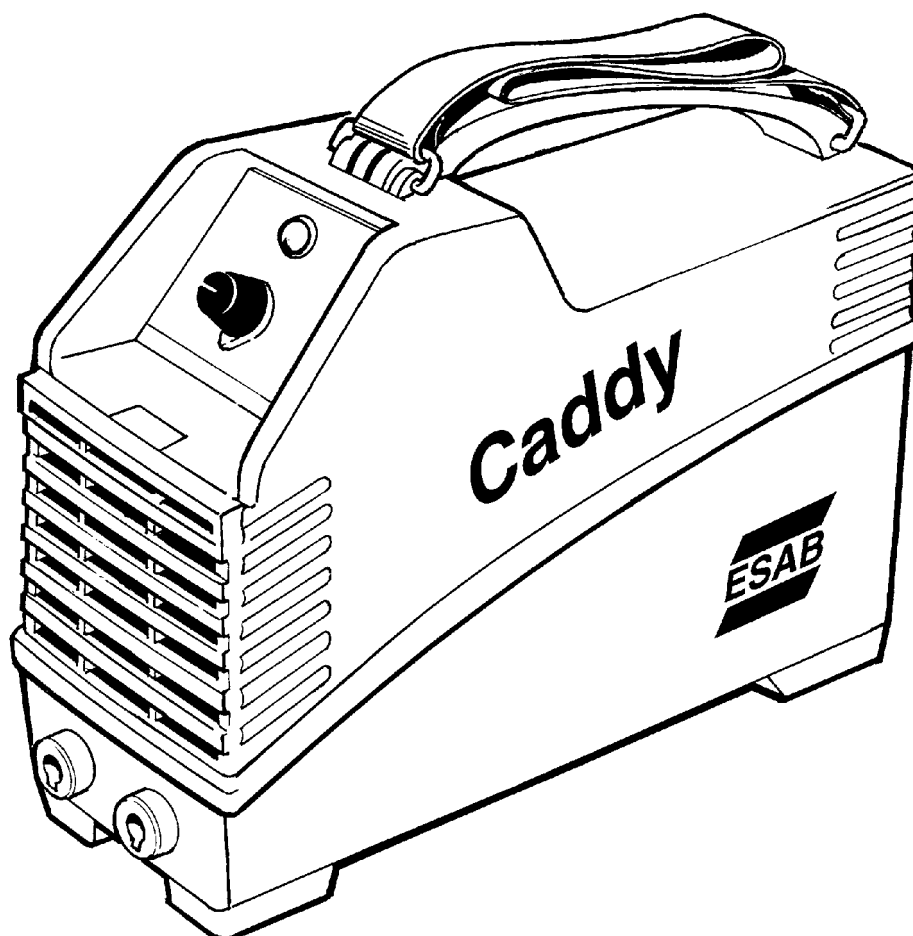




# ***LHO 110/150***

## ***Caddy 110/150***

**Welding rectifier**



**Service manual**

<b>LIST OF CONTENTS</b>	<b>Page</b>
READ THIS FIRST .....	2
COMPONENT DESCRIPTION LHO 110/150 .....	4
CONNECTION DIAGRAM LHO 110/150 .....	5
FUNCTION DESCRIPTION .....	6
DISMANTLING .....	12
FITTING .....	15
FAULT TRACING .....	17
TECHNICAL DATA .....	20
LOAD CHARACTERISTIC .....	21
INSTRUCTIONS .....	22
INTRODUCTION .....	22
INSTALLATION .....	23
OPERATION .....	23
MAINTENANCE .....	25
FAULT TRACING .....	25
ORDERING OF SPARE PARTS .....	25
SPARE PARTS LIST LHO 110/150 .....	27
NOTES .....	32

## **READ THIS FIRST**

This service manual is intended for use by technicians with appropriate electro-technical training when carrying out fault-tracing and repair work.

The connection diagram can be used as a Contents for the function and component descriptions. The connection diagram is divided into numbered blocks, which are used to identify the various parts in the function description.

The manual contains details of all design changes up to and including April 1998.

The LHO 110/150 is made in a special version, LHO 110B/150B, for the Belgian market. It does not have a hot start facility, but does have open-circuit voltage control.

### **WARNING!**

**The components in the machine are at mains voltage.  
Never make any measurements inside the machine when it is  
energised in the normal manner.**

ESAB reserves the right to make changes to the specification without prior notice.

The LHO 110 and LHO 150 are designed and tested in accordance with the international EN 60 974-1 (IEC 974-1) standard.

After service or repair, it is the responsibility of the person, company, section etc. that have/has performed the work to make sure that the product does not depart from the requirements of the above standard.



## WARNING



**ARC WELDING AND CUTTING CAN BE INJURIOUS TO YOURSELF AND OTHERS. TAKE PRECAUTIONS WHEN WELDING. ASK FOR YOUR EMPLOYER'S SAFETY PRACTICES WHICH SHOULD BE BASED ON MANUFACTURERS' HAZARD DATA.**

**ELECTRIC SHOCK - Can kill**

- Install and earth the welding unit in accordance with applicable standards.
- Do not touch live electrical parts or electrodes with bare skin, wet gloves or wet clothing.
- Insulate yourself from earth and the workpiece.
- Ensure your working stance is safe.

**FUMES AND GASES - Can be dangerous to health**

- Keep your head out of the fumes.
- Use ventilation, extraction at the arc, or both, to keep fumes and gases from your breathing zone and the general area.

**ARC RAYS - Can injure eyes and burn skin.**

- Protect your eyes and body. Use the correct welding screen and filter lens and wear protective clothing.
- Protect bystanders with suitable screens or curtains.

**FIRE HAZARD**

- Sparks (spatter) can cause fire. Make sure therefore that there are no inflammable materials nearby.

**NOISE - Excessive noise can damage hearing**

- Protect your ears. Use ear defenders or other hearing protection.
- Warn bystanders of the risk.

**MALFUNCTION - Call for expert assistance in the event of malfunction.**

**READ AND UNDERSTAND THE INSTRUCTION MANUAL BEFORE INSTALLING OR OPERATING.**

**PROTECT YOURSELF AND OTHERS!**

## COMPONENT DESCRIPTION LHO 110/150

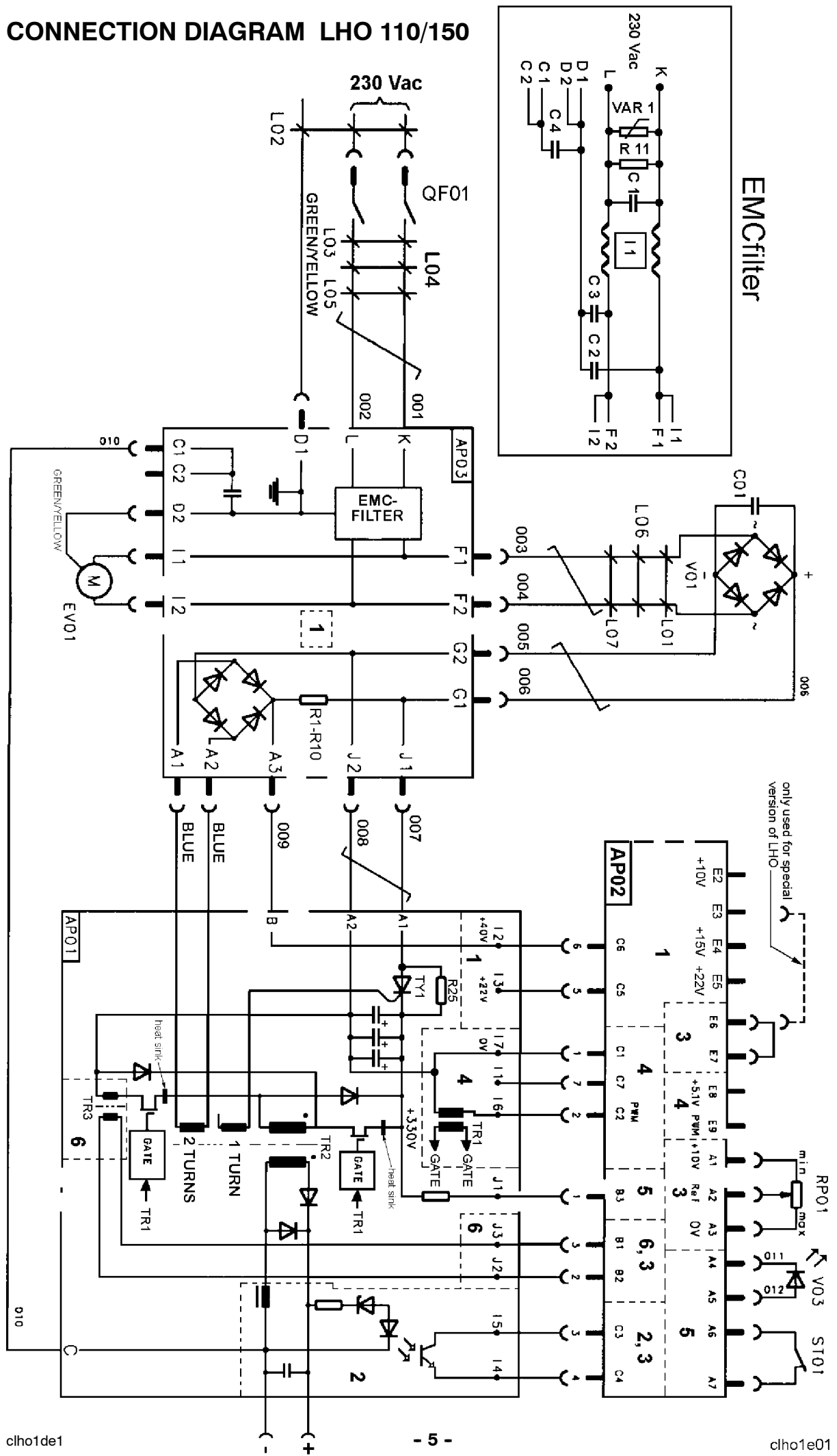
**WARNING! The components in the machine are at mains voltage.  
Never make any measurements in the machine when it is energised  
in the normal manner.  
Read and follow the fault-tracing instructions on page 17.**

- AP01** Circuit board, power part, see the function description.
- AP02** Circuit board with the control electronics. The board has a link between contacts E6 and E7 for the hot start function. The LHO 110B/150B is a special version without hot start, but with open-circuit voltage control (provided by the link between contacts E3-E6), see pages 8 and 9 in the function description.
- AP03** Circuit board with EMC filter and rectifier bridge. See the circuit diagram and description on pages 6 - 7.
- C01** Capacitor, decoupling.
- EV01** Cooling fan, 230 V AC.
- L01** Ferrite ring, interference suppression (EMC).
- L02** Ferrite ring, interference suppression (EMC).  
LHO 110: fitted only around the earth wire (yellow/green).  
LHO 150: fitted around all three wires.
- L03 - L07** Ferrite ring, interference suppression (EMC); LHO 150 only.
- QF01** Main On/Off switch.
- RP01** Potentiometer for current setting. This potentiometer is of a special insulated type: it is important to use only the correct replacement potentiometer as shown in the spare parts list.
- ST01** Thermal overload switch. See description on page 10.
- V01** Rectifier bridge.
- V03** LED, orange. Indicates overtemperature and low mains voltage. See the description on page 10.

