DELTA ELEKTRONIKA BV

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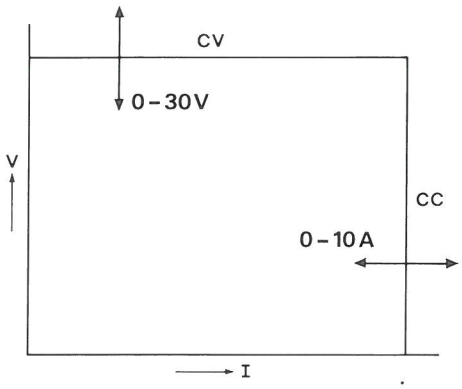
# EK 030 – 10

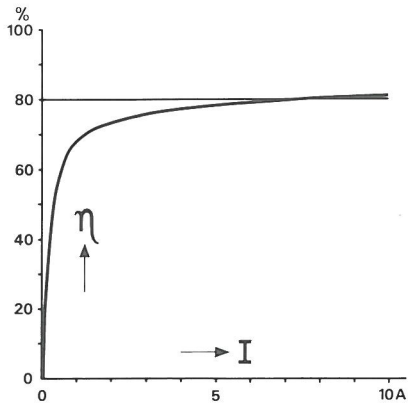
## HIGH EFFICIENCY LINEAR POWER SUPPLY

### 0 – 30 V  0 – 10 A

* A new improvement in preregulation makes this linear power supply as small and efficient as a high frequency switcher, but with better specifications and at a more economical price.
* **Efficiency 80%**
* **Small dimensions**
* **Fast response, low ripple**
* Natural convection cooling, no blower
* No inrush current
* Ready for programming by computer (via PSC 625 programmer)
* All programming and monitor levels standardized at 0-5 V
* Protected against all overload and short circuit conditions
* Equal current sharing when connected in parallel and equal voltage sharing when used in series




Constant voltage/constant current




Efficiency versus load current at 30 V output

## Efficiency

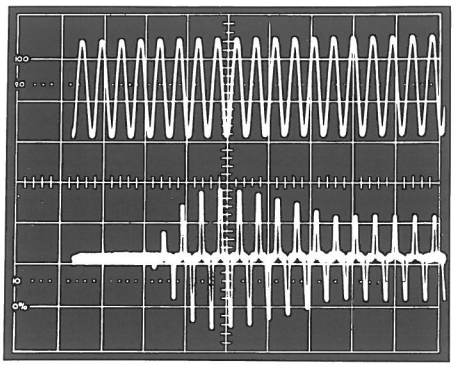
The efficiency is very high (80%) and constant over a large output range.
At no load the input power is less than 15 Watts.

## Input voltage

198-265V 50Hz +/-1Hz (for use at 220 and 240V 50Hz line voltage)

Up to 25V 10A the input voltage range is 185-265VAC.

This power supply can only be used at 50Hz because the pre-regulation is frequency dependent.

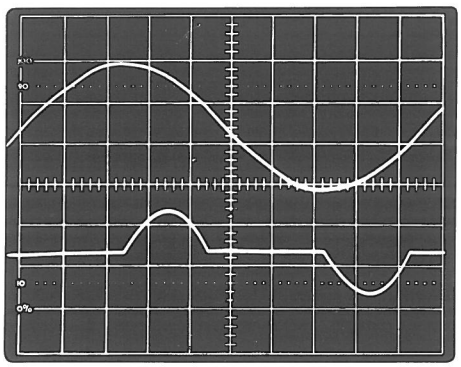


## Inrush current

During switch-on the inrush current is kept very low to avoid stress on the input fuse and switch.

Photo: AC input voltage and current during switch on.

Upper diagram : Input voltage, 200V/div.
Lower diagram : Input current, 5A/div.



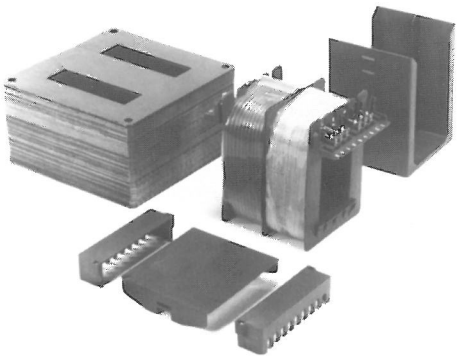
## Input current

The input current is 2,6 A rms at 220VAC input and 300Watts output.

Input current shows no sharp peaks that can cause distortion at the line voltage.

Photo: Input voltage and current at 300W output

Upper diagram : Input voltage, 200V/div.
Lower diagram: Input current, 5A/div.

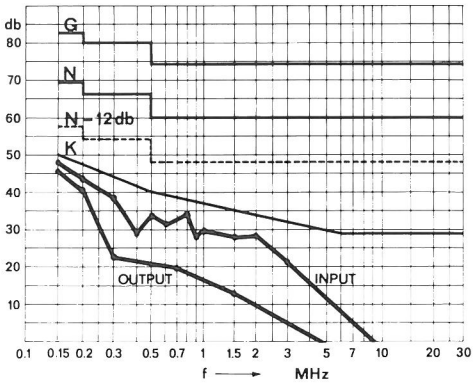


## Insulation voltage

Input-output 2500 Vrms
Input-case 2500 Vrms
Output-case 500 VDC

Safety is in accordance with IEC 348

For extra safety the input transformer has a split bobbin with an insulation voltage of 3750Vrms

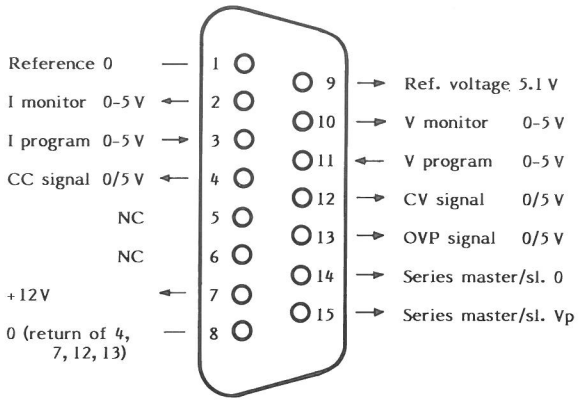



## RFI suppression

No radio frequency interference on input and output. RFI suppression is in accordance with VDE 0875 below level K, both on input and output.

### Master and slave connection

The rear panel 15-pole D-connector has special connections to make a master and slave connection of two or more units EK 030-10 possible. Parallel as well as in series, with automatic equal current sharing respectively equal voltage sharing. Series connection is allowed up to 500 V total output.

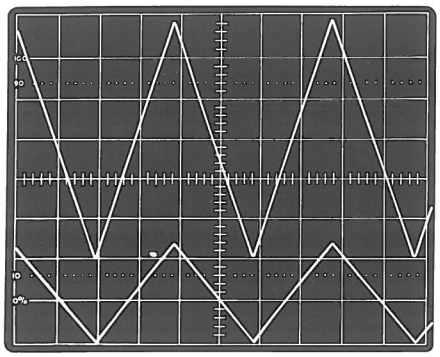



### Remote programming

Output voltage and current can be programmed by voltage. A programming voltage of 0-5 V corresponds with 0 to full range of output voltage or current. The max programming speed is 30 V/sec.. Output voltage and current can also be set by external potentiometers of 5 kOhm.

### Voltage and current monitoring

At the rear plug two monitor voltages 0-5 V are available, corresponding with 0 to full range of output voltage and current. These can be used to talk back to a computer or to connect external meters.



