

Elektronik

**REGULATED
POWER SUPPLY**

Original

D 050-10

KONTRON ELECTRONIC AG



8048 ZÜRICH

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NV DELTA ELEKTRONIKA



**ZIERIKZEE
NETHERLANDS**



REGULATED POWER SUPPLY D 050-10

0 – 50 V, 0 – 10 A

DESCRIPTION

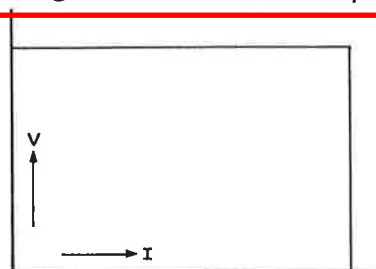
The power supply D 050-10 can be used as a constant voltage source with a limited current or as a constant current source with a limited open voltage. The change of mode occurs sharply at the crossing of the voltage and current settings.

A preregulator with silicon controlled rectifiers keeps the rectified voltage in accordance with the output voltage.

This means low dissipation in the transistors of the series regulator, so that no blower is needed for cooling.

The preregulator causes no interference on the mains.

The power supply is protected against any overload condition.



CONSTANT VOLTAGE OPERATION

Voltage control	10-turn potentiometer, range 0-50 V.
Remote programming	The voltage can be programmed by an external variable resistor of 0-5000 Ohm. Input on the rear panel.
Remote sensing	Separate amplifier terminals enable the output voltage to be regulated at a remote load point, using two sensing leads.
Voltage regulation	3 mV for a + or – 10 % AC input voltage variation. 10 mV for a 100 % load change.
Temp. coeff.	Less than 5 mV per °C.
Ripple voltage	0.1 mV r.m.s.

Output impedance Maximum 0.1 Ohm up to 100 kHz load frequency.

Recovery time 25 micro seconds for recovery to within 30 mV of steady state voltage after a step load change from 10 % to 100 %.

CONSTANT CURRENT OPERATION

Current control 10-turn potentiometer, range 0-10 A.

Remote programming The current can be programmed by an external variable resistor of 0-5000 Ohm. Input on the rear panel.

Current regulation 3 mA for a + or - 10 % AC input voltage variation.
5 mA for a maximum output voltage swing.

Temp. coeff. Less than 10 mA per °C.

Ripple current 0.5 mA r.m.s.

REMAINING SPECIFICATIONS

Input voltage 110-130-200-220-240 V, 50 Hz.

Parallel and series connection Special design enables parallel and series operation without any precaution.

Ambient temp. - 20 to + 45 °C.

Output terminals On front and rear panel, isolated from the case.
Maximum voltage between output terminals and case 500 V.

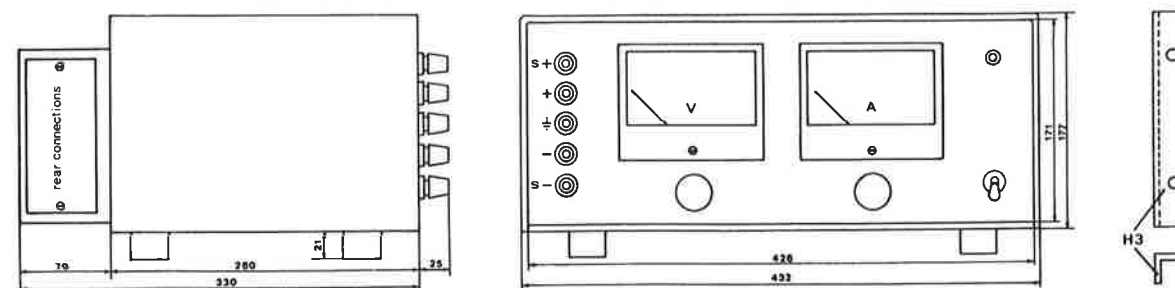
Rack mounting For 19-inch rack mounting two H3 brackets can be ordered.

Cooling By natural convection cooling. The air must flow freely through the vertical heat sink for effective cooling.

Meters Voltage meter 0-50 V, accuracy 1.5 %.
Current meter 0-10 A, accuracy 1.5 %.

Finish Light gray front panel with dark blue case.

Weight and size 26 kg, 432 x 177 x 330 mm.



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The power supply D 050-10 can be used as a source of constant voltage with a limited current, or as a source of constant current with a limited open voltage.

Remote sensing

The output voltage may be regulated at a load point remote from the power supply by means of two extra wires (fig. 1).

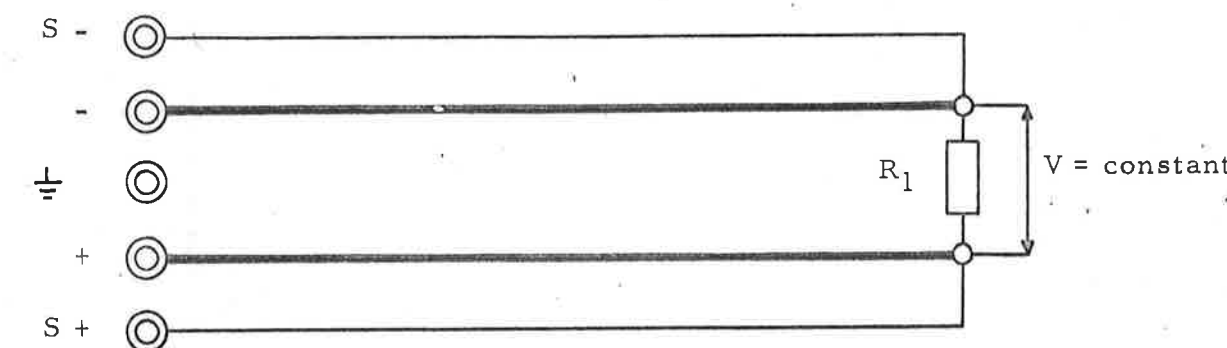


Fig. 1

The shorting links between the terminals S+ and + and between the terminals S- and - have to be disconnected in this case.

