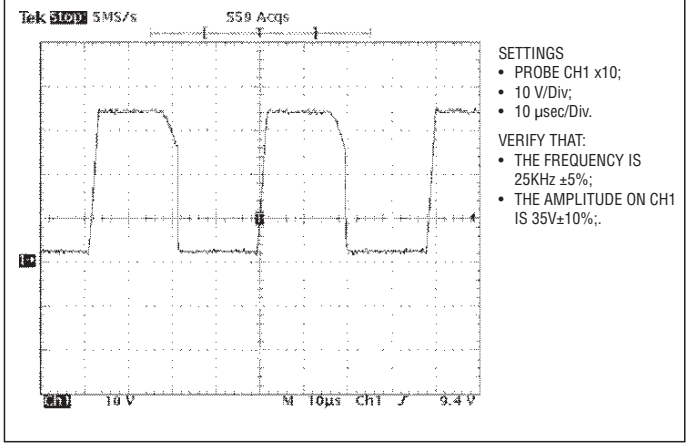
H) Set up the oscilloscope with the probe x10 connected between the collector (probe) and emitter (earth) of IGBT 6 on the primary board (**fig. 6**).

I) On the primary board reconnect the E ALTO and C BASSO eyelets of the power transformer (**fig. 3**).

J) Keeping the machine in "test mode" switch on the variac (initially set to 0V), close the main power supply switch on the machine and gradually increase the voltage generated by the variac until it reaches 24Vac. Press the torch button and make sure that:

- the yellow voltage over torch LED, D38, goes off after about 2 seconds;
- the waveform on the display resembles that in **fig. E**;
- repeat this test on IGBT 1 of the primary board.

FIGURE E



J) Take the variac back down to 0V and also:

- open the main power supply switch on the machine (OFF);
- open switch SW1 (OFF) on the wiring shown in **fig. A**.
- disconnect the oscilloscope.

7.0 Repairs, replacing the boards

If it is very complicated or impossible to repair the boards, replace them completely. 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 when ordering replacements: Telwin reserves the right to supply boards that are compatible but with different codes. Warning: before inserting a new board check it carefully for damage that may have occurred in transit. We supply boards that have already been tested and so if the fault is still present after correct replacement check the other machine parts**.** Unless the instructions explicitly require it, never adjust the trimmers on the boards.

7.1 Removing the primary board (fig. 6)

- disconnect all the wiring connected to the board and the cables from the board to the fans and the power transformer. **N.B.** Never under any circumstances invert the connections between the primary board and the power transformer when assembling the new board;
- undo the 4 screws fastening the primary board to the metal structure;
- undo the 6 screws fastening the dissipator to the metal structure;
- extract the board upwards from the front panel side (this movement is simplified by pulling slightly outwards on the front panel plate).

N.B. For assembly proceed in the reverse order.

A) Take special note of the procedure for replacing the IGBT's and/or rectifier bridges:

Even if only one IGBT is damaged, all 10 should be replaced.

- after removing the board from the machine undo the 4 nuts fastening the dissipators (fig. 6);
- unsolder the parts, clean the tin from the bump contacts on the PCB and separate the dissipator from the board;
- before making the replacement make sure that the parts piloting the IGBT's are not damaged as well:
  - with the multimeter on ohms check the PCB to make sure there is no short circuit between the 1st and 3rd bump contacts (between gate and emitter) corresponding to each component;
  - alternatively resistors R33, R35, R41, R42, R43, R44, R45, R46, R47, R48 could have burst and/or diodes D26, D27, D28 and D29 could be unable to operate at a correct Zener voltage (this should have shown up in the preliminary tests).
- remove the components (IGBT's, diode bridges or both) by loosening the screws fastening them to the dissipators;
- clean any irregularities or dirt from the dissipators. If the IGBT's have burst the dissipators may have been irreversibly damaged: in such a case they should be replaced;
- apply thermoconductive grease following the general instructions;
- prepare the components to be replaced. For the IGBT's it is necessary to bend the rheofores through 90° (never ever bend or tension the parts of the IGBT's near the case);
- position the component fastening screws, but do not tighten them up completely;
- join the dissipator/component assembly with the PCB, inserting all the rheofores in the bump contacts and the threaded spacers into the 4 fastening holes;
- fasten down the dissipators with the nuts and then tighten up the components completely in the following order:
  - nuts fastening dissipator to PCB with torque wrench setting 2 Nm ±20%;
  - screws fastening rectifiers to dissipators with torque wrench setting 2 Nm ±20%;
  - screws fastening IGBT's to dissipators with torque wrench setting 1 Nm ±20%;
- solder the terminals taking care not to let the tin run along them;
- on the components side cut the protruding part of the rheofores and make sure they have not shorted (gate and emitter in particular).

N.B. The 10 IGBT's should belong to the same selection Kit supplied by Telwin.

B) Removing the secondary board (fig. 5)

Unless the dissipator has been damaged by a destructive explosion of the diodes, the secondary board should not generally be removed and the diodes can be replaced directly with the board mounted on the machine. In any case, it should be specified that to remove it is necessary to **(fig. 4)**:

- remove the base by undoing the 4 screws;
- turn the machine upside down and undo the 6 screws fastening the base assembly to the metal structure;
- disconnect all wiring that hampers removal of the base assembly;
- after separating the base assembly disconnect the fastons from the thermostatic capsule and make the replacement.

N.B. For assembly proceed in the reverse order.

B) Take special note of the procedure for replacing the secondary diodes:

- operating on the upturned machine, undo the screws fastening the damaged components to the dissipator and unsolder the metal tab;
- after removing the components clean the dissipator, removing dirt and irregularities;
- apply thermoconductive grease following the general instructions;
- place the components on the dissipator to correspond with the soldering zones and fasten them down with the screws (torque wrench setting 1.4 Nm ±20%);
- solder the rheofores taking care not to let the tin form short circuits.

N.B. make sure that R1 and C1 (secondary snubber) are correctly soldered to the PCB.

C) Replacing the control board (fig. 2A)

If the fault is in the control board we strongly advise replacing it without further intervention.

- undo the 4 screws on the front panel;
- disconnect all the connectors.

N.B. For assembly proceed in the reverse order.

TESTING THE MACHINE

Testing should be carried out on the assembled machine before closing the top cover. During tests never ever commute the selectors or operate the ohmic load contactor with the machine in operation. **WARNING!** Before proceeding with testing, 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 source under load.

1.1 Preparation for testing

A) Using cables with suitable dinse connectors, connect the machine to the ohmic load (two ohmic loads connected in parallel should be available).

N.B. To connect the negative of the ohmic loads to the torch connector it is necessary to use the adapter with torch button simulator. If no adapter is available, it can always be ordered from Telwin.

B) Connect a voltage probe x100 between the collector (probe) and emitter (earth) of IGBT 6.

C) Pass the current probe of the Hall effect transducer along the cable connecting the power transformer at eyelet C BASSO with the reference arrow pointing into C BASSO.

D) Lastly, connect the Hall Probe and the current probe to the oscilloscope.

E) Keep the auxiliary cables (**fig. A** and **fig. B**) connected to the machine as previously.

F) On the control board position the current potentiometer to minimum.