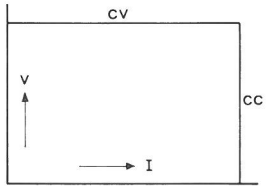
Upper diagr. : Output voltage 5V/division
Lower diagr. : Programming voltage 2V/div.
Time scale : 0.5 sec./division
Load : 3 Ohm

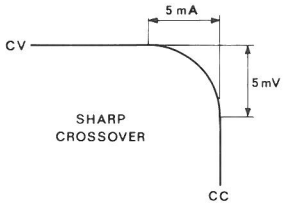
### CC signal and OVP signal

These are logic signals indicating the status of CV/CC and OVP

### CV/CC regulation

The EK 030-10 can be used as a constant voltage source with current limiting or as a constant current source with voltage limiting.
The change of mode occurs sharply at the crossing of the voltage and current settings.




| | CV | CC |
|---|---|---|
| **Line regulation** | | |
| Input 198-265 V AC | 1 mV | 3 mA |
| **Load regulation** | | |
| Load 0-100% | 10 mV | 10 mA |
| **Ripple** p-p | 1 mV | 5 mA |
| **Temperature coefficient** per °C | $5.10^{-5}$ | $5.10^{-4}$ |
| **Stability** | | |
| During 8 hours after one hour warm up, under constant load and ambient conditions | $3.10^{-4}$ | $1.10^{-3}$ |
| **Output impedance** | | |
| Up to 100 kHz, less than | 0.1 Ohm | - |

### Recovery time

In the constant voltage mode the recovery time to within 30mV after a load step of 10-100% is less than 20 uS

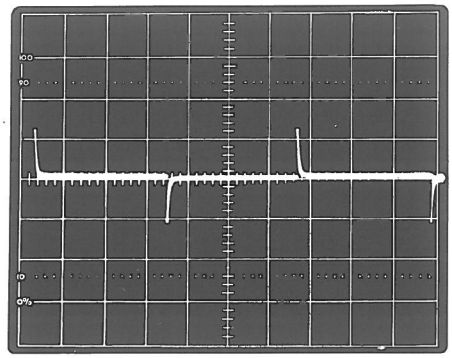


Photo:

Vertical : Output voltage 50mV/div.
Horizontal: Time 200 micro-sec./div.

### Ambient temperature

0 - 35 °C at a continuous load of 10A

0 - 50 °C at a continuous load of 8A

0 - 70 °C at a continuous load of 5A

### Thermal protection

In case of insufficient cooling the output will be shut down by a thermoswitch.

### Overvoltage protection

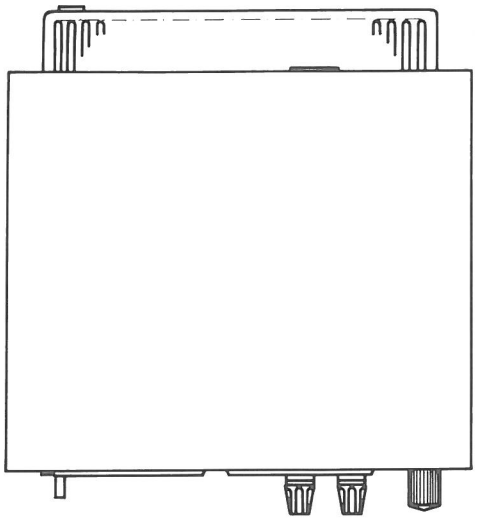
Built-in over voltage protection is adjustable 7-35 V with a screwdriver through a hole in the front panel. When the output reaches the set trip level of the OVP the power supply shuts down. To reset the output it is necessary to switch off the power supply and switch it on again.
The OVP is not of the crowbar type and therefore cannot absorb power from external sources.

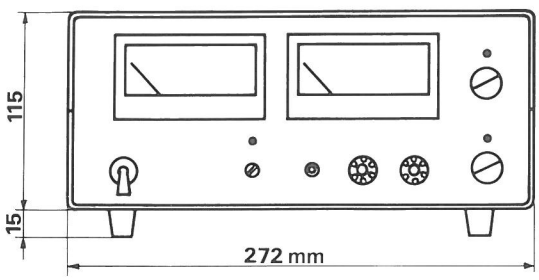
### Voltage and current controls

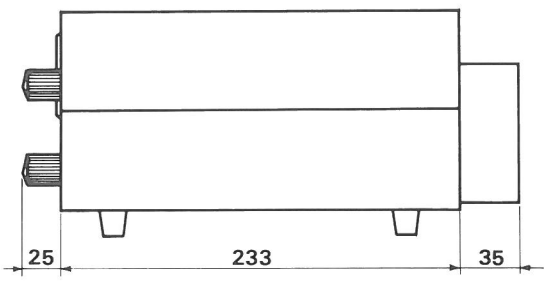
Voltage and current controls are by 10-turn potentiometers for high resolution.