If the terminals at the back side are used for error sensing, the shorting links at the front side have also to be disconnected.

A voltage drop up to 1.5 Volts in each connecting wire can be compensated. Depending on the output voltage and current it is often possible to compensate for still larger voltage drops.

Remote sensing does not compensate for the inductance of the load connecting wires.

To establish a low source impedance at the load a capacitor bypass directly at the load terminals is useful.

To minimize the inductance the load wires should be twisted together. The sensing wires can also be twisted together.

Ambient temperature

The maximum allowed ambient temperature is 40°C when the load current is 10 A continuously and 70°C at 5 A.

When mounted in a rack or cabinet one should care for sufficient ventilation to remove the dissipated heat.

Circuit description

To explain the circuit a simplified circuit diagram is drawn (fig. 2).

The regulation consist of two parts: A fast regulation with silicon transistors and a slower pre-regulation with silicon controlled rectifiers.

Pre-regulation:

The switching pre-regulation with controlled rectifiers is used to keep the dissipation in the pass transistor T low.

For this purpose the voltage across T is kept constant, independent of the input and output voltage.

The voltage across T is compared with a part of the reference voltage (the voltage across R1 is neglected for simplification).

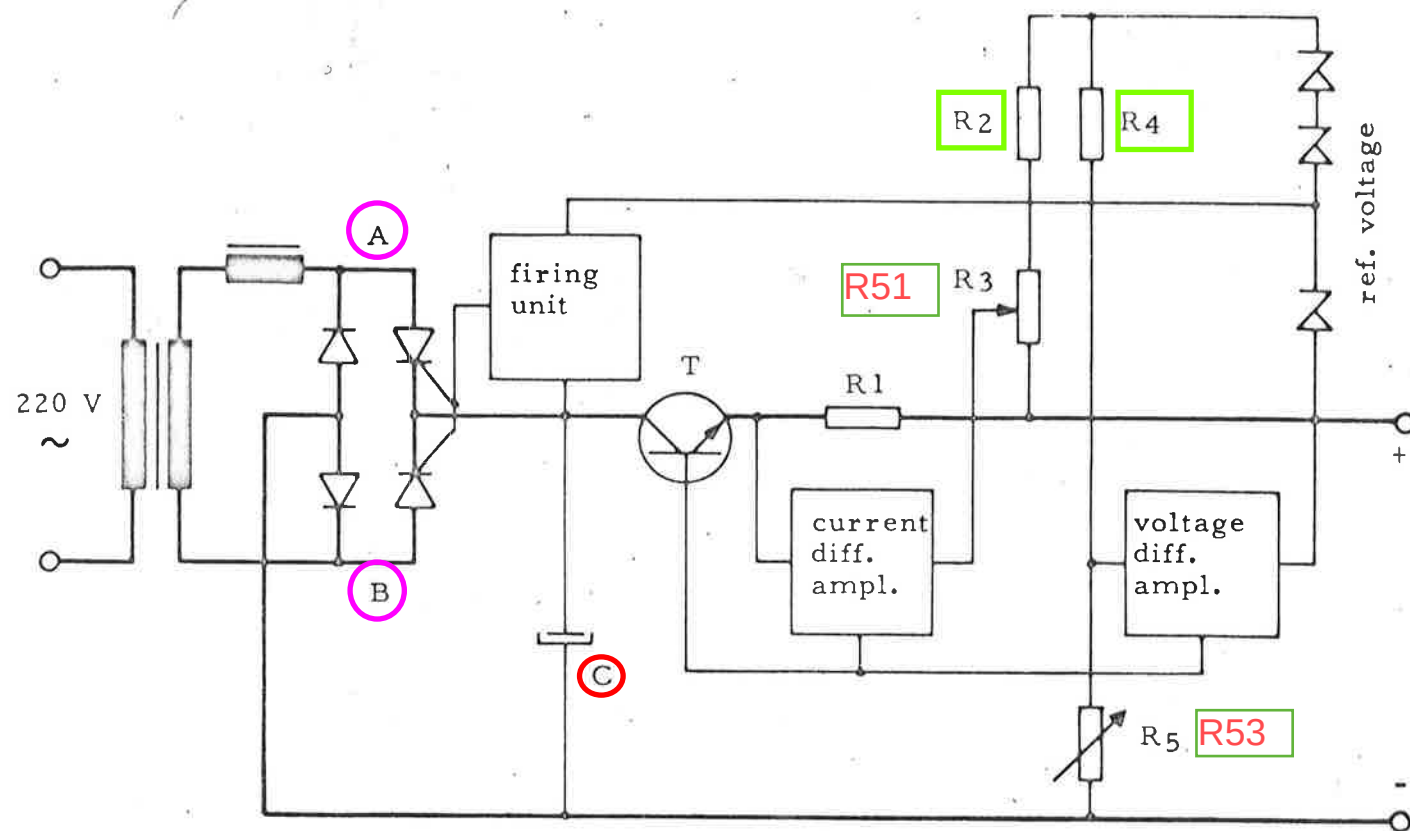


Fig. 2 Simplified Circuit diagram D 050-10
D 030- 3

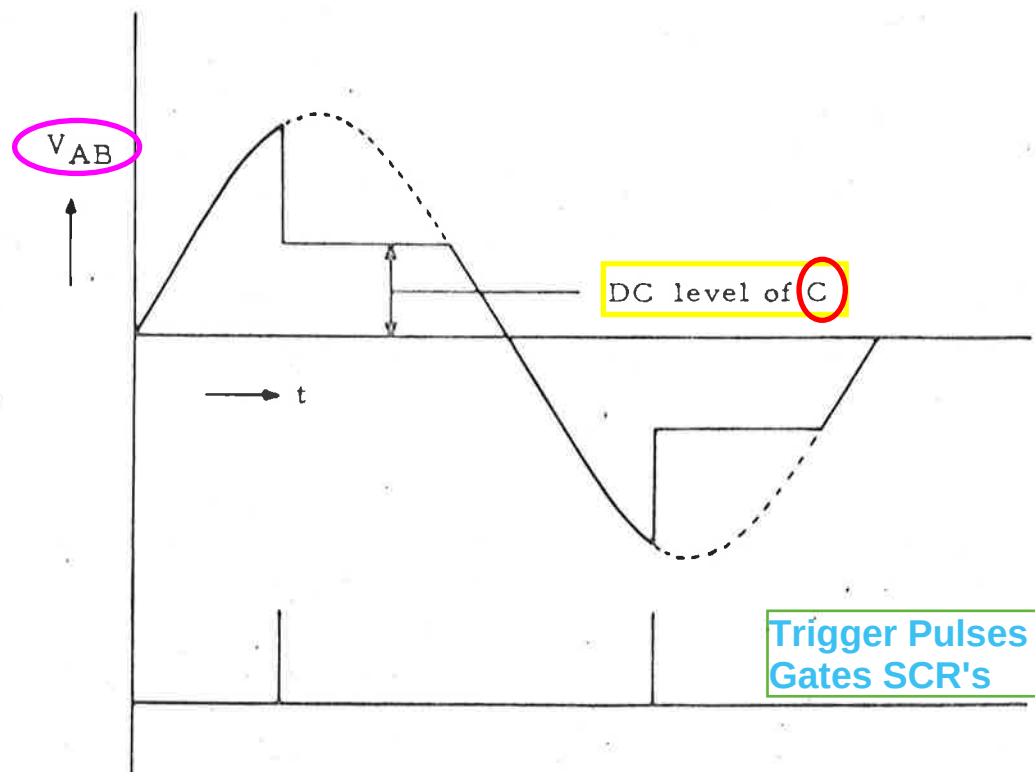


Fig. 3

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The error voltage is converted into a time shift of the firing pulses of the controlled rectifiers, with regard to the zero crossings of the sine wave input voltage.