G) Connect the power supply cable of the machine to a 3-phase variac with variable output 0-500 Vac.

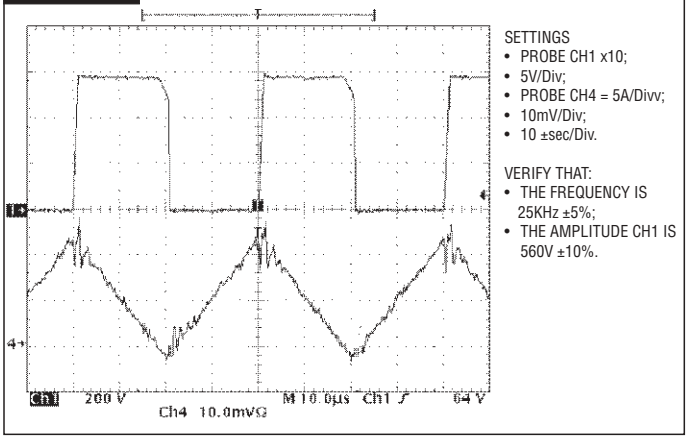
N.B. To obtain the waveform it is necessary to press the torch button simulator several times, because the machine remains switched on for a maximum of about 2 seconds.

1.2 Scheduled tests

A) Loadless test:

- with the loads switched off, set the machine in "**test mode**", by first pressing the air button on the front panel and then closing switch SW1 (ON) of the wiring in fig. A. Keep the air button pressed for more than 6 sec, after which diode D3 will start to flash (this status will remain until the machine is switched off).
  N.B. In this mode we disable HF (which is lethal to any instrument connected to the machine) and air input. Before continuing testing make sure the machine is in test mode.
- switch on the machine and the variac and take the latter to 400 Vac.
- press the torch button simulator and make sure the voltage and current waveforms displayed on the oscilloscope resemble those in **fig. F.**

FIGURE F



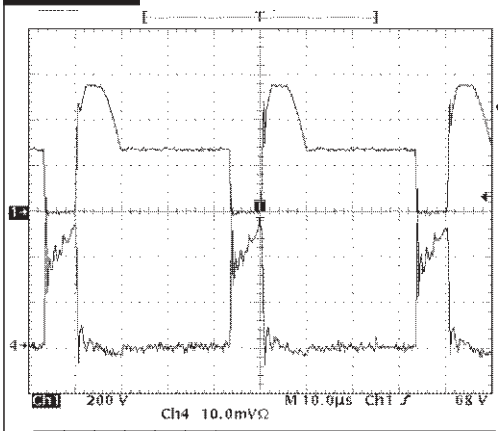
- switch off the auxiliary power supply, the machine and the variac;
- disconnect the wiring shown in fig. A from the machine and restore the original wiring on the auxiliary transformer and on the power supply board;
- disconnect the wiring shown in fig. B from the machine and restore the original wiring between the control board and the primary board;
- connect the machine to the 3-phase 400Vac power line.

B) Minimum load test:

- switch on the machine and set it to "**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 diode D3 will start to flash (this status will remain until the machine is switched off).
  N.B. In this mode we disable HF (which is lethal to any instrument connected to the machine) and air input.
  Before continuing with testing make sure the machine is in test mode.
- set up the ohmic loads with the switch settings as in the table in **fig. G;**
- on the front panel position the current potentiometer to minimum;
- start up the ohmic load, press the torch button simulator and verify that:
  - the waveforms displayed on the oscilloscope resemble those in **fig. G**;
  - the output current is equal to +20Adc ±10% and the output voltage is equal to +88Vdc ±10%;

- if the output current on the load is not 90A, adjust it using R55 on the control board (**fig. 7**)
- disable the ohmic loads and switch off the machine at the main switch.

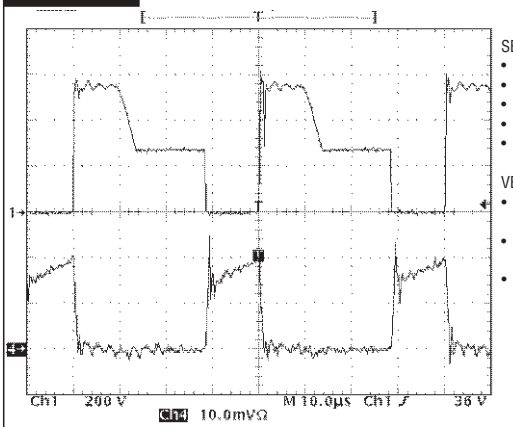
FIGURE G



1	2	3	4	5	6	Switch number	
0	0	0	1	1	1	Switch position	LOAD 1
0	0	0	0	0	0	Switch position	LOAD 2

C) Rated load test:
- set up the ohmic loads with the switch settings as in the table in **fig. H;**
- on the front panel position the current potentiometer on maximum (turn clockwise as far as it will go) and switch on the machine in "**test mode**";
- start up the ohmic load, press the torch button simulator and verify that:
  - the waveforms displayed on the oscilloscope resemble those in **fig. H**;
  - the output current is equal to +90Adc ±5% and the output voltage is equal to +116Vdc ±10%;
  - if the output current on the load is not 90A, adjust it using R55 on the control board (**fig. 7**);
- disable the ohmic loads and switch off the machine at the main switch.

FIGURE H

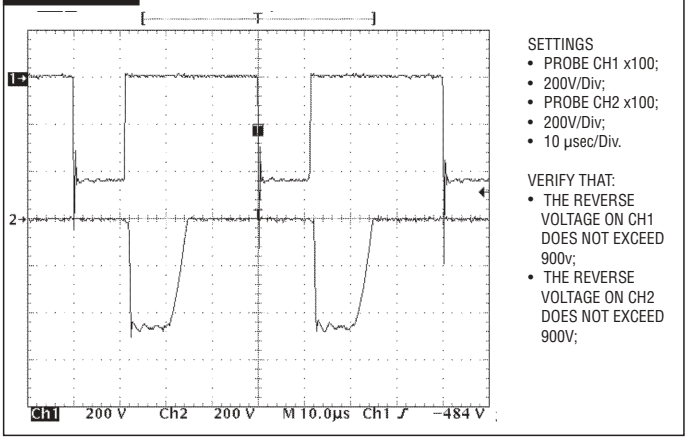


1	2	3	4	5	6	Switch number	
1	1	1	1	1	1	Switch position	LOAD 1
1	1	1	1	1	0	Switch position	LOAD 2

N.B. To prevent the ohmic loads from being subjected to excessive overheating, do not leave the machine in operation under these conditions for long periods.

D) Checking the secondary board diode voltages:
- set up the dual trace oscilloscope by connecting probes CH1 and CH2 x100 to the secondary outputs of the power transformer. The earth terminals should be connected together to the shunt towards the secondary dissipator; remove the multimeter from the OUT+ and OUT- bump contacts;
- set up the ohmic load with the switch settings as in the table in **fig. H**;
- on the front panel position the current potentiometer on maximum (turn clockwise as far as it will go);
- start up the ohmic load, press the torch button simulator and make sure the waveforms displayed on the oscilloscope resemble those in **fig. I**.
- disable the ohmic load and switch off the machine at the main switch.