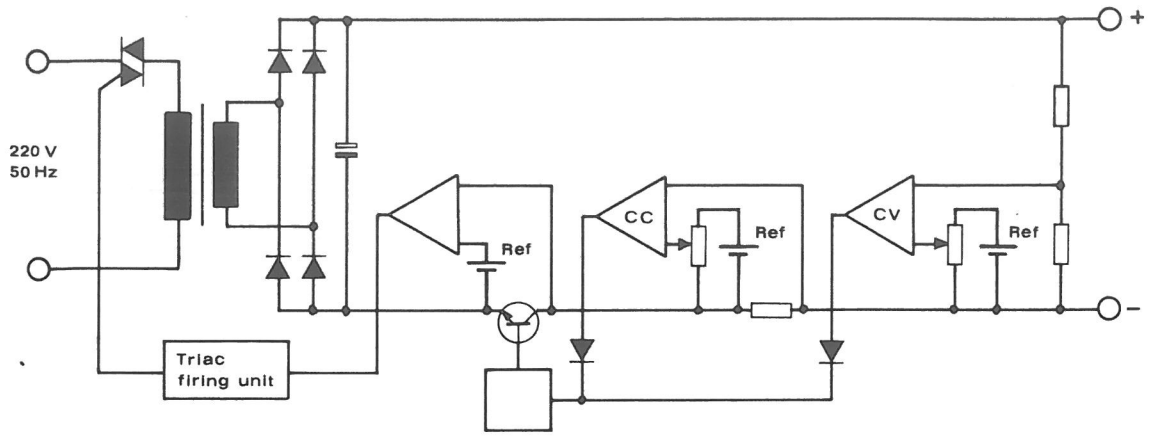
### Dimensions and weight

272 x 115 x 268mm, 10.5kgs








Simplified diagram of the EK 030-10

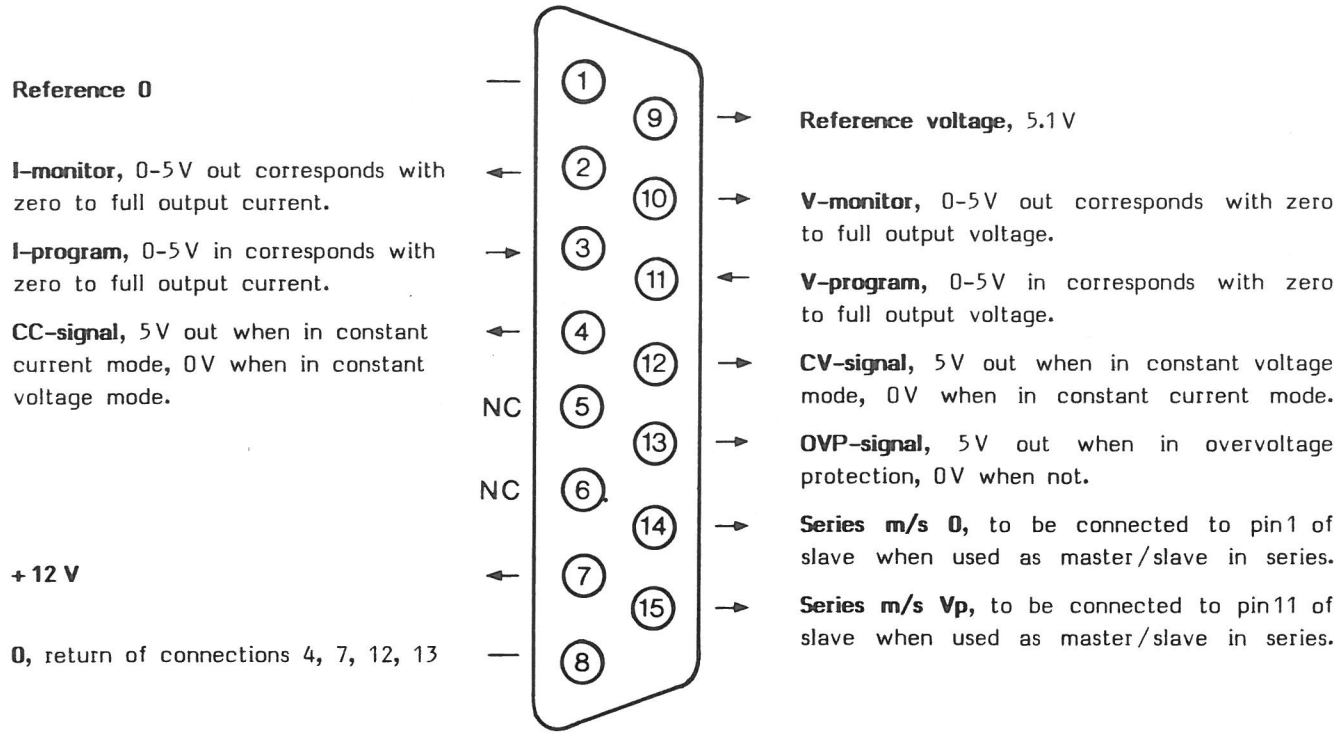
The EK 030-10 is a linear series regulated DC power supply with triac pre-regulation. The voltage drop across the power transistor of the series regulation is kept at a low constant value by comparing it with a reference voltage and using the error voltage to influence the firing angle of the triac. This pre-regulation is slow because it operates at the 50Hz line frequency. It is used to keep the heat dissipation in the transistors low. The series pass tranistors take care of the fast regulation with a recovery time of 25 microseconds.

The pre-regulation technique has been used already 25 years in previous Delta Elektronika power supplies but now the size and weight have been reduced and the efficiency increased to 80% by improved circuitry and the use of modern components.

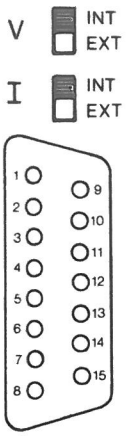
The 15-pole D-connector at the rear panel is a new standardisation on Delta power supplies which offers many features like voltage and current programming by 0-5V, monitoring voltages of 0-5V proportional to the output voltage and current and the possibility of interconnecting the regulation circuits of two or more power supplies to enable parallel master and slave operation with equal current sharing or master and slave series operation with equal voltage sharing.

All input and output levels at this plug are standardized at 0-5V.

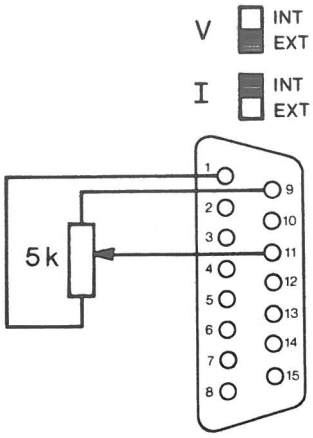
In future this plug with standardized connections will be fitted on most new designs. With the help of the interface unit PSC625 (Power Supply Controller) these power supplies can easily be programmed by computer with IEC625 or IEEE448.



