OPERATING INSTRUCTIONS

BALZERS

BB 800 180 BE

High Voltage supply EHV 108 A
Electron beam evaporator ESQ

A product of the BALZERS AG, Balzers

Edition: 7.80 / DN 9218

DANGER HIGH VOLTAGE

Touching parts under high voltage is absolutely FATAL.
Service work on the high voltage supply and the high voltage feedthroughs may only be carried out by qualified personnel. Service work on the high voltage system may only be carried out when the high voltage has been turned off.
The system is considered turned off when the master switch (MAIN SWITCH) on the EHV 108 A has been turned off or when the mains plug has been disconnected.
As a safety precaution a screw coupling connection is to be made from the grounding bar in the high voltage supply to the high voltage output (capacitator discharge).
The various terminals in the interlock circuit must not be considered as safety elements.
Caution:
When the cabinet doors are open and the high voltage supply is on there is **FATAL DANGER.**
The cabinet door of the EHV 108 A is only to be opened with a specially marked key (high voltage lightening streak). This key may only be carried by a qualified electrical expert.
The doors to the system frame must be provided with a lock. For service purposes the doors to the system frame may only be opened by a qualified electrical expert. Interlock switches on the frame doors do not qualify as safety elements. Before installing the EHS, therefore, be sure that the master switch is off or that the mains plug has been pulled.

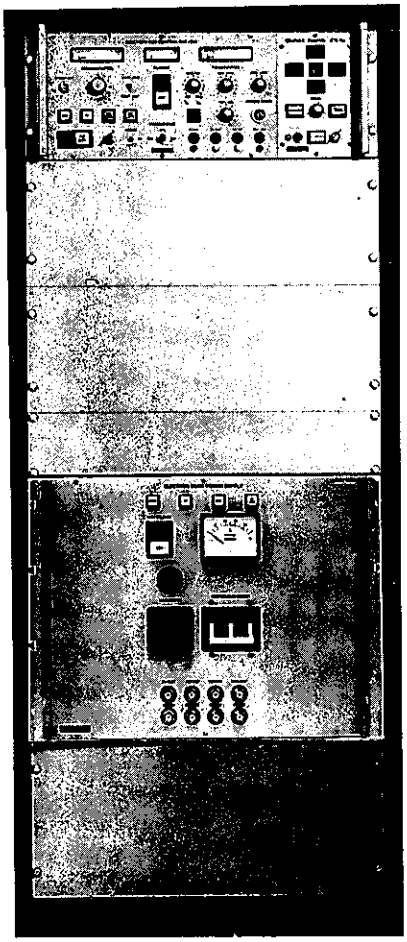


Fig. 1

1. DESCRIPTION

1.1. General

Evaporation with the power supply EHV 108 A permits two evaporation sources to be operated independently from one another in one vaccum chamber. However, it is not possible to realize a two-chamber operation with one power supply using the high voltage switching unit EHU 103.

A mutual influencing of the two sources is only present when the output power from the power supply is limited to 7 kW (0.7 A emission current.) The emission currents of the two sources together may not exceed 0.7 A (at 6 kV and 10 kV). The high voltage can be set to 6 kV or 10 kV using mains switch S1.

The instrument is equipped for the installation of a disconnect plug on the vacuum chamber (plug J13 and J14 on the back). The disconnect plug gives maximum protection to the person operating the system.
The entire power supply is housed in a rack module. This rack module can, together with the gun control devices EKS, be installed in a rack cabinet.

2. TECHNICAL DATA

Connection voltage (can be converted intern.)	3x380/220 V,	50 Hz (3P+N+E)
	3x220V	50 Hz (3P+E)
	3 x 415/240V	50 Hz (3P+N+E)
	3x208V	60 Hz (3P + E)
	3x230V	60 Hz (3P+E)
Connection rating for complete evaporation equipment	11 kVA	
Connection rating for two evaporation sources	11.7 kVA	
Nominal voltage of the high voltage unit	6 kV/10 kV DC convertable, not regulated	
Emission current	0 – 700 mA, DC, adjustable	
Emission current	900 mA	

3.2. The following are on the front panel

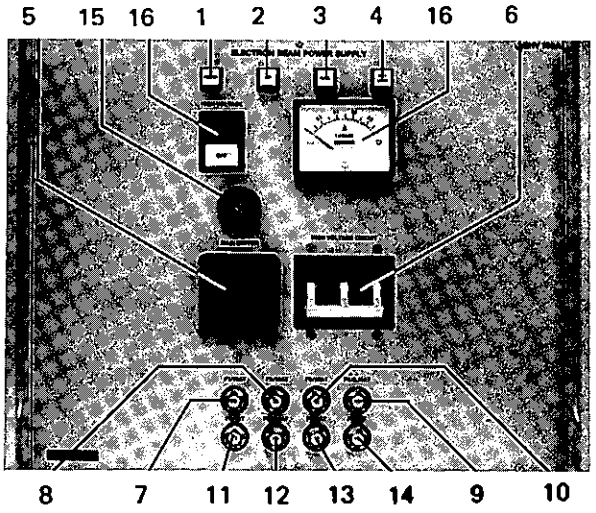


Fig. 2

3. PRINCIPLE OF OPERATION

3.1. General

The mains power supply for the entire electron beam evaporation equipment is lead over the master switch S1 (MAINS). The EHV 108 A consists of the high voltage part and the control part.

The high voltage part consists of:
Circuit breaker F9, contactor K1, high voltage transformer T2, high voltage rectifier D1 ... D6, series resistors R6 ... R9, smoothing capacitator C4, high voltage relay K3, high voltage distributor R10 ... R13, as well as the high voltage cable which leads to the evaporation source through the transductor.

The control part consists of:

Control transformer T1, relay pc board E1, general pc board E2, overcurrent pc board E3, and switchover relay unit E4.
All auxiliary and control voltages including those for the EKS and ETS are delivered by the control transformer T1.

The high voltage transformer T2 delivers approx. 8600 V~ on the secondary side which is jacked up to the idling voltage of approx. 11400 V by the rectifier D1 ... D6 and the high voltage capacitator C4. The minus output of the high voltage rectifier leads over the resistors R6 ... R9 and through the transfuctor to the heating current control unit EHS. After the grounding point on the back panel of the EHV 108 A (make the grounding line connection EHV 108 A -- coating system very carefully!) the emission current is lead over the switching relay unit E4 (over resistor R17 which delivers the current signal) and the high voltage relay K3 to the plus output of the high voltage rectifier. From the switching unit E4 the current signal is then lead to the supply pc board E2, contact 5. The voltage signal belonging to the current signal is lead from contact 38/E2 of the pc board generally to plug contact 15 on the overcurrent pc board. On the general pc board E2 the auxiliary voltage 24 VDC (over the rectifier D2) the operating voltage for the HV relay K3 (over the rectifier D4) is produced. In order that the HV relay responds quickly it receives an extra shot of high voltage approx. 60 VDC (nominal operating voltage is 26.5 VDC) in the starting phase.

