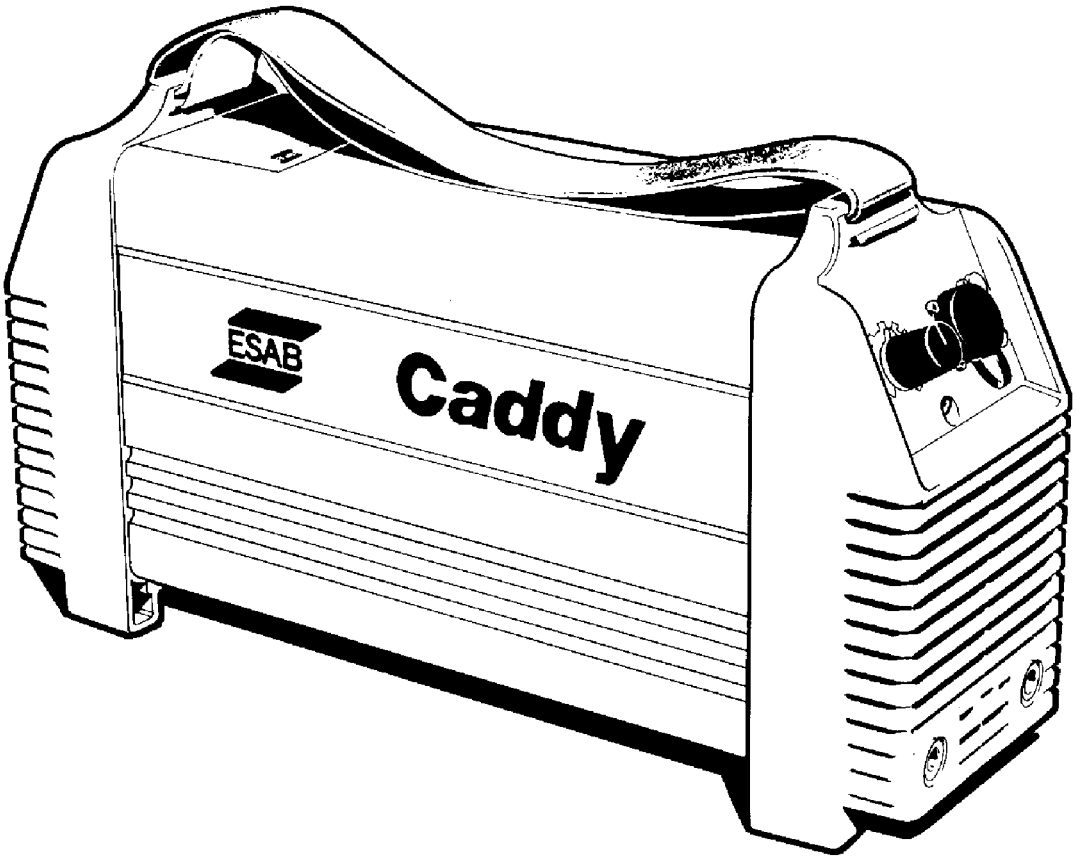
LHN 130/140/200

Caddy 130/140/200



Service manual

0740 800 043 040906

Valid for serial no. 301-xxx-xxxx to 220-xxx-xxxx

LIST OF CONTENTS

READ THIS FIRST

Maintenance and repair work should be performed by an experienced person, and electrical work only by a trained electrician. Use only recommended replacement parts.

This service manual is intended for use by technicians with electrical/electronic training for help in connection with fault-tracing and repair.

Use the wiring diagram as a form of index for the description of operation. The circuit board is divided into numbered blocks, which are described individually in more detail in the description of operation. All component names in the wiring diagram are listed in the component description.

This manual contains details of all design changes that have been made up to and including August 2004.

The manual is valid for the LHN 130, LHN 140 and LHN 200 with serial numbers: 301-xxx-xxxx, 508-xxx-xxxx, 535-xxx-xxxx, 540-xxx-xxxx, 628-xxx-xxxx, 011-xxx-xxxx and 220-xxx-xxxx.

The LHN 130, LHN 140 and LHN 200 are designed and tested in accordance with international and European standard IEC/EN 60974-1 and EN 50199.
On completion of service or repair work, it is the responsibility of the person(s) etc. performing the work to ensure 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!

ESD

WARNING !

STATIC ELECTRICITY can damage circuit boards and electronic components.

- **Observe precautions for handling electrostatic sensitive devices.**
- **Use proper static-proof bags and boxes.**

COMPONENT DESCRIPTION, LHN 130/140/200

This component description relates to the wiring diagrams on pages 7 - 11.

The LHN 130/140/200 rectifier power units are primary switched type, using parallel-connected MOSFET transistors as switching devices. Switching frequency is 36 kHz. The conduction interval ranges between zero and 11 µs, depending on the welding current being supplied. The conduction time and frequency are controlled by circuit board AP01.

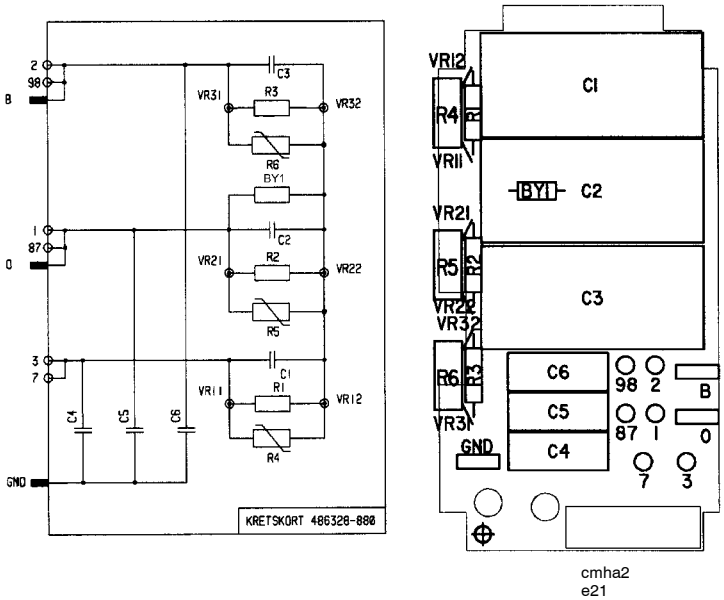
AP01 Main circuit board with control electronics. See the description on page 14.

AP02 Circuit board with power transistors for the positive pole:see description on page 20.
WARNING: these transistors are at mains voltage.

AP03 Circuit board with power transistors for the negative pole:see description on page 22.
WARNING: these transistors are at mains voltage.

AP04 Suppression circuit board and protection against transient voltages: protects the secondary diodes against transient voltages.
Replaced by capacitors C06 from serial number 628-xxx-xxxx.
See “transient protection, rectifer unit V03, V04” on page 6.

AP05 Suppression circuit board, EMC. Protects from mains borne interference to/from the machine. Mounted from serial no. 540-xxx-xxxx.
LHN 200: The ferrite ring cores L06 and L07 are included in AP05.



Circuit diagram and component positions circuit board AP05

C01 Capacitor, 0.1 µF, 1000 VDC, transient protection.

C02 Capacitor, 1000 µF, buffer/smoothing capacitor. This capacitor takes about two minutes to discharge after disconnecting the equipment from mains.

C03 See C02. Not mounted in LHN 130/140.

C04	Capacitor, 0.1 µF, 1000 VDC, protects the equipment against RFI.
C05	2 - capacitors, 4.7 µF: see L02. Not mounted in LHN 130.
C06	2 - capacitors, 12 nF. Protection against transient voltages. Replacing AP04 from serial number 628-xxx-xxxx. See "transient protection, rectifer unit V03, V04" on page 6. C06 is replaced by ferrite rings (L03-L05) from ser. no. 011-xxx-xxxx.
EV01	Fan, 24 VDC. Note: The fans are different in LHN 130 and LHN 140/200. In LHN 130 must not the same fan be used as in LHN 140/200.
HL01	Indicating lamp, 28 V, white, showing that the mains power supply is turned on.
L01	Secondary inductor.
L02	Inductor. Not mounted in LHN 130. Together with C05 and V06, this forms an LC circuit which reduces the risk of the arc extinguishing at low welding currents. Capacitor C05 in the LC circuit charges when V03 conducts. The circuit can temporarily maintain a high output voltage at low welding current, reducing the risk of the arc being extinguished. Diode V06 protects capacitor C05 against negative voltage.
L03	**LHN 140**: Primary inductor, for improving the machine's form factor, i.e. reducing mains loading. **LHN 200**: Ferrite ring core (from serial number 011-xxx-xxxx).
L04	**LHN 200**: Coil, included in conductor 013. **LHN 140**: Ferrite ring core (from serial number 011-xxx-xxxx).
L05	Ferrite ring core (from serial number 011-xxx-xxxx).
L06, L07	**LHN 200**: Ferrite ring cores, included in AP05.
QF1	Mains switch: 2-pole in the LHN 130/140 and 3-pole in the LHN 200.
RP01	Potentiometer for adjusting welding current, 10 kΩ, 2 W.
RS01	Shunt, 120 mV at 130 A or 140 A or 200 A respectively.
RV01	Varistor, 275 V, transient voltage protection. Only LHN 130/140. From serial no. 540-xxx-xxxx the transient voltage protection is included at circuit board AP05.
RV01-RV03	Varistors, 480 V, transient voltage protection. Only LHN 200. From serial no. 540-xx-xxxx the transient voltage protection is included at circuit board AP05.
ST01	Thermal overload cutout, fitted in the main transformer (TC02) winding. LHN 130/140: interrupts at 130 °C, recloses at 100 °C. LHN 200: interrupts at 150 °C, recloses at 130 °C.
TC01	Control power supply transformer. Primary side is supplied at 230 V or 400 V respectively. Dual secondary windings supply 20.5 V and 17 V to circuit board AP01.
TC02	Main transformer: see on page 29 for installation instructions.

V01, V02 Mains rectifier diode bridge, 35 A, 1200 V. After replacing the rectifier bridges, the machine must be soft-started: see instructions on page 25. Rectifier bridge V02 is only mounted in LHN 200.

V03, V04 Rectifier and freewheel diodes.

V03 rectifies the welding current.
During the time interval between two voltage pulses from transformer TC02, the freewheel diodes V04 maintain the welding current from inductor L01.

Before serial number 628-xxx-xxxx:
V03 consists of six parallel-connected diodes, and V04 consists of eight parallel-connected diodes. V03 and V04 are mounted on the same cooling fins. If any of the diodes is/are faulty, the entire cooling fin unit must be replaced, as the diodes are soldered to it. For spare parts see the spare parts list item 430 (LHN 140/200) and item 830 (LHN 130)

From serial number 628-xxx-xxxx:
A new rectifier unit is introduced. On the cooling fins in LHN 130/140 is one diode module mounted and in LHN 200 are two diode modules mounted. Each diode module has two diodes.
See page 27 for fitting instructions.

V05 LED, yellow.
Lit when thermal overload cutout ST01 opens due to high temperature.

V06 Diode: see L02. Not mounted in LHN 130.

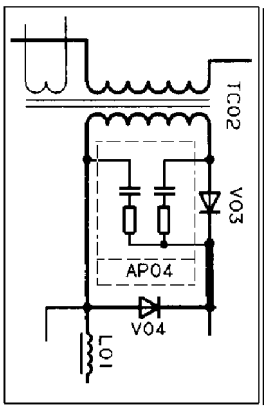
X01 Mains terminal block: 4-pole or 8-pole respectively. Replaced by circuit board AP05 from serial no. 540-xxx-xxxx.

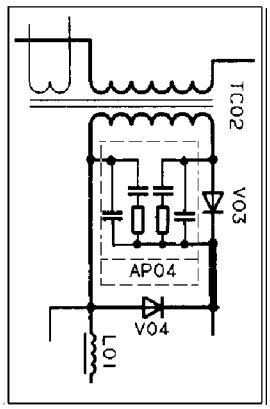
XS01-XS13 Sleeve connectors.

XS11 **LHN 140/200**: 12-pole connector for connection of remote control unit.

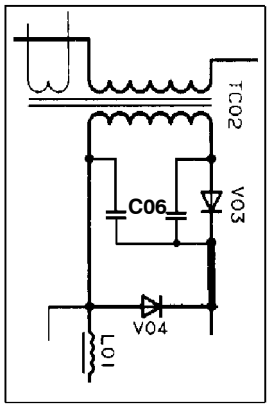
XS12 Welding terminals (2 - OKC connectors).