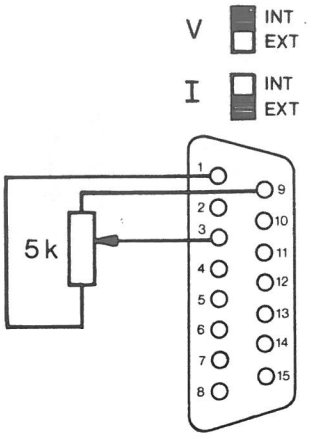

Connections to 15-pole D-connector



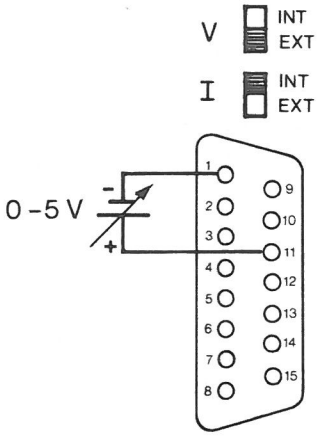

Voltage and Current control by frontpanel potentiometers



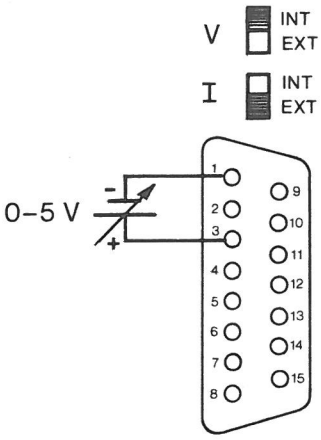

Voltage control by external potentiometer



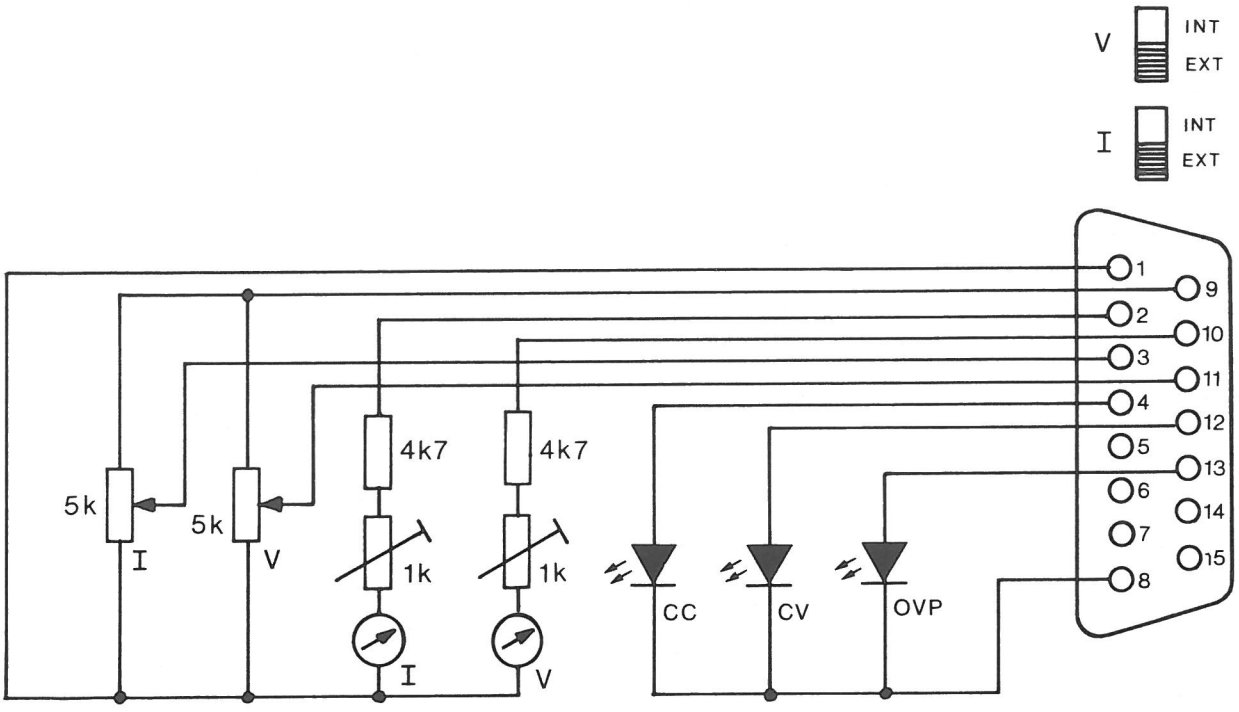

Current control by external potentiometer



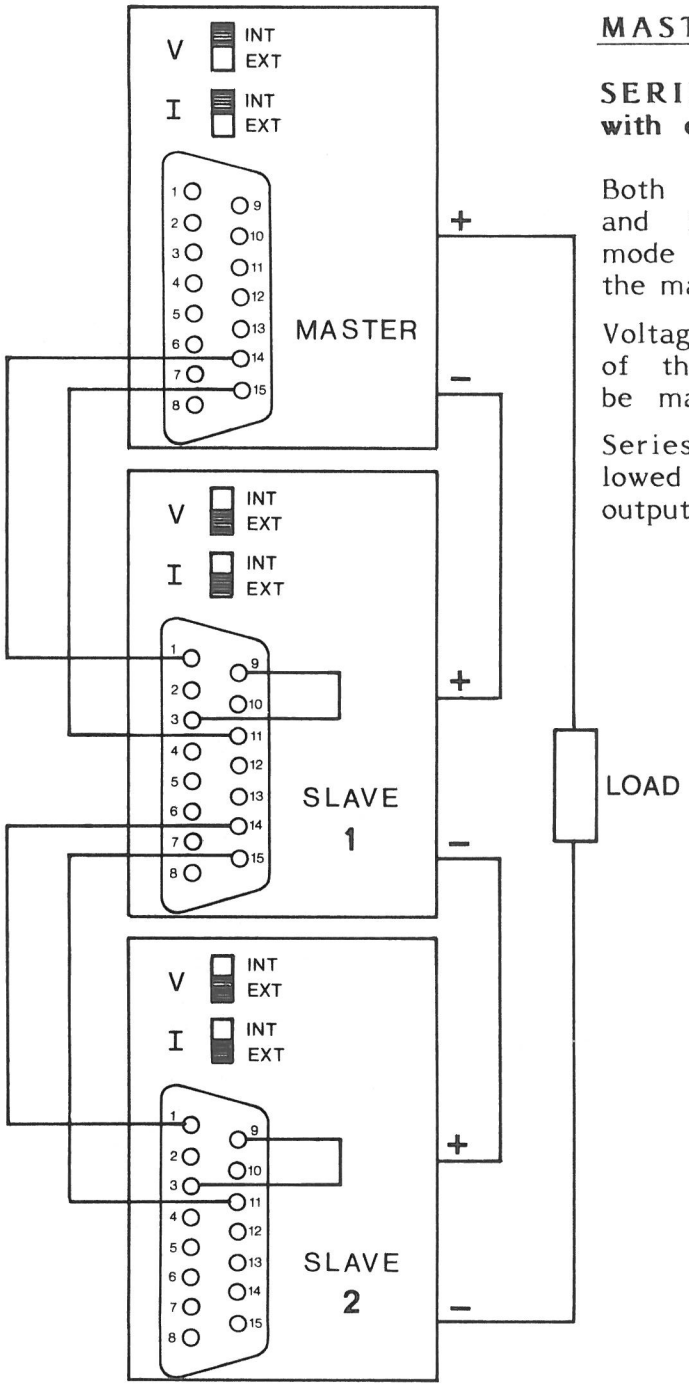

Remote programming : Voltage by Voltage




Remote programming : Current by Voltage




Remote control



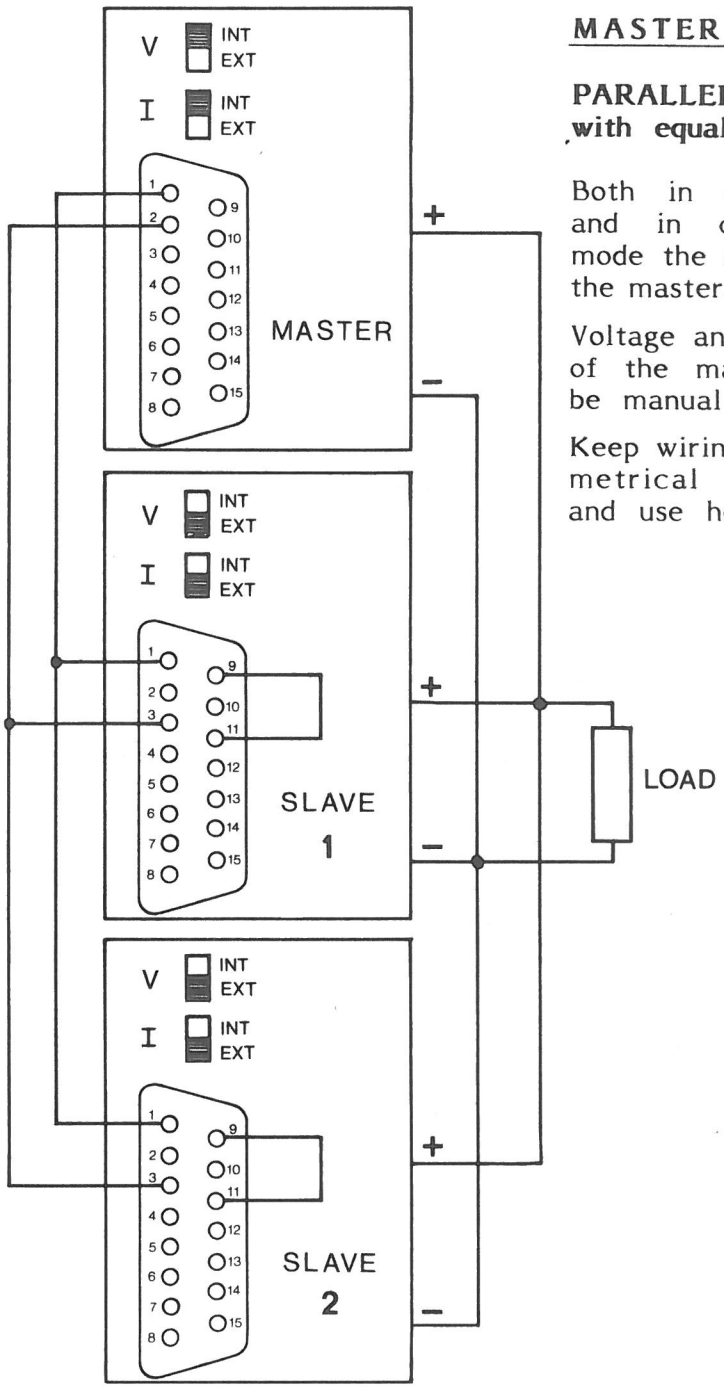

## MASTER AND SLAVE

### SERIES CONNECTION
**with equal voltage sharing**

Both in constant voltage and in constant current mode the slaves will follow the master.

Voltage and current control of the master can either be manual or programmed.

Series connection is allowed up to 500V total output.




## MASTER AND SLAVE

### PARALLEL CONNECTION
**with equal current sharing**

Both in constant voltage and in constant current mode the slaves will follow the master.

Voltage and current control of the master can either be manual or programmed.