1 Mains control lamp (POWER
2 Cooling fan control lamp (AIR)
3 Control lamp for external interlock circuit (AUXIL). The interlock circuit AUXIL permits the installation of an additional interlock contact in the control circuit. This can be done either over the terminal box (refer to the specific gun connection plan for each coating system) or over plug J12 (AUXIL) on the back panel. If the interlock contact for AUXIL is made in the terminal box, then plug J12 must be disconnected.
There are also 2 safety switches (refer to Item 11 and Item 12 in Fig. 4) in this circuit.
4 Control lamp for the key switch (KEY LOCK)
(If one of the functions displayed on the lamp is not carried out, then that lamp lights and all the other lamps to its right are dark)
5 Master switch (mains input) MAIN SWITCH and high voltage switchover 6 kV/10 kV
6 Circuit breaker F9 (overcurrent safety on the primary side of the high voltage transformer (HIGH VOLTAGE CIRCUIT)
7 Fuse F1 10 AT
8 Fuse F2 10 AT
9 Fuse F3 10 AT
10 Fuse F4 3.5 AT
11 Fuse F5 1 AT
12 Fuse F6 0.4 AT
13 Fuse F7 2 AT
14 Fuse F8 1 AT
15 Key switch to make the high voltage available
16 Emission current ampmeter 0 – 1 A (EMISSION)
17 Pushbutton high voltage on – off (OFF-ON, HIGH VOLTAGE)

3.3. The following are located on the back panel:

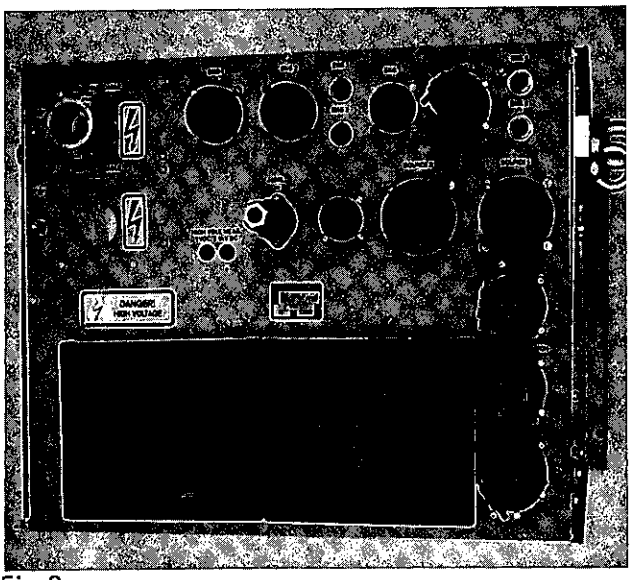


Fig. 3

3.4. The following are built into the inside:

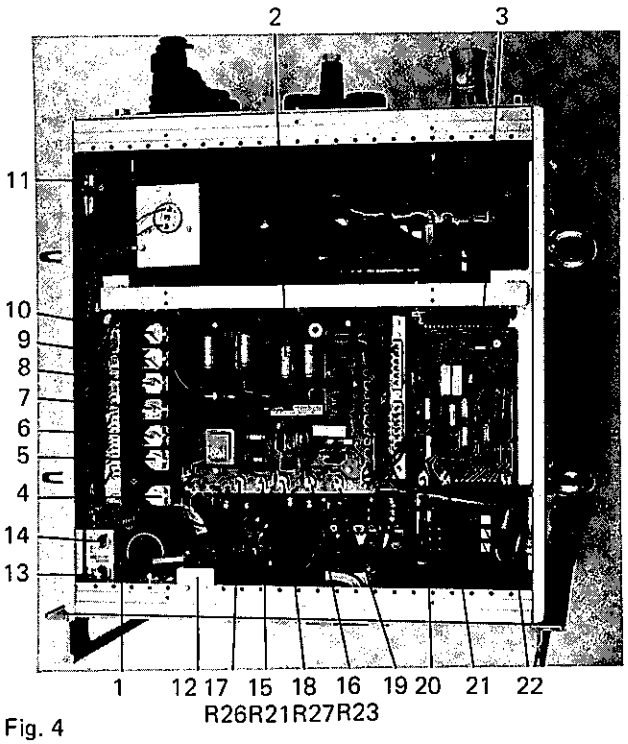


Fig. 4

EKS1-J1	Control cable to EKS, plug J3 (source 1)
EKS2-J2	Control cable to EKS, plug J3 (source 2)
EKS1-J3	Motor cable to EKS, plug J5 (source 1)
EKS2-J4	Motor cable to EKS, plug J5 (source 2)
EKS1-J5	Control cable to EKS, plug J6 (source 1)
EKS2-J2	Control cable to EKS, plug J6 (source 2)
EKS1-J7	Transductor cable to EKS, plug J8 (source 1)
EKS2-J8	Transductor cable to EKS, plug J8 (source 2)
Source 1-J9	Control cable to source 1
Source1-J10	Control cable to source 2
J11	Mains connection for the evaporation control unit ADU 100
J12 AUXIL:	Plug for additional interlock contact in the high voltage control circuit (refer to control lamp AUXIL. under Section 3.2) The plug with the built-in bridge must be plugged in when no interlock contact is connected in the terminal box.
J13 J14	DISCONNECT SWITCH: Connection for the disconnect plug on the vacuum chamber
J15 MAINS:	Mains input
HIGH VOLT. MEAS.:	Measurement sockets for checking the high voltage inpot resistance of the instrument Ri > 20 kΩ/V)
HIGH VOLT. CABLE SOURCE 1	High voltage output source 1
HIGH VOLT. CABLE SOURCE 2	High voltage output source 2

1 Relay pc board E1

2 Pc board general E2

3 Overcurrent pc board E3

4 Relay K1, command high voltage on

5 Relay K2, report high voltage on

6 Relay K3, switch off relay

7 Relay K4, high voltage monitoring

8 Relay K5, fan monitoring

9 Relay K6, not functioning

10 Relay K7, auxiliary relay for switchover from 6 kV to 10 kV

11 Safety switch to the cover panel of the high voltage part

12 Safety switch to the protective hood of the high voltage capacitator C4

13 Trimming potentiometer R19 RESET CURR. ADJUST for 6 kV range

14 Trimming potentiometer R20 RESET CURR. ADJUST for 10 kV operation. These R19 and R20 potentiometers determine how long after an arc-cover the over current signal on point 5/E2 remains stable. It is so adjusted that at when a normal arc-over occurs the high voltage relay responds and after approx. 50 ms releases again (potentiometer not adjusted to any value). In contrast when venting the coating system when the high voltage is on (short circuit caused by discharge) the relay remains in respond position for approx. 1.5 which shuts off the high voltage on the primary side (potentiometer set at a higher value). If the potentiometer is set too low, the high voltage relay flutters when a high voltage short circuit occurs

15 Trimming potentiometer R21 } Coil current adjustment

16 Trimming potentiometer R23 } 10 kV operation

17 Trimming potentiometer R26 } Coil current adjustment
18 Trimming potentiometer R27 } 6 kV operation
19 Potentiometer R25, calibration instrument J_E
20 Potentiometer R26, cutout delay (0,5 ÷ 1 sec)
21 Potentiometer R27, longer release delay (150 ÷ 200 ms)
22 Potentiometer R28, overcurrent triggering (900 mA)

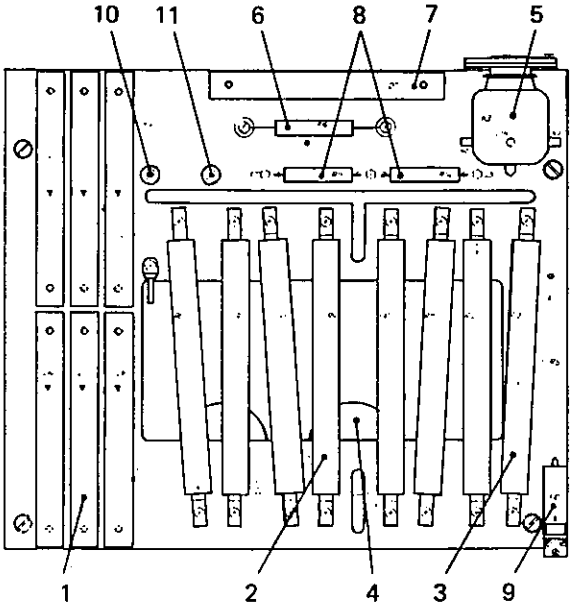


Fig. 5

1 6 high voltage rectifiers D1 ... D6
2 Series resistors R6 ... R9
3 High voltage divider R10 ... R13
4 Switching capacitator(s) C1, C2, C3
5 High voltage relay K3
6 Limiting resistors R16 to relay K3
7 High voltage diode D7
8 Discharge resistors R14, R15
9 Over voltage downlead F10
10 High voltage output for 1st source
11 High voltage output for 2nd source

4. OVERCURRENT INTERRUPTION OR CUTOUT
(overcurrent pc board BG 241 904 -S)

When operating the high voltage supply it is absolutely necessary that in the event of a high voltage arc over in the vacuum chamber the high voltage output immediately (i.e. after just a few milliseconds) cuts out for a short period. The short circuit current flowing during this time (limited by the series resistors R6 ... R9) is approx. 10 A. At this current the circuit breaker F9 would switch off the primary side of the high voltage transformer T2 after approx. 50 ms. In order to avoid this the switchover circuit K2 on pc board E4 is driven according to the following functional process:

The voltage on contact 15-P6 is proportional the the current coming from the high voltage rectifier (emission current). If the voltage (contact 15) exceeds the value set on the voltage divider R28, then a voltage of approx. +14V occurs at the output of the amplifier N10 and this also at the input (2.3) of N8. The wiring of N8 (12-15) through the capacitator C10 has the effect that the overcurrent signal is only given further when it occurs for longer than approx. 6 ÷ 9 ms on contact 15. In this way high voltage arc-overs trigger no switching function of the high voltage relay K3 when they last for less than 6 ÷ 10 ms.

