DELTA ELEKTRONIKA BV

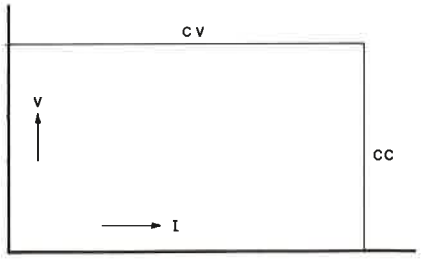
P.O. BOX 27
ZIERIKZEE
NETHERLANDS
TELEPHONE (01110) 3656


# REGULATED POWER SUPPLY E 030-3

0-30 V, 0-3 A

## DESCRIPTION

The power supply E 030-3 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 0-30 V, resolution 0.02 %. |
| **Remote programming** | The voltage can be programmed by an external variable resistor of 0-5000 Ohm. Input on the front panel. Output voltage programming by an external voltage (0-30 V) on request. |
| **Voltage regulation** | 2 mV for a + or − 10 % AC input voltage variation.<br>10 mV for a 100 % load change. |
| **Temp. coeff.** | $2.10^{-4}$ per °C from maximum output voltage. |
| **Ripple voltage** | 0.1 mV r.m.s. |

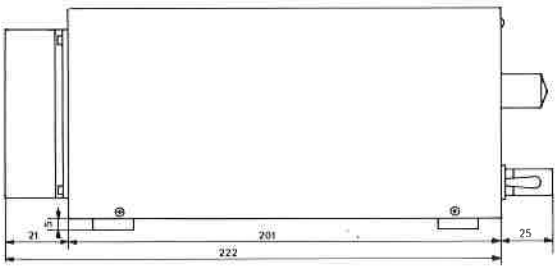
| | |
|---|---|
| **Output impedance** | Maximum 4 milli-ohm at DC<br>Maximum 0.1 Ohm up to 100 kHz load frequency. |
| **Recovery time** | 15 micro seconds for recovery to within 30 mV of steady state voltage after a step load change from 10 % tot 100 %. |

