Elektronik

REGULATED POWER SUPPLY

Original

D 050-10

NV DELTA ELEKTRONIKA

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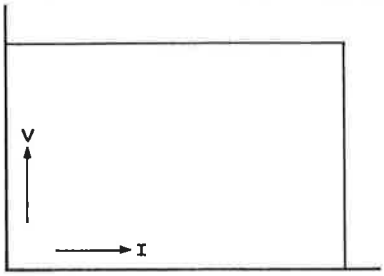
REGULATED POWER SUPPLY D 050-10

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.

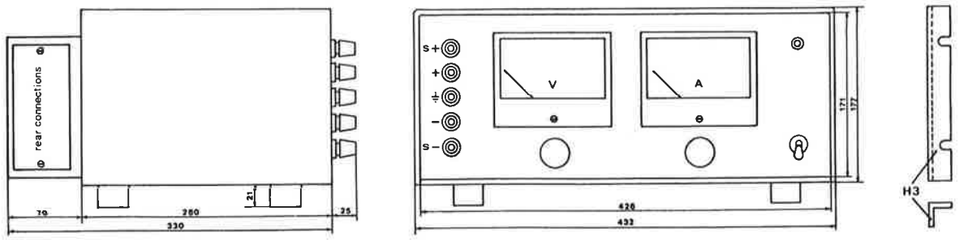
Output impedance	Maximum 0.1 Ohm up to 100 kHz load frequency.
Recovery time	25 micro seconds for recovery to within 30 mV of steady state voltage after a step load change from 10 % to 100 %.

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.



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).

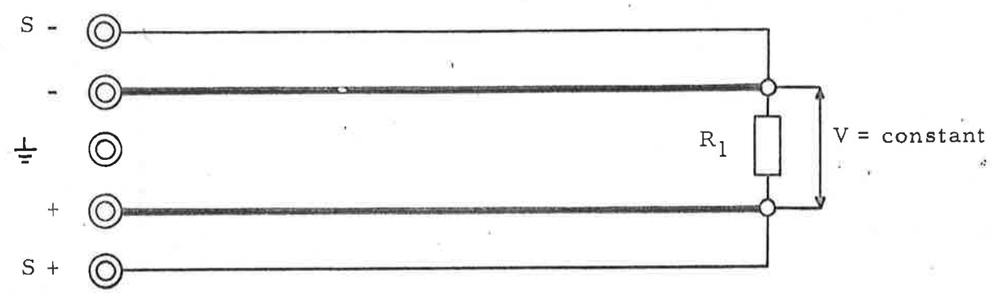


Fig. 1

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 simplfied 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 R_1 is neglected for simplification).

