

**Heater current power supplies EHS 110 / EHS 110 U
and EHS 111**

Products of BALZERS AG, Balzers

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DANGER HIGH VOLTAGE

The high current supply units EHS 110, EHS 110 U, and EHS 111 work under high voltage. Repair or service work may only be undertaken by specialists. The EHS version without metal cover has no protection to keep people from touching it and must therefore be located in a room that can be locked, and a high voltage warning sign must be mounted on the outside of the door close to the lock. The PVC cover and the Wehnelt voltage switch may not be touched when the high voltage is on.

1. APPLICATION

These units have been designed to supply the electron beam gun with the necessary filament current (dc) and the Wehnelt voltage, both on a high voltage potential.

2. TECHNICAL DATA (EHS 110, 110 U)**2.1. Heater circuit**

Primary voltage	0 – 220 V, 50 / 60 Hz
Primary current	0 – 2.5 A
Secondary voltage	0 – 6 V, dc
Secondary current	0 – 60 A
Residual ripple at 0.1 ohm ballast resistance (normal filament)	0 – 2 V

2.2. Wehnelt circuit

Primary voltage	115 V, 50 / 60 Hz
Primary current	0.3 A
Secondary voltage	0, 200, 250, 300 V
Secondary current	3 mA

2.3. Technical data EHS 111

Primary voltage	0 – 220 V, 50 / 60 Hz
Primary current	0 – 2.5 A
Secondary voltage	0 – 8 V, 50 / 60 Hz
Secondary current	0 – 60 A

3. DESCRIPTION**3.1. EHS 110, Heater Current Power Supply**

The EHS 110 contains the high-tension-insulated filament current transformer (1); a high current rectifier (2), on high potential, for the filament current; the high-tension-insulated Wehnelt transformer (3); and the Wehnelt rectifier (4).

The rotary switch (5) allows the following Wehnelt voltages to be connected to the gun:

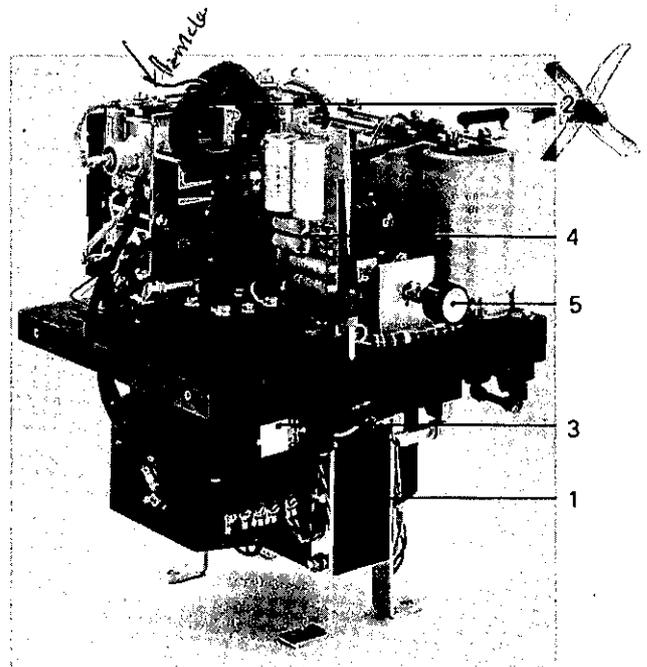


Fig. 1 Heater current power supply EHS 110 without plastic cover hood

Danger High Voltage

The Wehnelt voltage may only be switched when the high voltage supply is off.

- 0 = 0 volts
- 1 = 200 volts
- 2 = 250 volts
- 3 = 300 volts

The above values can be increased by approx. 15 %, if the series resistor R4 (47 k Ω) on the Wehnelt rectifier board S 5194 D1 is replaced by a resistor of 10 k Ω , which results in a better focussing of the electron beam.

At the same time, an additional lightning arrester (300 V) has to be switched in series to the lightning arrester V 1 on the same socket.

In general, the evaporation rate can be raised by increasing

the Wehnelt voltage. In case of aluminium, for example, a Wehnelt voltage of 300 V allows an excessive power density to be adjusted for a beam power of over 4 kW. Therefore, the optimum Wehnelt voltage (max. rate) has to be determined for the maximum beam power:

at 10 kW beam power = switch position 1 (200 V) or position 2 (250 V)

at 12 kW beam power = switch position 0 (0 V) or position 1 (200 V)

3.2. EHS 110 U, Heater Current Power Supply

The EHS 110 U is a normal EHS 110 in a metal housing which is closed from all sides. The Wehnelt and heater current cables are conducted to the high voltage lead-in through a metal hose. Both, the metal hose and the metal housing are earthed over the outer conductor of the high voltage cable.