**1 - 6** These figures refer to the machine's function description. The headings and page numbers of the respective items are listed below.

	<b>Page</b>
<b>1 POWER SUPPLY</b> .....	<b>6</b>
POWER SUPPLY, AP01	
POWER SUPPLY, AP02	
POWER SUPPLY WHEN STARTING	
<b>2 OPEN-CIRCUIT VOLTAGE SENSING</b> .....	<b>8</b>
<b>3 STARTING</b> .....	<b>8</b>
<b>4 PULSE WIDTH MODULATOR / GATE DRIVE</b> .....	<b>9</b>
<b>5 THERMAL SWITCH / LOW-VOLTAGE DETECTION</b> .....	<b>10</b>
<b>6 CURRENT MEASUREMENT</b> .....	<b>11</b>

# CONNECTION DIAGRAM LHO 110/150



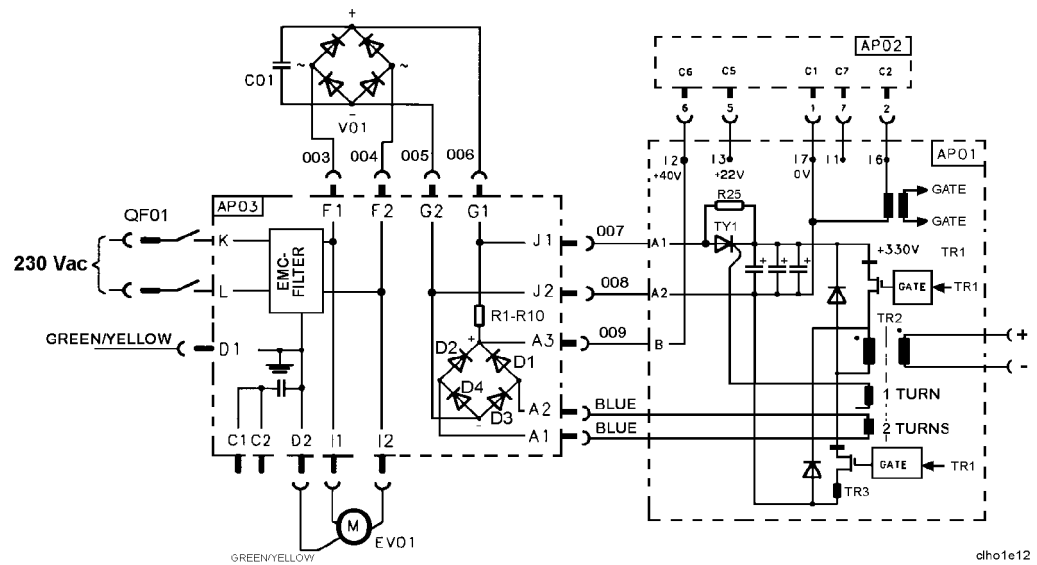
# FUNCTION DESCRIPTION

This description refers to the circuit diagram on page 5.

**WARNING! The components in the machine are at mains voltage. Never make measurements in the machine when it is energised in the normal manner. Read and follow the fault-tracing instructions on page 17.**

## 1 POWER SUPPLY

### POWER SUPPLY, AP01



Power supply circuit board AP01 is supplied at two different voltages:

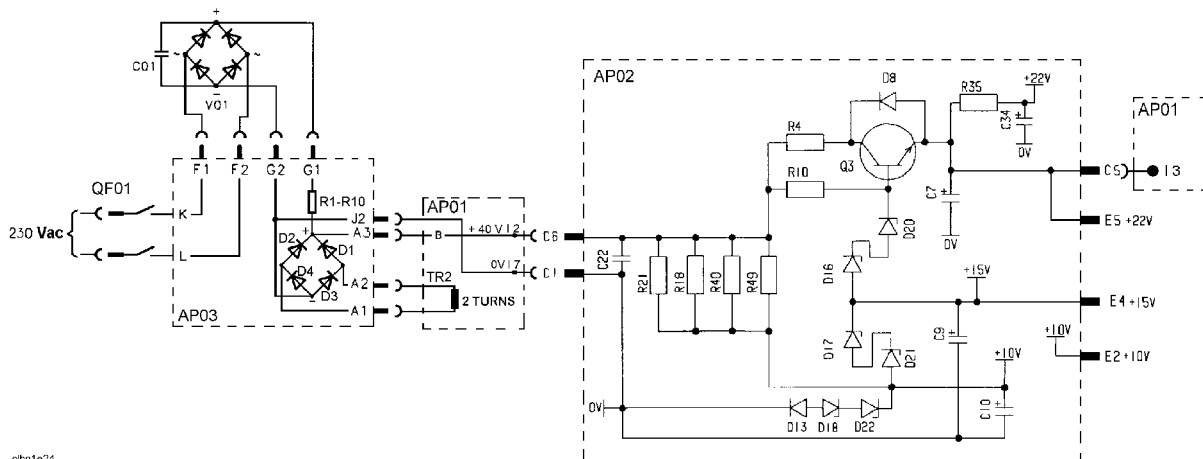
- Rectified mains voltage, about +330 V to the switch transistors.
- Power supply voltage from AP02: +22 V, tolerance 22-26V, power supply to the gate drive circuit boards.

The winding on TR2 that is marked 1 TURN provides pulses to TY1, which short-circuits charging resistor R25 about one second after power-up.

Interference suppression is partly by ferrite rings around wires and partly by twisting wire pairs. Most of the suppression is provided by the EMC filter.

Cooling fan EV01 is supplied with 230V AC immediately after the EMC filter via contacts I1 and I2, and starts when the main switch, QF01, is turned on.

## POWER SUPPLY, AP02



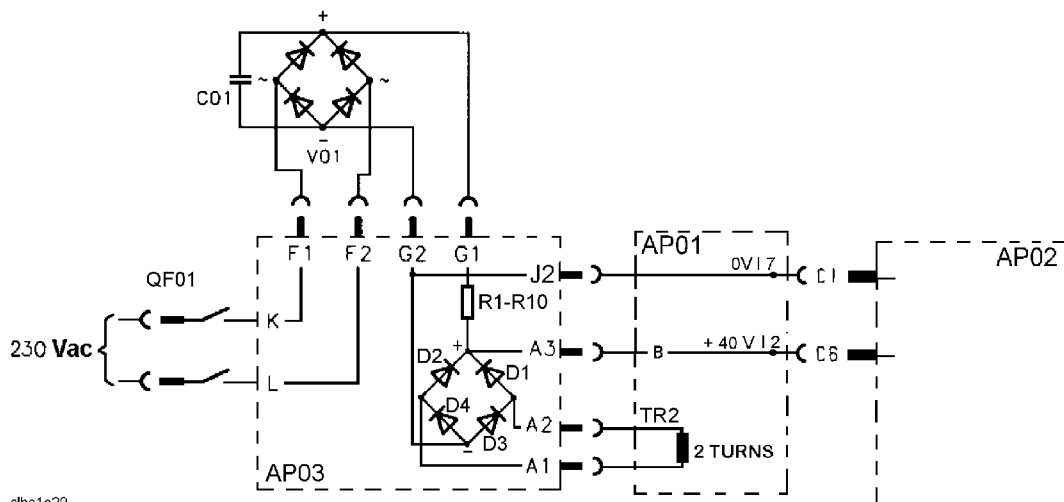
clho1e24

Contact C6 on AP02 is supplied at +40V, tolerance 38-49V, which is then converted to the following voltages:

- +22V, tolerance 22-26V, for supplying the gate drive boards on AP01.
- +10V, tolerance 10-11V, used internally on AP02 and for supply to potentiometer RP01 (current setting).
- +15V, tolerance 15-17.5V, used internally on AP02.

If a short circuit should occur in any of the diodes D13, D18 or D22, the +40V supply will be too low to supply AP02.

## POWER SUPPLY TO AP02 WHEN STARTING

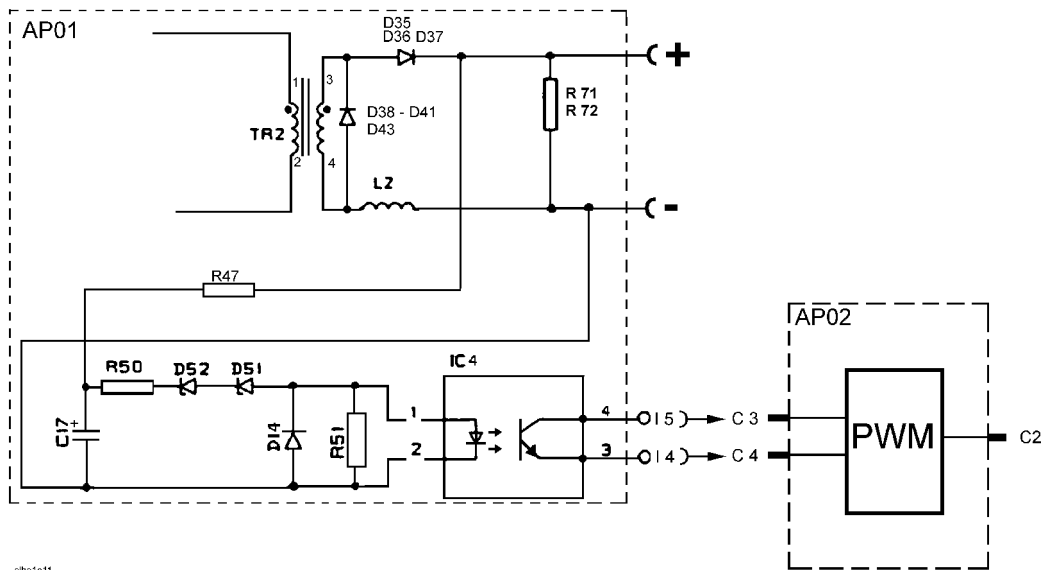


clho1e29

When the mains power supply is turned on, AP02 is supplied from rectifier bridge V01, the voltage from which is reduced by ten resistors R1-R10, connected in parallel. This power supply is used during the starting procedure, which takes about one second. The power supply is then taken from the winding marked '2 TURNS' on the welding transformer via diodes D1-D4.