This causes a voltage change across the capacitor C in order to keep the voltage across T constant.

At a load current of 10 Amp. the voltage across T is about 3 Volts.

So the dissipation of T is than 30 Watts.

Without preregulation the dissipation would be about 500 Watts at low output voltages.

Constant voltage regulation:

A comparison bridge is formed with the resistors R4, R5, the reference voltage and the output voltage.

After amplification the error voltage of the bridge drives transistor T. At the condition of balance the output voltage is practically proportional to R5.

As long as the constant voltage regulation is active, the constant current regulation is inoperative, because one of the transistors of the current error amplifier is blocked.

Constant current regulation:

At constant current regulation the voltage drop across R1, which is proportional to the output current, is compared with the part of the reference voltage across R3.

The error voltage is amplified and drives transistor T in such a way that the voltage across R1 is kept constant and this means that the output current is constant.

The constant current is adjustable with potentiometer R3.

As long as the constant current regulation is active, the constant voltage regulation is inoperative, because one of the transistors of the voltage error amplifier is blocked.

The position of the crossover point of constant voltage regulation and constant current regulation depends on the settings of the voltage and current controls.

In fig. 4 the crossover point is drawn.

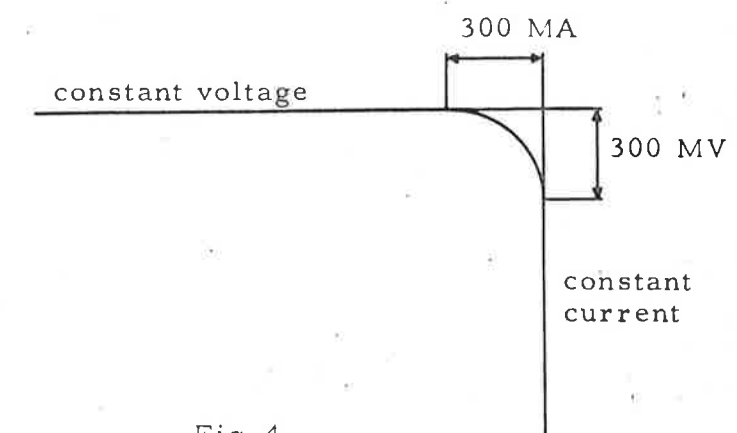


Fig. 4

R (Ohm)