Keep wiring short and symmetrical (equal lenghts) and use heavy gauge wire.

## MASTER AND SLAVE

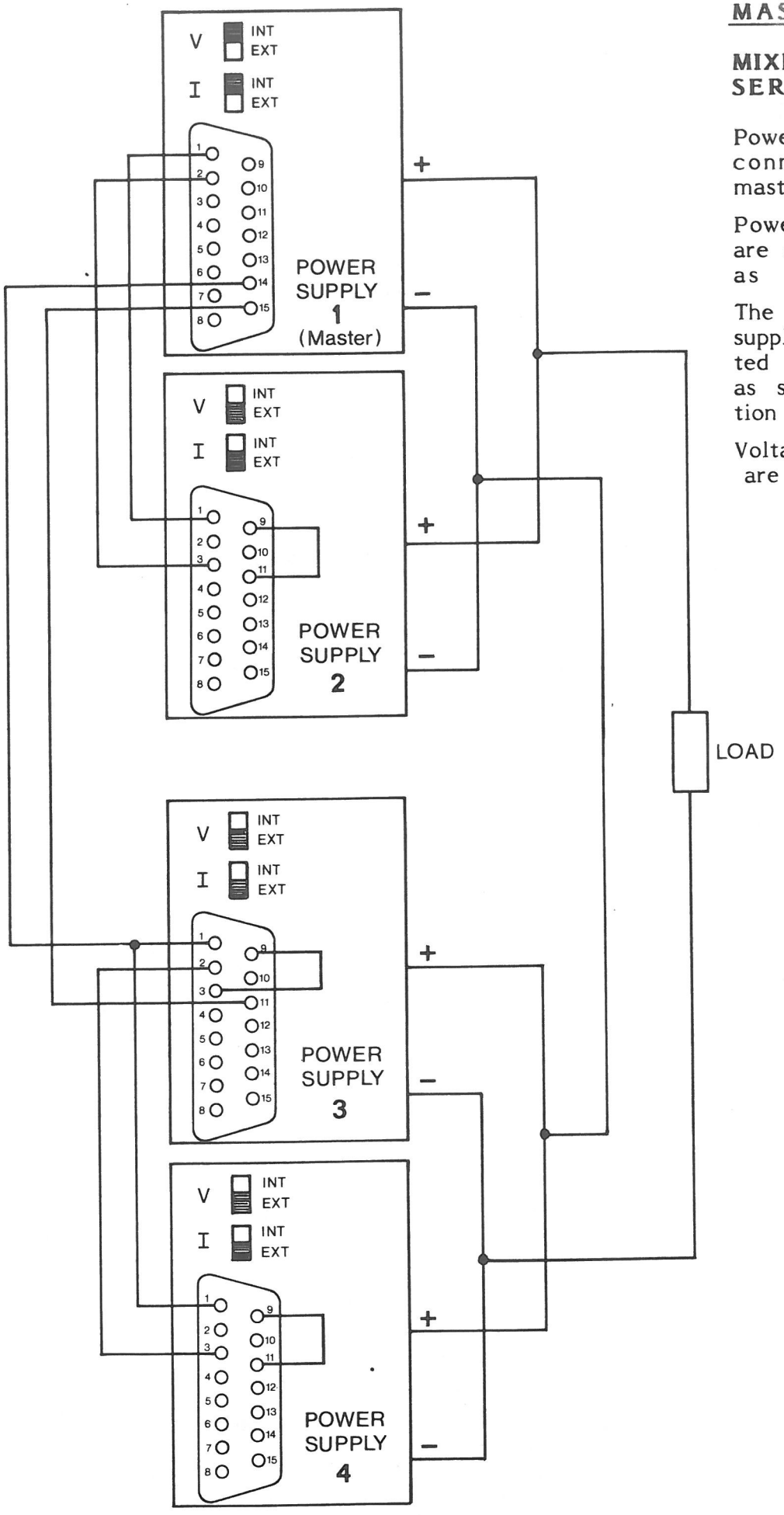
### MIXED PARALLEL AND SERIES CONNECTION

Power supply 1 and 2 are connected parallel as master and slave.

Power supply 3 and 4 are also connected parallel as master and slave.

The combination of power supply 3 and 4 is connected in series with and as slave of the combination 1 and 2.

Voltage and current control are now by power supply 1.



R = Ohm

| | | | |
|---|---|---|---|
| 1 = | 3,3 | k | |
| 2 = | 100 | k | |
| 3 = | 12 | k | |
| 4 = | 68 | k | |
| 5 = | 10 | k | potm. |
| 6 = | 27 | k | |
| 7 = | 3,9 | k | |
| 8 = | 1 | k | |
| 9 = | 10 | k | |
| 10 = | 18 | k | |
| 11 = | 4,7 | k | |
| 12 = | 4,7 | k | |
| 13 = | 10 | k | potm. |
| 14 = | 120 | k | |
| 15 = | 100 | | |
| 16 = | 18 | k | |
| 17 = | 18 | k | |
| 18 = | 3,9 | k | |
| 19 = | 3,9 | k | |
| 20 = | 18 | k | |
| 21 = | 1 | | |
| 22 = | 1 | | |
| 23 = | 10 | k | |
| 24 = | 10 | k | potm. |
| 25 = | 15 | k | |
| 26 = | 6,8 | k | |
| 27 = | 4,7 | k | |
| 28 = | 100 | | |
| 29 = | 18 | k | |
| 30 = | 18 | k | |
| 31 = | 1,2 | k | |
| 32 = | 1 | M | |
| 33 = | 1,2 | k | |
| 34 = | 1,2 | k | |
| 35 = | 1,2 | k | |
| 36 = | 18 | k | |
| 37 = | 18 | k | |
| 38 = | 6,8 | k | |
| 39 = | 6,8 | k | |
| 40 = | 1 | M | |
| 41 = | 6,8 | k | |
| 42 = | 6,8 | k | |
| 43 = | 8,2 | k | |
| 44 = | 8,2 | k | |
| 45 = | 3,3 | k | |
| 46 = | 560 | k | |
| 47 = | 560 | | |
| 48 = | 560 | | |
| 49 = | 560 | | |
| 50 = | 27 | k | |
| 51 = | 39 | k | |
| 52 = | 5 | k | 20 trns trim |
| 53 = | 5 | k | 20 trns trim |
| 54 = | 5 | k | 20 trns trim |
| 55 = | 680 | | |
| 56 = | 1 | k | |
| 57 = | 470 | | |
| 58 = | 680 | | |
| 59 = | 150 | | |
| 60 = | 470 | | |
| 61 = | 470 | | |
| 62 = | 12 | k | |
| 63 = | 2,2 | k | |
| 64 = | 22 | k | |
| 65 = | 4,7 | k | |
| 66 = | CR | | |
| 67 = | 470 | | |
| 68 = | 470 | | |
| 69 = | 1 | k | |
| 70 = | 22 | | |
| 71 = | 470 | | |
| 72 = | 1 | k | |
| 73 = | 22 | | |
| 74 = | 22 | | |
| 75 = | 4,7 | k | |
| 76 = | 4,7 | k | |
| 77 = | 1 | k | |

CR = calibration resistor
WW = wire wound
all non specified resistors are of MRS 25

MRS 25 = metal film 0,4W 1%
PR 37 = metal film 1,6W 5%

| | | | |
|---|---|---|---|
| | | | Title: P 342 |
| | | | |
| | | | Date: 1-'85 |
| Modifications | Date | App. | delta elektronika bv |

