cod. 988647

TELWIN

TECHNOLOGY TIG 172
AC/DC - HF/LIFT

inverter

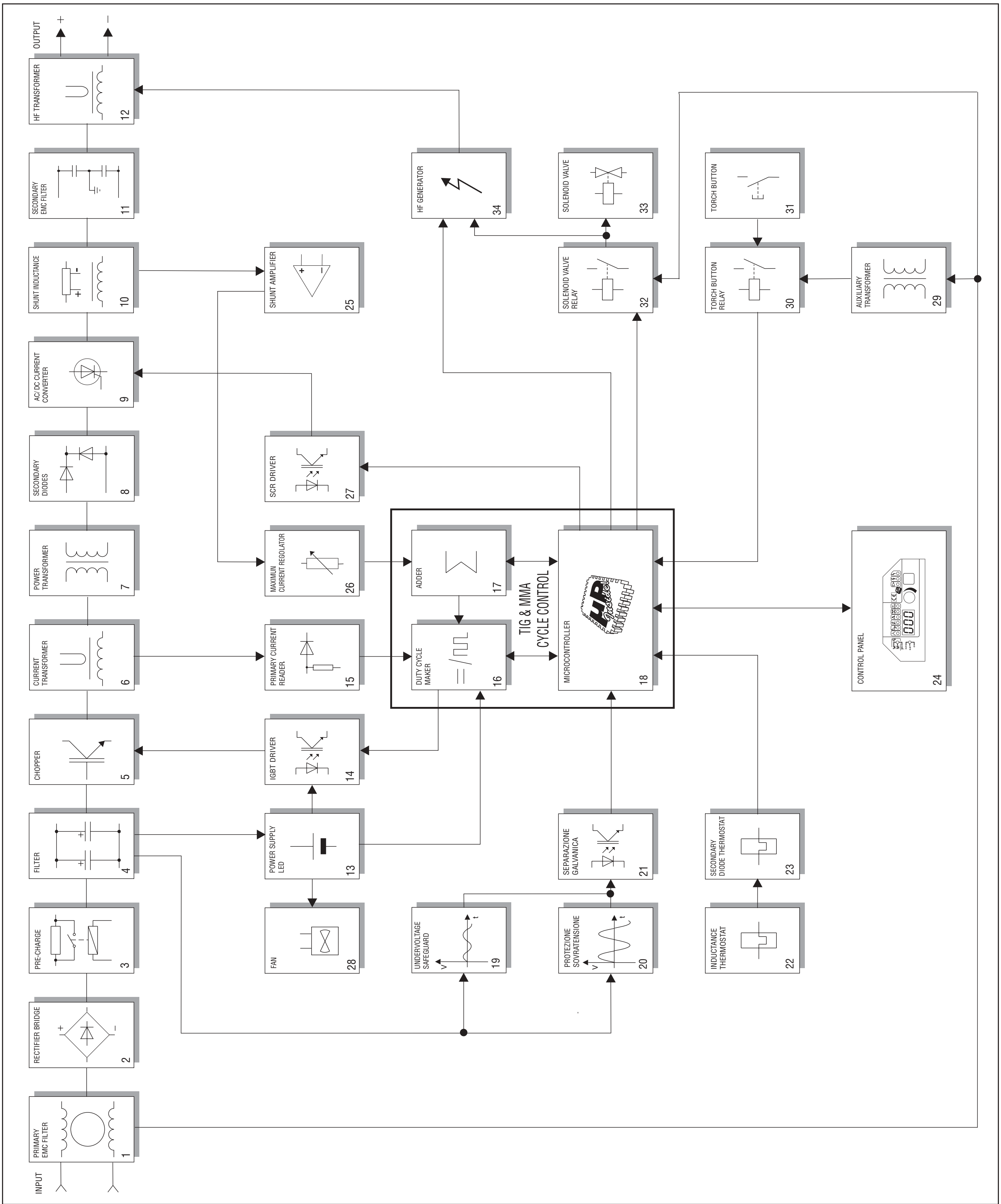
TROUBLESHOOTING AND REPAIR MANUAL

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 thewelding machine.

Block 1

EMC Filter
Consisting of: C3, C8, C9, L1(primary board).
Prevents noise from the machine from being transmitted along the main power line and vice versa.

Block 2

Rectifier bridge
Consisting of: D3, D5 (primary board).
Converts the mains alternating voltage into continuous pulsed voltage.

Block 3

Pre-charge
Consisting of: K1, K2, R1 (primary board).
Prevents the formation of high transient currents that could damage the main switch, the rectifier bridge and the electrolytic capacitors.
When the power source is switched on relays K1 and K2 are de-energised, capacitors C2, C4, C5, C6, C7 are therefore charged via R1. When the capacitors are charged the relays will be energised.

Block 4

Filter
Consisting of: C2, C4, C5, C6, C7 (primary board).
Converts the pulsed voltage from the rectifier bridge into continuous voltage.

Block 5

Chopper
Consisting of: Q1, Q2 (primary board).
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: T1 (primary board).
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: D1, D2, D3, D4, D5, D6, D7, D8, D9, D10 (secondary board)
<u>Positive polarity diodes in the circuit:</u>
D1, D2 convert the current circulating in the positive OUT of the power transformer to a single direction, preventing saturation of the nucleus.
D3, D4, D5 recirculate the inductance output current (block 9) during the time when the IGBT's are not conducting, bypassing the power transformer (block 7).
<u>Negative polarity diodes in the circuit:</u>
D9, D10 convert the current circulating in the negative OUT of the power transformer to a single direction, preventing saturation of the nucleus.
D6, D7, D8 recirculate the inductance output current (block 9) during the time when the IGBT's are not conducting, bypassing the power transformer (block 7).
<u>DC Operation:</u> The positive polarity diodes in the circuit are involved.
<u>AC Operation</u> The positive and negative polarity diodes in the circuit are involved alternately.

Block 9

AC/DC current converter
Consisting of: SCR (secondary board)
The SCR module is piloted by block 18 (microcontroller) and block 27 (SCR driver), transforming the secondary output current from DC to AC when TIG AC welding is required.

Block 10

Inductance and Shunt
Consisting of: L1, R2, (secondary board)
The inductance levels the output current from the secondary board diodes making it practically direct. The shunt detects the current circulating in the secondary and sends a voltage signal to block 25 (shunt amplifier), which will process it.

Block 11

Secondary EMC Filter
Consisting of: CY1.
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 34 (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: T2, U2 (primary board).
Uses switching methods to transform and stabilise the voltage obtained from block 4 (filter) and supplies auxiliary voltage to power block 14 (driver) and the control board correctly.

Block 14

IGBT Driver
Consisting of: ISO1, ISO2 (primary board)..
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: D16, R81, R82, R83, R84, R85 (control board).
Detects and limits the signal from block 6 (current transformer) and, via trimmer R85, adjusts the maximum allowable primary current. The signal is also redimensioned so that it can be processed and compared in block 16 (duty cycle maker).

Block 16

Duty cycle maker
Consisting of: U14 (control board).
Processes the information arriving from block 17 (adder) and block 15 (primary current reader and limiter), producing a square wave with variable duty cycle, limiting in any case the primary current to a maximum preset value.

Block 17

Adder

Consisting of: U13A, U13B (control board).
Collects the information from block 26 (maximum current regulator) and block 18 (microcontroller), producing a voltage signal that is suitable for processing by block 16 (duty cycle maker).

Block 18

Microcontroller

Consisting of: U4 (control board)
Control logic, which manages typical timing for the TIG and MMA cycles. Also drastically limits power source output current when it detects an alarm event. In the event of an alarm it acts directly on block 16 (duty cycle maker) and directly changes the reference signal obtained from block 23 (control panel).

Block 19

Undervoltage safeguard

Consisting of: U3A, R62, U68 (primary board).
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 20

Overvoltage safeguard

Consisting of: U3B, R61, U67 (primary board).
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 21

Galvanic separation

Consisting of: ISO3 (primary board).
The signal arriving from blocks 19 and 20 (over- and under-voltage safeguard) is separated galvanically and sent to block 18 (microcontroller) for detection of a possible alarm event.

Block 22

Inductance thermostat

Consisting of: ST2.
When the temperature of the inductance is too high the thermostat cuts in, sending an alarm signal to block 18 (microcontroller). It is reset automatically when this alarm condition is no longer present.

Block 23

Secondary diode thermostat

Consisting of: ST1 (secondary board).
When the temperature of the secondary diode dissipator is too high the thermostat cuts in, sending an alarm signal to block 18 (microcontroller). It is reset automatically when this alarm condition is no longer present.

Block 24

Control panel

Consisting of: Control panel board
Panel for setting and displaying the parameters and operating modes of the power source, all controlled by block 18 (microcontroller).

Block 25

Shunt Amplifier

Consisting of: U12 (control board).
Amplifies the signal arriving from block 10 (shunt inductance), and makes it appropriate for block 26 (maximum current regulator).

Block 26

Maximum current regulator

Consisting of: R105 (control board).
Processes the information arriving from block 25 (shunt amplifier) and, via trimmer R105, allows calibration of the maximum welding current that can be supplied by the power source. The signal is re-dimensioned so that it can be processed and compared with block 17 (adder).

Block 27

SCR Driver

Consisting of: ISO1,ISO5, Q1, Q2 and ISO2, ISO6, Q3, Q4 (secondary board)
Receives the signals arriving from block 18 (microcontroller) and makes them appropriate for piloting block 9 (AC/DC current converter).

Block 28

Fan

Consisting of: V1.
Powered directly by block 13 (flyback transformer) and cools the power components.

Block 29

Auxiliary transformer

Consisting of: T1, D2 (torch button board).
Its purpose is to supply a redimensioned, rectified voltage to power block 30 (torch button relay).

Block 30

HF safeguard

Consisting of: K1, R1 (torch button board).
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 31

Torch button

Consisting of: TIG Torch
When the torch button is operated, a separate signal is sent to block 18 (microcontroller), to achieve arc strike and enable the solenoid valve.

Block 32

Solenoid valve relay and HF

Consisting of: K2 (secondary board).
When the torch button is pressed, block 18 (microcontroller) activates relay K2 which supplies the mains voltage needed to power block 33 (solenoid valve) and block 34 (HF generator).

Block 33

Solenoid valve

Consisting of: Y1
Supplies an appropriate amount of the desired gas mixture to strike the arc in the torch and the quantity needed to operate and cool the torch itself.

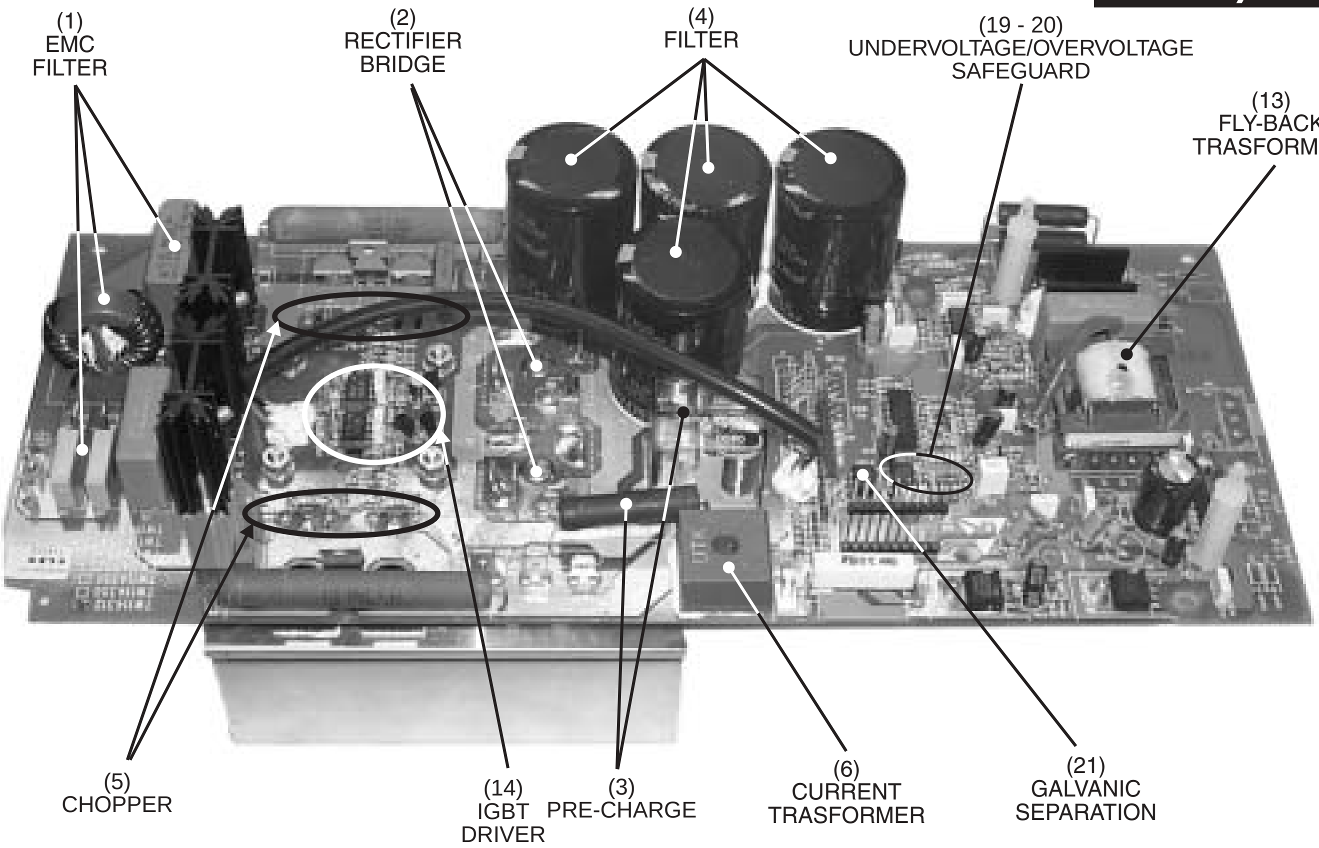
Block 35

HF generator

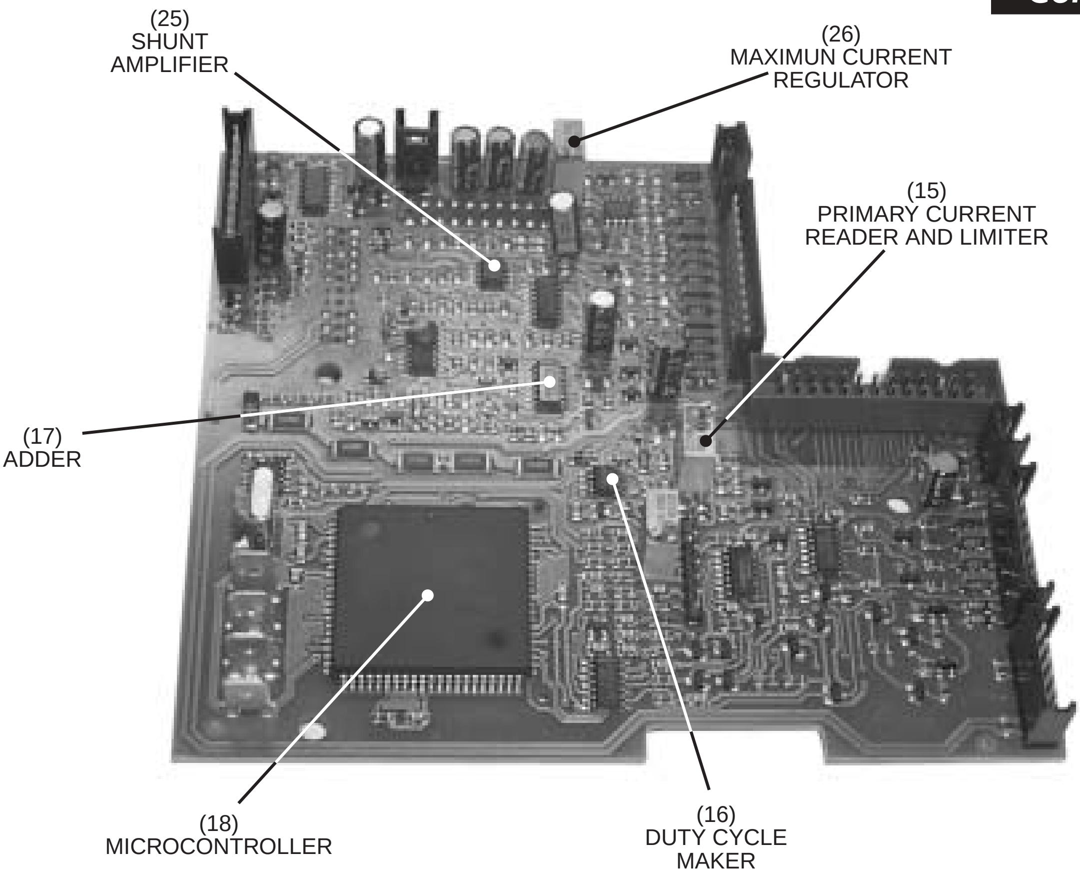
Consisting of: HF generator board
Using the signal sent by block 32 (s*olenoid valve relay*), the generator produces a high frequency signal that is sufficient for powering block 12 (HF transformer).

