Electron gun control EKS 110 A

Products of BALZERS AG, Balzers

Issued: Nov. 1975 / DN 6597

1. APPLICATION

Whilst the EHV, High Voltage Supply, provides the regulated high voltage for the evaporation source, the EKS 110 A, Electron Gun Control Unit, is used as power supply for the cathode (to control the electron beam output), as control for the beam spot on the evaporant, and as power supply for the crucible drive motor. The ETS, Crucible Control Unit, for various automatic movements of the crucible, can be mounted into the EKS 110 A as a plug-in module.

2. TECHNICAL DATA

2.1. Dimensions

Width: 483 mm
Height: 221.5 mm
Depth: 530 mm

2.2. Electrical connection

The electric power is fed over the respective EHV, High Voltage Supply Unit. See the separate operating instructions and the block diagram.

3. DESCRIPTION

3.1. The front panel contains:

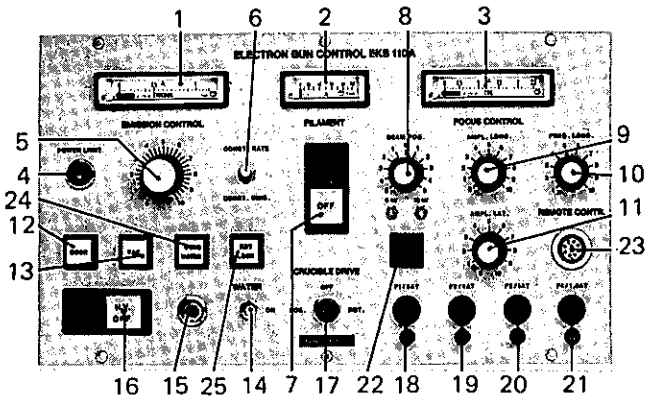


Fig. 1 Front panel EKS 110 A

1. Instrument for emission current MJ1 (emission current via the transducer T5 and the measurement amplifier A 1)
2. Instrument for the cathode heater current MJ2
3. Instrument for the coil current MJ3
4. Emission current limitation (POWER LIMIT) R 2
5. Emission current potentiometer R 1
6. Toggle switch with 2 positions, S 6
   a. CONST. RATE, for use when the evaporisation rate is stabilised via film thickness measuring instrument and a rate-meter.
   b. CONST. EMIS., used without rate regulation
7. Cathode heater ON/OFF (FILAMENT ON/OFF) S 1/ S 2
8. Spot positioning (BEAM POSITION) with adjustment potentiometers R 6 and R 7 below it for adjusting the beam position at 6 kV or 10 kV operating voltage, resp.
9. Sweep Y-direction (APML. LONG) R 4
10. Frequency for Y-direction sweep (FREQU. LONG) R 5
11. Sweep X-direction (AMPL. LAT.) T 4
12. Signal lamp for coating unit door, vacuum bell etc. (DOOR) LA 1
13. Signal lamp, vacuum (VAC.) LA 2
14. Toggle switch cooling water for the gun (GUN WATER)
15. Key switch for the high voltage (KEYLOCK)
16. High voltage ON/OFF (HIGH VOLT.) S 3/S 4 ON/OFF
17. Crucible drive. Toggle switch with 3 positions:
    left: Crucible rotation towards the left (switch position with release) (anti-clockwise)
    centre: The crucible does not rotate, the crucible control ETS 110 can be operated normally
    right: Crucible rotation towards the right (clockwise) (permanent contact).
18. Fuse F 1 cathode heater circuit
19. Fuse F 2 emission current regulation and power supply to the coil
20. Fuse F 3 sweep X-direction
21. Fuse F 4 power supply to the motor (crucible drive)
22. Signal lamp automatic control
23. Receptacle for remote control EFS
24. Signal lamp for gun cooling water (GUN WATER)
25. Signal lamp for high voltage (KEYLOCK) LA 3

Balzers Aktiengesellschaft für Hochvakuumtechnik und Dünne Schichten, FL-9496 Balzers, Fürstentum Liechtenstein

Printed in Liechtenstein

3.2. The rear panel contains:

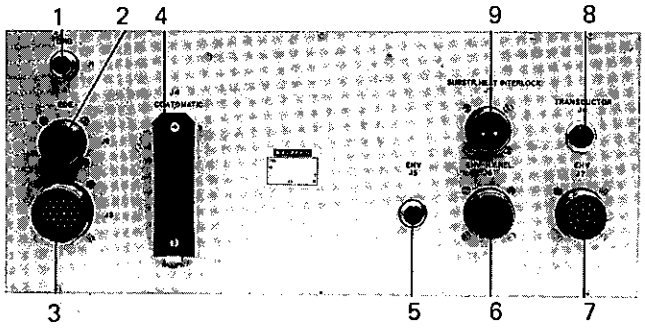


Fig. 2 Rear panel EKS 110 A

1. J 1 Connection for automatic rate regulation 0 - 10 V.
2. J 2 Crucible drive EDE
3. J 3
4. J 4
5. J 5
6. J 6
7. J 7
8. J 8
9. J 9

refer to the separate operating instructions "Installation example and block diagram".

3.3. The EKS 110 A contains the following components:

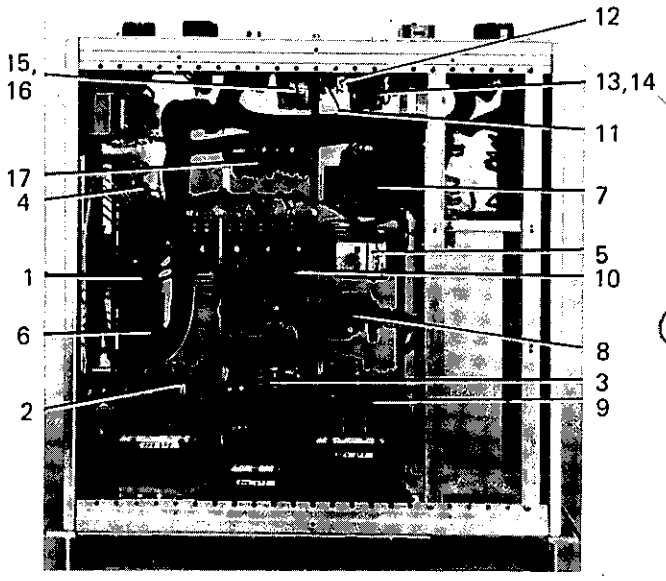


Fig. 3

Cathode heater current circuit, comprising:

1. Thyristor set
2. Thyristor drive printed circuit (see Fig. 4)
3. Measurement and control amplifier A 1 (see Fig. 5)
4. Series resistor R 1, 2, for switching on the cathode heater current in stepped switching.
5. Time relay K 13 for stepped switching of the cathode heater current (setting time, approx. 3 sec).
6. Rectifier D 3 for heater current measurement and potentiometer R 6 for calibrating the heater current measuring instrument MJ 2

Power supply to the coil, comprising:

7. Power supply transformer T 3 for the current stabilised coil printed circuit E 4
8. Coil printed circuit E 4 (see Fig. 7).
9. Sweep printed circuit E 3 (see Fig. 6)
10. Relay K 11 for monitoring the current of the power supply
11. Adjustment potentiometer R 11 for monitoring the current supply to the coil (on E 1)
12. Relay plate E 1
13. Relay K 3, Coat-O-Matic power supply failure
14. Relay K 4, Change-over to remote control of the emission current
15. Relay K 5, Change-over to remote control BEM. POS. and crucible drive
16. Relay K 6, Change-over to remote control FILAMENT OFF
17. Relay plate E 5 COAT-O-MATIC (see Fig. 8, item 2)

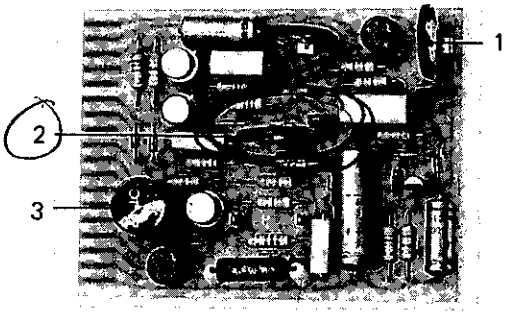


Fig. 4 Thyristor driver

1. Current limitation (current converter)
2. Minimum current (cathode pre-heating
3. Impulse transformer

0% Stand by power adjust

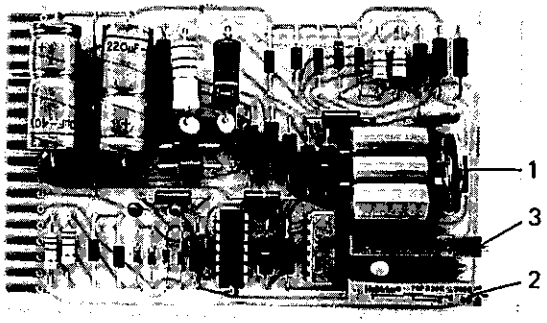


Fig. 5 Measurement and control amplifier A 1

1. Emission current damping
2. Amplification
3. Zero point emission current on the instrument

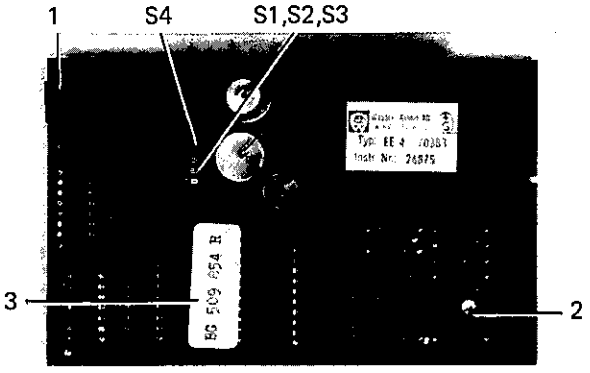


Fig. 6 Sweep printed circuit E 3

S1, S2, S3	Selection of the deflection curve shape
S4	Selection of the sweep speed
1, 2	Potentiometers R4 and R12
3	Program memory