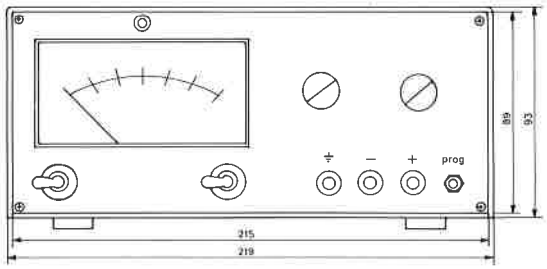
## CONSTANT CURRENT OPERATION

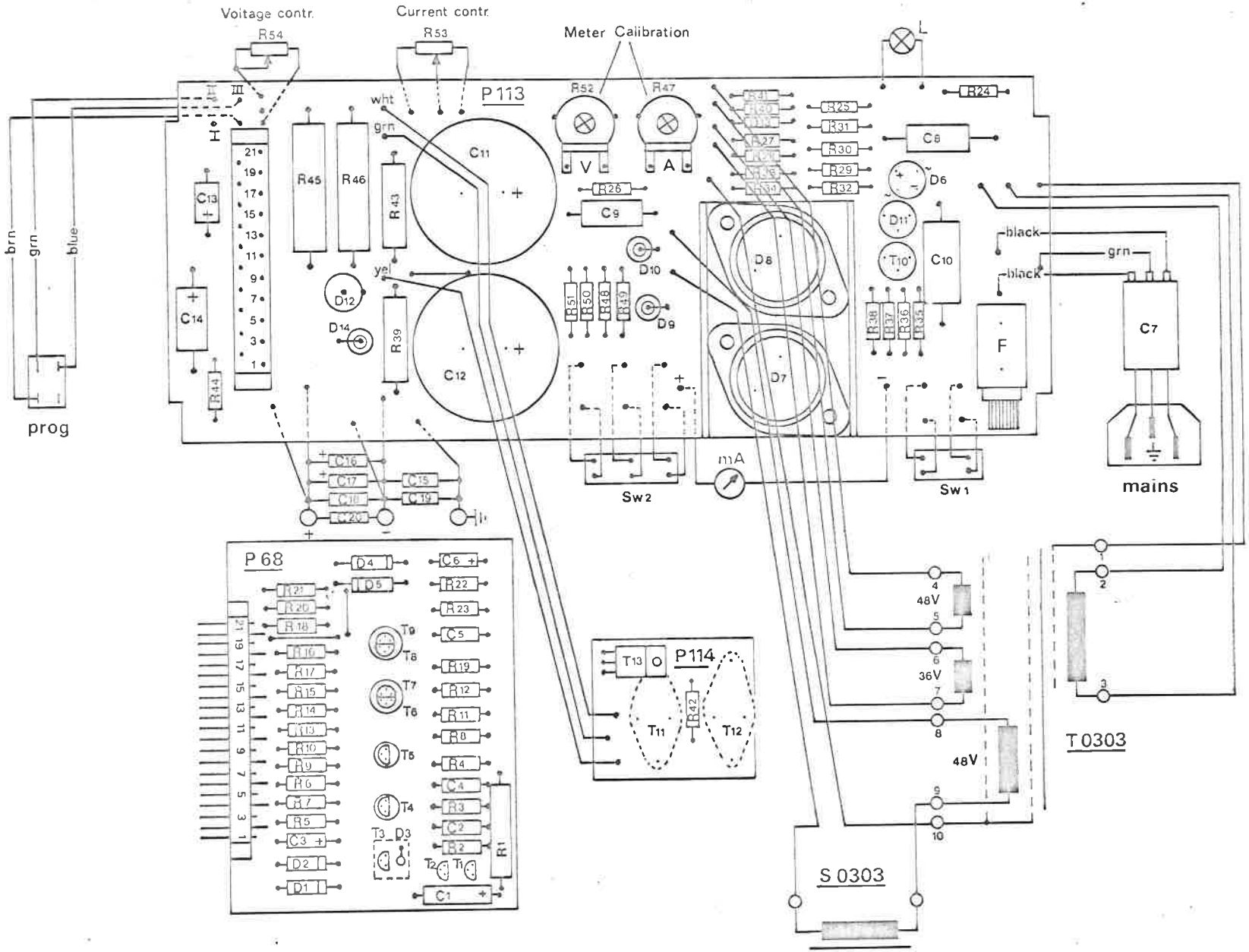
| | |
|---|---|
| **Current control** | Single turn potentiometer, range 0-3 A, resolution 0.02 %. |
| **Current regulation** | 1 mA for a + or – 10 % AC input voltage varation.<br>5 mA for a maximum output voltage swing. |
| **Temp. coeff.** | $5.10^{-4}$ per °C from maximum output current. |
| **Ripple current** | 0.5 mA r.m.s. |

## REMAINING SPECIFICATIONS

| | |
|---|---|
| **Input voltage** | 220 V, 50 Hz. Other input voltages on request. |
| **Parallel and series connection** | Special design enables parallel and series operation without any precaution. Series connection up to 300 V. |
| **Ambient temp.** | – 20 to + 45 °C. |
| **Output terminals** | On front panel only, isolated from the case.<br>Maximum voltage between output terminals and case 500 V. |
| **Rack mounting** | Two uncased units can be mounted side by side and with the addition of two H 6 brackets can be inserted in a 19" rack. For |
| **Cooling** | By natural convection cooling. The air must flow freely through the case and the vertical heat sink for effective cooling. |
| **Meter** | Meter with selector switch for voltage and current, accuracy 1.5 % f.s. |
| **Finish** | Light gray front panel with dark gray case. |
| **Weight and size** | 5.7 kg, 219 x 93 x 222 mm. |