ILLUSTRATIONS

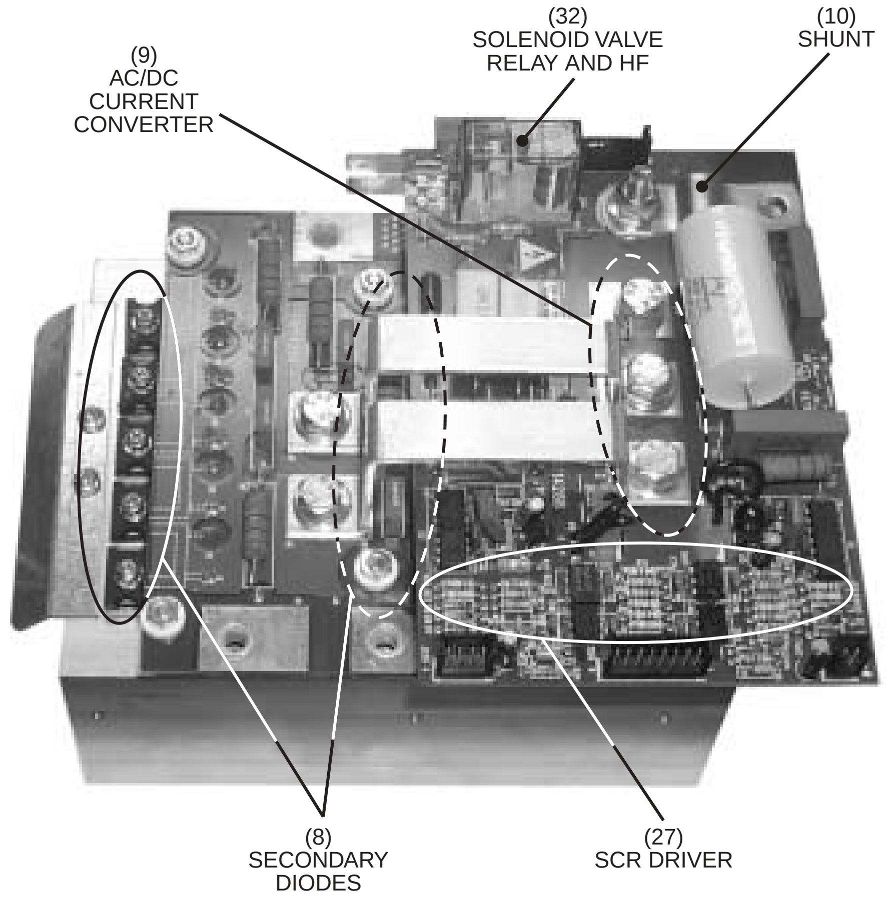
Primary board



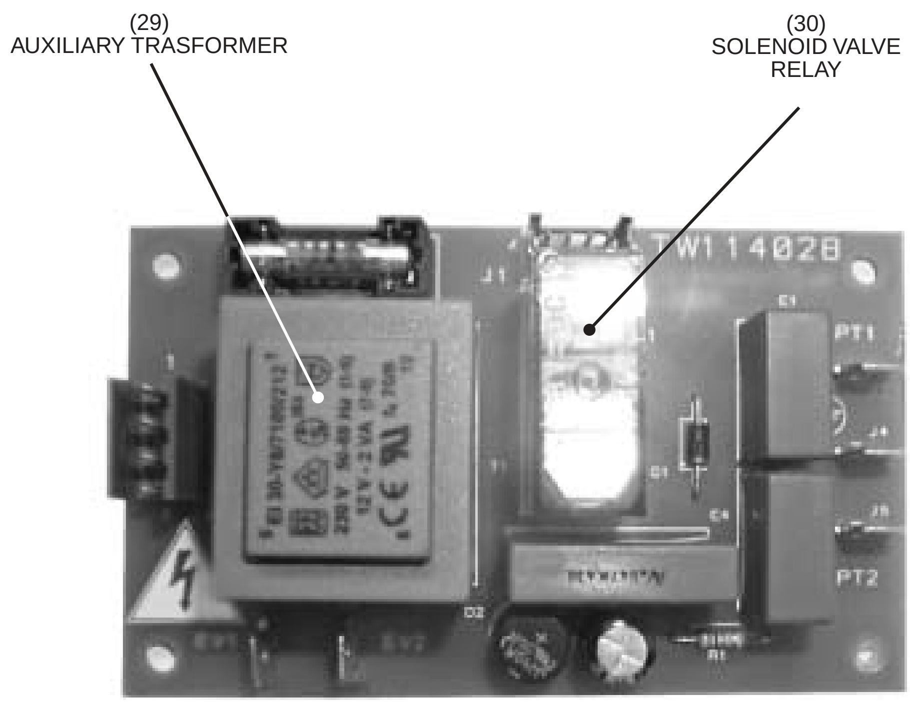
Control board



Secondary board

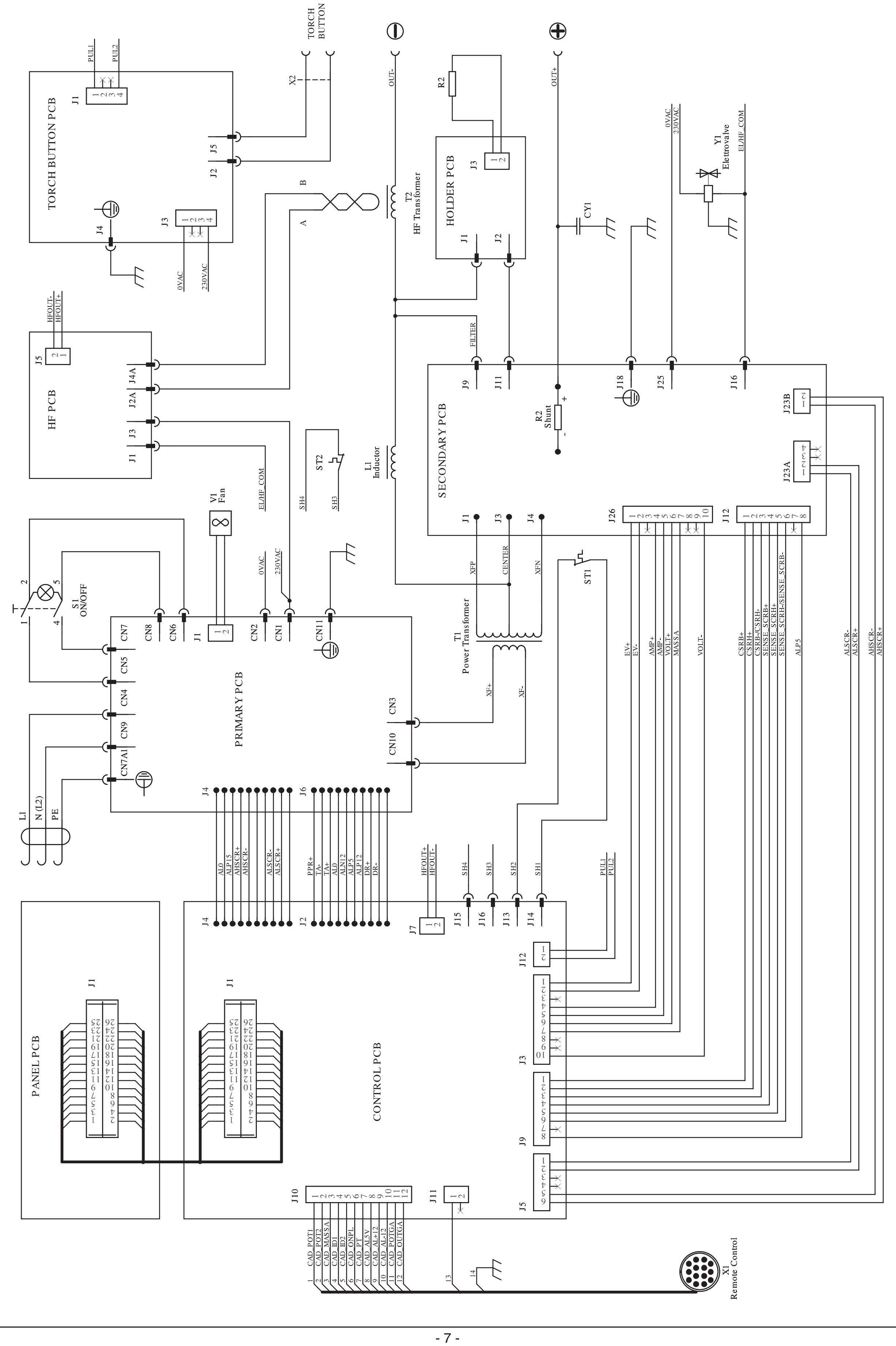


Torch button board

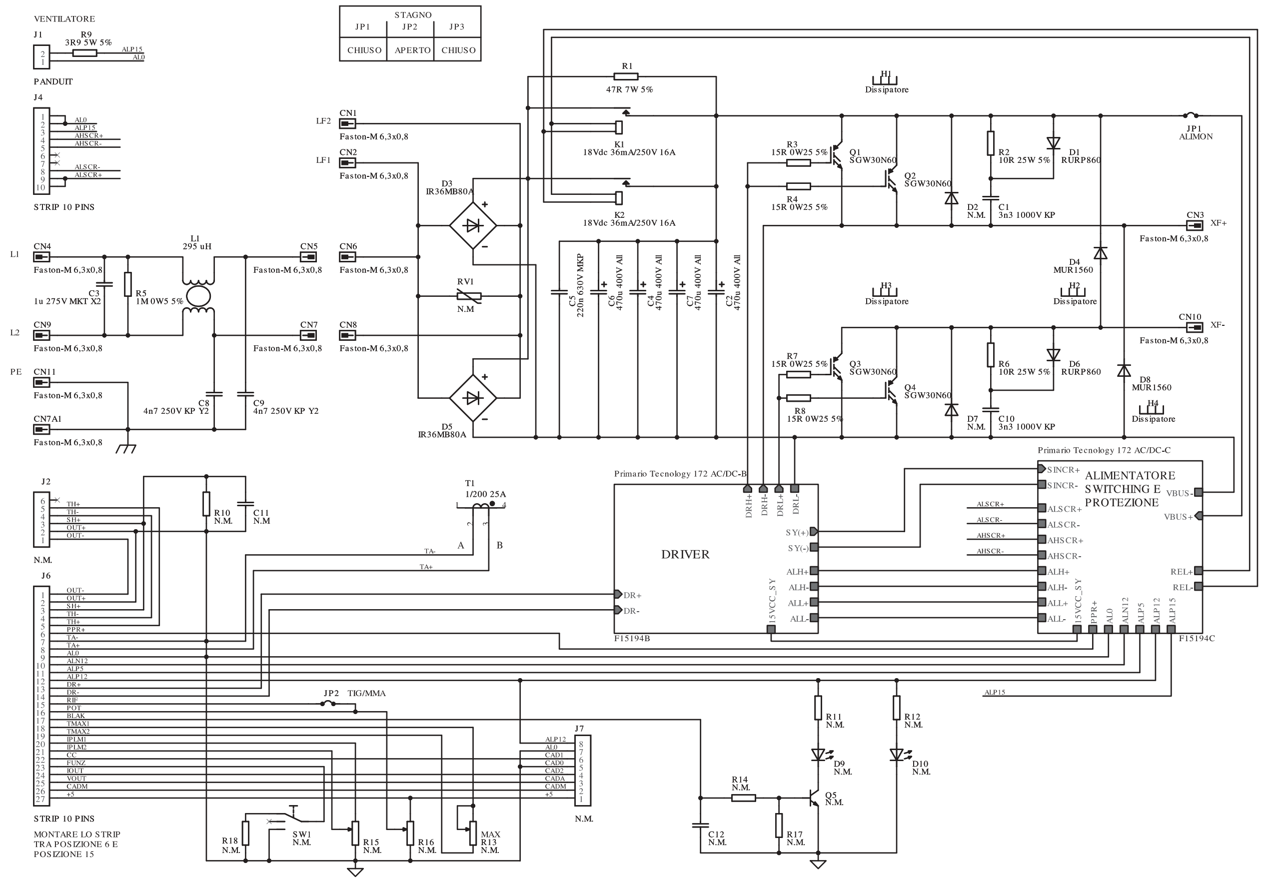


WIRING DIAGRAMS

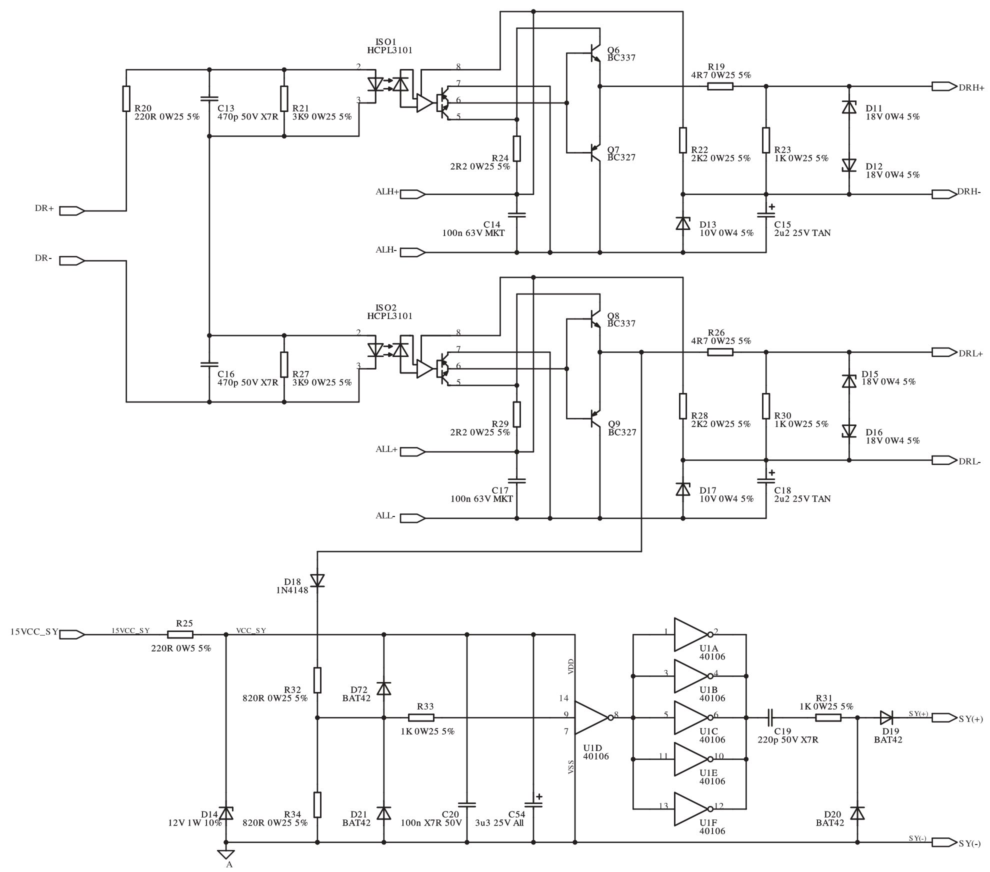
General wiring diagram



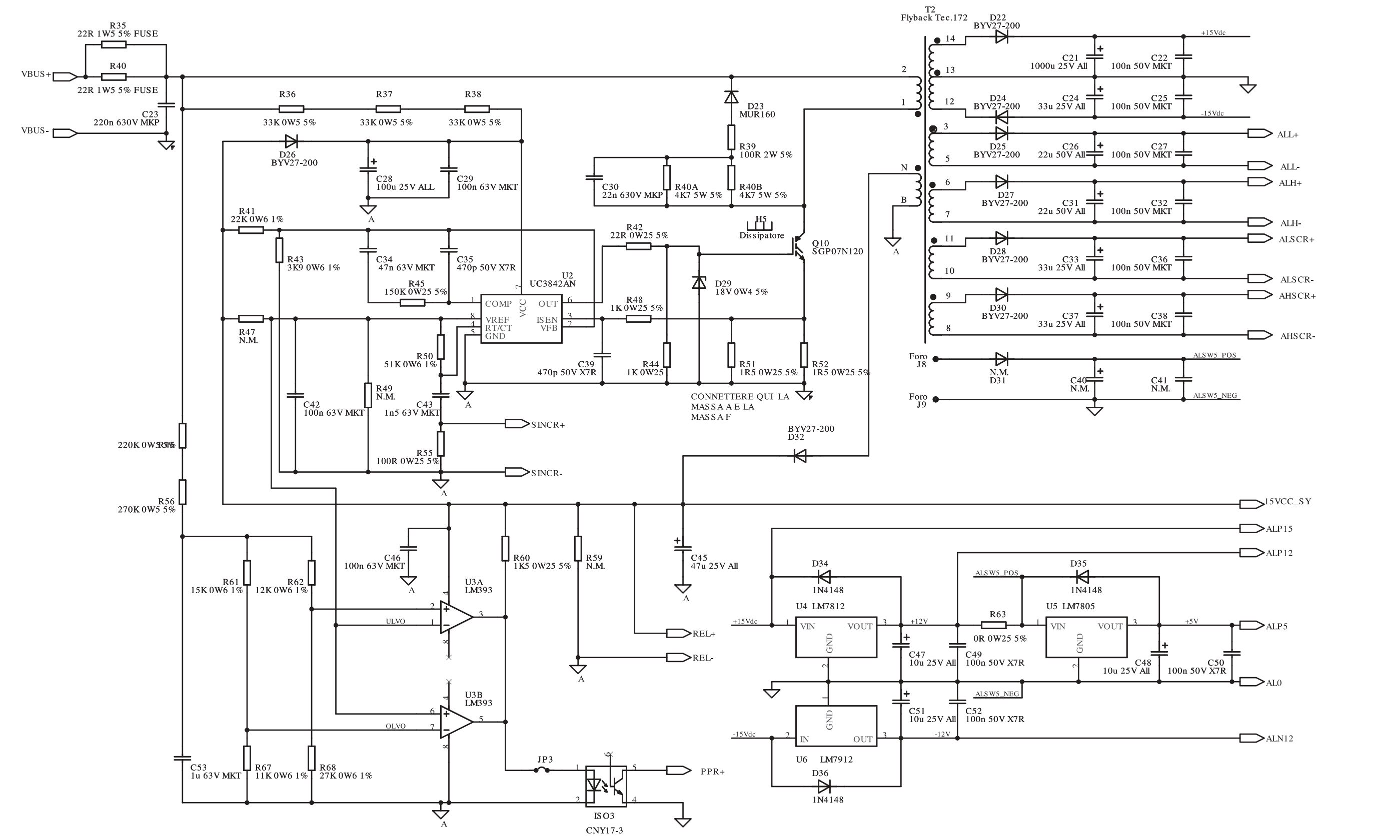
Wiring diagram primary board - Power



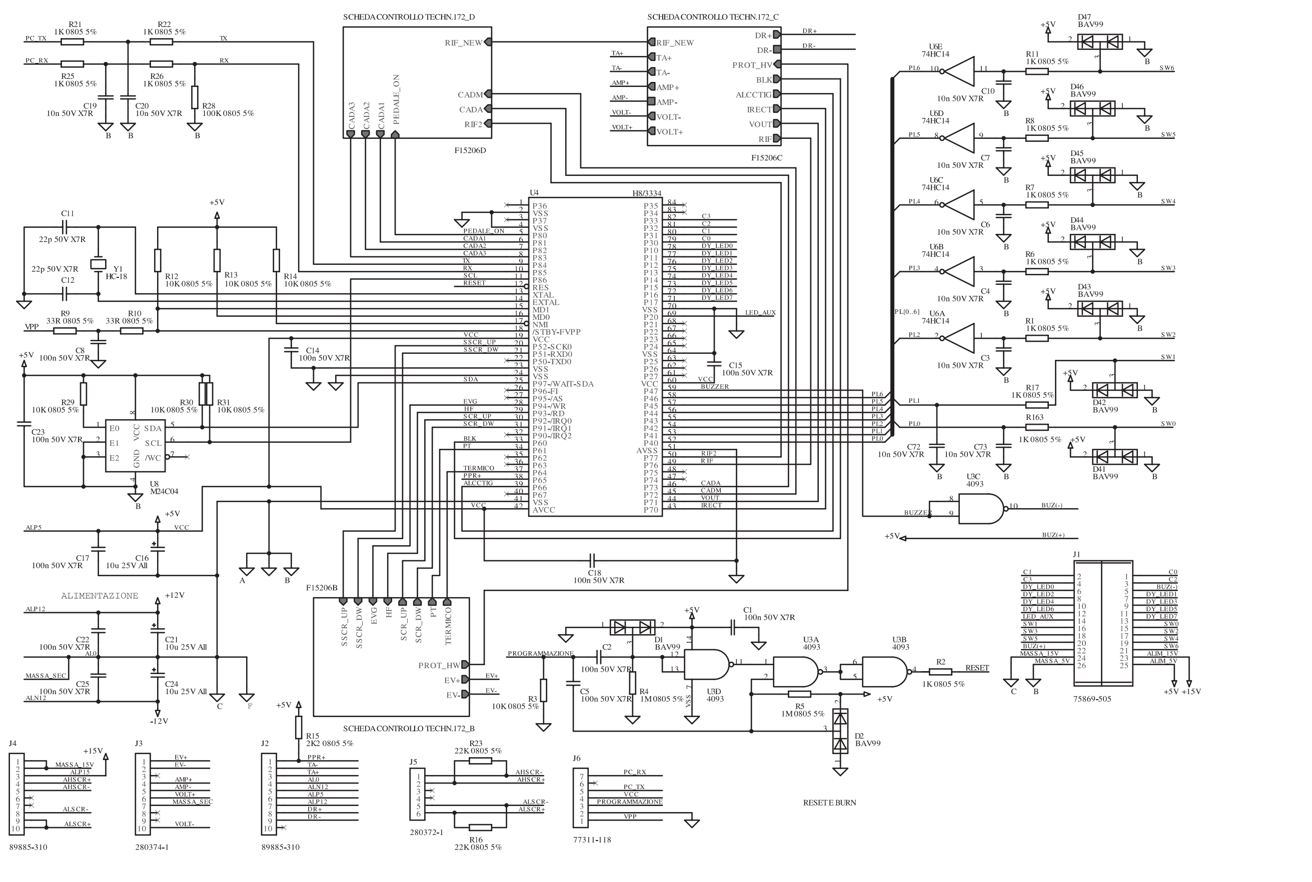
Wiring diagram primary board - Driver



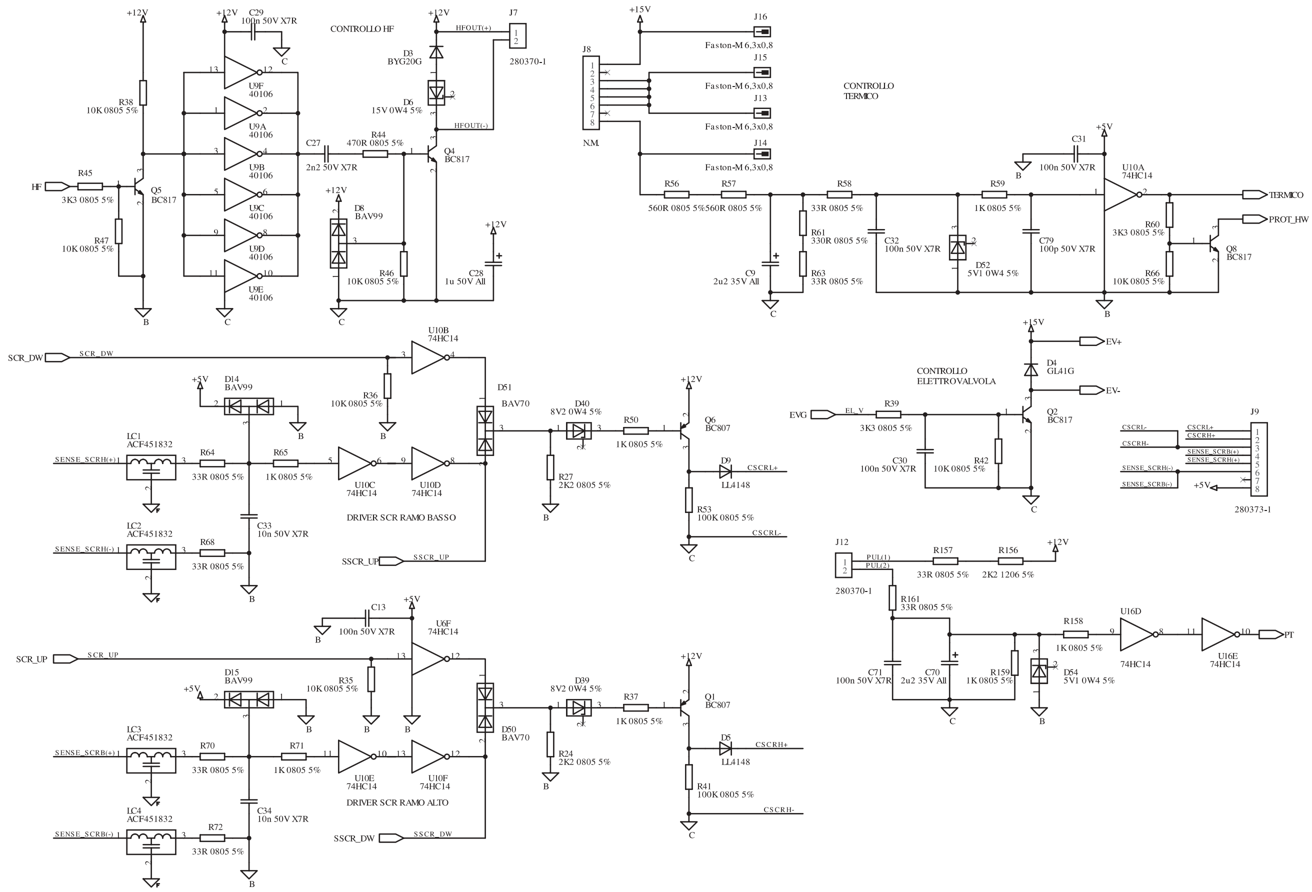
Wiring diagram primary board - power supply