The release delay effected by capacitator C9 (N7, 4 — 6) has the effect that once the arc over has gone out the signal on point (N7, 12) remains a maximum of 30 ms (HIGH) and thus high voltage relay K3 and the switchover relay K2 release after a delay of the same time. From contact 11N7 the singal is lead to flip-flop N11 as well as to contact 10 N8 and 14N9. Output 9N8 or 12N9 HIGH receives a signal alternately from outputs 9,7 of N11 (this as a result of the individual overcurrent responses). If now two arc overs occur at the electron beam evaporator within the time period defined by both the delay elements (R18, C12) or (R17, C6), then output 9N5 HIGH receives voltage which results in output 4N5 LOW or 12N6 HIGH remains during the time defined by the delay element (R27 + R16, C7). This delay is approx. 150 ms and effects a corresponding response time (contact open) on the high voltage and switch over relay.

If input 10N4 is supplied with voltage as a result of the overcurrent trip HIGH, then timer N2 is driven. If the signal remains at the input longer than the time defined by the time element (C4, R19, + R26) (approx. 0,5 s), then the output 7N1 will be supplied with a delayed signal HIGH. Thus transistor H1 is driven and with it the switch off relay K3 on pc board E1, which then switched off contact K1 on the high voltage transformer (short circuit switch off).

If contacts 12N6 HIGH, 4N6 LOW, and 9N6 HIGH receive voltage and transistors H3 and H4 connect through, the the high voltage relay K3 is activated.

The switchover circuit of the swithing unit E4 K2 (attached to the back panel, lower left side) is driven approx. 20 ms after the high voltage relay by the delay element (R13, C5) response delay of the switchover relay K2 on pc board E4). The time element (R14, C8) effects the release delay of approx. 25 ms of the high voltage relay in relationship to the switching relay K2 on pc board E4.

When the overcurrent pc board is functionning properly it has the following transient responses:

Input ⟶	Output
P6 (15) P1 = Voltage zero point	P7 (12) Switching relay P8 (13) High voltage relay P5 (8) Cutout relay
Overcurrent signal $\tau_{UE} \leqslant$ (6 ÷ 9 ms)	P7 = 24 V, P8 = 60 V, P9 = 24 V
6 ÷ 9 ms $< \tau_{UE} =<$ 1,5 s	P8 = 0 V ca. 20 ms delay of overcurrent signal
	P7 = 0 V ca. 10 ms delay to P8
	P7 = 24 V ca. 30 ms + τ_{UE}
	P8 = 60 V ca. 45 ms + τ_{UE}
τ_{UE} = 1,5 s	P8 = 0 V ca. 20 ms delay of overcurrent signal
	P7 = 0 V ca. 15 ms delay to P8
	P5 = 0 V

5. COIL CURRENT CONTROL

In order that the beam spot position remains stable and independent from the high voltage, the coil voltage J_C must be appropriately readjusted. Voltage fluctuations chiefly occur as a result of load changes (change in the emission current) or of fluctuations in the mains voltage.

The high voltage influence on the coil current is separately adjusted for 6 kV and 10 kV. The follow-up control on pc board E2 acts over connections 2 – 1 (in 10 kV operation) or 2 – 47 (in 6 kV operation) and the plug contacts P, T, Z of the plug connection EHV 108 A/J1-EKS 110 A/J3 at the programming input 4/5 – 6/7 of the coil supply pc board E4 in the EKS 110 A.

In this step the action of the high voltage is introduced into the programming circuit over the high voltage divider R10 ... R13, R17 and the optoisolator N1 (TIL 111). The correct coil current change is adjusted as a function of the high voltage change using potentiometer R23 in 10 kV operation and R27 in 6 kV operation on pc board E2. The appropriate biasvoltage is introduced into the programming circuit using potentiometer R21 (10 kV operation) or R26 (6 kV operation) on pc board E2 because the coil current supplied by the pc board E4 in the EkS 110 A increases when the voltage at the programming input 4/5 – 6/7 decreases.

The optoisolator galvanically separates the programming circuit of the coil current supply from the high voltage measurement circuit.

5.1. Adjustment of the proper compensating coil current at 10 kV

a) With the high voltage off, set the coil current to 0.8 A using potentiometer R7 (10 kV) on the EKS.

b) With the high voltage on, set the coil current to approx. 1.5 A using potentiometer R23 on pc board E2 located in the EHV 108 A.

c) Set potentiometer R7 on the EKS to end position (cw) and set the coil current to 2A using potentiometer R21 on pc board E2 in the EHV 108 A.

d) With the high voltage off, set the coil current to 0.8 A using potentiometer R7 on the EKS.

e) With the high voltage on set the coil current to exactly 1.5 A using potentiometer R23 on pc board E2 located in the EHV 108 A.

f) Set the beam spot position to the desired place using potentiometer R3 (BEAM POSITION) and perhaps R7 on the EKS.

(If the beam spot is to be adjusted on potentiometer R7 very great care must be taken because the beam spot can be quickly positioned outside of the crucible rim when this potentiometer is used).

g) Push button filament ON and, using potentiometer (R1) EMISSION CONTROL increase the emission current slowly (crucible material Al or Cu). The beam spot must not move when the emission current is adjusted.

h) If the beam spot moves towards the crucible rim when the emission current is increased the coil current on pc board E2 in the EHV 108 A is to be increased by approx. 100 mA using potentiometer R23, and afterwards dropped to the inital value using potentiometer R21 on pc board E2 in the EHV 108 A.

(By doing this the high voltage influence on the coil pc board E4 in the EKS 110 A is increased and with it the magnetic field is more rapidly decreased).

5.2. Adjustment of the proper compensation coil current at 6 kV:

a) With the high voltage off, set the coil current to 0.5 A using potentiometer R6 (6 kV) on the EKS.

b) With the high voltage on, set the coil current to approx. 0.7 A using potentiometer R27 on pc board E2 in EHV 108 A.

c) Set potentiometer R6 on the EKS to end position (cw) and set the coil current to 1.5 A using potentiometer R26 on pc board E2 located in the EHV 108 A.

d) With the high voltage off, set the coil current to 0.5 A using potentiometer R6 on the EKS.

f) Adjust beam spot to desired position using potentiometer R3 (BEAM POSITION) and possibly R6 on the EKS.

(If the beam spot position is to be adjusted using potentiometer R6 great care must be taken because the beam spot can be rapidly positioned outside the rim of the crucible when this potentiometer is used).

g) Push button filament ON and slowly increase the emission current (crucible material Al or Cu) using potentiometer (R1) EMISSION CONTROL. The beam spot must not move when the emission current is changed.

h) If the beam spot moves towards the rim of the crucible when the emission current is increased, the coil current on pc board E2 located in the EHV 108 A must be increased by approx. 100 mA using potentiometer R27, and afterwards dropped to the original value using potentiometer R26 on pc board E2 located in the EHV 108 A.