1	=	1	k	5W
2	=	4,7	k	$\frac{1}{2}$ W 2% MF
2a	=	CR		
3	=	10	k	$\frac{1}{2}$ W 2% MF
4	=	1,2	k	W 2% MF
5	=	1,5	k	W 5%
6	=	1,2	k	W 5%
7	=	33	k	W 5%
8	=	1	k	W 5%
9	=	30	k	W 2% MF
10	=	4,7	k	W 5%
11	=	CR		
12	=	CR		
13	=	3,3	k	$\frac{1}{2}$ W 2% MF
14	=	82	k	$\frac{1}{2}$ W 1% MF
15	=	CR		
16	=	10	k	$\frac{1}{2}$ W 5%
17	=	100	k	W 5%
18	=	8,2	k	$\frac{1}{2}$ W 5%
19	=	1	k	var.
20	=	10	k	var.
21	=	1,8	k	$\frac{1}{2}$ W 5%
22	=	1	k	var.
23	=	1	k	$\frac{1}{2}$ W 5%
24	=	10		W 5%
25	=	100		W 5%
26	=	4,7	k	$\frac{1}{2}$ W 5%
27	=	180		W 5%
28	=	100		W 5%
29	=	CR		
30	=	330		W 5%
31	=	330		W 5%
32	=	1	k	W 5%
33	=	3,3	k	W 5%
34	=	8,2	k	$\frac{1}{2}$ W 5%
35	=	10	k	var.
36	=	47	k	$\frac{1}{2}$ W 5%
37	=	15	k	$\frac{1}{2}$ W 5%
38	=	1	m	$\frac{1}{2}$ W 5%
39	=	1	m	var.
40	=	5,6	k	W 5%
41	=	8,2	m	W 5%
42	=	50	k	$\frac{1}{2}$ W 2% MF
43	=	1	k	var.
44	=	1,2	k	9W 5%
45	=	1,2	k	9W 5%
46	=	330		5W 5%
47	=	1,2	k	9W 5%
48	=	1,2	k	9W 5%
49	=	0,1		65 W
50	=	0,1		65 W
51	=	5	k	10 turn potm.
52	=	47		5W 5%
53	=	5	k	10 turn potm.
54	=	47		5W 5%

C (microfarad)

1	=	250	15 V
2	=	250	15 V
3	=	250	15 V
4	=	250	15 V
5	=	100	100 V
6	=	25	15 V
7	=	10	100 V
8	=	25	70 V
9	=	0,001	400 V
10	=	10	100 V
11	=	10.000	70 V
12	=	10.000	70 V
13	=	10.000	70 V
14	=	10.000	70 V
15	=	1	250 V
16	=	1	250 V
17	=	500	70 V
18	=	500	70 V
19	=	10	100 V
20	=	10	100 V
21	=	0,2 uF + 2 x 5000 pF	-250 V Ero
22	=	0,22	630 V
23	=	500	70 V

EROMET

1	=	1N3193	RCA
2	=	ZG 6,8	Intermetall
3	=	ZG 6,8	Intermetall
4	=	OA 202	Philips
5	=	RE 38	Delta
6	=	ZG 6,8	Intermetall
7	=	MR 1031 B	Motorola
8	=	MR 1031 B	Motorola
9	=	MR 1031 B	Motorola
10	=	MR 1031 B	Motorola
11	=	40210	RCA
12	=	2N3669	RCA
13	=	40210	RCA
14	=	2N3669	RCA
15	=	MR 1031 B	Motorola
16	=	40210	RCA