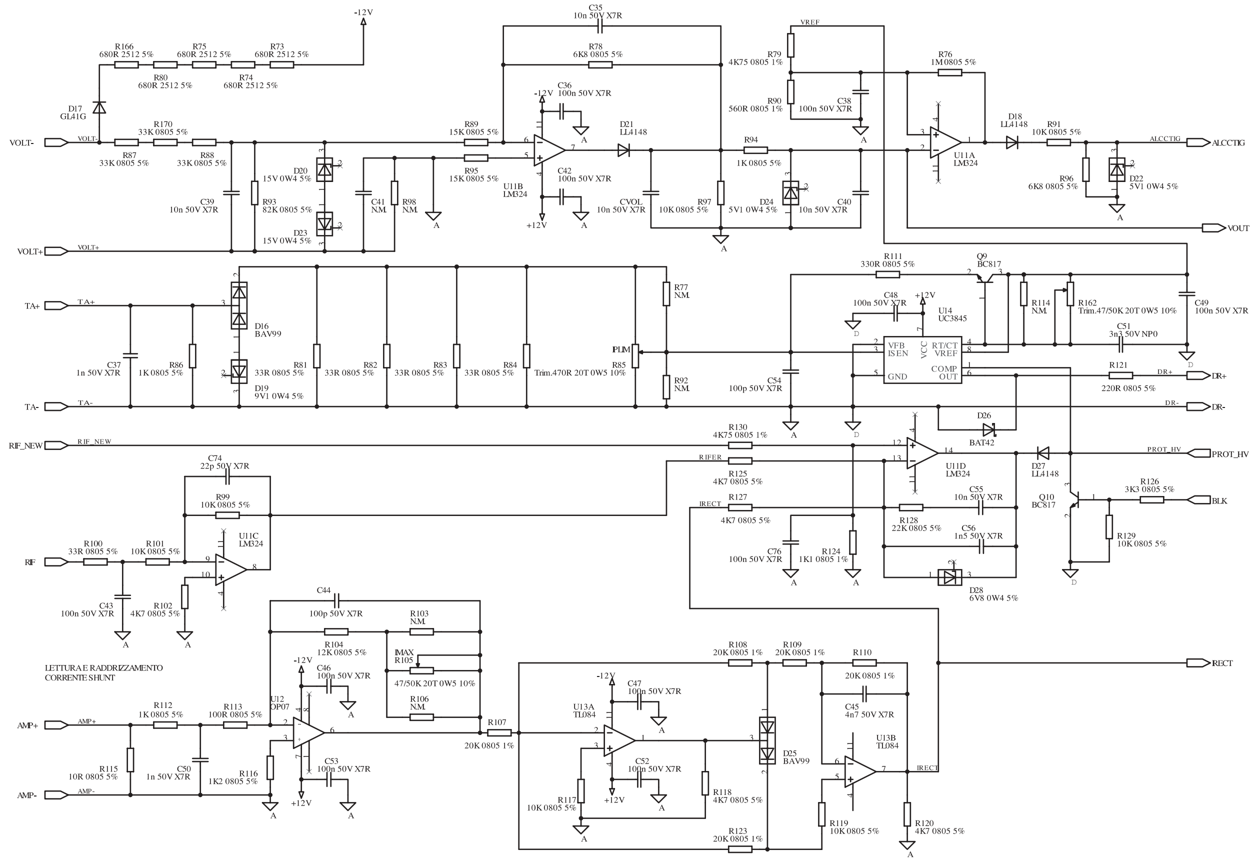
Wiring diagram control board - Micro



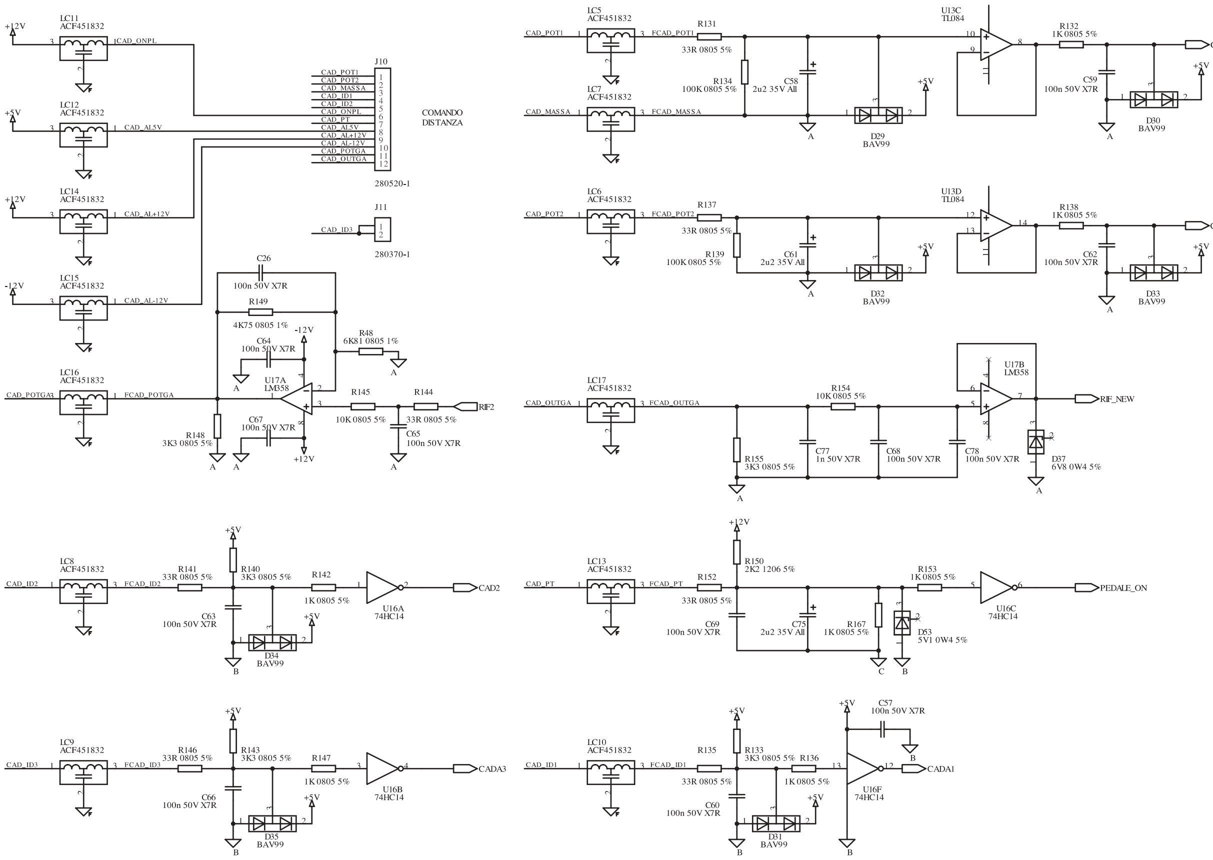
Wiring diagram control board - Digital



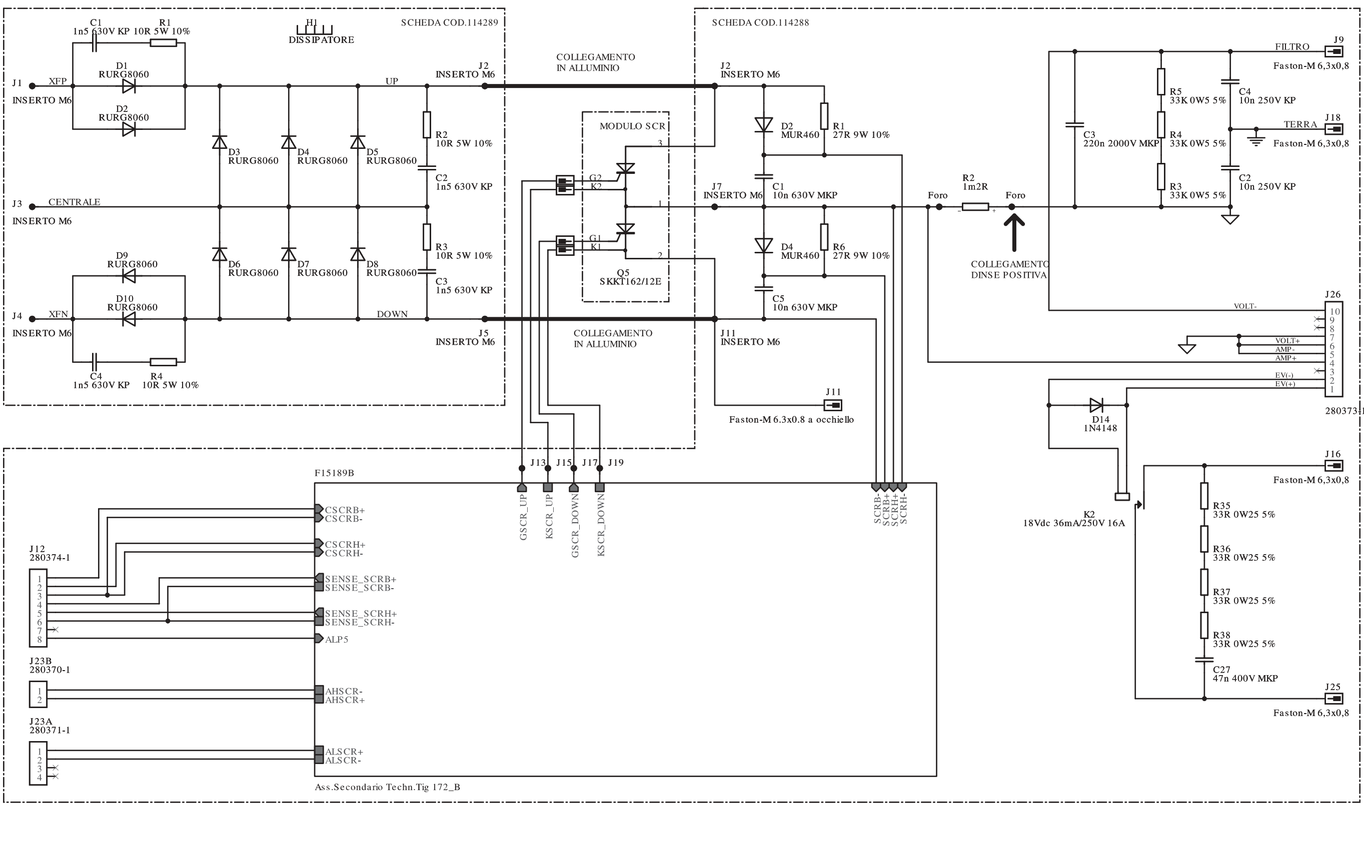
Wiring diagram control board - Analogyc



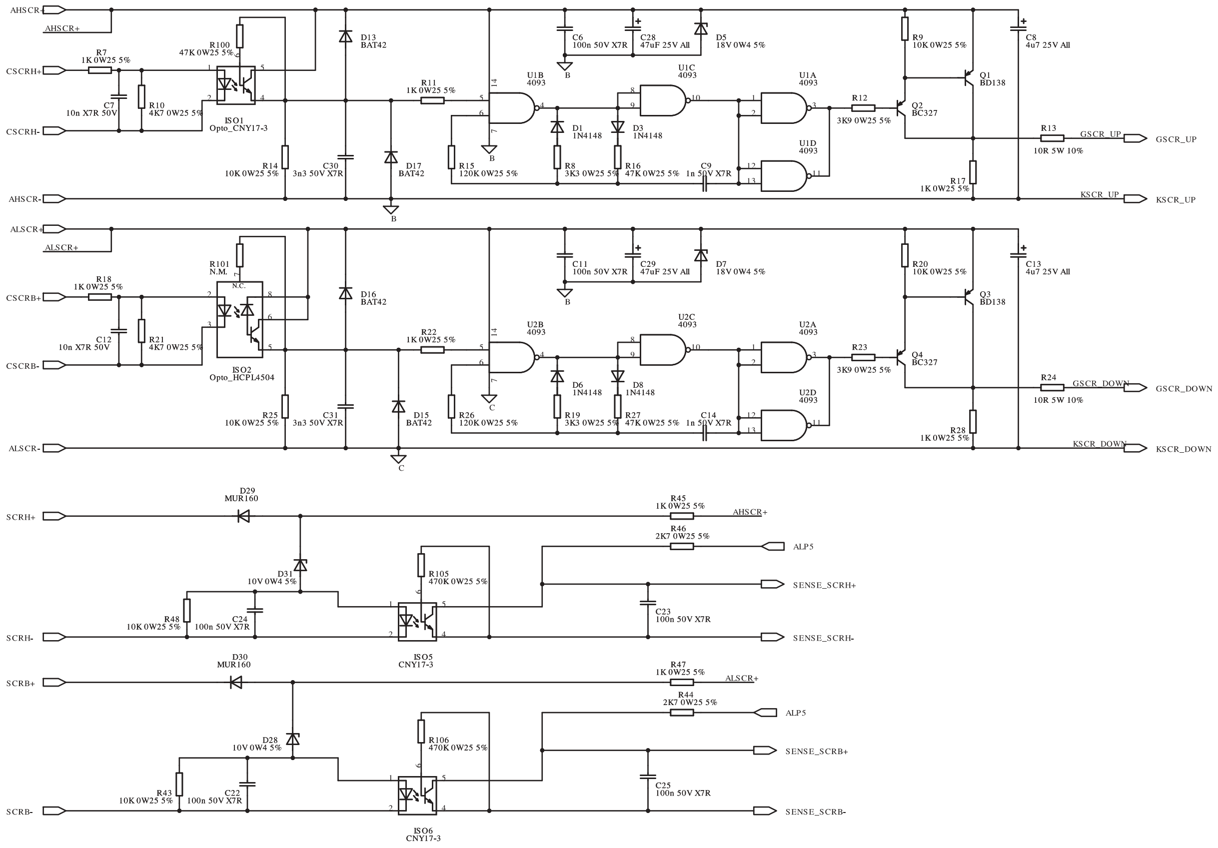
Wiring diagram control board - In / Out



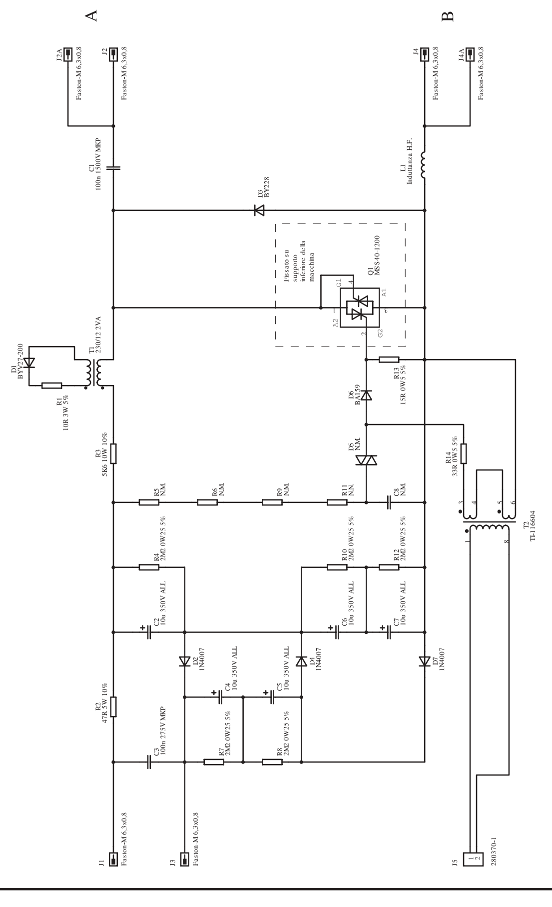
Wiring diagram secondary board - Power



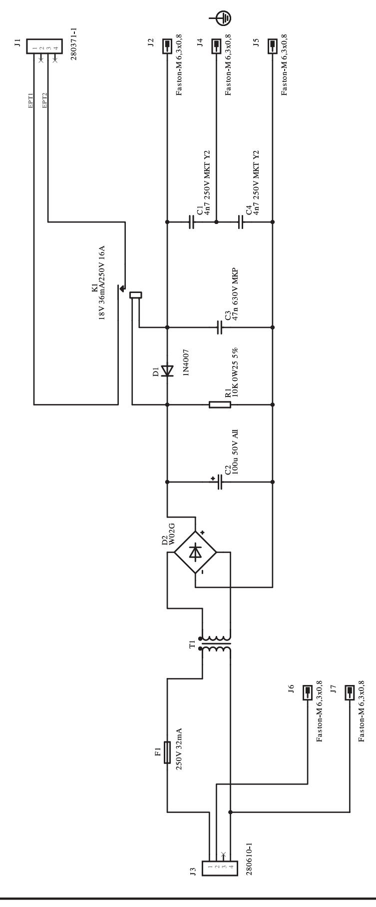
Wiring diagram secondary board - Driver



Wiring diagram HF board

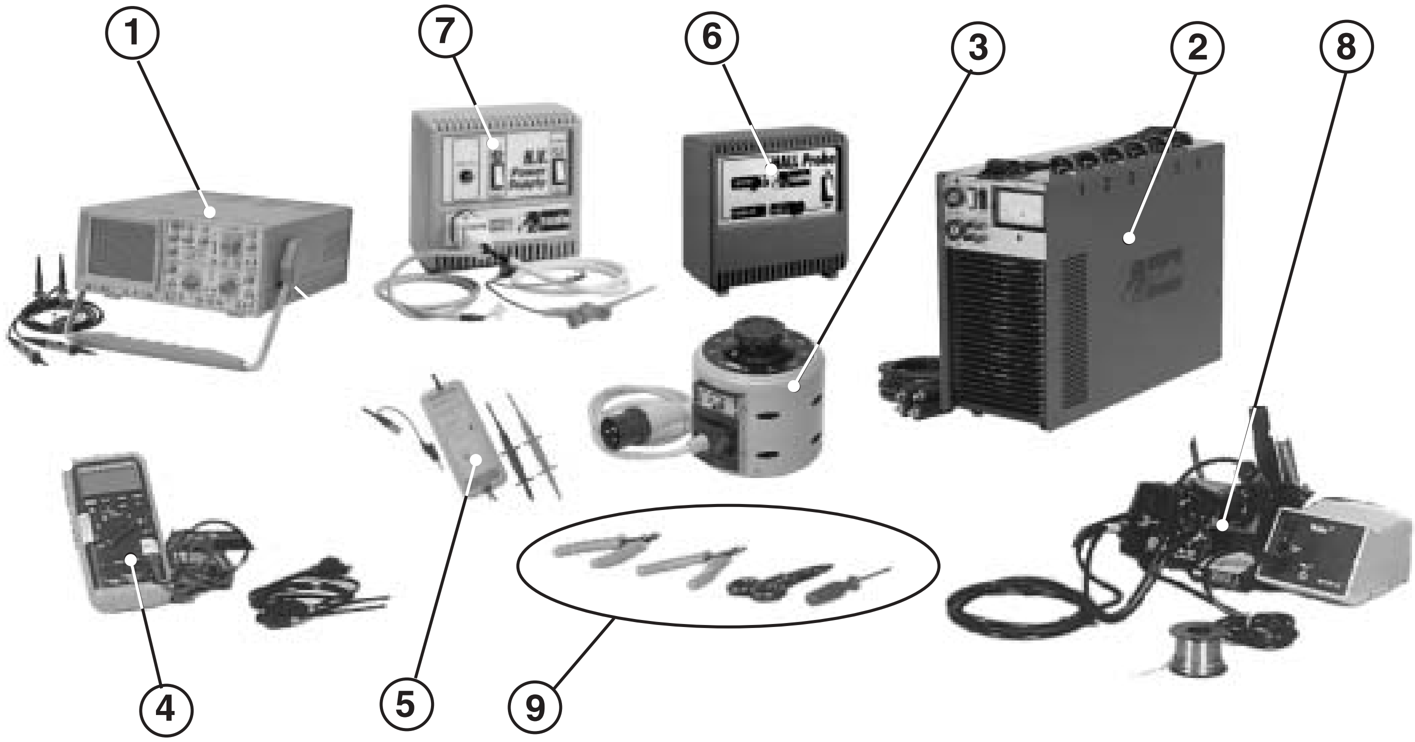


Wiring diagram PT board



REPAIR GUIDE

EQUIPMENT REQUIRED



ESSENTIAL INSTRUMENTS

1 Dual trace oscilloscope	*cod. 802401 (*)*
2 Static load generator	*cod. 802110 (*)*
3 Variac 0 - 300v 1500 VA	*cod. 802402 (*)*
4 Digital multimeter	
5 Differential probe 1/200	
6 Hall Probe	*cod. 802406 (*)*
7 HV Power supply	*cod. 802403 (*)*

USEFUL INSTRUMENTS

6 Unsoldering station
7 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.

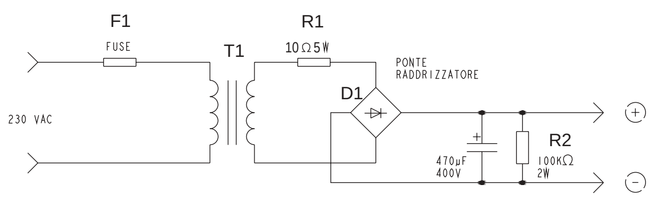
HV POWER SUPPLY MODULE

THE HV POWER SUPPLY is used to ensure operation of the switching power supply (the circuit on the primary board supplying auxiliary voltages), even when the machine is operating at low voltage.
It is easy to build using the electrical diagrams in fig. A for reference and using the following components or, alternatively, it can be ordered from Telwin.

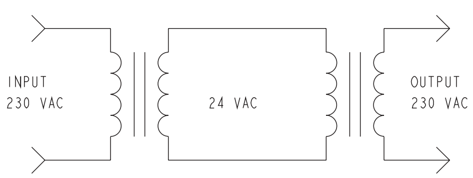
T1 = insulation transformer 230-230V 50VA(*)
D1 = rectifier bridge 36MB 80 (cod. 112357)
C1 = electrolytic capacitor 470uF 400V ALL (cod.112514)
R1 = resistor 10 ohm 5W 5%
R2 = resistor 100K ohm 2W 5%
F1 = delayed action fuse 1.5 A Fuse holder 5X20mm
Female red and black faston
Plastic box.

Figure A

ELECTRICAL DIAGRAM FOR POWER SUPPLY (HV OUTPUT):



THE INSULATION TRANSFORMER CAN BE REPLACED WITH TWO TRANSFORMERS OF THE SAME POWER, CONNECTING THE SECONDARIES ACCORDING TO THE FOLLOWING DIAGRAM:



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

WARNING! Every operation should be carried out in complete safety with the power supply cable disconnected from the mains outlet:
- Undo the 8 screws fastening the 2 plastic covers (4 each) to the front and back **(figure 1A)**.
- Undo the 8 screws fastening the top cover to the structure **(figure 1B)**.
- Slide out the top cover by pulling gently outwards **(figure 1B)**.
- Undo the 4 screws fastening the bottom to the structure **(figure 1B)**.
- Separate the top metallic structure from the base and put it on the work bench(figure 3).

NOTE: Because the base is an integral part of support structure it
should be removed if it is necessary to gain access to internal boards.
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.

Primary board (fig. 5:)
- rheofores of IGBT's Q1, Q2, Q3, Q4;
- rheofores of recirculating diodes D4, D8;
- rheofores of snubber network diodes D1, D6;
- rheofores of opto-couplers ISO1 and ISO2;
- rheofores of connectors J4 and J6;

Secondary board (fig. 6):
- rheofores of secondary power diodes D1…D10;
- bump contacts on top of and under the printed circuit of the SCR Q5 module;
- thermostat ST1 on secondary diode dissipator;
- rheofores of opto-couplers ISO1, ISO2, ISO3, ISO4;

Power transformer and inductance assembly (fig. 2A)
Do this if it is necessary to remove the primary board, otherwise it is possible to clean the part superficially from the side of the secondary board.

Parts fastened to the base (fig. 4)
If the primary and secondary boards are removed (with the diaphragm), carefully clean all the parts fastened to the base, or clean the base partially from the sides of the machine.

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).

Relays K1, K2 primary board (fig. 5)
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 C2,C4,C6,C7 primary board (fig. 5)
Probable cause:
- 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 primary board(fig. 5)
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 D1, D4, D6, D8 primary board(fig. 5)
Probable cause:
- excessive overheating related to faulty operation.

Mode selector switches SW2 and SW3 panel board (fig. 2A)
Probable cause:
- mechanical shock.

Secondary diodes D1...D10 secondary board (fig. 2A)
Probable cause:
- discontinuation in snubber network;
- poorly functioning thermal contact between IGBT and dissipator (e.g. loosened attachment screws: check);
- faulty output connection.

Relay K2 secondary board (fig. 6)
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.

Shunt R2 secondary board (fig. 6)
Check it for colour changes.
Probable cause:
- overheating due to loosening of the screws connecting the shunt to the PCB.

Relay K1 torch button 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.

Fuse F1 torch button board (fig. 4)
Make sure the fuse is correctly inserted into the fuse holder and that it has not blown (blackened in colour). Use the multimeter to check whether the fuses have blown. Probable cause:
- excessive current absorption from the main supply.

Power transformer and filter inductance (fig. 2A)
Inspect the windings for colour changes.
Probable causes:
- aging after a substantial number of working hours;
- excessive overheating related to faulty operation.

HF transformer (fig. 2A)
Inspect the windings for colour changes. Probable causes:
- aging after a substantial number of working hours;
- excessive overheating related to faulty operation.

Shunt (fig. 2A)
Check it for colour changes. Probable cause:
- overheating due to loosening of the screws connecting the shunt to the PCB.

Solenoid valve (fig. 3)
Check the solenoid valve to see if it opens. Probable causes:
- the solenoid valve does not open because of a mechanical block; do not attempt to open the valve but used compressed air to carry out thorough cleaning or replace the solenoid valve.