(By doing this the high voltage influence on the coil pc board E4 in the EKS 110 A is increased and thus the magnetic field is more quickly decreased)

6. HIGH VOLTAGE MEASUREMENT RELAY (High voltage monitoring) K4 (on relay pc board E1)

From the general pc board E2 the voltage at the diode D1 (ZX 120) which appears as a result of the high voltage, the contacts 6 – 8 to the contacts 18-22 of relay pc board E1. Two of the contacts of the monitoring relay K4 are in the control circuit of the EKS (per control unit one switching contact K4) between the emission current, measurement and regulation pc board A1 (S 5220 c) and to the SCR driver BG 522 228 DS (in the diagram to the EKS it is drawn with a broken line directly above contact H-J of plug J3) This interruption of the control circuit prevents the cathode from blowing when there is no high voltage (emission current) present.

7. TRANSDUCTOR CIRCUIT (Measurement of the emission current per evaporation source)

The EHV 108 A permits two independent sources (electron beam evaporation) to be operated simultaneously or one after the other in the same vacuum chamber. For this it is necessary to be able to measure the emission current from each source separately. This measurement takes place at transductor T3 or T4. Transductors T3 and T4 are located immediately before the point at which the high voltage cable comes out of the back panel of the EHV 108 A.

The high voltage cable (without shielding) runs through the transductor T3 for the first source and T4 for the second source and then exits the EHV 108 A. Only one measurement signal is produced in each transductor. This measurement signal is proportional to the emission current of the central lead. Connections 1, 2 are the supply lines and 3, 4 the measurement lines (can be verified with an Ohmmeter, supply line low impedance measurement line high impedance)

8. OPERATION WITH TWO EVAPORATION SOURCE

in the same vacuuum chamber:

If a second source is to be operated with the same power supply EHV 108 A, the instrument is to be converted as follows:

8.1. Install second transductor (diagram Nr. BG 241 852 -S, Item T4)

Installation under the first transductor (Item T3) Connection according to diagram Nr. BG 241 852 -S)

8.2. Instead of the 2 soldering lugs J17 the pc board FOCUS CORRECTION SOURCE 2., BG 241 853. In this connection Nr. of the pc board is to be connected etc.

8.3. The following cable connections are to be made.

EHV 108 A

J2	——►	EKS 2/J3
J4	——►	EKS 2/J5
J6	——►	EKS 2/J6
J8	——►	EKS 2J8
J10-SOURCE 2	——►	Terminal box, connections source 2 (refer to connection plan gun belonging to it)
HIGH VOLT. CABLE	►	EHS source 2
SOURCE 2		Attention! The HV cable shielding must not run through the transductor, but must be lead between the back panel and the transductor to the grounding screw.

8.4. Adjustment of the properly compensated coil current:

Procedure as in point 5.1. and 5.2., description for source.

The potentiometer functions on pc board FOCUS CORRECTION are:

R5, R6 — Adjustment of the high voltage influence (smae as R23, R27 at source 1)

R7, R8 Adjustment of the bias voltage for the programming circuit of the coil supply pc board E4 (same as R21, R26 for source 1)

9. TROUBLESHOOTING

The EHV 108 A weighs 108 kg. If the power supply is to be taken out of the rack cabinet a satisfactory support must be provided (for example, a cart). If the module is only to be partially taken out (service work on the low voltage) the front panel mounted under the EHV 108 A must be screwed tightly to the rack cabinet.

The EHV 108 is so designed that a separation of the control voltage from the high voltage is guaranteed. All electronic components and relays are easily accessible on the three pc boards above the core of the high voltage transformer. (the switching unit E4 with switching relay K2 is an exception. It is located on the rear panel of the EHV 108 A) The cover panel may only be removed by trained personnel because once the panel has been removed all parts under high voltage are exposed!
Pull out the mains plug first!

When troubleshooting it may become necessary to take measurements on the open high voltage parts (under separate cover). Such measurements may only be carried out by well qualified, properly trained personnel. When taking the measurements, measurement connections must under no circumstances be made or disconnected when the high voltage is on. Neither may the individual measurement instruments be touched during the taking of the measurements.

The measurement lines must be constantly so lead that they are always at a distance of several cm away from the parts under high voltage.

All safety elements must be properly functioning before the gun is operated. In this case all the square white lamps on the EHV as well as on the EKS light. If a safety element is not properly functioning, then the corresponding light and all the following display lights on the right are dark.

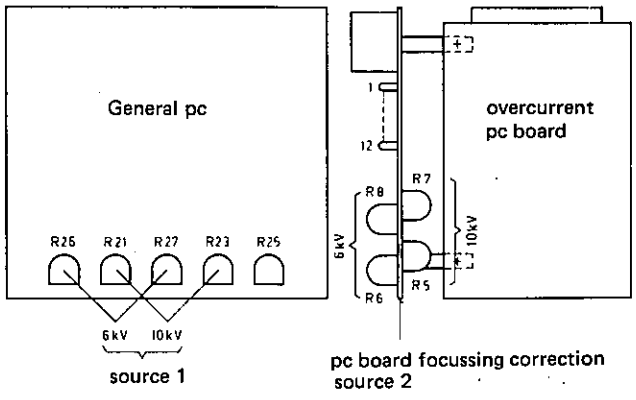


Fig. 6

Disturbance	Cause	Correction
HV ON doesn't function (OFF lamp does not light)	Circuit breaker (HIGH VOLTAGE CIRCUIT) not on	Switch on circuit breaker
No heating current after pushing button FILAMENT ON	The coil current is controlled by the EHV 108 A correspondingly to the high voltage. When the high voltage is off it is thus easily possible that a coil current of J_c 0.4 A is flowing and the FILAMENT OFF button does not light. If the high voltage is switched on this problem is solved. The filament can thus only be switched on once the high voltage is on.	
Emission rises immediately to the adjusted limit when the potentiometer is slightly turned.	Transductor output mixed up (J7, J8) Measurement output of the transductor mixed up	Plug cable into proper socket.
No emission with high voltage on, heating current remains at minimum position	HV monitoring relay K4 on pc board E1 (EHV 108 A) defective	Check relay K4 function
Circuit breaker F9 responds when high voltage is turned off	High voltage relay K3 is not driven	Turn off high voltage. Check functioning of overcurrent pc board E3 BG 241 903 -U a) Input 60 V/O Check 15 V supply on pc board E3 b) Supply current to pc board E2 between contacts 5 and 40 (0 ÷ 1 A) at approx. 900 mA the HV relay should trip. If it doesn't the overcurrent signal on plug-in pc board *E3 must be checked from input 15 to output 13.
Circuit breaker F9 responds once the high voltage has been turned on after the system has been cleaned or installed	High voltage parts contaminated from being touched during cleaning or installation	Turn on the high voltage several times

10. SPARE PARTS

Spare parts are to be ordered according to the enclosed spare parts list.

When ordering spare parts be sure to include the name of the instrument and its serial number.

Ordering example:

1 fuse 10 A slow blowing, order nr. B 4666 471 FA according to spare parts list BB 800 050 E/1, Item 11.

Regulations for converting operating voltage to various mains voltages when using the high voltage supply EHV 108 A.

Refer to diagram BG 241 852 AS and BG 241 853 AS

The standard power supply for connection to mains power is 3 x 380/220 V, 50 Hz. For other mains voltages and frenquencies the following is to be undertaken.

1. Mains voltage 3 x 208 V, 3 x 220 V, 3 x 230 V with or without neutral lead

1.1. Replace the three phase protection switch F9 nominal current 16 A, on the front panel with a switch for a nominal current of 25 A.

1.2. Rewire the HV transformer primary side to the appropriate tap 208 V, 220 V, or 230 V.

1.3. Rewire the control transformer T1, right hand side of front panel, to the appropriate tap either 208 V, 220 V, or 230 V.

1.4. Rewire the plug strip J18 (on the back of the protective switch F9) The three wires marked 1 B, and C are to be rewired from connection 4 and 5 to connections 1, 2 and 3 according to diagram BG 241 852 AS.

