



# TECNICA 150-152-170-168<sup>GE</sup>

## *inverter*



# **TROUBLESHOOTING AND REPAIR MANUAL**

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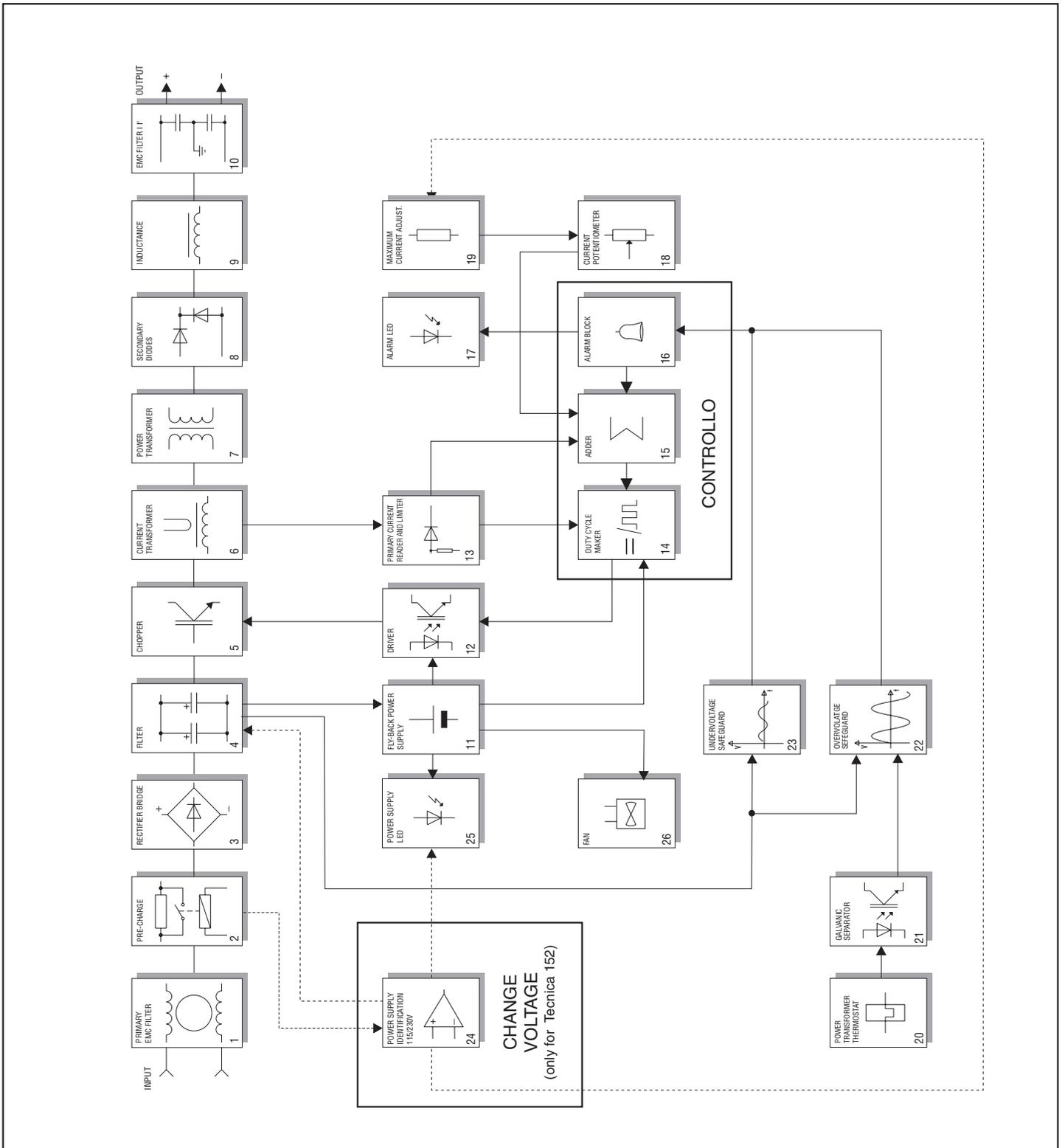
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**"reparation no problem!"**

## 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 power board.

### Block 1

#### **EMC Filter**

Consisting of: C1, C2, C3, L1.

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

### Block 2

#### **Pre-charge**

Consisting of: K1, R1.

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 the relay K1 is de-energised, capacitors C4, C5, C6, C7, C8 are then charged by R1. When the capacitors are charged the relay is energised.

### Block 3

#### **Rectifier bridge**

Consisting of: D1.

Converts the mains alternating voltage into continuous pulsed voltage.

### Block 4

#### **Filter**

Consisting of: C4, C5, C6, C7.

Converts the pulsed voltage from the rectifier bridge into continuous voltage (C7 fitted on Tecnica 152 only).

### Block 5

#### **Chopper**

Consisting of: Q1, Q2, Q3, Q4.

Converts the continuous voltage from the filter into a high frequency square wave capable of piloting the power transformer.

Regulates the power according to the required welding current/voltage.

### Block 6

#### **Current transformer**

Consisting of: T2.

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 7

#### **Power transformer**

Consisting of: T3.

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

### Block 8

#### **Secondary diodes**

Consisting of: D20, D21, D22, D23.

D20, D21 converts the current circulating in the transformer to a single direction, preventing saturation of the nucleus.

D22, D23 recirculate the inductance output current (block 9) when the IGBT's are not conducting, bypassing the power transformer (block 7).

### Block 9

#### **Inductance**

Consisting of: L2.

Levels the secondary board diodes' output current making it practically continuous.

### Block 10

#### **Secondary EMC Filter**

Consisting of: C21, C22.

Prevents noise from the power source from being transmitted through the welding cables and vice versa.

### Block 11

#### **Flyback power supply**

Consisting of: T1, U2.

Uses switching methods to transform and stabilise the voltage obtained from block 4 (filter) and supplies auxiliary voltage to power block 12 (driver) and the control board correctly.

### Block 12

#### **Driver**

Consisting of: ISO2, ISO3.

Takes the signal from block 11 (flyback power supply) and, controlled by block 14 (duty cycle maker), makes the signal suitable for piloting block 6 (chopper).

### Block 13

#### **Primary current reader and limiter**

Consisting of: R63, R64, R65 and part of the control section.

Reads the signal from block 6 (current transformer) and scales it down so it can be processed and compared in blocks 14 and 15.

### Block 14

#### **Duty cycle maker**

Consisting of: U2 (control board).

Processes the information from block 15 (adder) and block 13 (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 15

#### **Adder**

Consisting of: U1C (control board).

Gathers all the information from block 13 (primary current reader and limiter), from block 16 (alarms) and from block 18 (current potentiometer), and produces a signal with a suitable voltage for processing by block 14 (duty cycle maker).

### Block 16

#### **Alarm Block**

Consisting of: U1A, U1B (control board).

When an alarm is detected the power source output current is drastically reduced by making direct adjustments to block 14 (duty cycle maker) and directly changing the reference signal obtained from block 18 (current potentiometer).

### Block 17

#### **Alarm LED**

Consisting of: D14.

It is switched on by block 16 (alarms) in the event of:

- 1) Triggering of thermostatic capsule/thermostat on power transformer.
- 2) Triggering due to undervoltage.
- 3) Triggering due to overvoltage.
- 4) Short circuit at output (electrode holder clamp and earth cable connected to one another or electrode stuck to piece being welded).

### **Block 18**

#### ***Current potentiometer***

Consisting of: R52.

This is used to set the reference voltage needed to adjust the output current: when the potentiometer knob is turned the cursor voltage varies, thus varying the current from the minimum to the maximum value.

### **Block 19**

#### ***Maximum current adjustment***

Consisting of: R56, R57, R58.

Used to adjust the maximum cutting current to be supplied by the power source.

### **Block 20**

#### ***Power transformer thermostat***

Consisting of: ST1.

When the temperature of the power transformer is too high, the thermostat transmit the information to block 21 (galvanic separation). It is reset automatically after the alarm condition has ceased.

### **Block 21**

#### ***Galvanic separator***

Consisting of: ISO1.

The signal arriving from blocks 20 and 21 (power transformer thermostat and secondary diodes) is separated galvanically and sent to block 16 (alarms) for detection of a possible alarm event.

### **Block 22**

#### ***Overvoltage safeguard***

Consisting of: R71, R73 and part of the control section.

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

### **Block 23**

#### ***Undervoltage safeguard***

Consisting of: R72, R70 and part of control board.

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

### **Block 24**

#### ***Power supply identification 115/230V***

Consisting of: U1A, Q2, Q1 (voltage change board).

This is only present on machines with the automatic identification function.

Identifies the power supply voltage level (115V or 230V) and compares the values with a reference signal. The comparison causes enabling of block 5 (filter) for operation in standard mode (230V) or as voltage duplicator (115V). This block also adjusts for the correct maximum current in relation to the different operating modes.

### **Block 25**

#### ***Power supply LED***

Consisting of: D12 (D13 for Tecnica 152).

Indicates when the power source is correctly powered and ready for use.

On machines operating exclusively at 230V it is green. On machines with automatic voltage identification (Tecnica 152) it is green for operation at 230V and orange for operation at 115V.