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

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 on diode testing check the following components (joint voltages not less than 0.2V):
- rectifier bridges D3, D5 (**fig. 5**);
- IGBT's Q1, Q2, Q3, Q4, (no short circuits between collector-gate and collector-emitter (**fig. 5**));
- secondary diodes D1…D10 between anode and cathode (**fig. 6**). SCR Q5 module (no short circuits between anode and cathode **fig. 6**).

B) With the multimeter in ohm mode check the following components:
- resistor R1: 47 ohm (pre-charge **fig. 5**).
- resistors R2, R6: 10 ohm (primary snubber **fig. 5**).
- resistors R1, R2, R3, R4: 10 ohm (secondary snubber **fig. 6**).
- thermostat continuity test on inductance: disconnect fastons

J15 and J16 from the control board and make sure the resistance is approx. 0ohm (**fig. 7**).
- thermostat continuity test on secondary dissipator: disconnect fastons J13 and J14 from the control board and make sure the resistance is approx. 0 ohm (**fig. 7**).

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) Do not connect the gas mixture source.
B) Disconnect all connectors and fastons from the control board and remove it from the primary board.
C) From the primary board, disconnect fastons CN3 (XF+) and CN10 (XF-) for the power transformer (**fig. 3**), and disconnect faston J1 from the support board (fig. 5).
D) On the primary board disconnect the jumper on JP1.
E) Connect the HV power supply OUT (code 802403) on the primary board as follows (**fig. 4**):
- (+) Positive (clamp) to rheofore of resistor R35 towards JP1 (after removing jumper JP1);
- (-) Negative (faston) to negative faston of diode bridge D3.

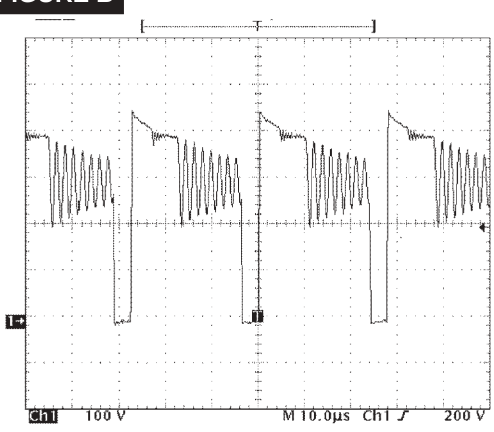
F) Set up the oscilloscope with the voltage probe x100 connected between the rheofore of R40A (collector Q10) towards JP1 (probe) and the negative of diode bridge D3 (earth) to the primary board (**fig. 5**).
G) Disconnect fastons J1 and J3 from the HF board (fig. 4).
H) Connect the power supply cable to a single phase variac with variable output 0-300 Vac.
WARNING! during testing prevent contact with the metal part of the torch because of the presence of high voltages that are hazardous to the operator.

6.1 Scheduled tests

A) Switch on the HV power supply (HV OUT) and make sure that (fig. 5):
- pre-charge relays K1 and K2 close;
- the fan starts to turn for the power transformer;

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

FIGURE B



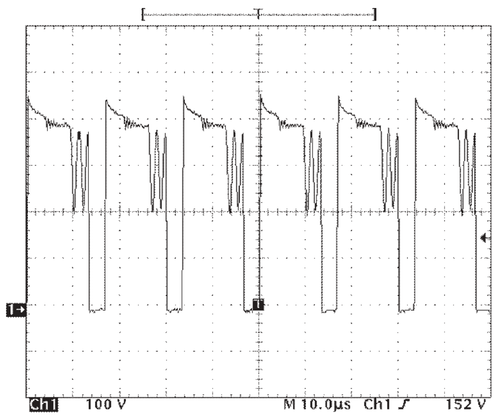
SETTINGS:
- PROBE x100;
- 100 V/Div;
- 10 µsec/Div.

VERIFY THAT
- THE FREQUENCY IS 35KHz ±15%;
- AMPLITUDE IS 450V ±10%;

N.B. if there is no signal it may be necessary to replace the integrated circuit U2 or IGBT Q10 on the primary board (**fig. 5**).
C) Set up the multimeter in volt mode and make sure the primary board has the following voltages: (**fig. 5**):
- between the cathode of diode D32 (+) and the negative of diode bridge D5 (-): equal to +16.5Vdc 3%;
- between pin 3 (+) and the dissipator (-) of U5: equal to +5Vdc 5%;
- between pin 3 (+) and the dissipator (-) of U4: equal to +12Vdc 5%;
- between pin 3 (+) and pin 1 (-) of U6: equal to -12Vdc 5%;
- between pin 8 (+) and pin 7 (-) of ISO1: equal to +30Vdc 5%;
- between pin 8 (+) and pin 7 (-) of ISO2: equal to +30Vdc 5%;
- between pin 4 (+) and pin 5 (-) of J4: equal to +18Vdc 10%;
- between pin 9 (+) and pin 8 (-) of J4: equal to +18Vdc 10%;

D) Switch off the HV power supply, reposition the control board and reconnect the wiring.
E) On the front panel set switch SW2 to MMA (as low as it will go) and switch SW3 to DC-LIFT (in the centre).
F) Switch on the HV power supply (HV out) and make sure that (fig. 2A):
- the green power supply LED D6 lights up;
- the green LED D7 indicating voltage over the torch lights up;
- the yellow alarm LED D8 is off;
- the display shows a numeric value that varies between 5 and 140 when the encoder is turned.
- with the oscilloscope probe connected as in point 6.1 F) the wave form resembles **fig. C**;
- the frequency is equal to 60KHz ±5%; if the frequency reading on the oscilloscope is not 60KHz ±5%, calibrate the frequency <u>only</u> when the machine is being tested (see point 1.2 A).

FIGURE C

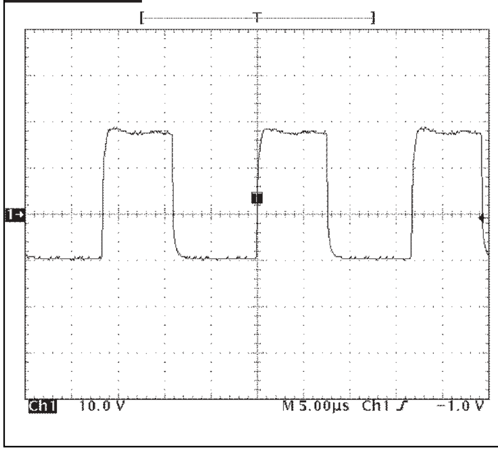


SETTINGS:
- PROBE x10
- 100mV/Div;
- 10 µsec/Div.

VERIFY THAT:
- THE FREQUENCY IS 60KHz ±10%;
- AMPLITUDE IS 450V ±10%.

N.B. if the signal is not present it may be necessary to replace the integrated circuit U2 or IGBT Q10 on the primary board **(fig. 7).**
G) Switch off the HV power supply.
H) Set up the oscilloscope with the voltage probe x10 connected between the gate (probe) and the emitter (earth) of IGBT Q4 on the primary board **(fig. 5)**.
I) Switch on the HV power supply (HV out) and make sure the waveform displayed on the oscilloscope resembles **fig. D**.

FIGURE D



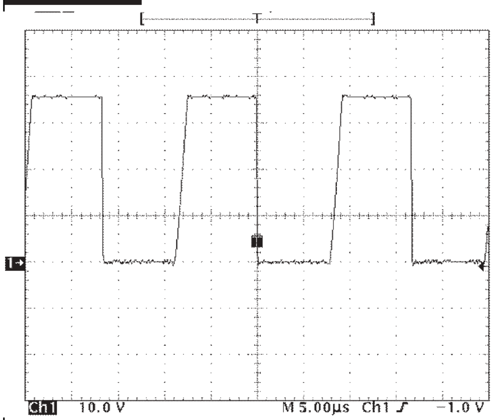
SETTINGS:
- PROBE x10;
- 100mV/Div;
- 5 µsec/Div.

TIME TOLLERANCE ± 20%

VERIFY THAT
- POSITIVE AMPLITUDE IS +18V ±10%;
- NEGATIVE AMPLITUDE IS -10V ±10%.

J) Repeat this test on Q1, Q2, Q3 as well. **N.B.** if the signal is not present there could be a fault in the IGBT driver circuit, specifically ISO1 and ISO2 (**fig. 5**), or in the control board (**fig. 3**, in which case we recommend replacing the board).
K) Switch off the HV and replace the 2 fastons connecting the primary board and the power transformer (CN3 and CN10).
L) Switch on the HV and 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 26Vac.
M) Set up the oscilloscope with the voltage probe x100 connected between the collector (probe) and the emitter (earth) of IGBT Q4 on the primary board (**fig. 5**).
N) Make sure the waveform shown on the oscilloscope resembles **fig. E.**

FIGURE E



SETTINGS:
- PROBE x10;
- 10V/Div;
- 5 µsec/Div.

TIME TOLLERANCE± 20%.

VERIFY THAT.
- AMPLITUDE IS: 35V ±20%.

O) Repeat this test on Q2 as well, using the differential probe.
N.B. If the signal is not present there may be a fault in the IGBT's (**fig.5**).
P) Return the variac voltage to 0V, switch off the machine and the HV power supply.
Q) Disconnect the HV power supply, replace jumper JP1 on the board.
R) Switch the machine on again and gradually increase the voltage generated by the variac to 150Vac 5% then make sure an alarm is registered with yellow LED D8 on and alarm "AL.1" shown on the display.
S) Increase the voltage on the variac to 230Vac and make sure the alarm ceases (yellow LED D8 goes off).
T) Increase the voltage on the variac yet again to 300Vac 5% and make sure the machine registers an alarm again. Return the variac voltage immediately to 230Vac and switch off the machine.
N.B. if an alarm persists (and is not caused by a fault in the control board) there could be a fault in opto-isolator ISO3 or integrated circuit U3 on the primary board (**fig. 3**).

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 control board (fig. 3)
If the fault is in the control board remove it from the primary board as follows:
- with the machine disconnected from the main power supply disconnect all the wiring from the control board;
- cut any bands restricting the board;
- remove the control board from the spacers attached to the primary board;

N.B. for assembly proceed in the reverse order.
If the fault is in the control board we strongly advise replacing it without further intervention.

7.2 Removing the primary board (fig. 3)
If the fault is in the primary board remove it from the machine structure as follows:
- with the machine disconnected from the main power supply and after removing the control board, disconnect all the wiring from the primary board;
- cut any bands restricting the board (e.g. on the power supply cable and primary connections);
- undo the screws fastening the front and back panels and remove the panels from the machine structure;
- undo the screws fastening the primary board to the machine structure;
- remove the primary board by lifting it upwards.

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

Please read the procedure for replacing the IGBT's carefully: (fig. 5).
The 4 IGBT's are attached to 2 different dissipators and whenever a replacement is required, both IGBT's should be replaced.
- **Unscrew the four (4) nuts that fix the dissipator onto the card;**
- **unscrew the four (4) screws that fix the four (4) IGBT onto the dissipator;**
- **unscrew the two (2) screws that fix the two diode bridges onto the dissipator;**
- **remove the four (4) IGBT and the two (2) diode bridges by unwelding the reophores, then remove tin from the printed plates;**
- **remove dissipator from card.**

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 1st and 3rd bump contacts (between gate and emitter) corresponding to each component;
- alternatively, resistors R3, R4, R7, R8 could have burst and/or diodes D11, D12, D15, D16 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.
- Prepare the components for replacement. For the IGBT's, bend the rheofores at 90° (never bend and/or place the parts under tension near the case).
- Position the components on the dissipator with the fastening screws, but do not tighten the screws completely
- Join the dissipator/component assembly to the printed board, inserting all the rheofores in the bump contacts and the threaded spacers on the 4 attachment holes.
- Attach the dissipators with the nuts and lock them once and for all in the following order:
  - the nuts fastening the dissipators to the printed circuit with a torque wrench setting of 2 Nm ±20%;
  - the screws fastening the rectifiers to the dissipators with a torque wrench setting of 2 Nm ±20%;
  - the screws fastening the IGBT's to the dissipators with a torque wrench setting of 1 Nm ±20%.
- Solder the terminals taking care not to let the solder run along them.
- On the component side cut away the protruding part of the rheofores and check they are not shorted (especially the gate and emitter).

NOTE. The 4 IGBT's should belong to the same selection kit supplied by Telwin.

7.3 Removing the secondary board (fig. 6)

If the fault is in the secondary board, it should be specified that to remove it, it is necessary to separate the base from the machine structure as follows:
- with the machine disconnected from the main power supply and after removing the control and primary boards, separate the base from the machine structure by undoing the 4 screws;
- disconnect all wiring connected to the secondary board;
- undo the 4 screws fastening the dissipator to the machine structure;
- extract the secondary board from the machine structure;

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

Take special note of the procedure for replacing the secondary diodes (fig. 6):

The 10 secondary DIODES are attached to the dissipator and to reach them it is necessary to remove the boards above and below. Whenever one diode is replaced, they should all be replaced.
- undo the 3 screws fastening the SCR module to the top board;
- disconnect the 4 fastons connected to the SCR module;
- undo the 2 screws fastening the aluminium connections to the bottom board;
- remove the top board;
- undo the 4 nuts fastening the bottom board to the dissipator;
- undo the 10 screws attaching the diodes to the dissipater;
- remove the 10 diodes by unsoldering the rheofores and also remove the solder from the bump contacts on the PCB;
- clean any irregularities or dirt from the dissipators. If the diodes have burst the dissipator may be irreparably damaged: in such a case it should be replaced;
- apply thermoconductive paste following the general instructions; **Warning!** for diodes D6, D7, D8, D9 and D10 remember to insert nomex insulation between the dissipator and the diode.
- place the dissipator with the new components on the bump contacts of the PCB and fasten it down with the screws (torque wrench setting 1 Nm 20%);
- solder the terminals taking care not to let the solder run along them;
- on the soldering side cut the protruding part of the rheofores and make sure they have not shorted (between cathode and anode).

N.B. make sure that resistors R1, R2, R3, R4 and capacitors C1, C2, C3, C4 on the snubber are soldered correctly to the bottom board.

Please take careful note of the procedure for replacing the SCR module (fig. 6):

The SCR module is attached to the dissipator and to reach it, it is necessary to remove the top board:
- undo the 3 screws fastening the SCR module to the top board;
- disconnect the 4 fastons connected to the SCR module;
- remove the top board;
- remove the SCR module by undoing the 2 screws at the side;
- clean any irregularities or dirt from the dissipators. If the SCR module has blown the dissipator may be irreparably damaged: in such a case it should be replaced;
- apply thermoconductive paste following the general instructions;
- place the new SCR module on the dissipator and fasten it with the screws (torque wrench setting 5 Nm 20%);

N.B. make sure that resistors R1, R6, diodes D22, D5 and capacitors C1, C5 on the snubber are soldered correctly to the top board.

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) Do not connect the gas mixture source.

B) Connect the machine to the static load generator (code 802110) using cables fitted with the appropriate dinse connectors (802110)

C) Set up the dual trace oscilloscope with the voltage probe CH1x100 connected between the collector (probe) and the emitter of Q4 (earth) on the primary board (**fig. 5**).

D) Pass the current probe of the Hall effect transducer along the cable connecting the power transformer at faston CN10 with the reference arrow pointing into CN10.

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

F) Set up a multimeter in DC volt mode and connect the prods to the OUT+ and OUT- dinse connections.

G) On the front panel set switch SW2 to MMA (as low as it will go) and switch SW3 to DC-LIFT (in the centre).

H) Keep fastons J1 and J3 disconnected from the HF board (fig. 3).

WARNING! the high frequency voltage will permanently damage any instrument connected to the generator. Before proceeding make very sure that the fastons listed above are disconnected and completely isolated from one another.

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

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

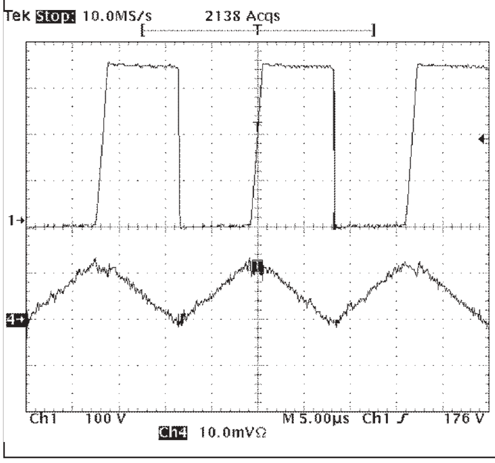
1.2 Scheduled tests

A) Loadless test:

Switch on the machine, gradually increase the power supply voltage from 0V to 230Vac and make sure that:
- the pre-charge relays on the primary board close;
- the fan starts operating correctly;
- the green power supply LED D6 lights up;
- the waveform displayed on the oscilloscope resembles **Fig. F** and the frequency is equal to +60KHz ±5%; if the frequency

reading on the oscilloscope is not 60KHz ±5%, adjust the frequency using trimmer R162 on the control board;
- the output voltage over dinse + and dinse is equal to 110Vdc 15%.

FIGURE F

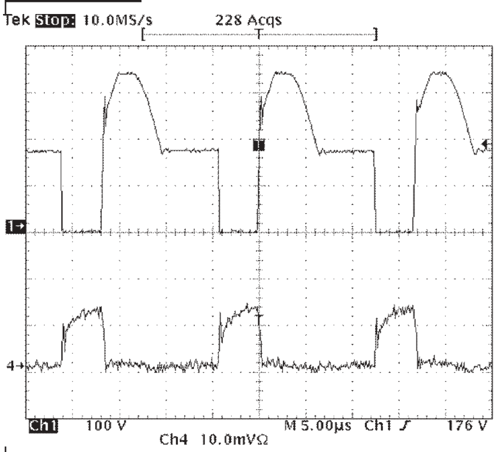


SETTINGS:
- PROBE CH1 x100;
- 100 V/Div;
- PROBE CH4 =1A;
- 10mV/Div;
- 5 µsec/Div.