TRANSIENT PROTECTION, RECTIFIER UNIT V03, V04



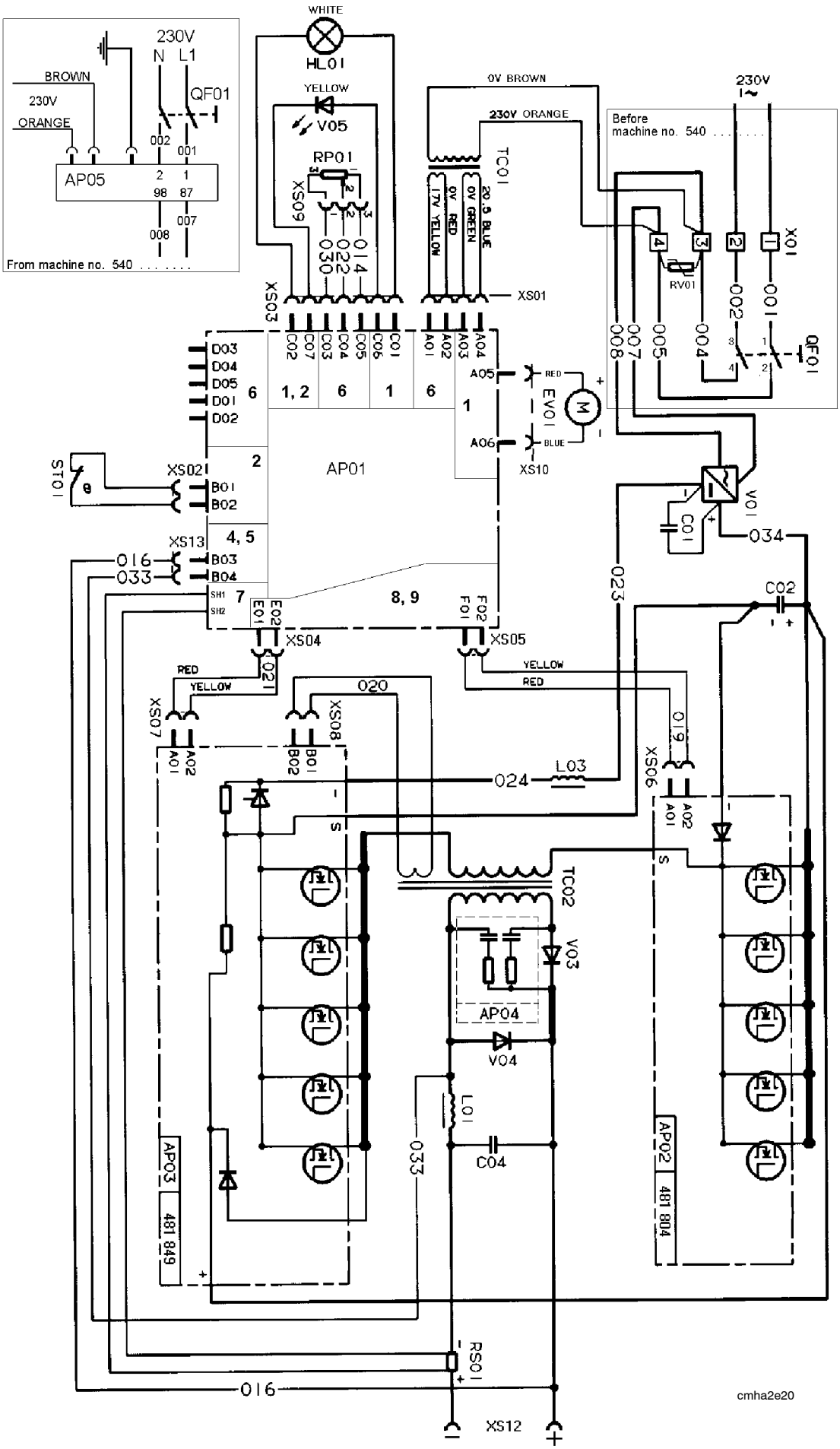


LHN 130/140 *LHN 200*
before serial number 628-xxx-xxxx

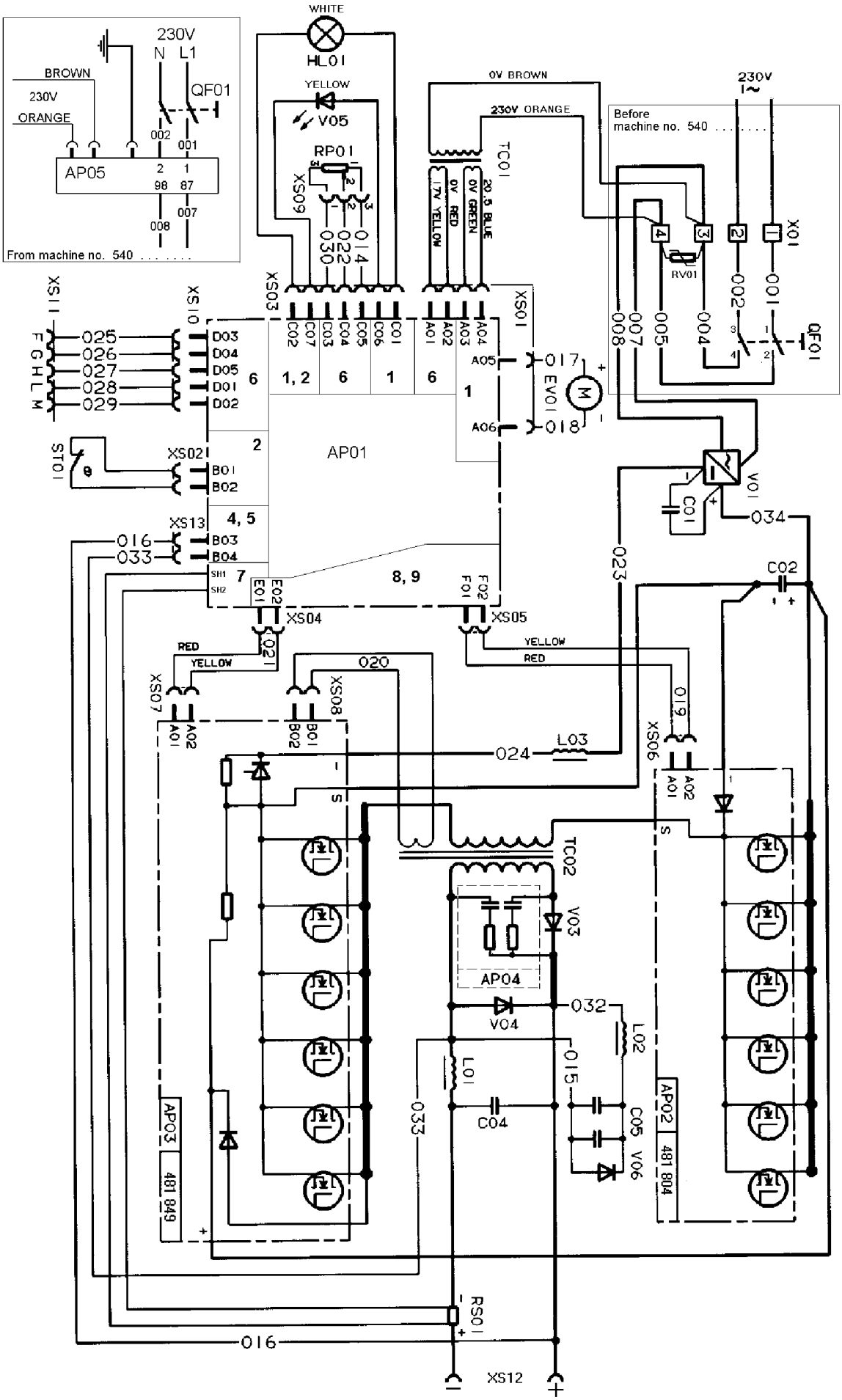


LHN 130/140/200
with serial number 628-xxx-xxxx and 220-xxx-xxxx

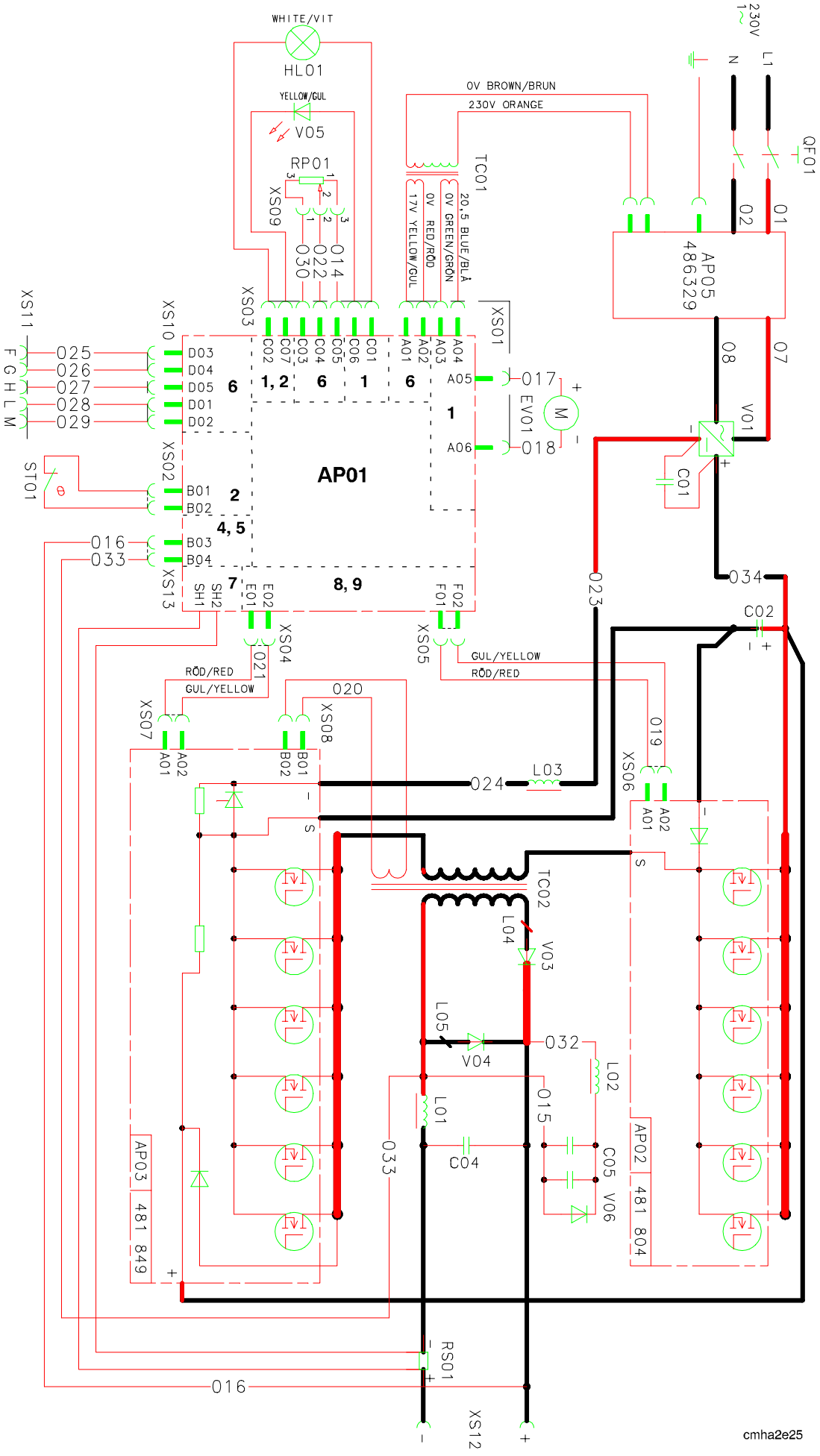
WIRING DIAGRAM LHN 130



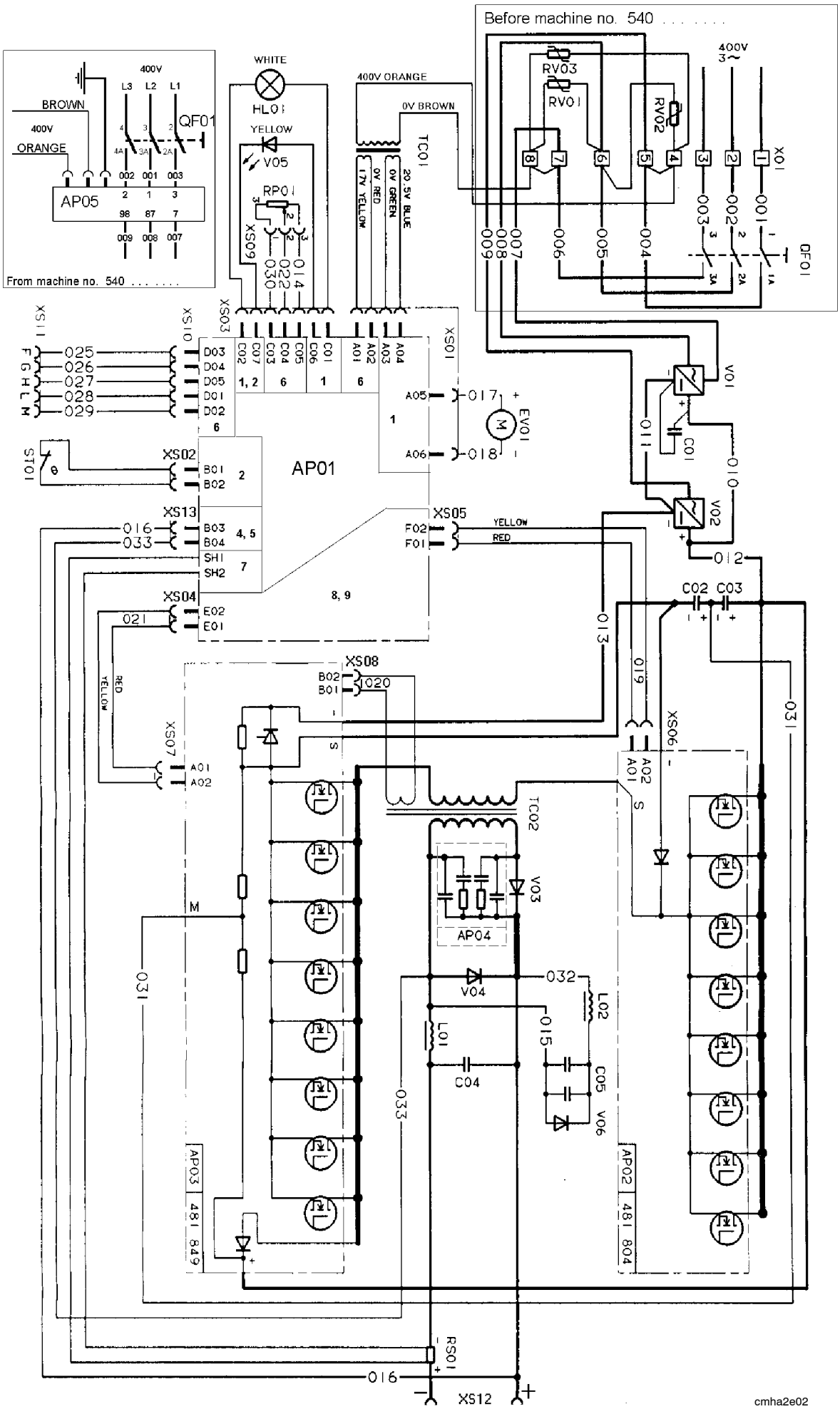
WIRING DIAGRAM LHN 140 valid before ser.no. 011-xxx-xxxx