FIGURE I



E) Endurance test
- to carry out the endurance test it is absolutely necessary to procure 4 static load generators (make a series with 2 pairs in parallel) to prevent the load generators themselves from breaking down.
- under the load conditions shown in the table in **fig. J** and with the cutting current potentiometer on maximum, switch on the machine in "**test mode**" and keep the torch button pressed until the thermostatic capsules trigger (machine in alarm status).

FIGURE J

1	2	3	4	5	6	Switch number	
2	2	2	2	2	2	Switch position	LOAD 1
2	2	2	2	2	2	Switch position	LOAD 2
2	2	2	2	2	2	Switch position	LOAD 3
2	2	2	2	2	2	Switch position	LOAD 4

F) Operational checks:
- switch on the machine in "test mode", press the air button on the panel board and make sure that the solenoid valve remains energised for a period of approx. 45 seconds (duration of cooling cycle or post-air).
- After making sure the wiring and boards are positioned correctly, disconnect the oscilloscope and ohmic loads. **Warning!** HF present in torch.
- Switch on the machine normally (not in test mode) and check the front panel to make sure the following LED's light up (**fig. 7**):
- green LED D5 (power supply);
- yellow LED D3 (air pressure too low);
- red LED D2 (general alarm);
- switch off the main switch on the machine.

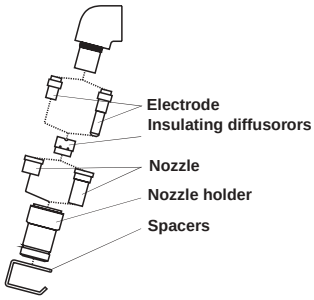
G) Checking torch operation (fig. K)

If the load test was positive but arc strike is difficult or even impossible, the fault could be located in the torch. With the machine disconnected from the main supply check electrical continuity in the torch with the torch mounted on the machine:

a) 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-);

b) 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 J4 on the HF filter board.

FIGURE K



H) Checking HF operation

For the following test, disconnect all the instruments, disconnect fastons J2 and J5 on the HF board **(fig. 4)**;
Before continuing check carefully to make sure all the instruments have been disconnected. Prevent body contact with the OUT terminals and with parts inside the power source. Switch on the machine and with a digital multimeter set on volts make sure that when the torch button is pressed the voltage over fastons J2 and J5 (disconnected) is equal to 230Vac ±20%;
If the result of the previous test was positive the fault could be in the HF board or in the HF filter board (torch button). In this case make sure the wiring is correctly assembled on the boards, if the problem persists we advise replacing the board concerned. Switch off the machine and assemble the machine definitively.

I) Cutting test

With the machine set up as described in the instruction manual, make a test cut on a piece of iron plate (less than 30 mm thick). To make the test it is necessary to connect the compressed air (pressure 5.5 bar). Monitor the dynamic behaviour of the machine.