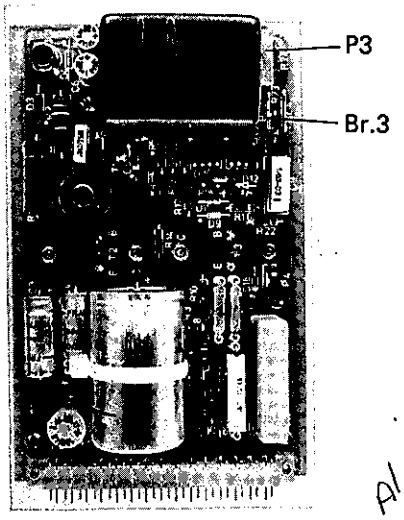


Fig. 7 Coil printed circuit E 4

Also 9.9

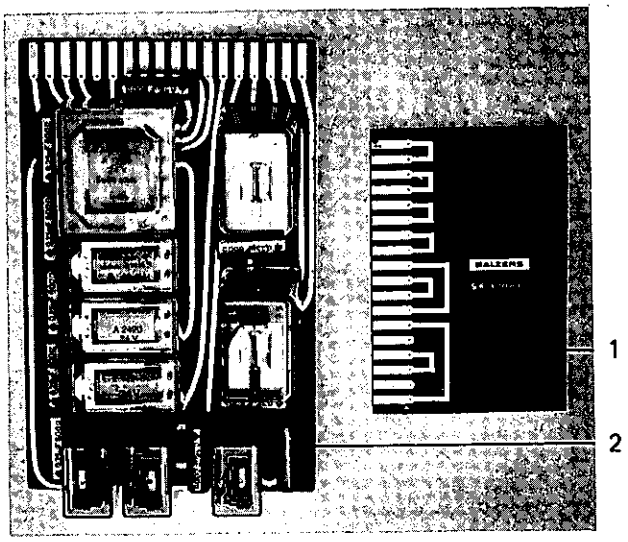


Fig. 8

1. Blind plug	COAT-O-MATIC
2. Relay plate E 5 (S 5221)	COAT-O-MATIC

4. FUNCTION

When the cooling water for the gun is switched on and the necessary throughput is signalled by the water flow control, the heater current (FILAMENT ON) can be switched on. This heater current is interlocked by the relay K 11 of the coil monitor. This means that the heater current is switched off if the current supply to the coil falls below a minimum value (0.4 A) set on the potentiometer R 11. When the high voltage is switched on, a control signal is transmitted by the control amplifier A 1 (Fig. 5) via the EHV, to the thyristor driver printed circuit. By this cathode overheating is avoided if the high voltage supply fails. The cathode heater is switched on in two stages by pressing the push-button FILAMENT ON (time relay K approx. sec.). Hence, to a large extent, the cathode can be protected from distortion.

If the EHV 110 A, high voltage supply, is used, the beam spot can be positioned accurately with the two potentiometers (6 kV and 10 kV) below the "BEAM POSITION" knob, for both high voltage values 6 kV and 10 kV. If another high voltage supply like EHV 108 is used, balancing will be necessary when the high voltage is switched from 10 kV to 6 kV (see the separate operating instructions for EHV 108). Beam spot positioning is then accomplished only with the 10 kV potentiometer.

The AMPL.LONG and FREQUENCY potentiometers belong to sweep pc board E3. From it the deflection function set on the AMPL.LONG (R4) potentiometer is conducted over the potentiometer's middle pick-up to the current programming path of the coil power supply E4.

The a.c. voltage 0 - 220 V from the variable transformer T 4 is connected to the high current transformer of the evaporation gun, via the rotary knob AMPL. LAT. The secondary winding of this high current transformer produces the anode current necessary for beam sweep (lateral).

With regard to the Wehnelt voltage feed for the cathode when the coating plant is open, it is essential to ensure the that the Wehnelt voltage is not connected to the operational evaporation gun (cathode change). For this reason, the Wehnelt voltage is interlocked on the primary side via the 'VAC'. signal (output at plug J 7 contact A).

4.1. Adjusting the cathode heating current
(see Fig. 4., thyristor driver)

The cathode heating current is adjusted with the potentiometer R 12 (Fig. 4, item 2), the high voltage being switched off. With the cathode heating current units EHS 110 and EHS 110 U, it will be approx. 25 A, with the EHS 111 it will be approx. 18 A.

With the high voltage on the EHV 110 A (6 kV) switched on, the cathode heating current is adjusted with the potentiometer R 7 (Fig. 4, item 1) so that with an emission current of 700 mA or more there will be less than 60 A.

With the EHV 108, the limitation of the cathode heating current will only be possible if the cathode inputs between high voltage lead-in and cathode block are shorted.

Adjusting: Switch-on the high voltage and turn on the emission current slowly with the "EMISSION CONTROL" potentiometer (because the cathode heating current rises quickly). Then, adjust the cathode heating current to 65 A with the potentiometer R 7 (Fig. 4, item 1).

4.2. Adjusting the emission current
(see Fig. 5 measuring and control amplifier A 1)

4.2.1. Damping the emission current control circuit, with "ERROR VOLTAGE" (signal on an external control unit) switched off.

a. Adjust the emission current to approx. 500 mA; toggle switch in "CONST. EMISS." position

b. Set toggle switch S 6 (Fig. 1, item 6) to "CONST. RATE" position

c. Switch back the toggle switch S 6 to "CONST. EMISS." position

The emission current should now rise to 500 mA without overshooting; otherwise the damping must be increased with the potentiometer R 9 (Fig. 5, item 1)

4.2.2. Amplifying the emission current control circuit.

Adjust the emission current to 500 mA with the "EMISSION CONTROL" potentiometer (Fig. 1, item 5). Then tune the emission current with the potentiometer R 6 (Fig. 5, item 2) until the EHV, high voltage supply, also reads a current of 500 mA (calibrating the emission current control circuit).

4.2.3. Zero adjustment

Without the high voltage, the emission current meter MJ 1 on the EKS 110 A should read about 1/2 to 1 scale division. Adjust this value with the potentiometer R 8 (Fig. 5, item 3).

4.3. Coil printed circuit E 4

Potentiometer P 1, for adjusting the current programming resistance of 1.8 kΩ/V

Potentiometer P 2, for adjusting the voltage programming resistance of 1 kΩ/V

Potentiometer P 3, for adjusting the voltage

Bridge Br 3; open in case of current programming (normally in EKS 110 A)

4.3.1. Pin bar connection

Pins:

12/-14/15, Main voltage, min 30 V / 2.5 A a.c.
26/27 - 28/29 = Auxilliary voltage, approx. 40 V / 100 mA a.c.
4/4 - 6/7 = Connections for current programming
2/3 30/31 = Connections for voltage programming
8/9/10/11 = Terminal, plus voltage
24/25 = Sensitive line plus
18/19/20/21 = Terminal, minus voltage
30/31 = Sensitive line minus

The charts are factory adjusted to 30 V. Current regulation starts at 2.1 A (3.6 k)

4.4 Sweep pc board E3

(see Fig. 6)

The control signal for the beam deflection coil current supply comes from a digital memory (EPROM) and is converted by a D/A converter. By varying the positions of switches S1, S2, and S3 different curves can be recalled from the digital memory.

Adjustment:

- Selection of the sweep speed with S4 ON = 1 + 10 s.
  S4 OFF = 0.1 + 1 s
- Selection of the desired deflection curve using S1, S2 and S3 (refer to enclosed PROGRAM TABLE)
- Potentiometers R4 and R12 are adjusted at the factory and must not be changed

4.5. Controlling the EKS 110 A with the EFS, remote control unit

When the EFS, remote control unit, is used, the emission current interlock will remain inactive for changing the crucible position, i.e. the emission current is not switched-off automatically for selecting another crucible position.

5. START-UP

See the separate installing and starting examples, e.g. BB 800 066 BE

If none of the separate operating instructions corresponds with the delivered system, follow the instructions given in the special instructions for each unit.

6. TROUBLESHOOTING

Fault	Cause	Correction
Cathode heater current lamp FILAMENT OFF does not light	COAT-O-MATIC blind plug is not plugged in to the EKS (J4)	Insert the plug
	The blind plug-in printed circuit (Fig. 8 No. 1) is missing	Plug-in the blind printed circuit board
	No coil current, or adjusted coil current is too low (< 0.4 A).	Adjust the coil current with tuning potentiometer (below BEAM pos.).
No coil current	Fuse F 2 is burnt out	Replace
	Coil connection is faulty, either outside or in the coating unit	Make the contact
The coil current is not influenced by the tuning potentiometer	Input transistor on coil circuit board is defective	Replace transistor, or change board
Coil current is instable	Transistor T 7 BC 261 B at the input 4/6 on coil circuit board faulty	Replace transistor, or change board

No heater current after pressing the push-button FILAMENT ON	MIN. setting on the potentiometer R 12 on Thyristor driver printed circuit is incorrect The pulse transformer on the thyristor driver printed circuit is faulty	Set the potentiometer (in Fig. 4 No. 2) at pre-heating current acc. to paragr. 4.1. Change the driver printed circuit board
Coil current 2A cannot be influenced	Transistor T 4, BSX 46 - 16 on coil pc-board E 4 is faulty.	Change transistor or pc-board
HV-OFF lamp does not light, high voltage can't be switched on	2nd safety circuit is faulty.	Check 2nd safety circuit as to schematic, repair fault
With a slight turn of the emission current potentiometer the heater current is over 70 A, no emission	Thyristor (Fig. 3, item 1) is faulty	Change the thyristor or thyristor set
After slightly turning the emission current potentiometer the emission rises immediately to the limit.	Transducer cable is wrongly connected. Potentiometer EMISSION R 1 is faulty (Fig. 1, item 5)	Insert the correct cable into EKS (socket J8) Change the potentiometer
The high voltage is on, there is no emission, the heater current remains at minimum setting	Toggle switch at CONST. RATE (Fig. 1, item 6) POWER LIMIT (Fig. 1, item 4) is too low	-Switch over Adjust the potentiometer clockwise

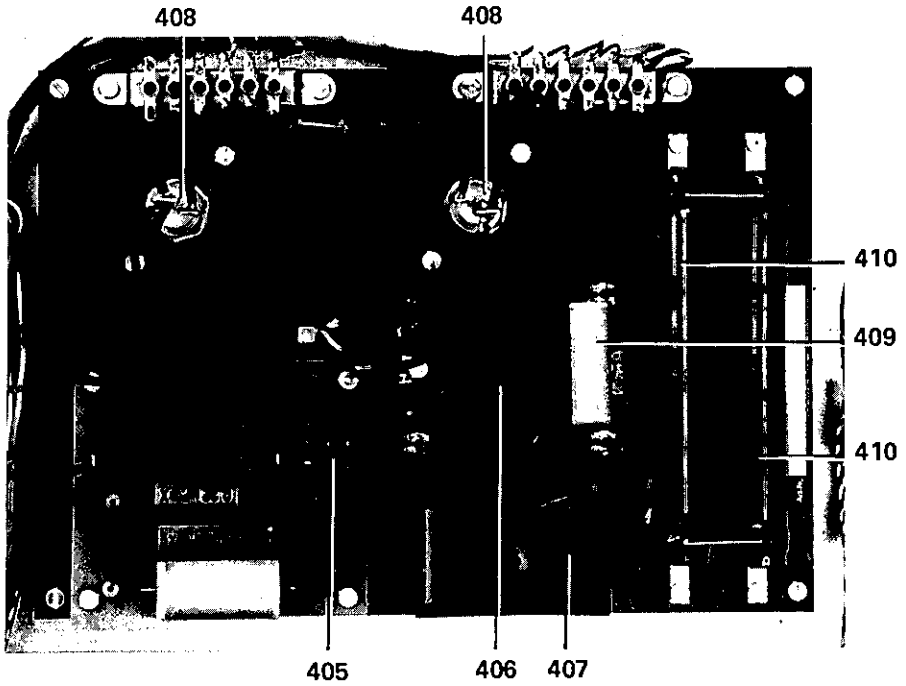
7. SPARE PARTS

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.