## 2

### OPEN-CIRCUIT VOLTAGE SENSING

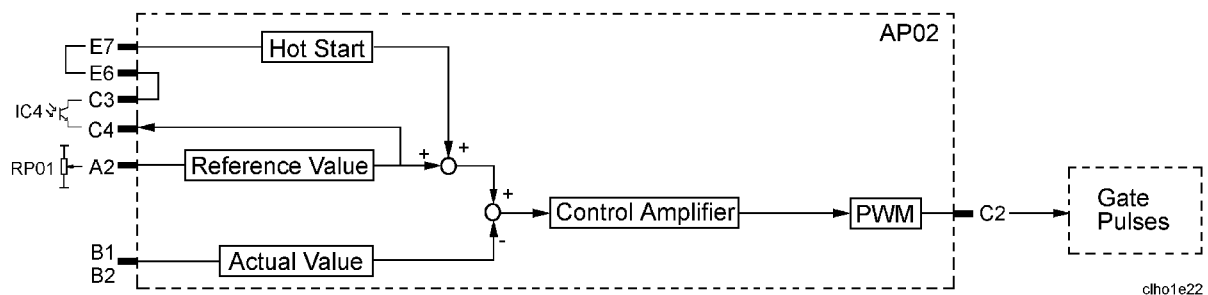


Optocoupler IC4 senses the open-circuit voltage. On open circuit, current flows through the LED and the transistor conducts. Shorting the welding electrode to the workpiece interrupts the current through the LED. The threshold value for activation of IC4 is about 50V output voltage from the machine. The optocoupler output is connected to AP02.

The open-circuit voltage from the machine is 70-90V. **NOTE:** this does not apply for the LHO 110B/150B, for which see the next page.

## 3

### START



The link between contacts E6 and E7 enables the hot start facility. A higher current is required when the arc is struck, and this is known as hot starting. The open-circuit voltage drops when the electrode contacts the workpiece. AP02 receives a signal from optocoupler IC4 via contacts C3 and C4.

During hot starting, The current reference is raised for about 0.5 seconds. The magnitude and duration of the starting current boost depends on the set value of the current.

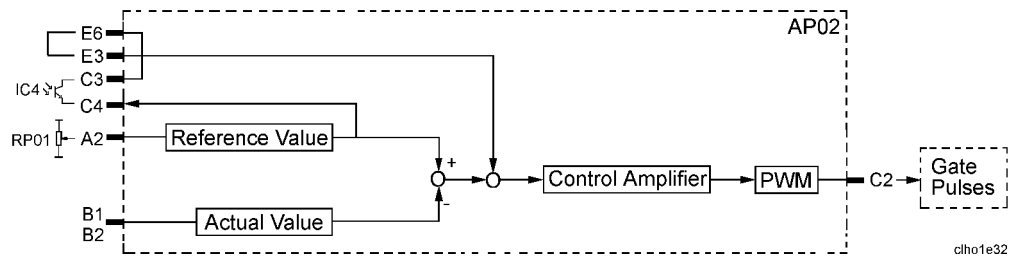
LHO 110: For current setting 110A, the starting current is about 190A.

LHO 150: For current setting 150A, the starting current is about 205 A.

The starting current is proportional to the set value of current.



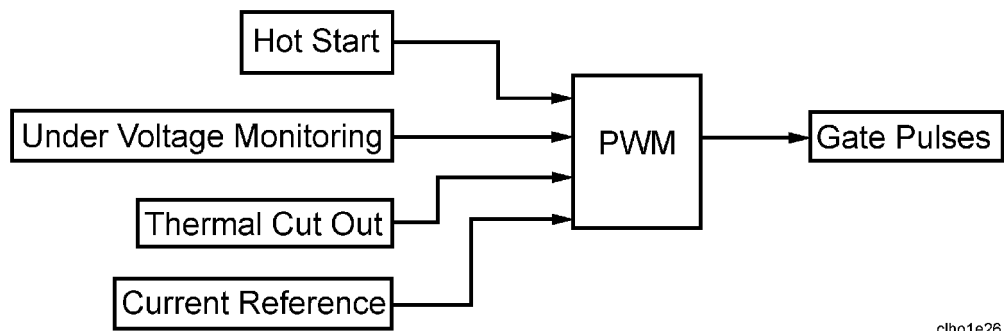
## STARTING PROCEDURE FOR THE LHO 110B/150B



This version of the LHO has no hot start function. The link between contacts E3 and E6 provides open-circuit voltage control: IC4 senses the output voltage, and the open-circuit voltage is limited to about 50V.

### 4

## PULSE WIDTH MODULATOR / GATE DRIVING



*Input signals to the pulse width modulator*

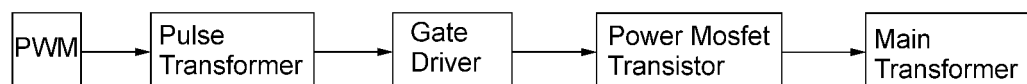
The PWM circuit controls the length of the gate pulses and thus the average value of the welding current. The thermal overload switch and the low-voltage monitor can turn off the pulses: with no pulses from the pulse width modulator, there is no welding current.

The pulse width modulator controls the frequency and pulse duration of the gate pulses to the MOSFET transistors. The pulse frequency is set to  $70.5\text{kHz} \pm 0.5\text{kHz}$ . The maximum pulse factor is 41.6%-42.2%. The proportion between pulse time and frequency depends on each of them, which means that they must both be correctly adjusted.

LHO 110 having a serial number prior to 744, and LHO 150 machines with a serial number prior to 745 have the following data for frequency and pulse factor:  $65\text{kHz} \pm 0.5\text{kHz}$ , 41%.

**Do NOT make measurements when the machine is being powered from the mains.**

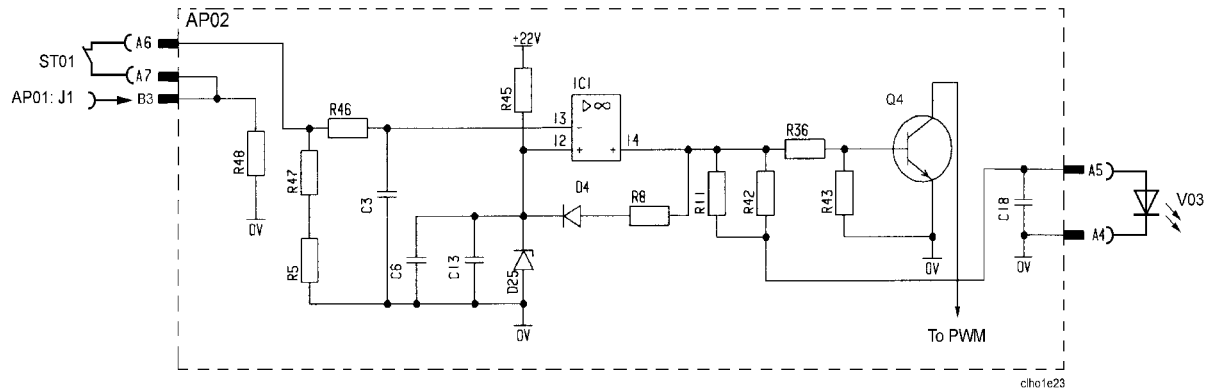
See CHECKING AP02 on page 18.



*Gate driving*

## THERMAL OVERLOAD SWITCH / LOW VOLTAGE MONITOR

### THERMAL OVERLOAD SWITCH



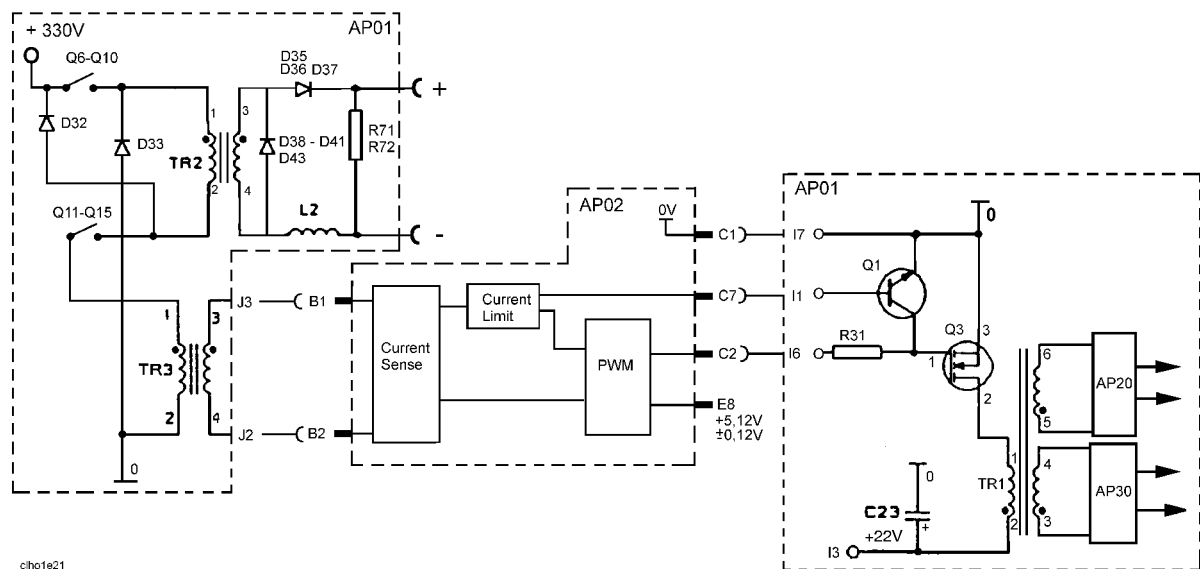
The thermal overload switch, ST01, which is fitted in the end of a heat sink, interrupts the gate pulses if the temperature exceeds  $75^{\circ}\text{C} \pm 5\%$ . LED V03 on the front panel lights to indicate that it has operated. The switch resets automatically when the temperature has fallen to  $55^{\circ}\text{C} \pm 5\%$ .

### LOW-VOLTAGE MONITOR

The low-voltage monitor interrupts the welding current if the voltage from rectifier V01 drops below about 220V DC. The signal to the monitor is taken via contact B3. Operation of the monitor is indicated by LED V03 on the front panel. See the circuit diagram above.

## 6

## CURRENT MEASUREMENT



clho1e21

Current transformer TR3, which has a ratio of 1:100, measures the current in the primary winding of the main transformer. The secondary of the current transformer is connected to AP02 via contacts J2 and J3.

The voltage is measured and the actual value of the welding current is calculated. It is compared with the set value, and the difference is used to control the reference to the PWM circuit, which controls the welding current to the required set value.

### HIGH-SPEED CURRENT LIMIT

The purpose of this current limit is instantaneously to interrupt the transistor pulse if the welding current exceeds the permissible peak value. Control is automatic, and operates for as long as the peak current is too high.