VERIFY THAT
- THE FREQUENCY IS 60KHz ±5%;
- AMPLITUDE CH1 IS 340V ±10%;

B) Rated load test:
- set up the ohmic load with the switch settings as in the table in **fig. G**;
- on the front panel use the encoder to position the current at 15A;
- switch on the main switch;
- start up on the ohmic load and make sure that:
  - the waveforms displayed on the oscilloscope resemble those in **Fig. F**;
  - the output current is equal to +15Adc±20% and the output voltage is equal to +15Vdc±5%.
- switch off the ohmic load and switch off the main switch.

FIGURE G



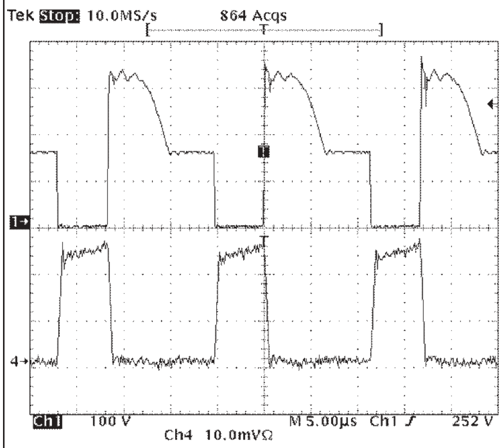
SETTINGS:
- PROBE CH1 x100;
- 100 V/Div;
- PROBE CH4 =5A;
- 10mV/Div;
- 5 µsec/Div.

VERIFY THAT
- THE FREQUENCY IS 60KHz ±5%;
- AMPLITUDE CH1 IS 340V ±10%;
- AMPLITUDE CH4 IS 7A ±20%;

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

C)Intermediate load test:
- set up the ohmic load with the switch settings as in the table in **fig. H**;
- on the front panel position with the encoder the current at 140A;
- start up the ohmic load and make sure that:
  - the waveforms displayed on the oscillscope resemble those in **Fig. H**;
  - the output current is equal to +80Adc ±10% and the output voltage is equal to +23.2.Vdc ±10%.
- switch off the ohmic load and switch off the main switch.

FIGURE H



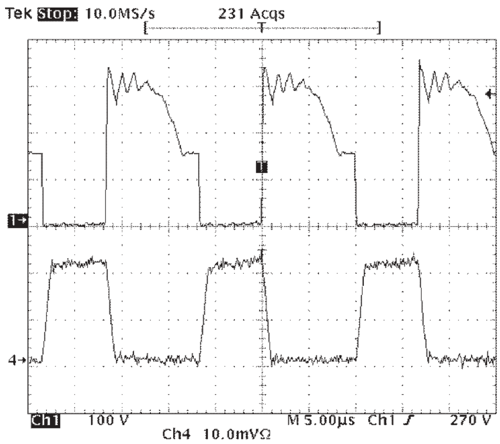
SETTINGS:
- PROBE CH1 x100;
- 100 V/Div;
- PROBE CH4 =10A;
- 10mV/Div;
- 5 µsec/Div.

VERIFY THAT
- THE FREQUENCY IS 60KHz ±5%;
- AMPLITUDE CH1 IS 340V ±10%;
- AMPLITUDE CH4 IS 26A ±20%;

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

D) Rated load test:
- set up the ohmic load with the switch settings as in the table in **fig. I**;
- on the front panel position with the encoder the current at 140A;
- start up on the ohmic load and make sure that:
  - the waveforms displayed on the oscilloscope resemble those in **Fig. I**;
  - the output current is equal to +140Adc 5% and the output voltage is equal to +26Vdc 5%; if the output current reading is not 140A ±3%, adjust the current using trimmer IMAX R105 on the control board (**fig. 7**).
- switch off the ohmic load and switch off the main switch.

FIGURE I



SETTINGS:
- PROBE CH1 x100;
- 100 V/Div;
- PROBE CH4 =20A;
- 10mV/Div;
- 5 µsec/Div.

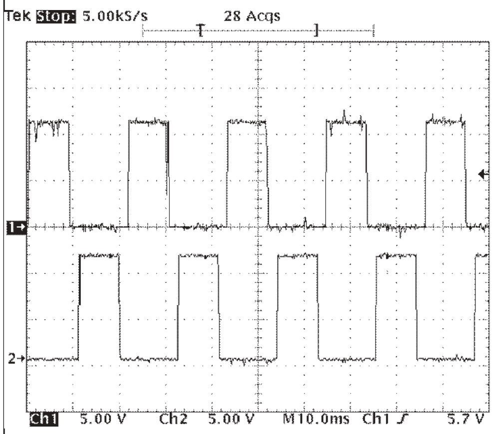
VERIFY THAT
- THE FREQUENCY IS 60KHz ±5%;
- AMPLITUDE CH1 IS 340V ±10%;
- AMPLITUDE CH4 IS 46A ±10%;

1	2	3	4	5	6	Number switch
3	3	3	2	2	2	Position switch

E) Testing operation of SCR module
- on the front panel set switch SW2 to TIG/2T (as high as it will go) and switch SW3 to AC (as low as it will go).
- connect the TIG torch to the machine.
- set up the dual trace oscilloscope, connecting probe CH1 x10 to pin 1 of connector J3, on the control board (**fig. 7**), and probe CH2 x 10 to pin 2. The earths are connected together to pin 3 on the same J3 connector;
- set up the ohmic load with the switch settings as in the table in **Fig. J;**
- on the front panel use the encoder to position the current at 15A;
- start up the ohmic load, press the torch button and make sure

the waveforms displayed on the oscilloscope resemble those in **Fig. J**.
- switch off the ohmic load and switch off the main switch.

FIGURE J



SETTINGS:
- PROBE CH1 x10;
- 5 V/Div;
- PROBE CH2 =10;
- 5V/Div;
- 10 µsec/Div.

VERIFY THAT
- THE FREQUENCY ON CH1 AND CH2 IS 45KHz ±10%;
- AMPLITUDE ON CH1 AND CH2 IS 12V ±10%;

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

N.B. If one of the two signals is absent the control board should be replaced (**fig. 3).** Otherwise, if the machine does not supply AC current the SCR module should be replaced, or if the worst comes to the worst replace the secondary board.

1.3 Operational tests

A) Checking torch button operation

Set switch SW2 to TIG/2T (toward to the top) and switch SW2 to LIFT (in the centre). Connect the TIG torch and press the button to verify that relay K1 closes **(fig. 4)**; if not check whether:
- Operation of the torch button;
- Operation of diode bridge D2 on the torch button board;
- Operation of transformer T1 on the torch button board;

B) Checking solenoid valve operation

After checking operation for point 1.3 A), press the button and check whether:
- the solenoid valve closes (fig. 2A); if not check whether:
  - the voltage over the female fastons (**fig.4**) is equal to 230Vac ±10%. If voltage is present this means the solenoid valve is faulty, otherwise check the operation of relay K2 on the secondary board;.
- **on the secondary board relay K2 closes (fig. 6); if not check whether:**
  - the voltage over pin 1 (+) and pin 25 of J9 (control board) is equal to +15Vdc ±20%, otherwise replace the control board.

C) Checking HF generator operation

Set switch SW2 to TIG/2T (as high as it will go) and switch SW3 to AC (as low as it will go). Now reconnect only fastons J1 and J3 to the HF generator board (**fig. 4**) and faston J1 on the support board.

WARNING! The high frequency voltage will permanently damage any instrument connected to the generator.

With the TIG torch still connected and pressing the button check whether:
- the HF generator board starts to hum for about 2 seconds (high frequency in torch); otherwise make sure the voltage over female fastons J1 and J3 (**fig.4**), disconnected from the HF board, is equal to 230Vac ±10%; if voltage is present the HF board is faulty; if not check the operation of transformer T1 and SCR Q1;

D) Running time test and closing the machine

On the front panel set switch SW2 to MMA (as low as it will go), switch SW3 to DC-LIFT (in the centre) and the welding current to maximum. Under the load conditions shown in **fig. I**, switch on the machine and leave it in operation until the thermostatic capsules trigger (machine in alarm). After making sure the internal wiring is positioned correctly re-assemble the machine once and for all.

E) Welding test

MMA: with the machine set up according to the instructions in the handbook make a test weld with an electrode diam. 2.5 and the current setting at 80A. Monitor the dynamic behaviour of the power source, also checking for the presence of the Arc Force, by first operating key SW1 and then the encoder.

TIG/DC: with the machine set up according to the instructions in the handbook make a test weld with a grey electrode diam. 2.4 and an argon gas bottle (gas flow at 4.5 litres/minute). Make a weld on iron or steel with a current setting of 80A, monitor the start and arc stability and make sure the piece melts properly. Also check all the main properties of the machine that can be set from the digital panel (see TAB.1).

TIG/AC: with the machine set up according to the instructions in the handbook make a test weld with a green electrode, diam. 1.6mm, and the argon gas bottle (gas flow at 10 litres/minute). Make a weld on aluminium with a current setting of 40A and Duty Cycle 80%, monitor the start and arc stability and make sure the piece melts properly. Also check all the main properties of the machine that can be set from the digital panel (see TAB.1).