### **Block 26**

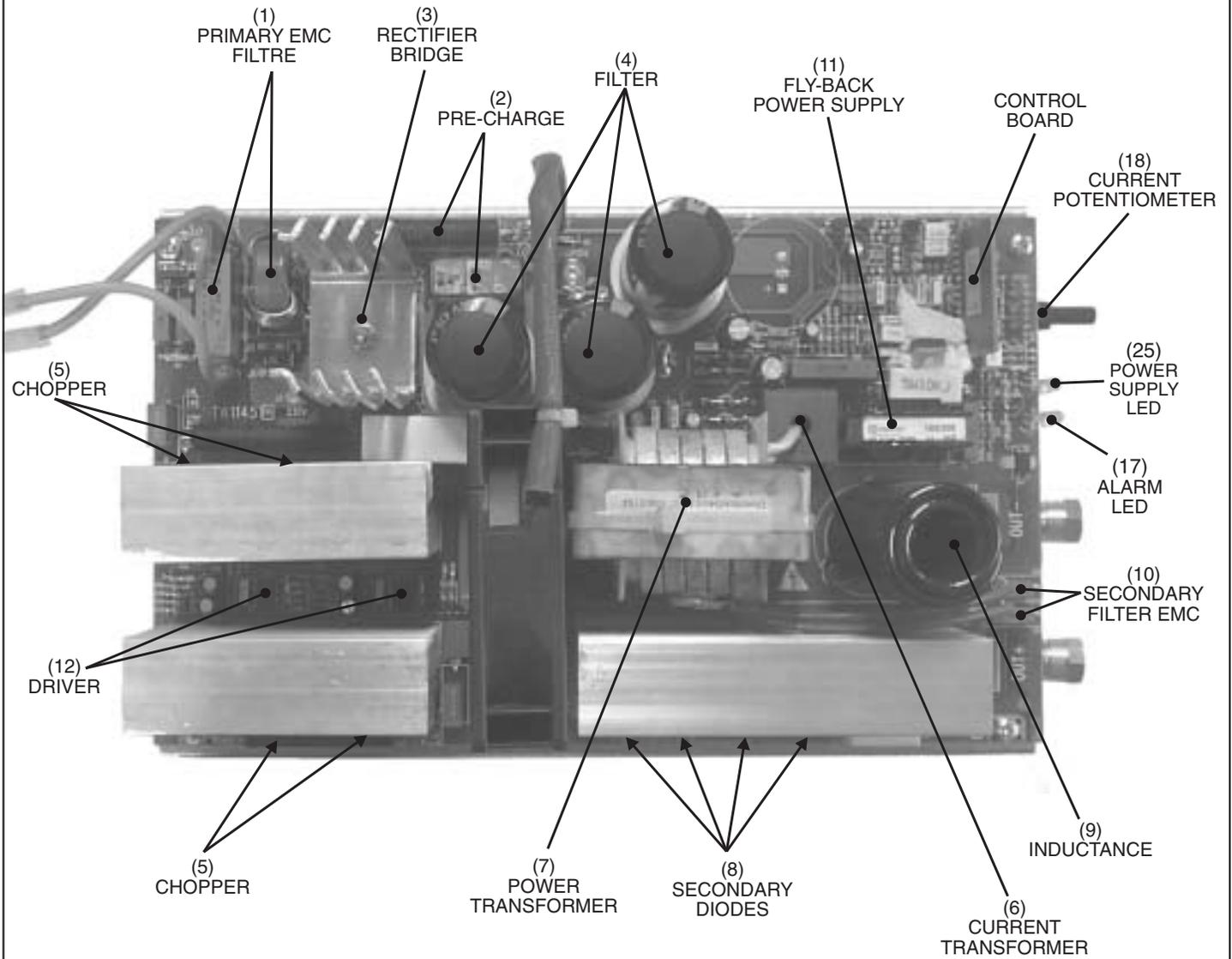
#### ***Fan***

Consisting of: V1.

Powered directly by block 13 (power supply) and cools the power components.