ILLUSTRATIONS

FIG. 1A

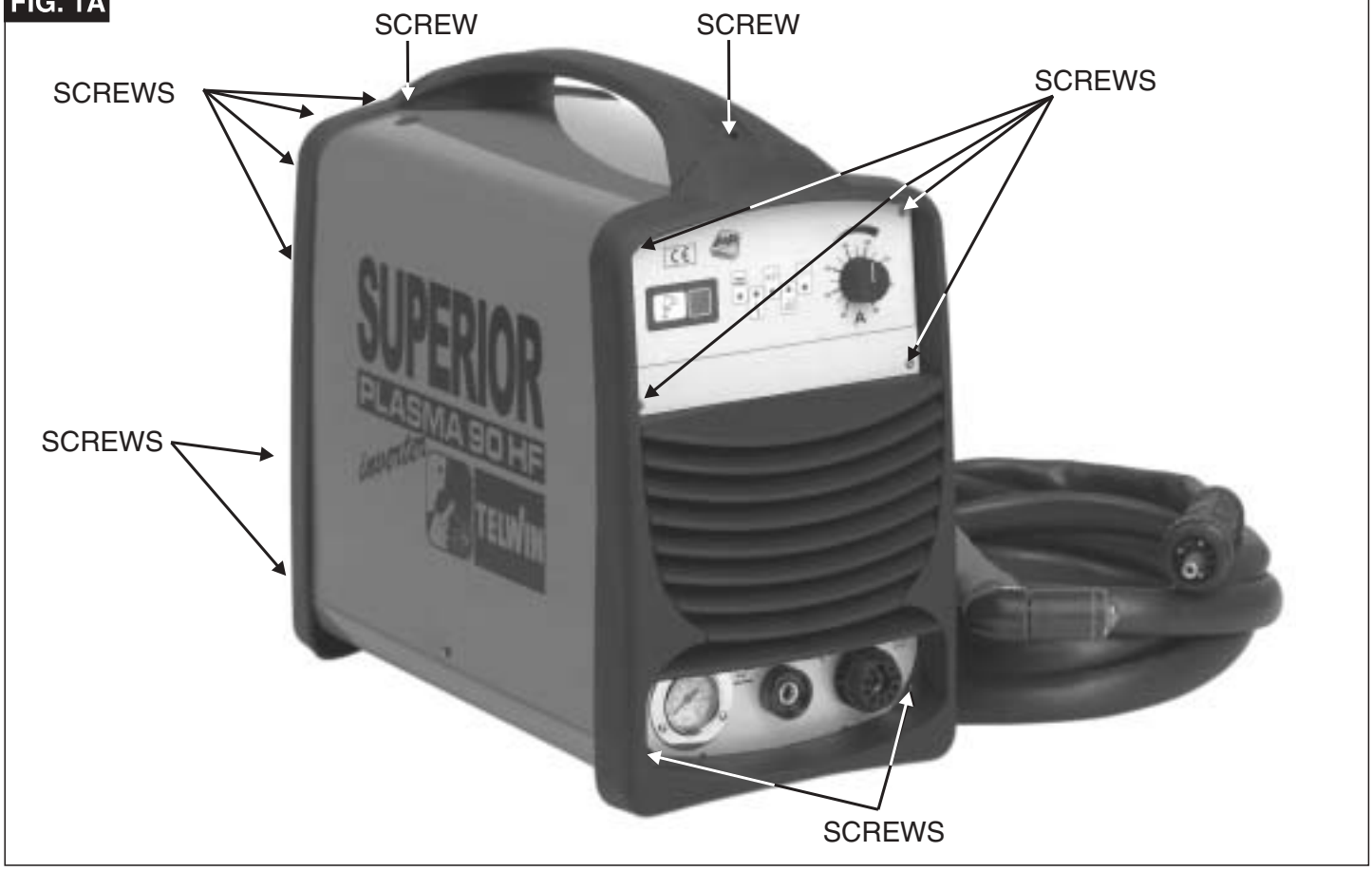


FIG. 1B

FIG. 2A

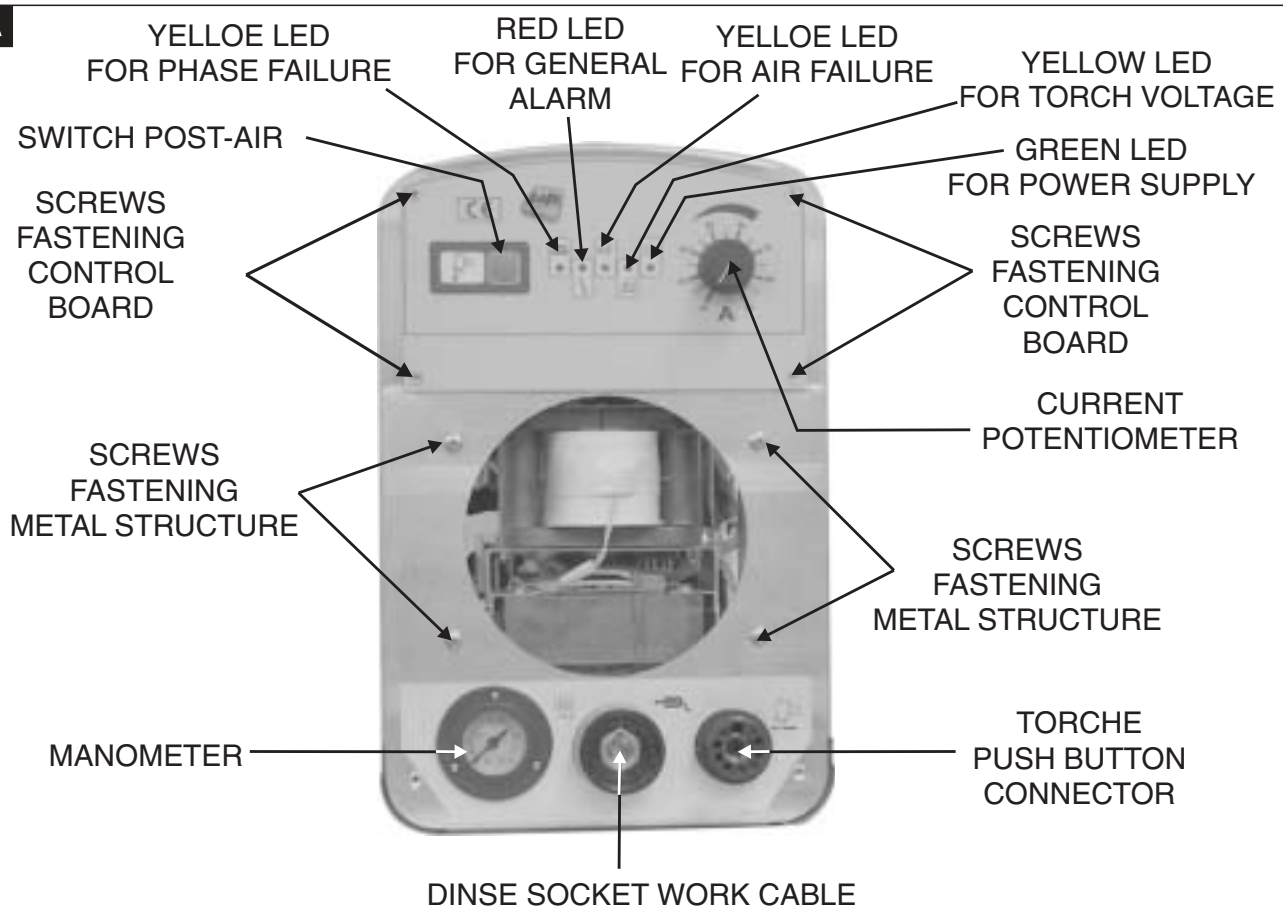

YELLOE LED
FOR PHASE FAILURE
RED LED
FOR GENERAL
ALARM
YELLOE LED
FOR AIR FAILURE
YELLOW LED
FOR TORCH VOLTAGE
SWITCH POST-AIR
GREEN LED
FOR POWER SUPPLY
SCREWS
FASTENING
CONTROL
BOARD
SCREWS
FASTENING
CONTROL
BOARD
CURRENT
POTENTIOMETER
SCREWS
FASTENING
METAL STRUCTURE
SCREWS
FASTENING
METAL STRUCTURE
MANOMETER
TORCHE
PUSH BUTTON
CONNECTOR
DINSE SOCKET WORK CABLE