L = Liliput telefonlamp
6 V, 0,04 A
Taunuslicht

MF = Metal filmresistor

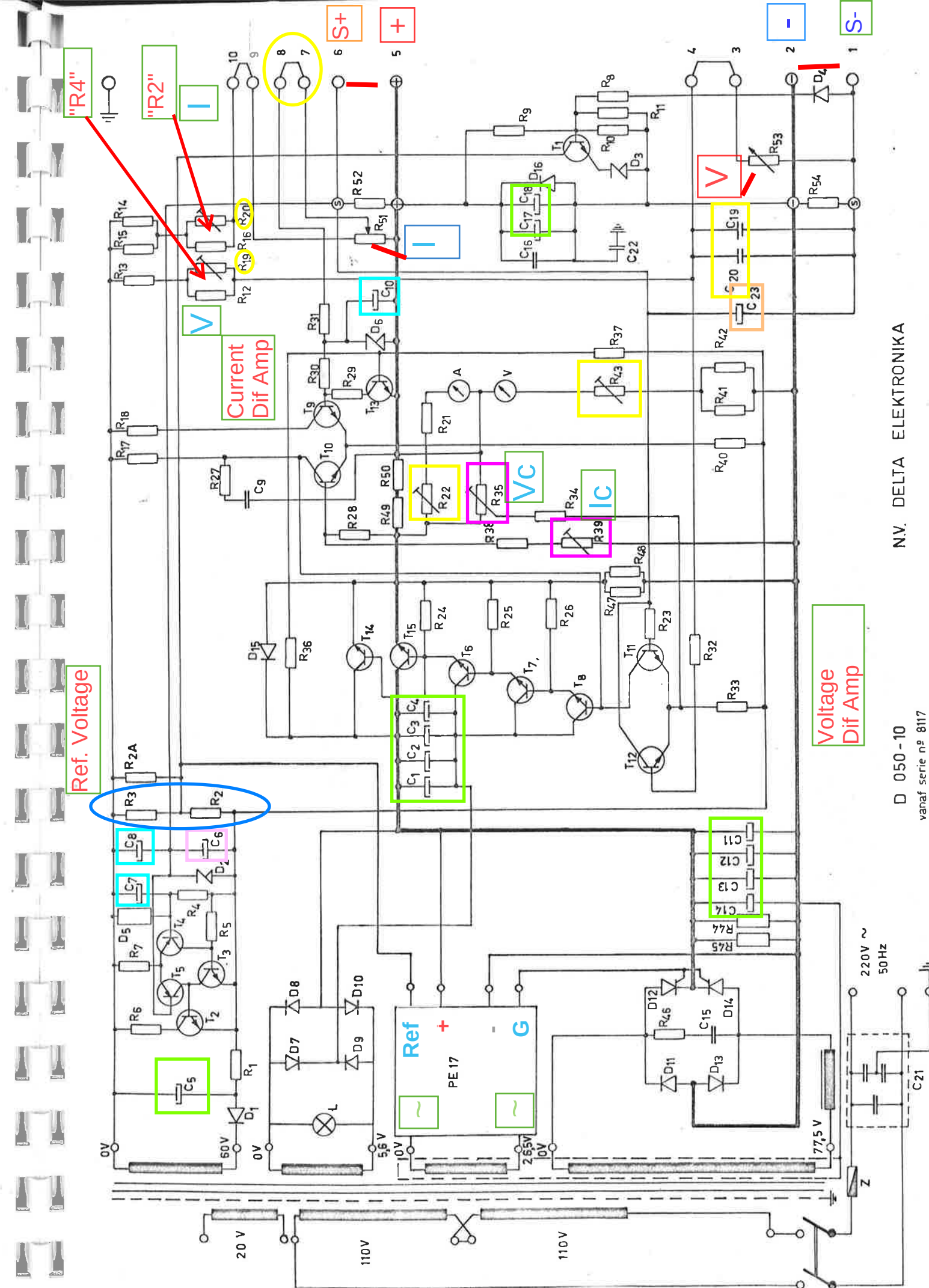
CR = Calibration resistor

Z = Fuse 10 A delay $5\frac{1}{4}'' \times \frac{1}{4}''$ 220 V
Fuse 20 A delay $5\frac{1}{4}'' \times \frac{1}{4}''$ 110 V