WIRING DIAGRAM LHN 140 valid for ser.no. 011-xxx-xxxx and 220-xxx-xxxx

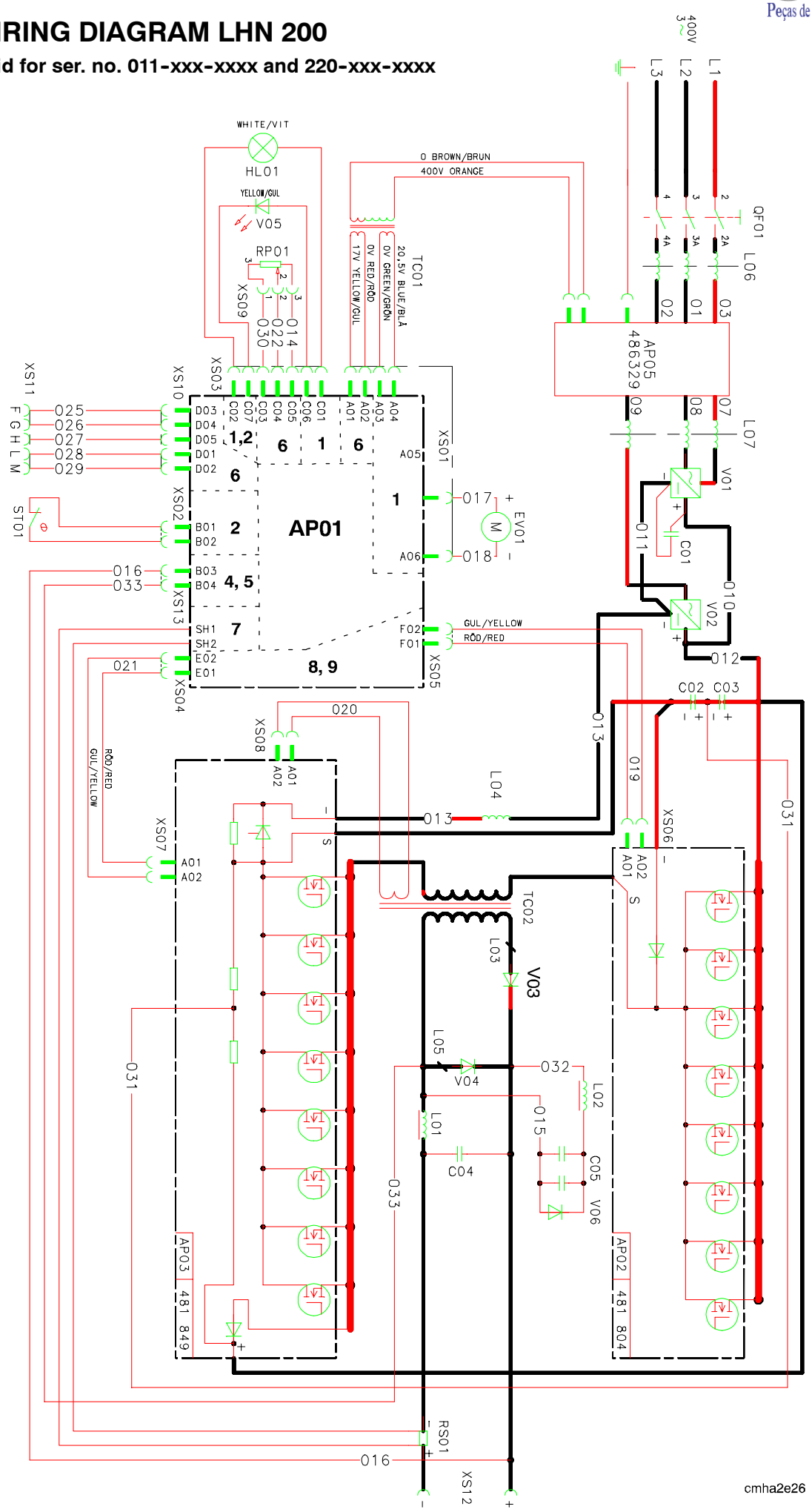


WIRING DIAGRAM LHN 200 valid before ser.no. 011-xxx-xxxx

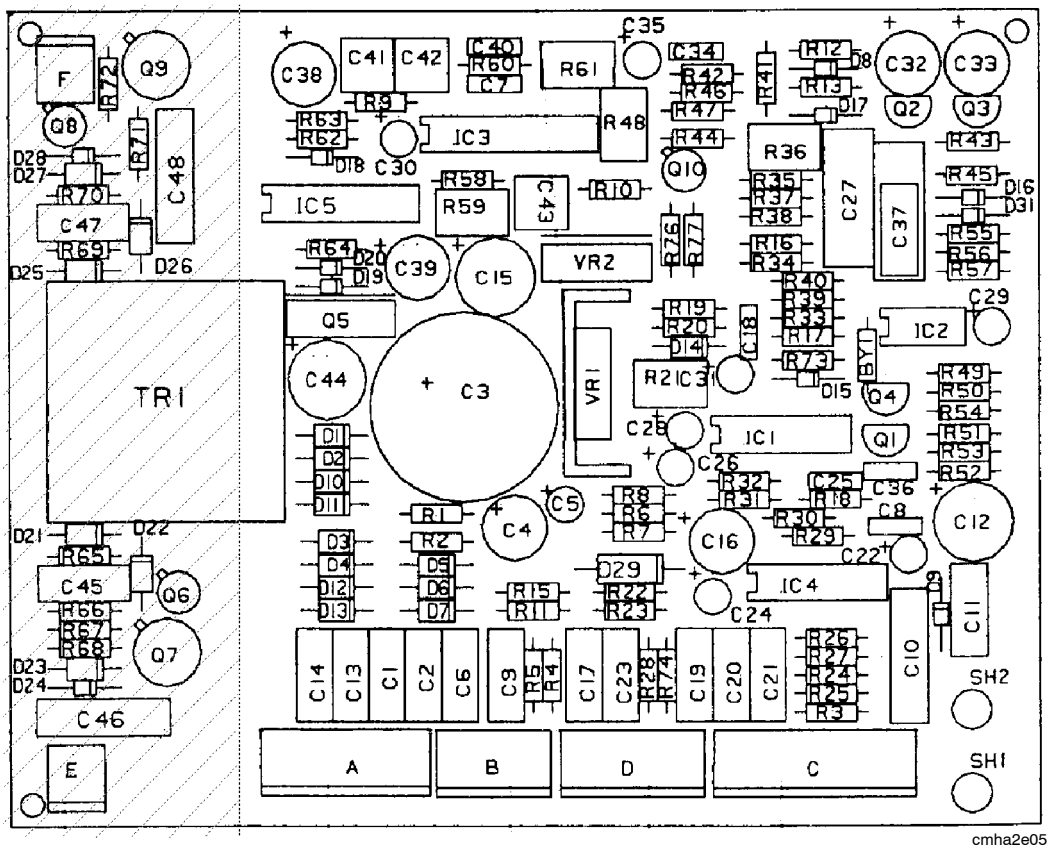


WIRING DIAGRAM LHN 200

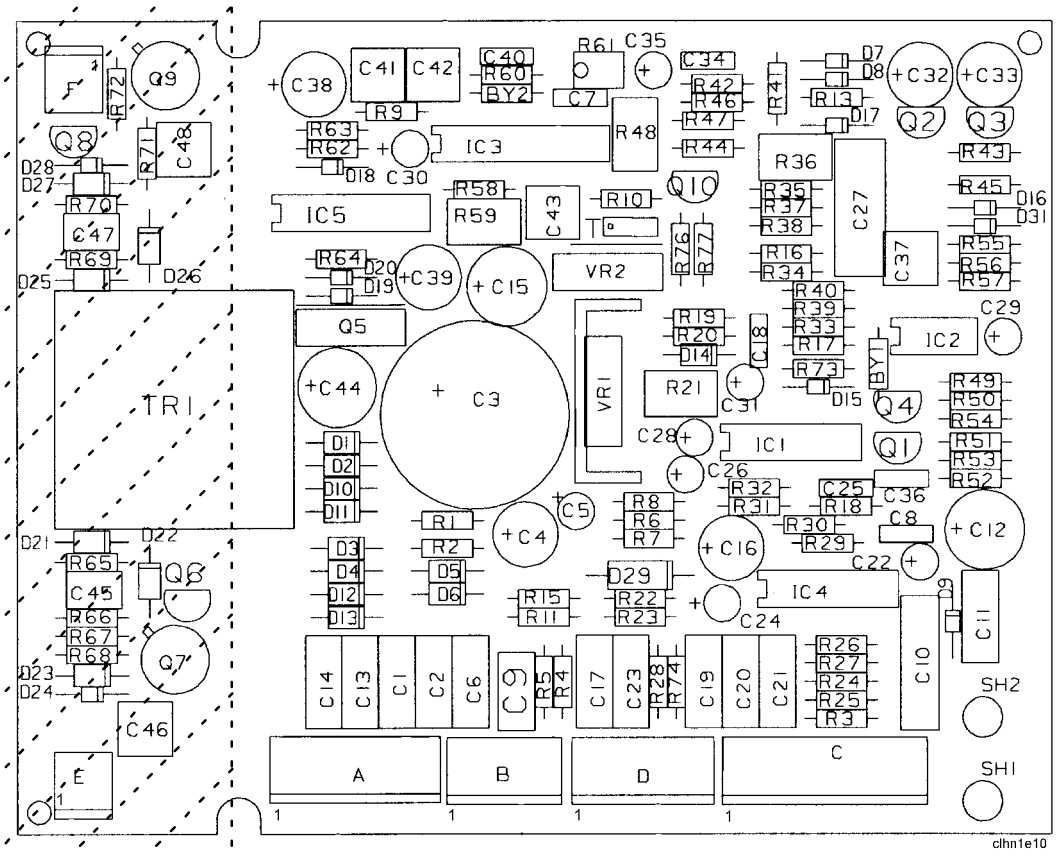
valid for ser. no. 011-xxx-xxxx and 220-xxx-xxxx



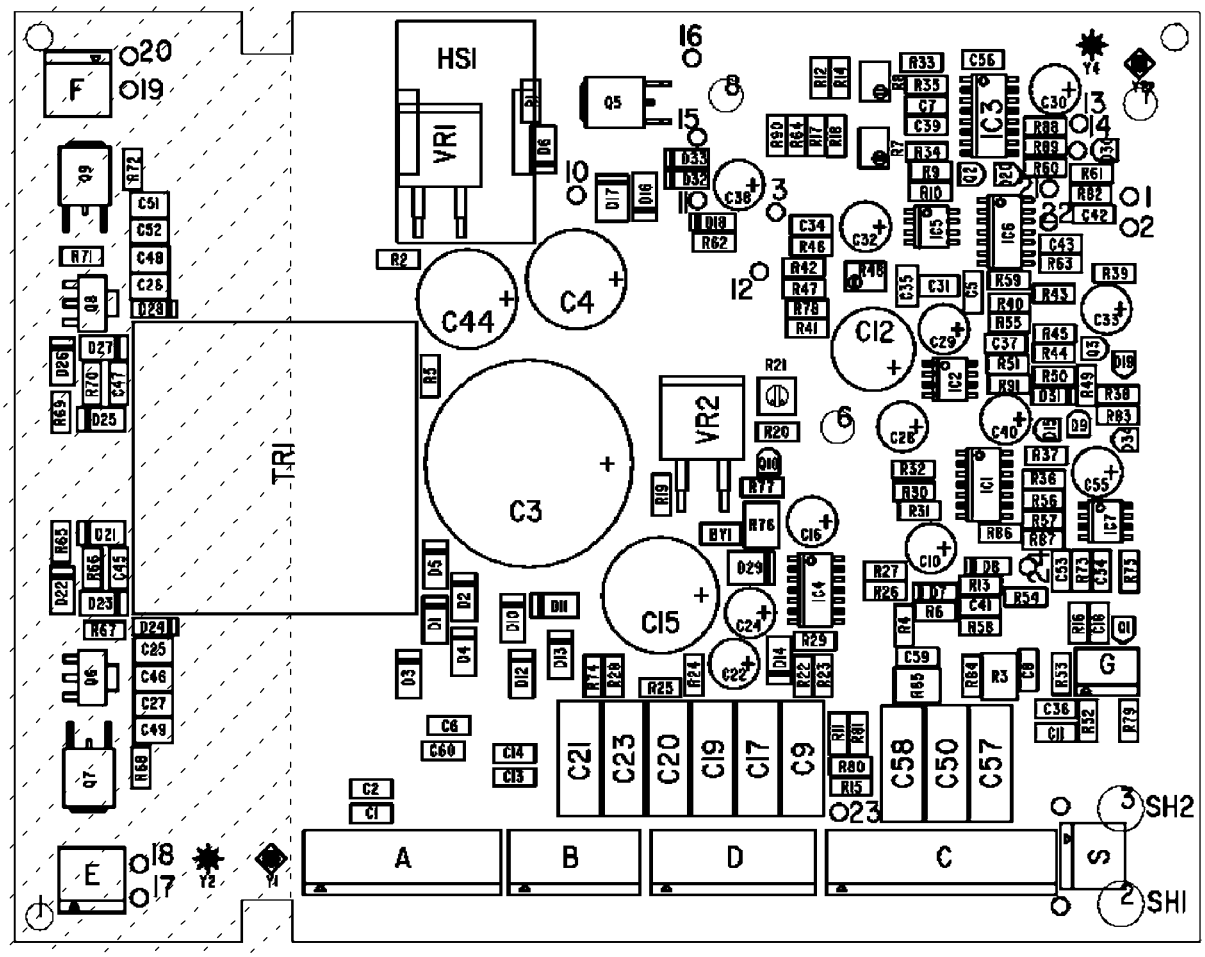
COMPONENT POSITIONS, CIRCUIT BOARD AP01



Circuit board AP01 0481 870 880, fitted before serial number 220-xxx-xxxx



Circuit board AP01 0481 870 885, fitted before serial number 220-xxx-xxxx



Circuit board AP01 0486 886 880, fitted from serial number 220-xxx-xxxx

WARNING: high voltage in the shaded areas

From serial number 220-xxx-xxxx circuit board 0486 886 880 is fitted in the machines. The circuit board versions are fully interchangeable and can be used in any of the machines.