FIG. 2B

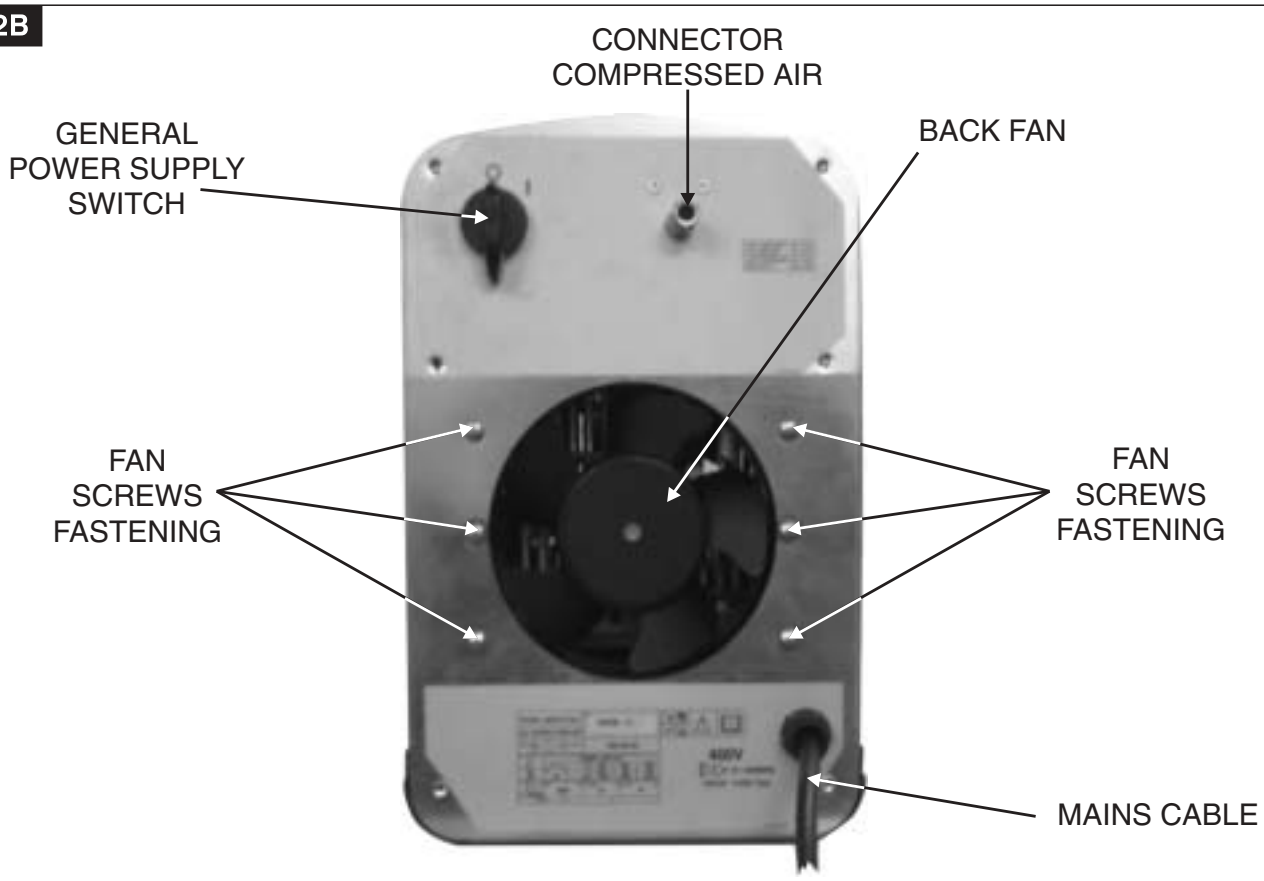

CONNECTOR
COMPRESSED AIR
GENERAL
POWER SUPPLY
SWITCH
BACK FAN
FAN
SCREWS
FASTENING
FAN
SCREWS
FASTENING
MAINS CABLE

FIG. 3

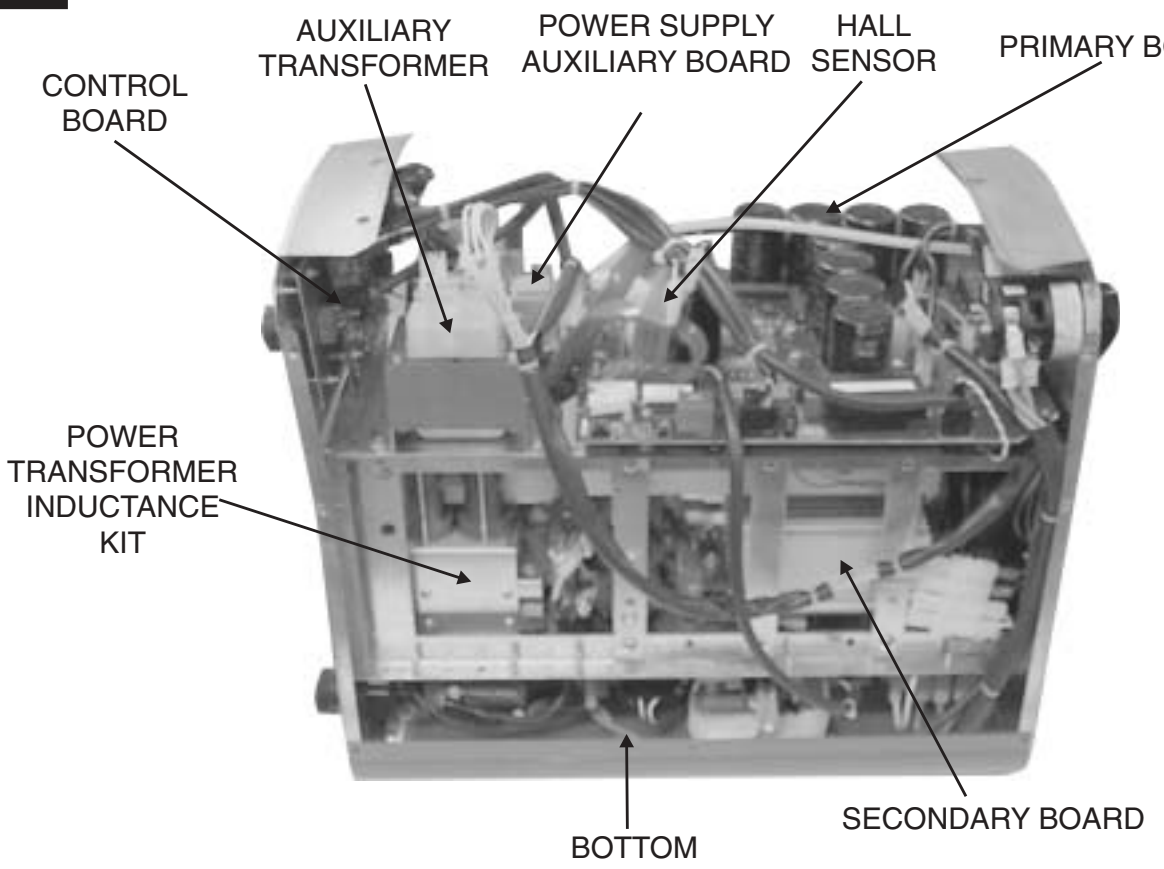

AUXILIARY TRANSFORMER
POWER SUPPLY AUXILIARY BOARD
HALL SENSOR
PRIMARY BOARD
CONTROL BOARD
POWER TRANSFORMER INDUCTANCE KIT
BOTTOM
SECONDARY BOARD