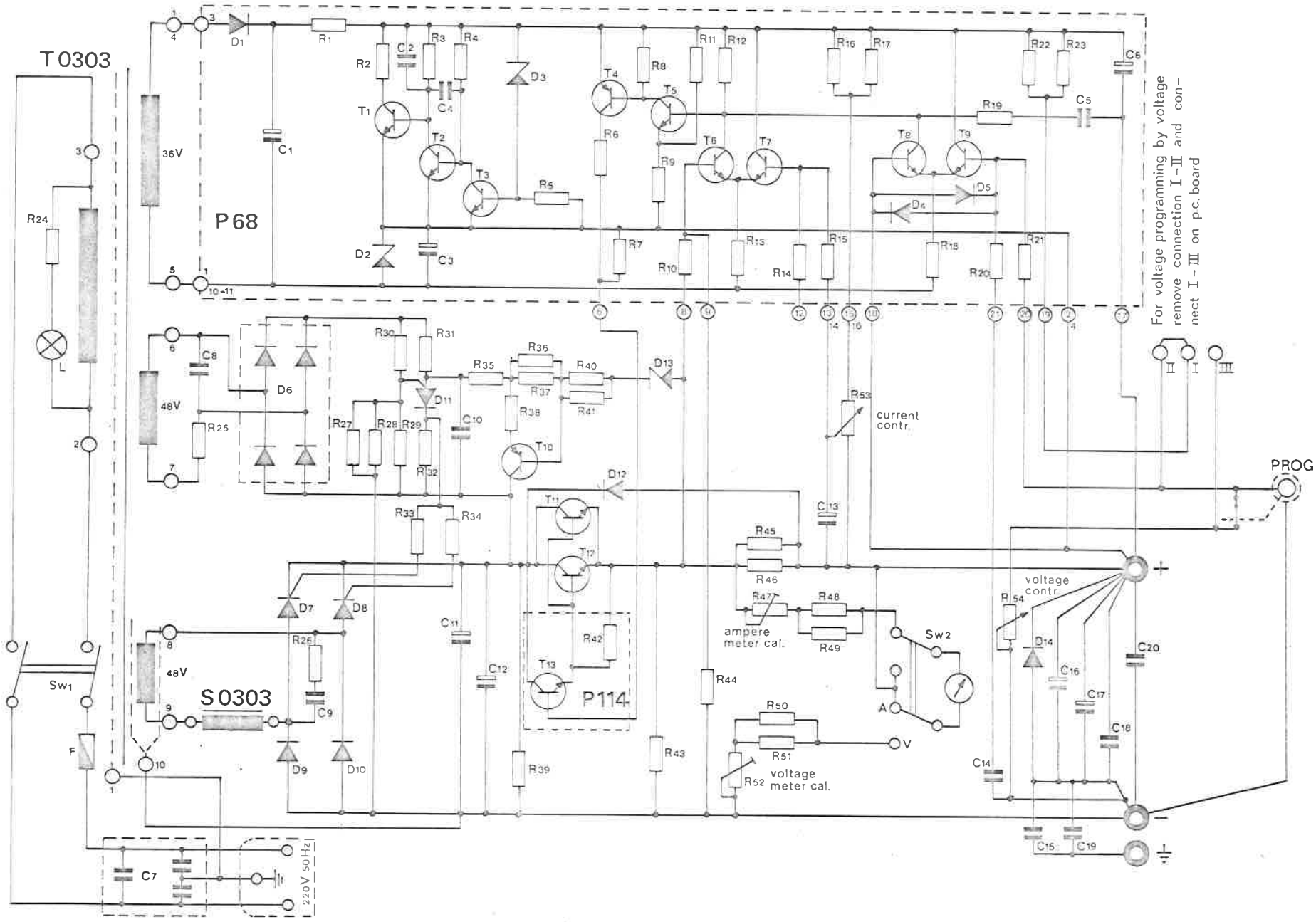





wiring diagram **E 030-3**

1-3-73




circuit diagram E 030-3

1-3-'73

R (Ohm)