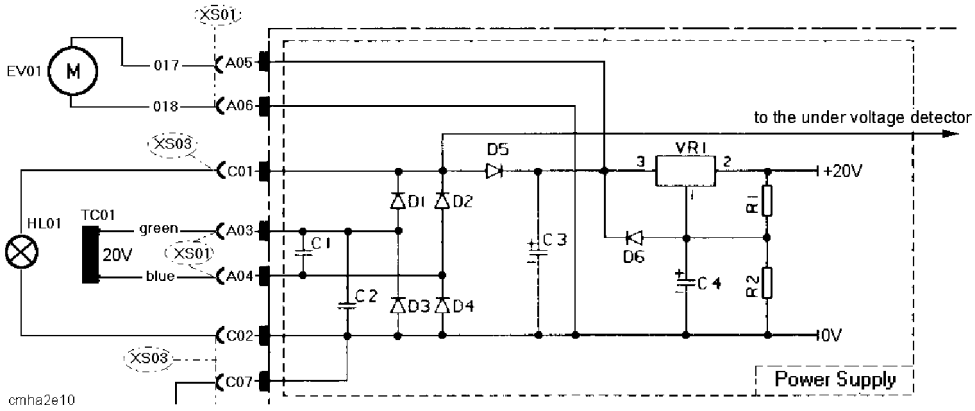
DESCRIPTION OF OPERATION, CIRCUIT BOARD AP01

This description refers to the wiring diagrams on pages 7-11 and to the component position diagrams on pages 12 and 13. Only those items connected to the circuit board inputs and outputs are described here. If the circuit board is faulty, it must be replaced.

There are three versions of the circuit board, this description applies to all versions. The circuit boards are fully interchangeable.

After replacing the circuit board, the machine must be soft-started, as described on page 25.

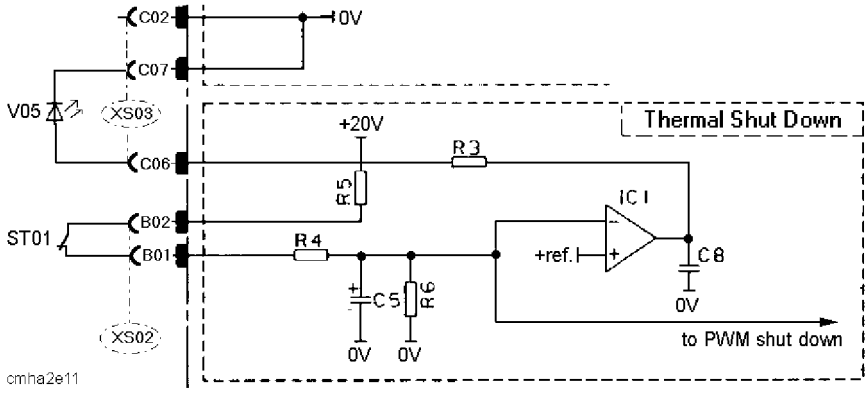
1 Power supply



Rectifier bridge D1-D4 is supplied at 20.5 V from transformer TC01. The rectified voltage is stabilised by voltage regulator VR1 to +20 ±1 V. All circuits on the circuit board except the current reference (6) and the gate circuit (9) are supplied from VR1.

Connections A05 - A06 supply 26 V DC ±2.5 V to the cooling fan.
The fan is **not** the same in LHN 130 as in LHN 140/200, see the spare parts list.

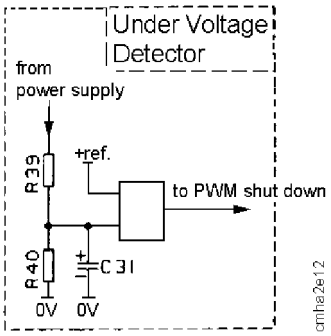
2 Thermal shutdown



This circuit interrupts the gate pulses from the pulse width modulator if the machine is overloaded. When it has not operated due to high temperature, the thermal overload cutout normally short-circuits inputs B01 and B02. If the cutout contact opens, IC1 lights LED V05 and the pulse width modulator (8) blocks the gate pulses. See also ST01 in the component description.

The reference voltage to IC1, +ref., is generated by IC3: see page 17.

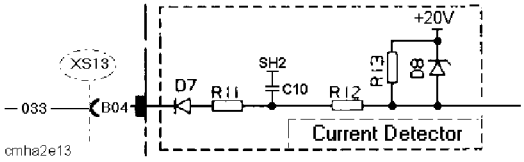
3 Under voltage detector



This circuit senses if the mains power supply voltage is too low. Loss of mains power supply for more than 10 ms, or low voltage, results in the pulse width modulator (8) blocking the gate pulses.
The reference voltage to IC1, +ref., is generated by IC3:
see page 17.

4a Current detector

Valid for circuit board 481 870 880



Inputs B04 and SH2 sense the voltage across welding inductor L01. Input SH2 is the zero point for the control amplifier. On no-load, the voltage is close to zero. During welding, the voltage between B04 and SH2 consists of short pulses at a potential of about -70 V.

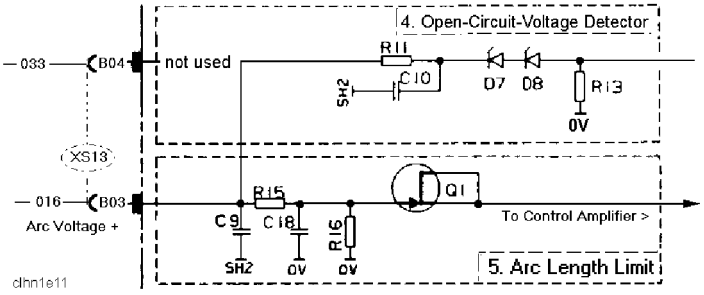
This voltage is rectified and smoothed by D7, R11 and C10, to provide a voltage after R11 of +3 to +3.5 V at no-load and -10 to -50 V when welding. This signal interrupts the Hot Start (starting current boost), the length (200 ms) of which is controlled by the control amplifier (7).

4b Open-circuit voltage detector

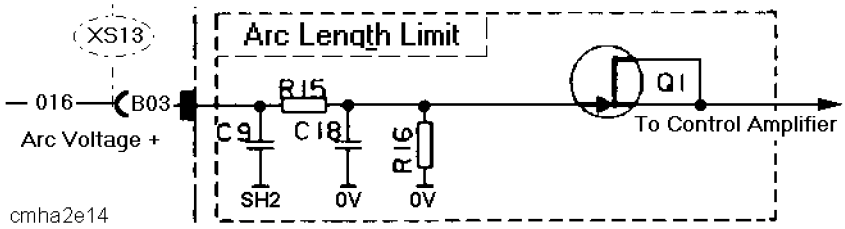
Valid for circuit boards 481 870 885 and 486 886 880

Voltages above 65V are defined as open-circuit voltage.
Voltages below 45V are defined as welding voltages.

When the machine is in open-circuit mode the current limit is at a low rate and the unit is ready for Hot Start.

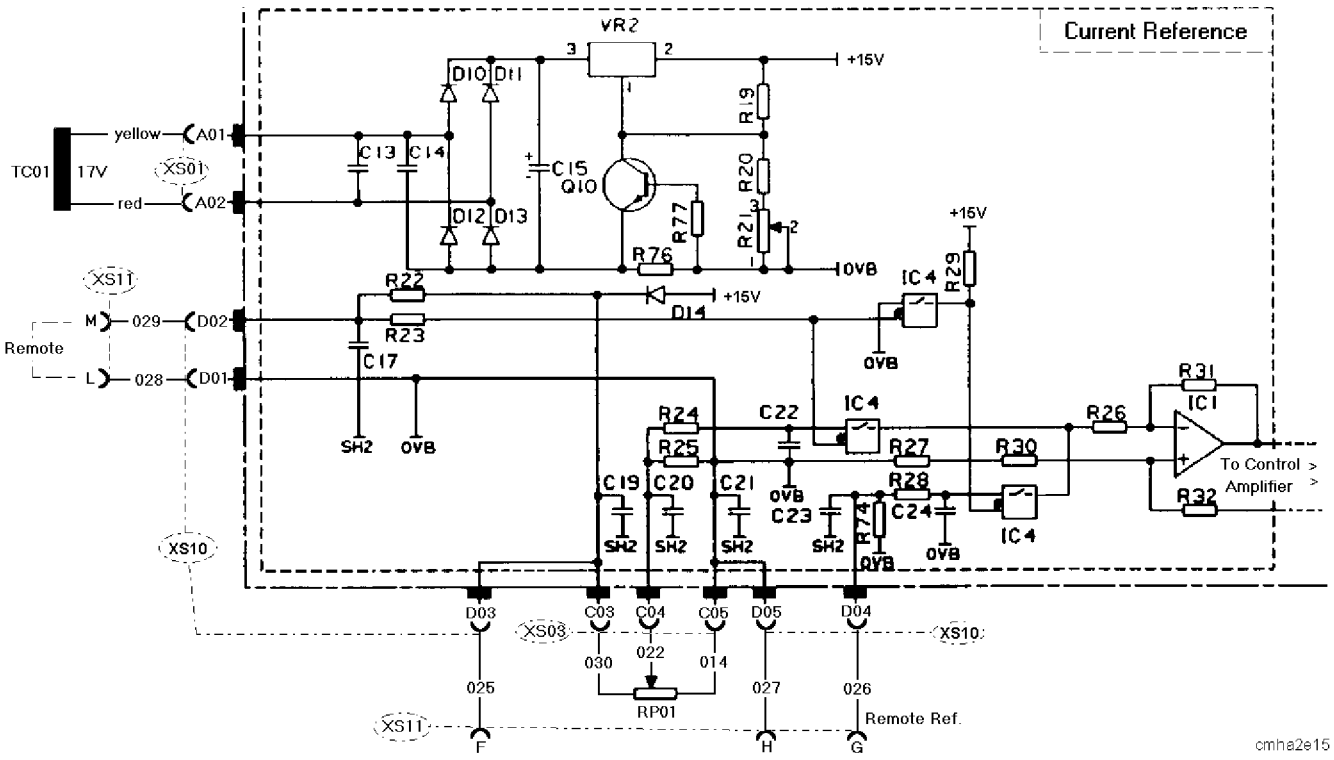


5 Arc voltage limitation



This circuit, which restrict the arc voltage and open-circuit voltage, assists in limiting the arc length when welding in the 20 - 50 A current range.

6 Current reference



This circuit supplies a signal voltage to the current setting potentiometer and remote control unit. It also modifies the current reference signal to a suitable level for the control amplifier (7).

Connections A01 and A02 are supplied at 17 V from transformer TC01. This supply is rectified and smoothed for supply to voltage regulator VR2. Potentiometer R21 adjusts the output voltage from VR2 for correct maximum current value from the current reference and control amplifier. After adjustment, the voltage between connection C03 and C05 must be 14 - 15 V.

Q10, R76 and R77 limit the current from VR2 to 60 mA. The current limit protects the circuit board in the event of a short circuit in the cable to the remote control unit.

The reference input has a separate power supply and high-impedance input to the control amplifier, protecting it against short circuits between the remote control unit cable and the welding circuit.

Changeover to remote control is arranged by short-circuiting connections D01 and D02 through insertion of the plug into the socket for the remote control unit. The short circuit is in the form of a link between L and M in the plug.

The current reference signal is connected to C04 or D04. The reference signal voltage is 0 V at minimum current and 14 - 15 V at maximum current. If inputs D01 and D02 are linked, but no remote control unit is fitted, resistor R74 holds the reference signal to the minimum level.

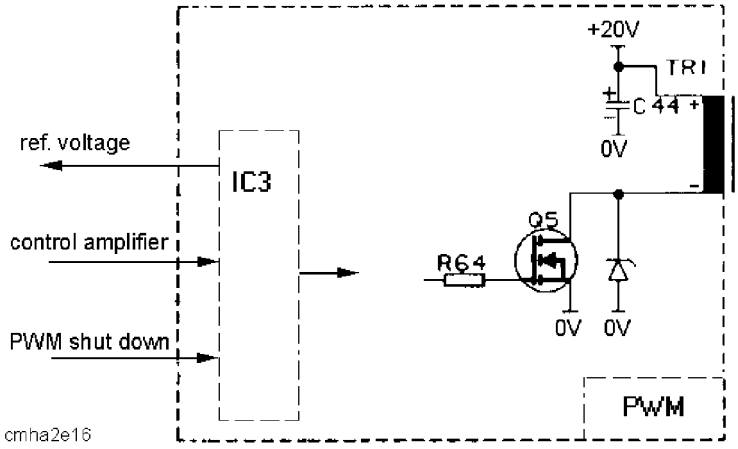
LHN 130 has no remote control connection.