3.3. EHS 111, Heater Current Power Supply

This unit contains only the high-tension-insulated filament current transformer of the EHS 110.



Fig. 2 EHS 111

4. INSTALLATION

4.1. EHS 110, Heater Current Power Supply

- a. The EHS 110 has to be mounted into the frame of the coating unit, underneath the electron beam gun, and fastened with 4 screws at the feet of the filament current transformer. The doors in the system frame must be equipped with locks.
- b. Loosen the 4 fastening screws for the red cover hood and lift the hood about 10 cm.
- c. Connect the high voltage cable:
Inner conductor to the centre tapping (secondary) of the filament current transformer T1 (screw M5); outer conductor (sheathing) to the earth screw (Fig. 3, item 3).
- d. Lower the hood again and fasten it with the 4 screws.
- e. Fit the angle with traction relief for the high voltage cable to the bottom of the stand frame.
- f. Carefully fasten the return conductor (16 mm², black) the high voltage cable to the base plate of the coating chamber (near the gun).
- g. Remove the cable guard from the red cover hood.

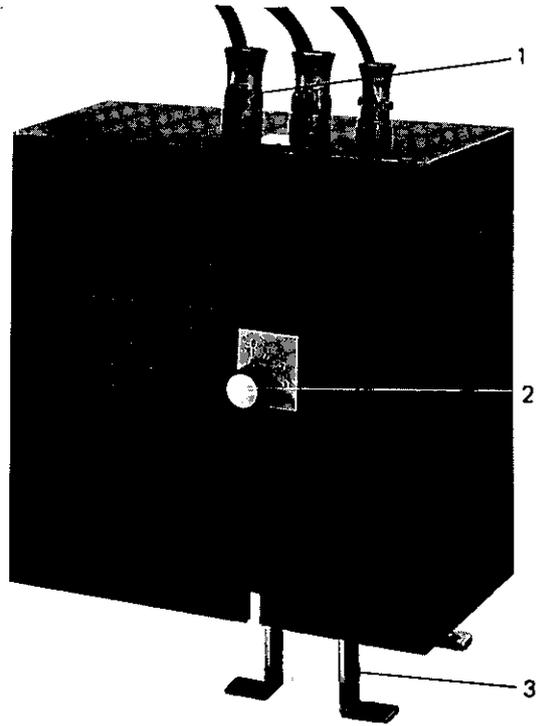


Fig. 3 EHS 110

- 1 Connection for high voltage lead-in (1 Wehnelt, 2 heater current)
 - 2 Rotary switch for adjusting the Wehnelt voltage
 - 3 Earth screw
- h. Pass the two high voltage cables and the Wehnelt cable through the rubber cuffs and the screw connections and plug them in.
 - i. Re-tighten the cable guard (traction relief) (mind the rubber cuffs!)
 - j. Connect the primary terminals of the two transformers in the terminal box below the gun (the connections inside the EHS were made in the factory). Make sure to follow the correct connection diagram e.g. S 5219 a.
- ### 4.2. EHS 110 U, Heater Current Power Supply
- a. The EHS 110 U may also be installed next to the coating unit. If so, make sure it is mounted mechanically safe. In such a case the safety switches in the cabinet doors are not required.
 - b. Loosen the 8 screws and remove the front panel of the metal housing.
 - c. Loosen the 4 screws from the feet of the filament current transformer and pull out the EHS from the metal housing.
 - d. Remove the return conductor (16 mm², black) from the high voltage cable.
 - e. Insert the high voltage cable through the cable connector on the metal housing.
 - f. Loosen the 4 fastening screws for the red cover hood and lift the hood about 10 cm.
 - g. Connect the high voltage cable:
Inner conductor to the centre tapping (secondary) of the filament current transformer T1 (screw M5); outer conductor (sheathing) to the earth screw (Fig. 3, item 3).
 - h. Lower the hood again and fasten it with the 4 screws.
 - i. Fit the angle with traction relief for the high voltage cable to the bottom of the stand frame.