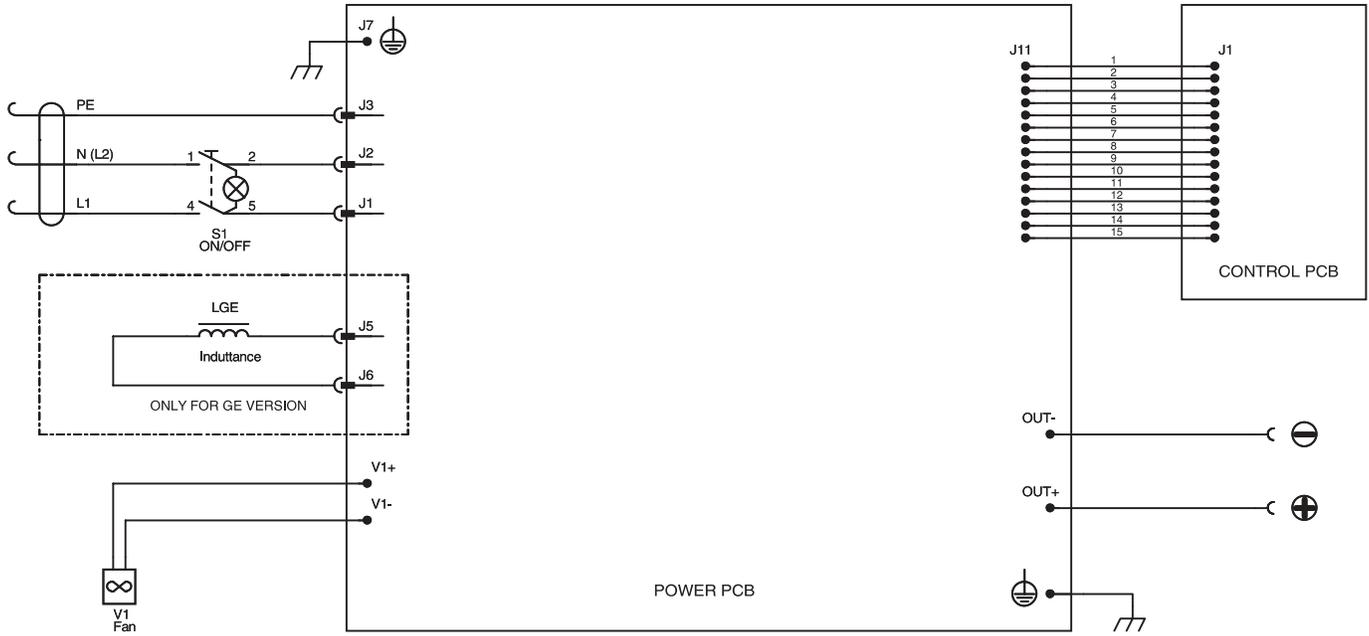
## ILLUSTRATIONS

### Power board

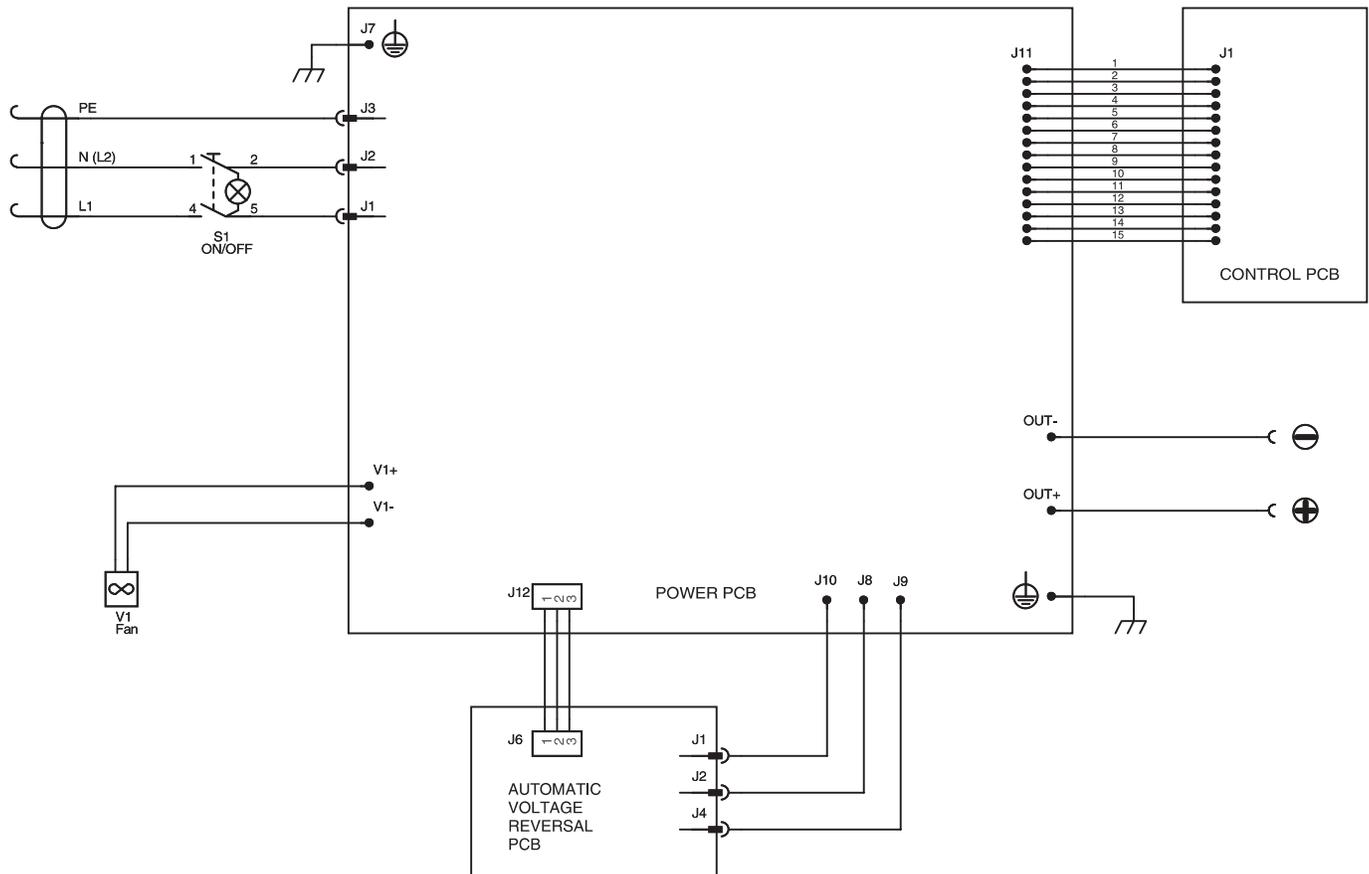


## WIRING DIAGRAMS

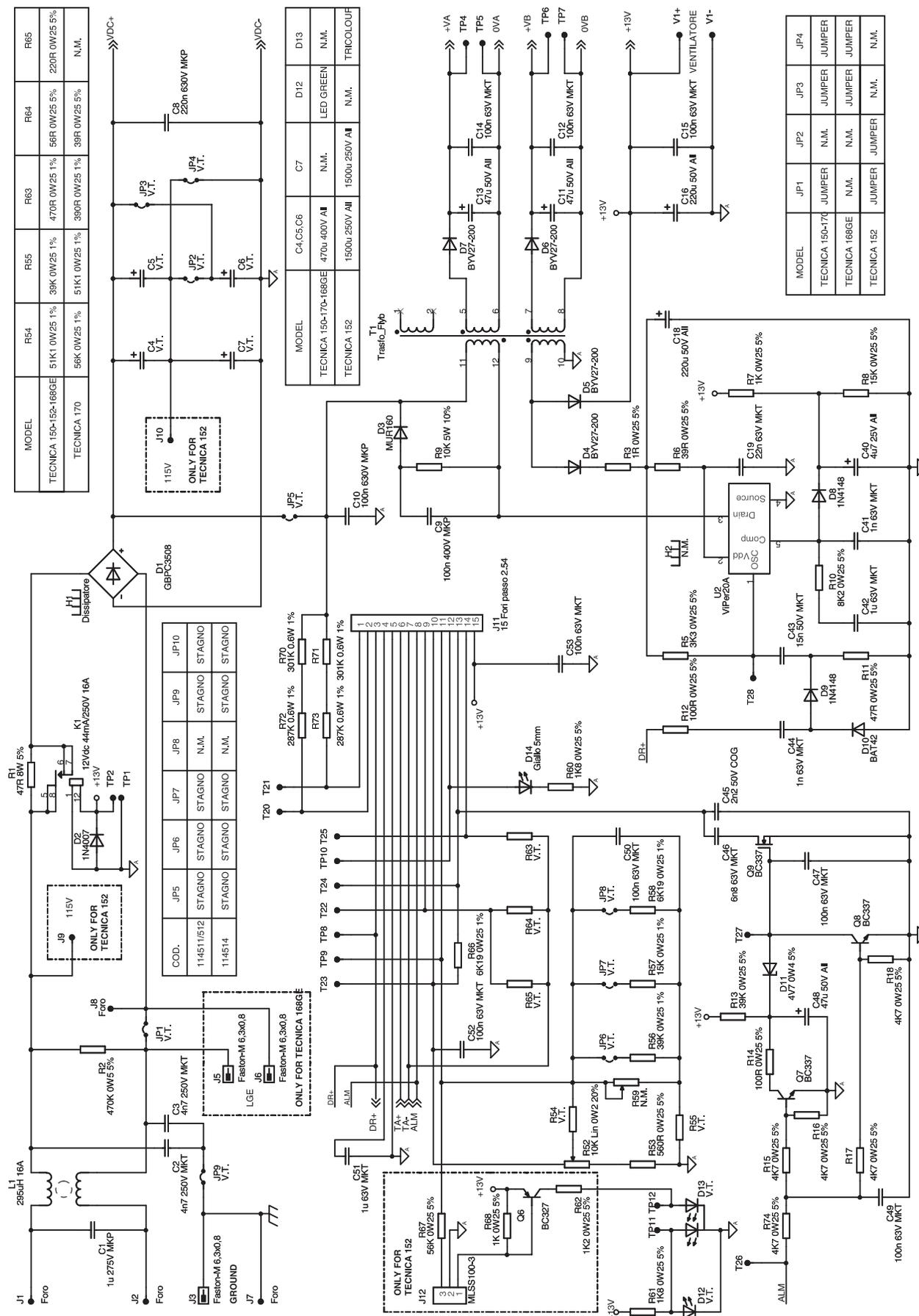
### Wiring general diagram - TECNICA 150 - 170 - 168GE



### Wiring general diagram - TECNICA 152



## Wiring diagram power board - power supply / control



| MODEL                 | R54          | R55          | R56          | R57         | R58          |
|-----------------------|--------------|--------------|--------------|-------------|--------------|
| TECNICA 150-152-168GE | 51K1 0W25 1% | 39K 0W25 1%  | 470R 0W25 1% | 56R 0W25 5% | 220R 0W25 5% |
| TECNICA 170           | 56K 0W25 1%  | 51K1 0W25 1% | 390R 0W25 1% | 39R 0W25 5% | N.M.         |

| MODEL                 | C4,C5,C6       | C7             | D12       | D13       |
|-----------------------|----------------|----------------|-----------|-----------|
| TECNICA 150-170-168GE | 470µ 400V AII  | N.M.           | LED GREEN | N.M.      |
| TECNICA 152           | 1500µ 250V AII | 1500µ 250V AII | N.M.      | TRICOLORE |

| MODEL           | JP1    | JP2    | JP3    | JP4    |
|-----------------|--------|--------|--------|--------|
| TECNICA 150-170 | JUMPER | N.M.   | JUMPER | JUMPER |
| TECNICA 168GE   | N.M.   | N.M.   | JUMPER | JUMPER |
| TECNICA 152     | JUMPER | JUMPER | N.M.   | N.M.   |

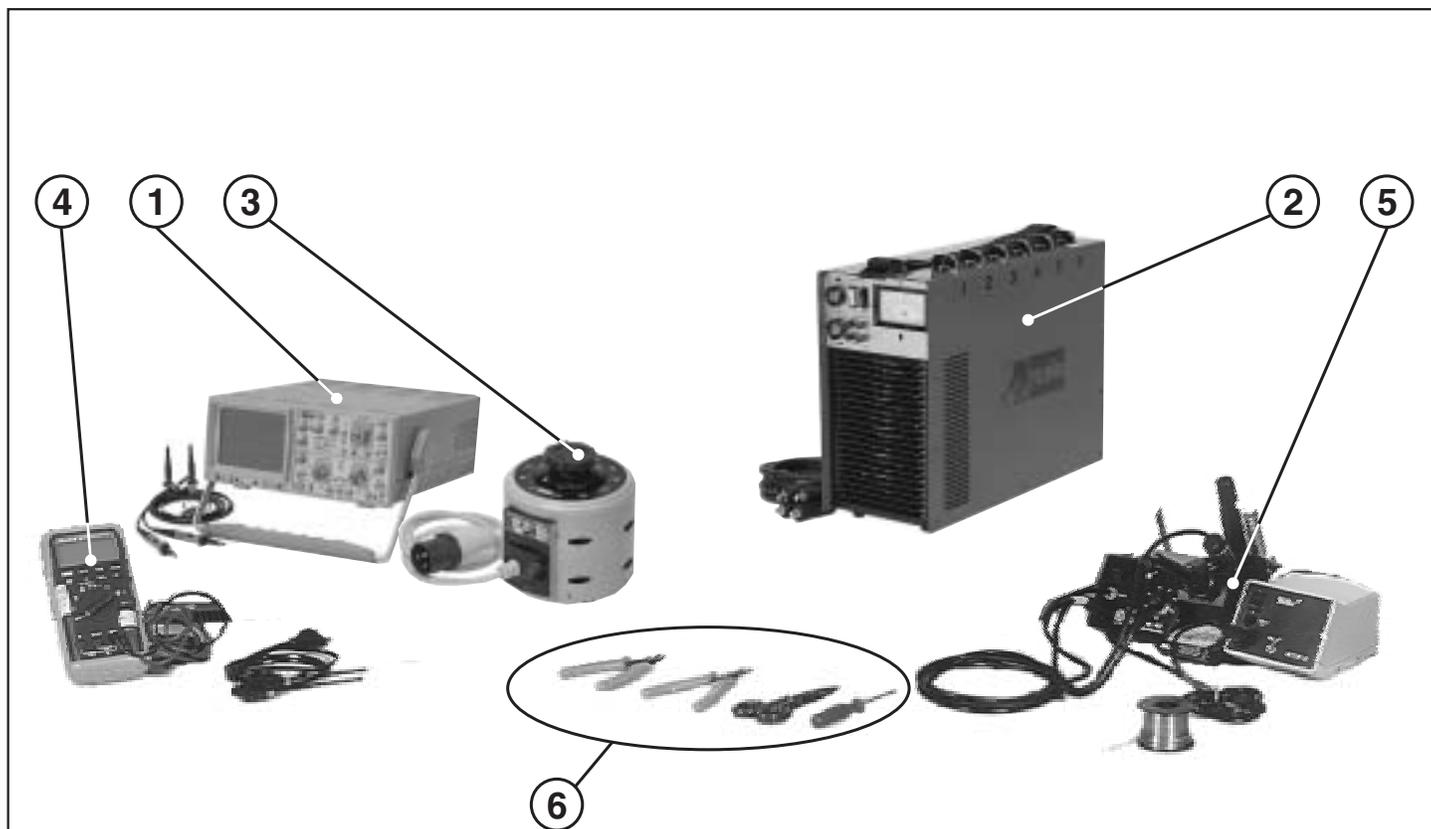
| COD.       | JP5    | JP6    | JP7    | JP8    | JP9    | JP10   |
|------------|--------|--------|--------|--------|--------|--------|
| 114511/512 | STAGNO | STAGNO | STAGNO | STAGNO | STAGNO | STAGNO |
| 114514     | STAGNO | STAGNO | STAGNO | STAGNO | STAGNO | STAGNO |