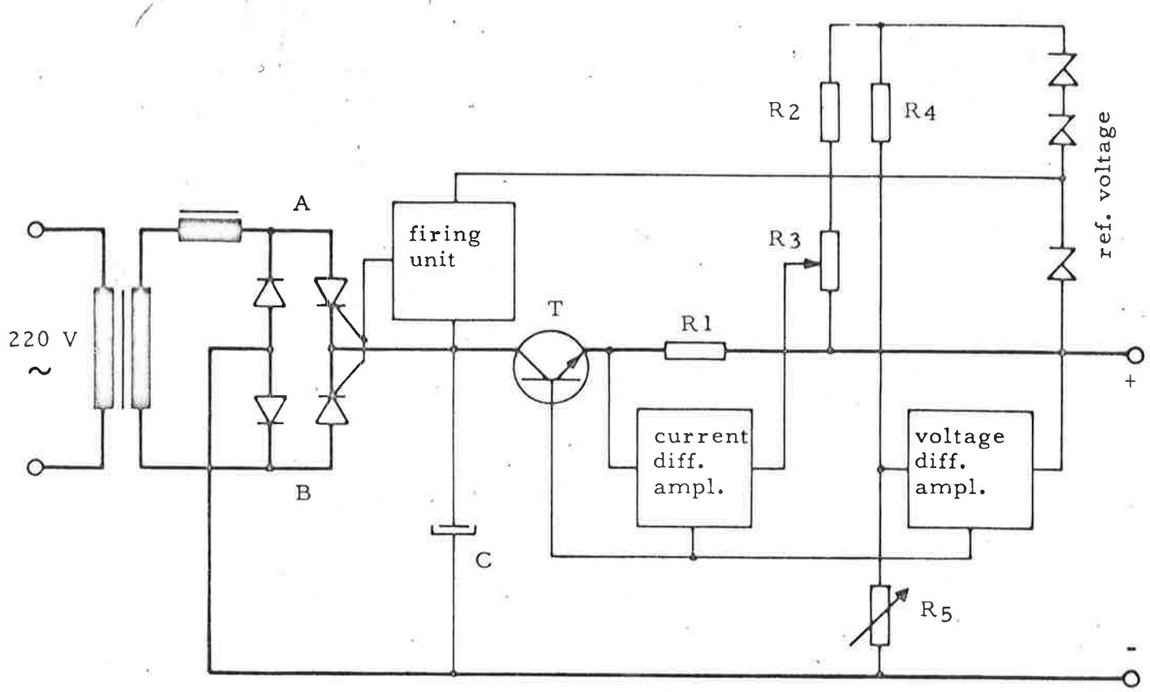


Fig. 2 Simplified Circuitdiagram D 050-10
D 030- 3

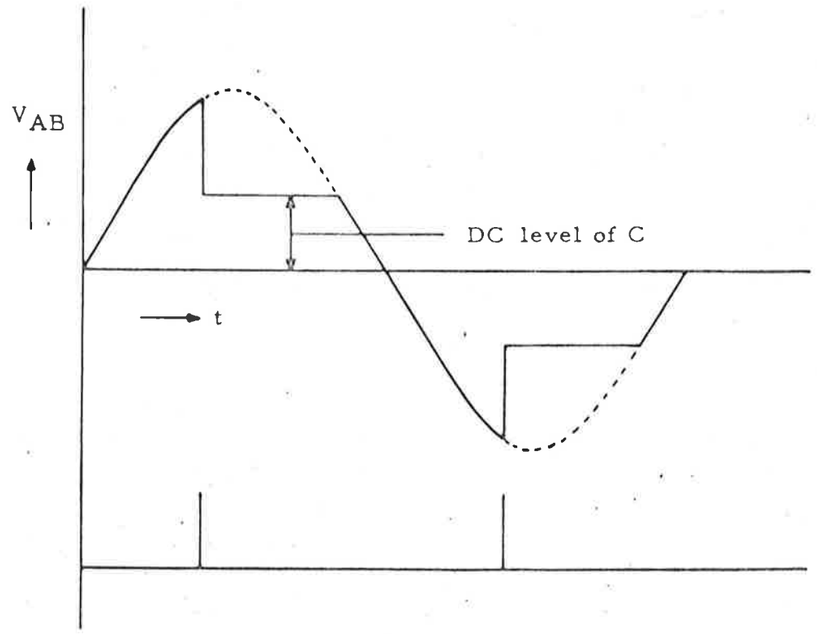


Fig. 3

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.

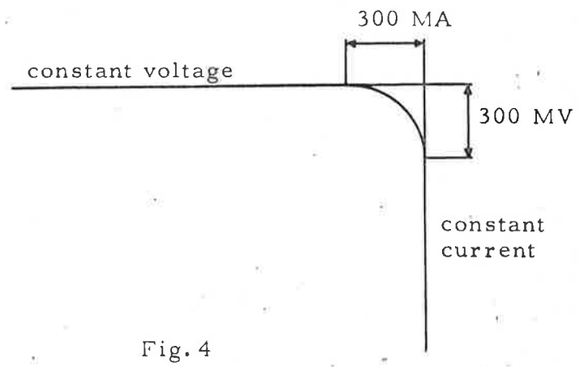


Fig. 4

R (Ohm)