1.5. Change nameplate. Information corresponding to the mains data.

2. Mains voltages 3 x 415/240 V with neutral

2.1. Rewire the high voltage transformer T2 primary side to tap 428 V.

2. Rewire control transformer T1 primary side to 240 V

3. Change nameplate. Information corresponding to the mains data.

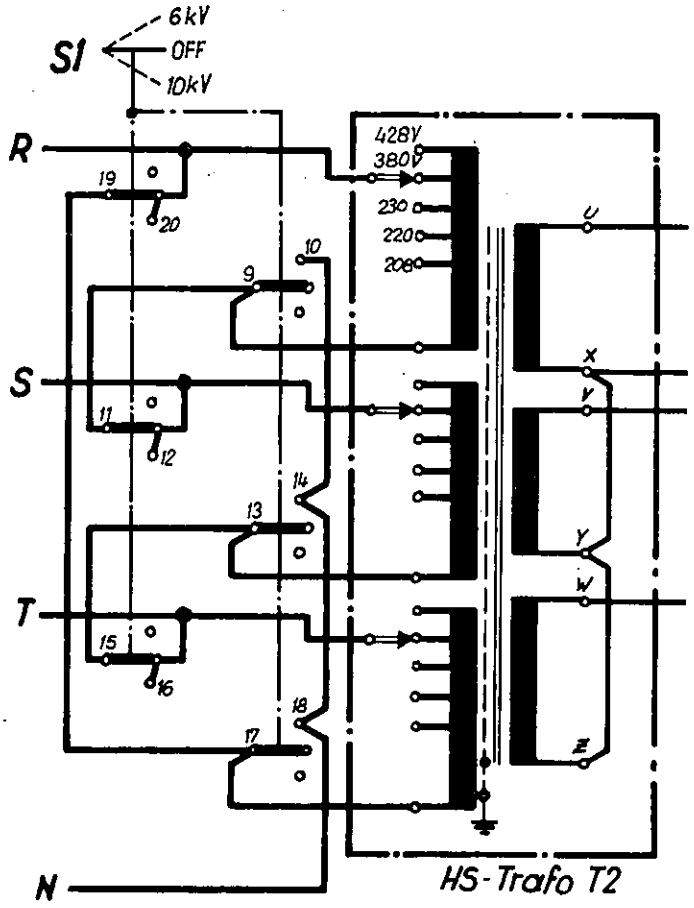
3. Mains frequency 60 Hz

Control transformer T1:
Rewire secondary side from 97 V to 115 V
Change nameplate

4. Switching for heating current supply unit EHS 110 or EHS 111

Rewire primary side corresponding to the mains voltage from 208 V, 230 V, 230 V or 240 V (for mains voltages of 3 x 415/240 V or 3 x 440/254 V)

Refer to diagram BG 005 194 BS for EHS 110
and diagram BG 241 192 AS for EHS 111



BG 850 192 -V

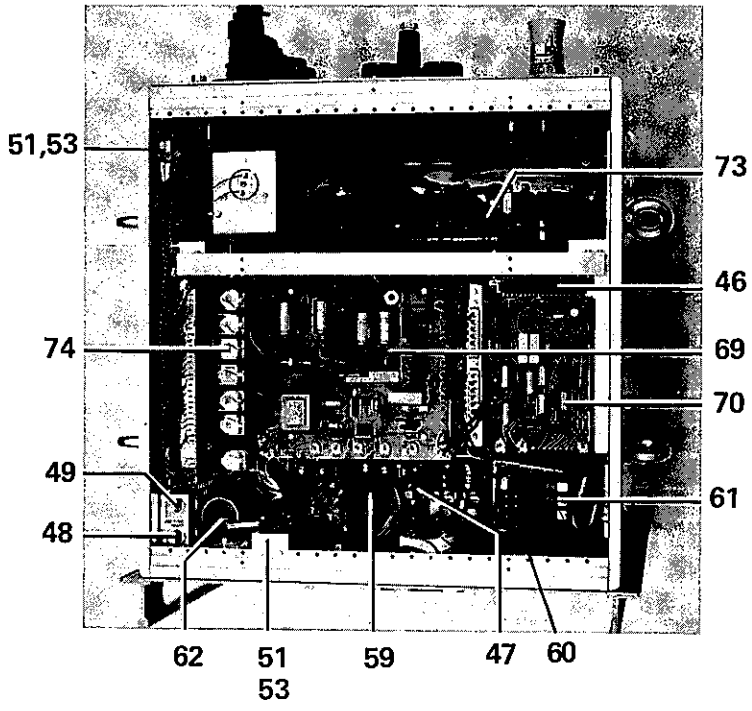
	Description Teil	Item Pos.	Code-No. Bestell-Nr.	S	Remarks Bemerkungen
1	Ammeter / Ampèremeter 0-1A/1 mA *BG 241 102*	1	B 5202 303 GG	MI 1	
1	Switch / Schalter C10-A220-EL-V753.200	2	B 4743 201 KG	S2	
1	Switch / Schalter *BG 241 978*	3	B 4743 401 KB	S 1	
1	Knob / R-Griff, red/rot S1C-G002	4	B 4743 012 K1		to item/zu Pos. 3
		5			
1	Circuit breaker / Schutzschalter *BG 241 869*	6	B 4668 101 ZE	F9	
3	Fuse holder /G-Sicherungslampe 032.1010	7	B 4661 212 AQ	F1-F3	
1	Fuse holder / G-Sicherungslampe 032	8	B 4661 212 AN	F4	
1	Fuse holder / G-Sicherungslampe 032.1008	9	B 4661 212 AL	F5	
3	Fuse holder / G-Sicherungslampe 032.1003	10	B 4661 212 AE	F6-F8	
3	Fuse / Sicherung 10 A, slow/träge	11	B 4666 471 FA		
1	Fuse / Sicherung 3,15 A, slow/träge	12	B 4666 446		
1	Fuse / Sicherung, 2 A, slow/träge	13	B 4666 442		
2	Fuse / Sicherung, 1 A, slow/träge	14	B 4666 436		
1	Fuse / Sicherung, 0,4, slow/träge	15	B 4666 428		
		16			
2	Push button / Leuchttaste 02 – 121	17	B 4750 401 EA	S3, S4	
4	Signal lamp / Signallampe 01 – 050	18	B 4683 413	L1-L4	
1	Lens / Kalotte "ON"	19	BG 241 119 AR		
1	Lens / Kalotte "OFF"	20	BG 241 120 AR		
1	Lens / Kalotte "POWER"	21	BG 241 121 -R		
1	Lens / Kalotte "AIR"	22	BG 241 122 -R		
1	Lens / Kalotte "AUXIL"	23	BG 241 123 -R		
1	Lens / Kalotte "KEY LOCK"	24	BG 241 124 -R		
		25			
2	Lamp / Glühlampe T 6,8 60 V 0,04 A	26	B 5005 608 60		
4	Lamp / Glühlampe T 5,5 60 V 0,03 A	27	B 5005 605 59		
		28			
2	Fan / Lüfter compl.	29	BG 241 103 -X	M1,M2	
2	Filter compl.	30	B 5099 152 E1		
2	Socket / G-Dose 4 BU, 5A 250 V, 3303000	31	B 4722 464 CA	J3,J4	
2	Socket / GS-Dose 7 St, 24 – 10 *BG 524 640*	32	B 4722 410 MJ	J14,J15	
2	Socket / GS-Dose 17 St, MS 3102 A20-29P	33	B 4722 682 MC	J5,J6	
2	Socket / GS-Dose 24 BU, MS3102A, 24 – 28 S	34	B 4722 753 MC	J1,J2	
2	Socket / GS-Dose 30 BU, 32 – 8 *BG 524 678*	35	B 4722 801 MJ	J9,J10	
2	Plug / G-Stecker 4St, 5A 250 V 3302000	36	B 4722 404 CA	J7,J8	
1	Socket / GS-Dose 8 BU, 18 – 8 *BG 524 641*	37	B 4722 455 MJ	J11	
2	Plug / Stecker 7 BU 24 – 10 *BG 524 611*	38	B 4722 409 MD	J14,J15	
1	Plug / Stecker 17 BU	39	BG 241 038 BX	J6	
1	Socket / G-Dose 3 P + E 380 V 10 A 3111 020	40	B 4722 131 CB	J12	
1	Plug / Stecker 3 P + E	41	BG 241 812 -X	J12	
1	Socket / Buchse 4mm, red/rot	42	B 4710 141 02		
1	Socket / Buchse 4 mm, blue/blau	43	B 4710 141 06		
1	Socket / GS-Dose 7 BU *BG 524 639*	44	B 4722 409 MJ	J13	
1	Plug / Stecker 7 St 24 – 10 *BG 524 533*	45	B 4722 410 MK	J13	
1	Plug strip / Steckerleiste PFCB 18 S04-GE00JO 18 p	46	B 4717 181 PE	J16	
1	Plug strip / Steckerleiste 2066.2 12 polig	47	B 4716 143 12	J18	
1	Potentiometer 2,2 kΩ 0,3 W	48	B 4870 322 LA	R20	
1	Potentiometer 1 kΩ 0,3 W	49	B 4870 310 LA	R19	
		50			
2	Micro-switch / Mikroschalter V3-9015 M	51	B 4746 115 BB	S6,S7	
1	Resistor / Widerstand 5% 0,50 W 680 Ω	52	B 4806 268 NA	R22	
2	Actuator / Betätiger JV-9026	53	B 4746 109 BZ		