R = Ohm

| | | | |
|---|---|---|---|
| 78 = | 470 | | |
| 79 = | 330 | | |
| 80 = | 100 | | |
| 81 = | 15 | | |
| 82 = | 3,9 | k | PR 37 |
| 83 = | 3,9 | k | PR 37 |
| 84 = | 470 | | |
| 85 = | 3,3 | k | |
| 86 = | 10 | | |
| 87 = | 470 | | |
| 88 = | 680 | | 9W WW |
| 89 = | 680 | | 9W WW |
| 90 = | 1 | k | |
| 91 = | 1 | k | |
| 92 = | 1 | k | 20 trns trim |
| 93 = | 1 | k | 20 trns trim |
| 94 = | 5 | k | 10 trns potm |
| 95 = | 5 | k | 10 trns potm |
| 96 = | 0,01 | | (shunt) 50W |
| 97 = | 10 | | |
| 98 = | 5 | k | potm |
| 99 = | 100 | | |
| 100 = | 100 | | |
| 101 = | 1,8 | | |
| 102 = | 1 | k | 20 trns trim |

CR = calibration resistor
WW = wire wound
all non specified resistors are of MRS25

MRS 25 = metal film 0,4W 1%
PR 37 = metal film 1,6W 5%

C

| | | | |
|---|---|---|---|
| 26 = | 2,2 | nF | 4 kV |
| 27 = | 0,22 | µF | 250V X2 |
| 28 = | 2,2 | nF | 4 kV |
| 29 = | 2200 | pF | 250V Y |
| 30 = | 5 | nF | 250V RY |
| 31 = | 0,15 | µF | 250V |
| 32 = | – | | |
| 33 = | 4700 | µF | 16V |
| 34 = | 4700 | µF | 16V |
| 35 = | 220 | µF | 40V |
| 36 = | 220 | µF | 40V |
| 37 = | 220 | µF | 40V |
| 38 = | 220 | µF | 40V |
| 39 = | 36000 | µF | 40V |
| 40 = | 36000 | µF | 40V |
| 41 = | 0,1 | µF | 100V |

D

| | | |
|---|---|---|
| 18 = | 558-0101 | Dialight |
| 19 = | 558-0101 | Dialight |
| 20 = | 558-0101 | Dialight |
| 21 = | 1 N 4148 | |
| 22 = | 1 N 4148 | |
| 23 = | 1 N 4003 | Philips |
| 24 = | MR 751 | Motorola |
| 25 = | BYW 77/200 | Sescosem |
| 26 = | 1 N 4003 | Philips |
| 27 = | 1 N 4003 | Philips |
| 28 = | SD 41 | IR |
| 29 = | SD 41 | IR |
| 30 = | SD 41 | IR |
| 31 = | SD 41 | IR |

Q

| | | |
|---|---|---|
| 11 = | TAG 725 | TAG |
| 12 = | BD 240 | RCA |
| 13 = | BD 239 | RCA |
| 14 = | 2 N 3055 | RCA |
| 15 = | 2 N 3055 | RCA |
| 16 = | 2 N 3055 | RCA |
| 17 = | 2 N 3055 | RCA |

TS = Thermoswitch Uchiya
OP 62 85 °C +/- 5%

T

| | | |
|---|---|---|
| 1 = | T 225 | Delta |
| 2 = | T 223 | Delta |
| 3 = | T 224 | Delta |

L

| | | |
|---|---|---|
| 1 = | L 226 | Delta |
| 2 = | L 227 | Delta |

F

2 = 4A slow blow

| | | | |
|---|---|---|---|
| | | | Title: EK 030-10 |
| R 99, 100, 101, 102 | 2-'86 | Ur. | |
| C 32 | 2-'86 | Ur. | Date: 1-'85 |
| Modifications | Date | App. | delta elektronika bv |

C

| | | | |
|---|---|---|---|
| 1 = | 220 | µF | 25V |
| 2 = | 220 | µF | 25V |
| 3 = | 220 | µF | 25V |
| 4 = | 15 | µF | 16V |
| 5 = | 15 | µF | 16V |
| 6 = | 4700 | pF | 63V |
| 7 = | 4700 | pF | 63V |
| 8 = | 4700 | pF | 63V |
| 9 = | 4700 | pF | 63V |
| 10 = | 0,022 | µF | 250V |
| 11 = | 100 | pF | 500V |
| 12 = | 100 | pF | 500V |
| 13 = | 100 | pF | 500V |
| 14 = | 100 | pF | 500V |
| 15 = | 100 | pF | 500V |
| 16 = | 0,1 | µF | 100V |
| 17 = | 100 | pF | 500V |
| 18 = | 100 | pF | 500V |
| 19 = | 100 | pF | 500V |
| 20 = | 2,2 | µF | 25V |
| 21 = | 15 | pF | 500V |
| 22 = | 0,047 | µF | 250V |
| 23 = | 0,022 | µF | 250V |
| 24 = | 2,2 | µF | 25V |
| 25 = | 2,2 | µF | 25V |

D

| | | |
|---|---|---|
| 1 = | B 80 C1000 | Siemens |
| 2 = | ZPD 12 | ITT |
| 3 = | 1 N 4148 | |
| 4 = | 1 N 4148 | |
| 5 = | 1 N 4148 | |
| 6 = | 1 N 4148 | |
| 7 = | 1 N 4148 | |
| 8 = | 1 N 4148 | |
| 9 = | 1 N 4148 | |
| 10 = | 1 N 4148 | |
| 11 = | ZPD 5,1 | ITT |
| 12 = | ZPD 8,2 | ITT |
| 13 = | ZPY 12 | ITT |
| 14 = | ZPD 8,2 | ITT |
| 15 = | ZPY 12 | ITT |
| 16 = | ZPY 12 | ITT |
| 17 = | TL 431 | TI |

IC

| | | |
|---|---|---|
| 1 = | L 7812 | SGS |
| 2 = | L 7912 | SGS |
| 3 = | REF 02 | PMI |
| 4 = | TDB 084 | Thomson |
| 5 = | TDB 084 | Thomson |

Q

| | | |
|---|---|---|
| 1 = | 2 N 2907A | Sescosem |
| 2 = | 2 N 2222A | Sescosem |
| 3 = | 2 N 2222A | Sescosem |
| 4 = | 2 N 2222A | Sescosem |
| 5 = | 2 N 2222A | Sescosem |
| 6 = | 2 N 2222A | Sescosem |
| 7 = | VN 10 KM | Siliconix |
| 8 = | VN 10 KM | Siliconix |
| 9 = | TAG 93A | TAG |
| 10 = | ESM 693 | Thomson |