1	=	1	k	5W
2	=	4,7	k	½W 2% MF
2a	=	CR		
3	=	10	k	½W 2% MF
4	=	1,2	k	½W 2% MF
5	=	1,5	k	½W 5%
6	=	1,2	k	½W 5%
7	=	33	k	½W 5%
8	=	1	k	½W 5%
9	=	30	k	½W 2% MF
10	=	4,7	k	½W 5%
11	=	CR		
12	=	CR		
13	=	3,3	k	½W 2% MF
14	=	82	k	½W 1% MF
15	=	CR		
16	=	10	k	½W 5%
17	=	100	k	½W 5%
18	=	8,2	k	½W 5%
19	=	1	k	var.
20	=	10	k	var.
21	=	1,8	k	½W 5%
22	=	1	k	var.
23	=	1	k	½W 5%
24	=	10		½W 5%
25	=	100		½W 5%
26	=	4,7	k	½W 5%
27	=	180		½W 5%
28	=	100		½W 5%
29	=	CR		
30	=	330		½W 5%
31	=	330		½W 5%
32	=	1	k	½W 5%
33	=	3,3	k	½W 5%
34	=	8,2	k	½W 5%
35	=	10	k	var.
36	=	47	k	½W 5%
37	=	15	k	½W 5%
38	=	1	m	½W 5%
39	=	1	m	var.
40	=	5,6	k	½W 5%
41	=	8,2	m	½W 5%
42	=	50	k	½W 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	k	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

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

T 1 = 2N3053 RCA
2 = 2N3053 RCA
3 = BC 182 A TI
4 = BC 213 TI
5 = BC 213 TI
6 = 2N3442 RCA
7 = 2N3440 RCA
8 = 2N3440 RCA
9 = BC 182 A TI
10 = BC 182 A TI
11 = BC 182 A TI
12 = BC 182 A TI
13 = BC 182 A TI
14 = 2N3773 RCA
15 = 2N3773 RCA