Spare Parts for / Ersatzteile zu

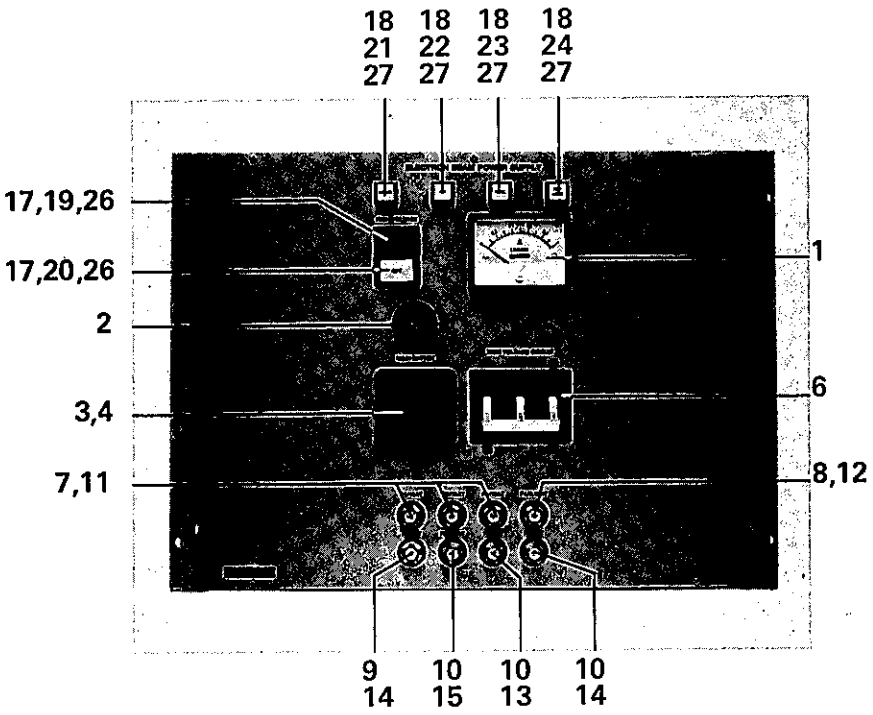
Electron beam power supply/Hochspannungsversorgung

BB 800 180 E/1

		Description Teil	Item Pos.	Code-No. Bestell-Nr.	S	Remarks Bemerkungen
1		Neon cable / Neonkabel TVH ϕ A7 1,5 mm2	55	B 4591 501 AQ		
1		NF-cable / NF-Kabel EHE 1 PR 1 x 0,22 mm2	56	B 4390 551 AA		
			57			
1		Transductor / Transduktor, DI 3585	58	B 5139 101 DH	T3	
1		HV-Transformer / HS-Transformator *BG 241 437 B*	59	B 5126 051 VA	T2	
1		Transformer / Steuertransformator *BG 241 101*	60a	B 5128 501 SG	T1	Fabr. Nr. 97 ÷ 116
1		Transfomer / Steuertransformator *BG 241 938*	60b	B 5128 502 SG	T1	ab Fabr. Nr. 117
1		Contactor / Schütz CA 1 – 10, 115 V 60 Hz	61	B 4771 063 GP	K1	
1		Capacitor / Kondensator 10 kV 1µF	62	B 4985 610 6X	C4	
1		Capacitor / Kondensator 15 kV 250 nF	63	B 4931 525 7W	C5	
			64			
1		Connection cable / Verbindungskabel 24 P	65	BG 241 141 BT		
1		Connection cable / Verbindungskabel 4 P	66	BG 241 142 BT		
			67			
			68			
1		Circuit board / Print allgemein	69	BG 241 900 -U	E2	
1		Overcurrent board / Überstromprint	70	BG 241 903 -U	E3	
			71			
			72			
1		High voltage board / HS-Platte	73			BB 800 180 E/5
1		Relay board / Relaisprint	74		E1	BB 800 180 E/4
1		Switching relay unit / Umschaltrelaiseinheit	75		E4	BB 800 180 E/ 6



Spare Parts for / Ersatzteile zu	
Electron beam power supply/Hochspannungsversorgung	BB 800 180 E/2


18 21 27
18 22 27
18 23 27
18 24 27
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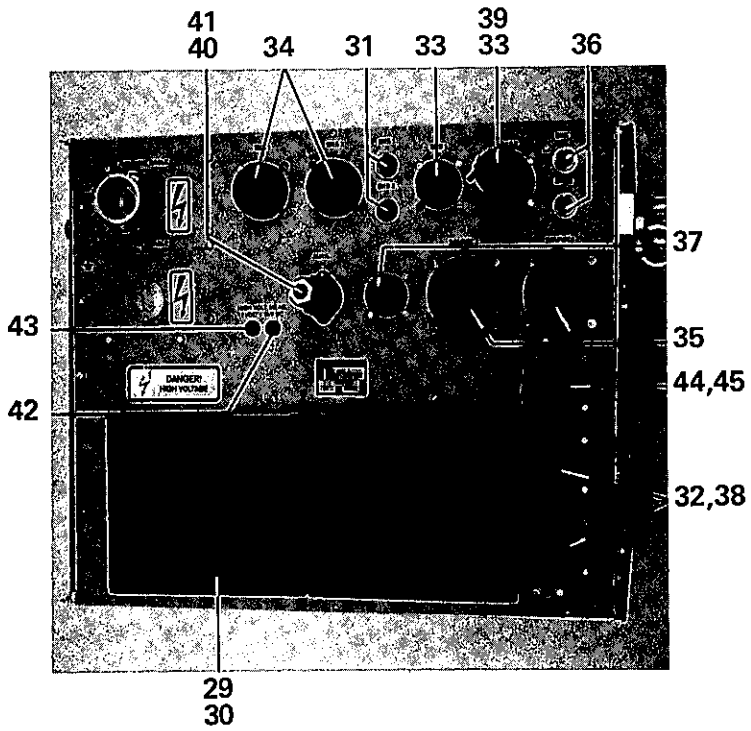
17,20,26
2
3,4
7,11
1
6
8,12
9 14
10 15
10 13
10 14