- j. Push the EHS again into the metal housing and fasten at the feet of the transformer.
- k. Fasten the traction relief to the cable connector of the high voltage cable.
- l. Fasten the metal hose (with filament current and Wehnelt cable) to the metal housing.
- m. Remove the cable guard from the red cover hood.
- n. Insert the two high voltage cables and the Wehnelt cable through the rubber cuffs and the screw connections and plug them in.
- o. Re-tighten the cable guard, traction relief. (Mind the rubber cuffs!)
- p. Connect the primary terminals of the two transformers in the terminal box below the gun (the connections inside the EHS were made in the factory). Make sure to follow the correct connection diagram, e.g. S 5219 a.
- q. Remount the front panel with 8 screws.
- r. The return conductor (16 mm², black) which runs parallel to the metal hose, is to be attached to the vacuum chamber, outside the heating zone. If metal hose and cover hood have to be dismantled for a heat-up, it is necessary that the return conductor remains connected to the vacuum chamber.

4.3. EHS 111, Heater Current Power Supply

4.3.1. Installation into a high vacuum coating unit

- a. The EHS 111 has to be mounted into the frame of the coating unit, beneath the electron beam gun. The doors in the system frame must be equipped with locks.
- b. Loosen 8 screws and remove the front panel.
- c. Insert the high voltage cable without the return conductor (16 mm², black) through the cable connector on the metal housing.
- d. Connect the high voltage cable:
Inner conductor to the centre tapping (secondary) of the filament current transformer T1 (screw M5); outer conductor (sheathing) to the earth screw (Fig. 3, item 3).
- e. Attach the angle with traction relief for the high voltage cable to the bottom of the metal box.
- f. Carefully fasten the high voltage cable, which is parallel to the return conductor (16 mm², black) to the base plate of the coating chamber (close to the gun).
- g. Remove the cable guard for the two filament current cables.
- h. Pass the two filament current cables through rubber cuffs and screw connectors and connect them to the filament current transformer (screw M5).
- i. Re-tighten the cable guards (mind the rubber cuffs).
- j. Connect the primary winding of the filament current transformer in the terminal box below the gun (the connection inside the EHS was made in the factory). Make sure to follow the correct connection diagram, e.g. S 5219 a.
- k. Remount the front panel with 8 screws.

4.3.2. Installation in a UHV system

- a. The EHS 111, heater current power supply may also be installed next to the coating unit. If so, make sure it is installed mechanically safe. In such a case, the safety switches in the doors are not required.
- b. Remove the return conductor (16 mm², black) from the high voltage cable.
- c. See section 4.3.1., item b – e.
- d. Replace the two cable connections for the filament current cables by the blind plugs, comprised in the consignment.
- e. Remove the blind plug for the metal hose with the filament current cables and mount the metal hose.
- f. Connect the two filament current cables to the secondary windings of the filament current transformer (screw M5).
- g. See section 4.3.1., items j and k.
- h. See section 4.2., item r.

5. CONTROL MEASUREMENTS

Caution: The EHS is under high voltage!

5.1. Measurements on the EHS 110/111, heater current power supply

Should it be necessary to check the secondary output data (heater current, Wehnelt voltage), this has to be done with the high voltage switched on. It will be necessary to place the measuring instrument on top of the EHS (even if the cover hood is removed).

Make sure the measuring lines do not protrude over the sides of the EHS. Measurements are only possible if the two door safety switches are operated with both hands at the same time.

A second person will be required to operate the gun on the EKS.

5.2. Measurements on the EHS 110 U, heater current power supply

Remove the metal housing and place the measuring instrument on top of the EHS. Make sure the measuring lines do not protrude over the sides of the EHS.

Make sure that these measurements are only carried out by two persons.