ILLUSTRATIONS

FIG. 1A

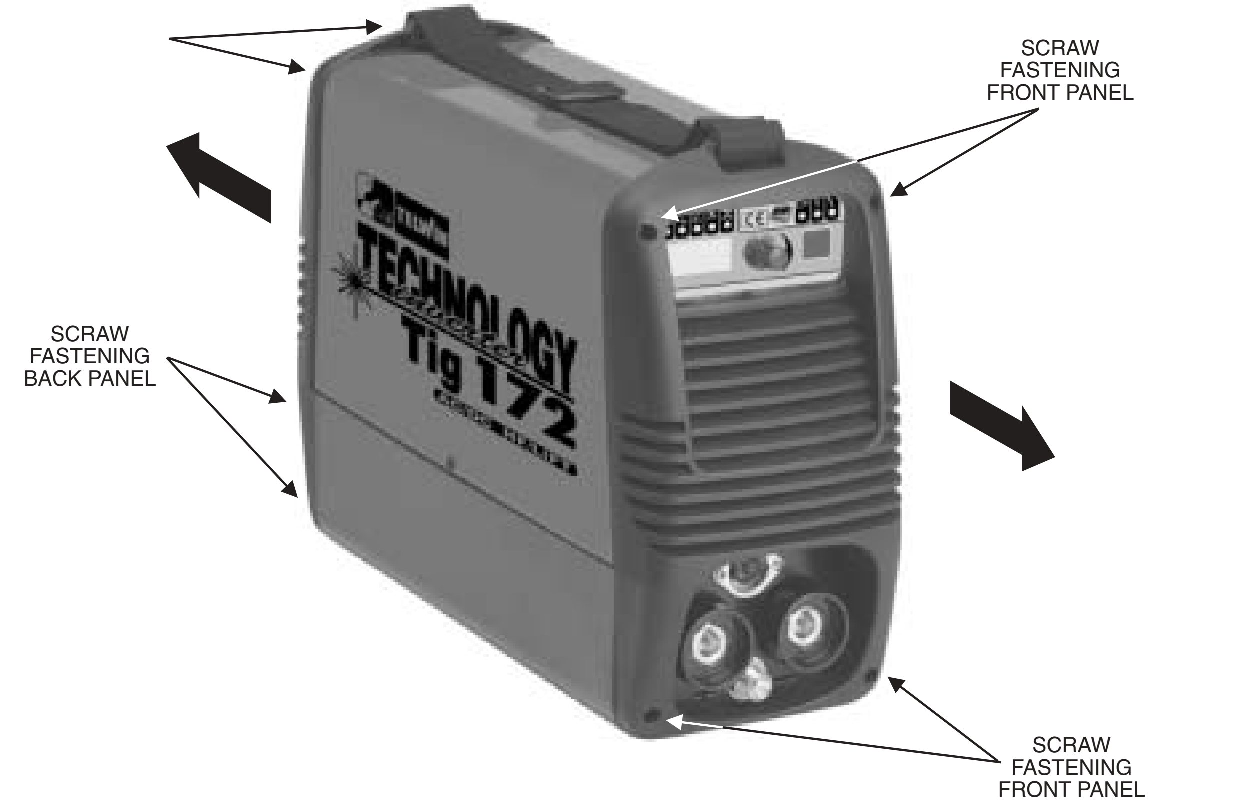


FIG. 1B

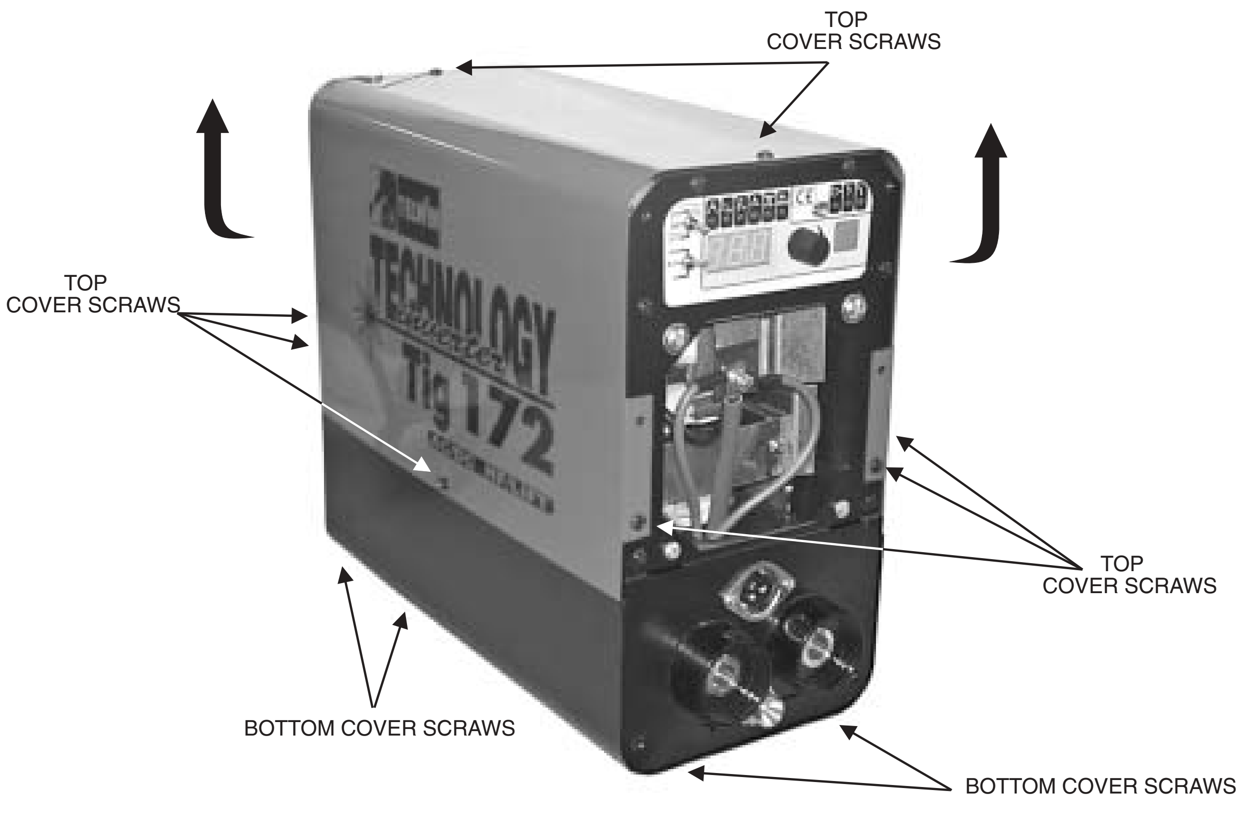


FIG. 2A

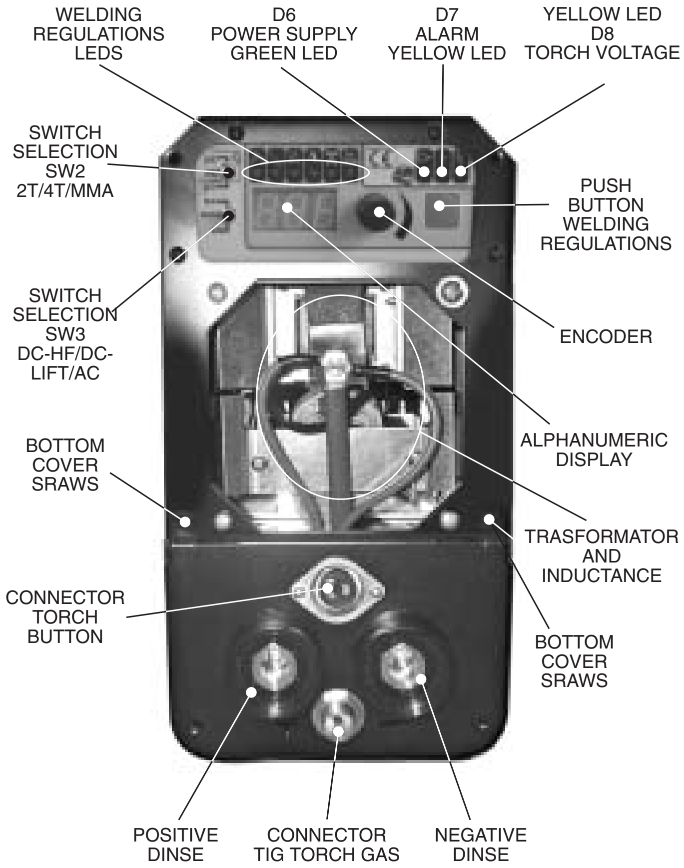


FIG. 2B

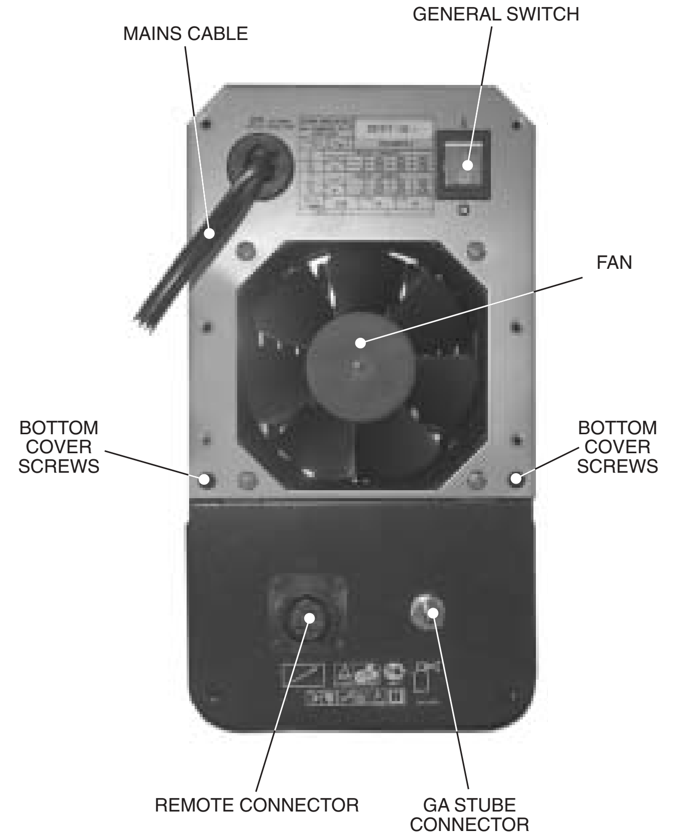


FIG. 3

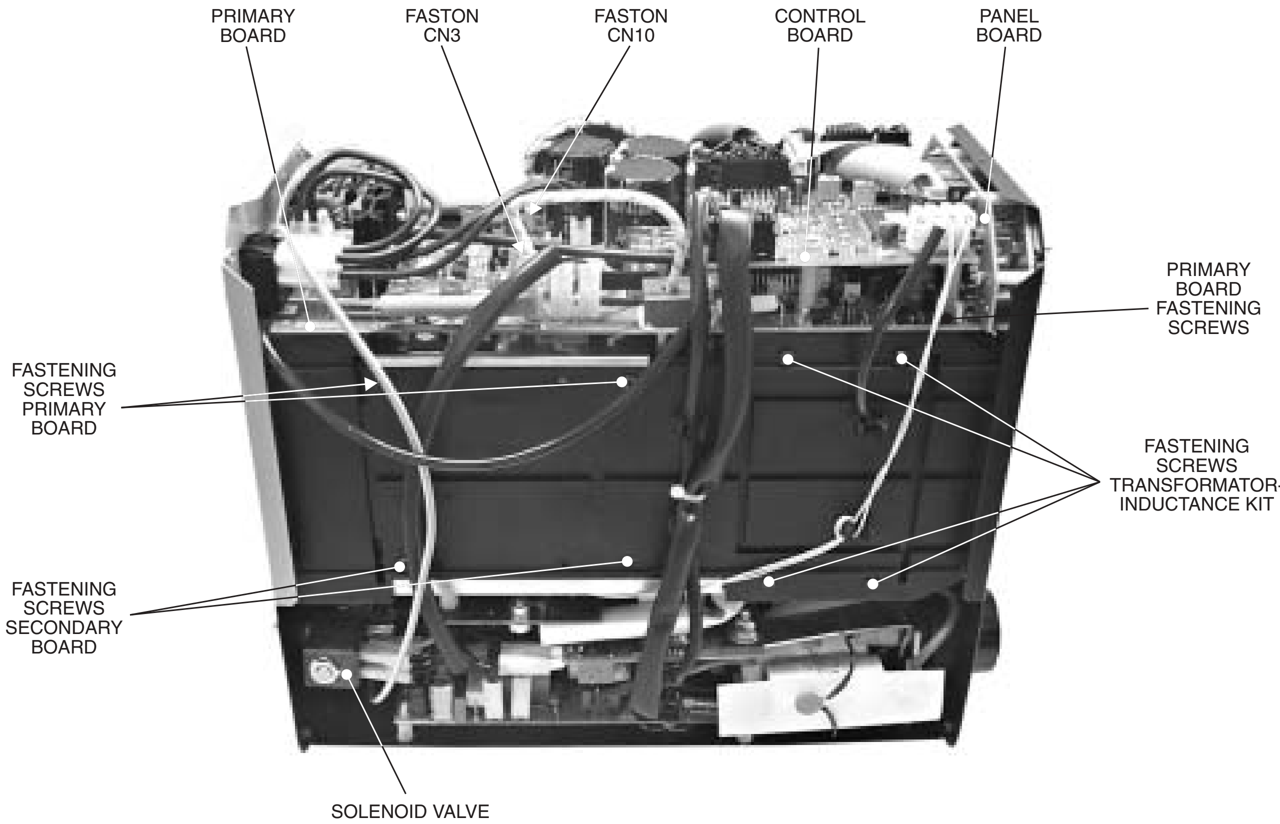


FIG. 4

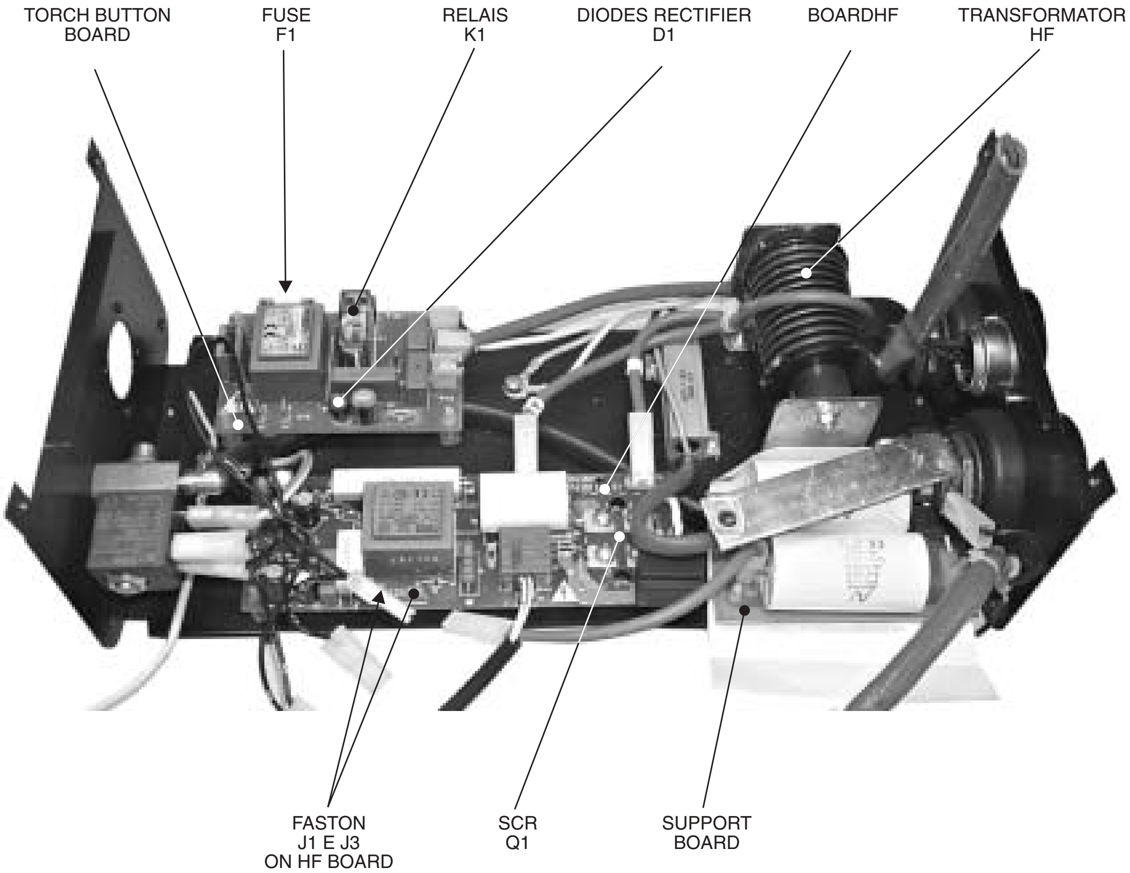

TORCH BUTTON
BOARD
FUSE
F1
RELAIS
K1
DIODES RECTIFIER
D1