41 40
34
31
33
39 33
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44,45
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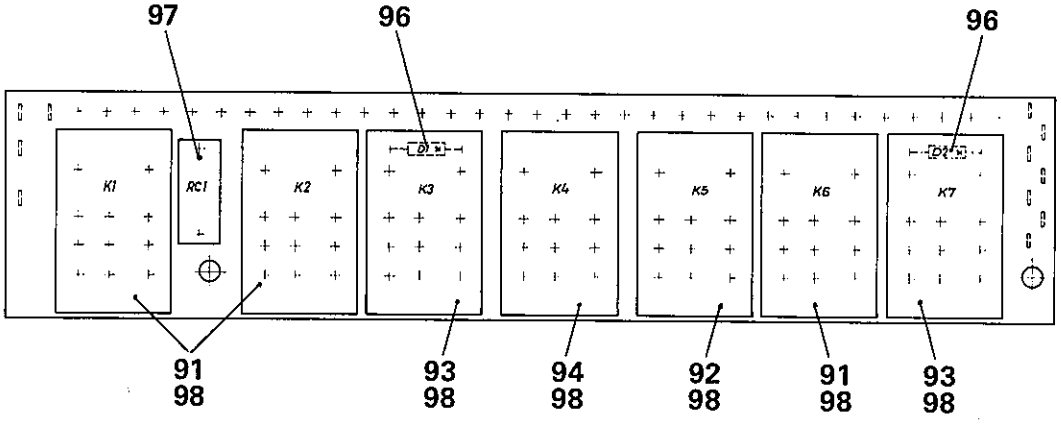
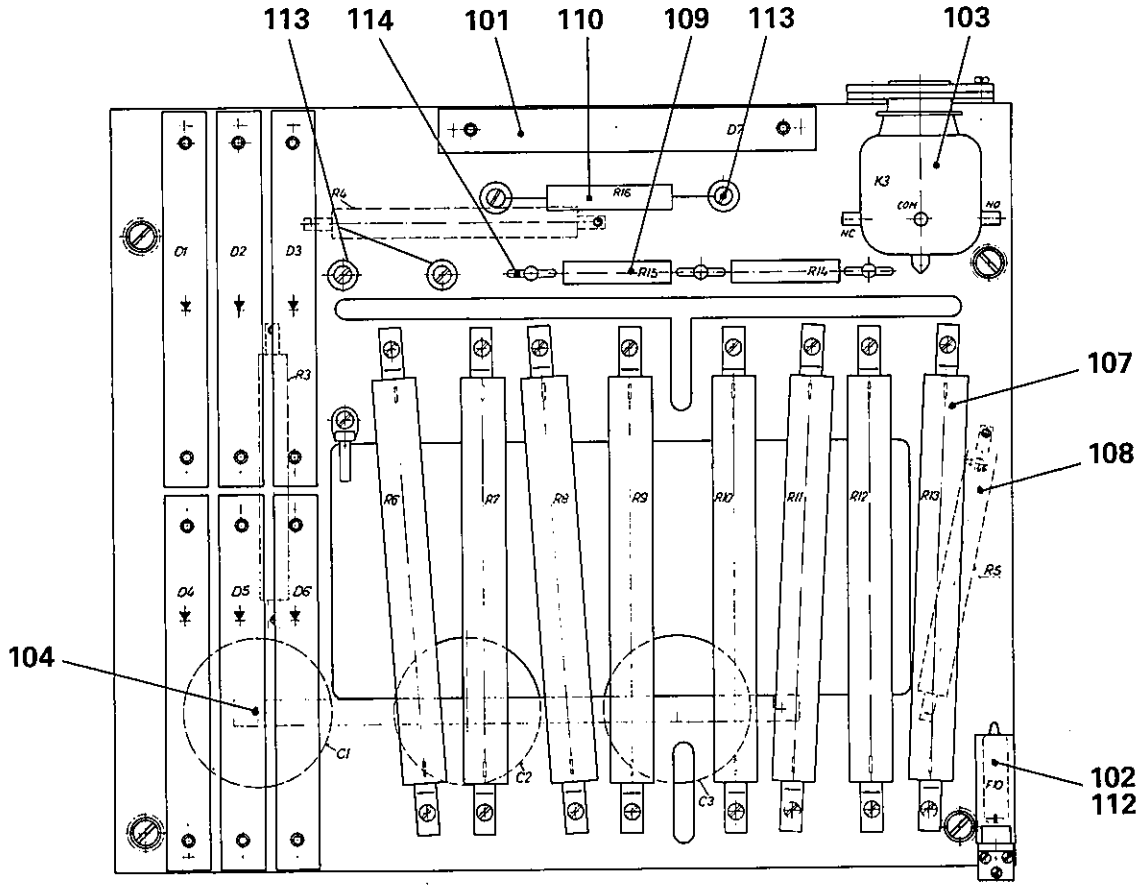
32,38
29 30

				Description Teil	Item Pos.	Code-No. Bestell-Nr.	S	Remarks Bemerkungen
3				Relay / Relais FR 11 P 110 V 50/60 Hz	91	B 4783 115 KA	K1,K2,K6	
1				Relay / Relais FR 11 P 24 V 50 Hz	92	B 4783 108 KA	K5	
2				Relay / Relais FR 11 P 24 V DC, 580 Ω	93	B 4782 123 KA	K3,K7	
1				Relay / Relais FR 11 P 110 V DC, 8 kΩ	94	B 4782 135 KA	K4	
					95			
2				Diode F 113 1300 V 1 A	96	B 5031 225 KS	D1,D2	
1				RC-Comb. / RC-Komb. 0,25 µF / 600 Ω 250 V	97	B 4988 345 AC	RC1	
7				Socket / Fassung 7B87	98	B 4793 101 EG		



Spare Parts for / Ersatzteile zu	
Relay board / Relaisprint BG 241 885 -U	BB 800 180 E/4

	Description Teil	Item Pos.	Code-No. Bestell-Nr.	S	Remarks Bemerkungen
7	Rectifier / Gleichrichter KVP 30, 30 kV, 0.75 A	101	B 5036 269 JS	D1-D7	
1	Lightning arrester / Überspannungsableiter UA 300	102	B 5013 800 27	F10	
1	Vacuum relay / Vakuumrelais 26,5 VDC	103	B 4786 751 VJ	K3	
3	Capacitor / Kondensator 4,8 nF, 20 kV, -20/+80%	104	B 4959 348 8R	C1-C3	
		105			
4	Resistor / Drahtwiderstand 250 Ω 100 W	106	B 4836 225 YG	R6-R9	
4	Resistor / Drahtwiderstand 100 kΩ 100 W	107	B 4836 510 YF	R10-R13	
3	Resistor / Drahtwiderstand 47 Ω 50 W	108	B 4837 147 XW	R3-R5	
2	Resistor / Drahtwiderstand 5 kΩ 12 W	109	B 4836 350 WC	R14, R15	
2	Resistor / Widerstand 600 kΩ 12,5 W	110	B 4824 560 WE	R16	
		111			
1	Socket / Fassung	112	B 5024 851 CA		
4	Insulator 74 – 12 F	113	B 4624 121 12		
3	Insulator / Isolator W 6115	114	B 4624 211 11		