# REPAIR GUIDE

## EQUIPMENT REQUIRED



### ESSENTIAL INSTRUMENTS

|                                  |                        |
|----------------------------------|------------------------|
| <b>1</b> Dual trace oscilloscope | <b>cod. 802401 (*)</b> |
| <b>2</b> Static load generator   | <b>cod. 802110 (*)</b> |
| <b>3</b> Variac 0 - 300v 1500 VA | <b>cod. 802402 (*)</b> |
| <b>4</b> Digital multimeter      |                        |

### USEFUL INSTRUMENTS

|                              |
|------------------------------|
| <b>5</b> Unsoldering station |
| <b>6</b> 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 SHOULD BE CARRIED OUT ONLY AND EXCLUSIVELY BY EXPERT OR SKILLED ELECTRICAL-MECHANICAL PERSONNEL.**

**WARNING:**

**ANY CHECKS CARRIED OUT INSIDE THE MACHINE WHEN IT IS POWERED MAY CAUSE SERIOUS ELECTRIC SHOCK DUE TO DIRECT CONTACT WITH LIVE 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, the IGBT's and Power DIODES in particular, take elementary antistatic precautions (use antistatic footwear or wrist straps, antistatic working surfaces etc.).
- B) To ensure the heat flow between the electronic components and the dissipator, 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 (rheophores of IGBT's, etc.) should be left to reticulate before the machine is tested.
- E) When the semiconductor devices are soldered the maximum temperature limits should be respected (normally 300°C for no more than 10 seconds).
- F) It is essential to take the greatest care at each disassembly and assembly stage for the various machine parts.
- G) Take care to keep the small parts and other pieces that are dismantled from the machine so as to be able to position 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 wiring should never be modified without prior authorisation from Telwin.
- I) For further information on machine specifications and operation, refer to the Instruction Manual.
- J) **WARNING!** When the machine is in operation there are dangerously high voltages on its internal parts so do not touch the boards when the machine is live.

**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 and should only be done by expert or skilled electrical-mechanical personnel.

- remove the current adjustment knob on the front panel of the machine (**fig. 1**);
- undo the 4 screws attaching the handle to the top cover (**fig. 1**).
- undo the 8 screws fastening the back and front plastic panels; 4 for the cap (**fig. 1**).
- undo the 2 screws attaching the top cover to the base: 1 screw on each side (**fig. 1**).
- undo the 2 screws fastening the top cover to the metal structure.
- slide out the top cover upwards

After completing the repairs, proceed in the reverse order to re-assemble the cover and do not forget to insert the toothed washer on the ground screw.

**2.0 Cleaning the inside of the machine**

Using suitably dried compressed air, carefully clean the components of the power source since dirt is a danger to parts subject to high voltages and can damage the galvanic separation between the primary and secondary.

To clean the electronic boards we advise decreasing the air pressure to prevent damage to the components.

It is therefore important to take special care when cleaning the following parts

**Fan (fig. 2A)**

Check whether dirt has been deposited on the front and back air vents or has damaged the correct rotation of the blades, if there is still damage after cleaning replace the fan.

**Power board (figs. 2A and 2B):**

- rheofores of IGBT's Q1, Q2, Q3, Q4;
- rheofores of recirculating diodes D40, D41;
- rheofores of secondary power diodes D21, D22, D 23;
- thermostat ST1 on power transformer;
- opto couplers ISO1;
- 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 the power supply cable has not been damaged or disconnected internally and that the fan works with the machine switched on. Inspect the components and cables for signs of burning or breaks that may endanger operation of the power source. Check the following elements:

**Main power supply switch (fig. 2A)**

Use the multimeter to check whether the contacts are stuck together or open. Probable cause:

- mechanical or electric shock (e.g. bridge rectifier or IGBT in short circuit, handling under load).

**Current potentiometer R52 (fig. 3)**

Probable cause:

- mechanical shock.

**Relay K1 (fig. 3)**

Probable cause:

- see main power supply switch. **N.B.** If the relay contacts are stuck together or dirty, do not attempt to separate them and clean them, just replace the relay.

**Electrolytic capacitors C4, C5, C6, C7 (fig. 3)**

Probable cause (C7 fitted on Tecnica 152 only):

- mechanical shock;
- machine connected to power supply voltage much higher than the rated value;

- broken rheophore on one or more capacitor: the remainder will be overstressed and become damaged by overheating;
- ageing after a considerable number of working hours;
- overheating caused by thermostatic capsule failure.

### IGBT's Q1, Q2, Q3, Q4 (fig. 4)

Probable cause:

- discontinuation in snubber network;
- fault in driver circuit;
- poorly functioning thermal contact between IGBT and dissipator (e.g. loosened attachment screws: check);
- excessive overheating related to faulty operation.

### Primary diodes D40, D41 (fig. 4)

Probable cause:

- excessive overheating related to faulty operation.

### Secondary diodes D20, D21, D22, D23 (fig. 4)

Probable cause:

- discontinuation in snubber network;
- poorly functioning thermal contact between IGBT and dissipator (e.g. loosened attachment screws: check);
- faulty output connection.

### Power transformer and filter reactance (fig. 2A)

Inspect the windings for colour changes. Probable causes:

- power source connected to a higher voltage than 280Vac;
- ageing after a substantial number of working hours;
- excessive overheating related to faulty operation.

## 4.0 Checking the power and signal wiring

It is important to check that all the connections are in good condition and 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.

## 5.0 Electrical measurements with the machine switched off

A) With the multimeter set in **diode testing** mode check the following components (junction voltages not less than 0.2V):

- rectifier bridge D1 (fig. 3);
- IGBT's Q1, Q2, Q3, Q4 (absence of short circuits between collector-gate and between emitter-collector fig. 4);
- secondary board diodes D20, D21, D22, D23 between anode and cathode (fig. 4). The secondary diodes can be checked without removing the power board: with one prod on the secondary board dissipator diodes and the other in sequence on the two power transformer outlets;
- viper U2 (absence of short circuits between pin 3 - pin 4 and between pin 4 pin 2, fig. 3).

B) With the multimeter set in ohm mode check the following components:

- resistor R1: 47ohm (pre-charge fig. 3);
- resistors R44, R45: 22ohm (primary snubber fig. 3);
- resistor R20: 10ohm (secondary snubber fig. 3);
- thermostat continuity test on the power transformer: clean the resin from the bump contacts of ST1 (A,B) and measure the resistance between the two bump contacts, it should be approx. 0 ohm (fig. 2B).

## 6.0 Electrical measurements with the machine in operation

**WARNING!** Before proceeding with faultfinding, 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 operation of the power and control parts of the power source.

### 6.1 Preparation for testing

A) Set up the oscilloscope with the voltage probe x100 connected between pin 3 of U2 and the earth on the anode of diode D2 (fig. 3).

B) Set up the multimeter in DC mode and connect the prods to the OUT+ and OUT- bump contacts.

C) Position the potentiometer R52 on maximum (turn clockwise as far as it will go).

D) Connect the power supply cable to a single-phase variac with variable output 0-300 Vac.

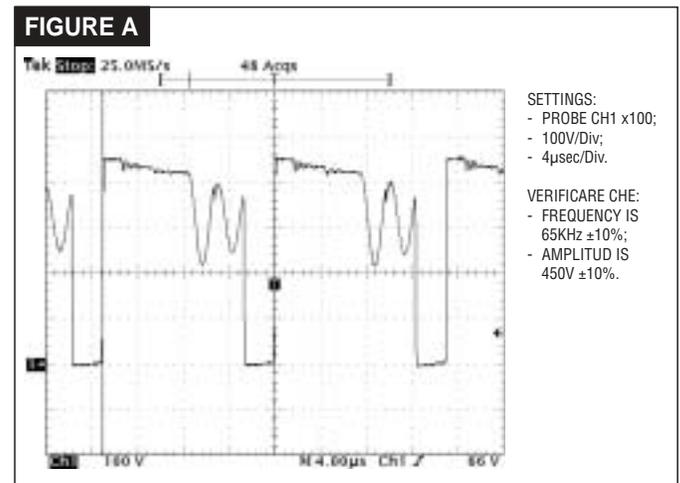
### 6.2 Tests for the TECNICA 150 - 170 - 168GE

A) Switch on the variac (initially set to the value 0 V), switch off the main switch on the power source and increase the variac voltage gradually to 230 Vac and make sure:

- the green power supply LED D12 lights up (fig. 3),
- the fan for the power transformer starts up correctly,
- the pre-charge relay K1 commutes (fig. 3),
- for voltages close to the rated power supply value (230Vac  $\pm 15\%$ ) the power source is not in alarm status (yellow LED D14 off).

**NB.** if the power source stays in alarm status permanently, there could be a fault in the control board (in any case, proceed to make the other tests)

B) Make sure the waveform shown on the oscilloscope resembles Fig. A.