7 Control amplifier

The control amplifier sets a suitable welding current in relation to the current setting and arc voltage. The circuit can be divided up into three main parts:

- Average current control
- Starting current control
- Short-circuit current limit

8 Pulse Width Modulator



The pulse width modulator determines the frequency and pulse time of the control pulses to the MOSFET transistors.

Pulse frequency is adjusted to 36.5 kHz ±0.5 kHz.
Maximum pulse time is 41% ±1.5% of the cycle time. Maximum pulse time results in maximum current and arc voltage. When no pulses are supplied by the pulse width modulator, no welding current will flow.

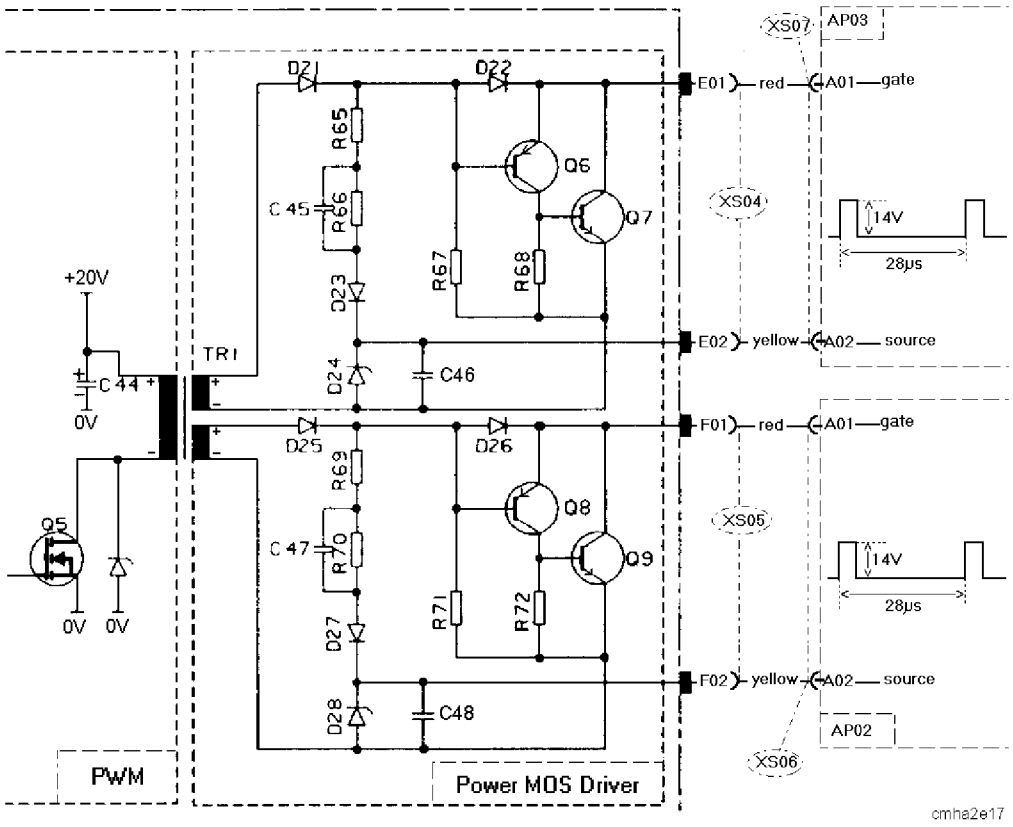
IC3 controls the pulse frequency, pulse time and blocking of pulses. The reference voltage from IC3 is +5.1 V on circuit board 0486 886 880.
On circuit boards 0481 870 880 and 0481 870 885 the voltage is +2.5 V.

Transistor Q5 controls the primary winding of the pulse transformer.

NOTE:

The frequency and pulse time are very important parameters. If incorrectly adjusted, they can result in transistor failure in the main circuit.

9 Gate circuit



The driver stage for the MOSFET transistors provides control pulses to the gate-source of the power transistors. There is a separate output for each switching unit.

All gate circuits are galvanically isolated from other circuits on the board.
The insulation voltage between the pulse width modulator and the gate circuits is 4 kV.

WARNING: the gate circuits are at mains voltage.

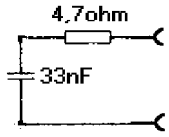
The two gate circuits are identical, and so only one is described here.

When Q5 conducts, a voltage pulse appears at the secondary winding of the transformer. This pulse is led via D21, D22 and connection E01 to the gate of the MOSFET transistors. It returns via the source, connection E02, D24 and C46. The peak gate - source voltage is 14 V.

The presence of the gate pulse between connections E01 and E02 charges capacitor C46 to 3.3 V. When Q5 is turned off, the voltage from the pulse transformer changes polarity, resulting in transistors Q6 and Q7 starting to conduct. This results in a gate voltage of -3.3 V, turning off the MOSFET transistors.

CHECKING THE GATE PULSES

If circuit board AP02 or AP03 has failed, the gate pulses must always be checked. Remove connections XS04 and XS05 (gate pulses), and connect a gate load to connections E01 and E02 and to F01 and F02.



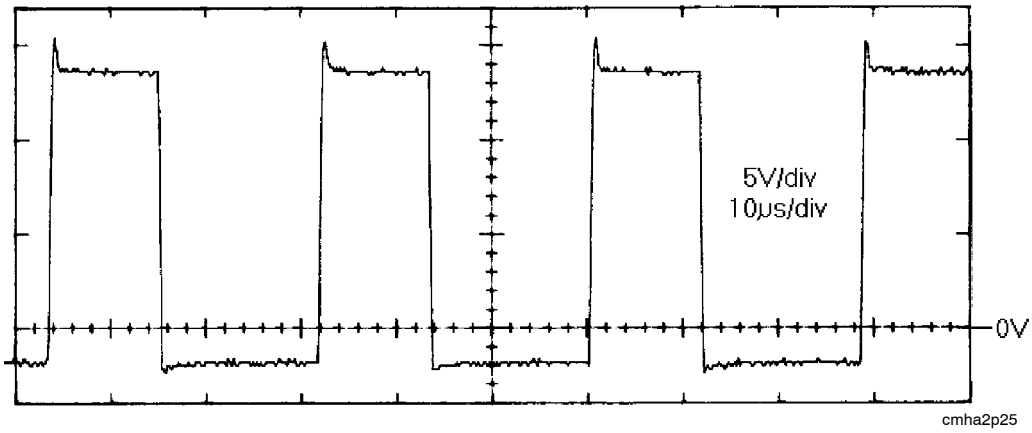
Gate load

IMPORTANT: never check the gate pulses when AP02 and AP03 are connected: always use a dummy gate load.

The gate pulse minimum level must be -2 to -4 V, and the maximum level 13.5 to 16.5 V. Frequency must be 36.5 kHz ±0.5 kHz. Check that the maximum pulse time, measured at a voltage level of +5 V, is 41% ±1.5% of the cycle time.

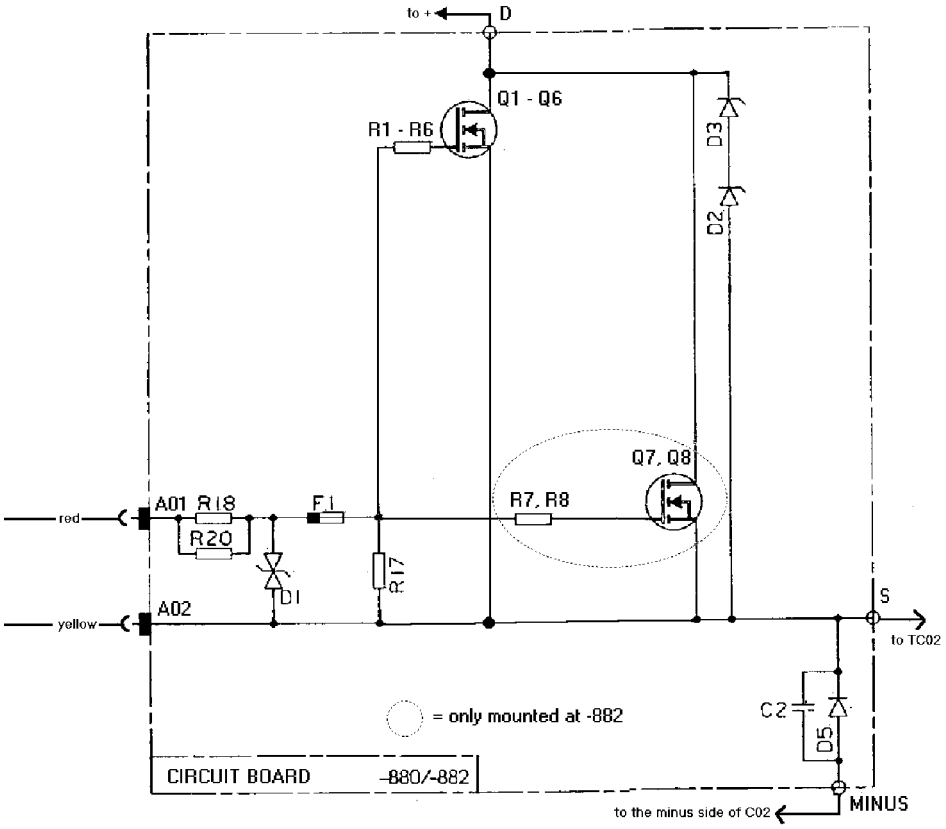
If the gate pulses are not within these tolerances, AP01 must be replaced.

After replacing AP01, the machine must be soft-started, as described on page 25.



Gate pulses as measured across the dummy gate load on circuit board AP01 between connections F01 and F02.

CIRCUIT DIAGRAM, CIRCUIT BOARD AP02



cmha2e06

AP02 (POSITIVE) CIRCUIT BOARD 481 803 -880 / -882 / -889

The -880 variant is used in the LHN 140, the -882 variant in the LHN 200 and the -889 variant in LHN 130.

The -889 variant has the same design as the -880 variant, the only difference is that transistor Q6 isn't mounted at the -889 variant.

Individual transistors must not be replaced: if the circuit board is faulty, it must be replaced in its entirety. In addition, circuit board AP03 must also be replaced.
Instructions on removing and fitting the circuit board are to be found on page 28.

A01,A02 Connections A01 - A02 are for the gate pulses from circuit board AP01.

D1-D3 Transient voltage protection.

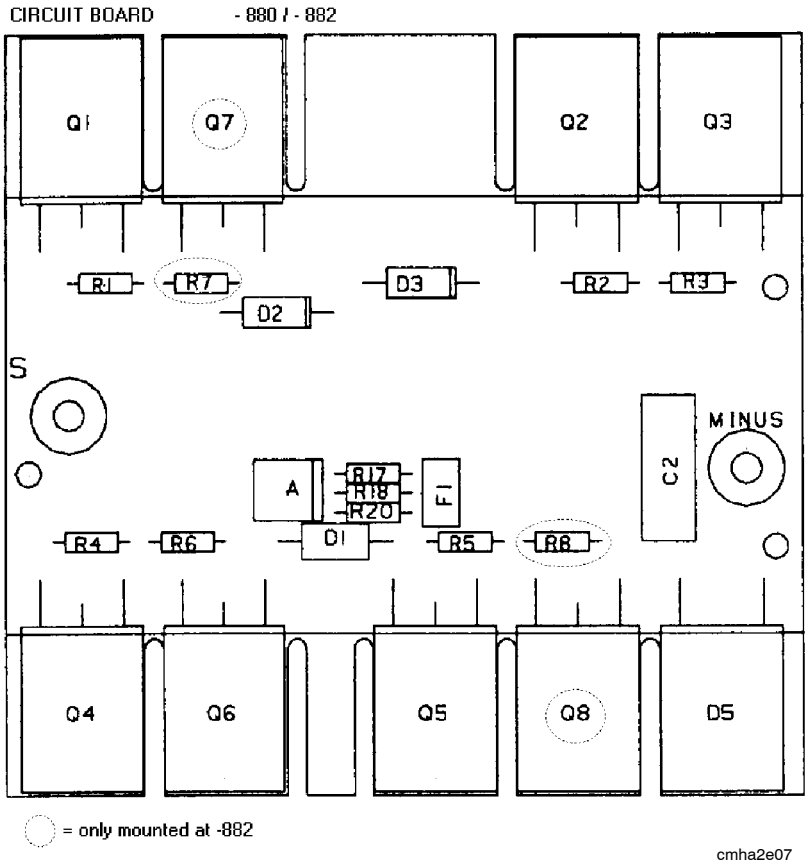
D5 Back-emf protection diode (squelch diode) for main transformer TC02 when the transistors turn off.

F1 Fuse, for protection of circuit board AP01 if circuit board AP02 fails.