FIG. 4

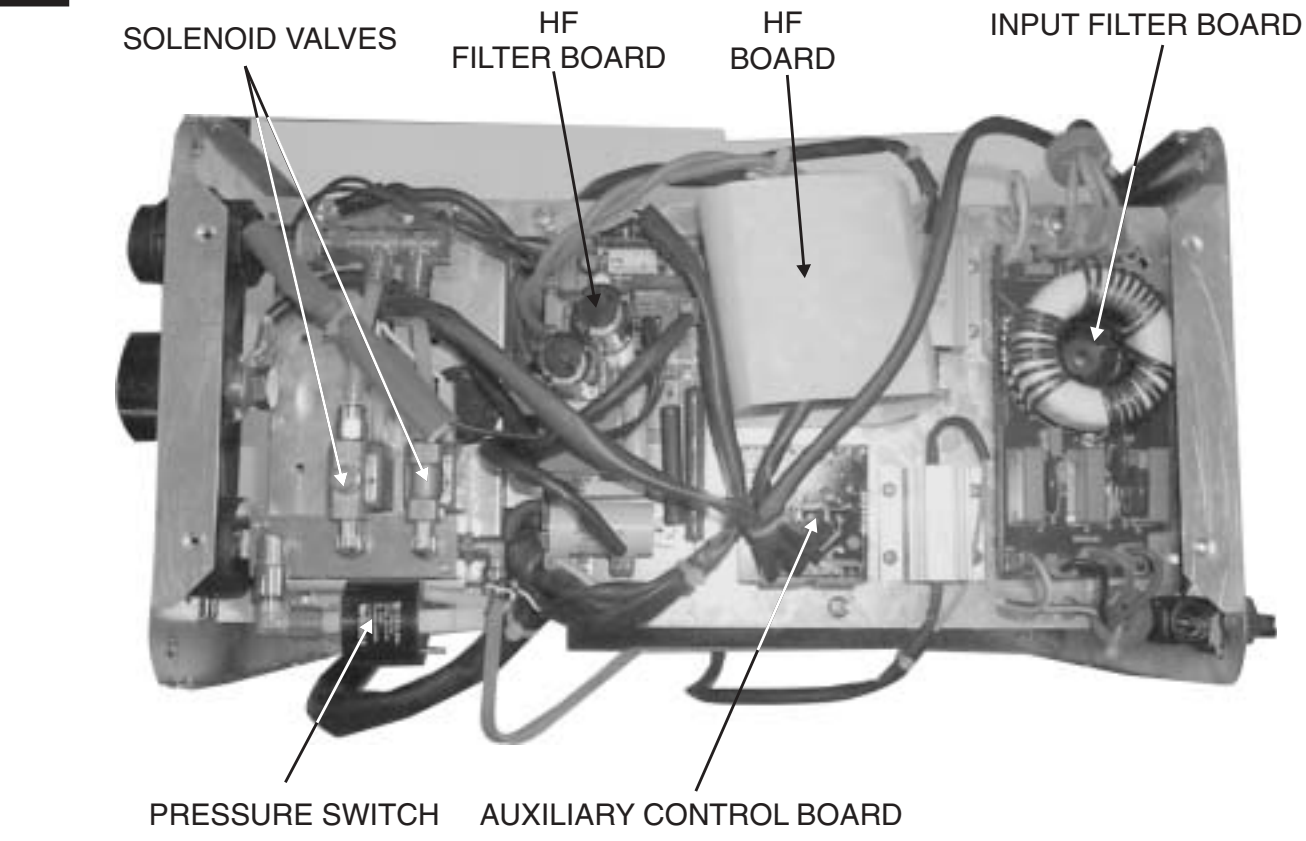

SOLENOID VALVES
HF FILTER BOARD
HF BOARD
INPUT FILTER BOARD
PRESSURE SWITCH
AUXILIARY CONTROL BOARD

FIG. 5

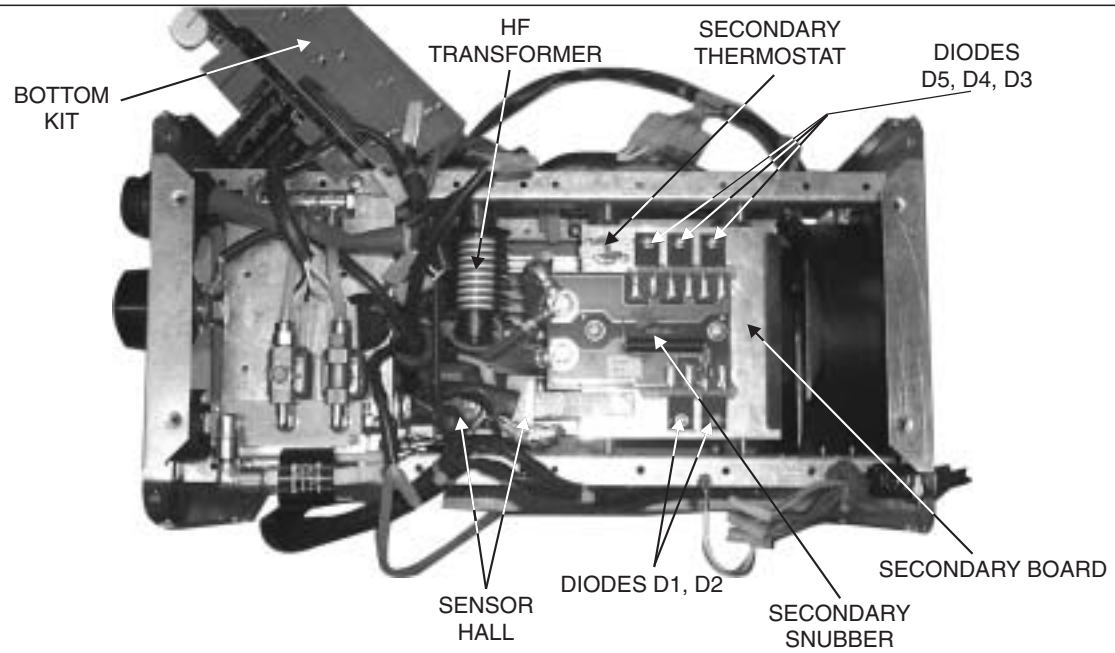


FIG. 6

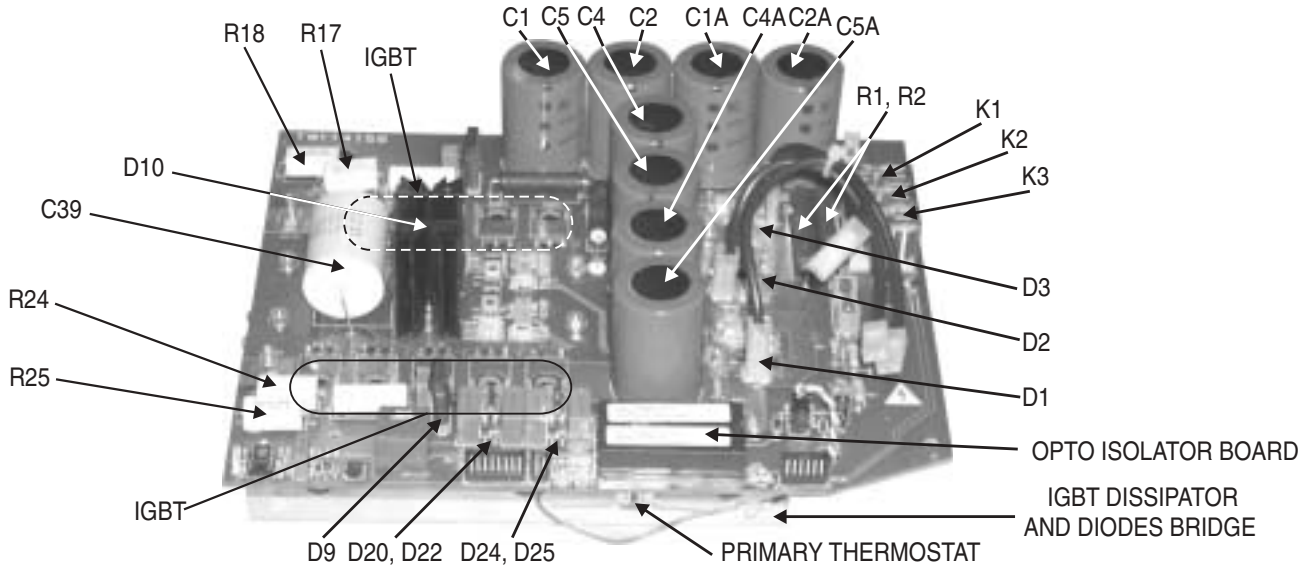
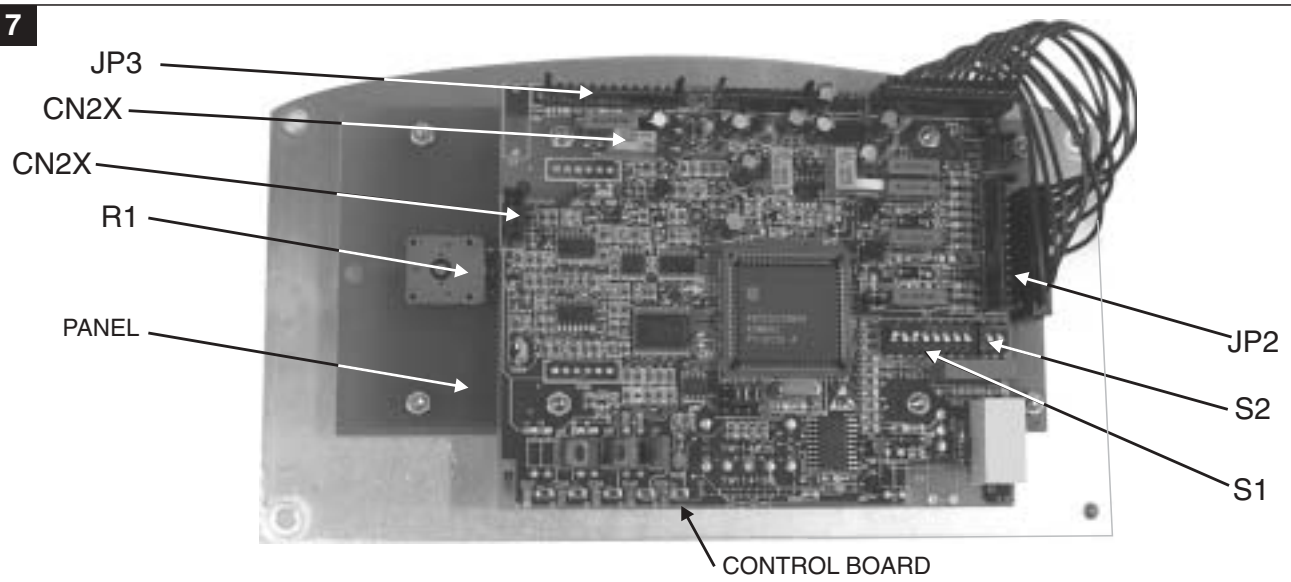
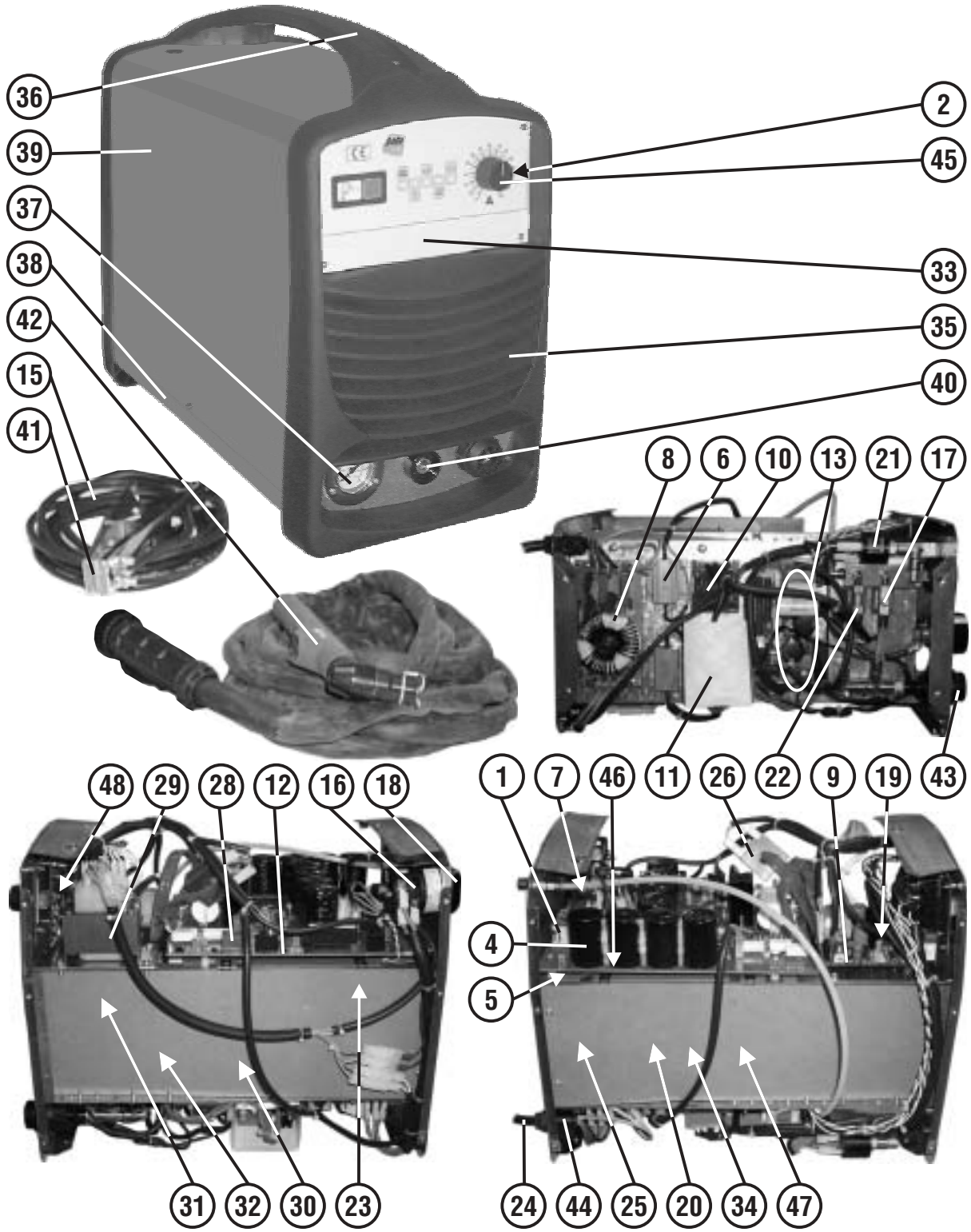


FIG. 7



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.