## DISMANTLING

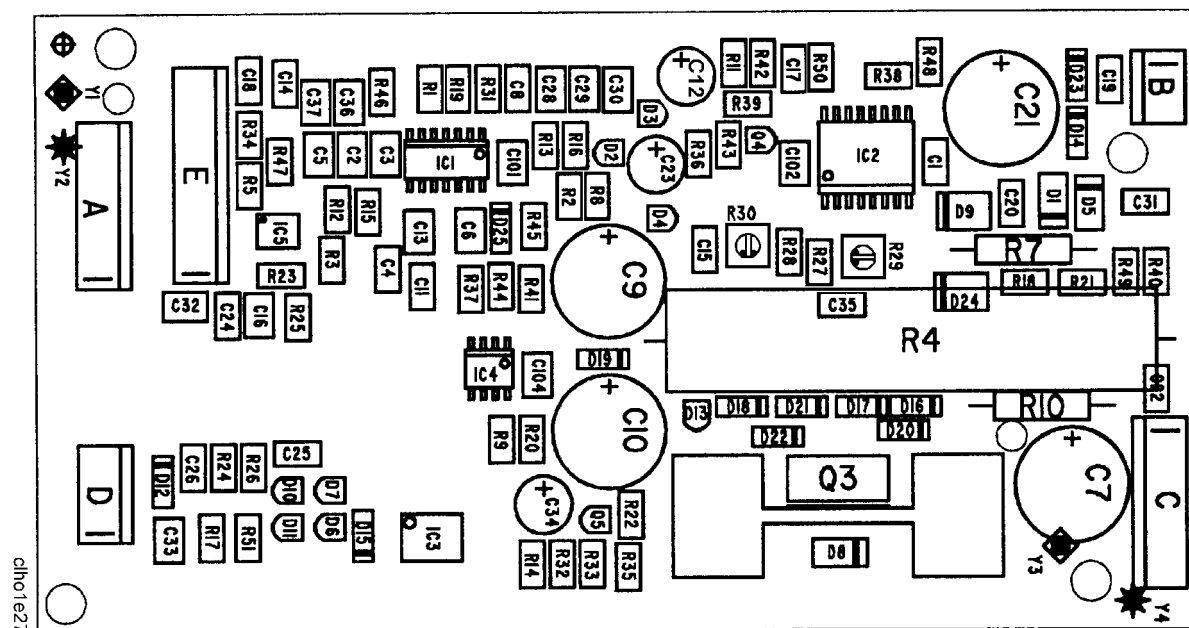
**WARNING: The components in the machine are at mains voltage**

### REMOVING THE CASE

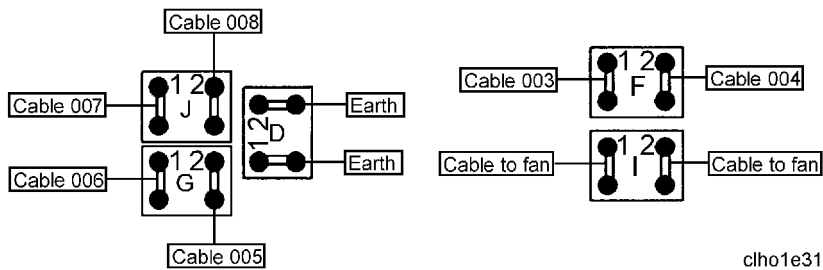
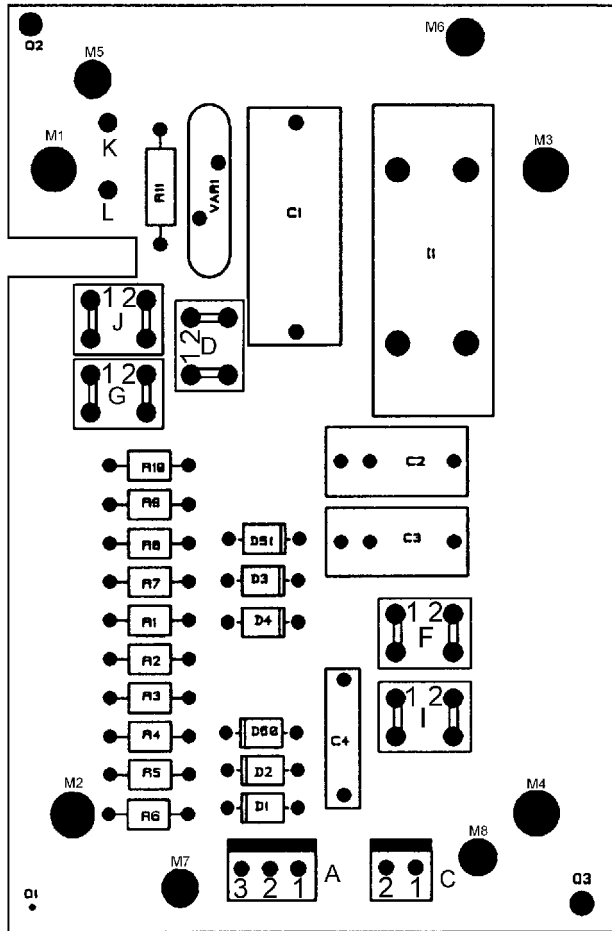
It is important, when dismantling the machine, to note the positions of the parts, in order to be sure of correct re-assembly.

1. Disconnect the machine from the mains supply.
2. Disconnect the welding current and return cables from the front of the machine.
3. Using a Torx screwdriver, remove the four screws from the underside of the case. The screwdriver can be ordered from ESAB: see **SERVICE TOOLS** on page 28.
4. Starting from the back, separate the two halves of the case and then lift the upper half straight up.
5. Remove the lower wires, from upper circuit board AP03, from the mains switch in the cover. Remove the yellow/green wire from AP03.
6. Remove the rear grille from the lower half of the case.
7. Remove the connector from the A contact on circuit board AP02. The wires, of which there are five, come from the cover.
8. Pull the fan forward and fold it out of the way.
9. Remove the four screws at the front and rear edges of the power circuit board AP01.
10. Unscrew the nuts holding the current busbars and bend the bars out of the way.
11. Lift the power unit out of the lower half of the case.

When working on the power unit, place it such that it cannot be damaged.



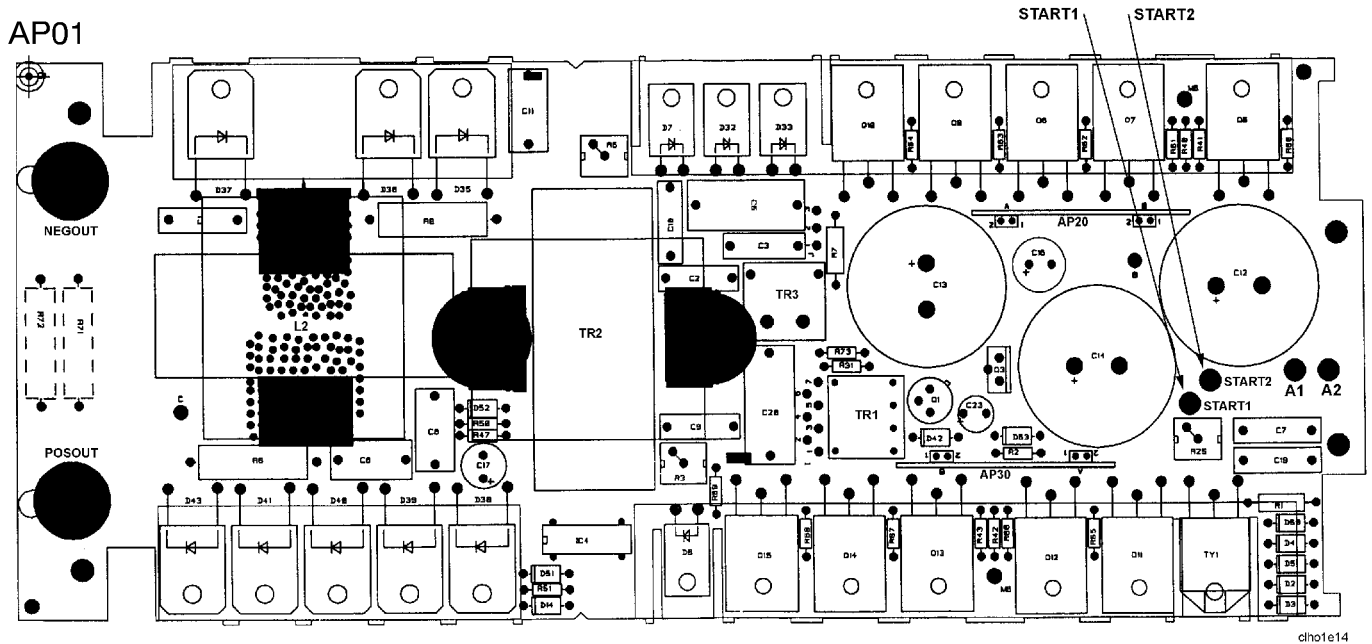
*Component positions, circuit board AP02*



clho1e31

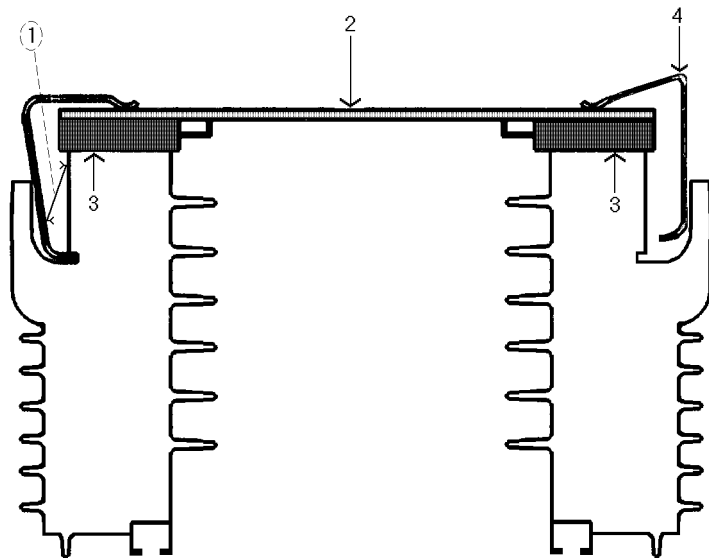
Component positions, circuit board AP03

## REMOVING POWER CIRCUIT BOARD AP01



*Component positions, circuit board AP01*

1. Remove the 11 nuts on the top of the machine.
2. Remove all the contacts on AP03 and contacts A, B and C on AP02.
3. Remove the bridge rectifier, the fan and circuit boards AP02 and AP03.
4. Remove the 11 screws from the slots in the heat sinks.
5. Turn the machine upside down.
6. Remove the springs (2) that hold the board in position by inserting a screwdriver (1) between each spring and the heat sink.
7. Unscrew the four socket-head screws in the bottom of the board, and remove transformer TR2 and inductor L2.
8. Unsolder the wires (blue) to the start1 and start2 thyristor controls.



dho1e03

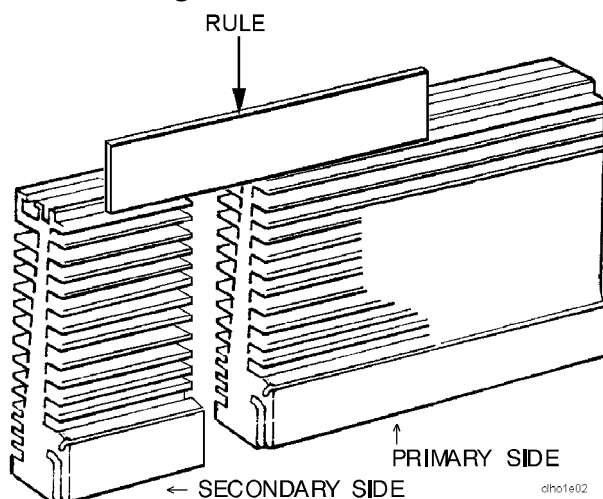
*Removal/refitting of circuit board AP01*

## FITTING

### FITTING CIRCUIT BOARD AP01

When fitting the heat sinks, apply thermal compound to the heat sinks of the secondary side and contact oil to the heat sinks of the primary side. Use only thermal compound and contact oil recommended by ESAB, see **SERVICE TOOLS** on page 28.