BOARDHF
TRANSFORMATOR
HF
FASTON
J1 E J3
ON HF BOARD
SCR
Q1
SUPPORT
BOARD

FIG. 5

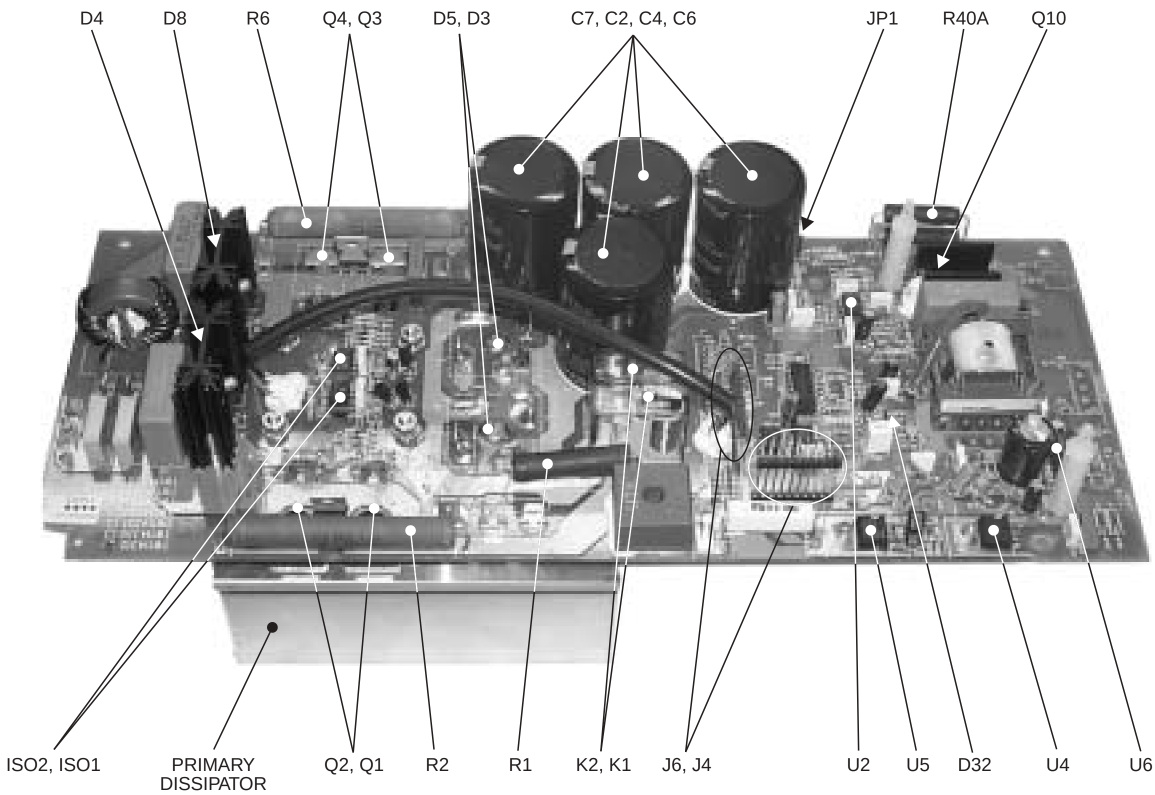

D4
D8
R6
Q4, Q3
D5, D3
C7, C2, C4, C6
JP1
R40A
Q10
ISO2, ISO1
PRIMARY
DISSIPATOR
Q2, Q1
R2
R1
K2, K1
J6, J4
U2
U5
D32
U4
U6

FIG. 6

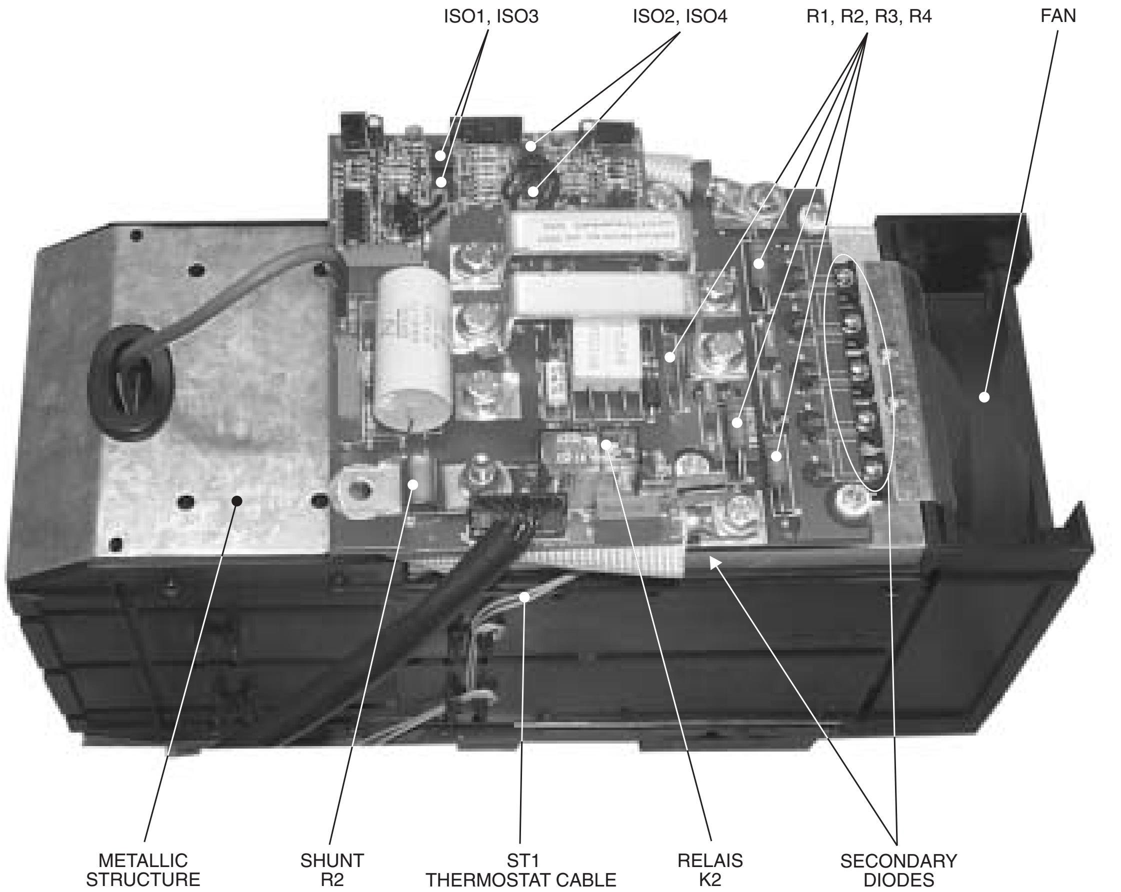
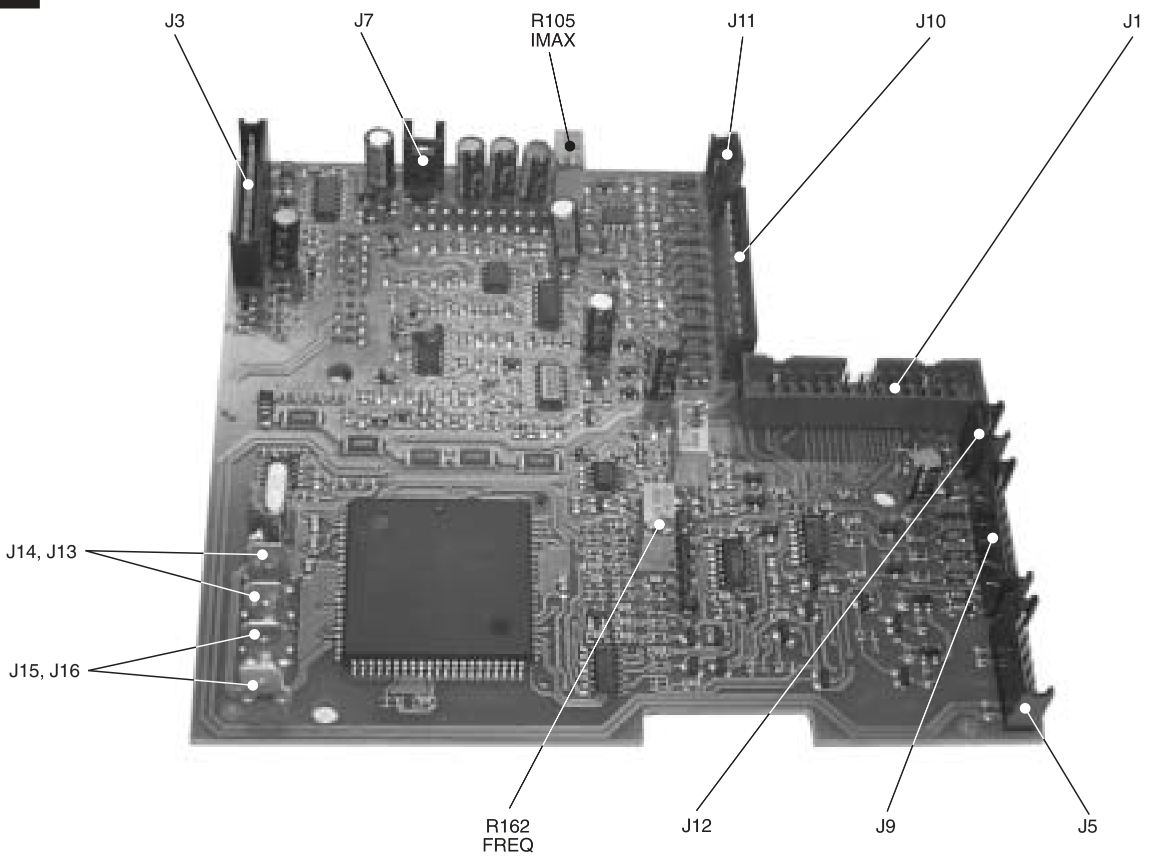
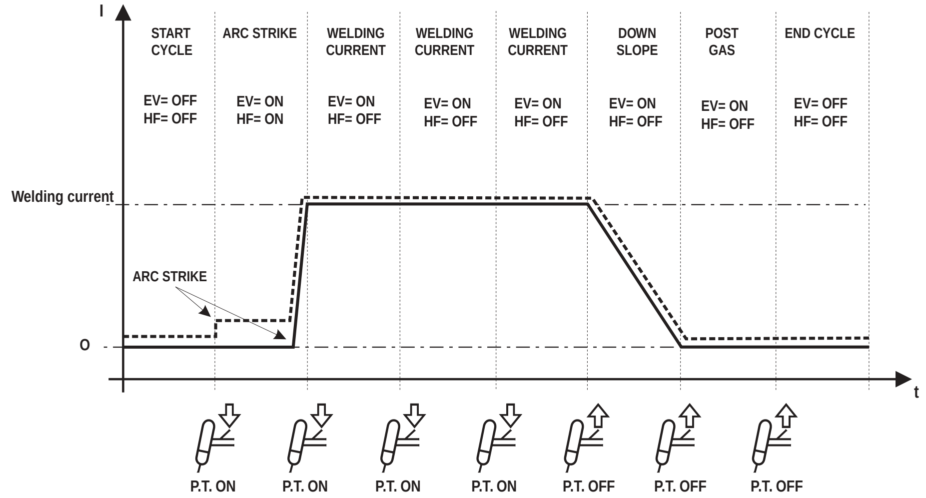