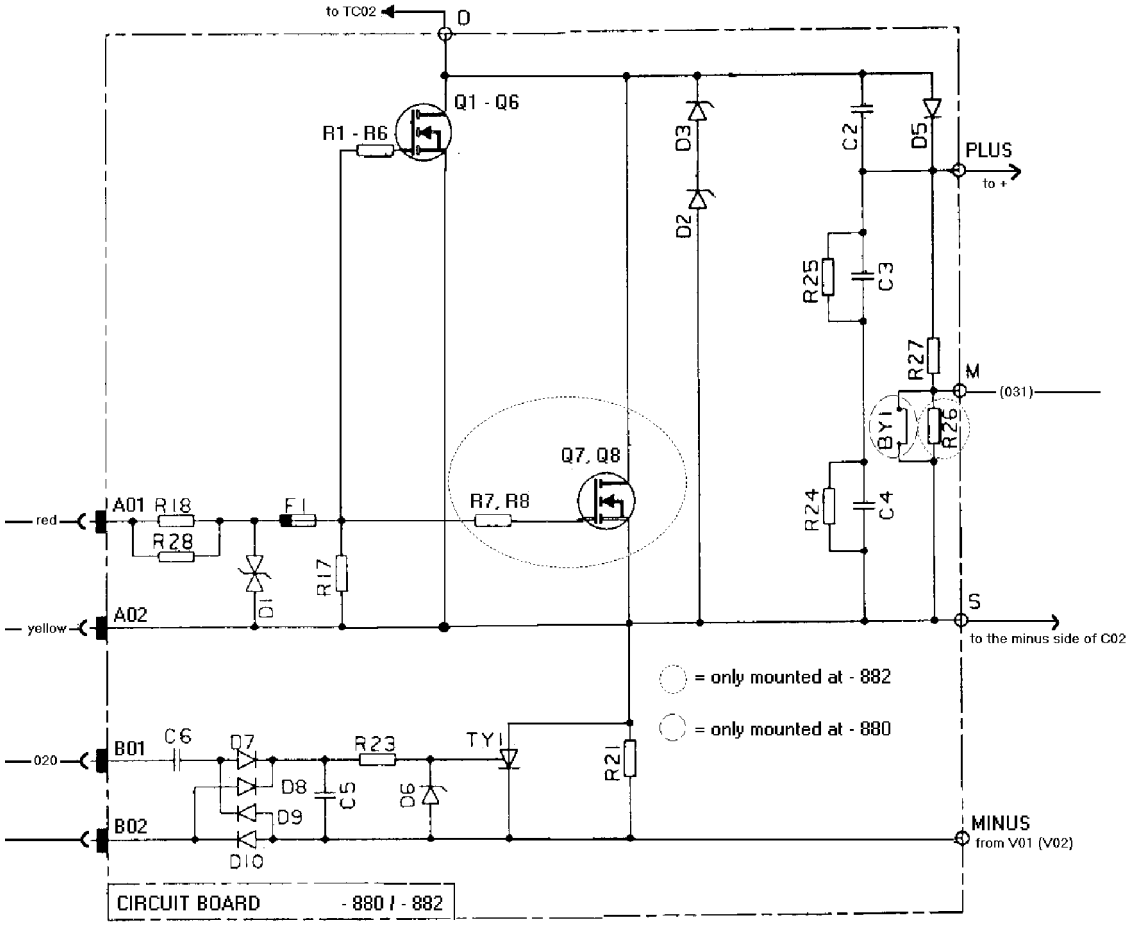
Q1-Q8 MOSFET transistors. These require a special instrument (see MOS TESTER on page 24) for testing.

Due to a change to transistors with higher current rating, the circuit board may have one transistor less than specified in the diagram above.

COMPONENT POSITIONS, CIRCUIT BOARD AP02



CIRCUIT DIAGRAM, CIRCUIT BOARD AP03



cmha2e08

AP03 (NEGATIVE) CIRCUIT BOARD 481 848 -880 / -882 / -889

The -880 variant is used in the LHN 140, the -882 variant in the LHN 200 and the -889 variant in LHN 130.

The -889 variant has the same design as the -880 variant, the only difference is that transistor Q6 isn't mounted at the -889 variant.

Individual transistors must not be replaced: if the circuit board is faulty, it must be replaced in its entirety. In addition, circuit board AP02 must also be replaced.
See on page 28 for instructions on removing and fitting the circuit board.

A01,A02 Connections A01 - A02 are for the gate pulses from circuit board AP01.

B01,B02 When the machine is loaded, pulses from a trigger pulse winding on main transformer TC02 are supplied to connections B01 and B02, for use as gate pulses in controlling thyristor TY1.

D1-D3 Transient voltage protection.

D5 Back-emf protection diode (squelch diode) for main transformer TC02 when the transistors turn off.

Q1-Q8 MOSFET transistors. These require a special instrument (see MOS TESTER on page 24 for testing.

Due to a change to transistors with higher current rating, the circuit board may have one transistor less than specified in the diagram above.

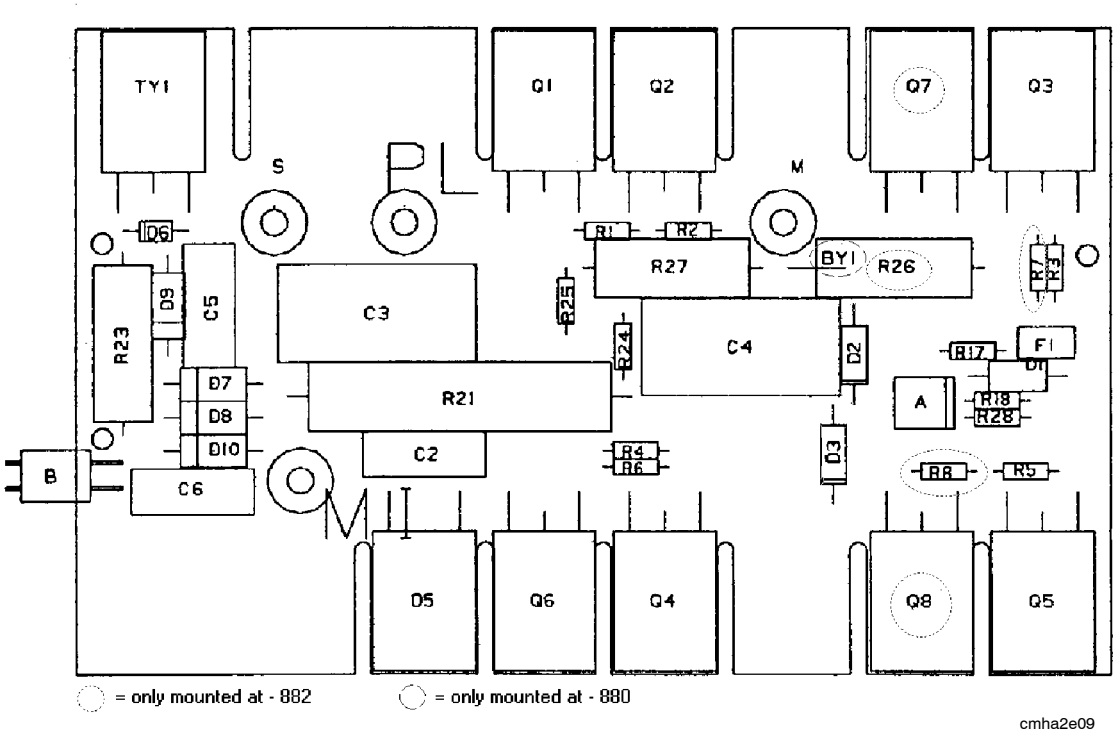
R21 Charging resistor, 12Ω, 10W, for buffer capacitor C02 (C03). When energising the power unit, pulses from control circuit board AP01 are delayed by 300 ms to allow the buffer capacitor to charge.

R26 Discharge resistor for buffer capacitor C03. This capacitor is fitted only in the LHN 200. Discharge time for the capacitor, after turning off the mains power supply, is about two minutes.

R27 Discharge resistor for buffer capacitor C02. After turning off mains power supply, discharge time for the capacitor is about two minutes.

TY1 Thyristor for shunting charging resistor R21 when the machine is loaded. If TY1 did not conduct, resistor R21 would burn out when the unit is on load.

COMPONENT POSITIONS, CIRCUIT BOARD AP03



MOS TESTER

The MOS tester is a special instrument, and can be ordered only from ESAB's service department in Laxå. Order number is 468 469-001.

Connect the instrument as follows:

- Disconnect the power unit from the mains.
- Disconnect capacitor C02 (and C03 in the LHN 200).
- Remove the gate connections from AP01.
- Connect the clip on the red wire to the red wire (the gate wire) on the transistor board.
- Connect the clip on the yellow wire to the yellow wire (the source) on the transistor board.
- Connect the black wire to the cooling fins (drain).

Testing

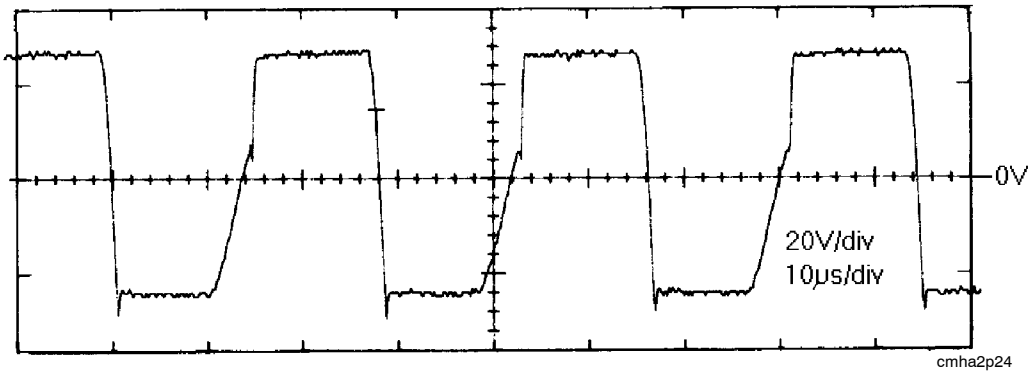
- Press the pushbutton marked TEST.
- If the board is healthy, both the red and green LED's should flash alternately, about once a second.
- If the transistor board is short-circuited, the red LED will light continuously (note that the green LED may also flash, or be continuously lit.)
- If the transistor board is open-circuited, the green LED will be continuously lit. Check that there is good electrical contact between the clip of the black wire and the cooling fins.

IMPORTANT!

Even if only one transistor board is indicated as faulty, both boards must be replaced.
Check the gate pulses from AP01 before commissioning the new transistor boards: see instructions on page 19.
After replacement of the boards, the machine must be soft-started.

SOFT STARTING

- Remove and insulate wires 007 and 008 from rectifier bridge V01: see the circuit diagram on page 7 and 8 for LHN 130/140.
  In the LHN 200, also remove and insulate wire 009 to rectifier bridge V02: see circuit diagram on page 10.
- Connect an external power supply, having a current limit of 1 A, to the positive and negative connections on V01.
- Adjust the power supply voltage to 30 V.
- Power the remaining parts of the unit from the normal power supply.
- Measure the output voltage from the machine. On the LHN 130/140 this must be 10 V ±1 V, and on the LHN 200 it must be 6 V ±1 V.
- Measure the primary voltage to transformer TC02. With a voltage of 30 V across the buffer capacitor, the waveform must appear as shown below.



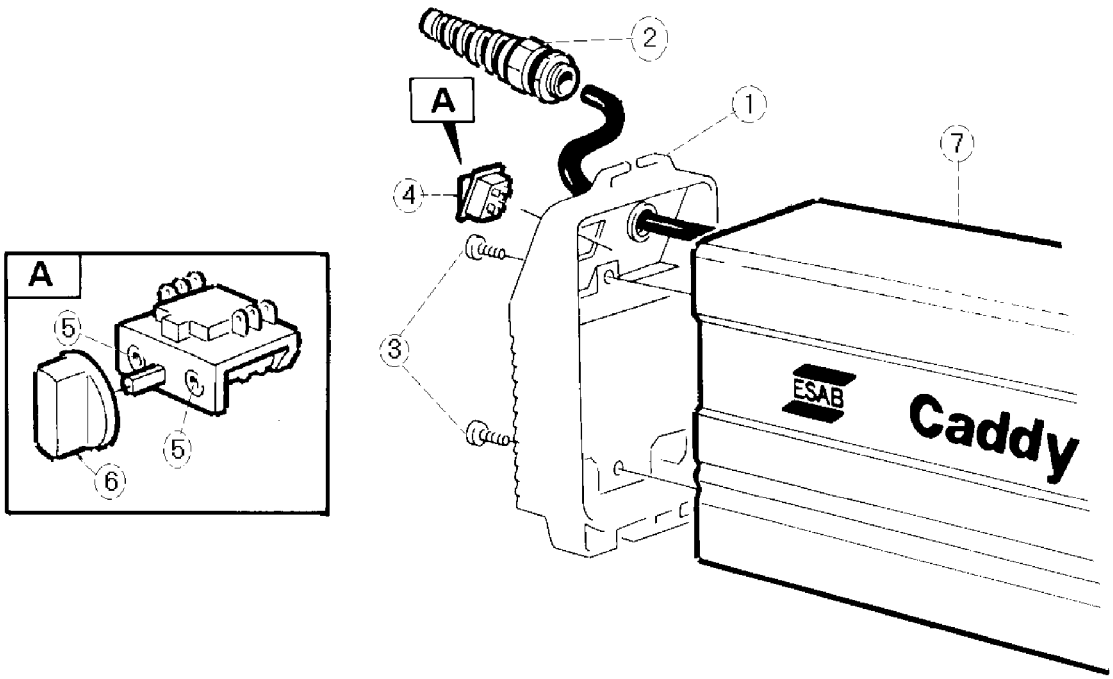
Primary voltage at TC02 for 30 V across the buffer capacitor

ASSEMBLY/DISASSEMBLY

REMOVAL OF REAR PANEL AND CASING

- Remove the strap from the rear panel (1).
- Remove the cable bushing (2) and slide it back along the cable.
- Remove the two screws (3).
- **Caddy 130/140:**
  Remove the rear panel from the casing (7) and disconnect the wires to the switch (4).