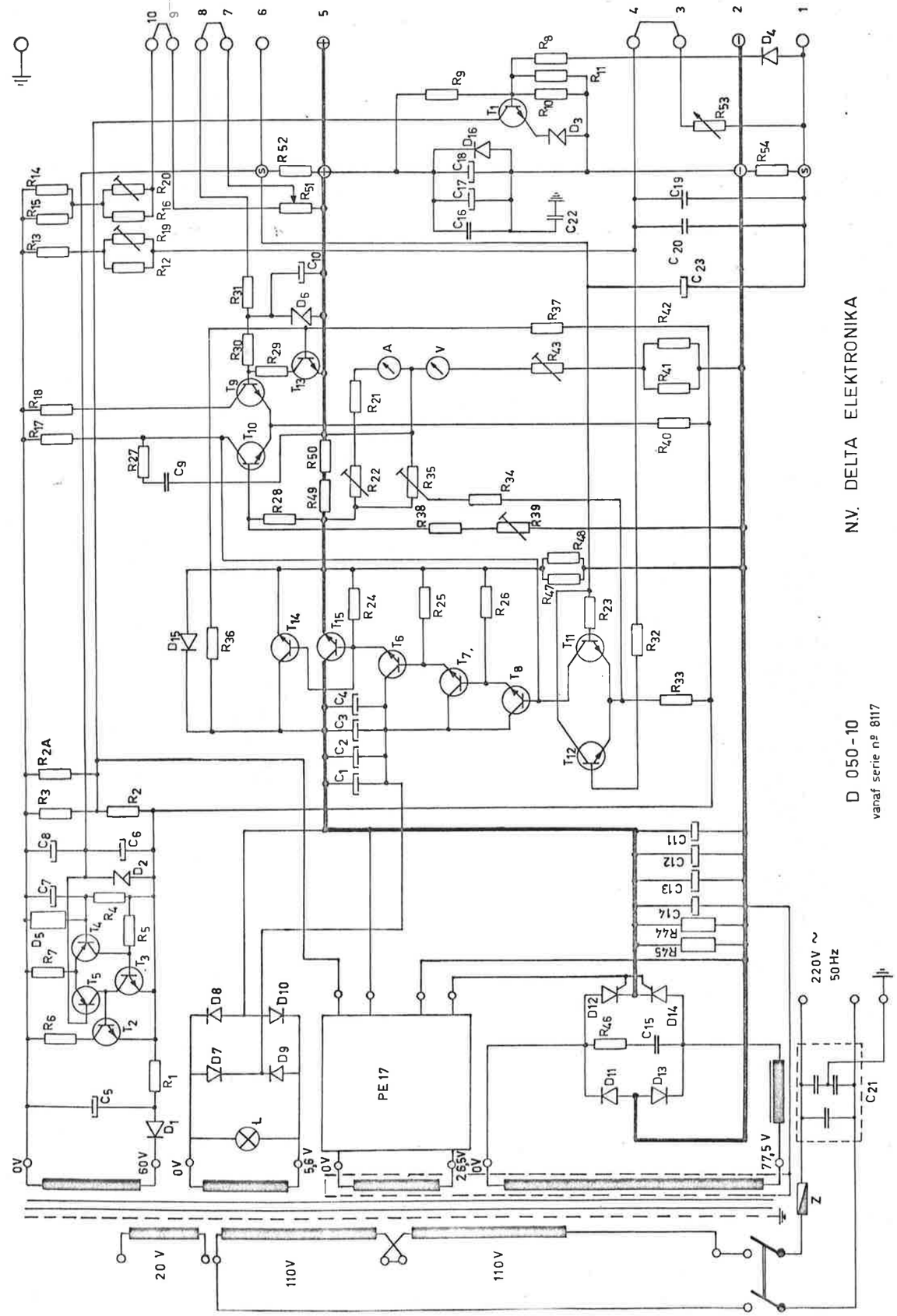
L = Liliput telefonlamp
6 V. 0,04 A
Taunuslicht