Order example:

1 potentiometer, 100 ohms, 0.25 W, Code No. B 4870 210 LA as to spare parts list BB 800 041 E / item 352



A.) Calibrating the EKS 110 A to emission current

(See the diagrams: for EKS 110 A:
BG 005 261-S, BG 005 262-S (formerly S 5206 and S 5207 or S 5235 and S 5236 resp.)
for the emission current of the measuring and regulating amplifier: S 5220).

If an EKS 110 A is installed later (e.g. subsequent to delivery or exchange), renewed calibration of the unit as to emission current measurement and of the high voltage supply (EHV 110, EHV 110 A, EHV 108) will be necessary.

Reason: The operating curve of the transducer which is used for measuring the emission current and which is always integrated into the high voltage supply, reveals considerable scattering.

Calibration procedure

Preparations: The EKS 110 A is readily connected; evaporation source and high voltage supply are ready for operation; main switch is "On".

1. **Adjusting the ZERO point** on the "EMISSION" meter of the EKS 110 A (see diagram S 5220):
   Turn the trimmpot R8 (minimum) on the measuring and regulating amplifier (see operating instructions EKS 110 A, Fig. 5, item 2) until the indicator display half a scale division positiv.
2. **Adjusting the operation current:**
   2.1. Set the "EMISSION CONTROL" potentiometer of the EKS 110 A to zero.
   2.2. Switch on the HIGH VOLTAGE and FILAMENT; set the beam to "Sweep".
   2.3. Adjust the emission current on the "EMISSION CONTROL" potentiometer to 0.8 A; check on the "EMISSION" meter of the EKS 110 A. (If there is a EHV 108 high voltage supply, adjust 0.5 A).
   2.4. The "EMISSION" meter of the **high voltage control unit** will now indicate a value different from that displayed on the meter of the EKS 110 A. With the trimmpot R6 (max.) on the measuring and regulating amplifier this value can now be balanced with the value indicated on the EKS 110 A.

B. Calibration of the EKS 110 A in conjunction with the EHS 111, heating current supply

In conjunction with the EHS 110, the "FILAMENT" base current for the EKS 110 A will be standard adjusted at the factory to about 25 A; the emission current being null. In conjunction with the EHS 111, however, the "FILAMENT" base current for the EHS 110 A has to be decreased.

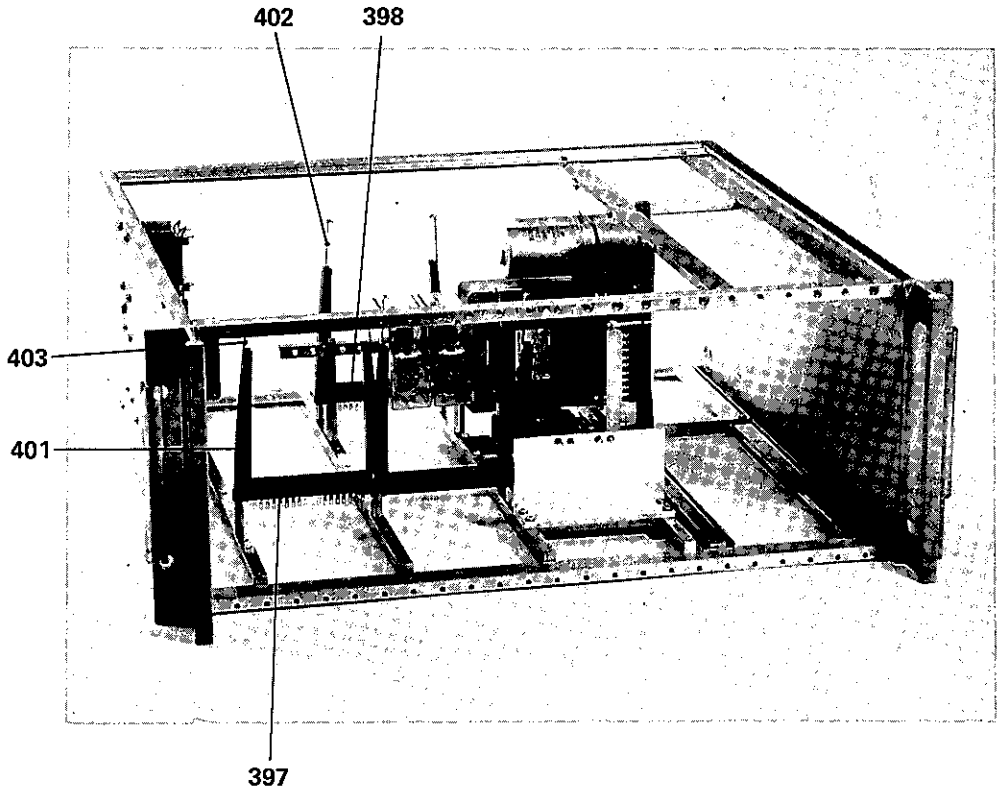
Procedure:

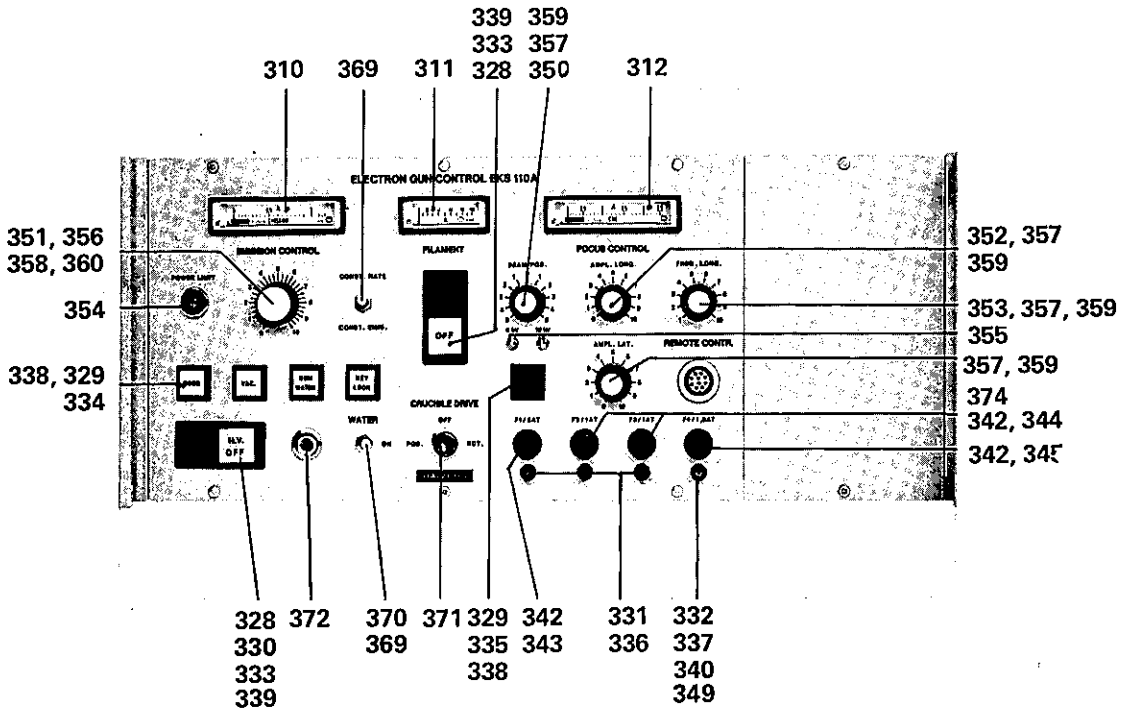
1. Adjust the "EMISSION CONTROL" potentiometer for "0" scale divisions.
2. Switch-on the "FILAMENT". Adjust the base current on the "FILAMENT" meter for about 18 A with the trimmpot "R 12" (diagram BG 522 228 AS) on the "thyristor driver" board (see the operating instructions for EKS 110 A, Fig. 4, item 2).
3. Switch-on the "HIGH VOLTAGE". Slowly adjust the "EMISSION CONTROL"potentiometer from "0" to "2" scale divisions; this produces the emission current. Make sure the beam spot in the crucible is in corrrect position.
4. Reduce the emission current to approx. 50 mA with the trimmpot "R 12" on the "thyristor driver" board (1 scale division on the "EMISSION" meter). The "FILAMENT" meter should now read about 18 A.
5. Switch-off "HIGH VOLTAGE" and "FILAMENT". Adjust the "EMISSION CONTROL" potentiometer back to "0".

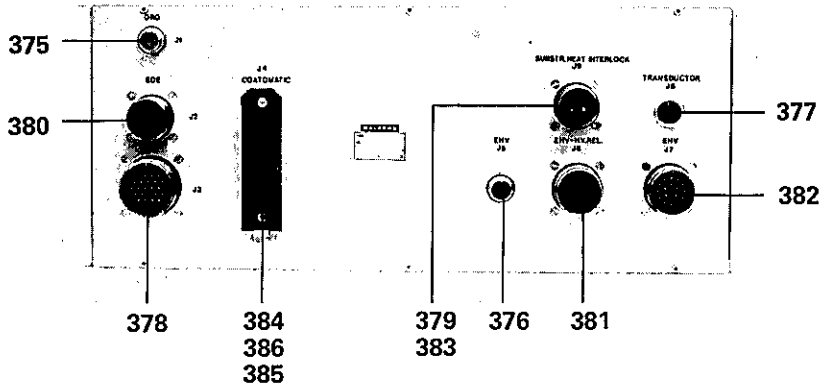
All calibration adjustments described above are made at the factory if the EHS is part of a complete coating unit. If the EHS 111 is delivered as a single unit together with other gun controls, this adjustment has to be carried out at the customer's premises.