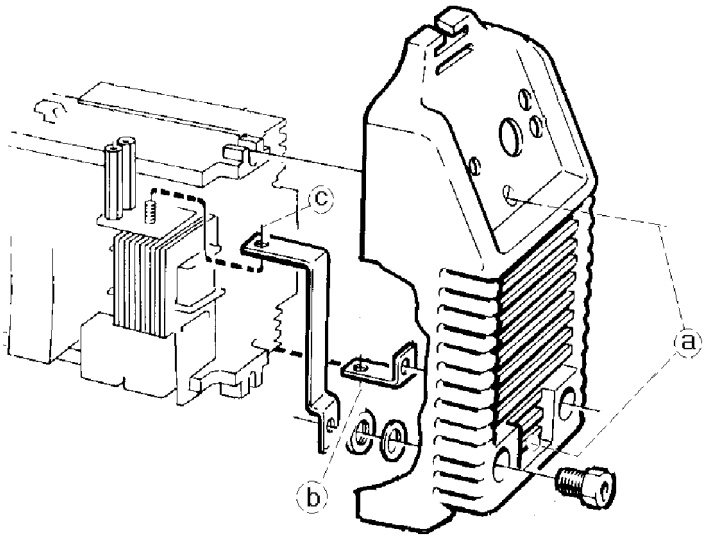
  Caddy 200:
  Remove switch knob (6) and screws (5). Remove the rear panel from the casing (7).
- Pull the casing back, over the rear panel and the mains cable.



Removal of the rear panel and casing

REMOVAL OF FRONT PANEL

- Remove the rear panel and casing.
  Remove screws (a).
- Remove the positive busbar from the rectifier unit.
  Screw (b) is accessible from beneath the machine.
- Remove nut (c) and remove the negative busbar from the shunt.
- Remove connectors XS10 and XS03 from circuit board AP01.

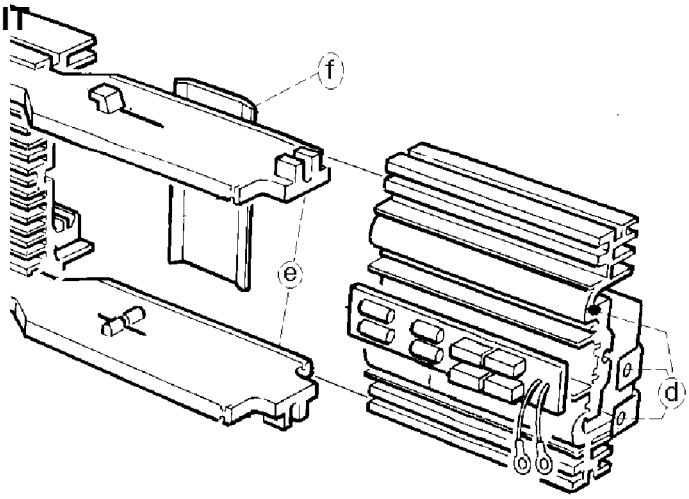


REMOVAL OF THE RECTIFIER UNIT

- Remove the rear panel, casing and front panel.
- Remove screws (d).
- Pull out the rectifier unit.

FITTING THE RECTIFIER UNIT

- Position insulation sheet (f) against transformer TC02 and slide the rectifier unit into the guides (e).

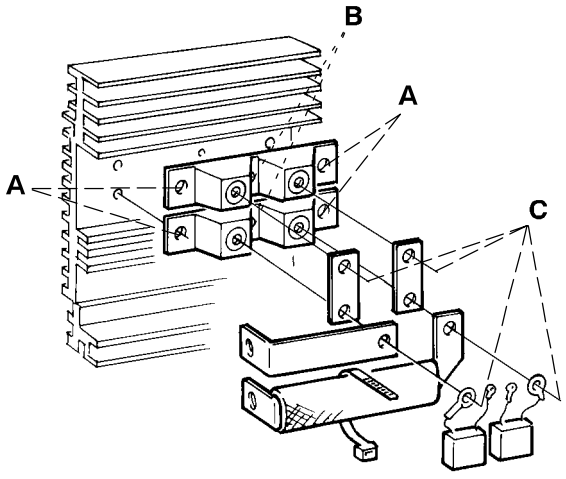


cmha2p28

FITTING THE DIODE MODULE

Valid from serial number 628-xxx-xxxx.

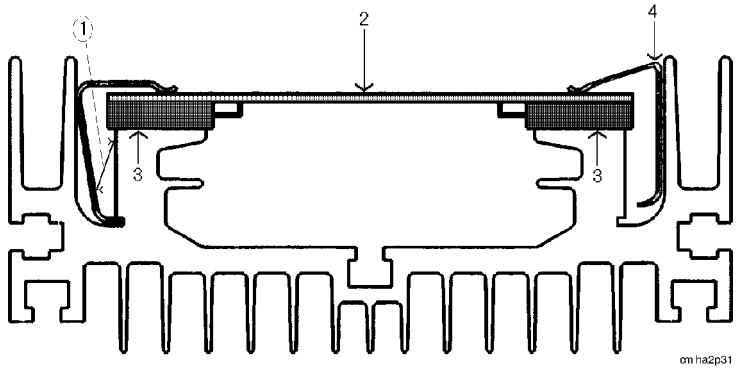
- Clean the contact surface of the heat sink with extremely fine abrasive paper.
- Apply a thin film of contact oil (see item 555 / 904 in the spare parts list) to the contact surfaces.
- Fit the diode modules and tighten the screws **A** (M6) to a torque of 6 Nm. Tighten the screws **B** (M4) to a torque of 1 Nm.
  The screws **C** (1/4" 20UNC2B) are to be tightened to a torque of 6 Nm.



From serial number 011-xxx-xxxx the diode modules are different connected compared to the picture above: see the spare parts list. The fitting procedure for the modules is however the same as described above.

REMOVAL OF TRANSISTOR CIRCUIT BOARDS AP02 AND AP03

- Remove the rear panel and casing.
- Remove all wires and busbars connected to the board.
- Remove the springs that hold the board (2) in position by prising them off with a screwdriver (1) between the cooling flange and the spring.

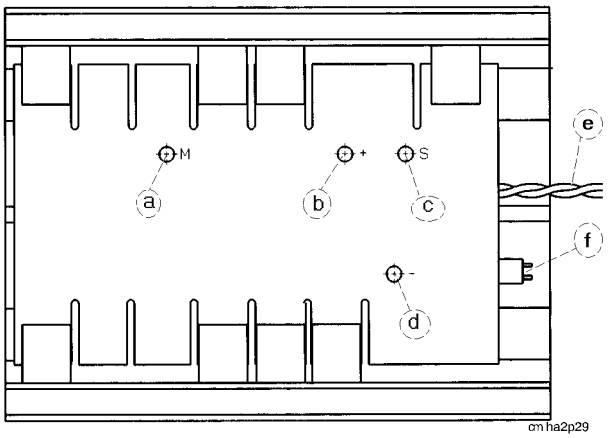


Removal/refitting of transistor circuit board

REFITTING THE TRANSISTOR CIRCUIT BOARD

- When replacing the transistor circuit board, both boards must always be replaced and new springs must be fitted.
- Clean the contact surface (3) of the heat sink with extremely fine abrasive paper.
- Apply a thin film of contact oil (see item 555 / 904 in the spare parts list) to the contact surfaces.
- Place the circuit board (2) on the cooling fins. Secure first one spring on each side of the board by pressing the spring down with a screwdriver (4). Then secure the remaining springs.
  NOTE: The springs must be fitted where there are components that are to be in contact with the heath sink. Due to a change to transistors with higher current rating, there might be less transistors on the spare part board than on the original board.
- When fitting cable lugs and busbars to the boards, it is important that the washers are fitted in the correct order. Start by placing the lug on the foil, and then fit a flat washer, a spring washer and finally the screw.

Connections to circuit board AP03



a LHN 130/140: not connected
LHN 200: wire 031 to the connection between C02 and C03

b LHN 130/140: busbar to positive on C02
LHN 200: busbar to positve on C03

c Busbar connected to negative on C02

d LHN 130/140: wire 024 from inductor L03
LHN 200: wire 013 from negative of V02

e Gate connection from circuit board AP01

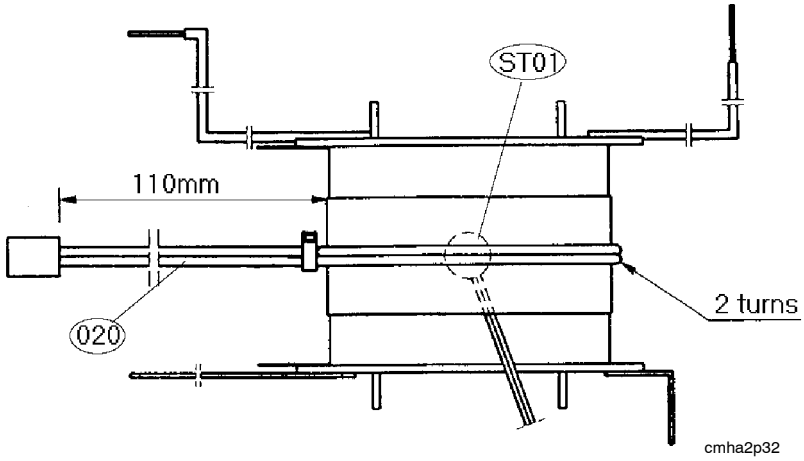
f Connector XS08 from transformer TC02

FITTING THE MAIN TRANSFORMER TC02

When replacing the main transformer, it is also necessary to replace the transformer core. This is because the core is bonded with adhesive, and cannot be disassembled.

Adhesive and tape are required when fitting a new transformer, in addition to the coil and core. Part numbers for the requisite adhesive and tape are shown as item 301 / 801 in the spare parts list.

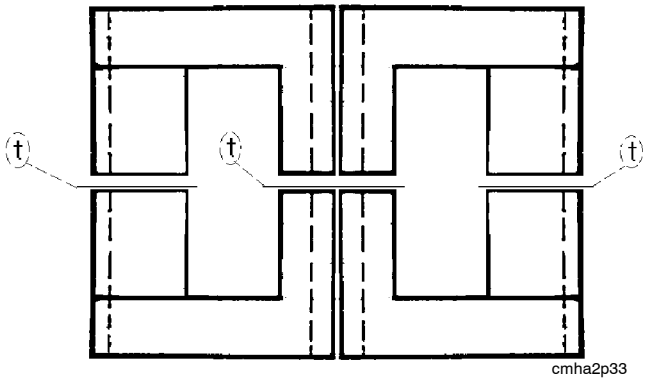
- Transfer wire 020 and connector XS08 to the new transformer. If the wire needs to be replaced, it is important to use the correct type of insulation (Teflon)



Fitting wire 020.

- Apply a layer of tape (t) to each of the three airgaps in the transformer core. Use the tape specified in the spare parts list.

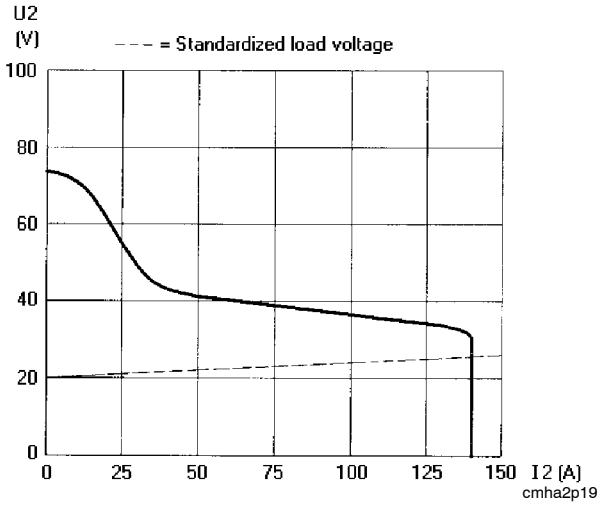
  Apply Loctite 648 (see the spare parts list) to the contact faces between the cores and between the core and coil. Secure the transformer in position in the machine. The adhesive takes about 20 minutes to harden.