| | | |
|---|---|---|
| 1 = | 820 | 1 W |
| 2 = | 150 | |
| 3 = | 10 k | |
| 4 = | 10 k | |
| 5 = | 150 | |
| 6 = | 33 | |
| 7 = | 1 k | |
| 8 = | 2,2 k | |
| 9 = | 2,2 k | |
| 10 = | 470 | |
| 11 = | 2,7 k | |
| 12 = | 22 k | |
| 13 = | 6,8 k | |
| 14 = | 470 | |
| 15 = | 470 | |
| 16 = | CR | |
| 17 = | 18 k | |
| 18 = | 6,8 k | |
| 19 = | 150 | |
| 20 = | 470 | |
| 21 = | 470 | |
| 22 = | CR | |
| 23 = | 1,2 k | |
| 24 = | 560 k | |
| 25 = | 560 | |
| 26 = | 330 | |
| 27 = | 27 k | |
| 28 = | 12 k | |
| 29 = | 2,2 k | |
| 30 = | 2,7 k | |
| 31 = | 15 k | |
| 32 = | 47 | |
| 33 = | 10 | |
| 34 = | 10 | |
| 35 = | 3,3 k | |
| 36 = | 15 k | |
| 37 = | 100 k | |
| 38 = | 220 | |
| 39 = | 2,2 k | 1 W |
| 40 = | CR | |
| 41 = | 220 k | |
| 42 = | 10 | |
| 43 = | 1,5 k | 1 W |
| 44 = | 5,6 M | |
| 45 = | 1 | 7 W WW |
| 46 = | 1 | 7 W WW |
| 47 = | 1 k | 1 turn |
| 48 = | 1,5 k | |
| 49 = | 12 k | |
| 50 = | 330 k | |
| 51 = | 33 k | |
| 52 = | 1 k | 1 turn |
| 53 = | 5 k | 1 turn Colvern |
| 54 = | 5 k | 10 turn Bourns |

F = fuse 2 A delay, 5 x 20 mm

C (microfarad)

| | | |
|---|---|---|
| 1 = | 47 | 63 V |
| 2 = | 0,01 | 250 V |
| 3 = | 22 | 25 V |
| 4 = | 0,01 | 250 V |
| 5 = | 0,047 | 250 V |
| 6 = | 22 | 25 V |
| 7 = | 0,07 + 2 x 2500 pF | 250 V |
| 8 = | 1 | 250 V |
| 9 = | 0,47 | 250 V |
| 10 = | 0,22 | 63 V |
| 11 = | 2200 | 63 V |
| 12 = | 2200 | 63 V |
| 13 = | 10 | 35 V |
| 14 = | 10 | 100 V |
| 15 = | 0,1 | 630 V |
| 16 = | 100 | 63 V |
| 17 = | 100 | 63 V |
| 18 = | 0,33 | 100 V |
| 19 = | 10 kpF | 500 V |
| 20 = | 10 kpF | 500 V |

D

| | | |
|---|---|---|
| 1 = | 1N 4003 | TI |
| 2 = | ZY 6,2 | ITT |
| 3 = | ZY 6,2 | ITT |
| 4 = | 1N 4148 | ITT |
| 5 = | 1N 4148 | ITT |
| 6 = | W01 | GI |
| 7 = | 2N 3668 | RCA |
| 8 = | 2N 3668 | RCA |
| 9 = | 60 S1 | IR |
| 10 = | 60 S1 | IR |
| 11 = | D 13 T 1 | GE |
| 12 = | MR 1031 B | Mot. |
| 13 = | ZD 5,1 | ITT |
| 14 = | 60 S1 | IR |

T

| | | |
|---|---|---|
| 1 = | BC 182 | TI |
| 2 = | BC 182 | TI |
| 3 = | BC 182 | TI |
| 4 = | BC 212 | TI |
| 5 = | BC 182 | TI |
| 6 = | BC 182 | TI |
| 7 = | BC 182 | TI |
| 8 = | BC 182 | TI |
| 9 = | BC 182 | TI |
| 10 = | BC 212 | TI |
| 11 = | 2N 3055 | RCA |
| 12 = | 2N 3055 | RCA |
| 13 = | TIP 29 A | TI |