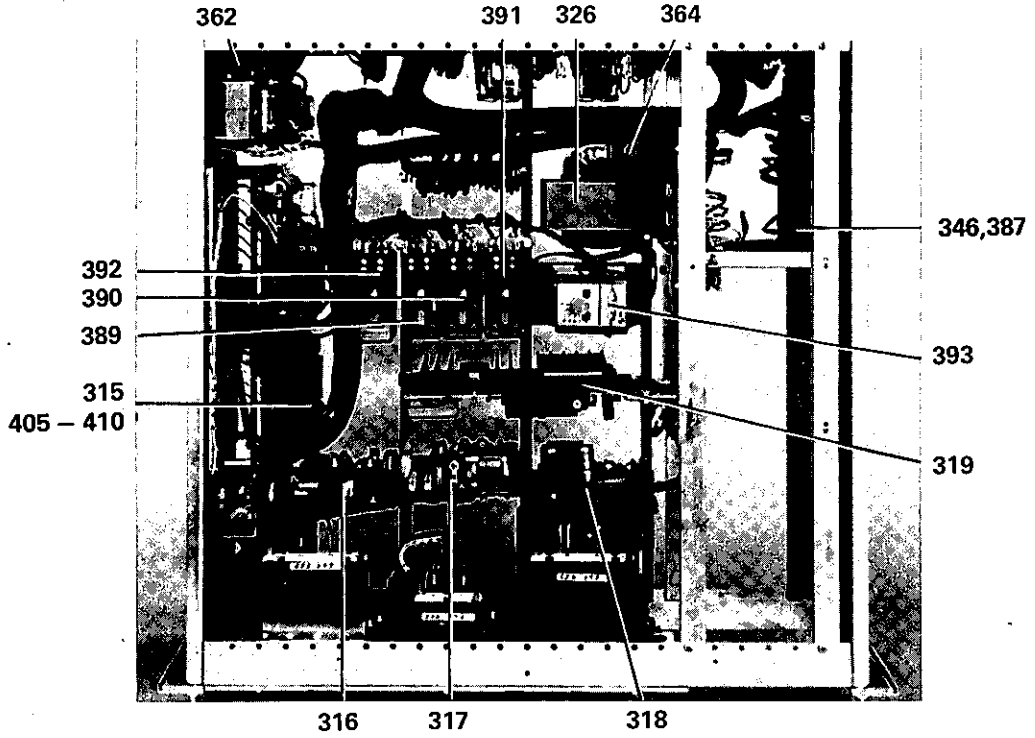
	Description Teil	Item Pos.	Code-No. Bestell-Nr.		S	Remarks Bemerkungen
1	Ammeter / Amperemeter 0 – 1,2 A *BG 202 804*	310	B 5202 401 GH		MJ 1	Emission
1	Ammeter / Amperemeter 0 – 100 A*BG 202 806*	311	B 5202 201 GH		MJ 2	
1	Ammeter / Amperemeter 0 – 2,5 A *BG 202 805*	312	B 5202 402 GH		MJ 3	
		313				
1	Relay plate / Relaisplatte	314	20-2852 R1			
1	Thyristor unit / Thyristor kompl.	315	20-2856 R1		E2	
1	SCR-driver / SCR-Treiber	316	BG 522 225 -U		G1	
1	Measuring and regulating print / Mess-Regelprint	317	20-2811 R1		A1	
1	Sweep printed circuit / Wobbelprint, unprogrammiert	318			E3	
1	Coil current supply / Steckerkarten-Netzgerät *20-3221*	319	B 5181 103 R1		E4	
		320				
1	Connection print / Blindsteckerprint	321	20-3041 P1			
1	Relay print / Relaisprint	322	20-2813 R1			
1	Variable Transformer / Regeltransformator	323	B 5133 050 EE		T4	
1	Transformer / Transformator *BG 522 099*	324	B 5128 150 ME			
1	Transformer / Transformator *BG 202 512*	325	B 5128 201 MD			
1	Transformer / Transformator *BG 202 807*	326	B 5128 701 MD			
		327				
2	Push button / Leuchttaste 03-421	328	B 4750 641 EA		S1-S4	
5	Lamp holder / Signallampe 01-050	329	B 4683 413		LA-LA5	
1	Lens / white / Kalotte weiss	330	B 4750 749 EA			
3	Lamp holder / Glimmlampenfassung 035.1601	331	B 4683 205 A1		F1-F3	
1	Lamp holder / Glühlampenfassung 035.1501	332	B 4683 202 SA		F4	
1	Lens green / Kalotte grün	333	B 4750 745 EA			
4	Lens white / Kalotte weiss	334	B 4683 473 QN			
1	Lens green / Kalotte grün	335	B 4683 473 QK			
3	Lens / Kalotte 035.1131	336	B 4683 274 -A			
1	Lens / Kalotte 035.1001	337	B 4683 272 -A			
5	Lamp / Glühlampe T 5,5 60 V, 0,03A	338	B 5005 605 59			
4	Lamp / Glühlampe T 6,8 60 V, 0,04 A	339	B 5005 608 60			
1	Lamp / Glühlampe 16V, 9130/116	340	B 5005 212 16			
		341				
4	Fuse holder / Sicherungshalter	342	B 4661 206 A0		F1-4	
1	Fuse / Sicherung 6,3 A	343	B 4666 452		F1	
2	Fuse / Sicherung 1A	344	B 4666 436		F2,3	
1	Fuse / Sicherung 1,6 A	345	B 4666 440		F4	
1	Resistor / Widerstand 12 Ω, 10W	346	B 4837 112 WF		R12	
2	Resistor / Schichtwiderstand 330 kΩ, 0,5 W	347	B 4816 533 LA			
1	Resistor / Schichtwiderstand 120 kΩ, 0,5 W	348	B 4816 512 LA			
1	Resistor / Schichtwiderstand 100 Ω, 0,5 W	349	B 4816 210 LA			
1	Potentiometer 500 Ω/0.25 W	350	B 4870 250 LA		R3	
1	Potentiometer with switch / mit Schalter 10 kΩ / 0,12 W	351	B 4870 410 HT		R1,S9	
1	Potentiometer 100 Ω / 0,25 W	352	B 4870 210 LA		R8	
1	Potentiometer 25 kΩ / 0,25 W	353	B 4870 425 LA		R5	
1	Potentiometer 10 kΩ / 0,25 W	354	B 4870 410 LA		R2,R9	
2	Potentiometer 5 kΩ / 1 W	355	B 4886 350 R3		R6,R7	
1	Knob / Drehknopf 020 – 442 SW	356	B 4797 101 PS			
4	Knob / Drehknopf 020 – 342 SW	357	B 4797 101 KS			
1	Cover / Deckel 040 – 401 GU	358	B 4797 115 PA			
4	Cover / Deckel 040 – 301 GU	359	B 4797 115 KA			
1	Pointer washer / Pfeil 041 – 402 SW	360	B 4797 117 PB			
		361				
1	Capacitor / Kondensator, 220 V, AC	362	B 4988 531 RK			
		363				
1	Capacitor / Elko 2500 µF, 35V	364	B 4901 525 P7		C2	
		365				
		366				
1	Z-Diode ZF 7,5	367	B 5046 464 KS		D4	
2	Si-Diode 1N914	368	B 5042 572 RS		D2,D3	
2	Switch / Schalter	369	B 4752 022 SA		56,58	
		370				
1	Switch / Schalter	371	B 4752 413 MH		S7	
		372				
		373				
1	Socket / Flanschdose 10P, D105 A062	374	B 4722 465 FC			
1	Socket / G-Stecker 3 ST, T 3262	375	B 4722 403 CA		J1	
1	Socket / G-Stecker 4 ST, T 3302	376	B 4722 404 CA		J5	
1	Socket / G-stecker 4 BU, T 3303	377	B 4722 464 CA		J8	

	Description Teil	Item Pos.	Code-No. Bestell-Nr.	S	Remarks Bemerkungen
1	Socket / G-Dose 24 ST, MS 3102 E24 - 28P	378	B 4722 754	J3	
1	Socket / G-Dose 3 ST, MS 3102 E18 - 5P	379	B 4722 128 MC	J9	
1	Socket / G-Dose 10 BU, MS 3102 E18 - 1S	380	B 4722 553 MC	J2	
1	Socket / G-Dose 17 BU, MS 3102 E20 - 29S	381	B 4722 681 MC	J6	
1	Socket / G-Dose 17 ST, MS 3102 E20 - 29P	382	B 4722 682 MC	J7	
1	Plug / K-Stecker 3 BU, MS 3106 E18 - 5S	383	BG 241 209 -X	J9	to/zu Pos. 379
1	Plug strip / M-Leiste 30 P	384	B 4720 185 NA	J4	
1	Plug / F-Leiste 30 P	385	B 4720 186 NA	J4	to/zu Pos. 384
1	Housing / Endgehäuse	386	B 4720 906 NA		to/zu Pos. 384
1	Current relay / Stromrelais MR2, 2WK, 0,50	387	B 4783 901 RA	K12	
1	Relay / Relais FR 11 P, 110 V, 50 / 60 Hz	388	B 4783 115 KA		to/zu Pos. 314
1	Relay / Relais MRA, 110 V, 50 / 60 Hz, 2W	389	B 4783 301 RA	K9	
2	Relay / Relais MRA, 110 V, 50 / 60 Hz, 4W	390	B 4783 307 RA	K8,10	
1	Relay / Relais 0,5 V DC, 1,3 Ω	391	B 4782 011 RA	K 11	
1	RC-combination / RC-Kombination 0,25 µF + 600 Ω	392	B 4988 708 AL	RC 1	
1	Timer / Zeitschalter Typ JUP - 8B1 UF, 0,04 – 10 sec.	393	B 4779 531 EJ	K13	
		394			
1	Rectifier / Gleichrichter 35 V, 2,5 A	395	B 5036 307 TS	D1	
		396			
3	Plug strip / Steckerleiste 18 P, PCC B 18 SO 4-GEOOJO	397	B 4717 181 PE		
1	Plug strip / Steckerleiste 2 x 18 P, PCCD 18 SO4-GEOO30	398	B 4717 181 QE		
1	Plug strip / Federleiste 56 P M 1S 56 S - P - 01-03	399	B 4717 191 56		
		400			
8	Board guide / Kartenführung	401	B 5098 212 ZA		
6	Clamp / Klammer	402	BG 516 091 A		
2	Clamp / Klammer	403	BG 517 144		
		404			
1	Printed circuit compl. / Print kompl.	405	20-2854 R1		in Pos. 315 enthalten
1	Current transformer / Stromwandler 4 A / 10 mA *BG 202 810*	406	B 5136 350 GD		
1	Interference suppression reactor / Störschutzdrossel RI - 11,5 A	407	B 5142 200 LE		enclosed in item 315
2	Thyristor 2 N 690	408	B 5034 320 JS		
1	Capacitor / Kondensator 1 µF, 250 V	409	B 4931 610 R8		
2	Resistor / Widerstand 100 Ω, 50 W	410	B 4837 210 XV		