ISO1, ISO3
ISO2, ISO4
R1, R2, R3, R4
FAN
METALLIC STRUCTURE
SHUNT R2
ST1 THERMOSTAT CABLE
RELAIS K2
SECONDARY DIODES

FIG. 7

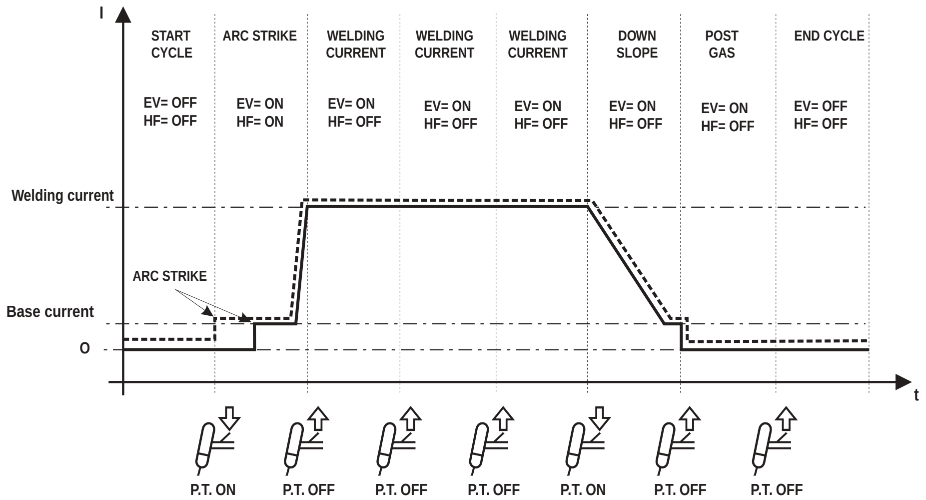

J3
J7
R105 IMAX
J11
J10
J1
J14, J13
J15, J16
R162 FREQ
J12
J9
J5

TAB. 1

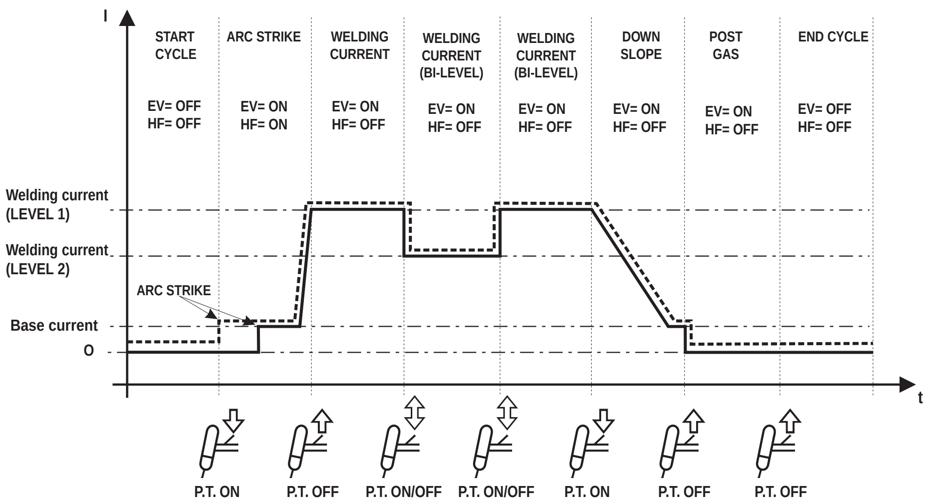
MACHINE CYCLE 2T WITH HF (——) - LIFT (----·)



MACHINE CYCLE 4T WITH HF (——) - LIFT (----·)



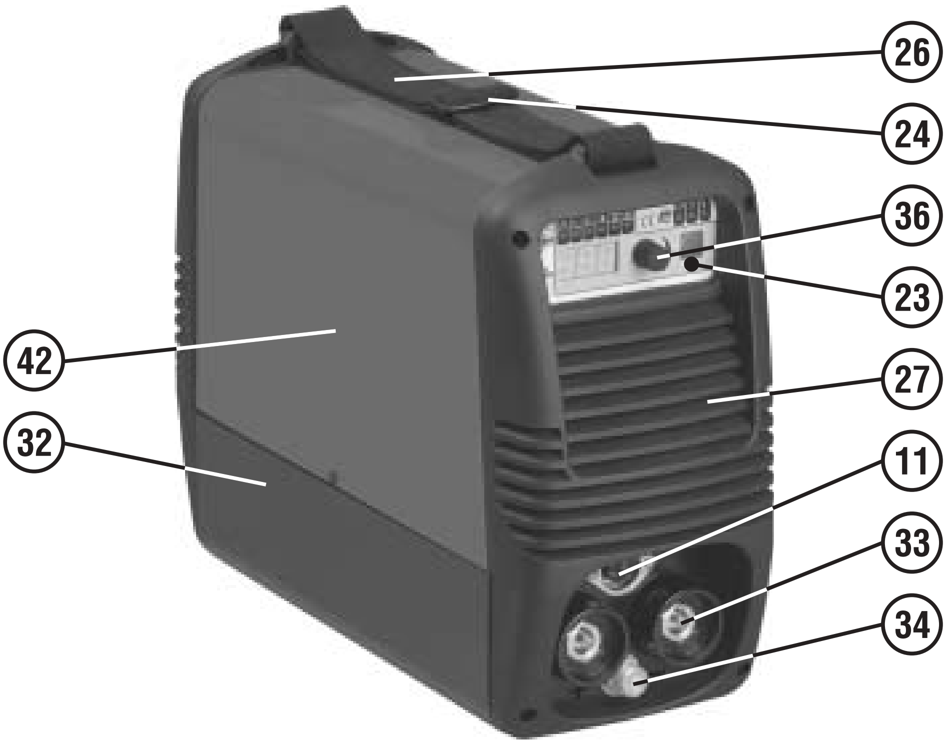
MACHINE CYCLE BI-LEVEL 4T WITH HF (——) - LIFT (----·)

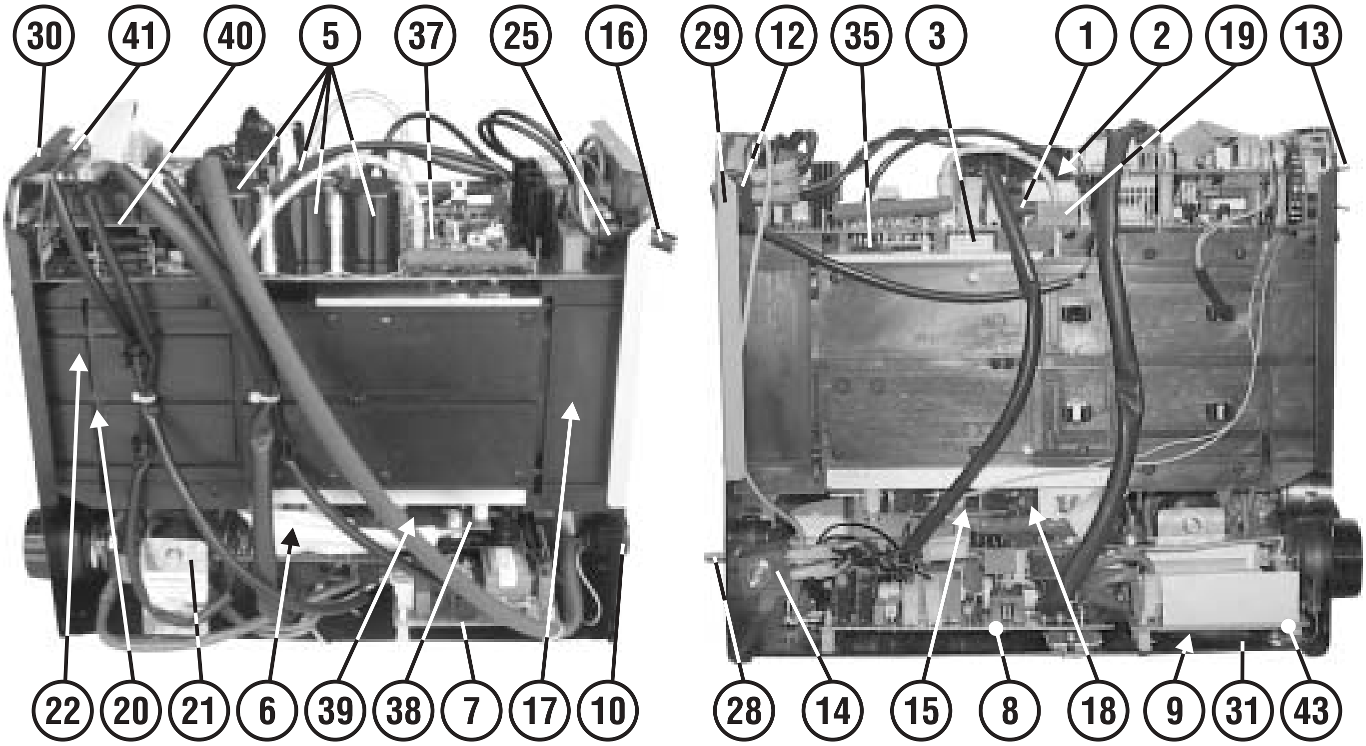


LEGENDA: EV = Solenoid valve
I = Welding current
HF = High Frequency (if active)
PT = Torch button

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

TECHNOLOGY TIG 172 AC/DC

REF.	ELENCO PEZZI DI RICAMBIO PIECES DETACHEES SPARE PARTS LIST ERSATZTEILLISTE PIEZAS DE REPUESTO
1	Resistenza Resistance Resistor Wiederstand Resistencia
2	Rele' Relais Relais Relais Relais
3	Raddrizzatore Monofase Redresseur Monophase Single-phase Rectifier Einphasiger Gleichrichter Rectificador Monofasico
5	Condensatore Condensateur Capacitor Kondensator Capacitor
6	Scr Scr Scr Scr Scr
7	Scheda Pulsante Torcia Platine Poussoir Torche Torch Pushbutton Card Brennerdruckknopfskarte Tarjeta De Pulsador Antorcha
8	Scheda H.f. Platine H.f. H.f. Card H.f. Karte Tarjeta H.f.
9	Condensatore Condensateur Capacitor Kondensator Condensador
10	Cablaggio Controllo Cable De Controle Control Cable Kontrolkabel Cable De Control
11	Cablaggio Presa Cable Prix Socket Cable Steckdosekabel Cable Enchufe
12	Interruttore Interrupteur Switch Schalter Interruptor

REF.	ELENCO PEZZI DI RICAMBIO PIECES DETACHEES SPARE PARTS LIST ERSATZTEILLISTE PIEZAS DE REPUESTO
13	Deviatore Commutateur Switch Schalter Conmutador
14	Elettrovalvola Electrovanne Electrovalve Elektroventil Electrovalvula
15	Termostato Thermostat Thermal Switch Thermostat Termostato
16	Cavo Alim. Cable Alim. Mains Cable Netzkabel Cable Alim.
17	Ventilatore Ventilateur Fan Ventilator Ventilador
18	Shunt Shunt Shunt Shunt Shunt
19	Trasformatore Di Corrente Transformateur De Courant Current Transformer Stromwandler Transformador De Corriente
20	Trasformatore Potenza Transformateur Puissance Power Transformer Leistungstransformator Transformador De Potencia
21	Trasformatore Hf Transformateur Hf Hf Transformer Hf Transformator Transformador Hf
22	Induttanza Inductance Inductance Drossel Induccion
23	Frontale Partie Frontal Front Panel Geraetefront Frontal

REF.	ELENCO PEZZI DI RICAMBIO PIECES DETACHEES SPARE PARTS LIST ERSATZTEILLISTE PIEZAS DE REPUESTO
24	Fibbia Boucle Buckle Schnalle Hebilla
25	Pressacavo Presse Cable Cable Bushing Kabelhalter Prensa Cable
26	Cinghia Courroie Belt Gurt Correa
27	Frontale Partie Frontal Front Panel Geraetesfront Frontal
28	Raccordo Acqua Raccord Eau Pipe Fitting Wasseranschluss Racor Agua
29	Retro Partie Arriere Back Panel Rueckseite Trasera
30	Frontale Partie Frontal Front Panel Geraetefront Frontal
31	Fondo Chassis Bottom Bodenteil Fondo
32	Fondo Chassis Bottom Bodenteil Fondo
33	Presa Dinse Prise Dix Dinse Socket Dinse Steckdose Enchufe Dinse
34	Kit Raccordo Entrata Gas Kit Raccord Entree Gaz Gas Pipe Connector Kit Gaseintrittkit Kit Racor Entrada Gas

REF.	ELENCO PEZZI DI RICAMBIO PIECES DETACHEES SPARE PARTS LIST ERSATZTEILLISTE PIEZAS DE REPUESTO
35	Kit Diodi-igbt-resistenza Kit Diodes-igbt-resistance Kit Diodes-igbt-resistance Kit Diodes-igbt-wiederstand Kit Diodos-igbt-resistencia
36	Kit Manopola Kit Poignee Kit Knob Kit Griff Kit Manija
37	Kit Ass. Primario Kit Primaire Primary Kit Primaertrafokit Kit Primario
38	Kit Ass. Secondario Kit Secondaire Secundary Kit Sekundaertrafokit Kit Secundario
39	Kit Diodi-igbt Kit Diodes-igbt Kit Diodes-igbt Kit Diodes-igbt Kit Diodos-igbt
40	Kit Scheda Controllo Kit Carte Controle Control Board Kit Kontrolskartekit Kit Tarjeta Control
41	Kit Pannello Kit Panneau Panel Kit Tafelkit Kit Panel
42	Kit Mantello Kit Capot Cover Kit Deckelkit Kit Panel De Cobertura
43	Kit Scheda Supporto Kit Platine Support Kit Support Control Pcb Kit Lager Steurungskarte Kit Tarjeta Soporte

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!

TELWIN®

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: ______________________

Mechanichal stresses the machine has undergone to

Description: ______________________

Dirty grade

Dirty inside the machine

Description: ______________________

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

Substitution of primary circuit board: yes ☐ no ☐

Substitution of primary control board: yes ☐ no ☐

Troubles evinced during repair :

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E-mail: telwin@telwin.com http://www.telwin.com

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