**N.B.** if no signal is present, it may be necessary to replace the integrated circuit U2 (fig. 3).

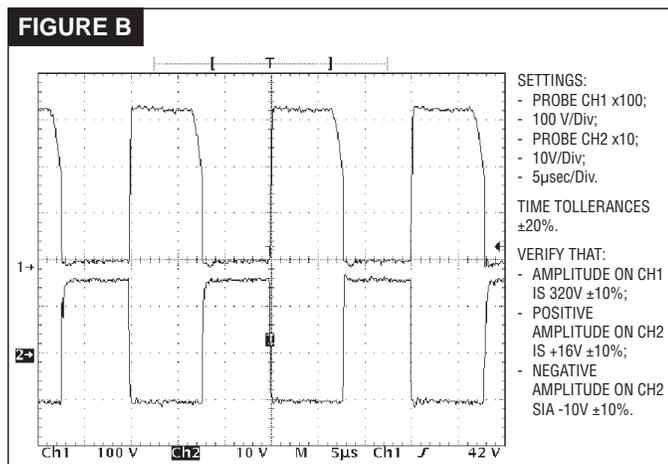
C) With the multimeter set in **volt** mode make sure that (fig. 3):

- Set up a multimeter in volt mode and make sure that (fig. 3):
- the voltage over the anode of D2 (-) and the cathode of D2 (+) is equal to +13V  $\pm 5\%$ ;
- the voltage over the anode of D30 (-) and the cathode of D7 (+) is equal to +29V  $\pm 5\%$ ;
- the voltage over the anode of D31 (-) and the cathode of D6 (+) is equal to +29V  $\pm 5\%$ ;

D) Set up the dual trace oscilloscope. Connect the probe CH1(x100) to the Q1 collector and probe CH2(x10) to the

gate, also of Q1. The earth connections are both made to the emitter of Q1.

E) Make sure the waveform displayed on the oscilloscope resembles **fig. B**.

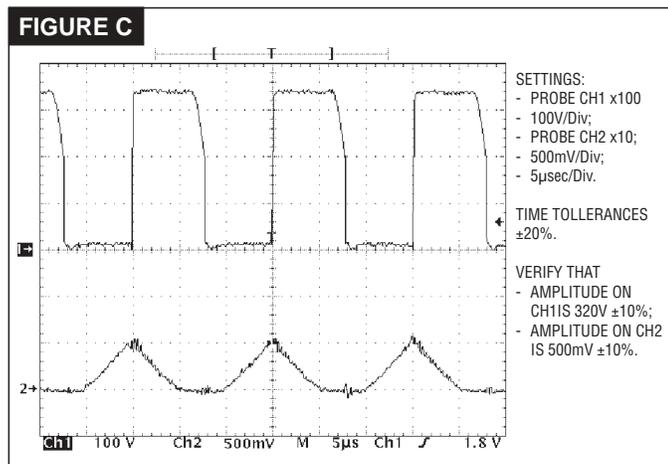


F) Repeat this test also for Q2, Q3, Q4 (for Q3 and Q4 use the differential probe).

**N.B.** if the signal is not present there could be a fault in the IGBT driver circuit (**fig. 3**) or in the control board (**fig. 2A**), in this case we recommend replacing the board).

G) Set up the dual trace oscilloscope. Connect probe CH1 (x100) to the collector of Q1 and probe CH2 (x10) to pin 9 on strip J11. The earth terminals are connected together to the emitter of Q1.

H) Make sure the waveform displayed on the oscilloscope resembles **fig. C** and that the output voltage over OUT+ and OUT- is equal to +80Vdc±10%.



I) Switch the power source on again and make sure that, following the brief start up time, the machine is not in alarm status (the yellow alarm LED D14 is off, **fig. 3**). **N.B.** If the machine remains in alarm status (and this is not due to a fault in the control board) there could be a fault in the photocoupler ISO1 (**fig. 3**).

### 6.3 Tests for the TECNICA 161

In this case the tests are just the same and can be carried out with either a 115V or 230V power supply:

- with a power supply of 115V±15% (LED D13 on and orange) the voltage change board enables voltage duplication by the input filter.
- with a power supply of 230V±15% (LED D13 on and

green) the voltage change board disables voltage duplication by the input filter.

**NOTE:** The intermediate band with a power supply between 115V±15% and 230V±15% will be considered incompatible so the machine will show alarm status (yellow LED D14 lit up).

### 7.0 Repairs, replacing the boards

If repairing the board is complicated or impossible, it should be completely replaced. The board is identified by a 6-digit code (printed in white on the component side after the initials TW). This is the reference code for requesting a replacement: Telwin may 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. When we supply a board it has already been tested and so if the fault is still present after it has been replaced correctly, check the other machine components. Unless specifically required by the procedure, never alter the board trimmers.

#### 7.1 Removing the power board (fig. 2A)

If the fault is in the power board remove it from the bottom as follows:

- with the machine disconnected from the main supply, disconnect all the wiring connected to the board;
- remove the current adjustment knob on the front panel of the machine (**fig. 1**);
- remove any bands constraining the board (e.g. on the power supply cable and connections to primary);
- undo the 3 screws fastening the board to the bottom (**fig. 2B**);
- remove the board from the metal structure, lifting it upwards.

**N.B.** for assembly proceed in the reverse order and remember to insert the toothed washer on the earth screw.

#### A) Please read the procedure for replacing the IGBT's carefully: (fig. 4).

The 4 IGBT's are attached to 2 different dissipators and whenever a replacement is required, both IGBT's should be all replaced.

- undo the screws attaching the dissipator to the board to replace Q1, Q3 (**fig. 2B**);
- undo the screws attaching the dissipator to the board to replace Q2, Q4 (**fig. 2B**);
- remove the 4 IGBT's and the 2 diodes D40, D41 by unsoldering the rheofores and then clean the solder from the printed circuit bump contacts;
- remove the 2 dissipators from the board;
- undo the screws locking the 4 IGBT's.

Before making the replacement make sure the components piloting the IGBT's are not also damaged:

- with the multimeter set in **ohm** mode make sure there is no short circuit on the PCB between the 1<sup>st</sup> and 3<sup>rd</sup> bump contacts (between gate and emitter) corresponding to each component;
- alternatively, resistors R40, R41, R42, R43 could have burst and/or diodes D32, D33, D34 and D35 may be unable to function at the correct Zener voltage (this should have shown up in the preliminary tests);
- clean any irregularity or dirt from the dissipators. If the IGBT's have burst the dissipators may have been irreversibly damaged: in this case they should be replaced;
- apply thermo-conductive grease following the general

instructions.- Insert the new IGBT's between the dissipator and the spring, taking care not to damage the component during assembly (the spring should be inserted under pressure on the dissipator so as to lock the component);

- place the dissipators with the new IGBT's and primary diodes D40 and D41 (**WARNING!** Make sure there is insulation between the case of diode D41 and the dissipator) in the PCB bump contacts, placing 4 spacers between the dissipator and the PCB (2 for each dissipator) and fasten them down with the screws (torque wrench setting for screws 1 Nm  $\pm$ 20%);
- solder the terminals taking care not to let the solder run along them;
- on the welding side cut away the protruding part of the rheofores and check they are not shorted (between the gate and emitter in particular).

### B) Please read the procedure for replacing the secondary board diodes carefully (fig. 4):

The 4 SECONDARY DIODES are attached to the same dissipator, and when a replacement is required, all of them should be replaced:

- undo the screws attaching the dissipator to the board, to replace diodes D20, D21, D22 and D23;
- remove the 4 secondary diodes unsoldering the rheofores and cleaning any solder from the bump contacts on the board;
- remove the dissipator from the board;
- remove the spring locking the 4 diodes;
- clean any irregularity or dirt from the dissipator. If the diodes have burst the dissipator may have been irreversibly damaged: in this case it should be replaced;
- apply thermo-conductive grease following the general instructions;
- insert the new diodes between the dissipator and the spring, taking care not to damage the component during assembly (the screw should be inserted under pressure on the dissipator so as to lock the component);
- place the dissipator with the new components in the PCB bump contacts and fasten them down with the screws (torque wrench setting for screws 1 Nm  $\pm$ 20%);
- solder the terminals taking care not to let the solder run along them;
- on the soldering side cut away the protruding part of the rheofores and check they are not shorted (between cathode and anode);

**N.B.** make sure resistor (R20) and capacitor (C20) on the snubber have been soldered to the PCB correctly (fig. 3).

### C) Please read the procedure for replacing the control board (fig. 3):

Whatever fault occurs in the control board, we strongly recommend its replacement without attempts at repair. To remove it, cut and then unsolder from the power board the connector keeping it fixed perpendicular to the PCB, replace it and re-solder the connector.

## TESTING THE MACHINE

Tests should be carried out on the assembled machine before closing it with the top cover. During tests with the machine in operation never commute the selectors or activate the ohmic load contactor.

**WARNING!** Before proceeding to test the machine, 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 given below are used to verify power source operation under load.

### 1.1 Preparation for testing.

A) Connect the power source to the static load generator using cables fitted with the appropriate dinse connectors (code 802110).

B) Set up the dual trace oscilloscope, connecting probe CH1 (x100) to the collector on Q1 and probe CH2 (x10) to pin 9 on strip J11 (plasma control board). The earth terminals are connected together to the emitter of Q1.

C) Set up the multimeter in DC mode and connect the prods to the OUT+ and OUT- bump contacts.

D) Connect the power supply cable to the 230Vac power supply.