vanaf serie nr 8117

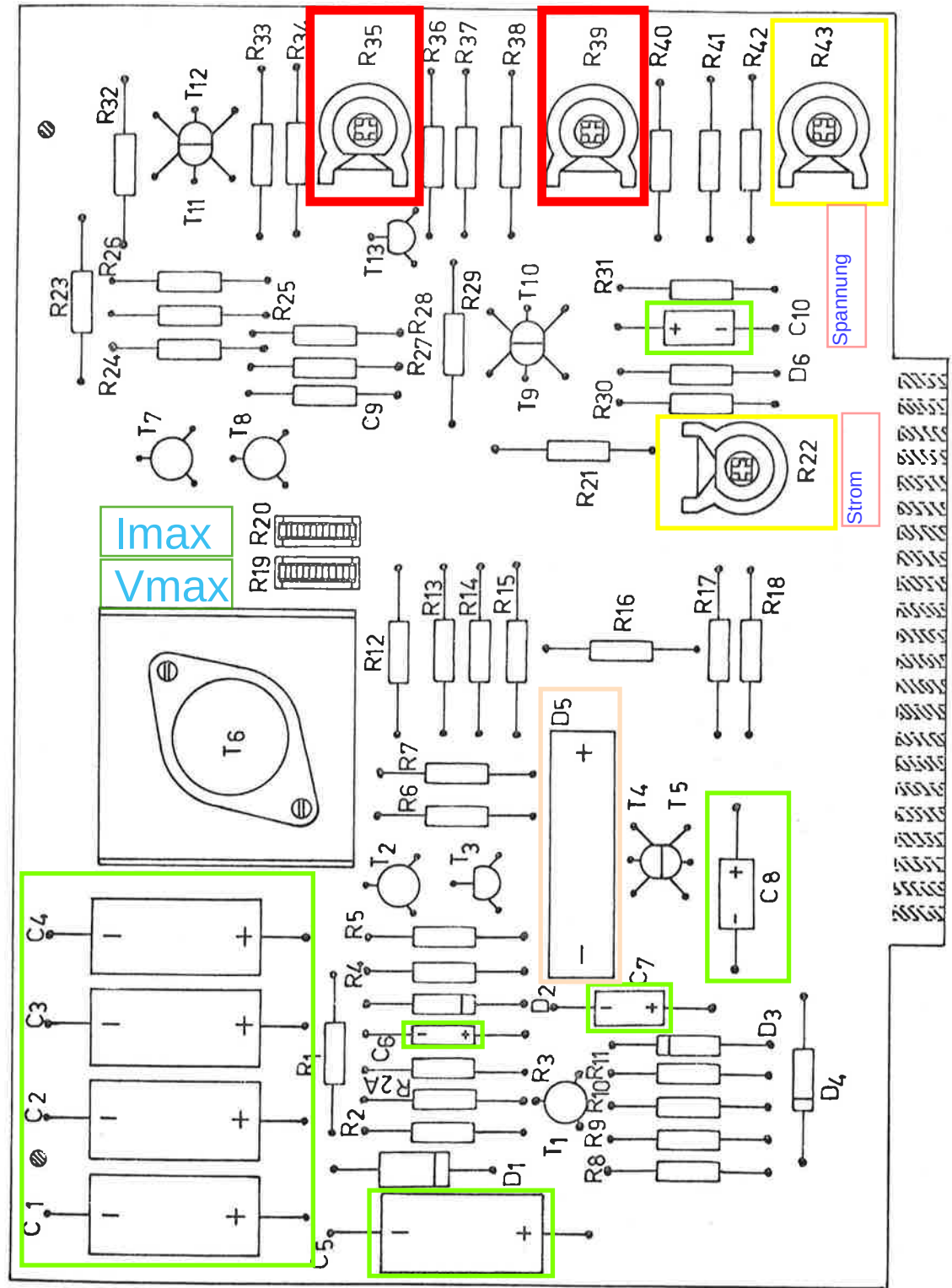
D 050-10

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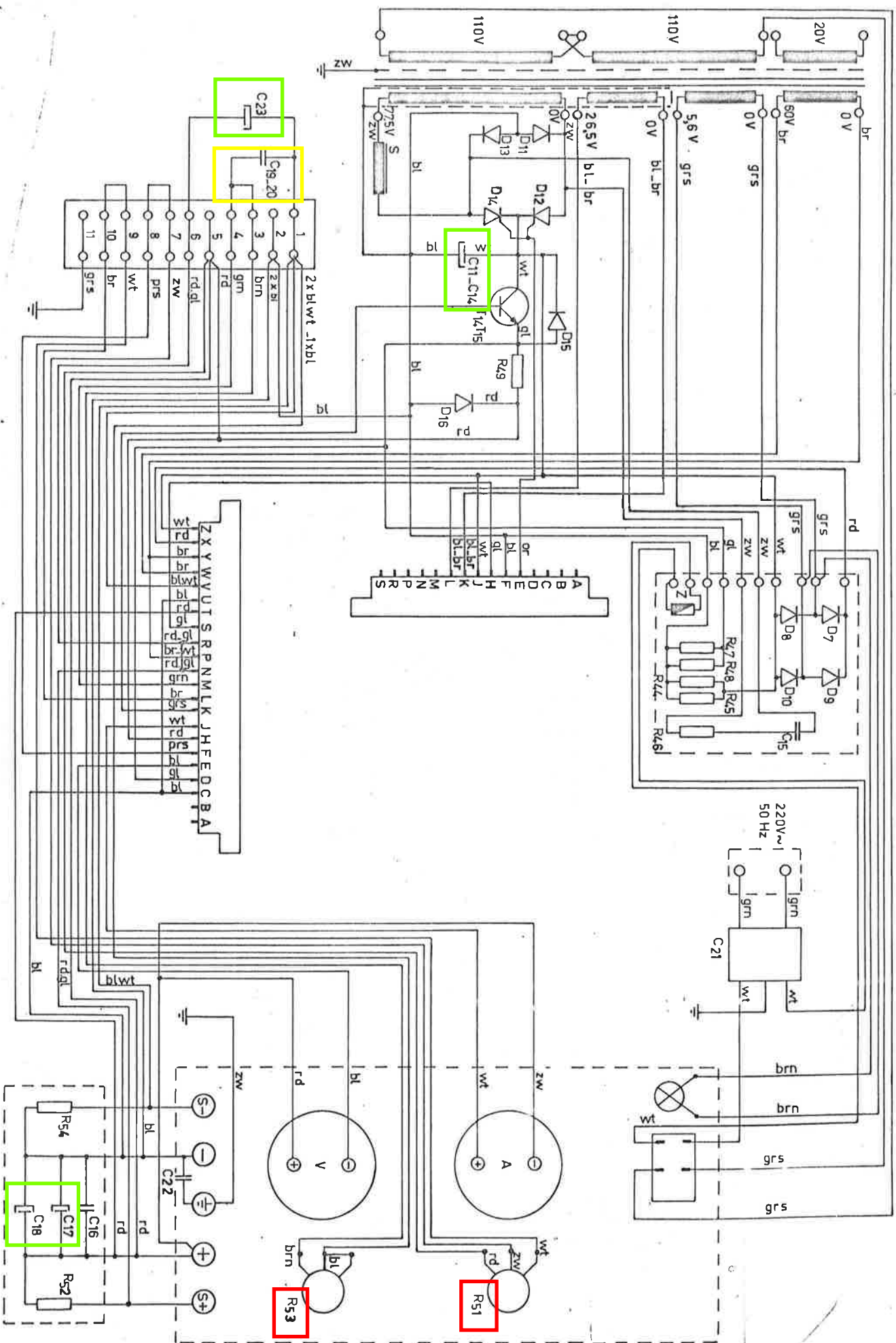