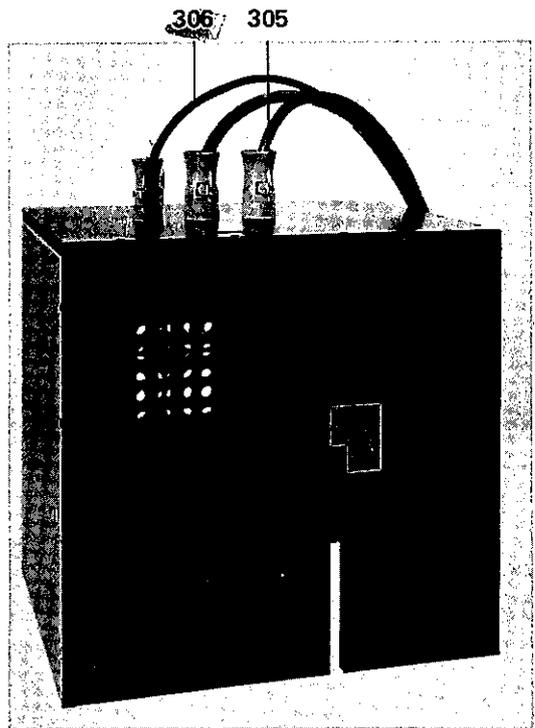
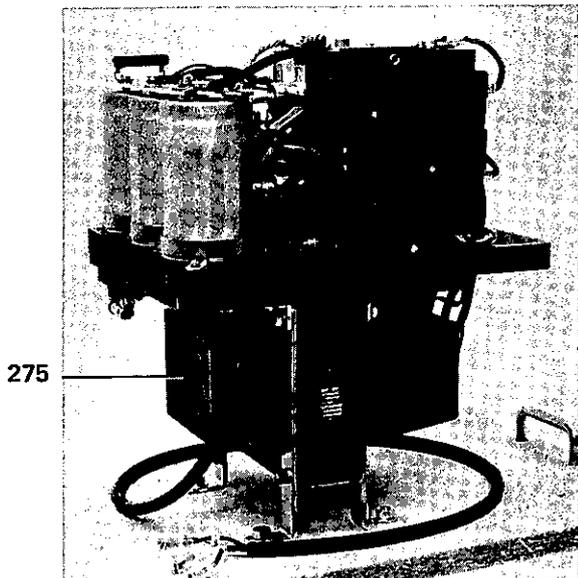
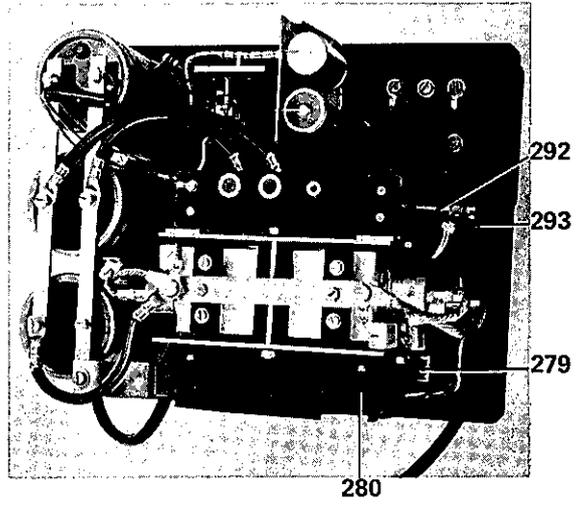
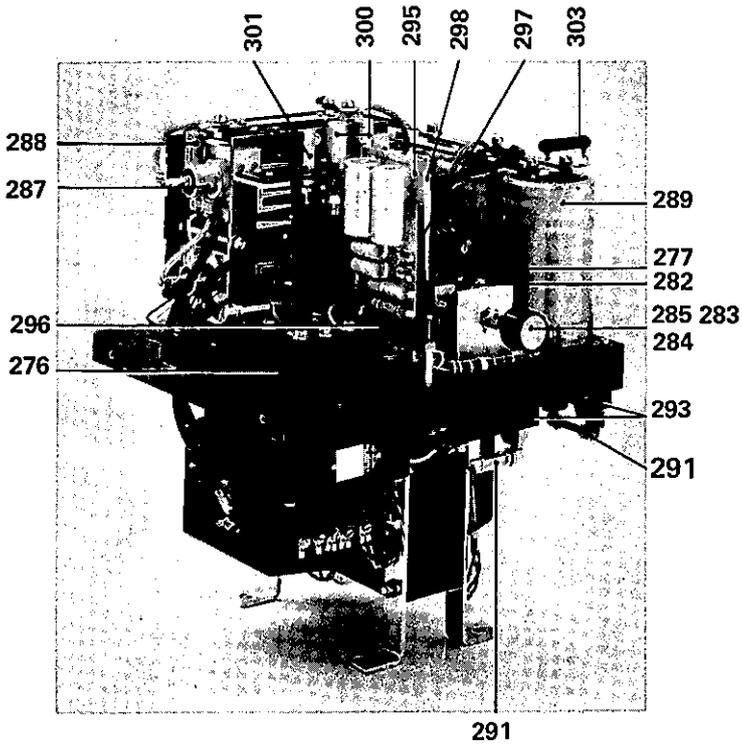
The distance between operator, measuring instrument and feed lines has to be at least 1 m.