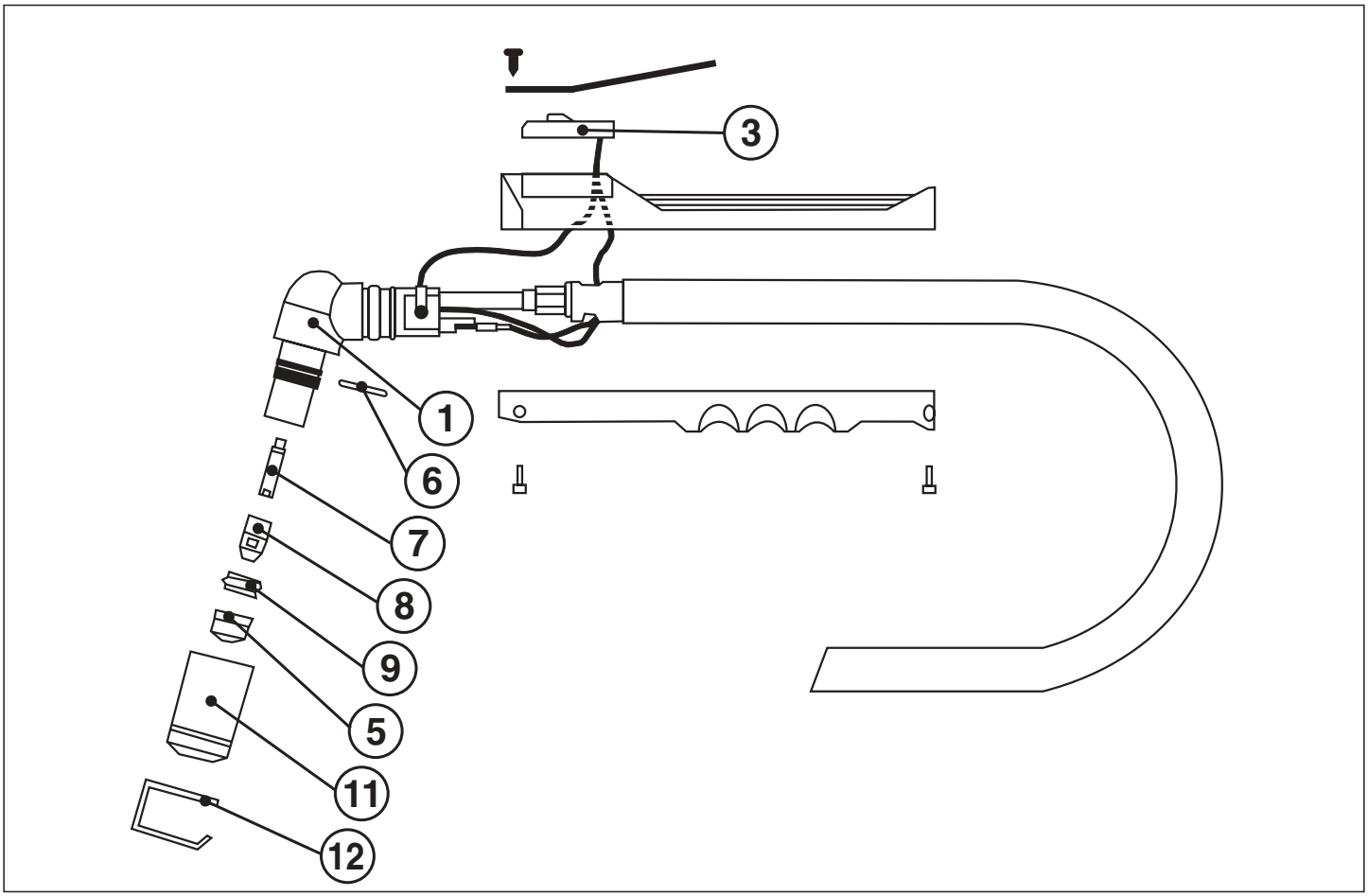
Per richiedere i pezzi di ricambio senza codice precisare: codice del modello; il numero di matricola; numero di riferimento del particolare sull'elenco ricambi.
Pour avoir les pieces detachees, dont manque la reference, il faudra preciser: modele, logo et tension de l'appareil; denomination de la piece; 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.