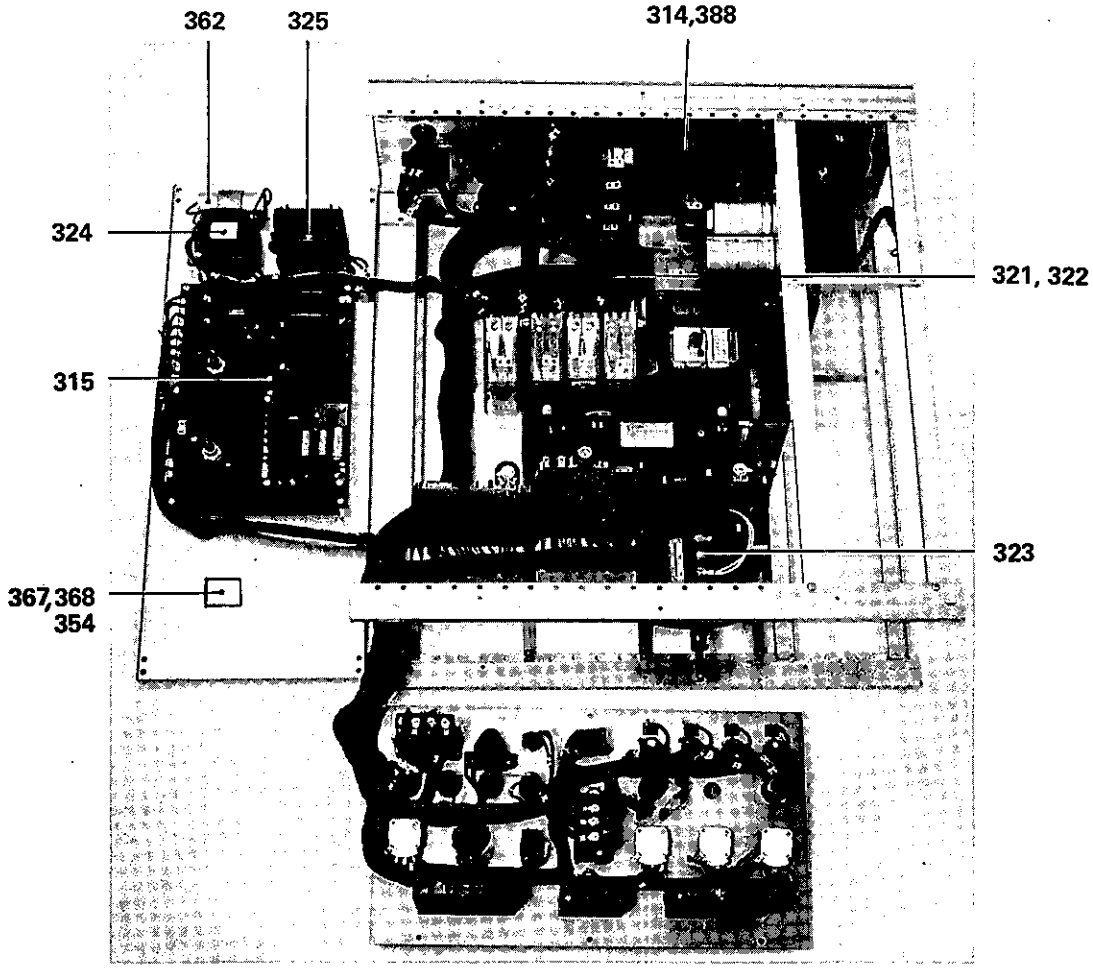


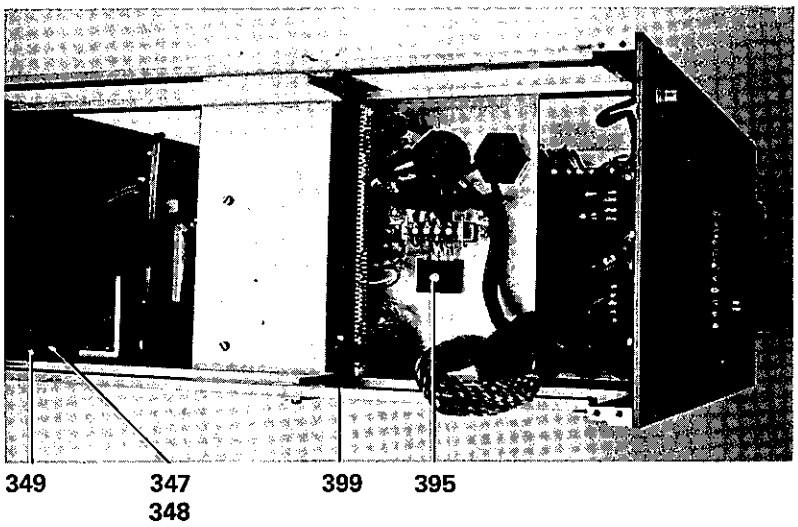




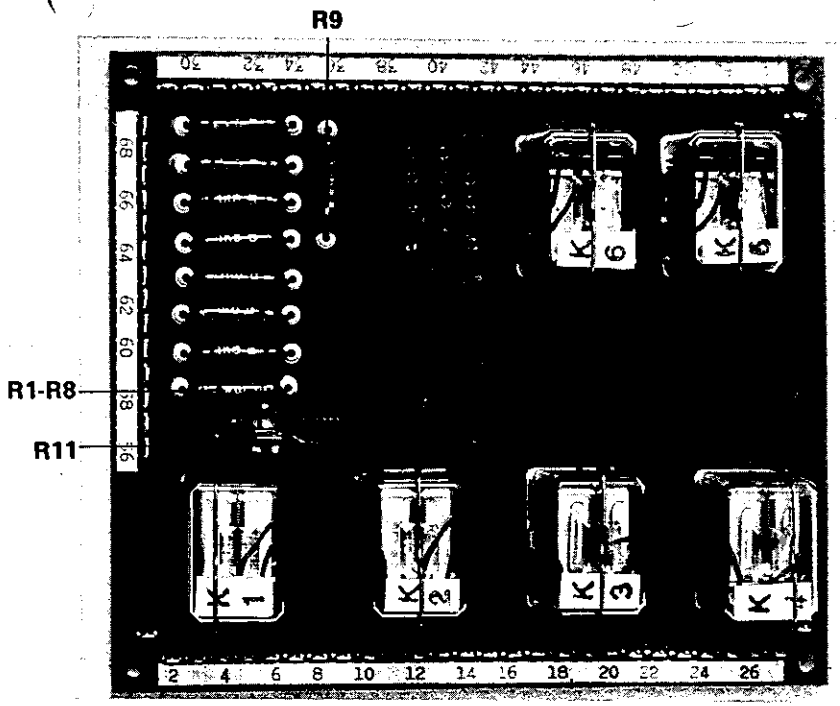


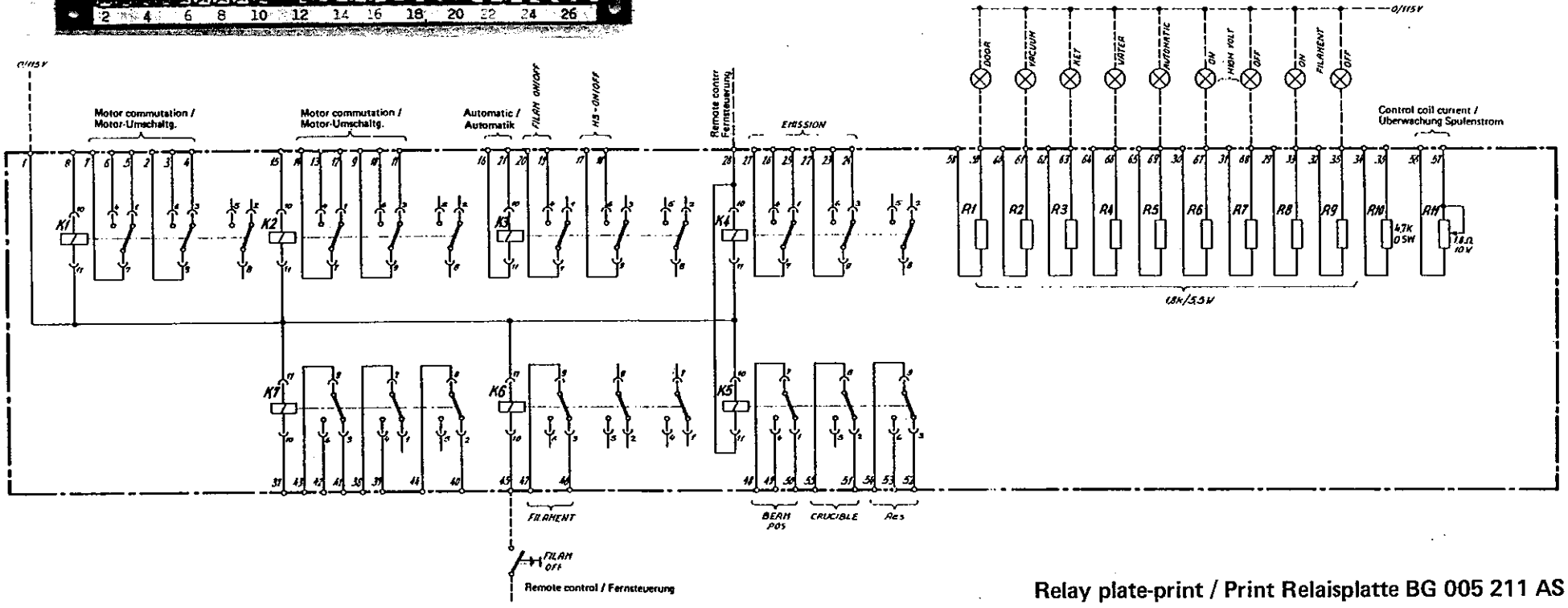
Electron gun control unit / Verdampfungssteuergerät EKS 110 A BB 800 041 E / 18 a