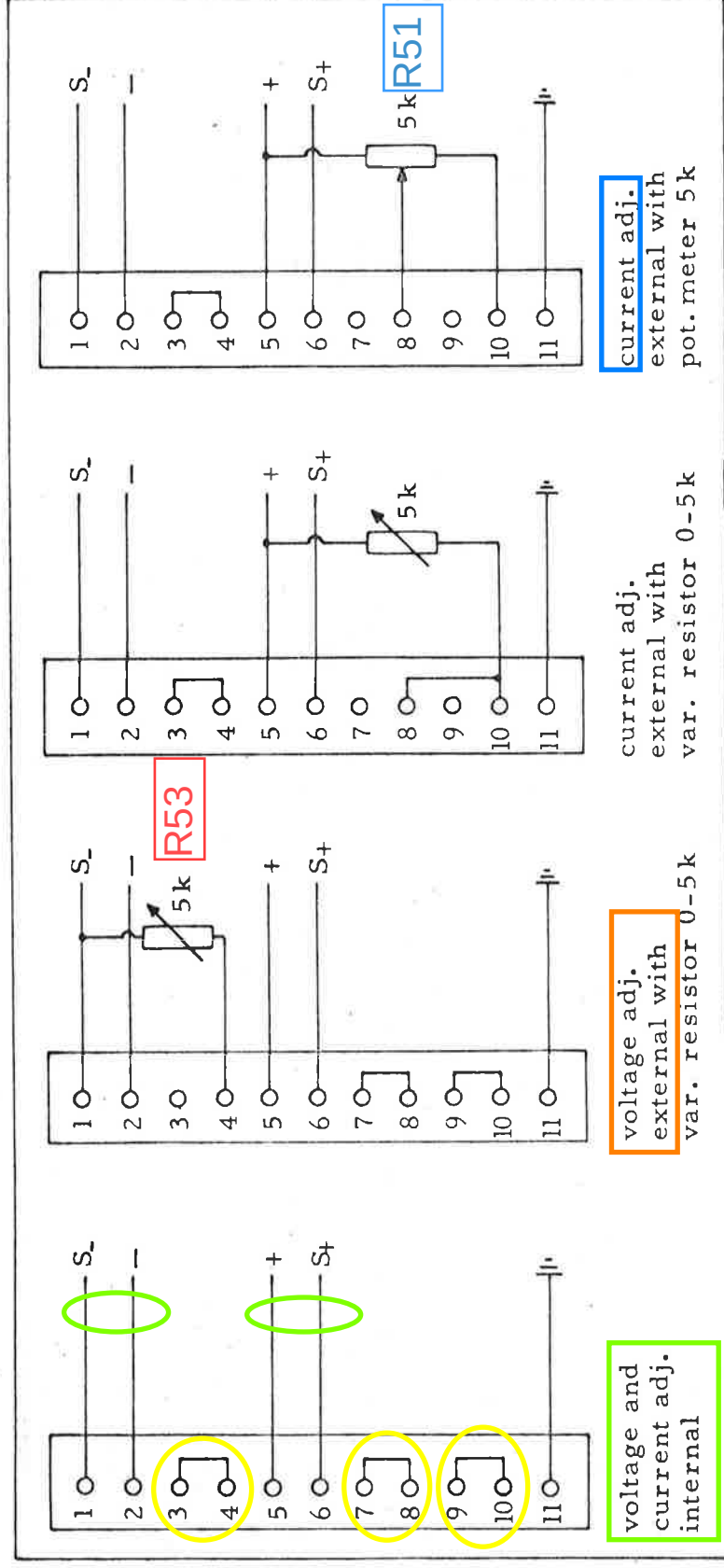
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D 050-10
vanaf serie nr 8117



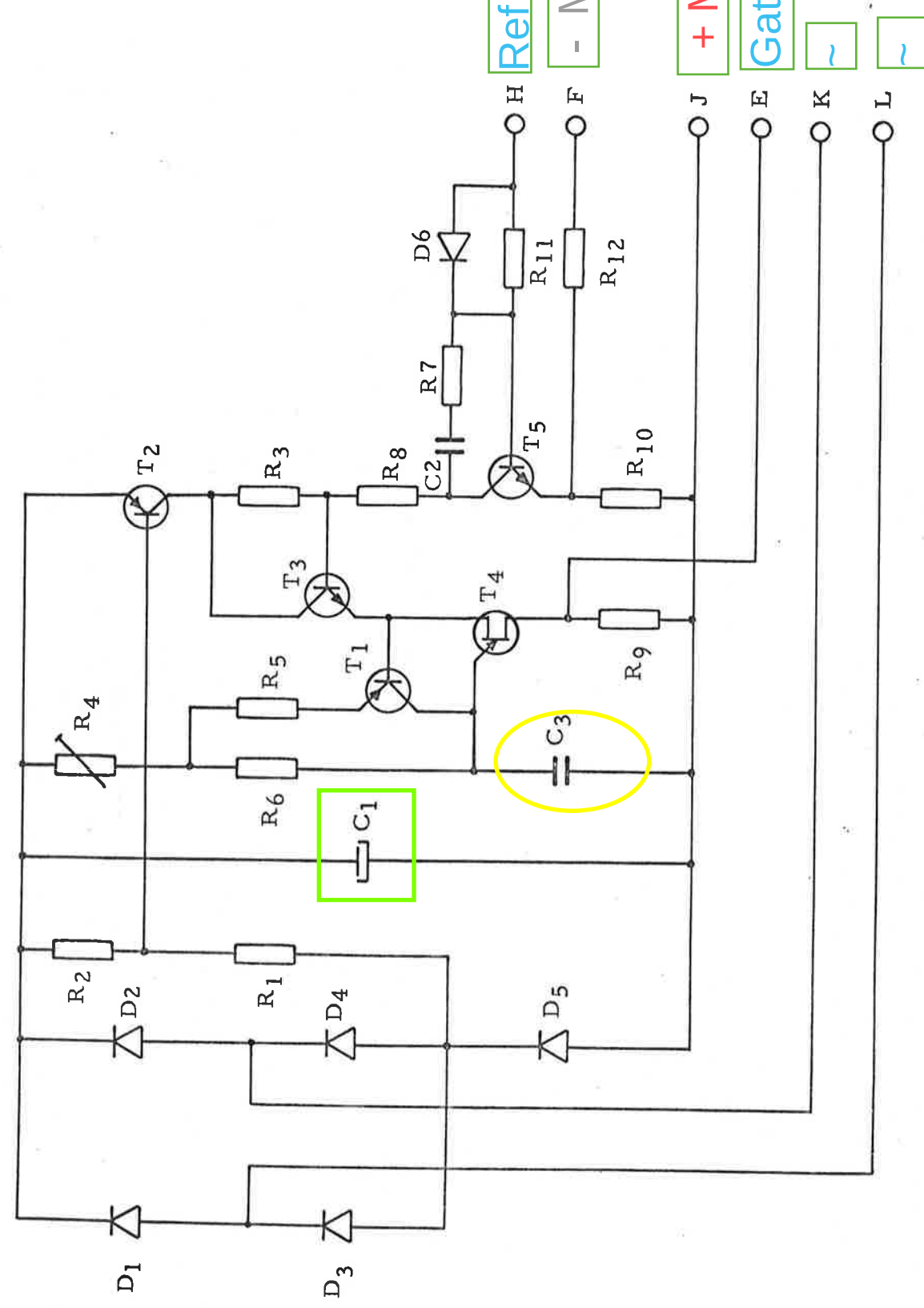
- R19 = Spannungsbereich (Voltage range)
- R20 = Strombereich (Current range)
- R22 = Eichung Strommesser (Calibration Current meter)
- R35 = Spannungskompensation (Voltage compensation)
- R39 = Stromkompensation (Current compensation)
- R43 = Eichung Spannungsmesser (Calibration Voltage meter)