1. Fit the transformer and inductor.
2. Solder the start1 and start2 wires back into position.
3. Remove all traces of old varnish on the heat sink contact surfaces (3) if the old ones are being refitted. Polish them with fine abrasive paper (P600). See the figure on the previous page.
4. Heat sinks, **primary side**: apply a thin layer of **contact oil** to the contact surfaces.
5. Heat sinks, **secondary side**: apply a thin layer of **thermal compound** to the contact surfaces.
6. Place the circuit board (2) on the heat sinks, and then fit a spring at each corner by pressing it down with a screwdriver (4). See the figure on the previous page. Fit the rest of the springs.  
**Note:** make sure that the springs are fitted over the components that are to contact the heat sinks. **Always use new springs when re-assembling.**
7. Turn the machine over and insert the screws in the slots.
8. Place circuit boards AP02 and AP03 and the diode bridge in position.
9. Fit the wires and contacts. See 'Fitting AP02 and AP03'.
10. Screw the circuit boards and diode bridge into position.
11. Using a straightedge, check that the heat sinks are parallel with each other and at the same height.



*Aligning the heat sinks using a straightedge*

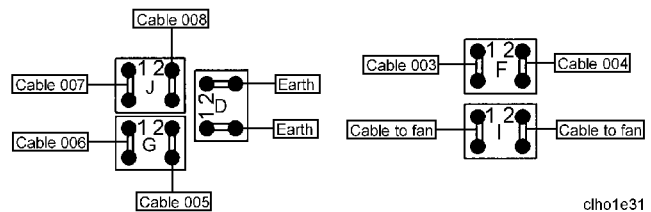
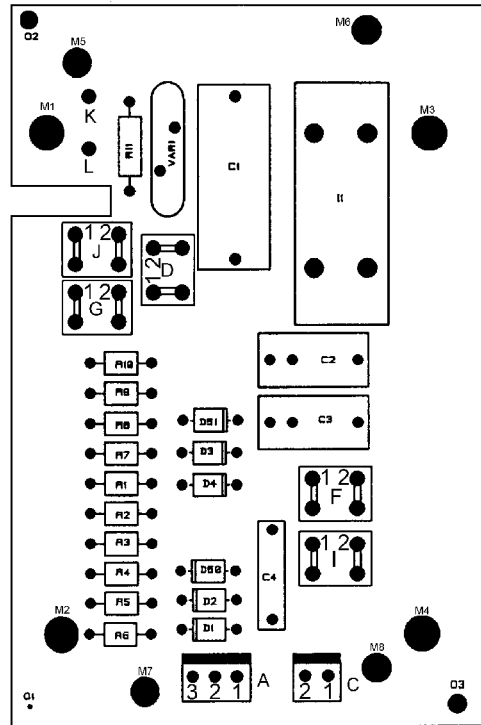
### FITTING POTENTIOMETER RP01

When replacing this potentiometer, the connections must face upwards.

For safety reasons, fit **only** a potentiometer with an insulated shaft.

## FITTING THE CONTACTS TO AP03

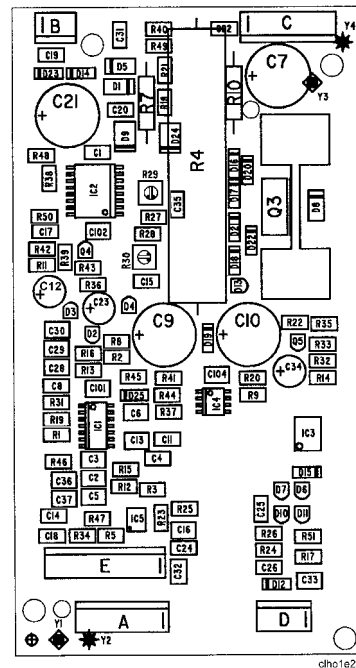
Contact	Wire
A1, A2	Blue (2-TURNS from TR2)
A3	009 black (+40 V DC)
C	010 from welding negative
D1	Yellow/green
F1	003
F2	004
G1	006
G2	005
J1	007
J2	008
I1, I2	230 V to the fan



clho1e31

## FITTING THE CONTACTS TO AP02

Contact	Wire
A1 - A3	To potentiometer
A4	011 to LED
A5	012 to LED
A6 - A7	To the thermal overload switch
B1 - B3	From AP01
C1 - C7	From AP01
D	Not fitted
E6 - E7	Link



clho1e27

## FITTING THE CASE

Fit the case in the reverse order to that of removal. Take care to ensure good contact between the busbars and the OKC connectors.



## FAULT TRACING

Measuring the open-circuit voltage:

1. Remove the positive and negative welding current cables from the machine.
2. Connect the mains supply plug to the mains and measure the voltage at the welding terminals with a multimeter. The value must be between 70-90 V, and not be affected by the potentiometer. The open-circuit voltage for the LHO 110B/150B must be 45-70 V.

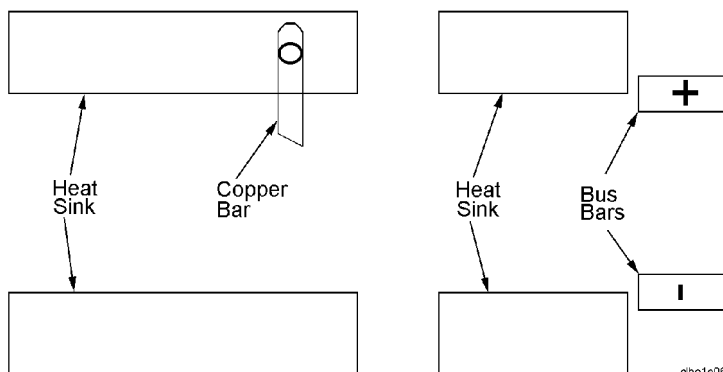
**This is the only measurement that may be made when the unit is connected to the mains power supply. Never make any measurements in the machine when it is connected to the mains power supply in the normal way.**

Now make sure that the mains cable is **not** connected to the mains power supply.

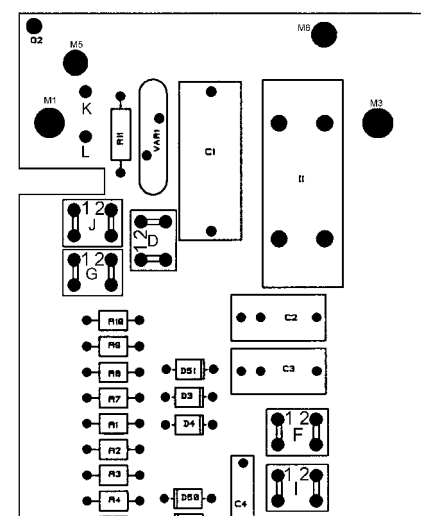
Dismantle the machine as described by items 1-7 on page 12.

Check:

1. Diode bridge V01: check the diodes with a multimeter.
2. Charging resistor R25 on AP01: measure between J1 on AP03 and the heat sink not having a copper strip. The value must be about  $22\Omega$ .
3. The switching transistors: measure across the large heat sinks, using the multimeter in the diode test position, with the positive connection on the heat sink having a copper strip. The value must be 0.3 - 0.5 V.  
Measuring with reverse polarity will indicate a higher value, which will rise as a result of charging up capacitors. If a value of less than 0.3 V is found, it indicates that a transistor has failed.
4. The welding and freewheel diodes: measure the resistance across the current busbars, with the positive terminal of the multimeter to the negative on the machine and the instrument negative to the machine positive. Then reverse the connections and re-measure. Both values must be about  $2.3\text{ k}\Omega$ . Measuring using the diode test position will give measured values of about 0.4 V and about 1.2 V respectively.
5. Capacitors C12 - C14 on AP01: measure using the negative terminal of the multimeter to contact AP03:J2 and the positive to the heat sink without a copper strip. The value must be about  $1500\mu\text{F}$ .



*Heat sinks and busbars to the OKC connector*



*Circuit board AP03*

**WARNING: The mains cable must be disconnected from the supply. Never make any measurements in the machine when it is connected to the mains power supply in the normal way.**

## **CHECKING AP02**

Follow items 1 to 5 under the headline **SOFT STARTING** below.

Turn circuit boards AP02 and AP03 so that the contacts on AP02 are accessible. Remove contact C (7-pole) from AP02. Connect 30V DC between contacts C1 and C6 on circuit board AP02; positive to C6 and negative to C1.

Measure the voltages on the E connector, relative to C1 (= 0 V). The link between B3 and E2 disables the undervoltage protection.

- a. E2: +10 V, tolerance 10-11 V.
- b. E4: +15 V, tolerance 15-17.5 V. With link B3-E2 connected: 12.2 V.
- c. E5: +22 V, tolerance 22-26 V. With link B3-E2 connected: 20 V.
- d. Measuring the PWM pulses: The thermal overload switch must be connected, or contacts A6-A7 be linked in order to obtain gate pulses.  
Using an oscilloscope, measure the pulses from the PWM circuit across C1 and C2. Frequency and duty cycle for the pulses are to be found on page 9. The edges of the pulses need to be square (not rounded).

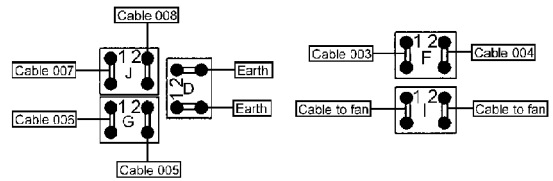
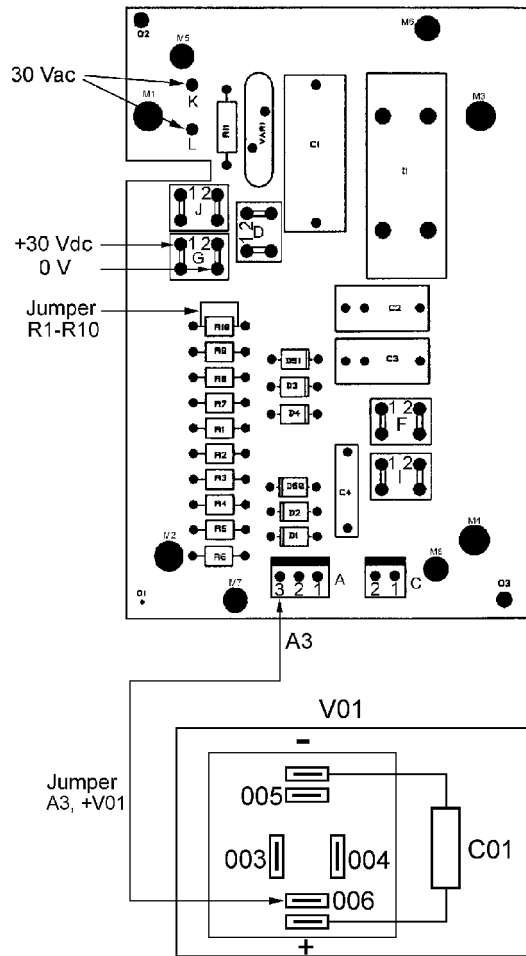
If the measurements above are within the tolerances AP02 is OK. Reassemble the contacts and check that they are correctly connected.