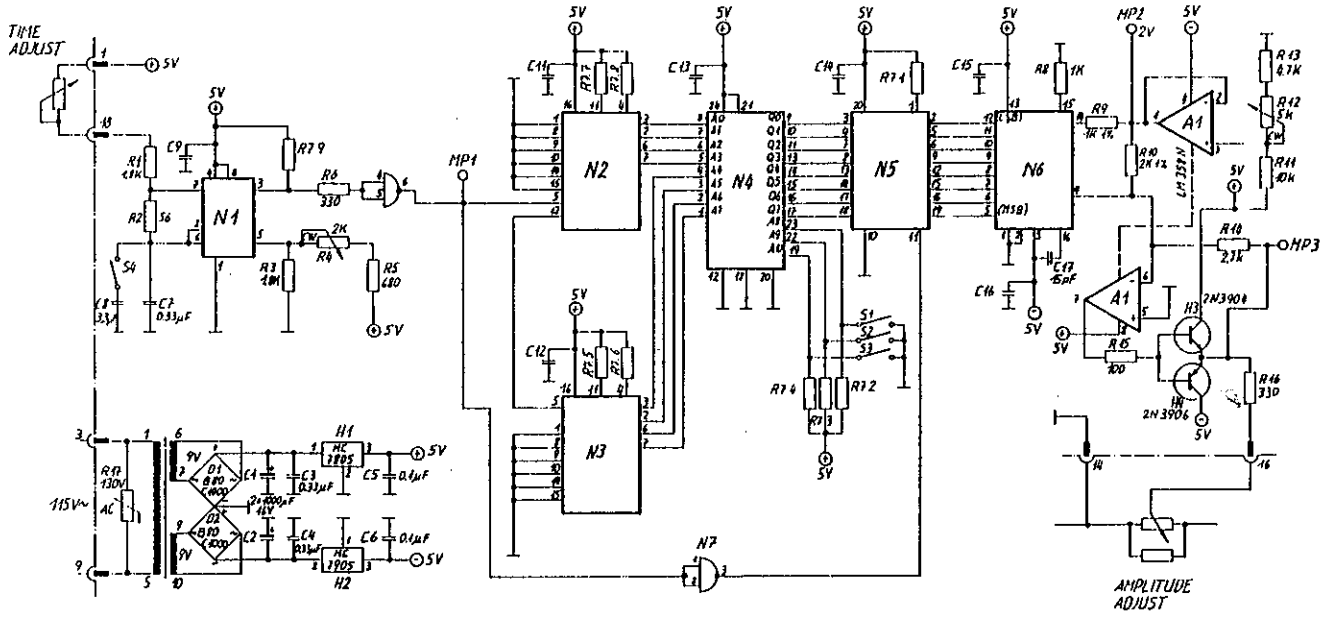


Electron gun control unit / Verdampfungssteuergerät EKS 110 BB 800 041 E / 19 a

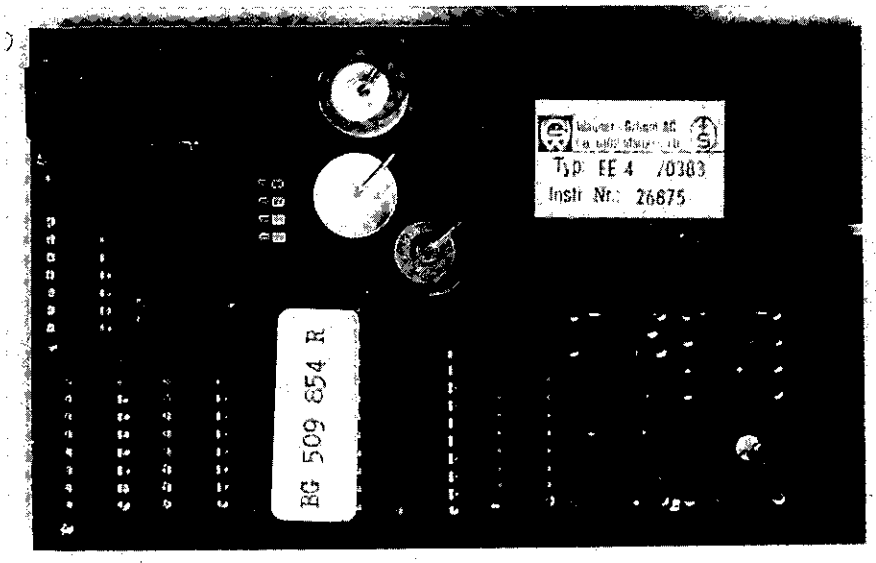




Relay plate-print / Print Relaisplatte BG 005 211 AS

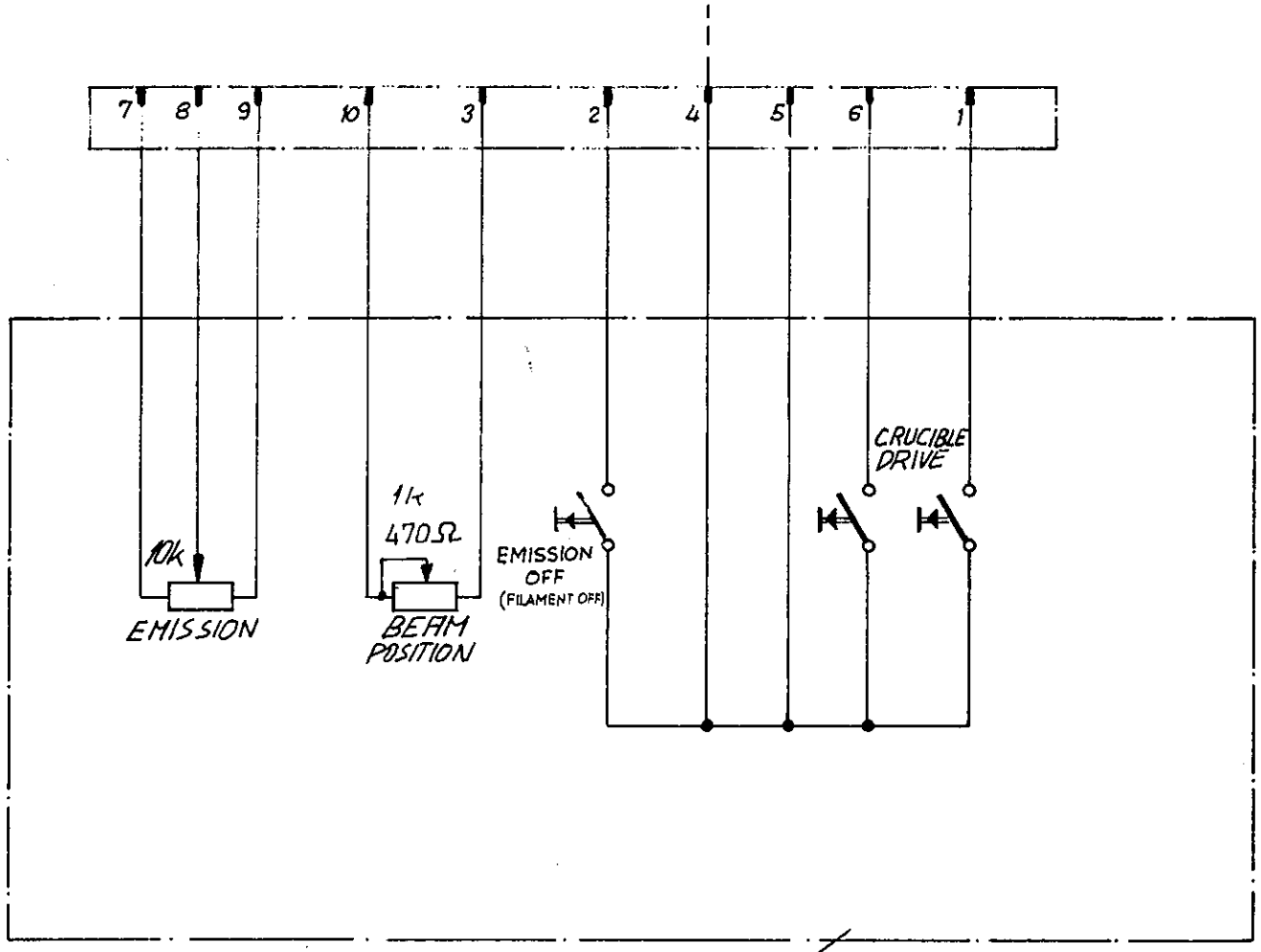


Nr.	Typ	SUPPLY +5V	SUPPLY -5V	SUPPLY GND	FREE GATES	
N1	NE 555	4		1		S16
N2	74LS 193	16		8		T1
N3	74LS 193	16		8		T1
N4	TM 2316/2516	24		12		T1
N5	74LS 273	20		10		T1
N6	HC 1408	13	3			H10
N7	74LS 132	14		7	2	T1

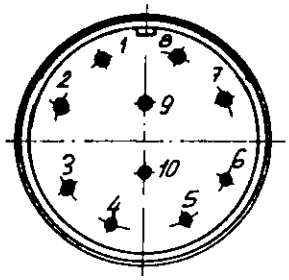


S1	S2	S3	Shape of curve.
OFF	OFF	OFF	clock
ON	OFF	OFF	zero adjustment
OFF	ON	OFF	
ON	ON	OFF	
OFF	OFF	ON	
ON	OFF	ON	
OFF	ON	ON	
ON	ON	ON	

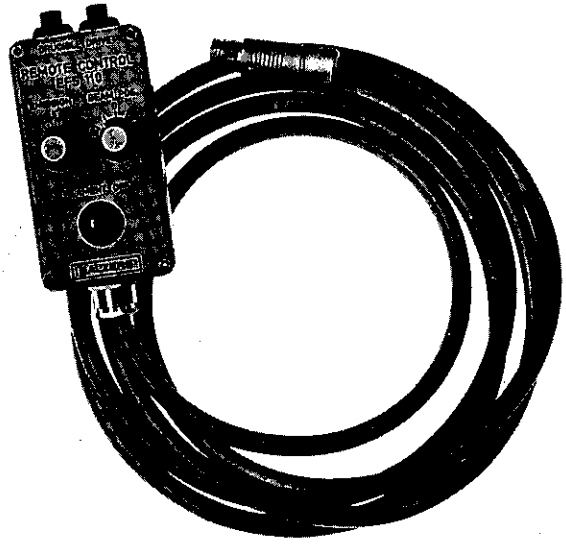
S4 ON t = 1sec - 10sec
S4 OFF t = 0,1sec - 1sec