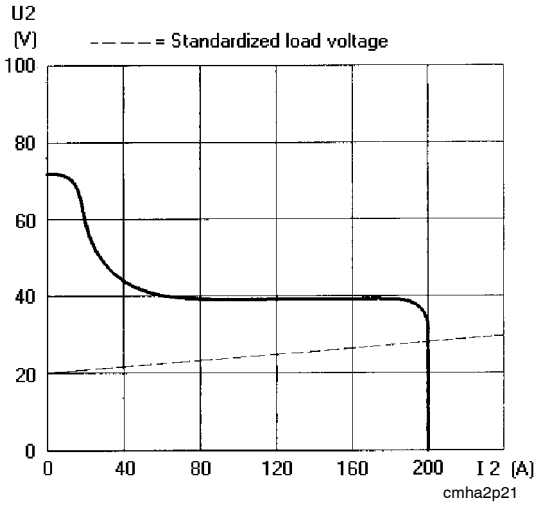
Airgap (t) in the transformer core

LOAD CHARACTERISTICS

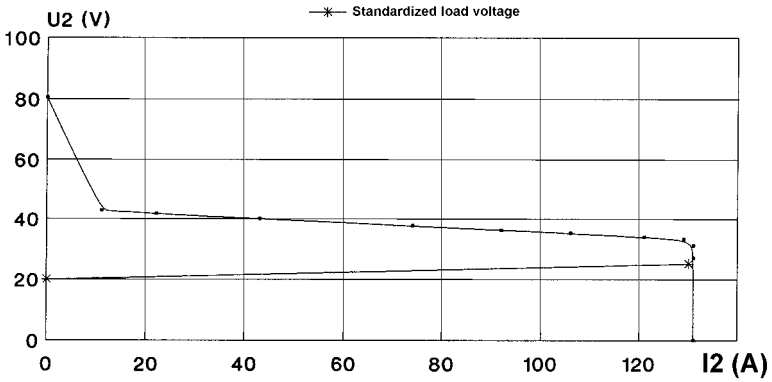
Caddy 140



Caddy 200



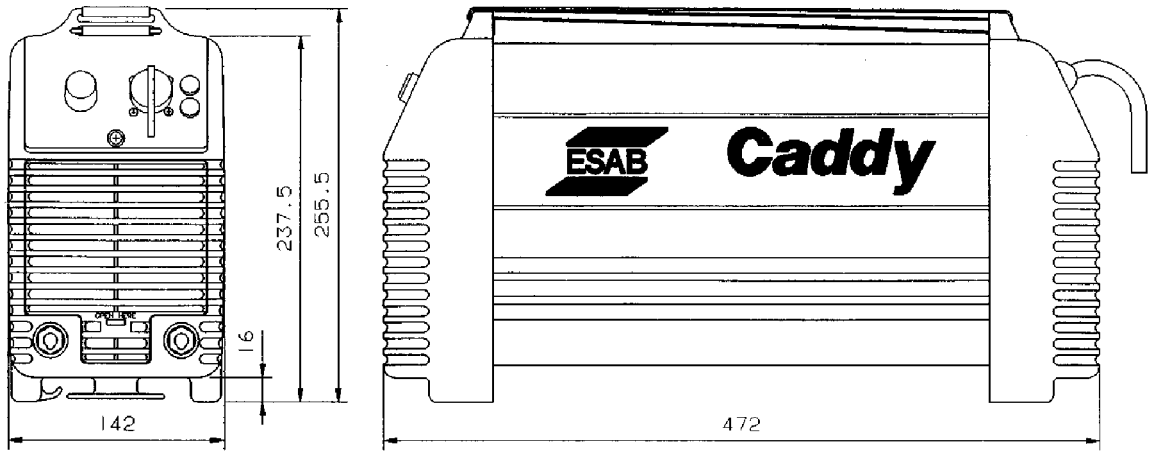
Caddy 130



TECHNICAL DATA

	Caddy 130	Caddy 140	Caddy 200
Load capacity			
At 35% intermittence	130 A / 25 V	140 A / 26 V	200 A / 28 V
At 60% intermittence	100 A / 24 V	110 A / 24 V	150 A / 26 V
At 100% intermittence	75 A / 23 V	80 A / 23 V	115 A / 25 V
Operating range	Stepless 3-130 A	Stepless 3-140 A	Stepless 5-200 A
Open-circuit voltage	64-80 V	53-75 V	53-75 V
Mains power supply			
Voltage	230 V	230 V	400 V
Primary current	21 A	22 A	10 A
Frequency	50-60 Hz	50-60 Hz	50-60 Hz
Fuse rating	16 A*	16 A*	16 A*
	* See also 'INSTALLATION' on page 32.		
Weight	approx. 11 kg	approx. 11 kg	approx. 11 kg

Outline dimensions, Caddy 140 and Caddy 200



cmha2p09

INSTALLATION

Caddy 130/140

The Caddy 130/140 is available in a version intended for 230 V, single-phase power supply, and can be used on supply voltages of 230 - 240 V, 50-60 Hz.

To use Caddy 130/140 at its full rating, it must be protected by a 16 A slow-blow fuse.
If, however, it will be used only for welding currents of up to about 100 A, a 10 A slow-blow fuse is sufficient.

Caddy 200

The Caddy 200 is available in a version intended for 400 V, three-phase power supply, 50-60 Hz.

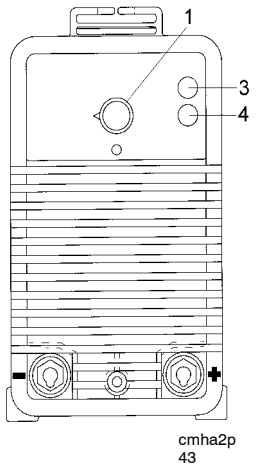
A 10 A slow blow fuse is sufficient to allow Caddy 200 to be used at its full rating.
(Normally, 400 V supplies are protected by 16 A fuses.)

Caddy 130/140/200

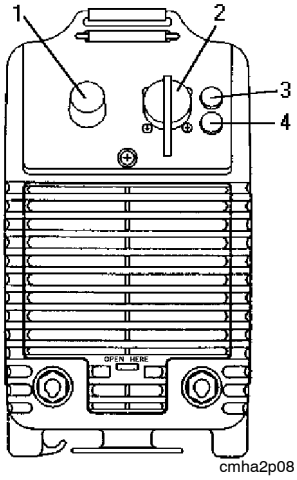
The requisite welding cable cross-sectional areas are 16 mm^2 for the Caddy 130/140 and 25 mm^2 for the Caddy 200.
Cable lengths in excess of 3 m are seldom required: if you intend to weld some distance from the nearest mains supply point, use a mains extension lead. It is always preferable to have a long mains cable rather than long welding cables, as the voltage drop is less in a mains cable. Note, however, that excessively long cables can affect the welding voltage.

Caddy incorporate mains voltage compensation, which means that ±10% variation in mains supply voltage results in a variation of only ±0.2% of arc voltage.

OPERATION



Front panel LHN 130



Fron tpanel LHN 140/200

1. Current setting potentiometer.
2. Socket outlet for connecting a remote control unit (only LHN 140/200). If the remote control is fitted, control of the machine is automatically transferred to the remote control unit.
3. The white indicating lamp on the front panel is lit, when the power supply is turned on. The mains switch on Caddy is fitted on the rear panel.
4. In order to prevent long-duration overloads, the machine incorporates a thermal overload cutout that operates before the temperature becomes excessive. Operation of the cutout is indicated by a yellow LED (4) on the front panel, and by refusal of the machine to weld. The overload protection resets automatically when the temperature has fallen to a safe level.

Welding with coated electrodes

Caddy supplies a DC welding current, suitable for welding the majority of metals, unalloyed and alloyed steels, stainless steel and cast iron.

The Caddy 130/140 is suitable for use with the majority of coated electrodes from 1.6 mm to 3.25 mm diameter, while the Caddy 200 can be used with electrodes up to 4.0 mm diameter.

TIG welding

TIG welding is particularly suitable for use when welding quality requirements are high, as well as for use with thin sheet metal.

Strike the arc by scraping the tungsten electrode lightly against the workpiece.
For use with TIG welding, Caddy must be fitted with a TIG welding torch with gas valve, a bottle of argon gas, an argon gas regulator, a tungsten electrode and, as required, suitable filler material.

Safety

Fortunately, accidents in connection with welding are uncommon. Nevertheless, everything can be misused, and carelessness can result in serious accidents.

Read the warning notice at the beginning of this service manual.

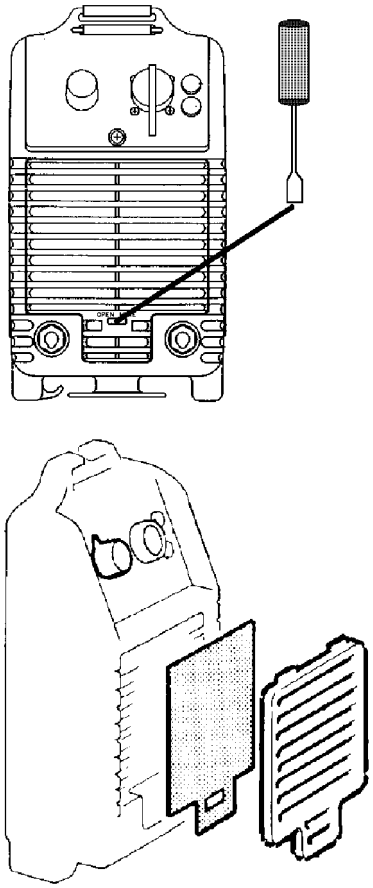
MAINTENANCE

Clean the air filter in the front panel of LHN 140/200 regularly, and replace it if damaged.

Remove the filter by inserting a screwdriver in the slit in the grille and prising out the lower part of the grille, as shown on the right.

Remove the entire casing once a year
(see instruction on page 26) and blow the dust out of the machine with dry compressed air.

If the machine is used in dusty or dirty areas, it should be blown clean, and the filter be cleaned, more frequently.



cmha2p23

Removal of filter

SPARE PARTS

The spare parts lists for the LHN 130 and LHN 140/200 are published in separate documents with filename / ordering no:

LHN 130: 0455 996 990
LHN 140/200: 0468 964 990

NOTES

ESAB subsidiaries and representative offices

Europe

AUSTRIA
ESAB Ges.m.b.H
Vienna-Liesing
Tel: +43 1 888 25 11
Fax: +43 1 888 25 11 85

BELGIUM
S.A. ESAB N.V.
Brussels
Tel: +32 2 745 11 00
Fax: +32 2 726 80 05

THE CZECH REPUBLIC
ESAB VAMBERK s.r.o.
Prague
Tel: +420 2 819 40 885
Fax: +420 2 819 40 120

DENMARK
Aktieselskabet ESAB
Copenhagen-Valby
Tel: +45 36 30 01 11
Fax: +45 36 30 40 03

FINLAND
ESAB Oy
Helsinki
Tel: +358 9 547 761
Fax: +358 9 547 77 71

FRANCE
ESAB France S.A.
Cergy Pontoise
Tel: +33 1 30 75 55 00
Fax: +33 1 30 75 55 24

GERMANY
ESAB GmbH
Solingen
Tel: +49 212 298 0
Fax: +49 212 298 204

GREAT BRITAIN
ESAB Group (UK) Ltd
Waltham Cross
Tel: +44 1992 76 85 15
Fax: +44 1992 71 58 03

ESAB Automation Ltd
Andover
Tel: +44 1264 33 22 33
Fax: +44 1264 33 20 74

HUNGARY
ESAB Kft
Budapest
Tel: +36 1 20 44 182
Fax: +36 1 20 44 186

ITALY
ESAB Saldatura S.p.A.
Mesero (Mi)
Tel: +39 02 97 96 81
Fax: +39 02 97 28 91 81

THE NETHERLANDS
ESAB Nederland B.V.
Utrecht
Tel: +31 30 248 59 22
Fax: +31 30 248 52 60

NORWAY
AS ESAB
Larvik
Tel: +47 33 12 10 00
Fax: +47 33 11 52 03

POLAND
ESAB Sp.z.o.o
Warszaw
Tel: +48 22 813 99 63
Fax: +48 22 813 98 81

PORTUGAL
ESAB Lda
Lisbon
Tel: +351 1 837 1527
Fax: +351 1 859 1277

SLOVAKIA
ESAB Slovakia s.r.o.
Bratislava
Tel: +421 7 44 88 24 26
Fax: +421 7 44 88 87 41

SPAIN
ESAB Ibérica S.A.
Alcobendas (Madrid)
Tel: +34 91 623 11 00
Fax: +34 91 661 51 83

SWEDEN
ESAB Sverige AB
Gothenburg
Tel: +46 31 50 95 00
Fax: +46 31 50 92 22

ESAB International AB
Gothenburg
Tel: +46 31 50 90 00
Fax: +46 31 50 93 60

SWITZERLAND
ESAB AG
Dietikon
Tel: +41 1 741 25 25
Fax: +41 1 740 30 55

North and South America

ARGENTINA
CONARCO
Buenos Aires
Tel: +54 11 4 753 4039
Fax: +54 11 4 753 6313

BRAZIL
ESAB S.A.
Contagem-MG
Tel: +55 31 3369 4333
Fax: +55 31 3369 4440

CANADA
ESAB Group Canada Inc.
Missisauga, Ontario
Tel: +1 905 670 02 20
Fax: +1 905 670 48 79

MEXICO
ESAB Mexico S.A.
Monterrey
Tel: +52 8 350 5959
Fax: +52 8 350 7554

USA
ESAB Welding & Cutting Products
Florence, SC
Tel: +1 843 669 44 11
Fax: +1 843 664 44 58

Asia/Pacific

CHINA
Shanghai ESAB A/P
Shanghai
Tel: +86 21 6539 7124
Fax: +86 21 6543 6622

INDIA
ESAB India Ltd
Calcutta
Tel: +91 33 478 45 17
Fax: +91 33 468 18 80

INDONESIA
P.T. Esabindo Pratama
Jakarta
Tel: +62 21 460 01 88
Fax: +62 21 461 29 29

MALAYSIA
ESAB (Malaysia) Snd Bhd
Selangor
Tel: +60 3 703 36 15
Fax: +60 3 703 35 52

SINGAPORE
ESAB Singapore Pte Ltd
Singapore
Tel: +65 861 43 22
Fax: +65 861 31 95

ESAB Asia/Pacific Pte Ltd
Singapore
Tel: +65 861 74 42
Fax: +65 863 08 39

SOUTH KOREA
ESAB SeAH Corporation
Kyung-Nam
Tel: +82 551 289 81 11
Fax: +82 551 289 88 63

UNITED ARAB EMIRATES
ESAB Middle East
Dubai
Tel: +971 4 338 88 29
Fax: +971 4 338 87 29

Representative offices

BULGARIA
ESAB Representative Office
Sofia
Tel/Fax: +359 2 974 42 88

EGYPT
ESAB Egypt
Dokki-Cairo
Tel: +20 2 390 96 69
Fax: +20 2 393 32 13

ROMANIA
ESAB Representative Office
Bucharest
Tel/Fax: +40 1 322 36 74

RUSSIA-CIS
ESAB Representative Office
Moscow
Tel: +7 095 937 98 20
Fax: +7 095 937 95 80

ESAB Representative Office
St Petersburg
Tel: +7 812 325 43 62
Fax: +7 812 325 66 85

Distributors

For addresses and phone numbers to our distributors in other countries, please visit our home page

www.esab.com

ESAB AB
SE-695 81 LAXÅ
SWEDEN
Phone +46 584 81 000

www.esab.com

031021