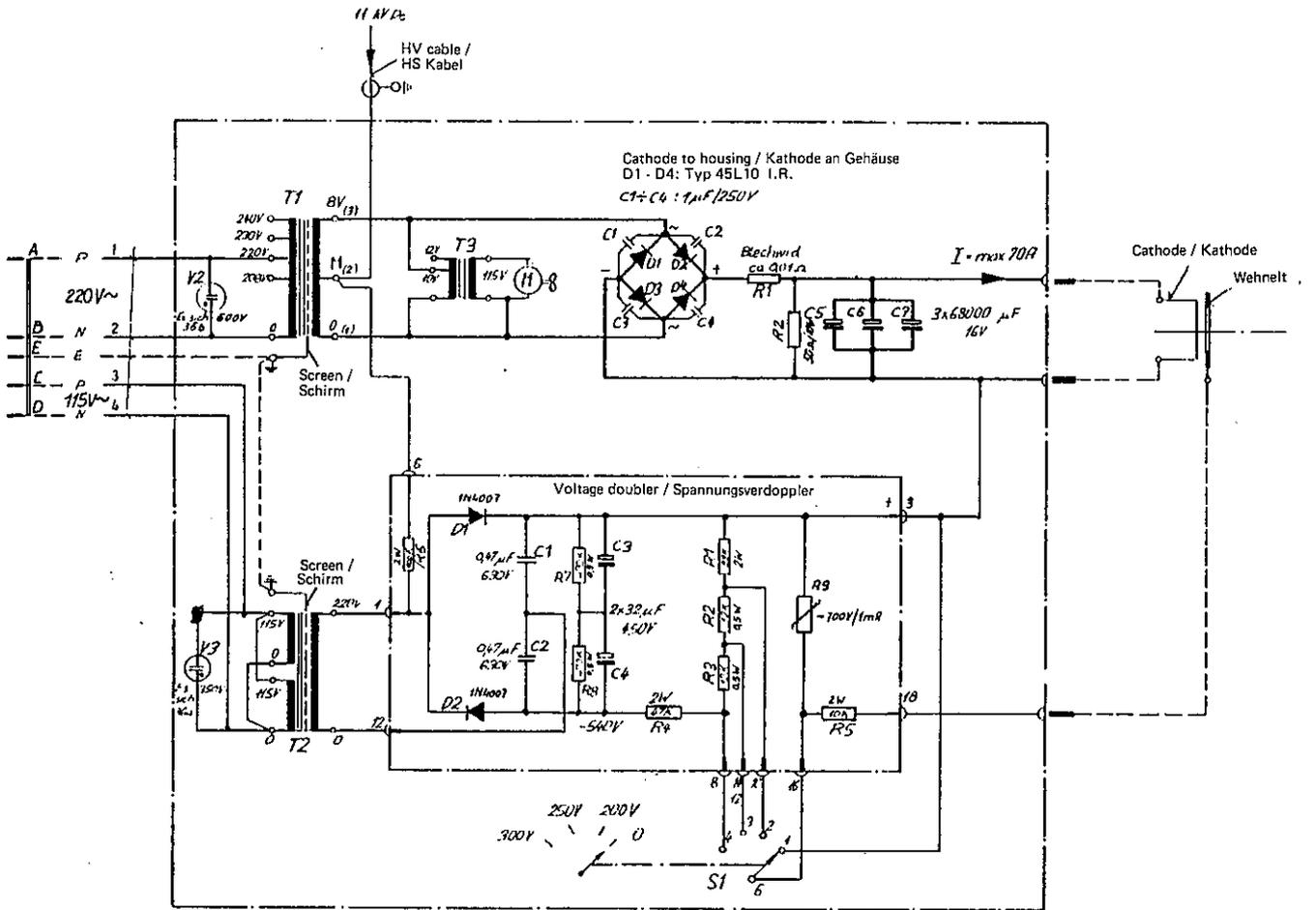
6. SPARE PARTS

Please order your spare parts according to the enclosed spare parts list. Always state type and serial number as indicated on the name plate of the unit.

Ordering example:

1 voltage doubler p-c board, Code No. 20–2862 R 1, as to spare parts list BB 800 041 E/14, item 295.





Attention!

The following metal parts to be connected to HV potential (connection M at transformer T1):
 Holding angle switch S1
 Core transformer T3
 Fixing clamps
 Holder of the diode.

Achtung!

Folgende Metallteile sind an das HS-Potential (Anschluss M auf Trafo T1) zu legen:
 Haltewinkel Schalter 1
 Kern Trafo T3
 Befestigungsbriden v. C5 - C7
 Halter der Diodenkühlkörper