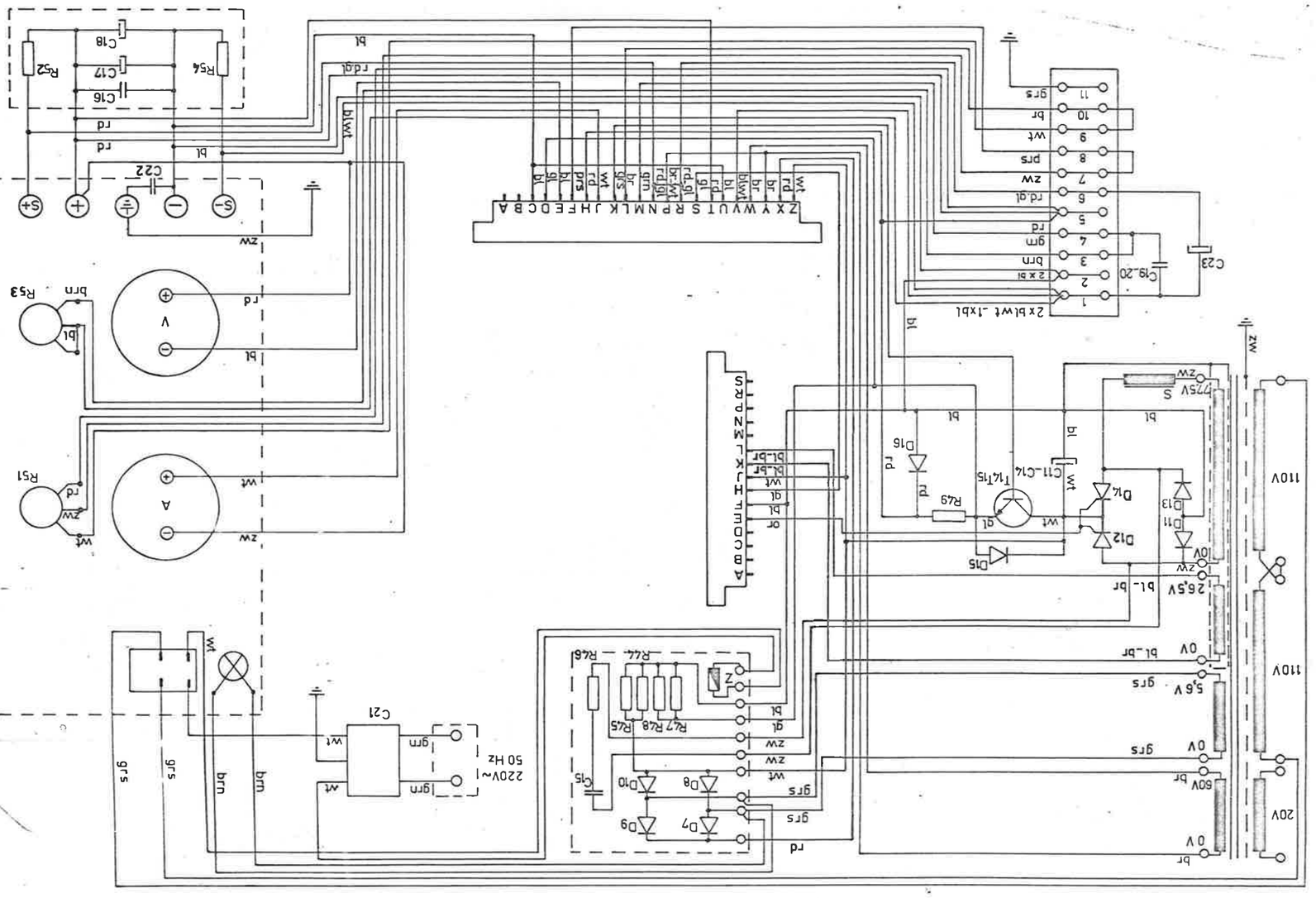
MF = Metal filmresistor

CR = Calibration resistor

Z = Fuse 10 A delay - $5\frac{1}{4}$" x $\frac{1}{4}$" - 220 V
Fuse 20 A delay - $5\frac{1}{4}$" x $\frac{1}{4}$" - 110 V

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)