F

1 = 250 mA

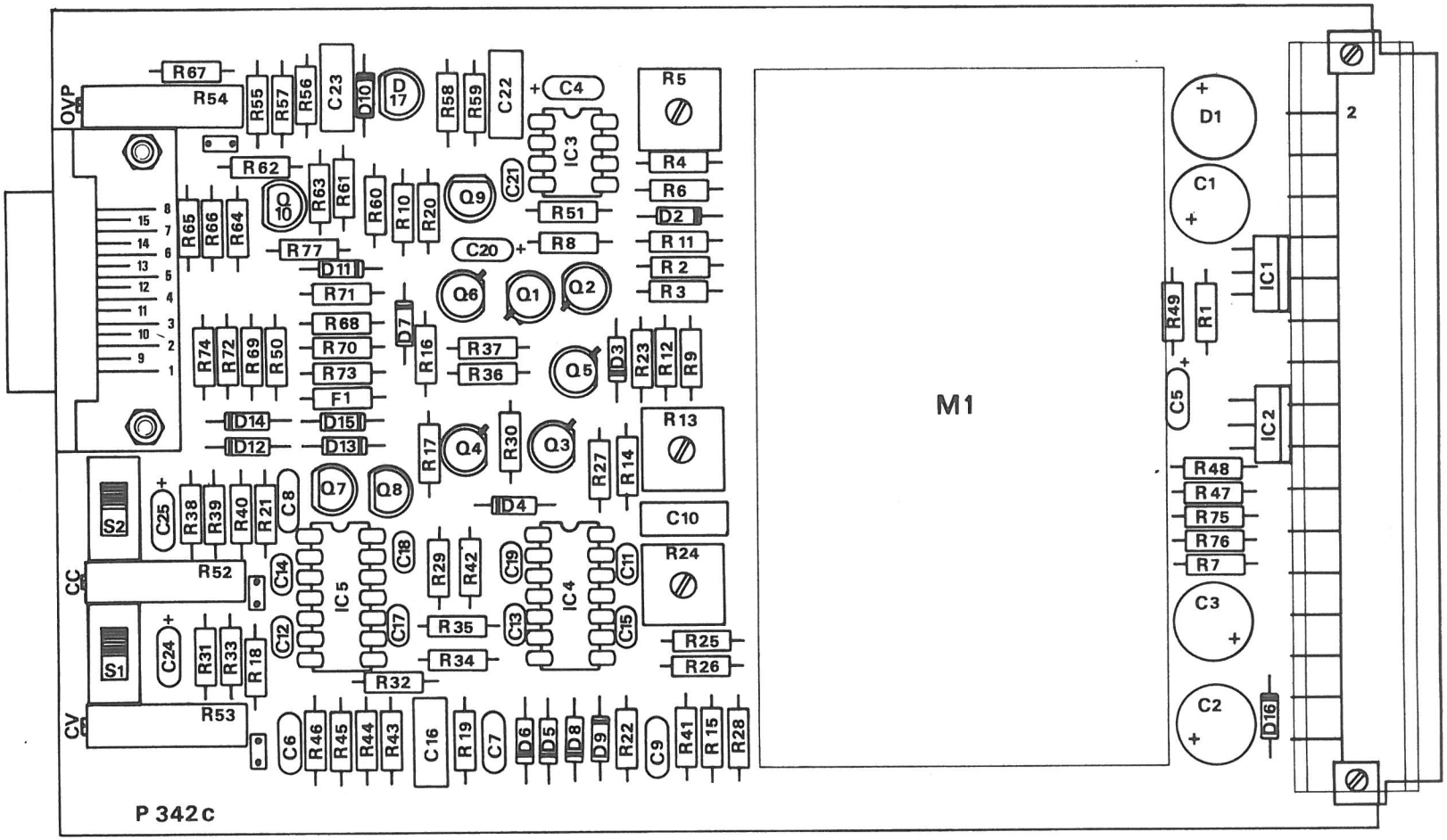
M

1 = PE 343

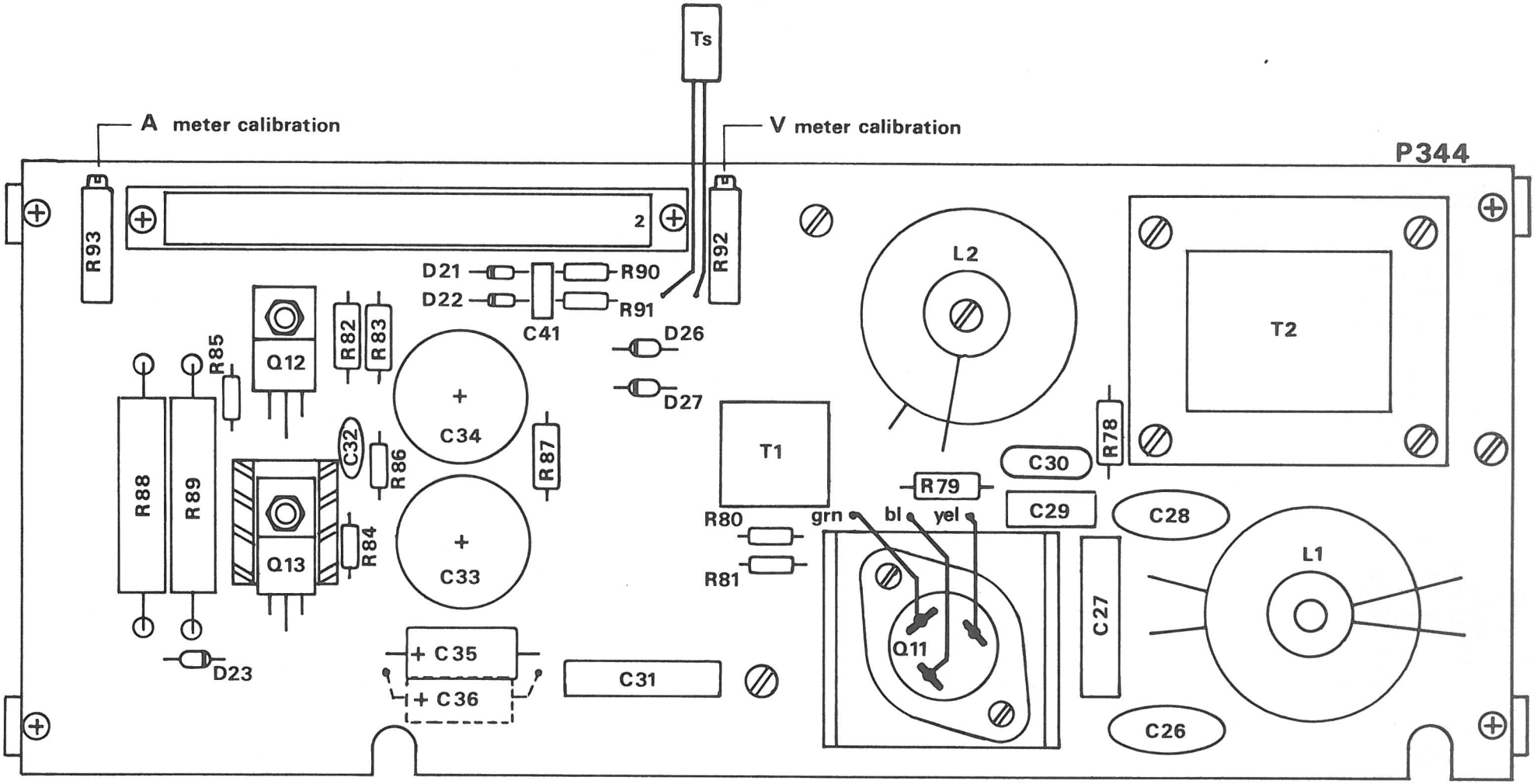
S

1 = C & K
2 = C & K

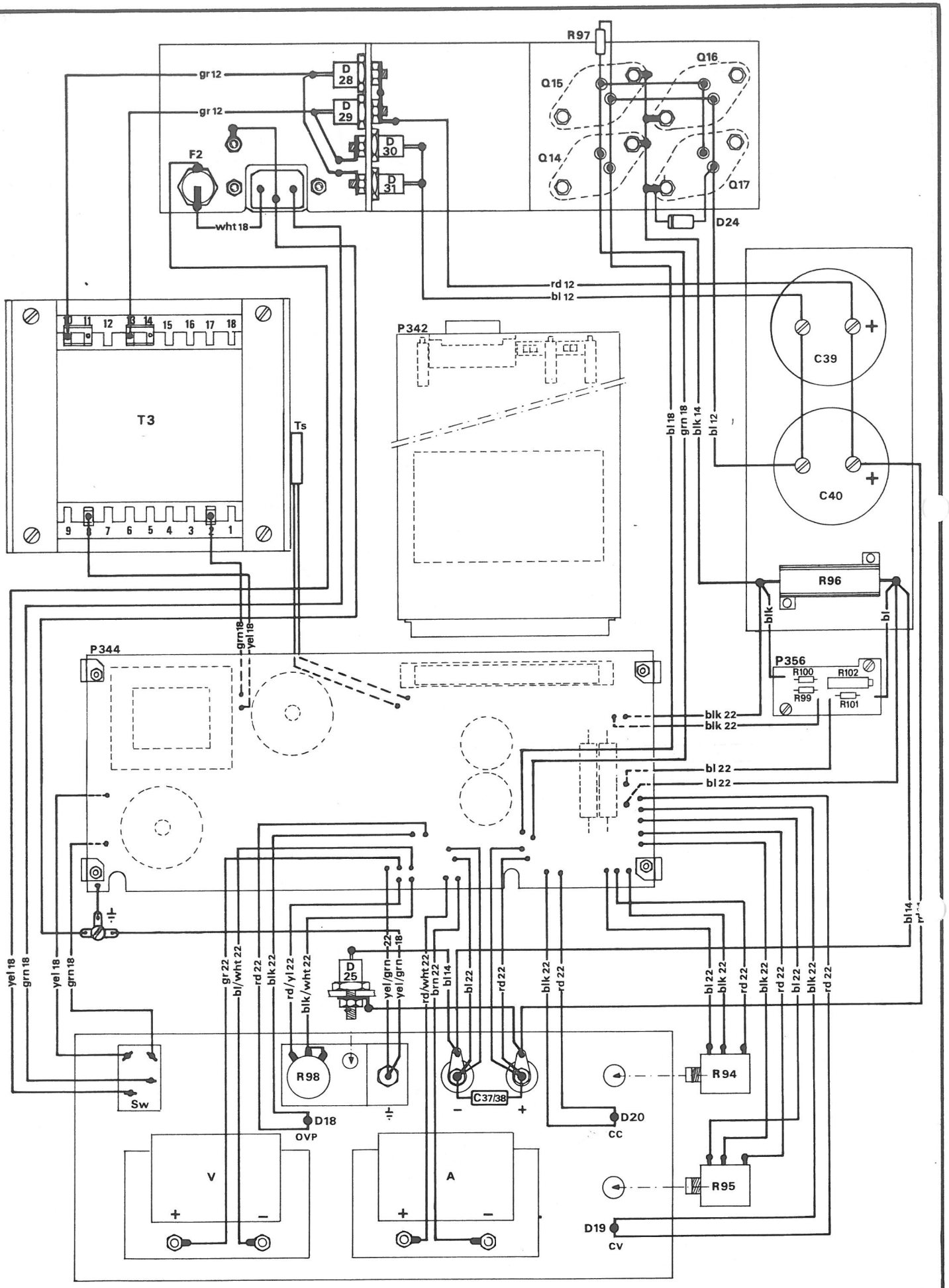
| | | | |
|---|---|---|---|
| | | | Title: P 342 (EK030 - 10) |
| | | | Date: 1 - '85 |
| Modifications | Date | App. | delta elektronika bv |



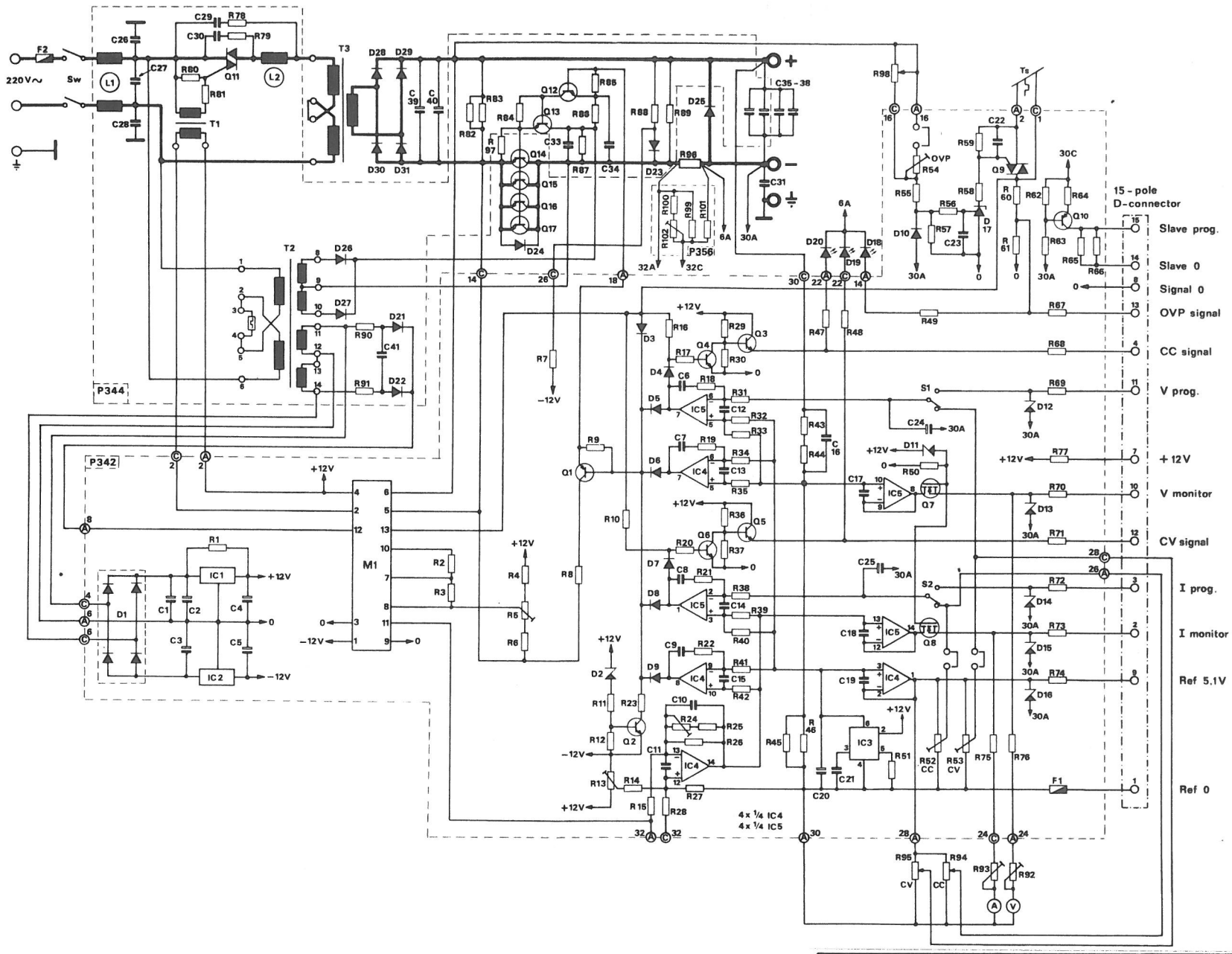

| | | | |
|---|---|---|---|
| | | | Title: P 342 (EK 030-10) |
| | | | Date: 1-'85 |
| odifications | Date | App | delta elektronika bv |




| | | | |
|---|---|---|---|
| | | | Title: P344 (EK 030-10) |
| | | | Date: 1-'85 |
| Modifications | Date | App | delta elektronika bv |




| | | | |
|---|---|---|---|
| | | | Title: EK 030 – 10 Wiring diagram |
| P356 | 2-86 | Vr. | Date: 1-'85 |
| Modifications | Date | App. | delta elektronika bv |




| | | | |
|---|---|---|---|
| | | | Title: Circuit diagram EK 030 -10 |
| P356 | 2-'86 | Vr | Date: 1 - '85 |
| Modifications | Date | App | delta elektronika bv |