## **SOFT STARTING**

Three contacts are needed in order to make the link connections and measurements on circuit board AP02. See under **SERVICE TOOLS** on page 28 for details of the ordering numbers of the contacts.

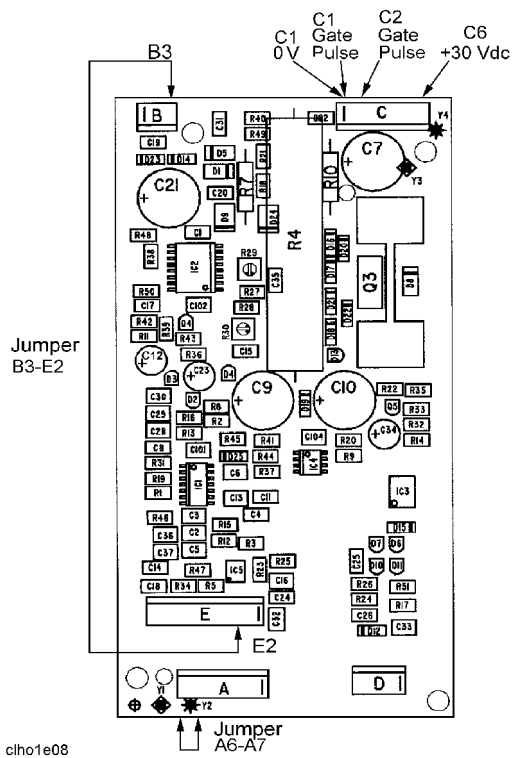
1. Dismantle the machine as in items 1 - 7 on page 12.
2. Place the fan so that it cannot short-circuit the welding current busbars.
3. Remove circuit boards AP02 and AP03, and remove connections A6-A7 (the thermal overload switch) from AP02.
4. Transfer the hot start link (E6-E7) to A6-A7 to replace the thermal overload switch during soft starting.
5. Remove contact B (3-pole) from AP02. Connect contact B3 to contact E2, which disables the under-voltage monitoring function.
6. Replace circuit boards AP02 and AP03, but do not screw them down.
7. Connect AP03:A3 to the positive on V01, Connector A3 must remain connected.
8. Connect 30V from a DC power supply to AP03. Connect to plus and minus on V01.
9. Measure the voltage between the busbars. The value must be about 7.5 V. The current from the DC power supply is about 0.4A.
10. Remove the thermal overload switch connections (A6-A7). The current must now drop to not more than 0.1 A. Then reconnect the thermal switch to A6 - A7.

If the measurements above are within the tolerances, reassemble the machine and make a test weld.



cho1e07

Test and connection points on circuit board AP03



cho1e08

Test and connection points on circuit board AP02

## TECHNICAL DATA

	Caddy 110	Caddy 150
Performance: at 25% duty cycle at 35% duty cycle at 60% duty cycle at 100% duty cycle	110 A/24 V 95 A/24 V 80 A/23 V	150 A/26 V 140 A/26 V 110 A/25 V 90 A/24 V
Setting range	13-110 A	13-150 A
Open circuit voltage	70-90 V LHO 110B: 45-70 V	70-90 V LHO 150B: 45-70 V
Mains supply: voltage frequency fuse mains cable, area	230 V AC 50/60 Hz 16 A slow* 3x1.5 mm <sup>2**</sup>	230 V AC 50/60 Hz 16 A slow* 3x1.5 mm <sup>2**</sup>
Enclosure class	IP 23	IP 23
Application class	<b>S</b>	<b>S</b>
Dimensions L x W x H	375 x 145 x 280 mm	375 x 145 x 280 mm
Weight	6.7 kg	6.7 kg

The welding power source comply with the requirements set out in IEC 974-1

*\*When welding below 100 A a 10 A slow fuse is adequate..*

*\*\*Power cable ratings complies with Swedish regulations..*

### Duty cycle

The duty cycle refers to the time in per cent of a ten-minute period that you can weld at a certain load without overloading the welding power source.

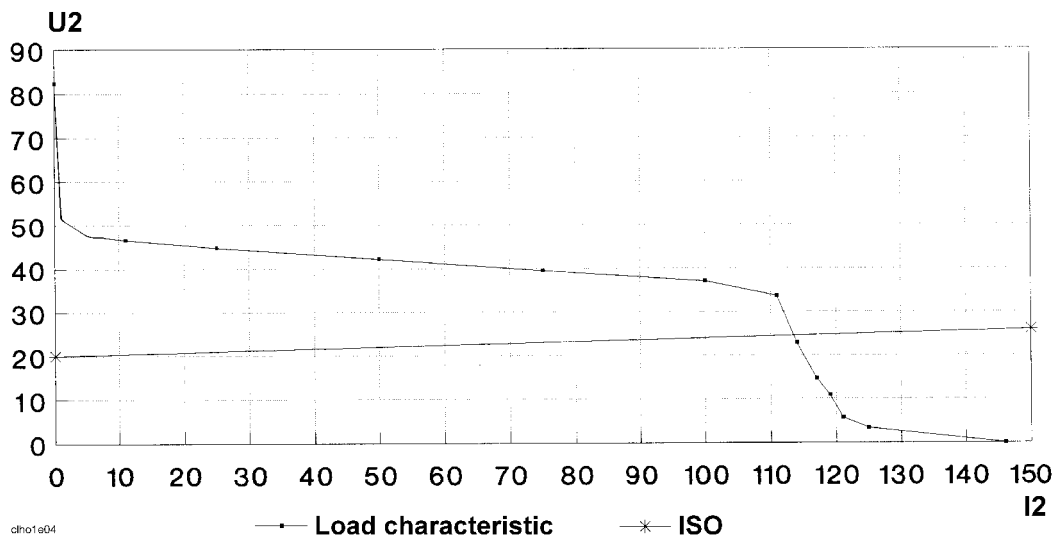
### Enclosure class

The **IP** code indicates the enclosure class, i. e. the degree of protection against penetration by solid objects or water. Equipment marked **IP 23** is designed for indoor and outdoor use.

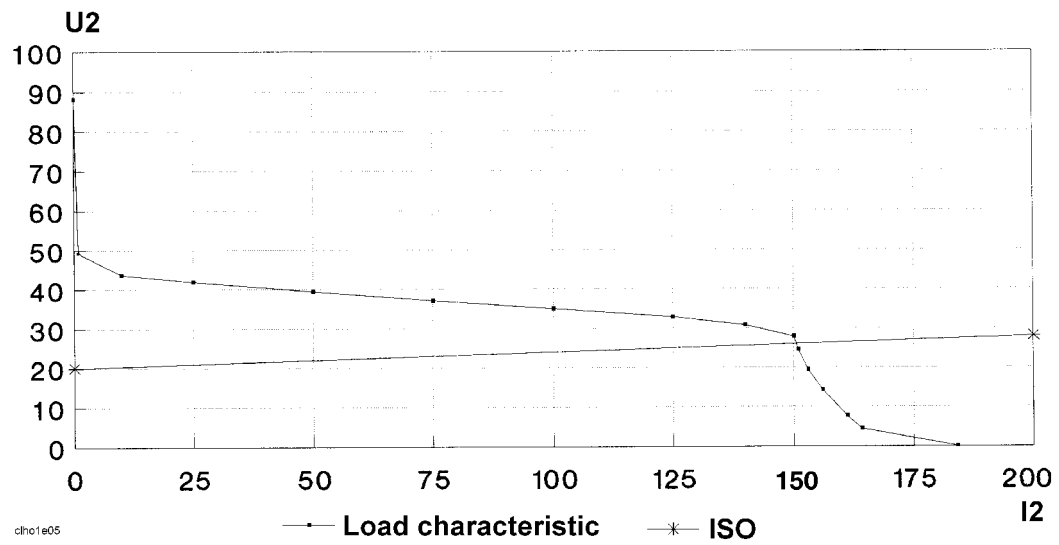
### Application class

The symbol **S** indicates that the power source is designed for use in areas where there is an increased electrical hazard.

# LOAD CHARACTERISTIC



Load characteristic, LHO 110



Load characteristic, LHO 150

## **INSTRUCTIONS**

This chapter contains an extract from the instruction manual for LHO 110/150.

---

### **INTRODUCTION**

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<p><b>Note!</b> <b>This product is solely intended for arc welding.</b></p>
---

Caddy 110 and Caddy 150 are two rectifying welding power sources based on the inverter technique, intended for welding with coated electrodes (MMA welding). Caddy also has very good TIG welding characteristics.

#### **Equipment**

The welding power sources Caddy 110 and Caddy 150 are delivered with:

- Mains cable (3 metres)
- Welding cable with electrode holder (3 metres)
- Return cable with earth clamp (2.5 metres)

#### **Field of application**

Caddy 110 and Caddy 150 both supply direct current, which allows you to weld most alloyed and non-alloyed steels, stainless steels and cast iron.

With the Caddy 110 you can use coated electrodes from 1.6 to 2.5 mm, and with the Caddy 150 coated electrodes from 1.6 mm to 3.25 mm.

#### **TIG welding**

TIG welding is particularly useful when high quality standards are required and when welding thin sheet.

Before using the Caddy for TIG welding it must be equipped with a TIG torch and gas valve, a cylinder of argon, an argon regulator, tungsten electrodes and, if necessary, suitable filler metal.

The best method to use is the touch start, where you gently stroke the tungsten electrode against the workpiece to establish the arc.

---

## **INSTALLATION**

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### **WARNING**

This product is intended for repair and maintenance welding  
In domestic or office environment this product may cause radio interference.  
It is the responsibility of the user to take adequate precautions.

### **Placing**

Place the machine so that there is nothing to prevent the cooling air from passing through it.

### **Mains connection**

The rating plate including connection data is placed on the underside of the welding power source.

Connect the welding power source to an earthed mains terminal. Make sure the welding power source is connected for the correct mains voltage and properly fused.

- Mains voltage 230 V
- Mains frequency 50-60 Hz
- Fuse, slow rupture 16 A
- Mains cable, area 3 x 1,5 mm<sup>2</sup>

### **Connection of welding and return cable**

The welding power source has two terminals, one plus and one minus pole, for the connection of the welding and the return cable. Connect the welding cable to the pole indicated on the package of the electrode to be used.

Connect the return cable to the other terminal. Fit the earth clamp of the return cable to the work-piece and make sure there is good contact between the work-piece and the return cable terminal on the welding power source.