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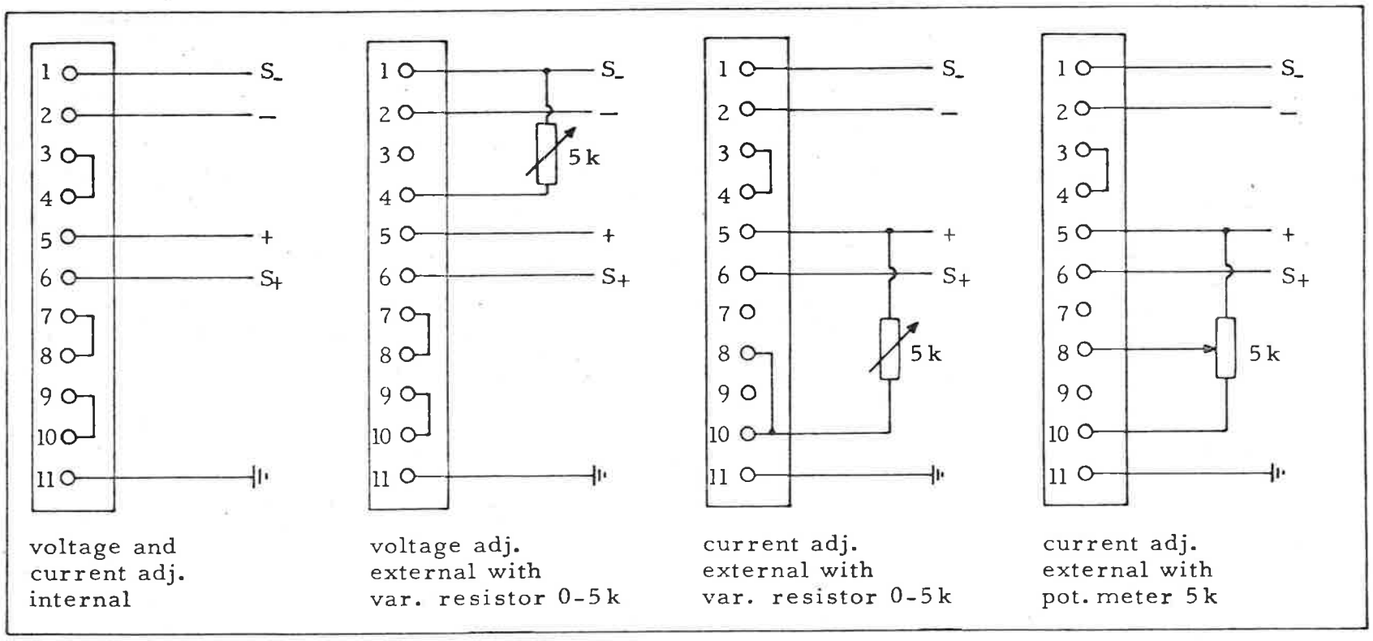
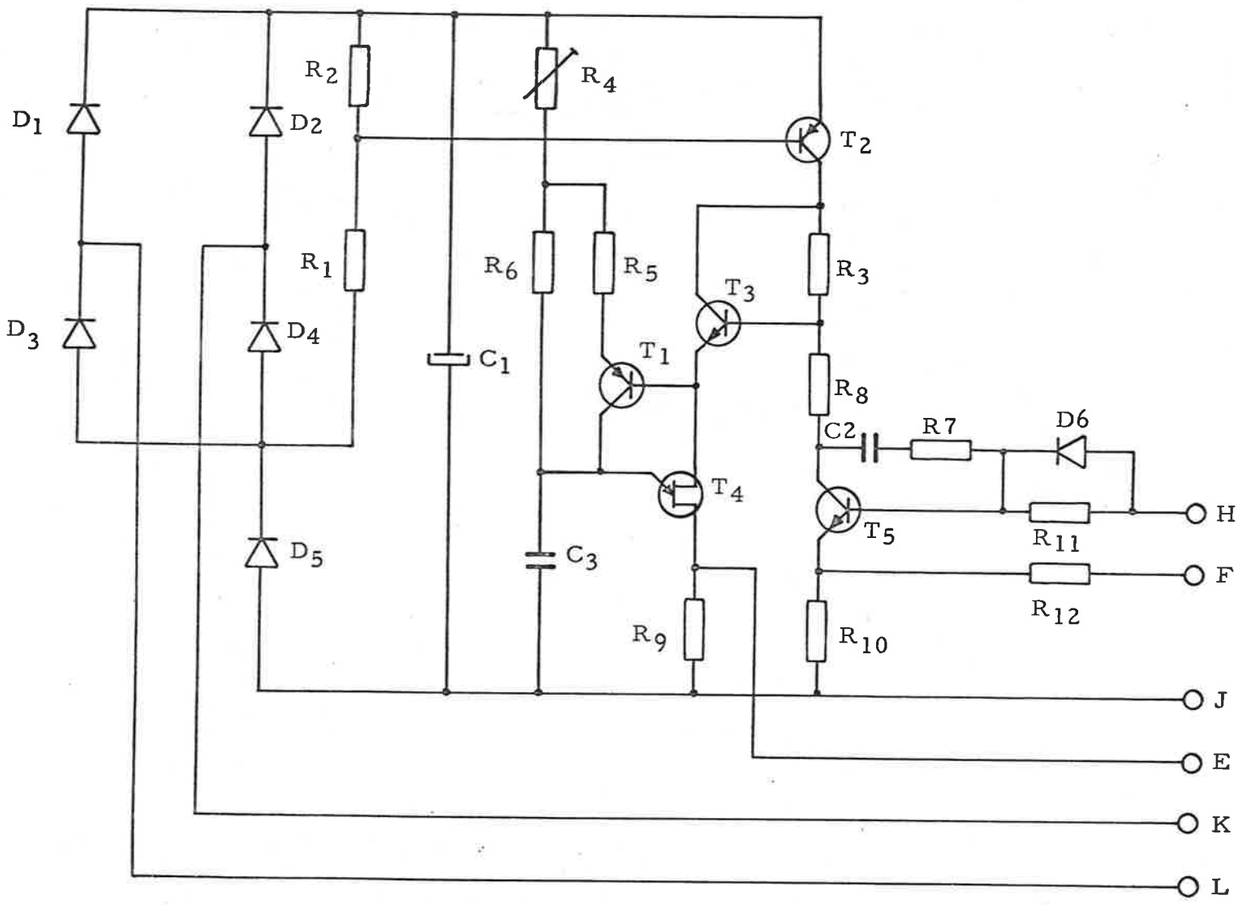
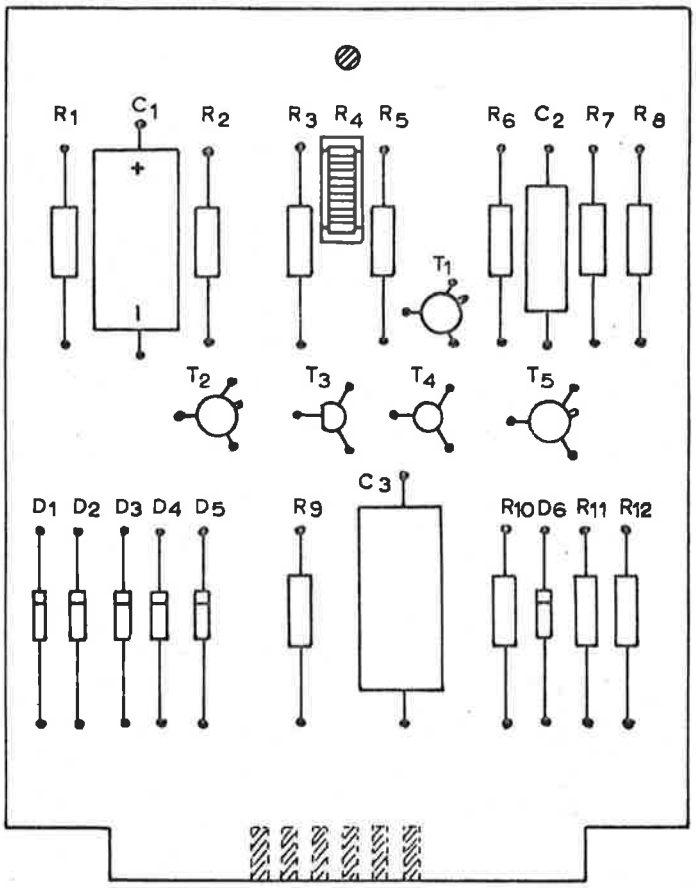
DELTA ELEKTRONIKA
zierikzee



Barier strip connections on rear of D 050-10



Stuureenheid PE 17



PE 17

R (Ohm)

1 =	4,7 k	½W	5%
2 =	4,7 k	½W	5%
3 =	4,7 k	½W	2% MF
4 =	10 k	var.	
5 =	22 k	½W	2% MF
6 =	50 k	½W	2% MF
7 =	22 k	½W	5%
8 =	2,7 k	½W	2% MF
9 =	27	½W	5%
10 =	1,8 k	½W	2% MF
11 =	10 k	½W	5%
12 =	39 k	½W	5%

C (microfarad)

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

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

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