SUPERIOR PLASMA 90 HF

TELWIN

REF.	ELENCO PEZZI DI RICAMBIO PIECES DETACHEES SPARE PARTS LIST ERSATZTEILLISTE PIEZAS DE REPUESTO
1	Rele' Relais Relais Relais Relais
2	Potenziometro Potentiometre Potentiometer Potentiometer Resistencia Elec. Variable
4	Condensatore Condensateur Capacitor Kondensator Condensador
5	Raddrizzatore Redresseur Rectifier Gleichrichter Rectificador
6	Resistenza Resistance Resistor Wiederstand Resistencia
7	Resistenza Resistance Resistor Wiederstand Resistencia
8	Scheda Filtro Platine Filtre Filter Card Filterkarte Tarjeta Filtro
9	Scheda Ausiliario Platine Auxiliare Auxiliary Pcb Hilfskarte Circuito Ausiliario
10	Scheda Ausiliario Di Controllo Platine De Reglage Auxiliare Auxiliary Control Pcb Hilfsteuerungskarte Circuito Ausiliario De Control
11	Scheda H.f. Platine H.f. H.f. Card H.f. Karte Tarjeta H.f.
12	Scheda Potenza Platine Puissance Power Pcb Leistungskarte Tarjeta De Potencia
13	Scheda Filtro Platine Filtre Filter Card Filterkarte Tarjeta Filtro
14	Assieme Riduttore Reducteur Gas Regulator Druckminderer Reductor De Presion
15	Cavo Cable Cable Kabel Cable
16	Commutatore Commutateur Switch Schalter Conmutador
17	Elettrovalvola Electrovanne Electrovalve Elektroventil Electrovalvula
18	Manopola Per Commutatore Poignee Pour Commutateur Switch Knob Schaltergriff Manija Por Conmutador
19	Fusibile 1A Fusible 1A Fuse 1A Sicherung 1A Fusible 1A
20	Termostato 10,0A Thermostat 10,0A Thermal Switch 10,0A Thermostat 10,0A Termostato 10,0A
21	Pressostato Pressostat Pressure Switch Druckanzeige Presostato
22	Elettrovalvola Electrovanne Electrovalve Elektroventil Electrovalvula
23	Termostato 10,0A Thermostat 10,0A Thermal Switch 10,0A Thermostat 10,0A Termostato 10,0A
24	Cavo Alim. 4G02.50 2.20 M Cable Alim. 4G02.50 2.20 M Mains Cable 4G02.50 2.20 M Netzkabel 4G02.50 2.20 M Cable Alim. 4G02.50 2.20 M
25	Ventilatore Ventilateur Fan Ventilator Ventilador
26	Trasformatore Di Corrente Ta Transformateur De Courant Ta Current Transformer Ta Stromwandler Ta Transformador De Corriente Ta
27	Shunt Shunt Shunt Shunt Shunt
28	Trasformatore Impulsi Trasformateur Pulsee Pulse Transformer Pulse Transformator Transformador Pulsado
29	Trasformatore Ausiliario Transformateur Auxiliaire Auxiliary Transformer Hilfstransformator Transformador Auxiliar
30	Trasformatore Hf Transformateur Hf Hf Transformer Hf Trafo Transformador Hf
31	Trasformatore Potenza Trasformateur Puissance Power Transformer Leistungstransformator Transformador De Potencia
32	Induttanza Inductance Inductance Drossel Induccion
33	Assieme Frontale Ensamble Partie Frontale Front Panel Assembly Geraetefrontsatz Grupo Frontal
34	Radiatore Radiateur Radiator Radiator Radiator
35	Cornice Cadre Frame Rahmen Marco
36	Poignee Knob Griff Manija Manometro
37	Manometre Manometer Manometer Manometro Fondo
38	Chassis Bottom Bodenteil Base Mantello
39	Capot Cover Deckel Panel De Cobertura Presa Dinse
40	Prise Dix Dinse Socket Dinse Steckdose Enchufe Dinse Pinza Di Massa
41	Pince De Masse Work Clamp Masseklemme Pinza De Masa Torcia Plasma 6 M
42	Torche Plasma 6 M Plasma Torch 6 M Plasma Brenner 6 M Antorcha Plasma 6 M Attacco Torcia
43	Attelage Torche Torch Connection Brenneranschluss Enganche Soplete Kit Pressacavo + Ghiera
44	Kit Presse Cable + Embout Kit Cable Bushing + Ring Nut Kit Kabelhalter + Nutmutter Kit Prensa Cable + Virola Kit Manopola
45	Kit Poignee Knob Kit Griff Kit Kit Manija Kit Igbt
46	Kit Igbt Kit Igbt Kit Igbt Kit Igbt Kit Diodi
47	Kit Diodi Kit Diodi Kit Diodi Kit Diodi Kit Micro.
48	Kit Micro. Kit Micro. Kit Micro. Kit Micro.

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

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 :

_____

_____

_____

_____

_____

_____

_____

TELWIN S.p.A. - Via della Tecnica, 3
36030 VILLAVERLA (Vicenza) Italy
Tel. +39 - 0445 - 858811
Fax +39 - 0445 - 858800 / 858801
E-mail: telwin@telwin.com http://www.telwin.com

ISO 9001
CERTIFIED QUALITY SYSTEM

CE