NOT USED

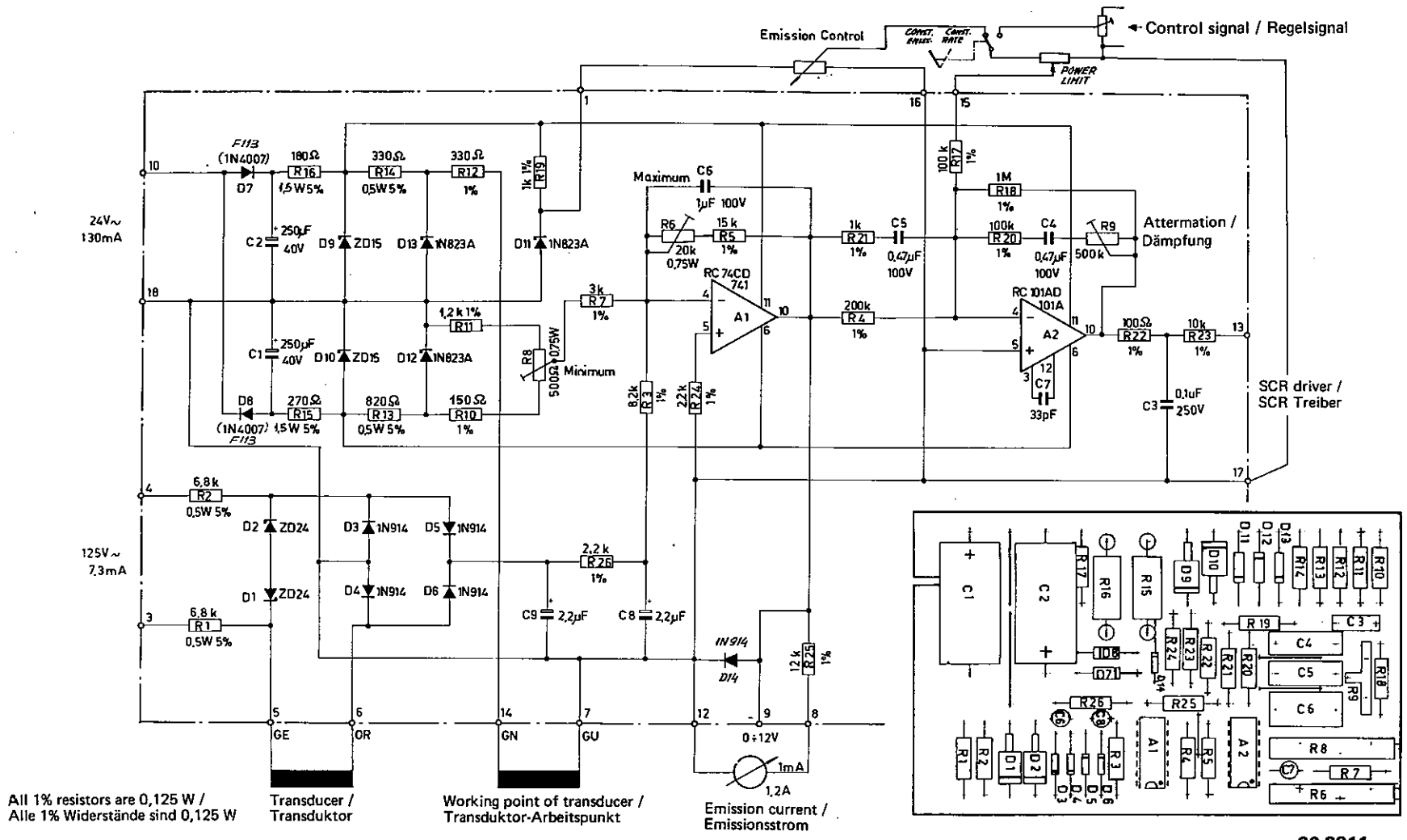


Plug connections / Anschlussbild Stecker
seen fom soldering side / von Lötseite gesehen



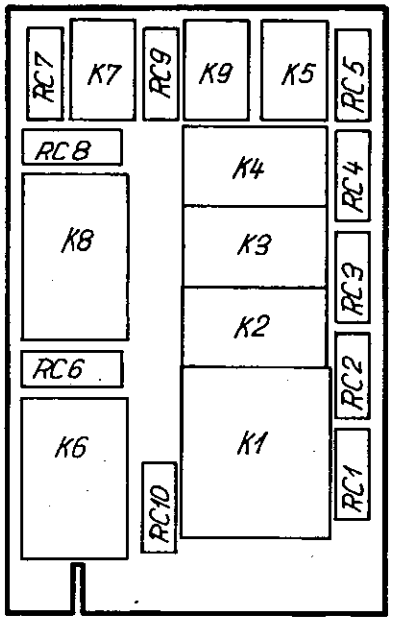
20-2915

Remote control unit / Fernsteuergerät EFS 110 BG 005 213 BS

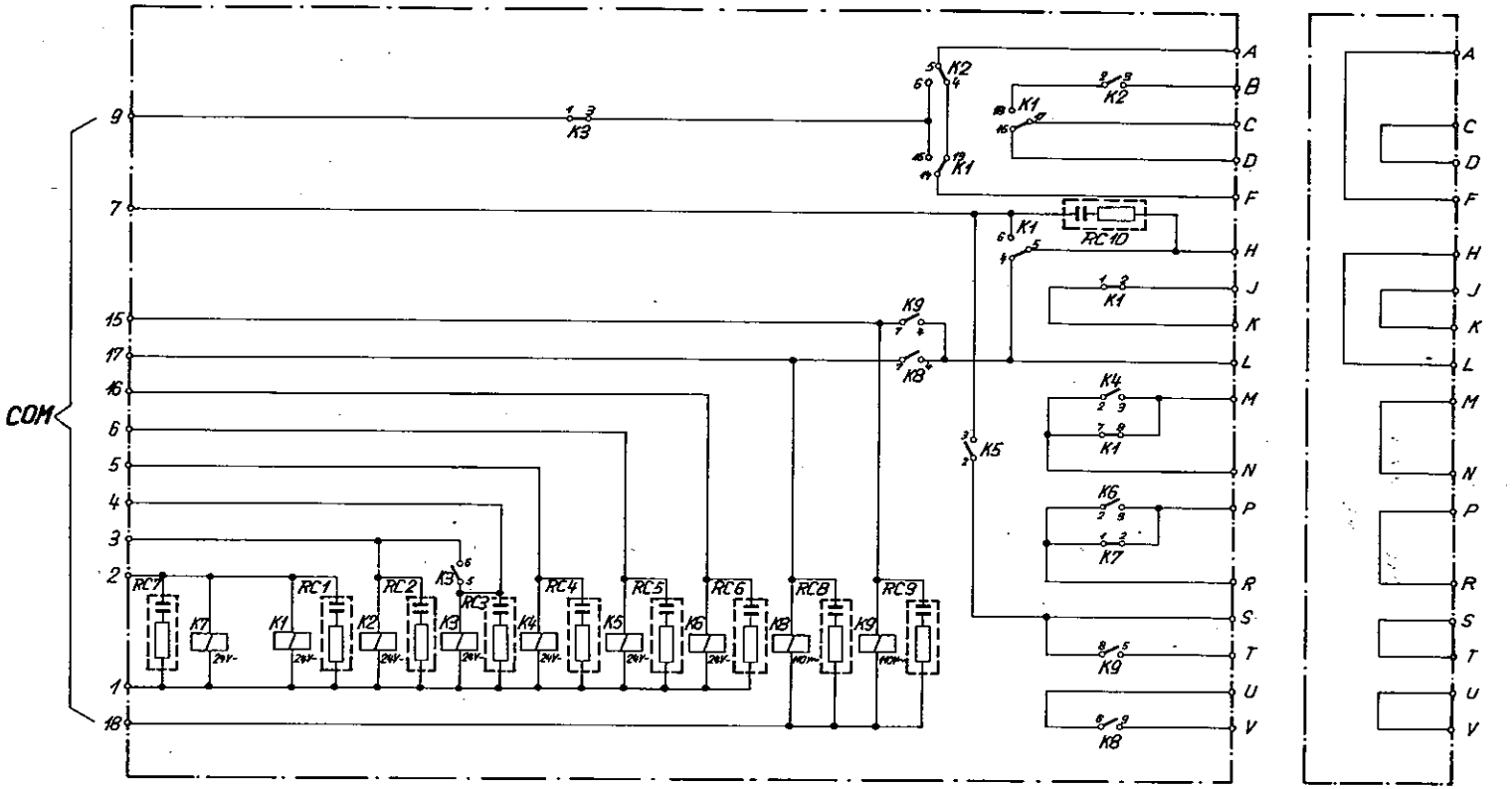


20-2811

Emission current regulation print / Emissionsstrom Mess- und Regelprint BG 005 220 CS



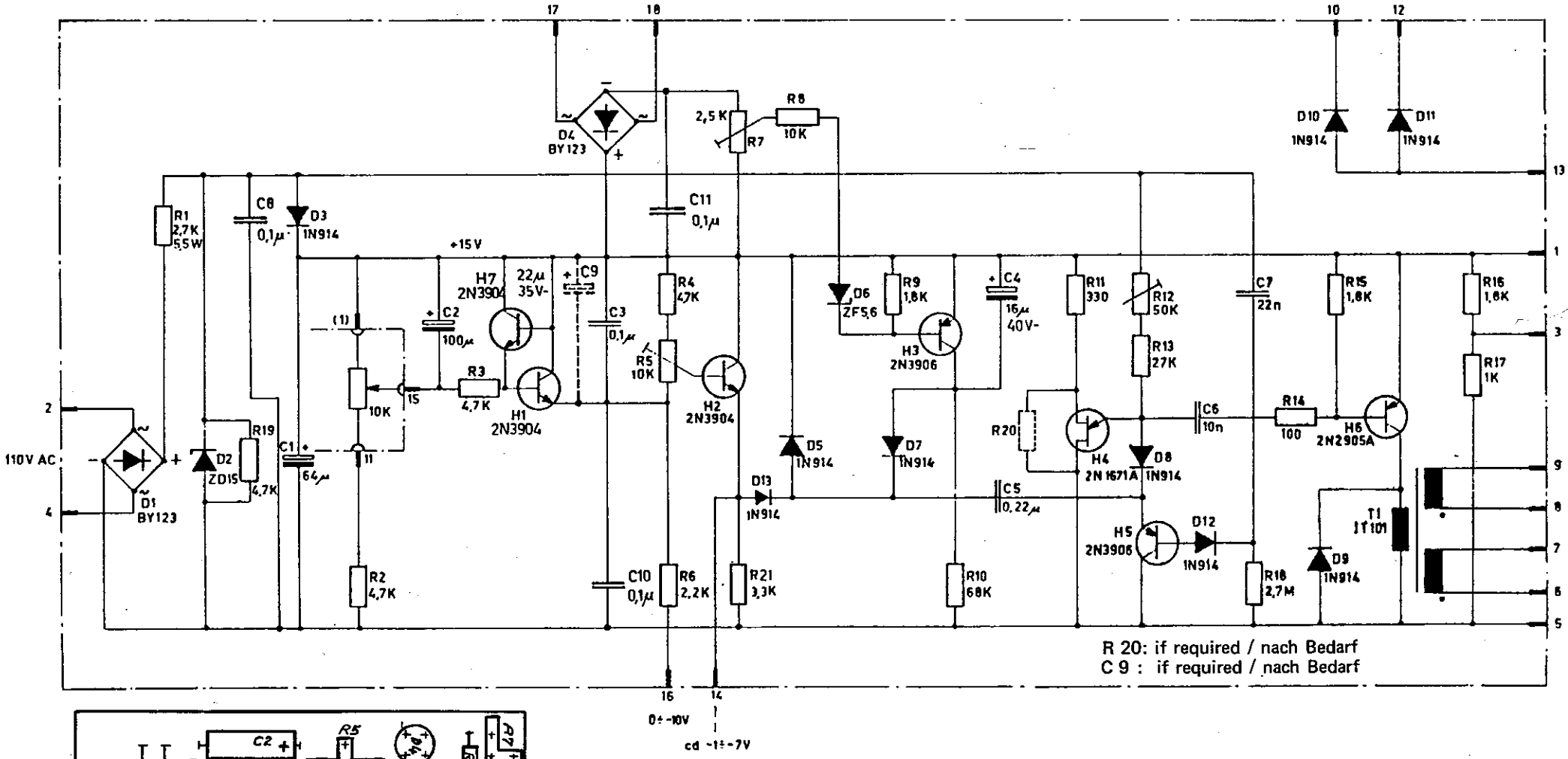
20-2813

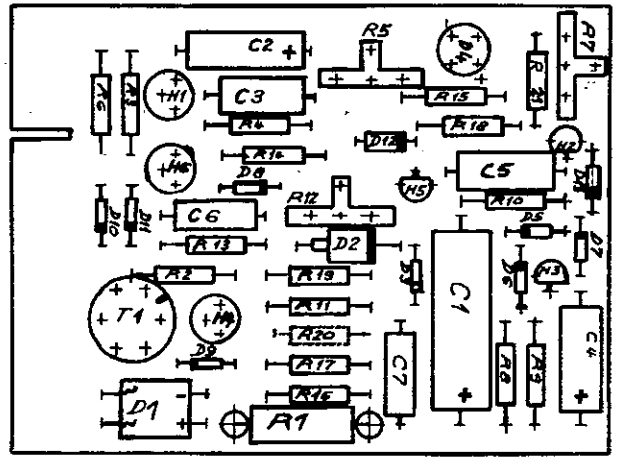


Short circuit print for operation without COM / Kurzschlussprint bei Betrieb ohne COM