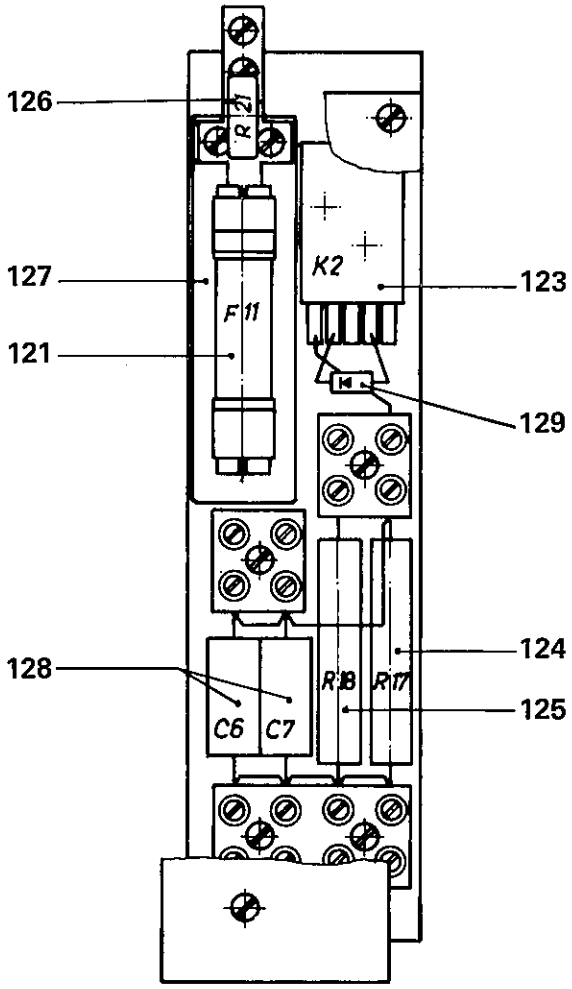


Spare Parts for / Ersatzteile zu

High voltage board / Hochspannungsplatte BG 241 864 -T

BB 800 180 E/5

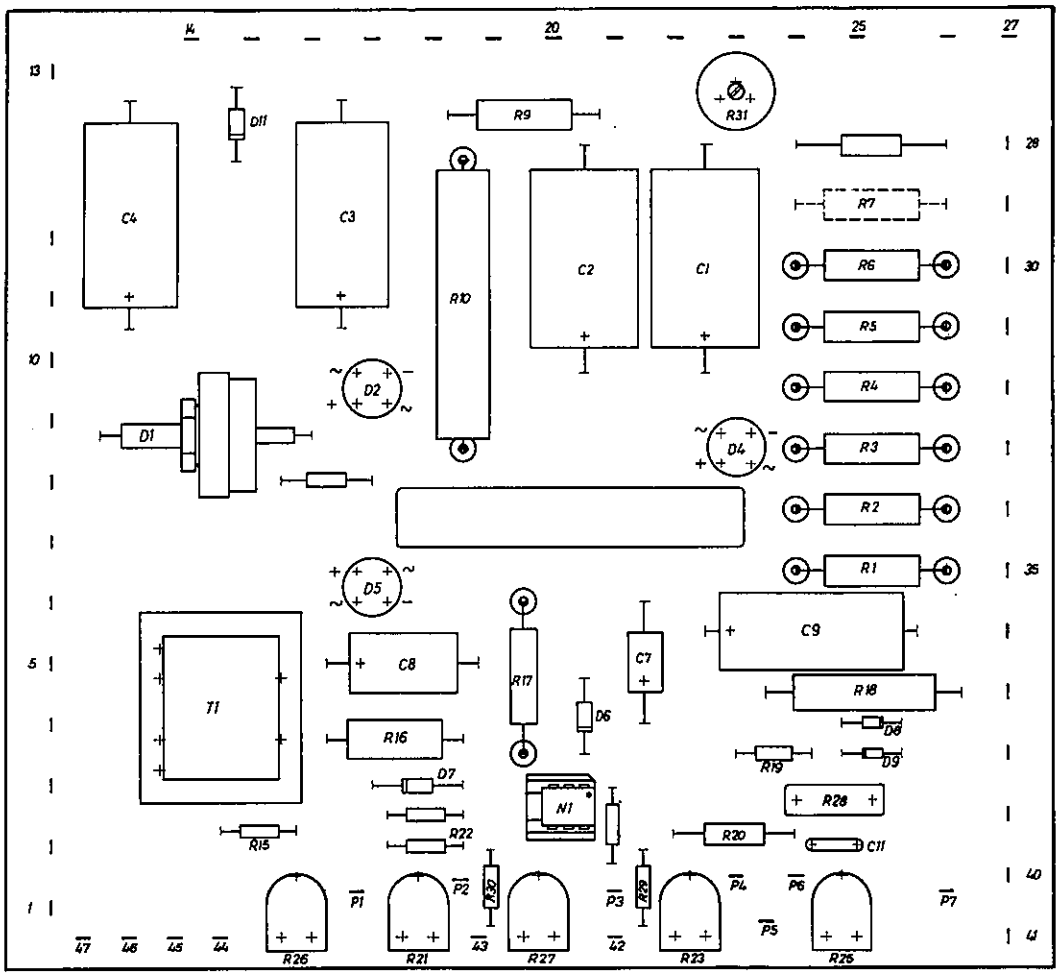
	Description Teil	Item Pos.	Code-No. Bestell-Nr.	S	Remarks Bemerkungen
1	Lightring arrester / Überspannungsableiter, 125 V Nr. 13821	121	B 5013 802 11	F11	
		122			
1	Relay / Relais V 23016-A006-A101 970 Ω	123	B 4782 125 HB	K2	
1	Resistor / Drahtwiderstand 10 Ω 12 W	124	B 4836 110 WC	R17	
1	Resistor / Drahtwiderstand 225 Ω 12 W	125	B 4836 222 WC	R18	
1	Resistor / Widerstand 60 VAC 0,55 W V 100 ZA 15	126	B 4863 160 VT	R21	
1	Socket / Halter	127	B 5024 853 75		
2	Capacitor / Kondensator 220 nF 250 V	128	B 4985 522 RY	C6, C7	
1	Diode F 113 1300 V 1 A	129	B 5031 225 KS	D8	



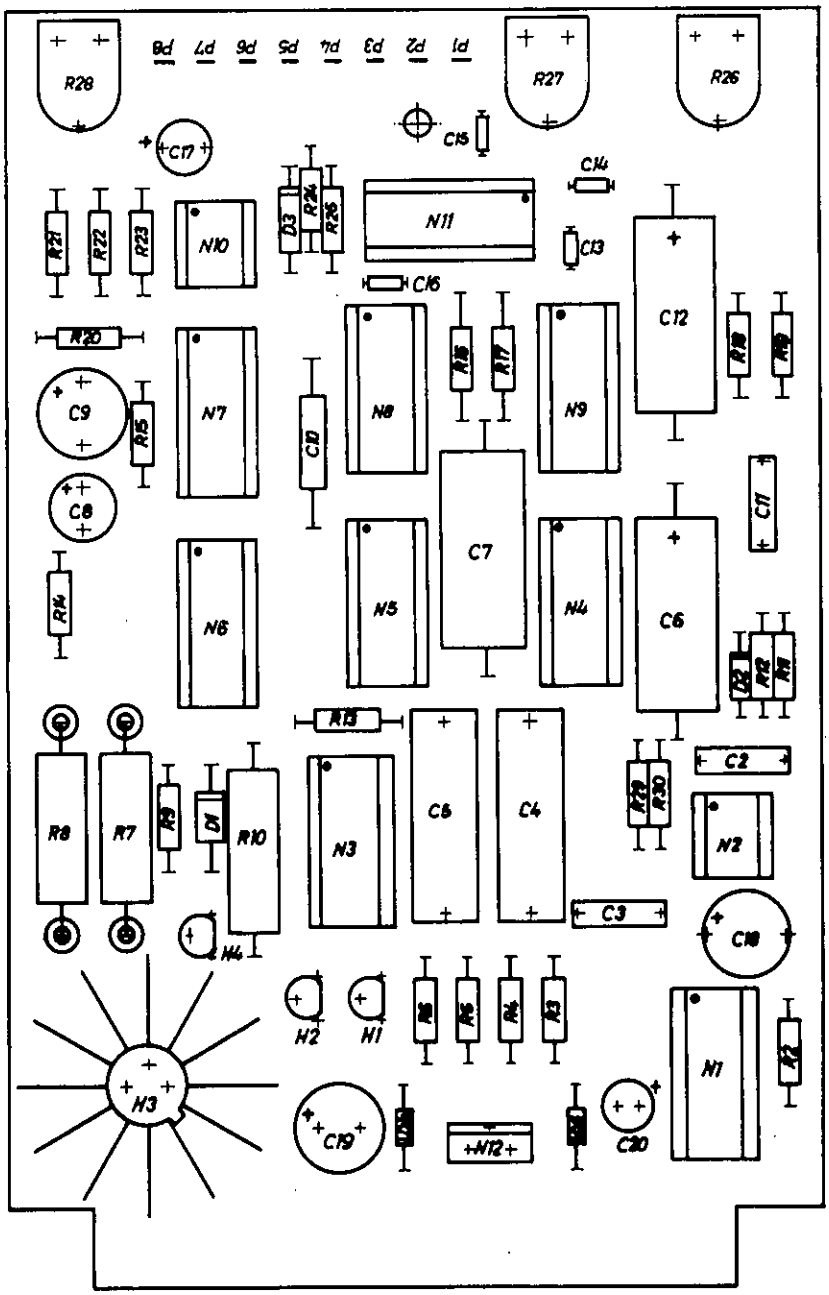
Spare Parts for / Ersatzteile zu

Switching relay unit / Umschaltrelaiseinheit BG 241 871 -U

BB 800 180 E/6



Circuit board / Print allgemein BG 241 900 - U



Over current circuit board / Überstromprint BG 241 903 - U