---

## **OPERATION**

---

### **Start-up**

- Make sure that the cables and the earth clamp are properly connected.
- Start the welding power source by setting the mains switch to position 1.
- Set the welding current, using the knob on the front panel of the power source. Follow the instructions on the electrode package for the recommended welding current.

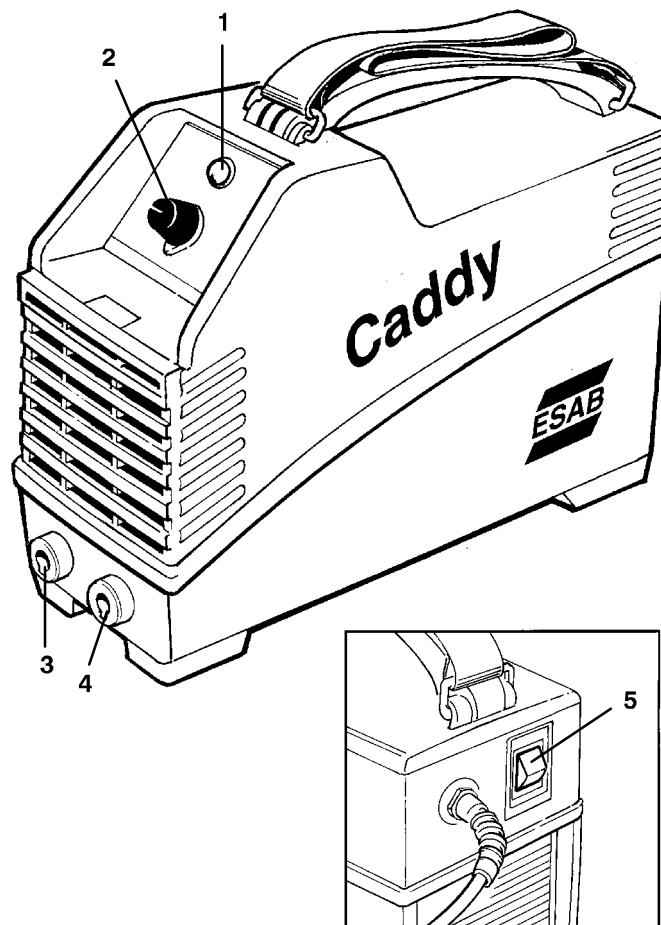
## Overload protection

Caddy 110 and Caddy 150 are provided with a thermal cut-out to prevent overheating of the welding power source. In the event of overload the supply voltage is interrupted and the orange lamp on the front goes on. Resetting takes place automatically as soon as the welding power source has cooled down.

## Mains voltage compensation

Caddy 110 and Caddy 150 both have mains voltage compensation, which means that  $\pm 10\%$  fluctuation in the supply voltage produces only  $\pm 0.2\%$  variation in the welding voltage.

## Controls and connections



1. *Orange indicating lamp (overheating)*
2. *Knob for adjusting the welding current*
3. *Terminal, minus pole, for connecting welding or return cable*
4. *Terminal, plus pole, for connecting welding or return cable*
5. *Mains switch*



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**MAINTENANCE**

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**Cleaning**

Normally it is sufficient to blow the welding power source clean regularly using dry compressed air (reduced pressure), and to clean the filter in the front regularly.

In dusty and dirty environment the welding power source should be cleaned at shorter intervals.

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**FAULT TRACING**

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**Possible faults and measures to take**

<b>Type of fault</b>	<b>Measure</b>
No arc is generated by the welding power source.	<ul style="list-style-type: none"> <li>• Make sure the mains switch is on.</li> <li>• Check that the welding and return cables are properly connected.</li> <li>• Make sure the welding current set is correct.</li> </ul>
The welding current is interrupted in the course of welding.	<ul style="list-style-type: none"> <li>• Check if the thermal cut-out has tripped (the orange indicating lamp on the front panel is on).</li> <li>• Check the mains fuse.</li> </ul>
The thermal cut-out trips frequently.	<ul style="list-style-type: none"> <li>• Check that the filter is not packed with dust.</li> <li>• Check that the ratings of the welding power source have not been exceeded (overload of the power source).</li> </ul>
Poor welding result.	<ul style="list-style-type: none"> <li>• Check that the welding and return cables are properly connected.</li> <li>• Make sure the welding current set is correct.</li> <li>• Check that there is nothing wrong with the electrodes.</li> </ul>

---

**ORDERING OF SPARE PARTS**

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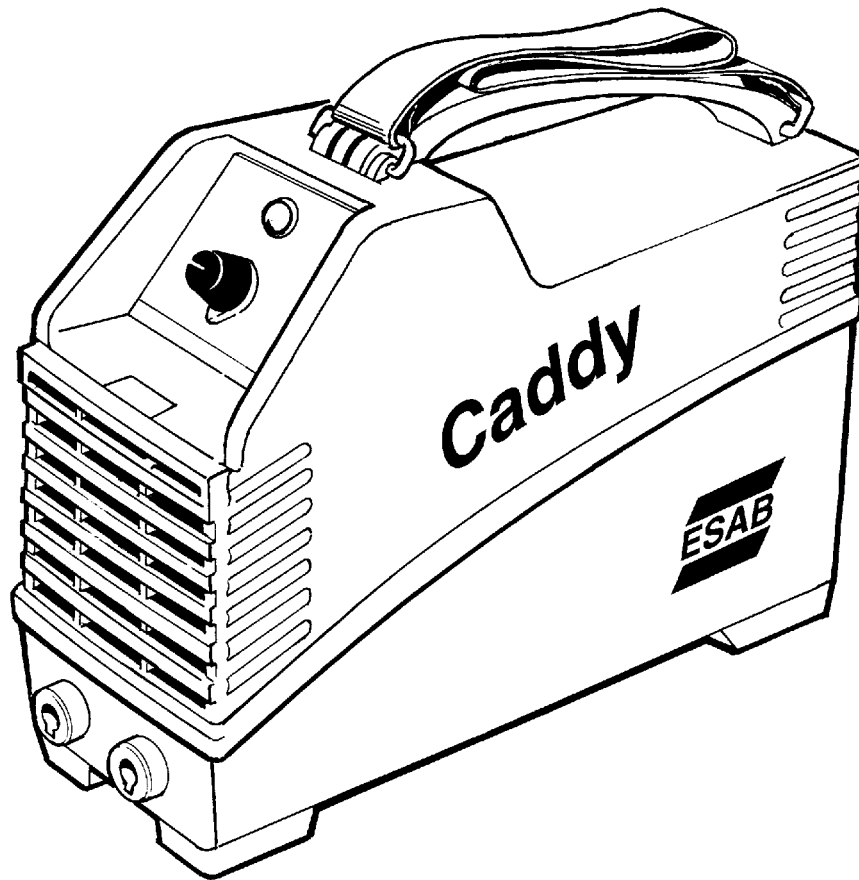
When ordering a spare part, please state the type and serial number of the machine as well as number of the spare part, according to the spare parts list.

This will simplify dispatch and ensure you get the right part.



## SPARE PARTS LIST LHO 110/150

Edition 980529



### Ordering numbers for LHO 110/150

0456 540 880	LHO 110	Caddy 110
0456 545 880	LHO 150	Caddy 150
0456 540 881	LHO 110B	Caddy 110B, special version for Belgium
0456 545 881	LHO 150B	Caddy 150B, special version for Belgium

## SPARE PARTS LIST LHO 110/150

C = component designation in the circuit diagram

Item	LHO 110	LHO 150	Ordering no.	Denomination	Notes	C
100	1	1	0456 538 001	Cover	Lower part	
101	1	1	0456 539 001	Inner grating		
102	1	1	0456 537 001	Cover	Upper part	
103	1	1	0456 192 881	Mains cable		
104	1	1	0193 307 104	Cable bush		
105	1	1	0193 317 001	Switch		QF1
106	1	1	0212 602 208	Nut		
107	1	1	0468 208 001	Strap		
108	2	2	0456 572 001	Clamp		
109	1	1	0321 475 885	Knob		
110	1	1	0193 995 501	Potentiometer		RP01
111	1	1	0455 201 002	Light-emitting diode		V03
112	1	1	0456 541 001	Front grating		
113	1	1	0456 574 001	Filter		
114	2	2	0366 306 881	Connector	OKC 25	
114b	2	2	0366 306 882	Connector	OKC 25 See 1) below	
115	2	2	0160 362 005	Nut		
115b	2	2	0192 238 327	Screw	See 1) below	
-	1		0194 034 001	Ferrite ring core	Mounted only on earth cable (yellow/green)	L02
116		1	0194 034 002	Ferrite ring core		L02
-	1	1	0457 051 880	Return welding cable	Complete	
-	1	1	0457 049 001	Electrode holder		

1) Items 114b and 115b are only used in some of the machines with machine numbers as listed below:

LHO 110: from no. 744 750 . . . . to no. 744 807 . . . .

LHO 150: from no. 745 750 . . . . to no. 745 807 . . . .