K1, K7	automatic manual	K1, K7	Automatik / Hand
K2	high voltage and filament	K2	Hochsp. + Filament
K3	aut. re-set blocked	K3	Aut. Wiedereinschaltg. blockiert
K4	beam wobbled } RC1 ÷ RC 10 are 0,25 µF + 600 Ω, 250 V	K4	Strahl gewobb. } RC1 ÷ RC 10 sind 0,25 µF + 600 Ω, 250 V
K5	cooling	K5	Kühlung
K6	beam wobbled ⟶	K6	Strahl gewobb. ⟶
K8	crucible control } manual / automatic interlock	K8	Tiegelsteuerung
K9	crucible cooling }	K9	Tiegelkühlung Hand.Autom.-Verriegelung

Relay print COM / Relaisprint COM **S 5221**

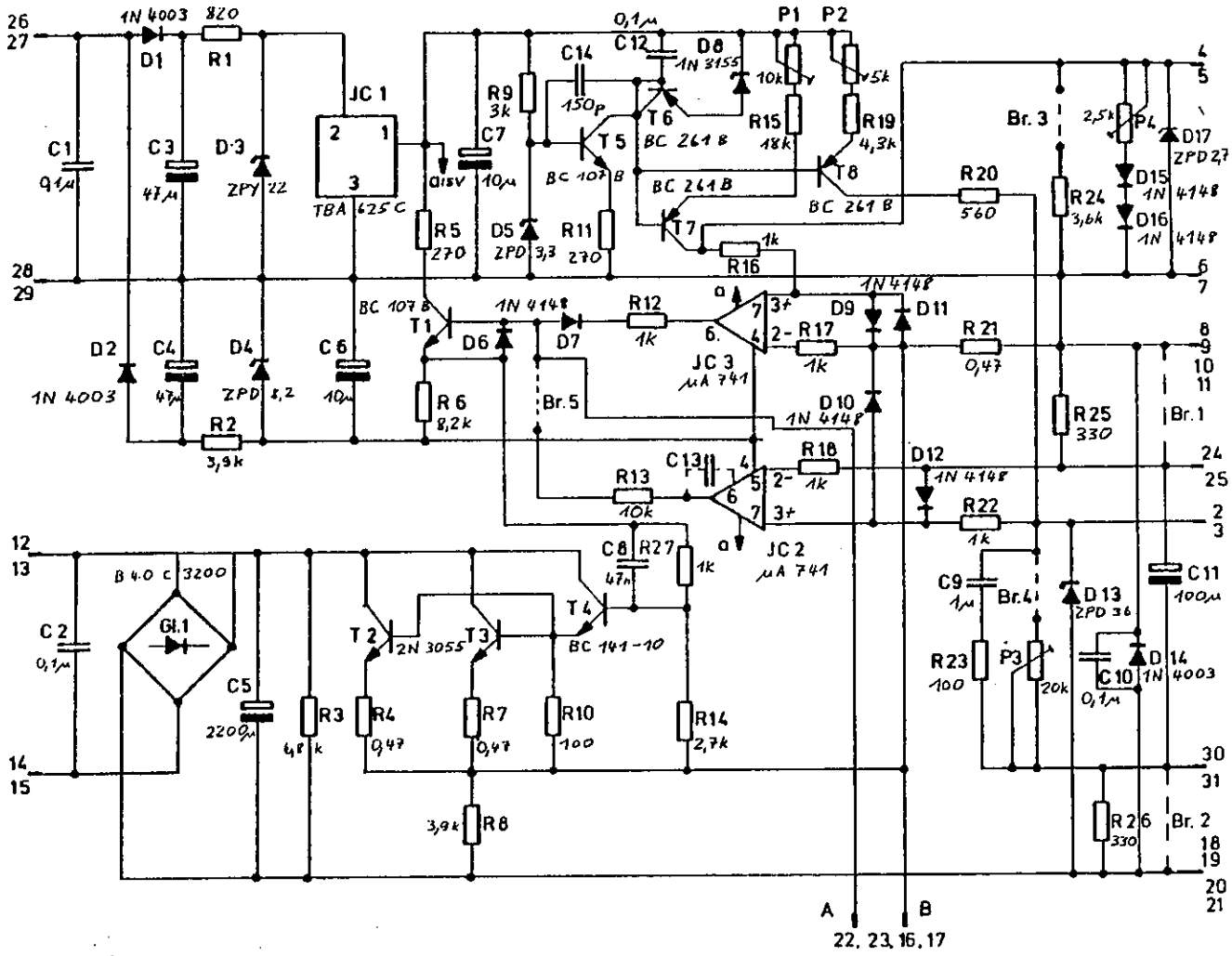


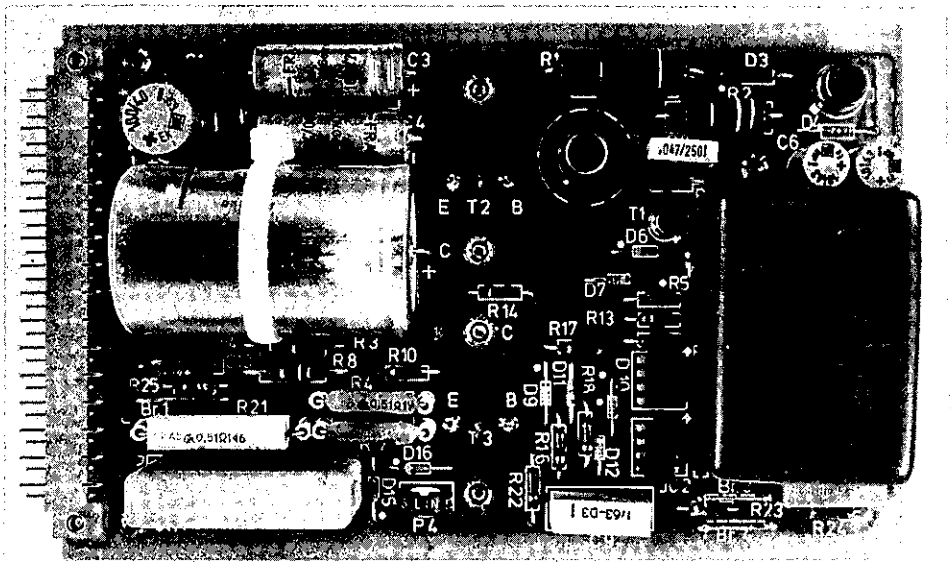


BG 522 225 AU

SCR-Driver / SCR-Treiber

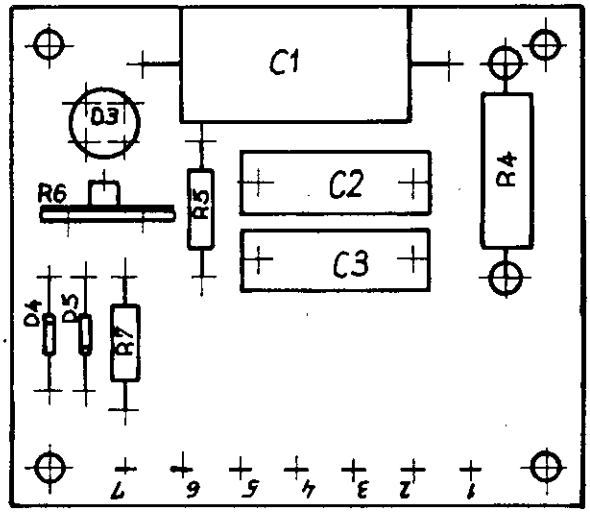
BG 522 228 FS



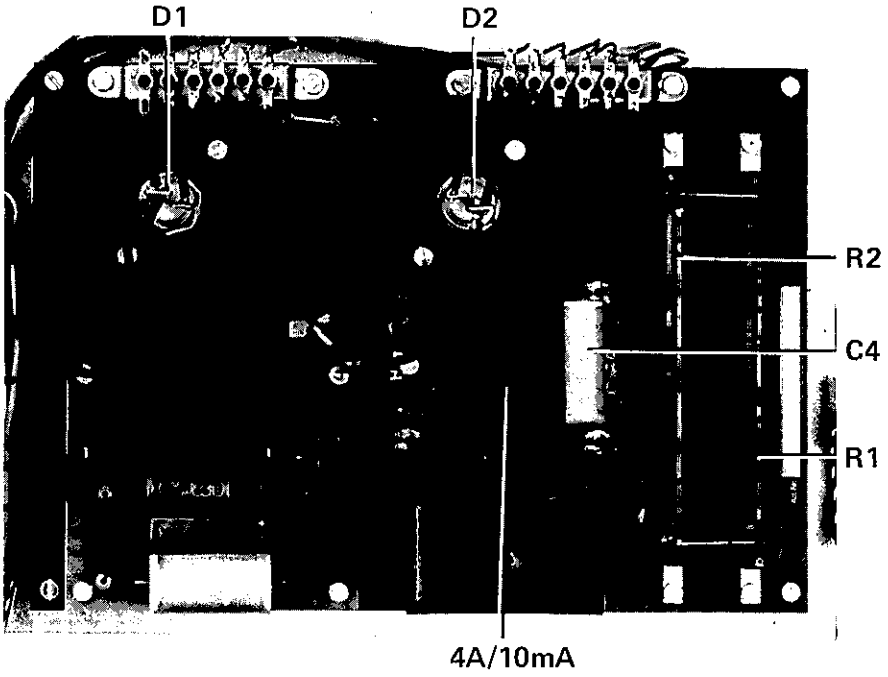


Art. Nr. / Code No.: B 5181 103 R 1

Coil current supply / Steckkarten-Netzgerät



Printed circuit / Print 20-2854



20-2856

Thyristor unit / Thyristoreinheit