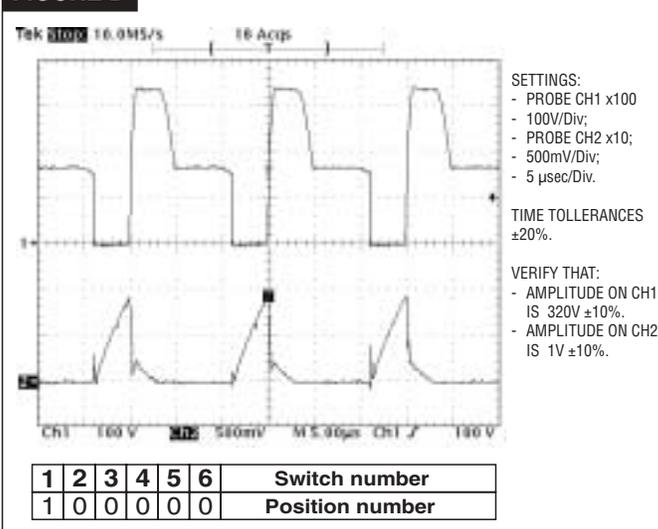
**WARNING!** During tests the operator must avoid contact with the metal parts of the torch because of the presence of dangerous, high voltage.

### 1.2 Tests for the TECNICA 150 - 170 - 168GE

#### A) Minimum load test:

- set up the static load generator with the switch settings as in the table in Fig. D;
- on the front panel position the current potentiometer R23 at (approx.) half way.
- switch on the main switch;
- activate the static load generator and make sure that:
  - the waveforms displayed on the oscilloscope resemble those in Fig. D;
  - the output current is  $+5\text{A}_{dc} \pm 20\%$ , and the output voltage is  $+20.2\text{V}_{dc} \pm 20\%$ .
- deactivate the static load generator and switch off the main switch.

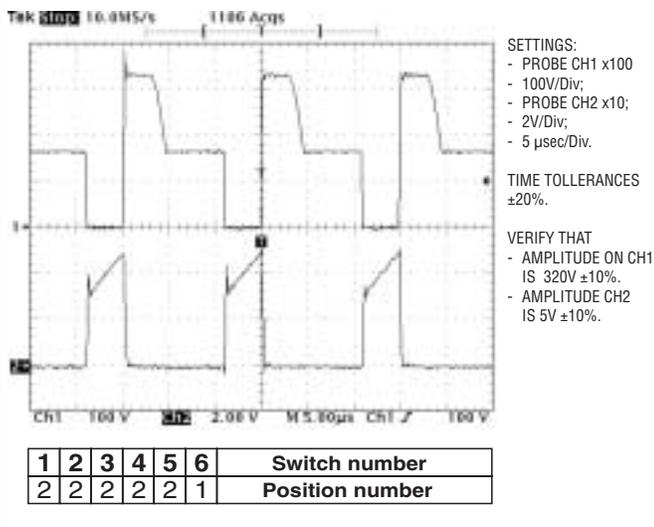
**FIGURE D**



#### B) Intermediate load test:

- set up the ohmic load with the switch settings as in the table in fig. E;
- on the front panel turn the current potentiometer to 75A (approx. half-way);
- start up the ohmic load and make sure that:
  - the waveforms displayed on the oscilloscope resemble those in Fig. E;
  - the output current is equal to  $+75\text{A}_{dc} \pm 10\%$  and the output voltage is equal to  $+24\text{V}_{dc} \pm 10\%$ .
- switch off the ohmic load.

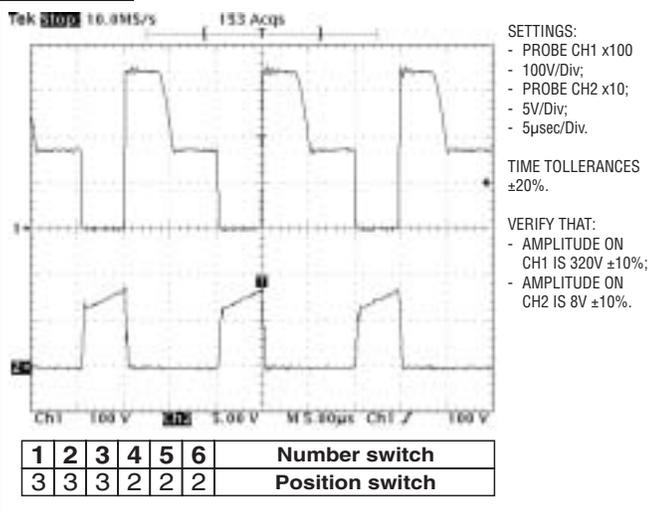
**FIGURE E**



**C) Rated load test for TECNICA 150-186GE:**

- set up the ohmic load with the switch settings as in the table in **fig. F**;
- on the front panel turn the current potentiometer to maximum (turn clockwise as far as it will go);
- start up the ohmic load and make sure that:
  - the waveforms displayed on the oscilloscope resemble those in **fig. F**;
  - the output current is equal to +130Adc  $\pm 5\%$  and the output voltage is equal to +25.2Vdc  $\pm 5\%$ ; if the output current reading is not 130A  $\pm 5\%$ , adjust the current using jumpers JP6, JP7 and JP8 (**fig. 7**).
- switch off the ohmic load.

**FIGURE F**

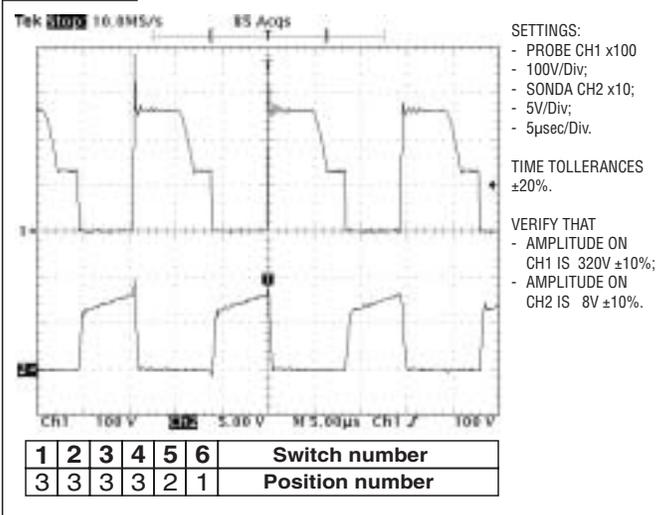


**D) Rated load test for TECNICA 170:**

- set up the ohmic load with the switch settings as in the table in **fig. G**;
- on the front panel turn the current potentiometer to maximum (turn clockwise as far as it will go);
- start up the ohmic load and make sure that:
  - the waveforms displayed on the oscilloscope resemble those in **fig. G**;
  - the output current is equal to +150Adc  $\pm 5\%$  and the output voltage is equal to +26Vdc  $\pm 5\%$ ;

- current reading is not 150A  $\pm 5\%$ , adjust the current using jumpers JP6, JP7 and JP8 (**fig. 7**).
- switch off the ohmic load.

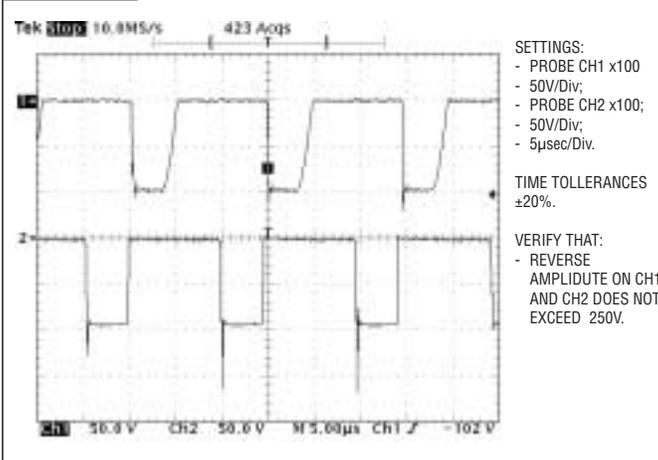
**FIGURE G**



**E) Checking the secondary diode voltages:**

- set up the dual trace oscilloscope, connecting probe CH1 x 100 to the anode of diode D21 and probe CH2x100 to the anode of diode D22. Earth connections are both made to the secondary dissipator;
- remove the multimeter from the OUT+ and OUT- bump contacts;
- set up the static load generator with the switch settings as in the table in **fig. F, G or I**;
- on the front panel position the current potentiometer to the maximum (turn the knob clockwise as far as it will go) and switch on the main switch;
- activate the static load generator and make sure that the waveforms displayed on the oscilloscope resemble those in **fig. H**;
- deactivate the static load generator and switch off the main switch.

**FIGURE H**



**F) Running time check and closing the machine**

With the load status as in **fig. F or G** and the current adjustment potentiometer on maximum, switch on the power source and leave it in operation until the thermostatic capsules trigger (machine in alarm status). Check the correct positioning of the internal wiring and finally re-assemble the machine.

## G) Welding test

With the power source set up according to the instructions in the handbook make a test weld at 80A (electrode diameter 2.5 mm). Check the dynamic behaviour of the power source.