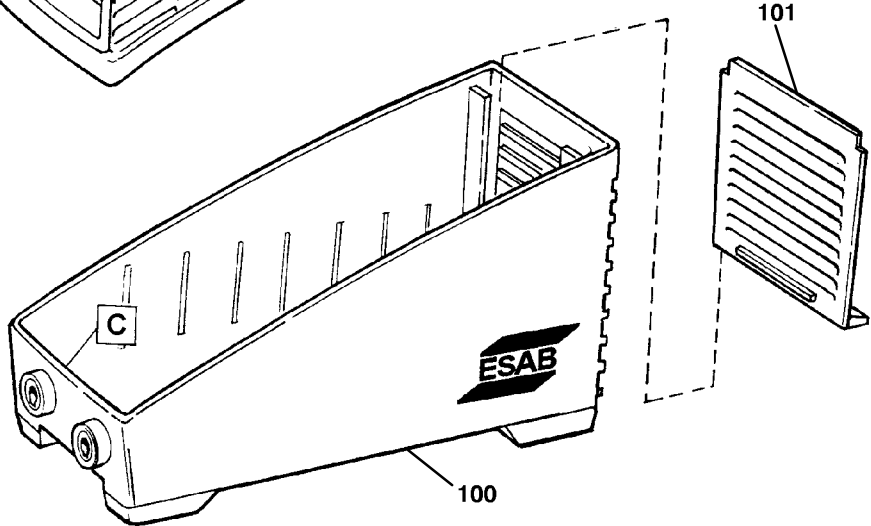
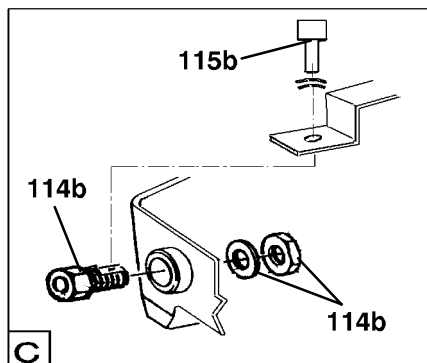
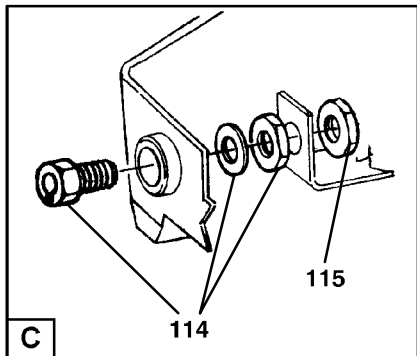
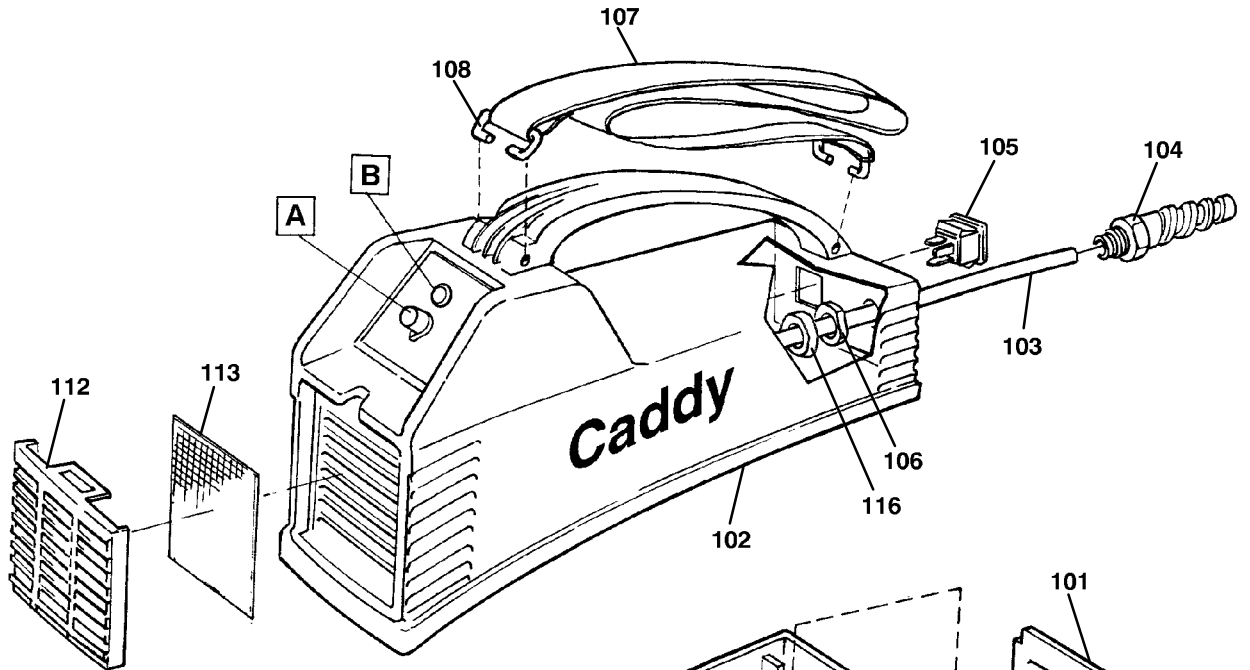
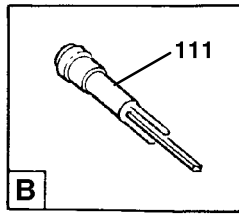
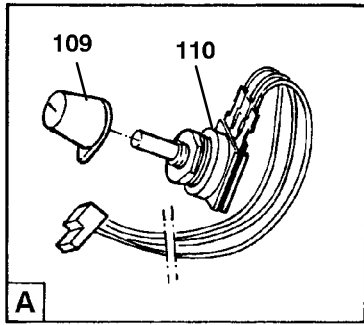
LHO 110B/150B: from no. 750 750 . . . . to no. 750 807 . . . .

This is also valid for item 221b on page 30.

### SERVICE TOOLS

Qty	Ordering no.	Denomination	Notes
1	0192 058 106	Contact oil	To be used when mounting the heat sinks on the primary side.
1	0192 058 101	Thermal compound	To be used when mounting the heat sinks on the secondary side.
1	0193 260 062	Connector	3-pole, to be used on contact B on AP02
1	0193 260 066	Connector	7-pole to be used on contact C on AP02
1	0193 260 068	Connector	9-pole to be used on contact E on AP02
1	0457 488 001	Torx screw driver	For dismantling the machine

**SPARE PARTS LIST LHO 110/150**



clho1p01

clho1p21

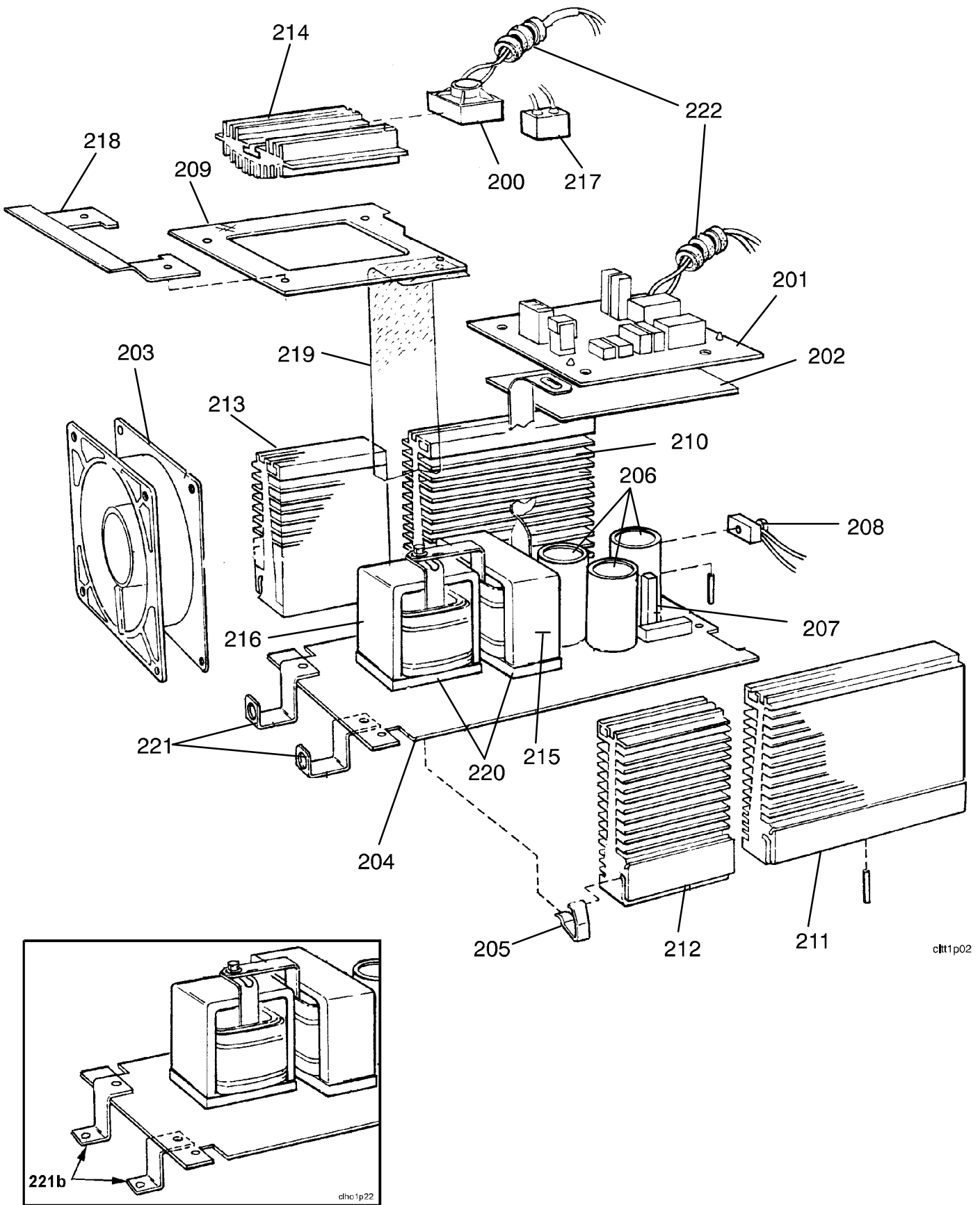
## SPARE PARTS LIST LHO 110/150

C = component designation in the circuit diagram

Item no.	Qty LHO 110	Qty LHO 150	Ordering no.	Denomination	Notes	C
200	1	1	0193 316 208	Rectifier bridge		V01
201	1	1	0486 457 880	Printed circuit board	EMC	AP03
202	1		0486 509 884	Printed circuit board	Before machine no. 744 . . . . .	AP02
			0486 509 890	Printed circuit board	From machine no. 744 . . . . .	AP02
	1	1	0486 509 882	Printed circuit board	Before machine no. 745 . . . . .	AP02
		1	0486 509 892	Printed circuit board	From machine no. 745 . . . . .	AP02
	-	-	0486 509 886	Printed circuit board	Only for <b>LHO 110B</b>	AP02
	-	-	0486 509 880	Printed circuit board	Only for <b>LHO 150B</b>	AP02
203	1	1	0365 539 001	Fan		EV01
204	1		0457 875 880	Printed circuit board	Item 205, 16 springs are included	AP01
		1	0457 875 881	Printed circuit board	Item 205, 23 springs are included	AP01
205	16	23	0457 002 001	Spring	Included in item 204	
206	3	3	0193 965 019	Capacitor	400V 470 $\mu$ F included in AP01	
207	1	1	0194 017 117	Resistor	9W 22 $\Omega$ included in AP01	
208	1	1	0468 940 002	Thermal switch	75°C	ST01
209	1	1	0457 044 001	Cover		
210	1	1	0457 232 001	Heat sink		
211	1	1	0457 232 002	Heat sink		
212	1	1	0456 576 080	Heat sink		
213	1	1	0456 576 075	Heat sink		
214	1	1	0456 699 060	Heat sink		
215	1		0456 546 880	Transformer*	Before machine no. 744 . . . . .	TR2
		1	0456 568 880	Transformer*	From machine no. 744 . . . . .	TR2
	1	1	0456 546 880	Transformer*	Before machine no. 745 . . . . .	TR2
		1	0456 568 880	Transformer*	From machine no. 745 . . . . .	TR2
216	1		0456 547 880	Inductor*	Welding current inductor	
		1	0456 569 880	Inductor*	Welding current inductor	
217	1	1	0320 805 884	Capacitor		C01
218	1	1	0457 081 001	Angle		
219	2	2	0457 265 001	Insulation		
220	2	2	0457 254 001	Spacer	For item 215 and 216	
221	2	2	0456 575 002	Bus bar		
221b	2	2	0456 575 001	Bus bar	See 1) on page 28	
222		6	0193 494 003	Ferrite ring cores		L01, L03-L07
222	1		0193 494 003	Ferrite ring core		L01

\*Items 215 and 216 are mounted on item 204, but they are not included in item 204

**SPARE PARTS LIST LHO 110/150**



clt1p02







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