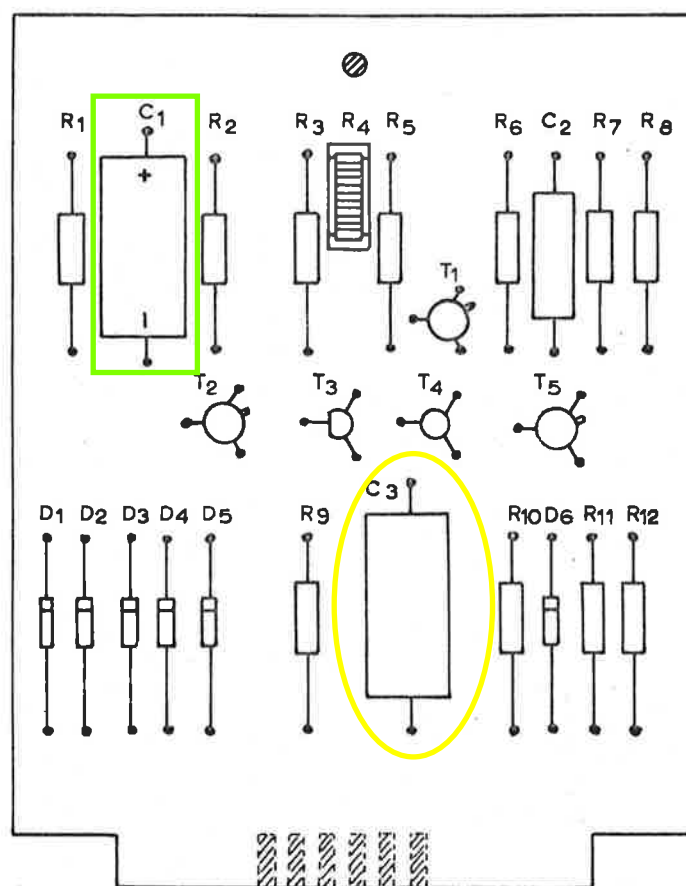


Barrier strip connections on rear of D 050-10

D 050-10



D 050-10



PE 17

R (Ohm)

1 =	4,7 k	$\frac{1}{2}$ W	5%
2 =	4,7 k	$\frac{1}{2}$ W	5%
3 =	4,7 k	$\frac{1}{2}$ W	2% MF
4 =	10 k		var.
5 =	22 k	$\frac{1}{2}$ W	2% MF
6 =	50 k	$\frac{1}{2}$ W	2% MF
7 =	22 k	$\frac{1}{2}$ W	5%
8 =	2,7 k	$\frac{1}{2}$ W	2% MF
9 =	27 k	$\frac{1}{2}$ W	5%
10 =	1,8 k	$\frac{1}{2}$ W	2% MF
11 =	10 k	$\frac{1}{2}$ W	5%
12 =	39 k	$\frac{1}{2}$ W	5%

C (microfarad)

1 =	50	70 V
2 =	0,1	250 V
3 =	0,22	63 V

T 1 =	2N4037	RCA
2 =	2N4037	RCA
3 =	2N3704	TI
4 =	2N2646	GE
5 =	2N3053	RCA

D 1 =	TS 05 DI
2 =	TS 05 DI
3 =	TS 05 DI
4 =	TS 05 DI
5 =	TS 05 DI
6 =	OA 202 Philips