### 1.3 Scheduled tests for the TECNICA 152

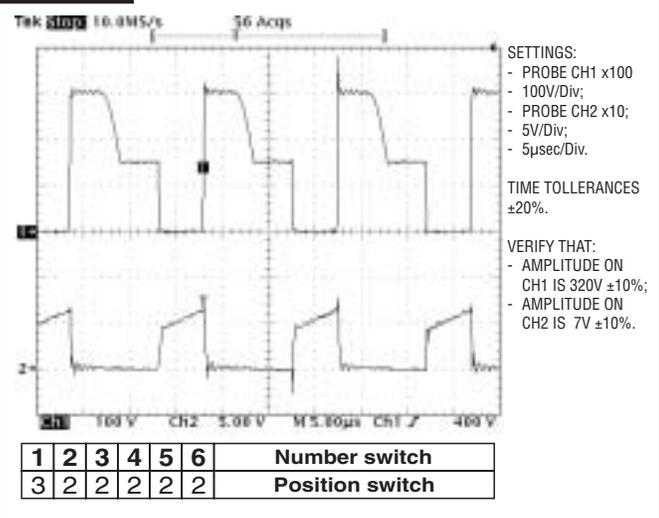
In this case it makes no difference whether the tests are carried out with a 115V or a 230V power supply:

- with a 230V power supply (LED D13 on and green) the tests are exactly the same as those described for the TECNICA 150-168GE.
- with a 115V power supply (LED D13 on and orange) the tests are exactly the same as those described for the TECNICA 150-168GE with the exception of the rated load test at point 1.2 C). To carry out the rated load test at 115V see point 1.3 A).

### A) Rated load test:

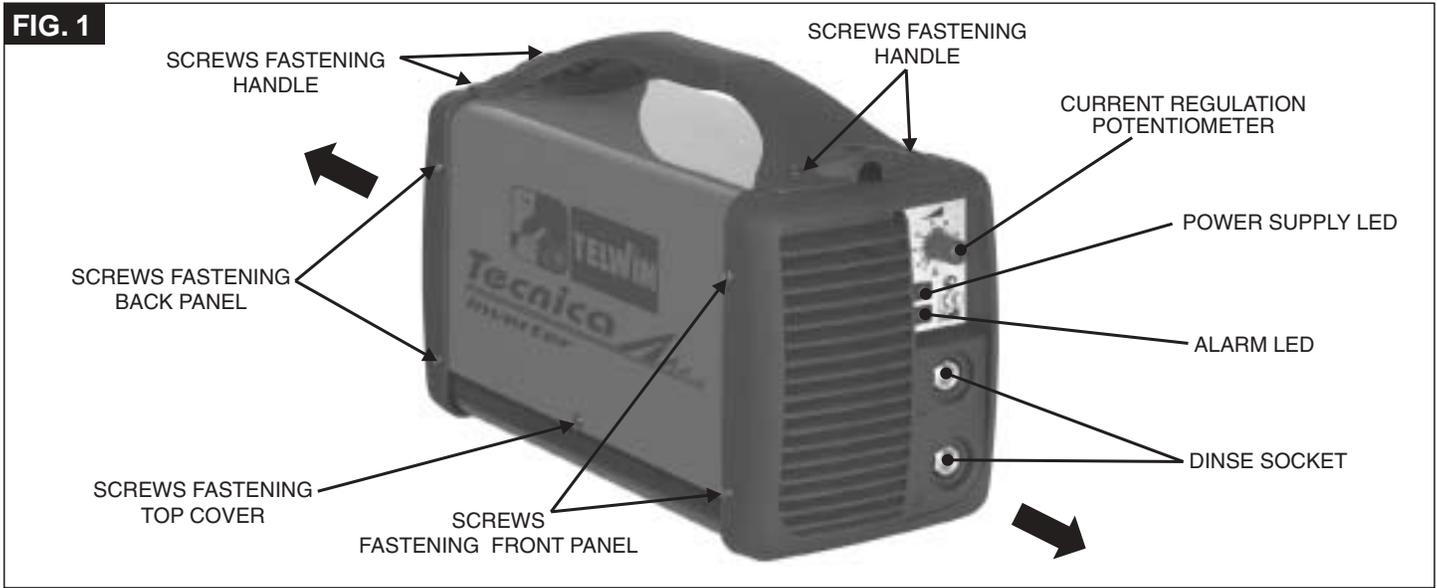
- set up the ohmic load with the switch settings as in the table in **fig. I**;
- on the front panel turn the current potentiometer to maximum (turn clockwise as far as it will go);
- switch on at the main switch;
- start up the ohmic load and make sure that:
- the waveforms displayed on the oscilloscope resemble those in **fig. I**;
- the output current is equal to  $+100\text{A} \pm 5\%$  and the output voltage is equal to  $24\text{Vdc} \pm 5\%$ ; if the output current reading is not  $100\text{A} \pm 5\%$ , adjust the current using jumpers JP6, JP7 and JP 8 (**fig. 5**).
- switch off the ohmic load and switch off the main switch.

**FIGURE I**

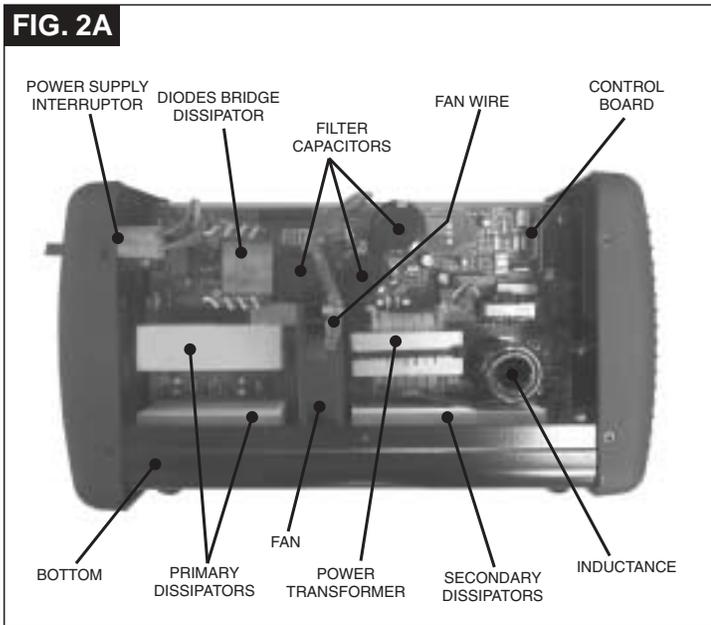


## ILLUSTRATIONS

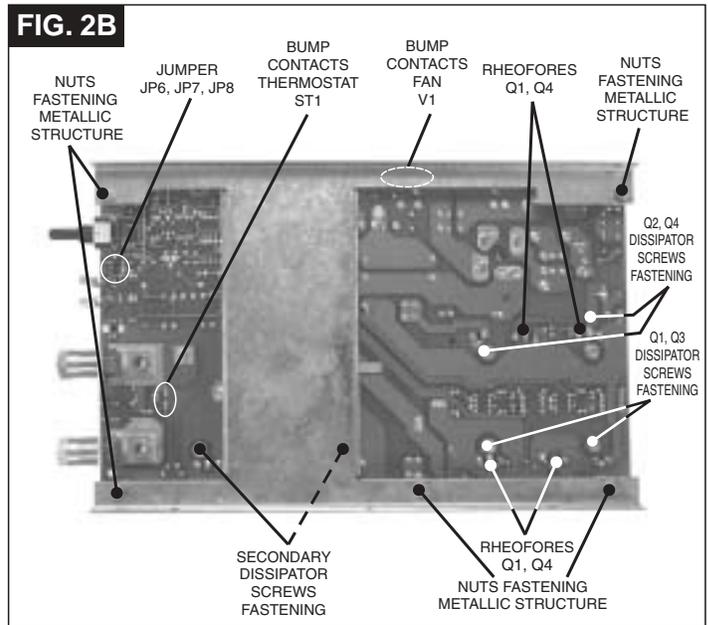
**FIG. 1**



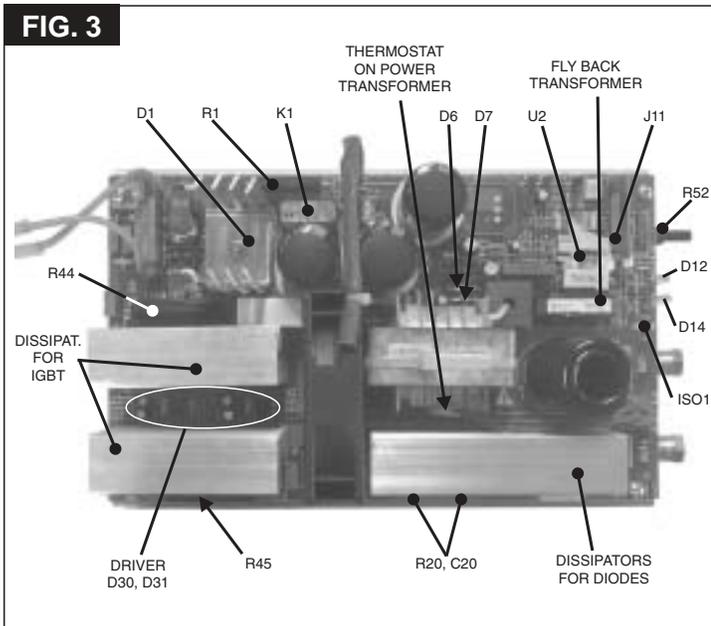
**FIG. 2A**



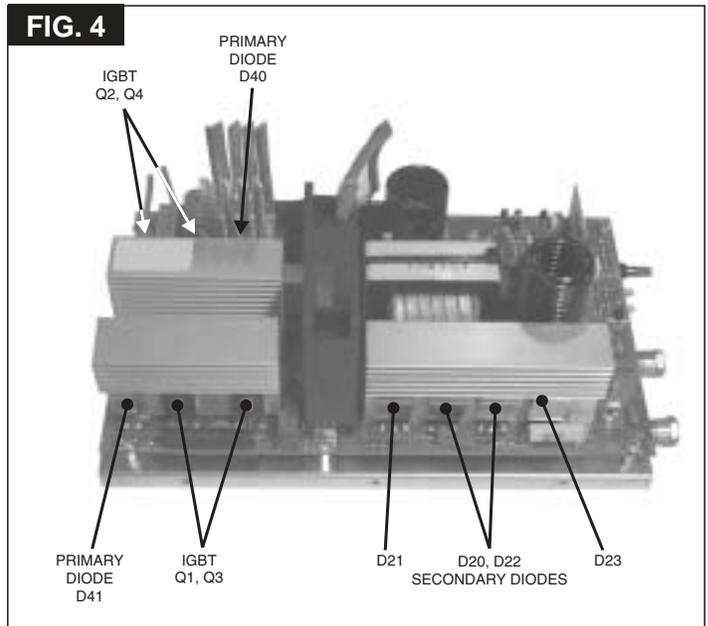
**FIG. 2B**



**FIG. 3**

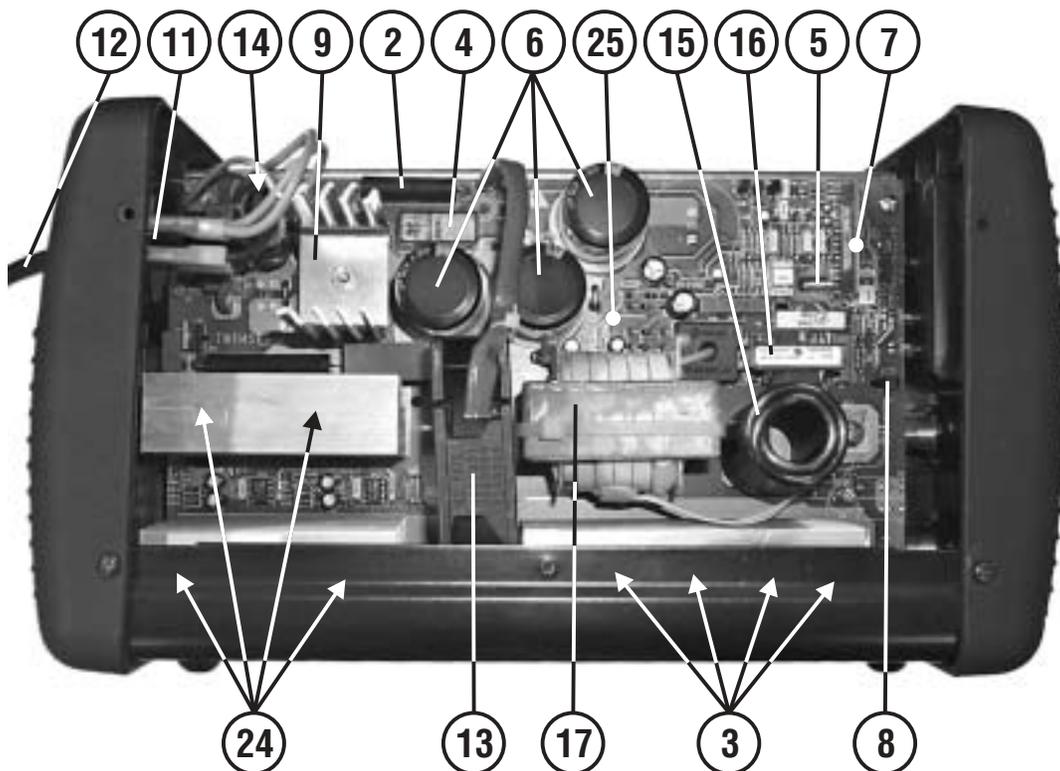


**FIG. 4**



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

Esploro 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;

| REF. | ELENCO PEZZI DI RICAMBIO<br>PIECES DETACHEES<br>SPARE PARTS LIST<br>ERSATZTEILLISTE<br>PIEZAS DE REPUESTO | REF. | ELENCO PEZZI DI RICAMBIO<br>PIECES DETACHEES<br>SPARE PARTS LIST<br>ERSATZTEILLISTE<br>PIEZAS DE REPUESTO                                 | REF. | ELENCO PEZZI DI RICAMBIO<br>PIECES DETACHEES<br>SPARE PARTS LIST<br>ERSATZTEILLISTE<br>PIEZAS DE REPUESTO                                     | REF. | ELENCO PEZZI DI RICAMBIO<br>PIECES DETACHEES<br>SPARE PARTS LIST<br>ERSATZTEILLISTE<br>PIEZAS DE REPUESTO |
|------|-----------------------------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------------------------------|
| 1    | Potenziometro<br>Potentiometre<br>Potentiometer<br>Potentiometergriff<br>Potenciometro                    | 10   | Manopola Potenziometro<br>Poignee Pour Potentiometre<br>Knob For Potentiometer<br>Potentiometergriff<br>Manija Por Resist.electr.variable | 19   | Retro<br>Partie Arriere<br>Back Panel<br>Rueckseite<br>Trasera                                                                                |      |                                                                                                           |
| 2    | Resistenza<br>Resistance<br>Resistor<br>Widerstand<br>Resistencia                                         | 11   | Interruttore<br>Interrupteur<br>Switch<br>Schalter<br>Interruptor                                                                         | 20   | Manico<br>Poignee<br>Handle<br>Handgriff<br>Manija                                                                                            |      |                                                                                                           |
| 3    | Diodo<br>Diode<br>Diode<br>Diode<br>Diodo                                                                 | 12   | Cavo Alim.<br>Cable Alim.<br>Mains Cable<br>Netzkabel<br>Cable Alim.                                                                      | 21   | Presse Dinse<br>Prise Dix<br>Dinse Socket<br>Einsteckdose<br>Enchufe Dinse                                                                    |      |                                                                                                           |
| 4    | Relè<br>Relais<br>Relais<br>Relais                                                                        | 13   | Ventilatore<br>Ventilateur<br>Fan<br>Ventilator<br>Ventilador                                                                             | 22   | Kit Mantello<br>Kit Capot<br>Cover Kit<br>Deckel Kit<br>Kit Panel De Cobertura                                                                |      |                                                                                                           |
| 5    | Pwm Controller<br>Pwm Controller<br>Pwm Controller<br>Pwm Controller                                      | 14   | Induttanza Filtro<br>Inductance Filter<br>Filter Inductance<br>Filter Drossel<br>Induccion Filtro                                         | 23   | Kit Fondo<br>Kit Chassis<br>Bottom Kit<br>Bodenteil Kit<br>Kit Fondo                                                                          |      |                                                                                                           |
| 6    | Condensatore<br>Condensateur<br>Capacitor<br>Kondensator<br>Condensador                                   | 15   | Induttanza<br>Inductance<br>Inductance<br>Drossel<br>Induccion                                                                            | 24   | Kit IGBT + Diodo<br>Kit IGBT + Diode<br>Kit IGBT + Diode<br>Kit IGBT + Diode<br>Kit IGBT + Diodo                                              |      |                                                                                                           |
| 7    | Scheda Controllo<br>Platine De Control<br>Control Pcb<br>Steuerungskarte<br>Tarjeta De Controllo          | 16   | Trasformatore<br>Transformateur<br>Transformer<br>Transformator<br>Transformador                                                          | 25   | Kit Scheda Completa<br>Kit Platine Complete<br>Complete Control Pcb Kit<br>Komplette Steuerungskarte Kit<br>Kit Tarjeta De Controllo Completa |      |                                                                                                           |
| 8    | Opto-accoppiatore<br>Opto-accoupler<br>Opto-coupler<br>Opto-koppler<br>Opto-acoplador                     | 17   | Trasformatore Potenza<br>Transformateur Puissance<br>Power Transformer<br>Leistungstransformator<br>Transformador De Potencia             |      |                                                                                                                                               |      |                                                                                                           |
| 9    | Raddrizzatore<br>Redresseur<br>Rectifier<br>Gleichrichter<br>Rectificador                                 | 18   | Frontale<br>Partie Frontal<br>Front Panel<br>Geraetefront<br>Frontal                                                                      |      |                                                                                                                                               |      |                                                                                                           |

## 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 sheet

**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: \_\_\_\_\_

**Mechanical stresses the machine has undergone to**

**Description:** \_\_\_\_\_

\_\_\_\_\_

**Dirty grade**

*Dirty inside the machine*

**Description:** \_\_\_\_\_

| Kind of failure            | Component ref. | <b>Substitution of primary power board:</b> yes <input type="checkbox"/> no <input type="checkbox"/><br><br><b>Troubles evinced during repair :</b><br>_____<br>_____<br>_____<br>_____<br>_____ |
|----------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rectifier bridge.....      |                |                                                                                                                                                                                                  |
| Electrolytic capacitors    |                |                                                                                                                                                                                                  |
| Relais.....                |                |                                                                                                                                                                                                  |
| In-rush limiter resistance |                |                                                                                                                                                                                                  |
| IGBT.....                  |                |                                                                                                                                                                                                  |
| Snubber.....               |                |                                                                                                                                                                                                  |
| Secondary diodes.....      |                |                                                                                                                                                                                                  |
| Potentiometer.....         |                |                                                                                                                                                                                                  |
| Others.....                |                |                                                                                                                                                                                                  |



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CERTIFIED QUALITY SYSTEM  
UNI EN ISO 9001:2000