WW= wire wound resistor

CR= calibration resistor

All other resistors metalfilm $\frac{1}{2}$ W 2%



DELTA ELEKTRONIKA BV

DELTA ELEKTRONIKA BV

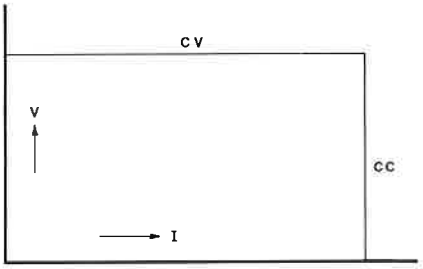
P.O. BOX 27
4300 AA ZIERIKZEE
NETHERLANDS
TEL. + 31 1110 13656
FAX + 31 1110 16919

# REGULATED POWER SUPPLIES

| | | |
|---|---|---|
| E 015 – 2 | 0 – 15 V | 0 – 2 A |
| E 030 – 1 | 0 – 30 V | 0 – 1 A |
| E 030 – 3 | 0 – 30 V | 0 – 3 A |
| E 060 – 0.6 | 0 – 60 V | 0 – 0.6 A |
| E 0300 – 0.1 | 0 – 300 V | 0 – 0.1 A |
| E 018 – 0.6 D | ± 0 – 18 V | 0.6 A |

## DESCRIPTION

### E 015-2, E 030-1 and E 060-0.6




These power supplies are of the linear transistor series regulator type. They can be used as a constant voltage source with a sharply limited current, or as a constant current source with a sharply limited open voltage. Both limits are continuously variable from zero to full range. The change of mode occurs at the crossing of the voltage and current settings.
A ten-turn potentiometer is used to provide a high resolution voltage control. For current control a single turn potentiometer (resolution 0,1%) is used to enable an approximate indication of the current setting.

### E 030-3 and E 0300-0.1

These models also have a linear transistor series regulator which however is preceeded by an SCR pre-regulator for better efficiency.
This pre-regulator keeps the rectified voltage in accordance with the output voltage to keep dissipation in the power transistors low.

### E 018-0.6 D

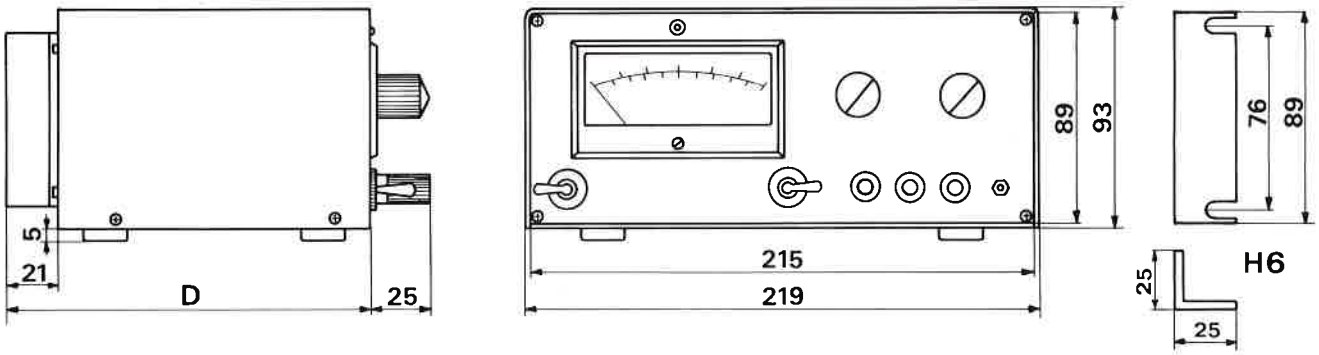
This model has been designed to supply plus and minus 15 volts for design work with operational amplifiers. It provides a plus 0 – 18 V and a minus 0 – 18 V which are tracking and can be varied with one ten-turn potentiometer. With the second potentiometer the ratio of the positive and negative voltage can be varied between ½ and 2. The positive and negative outputs have coupled overload protection circuits. This means that both output voltages will decrease proportionally if one is overloaded. Also if one output is short circuited, both outputs will drop to zero. The E 018-0.6 D has a fixed constant current overload characteristic. Independent of the ratio setting, the positive and negative output can never exceed a limit of about 18,5 V.

## SPECIFICATIONS

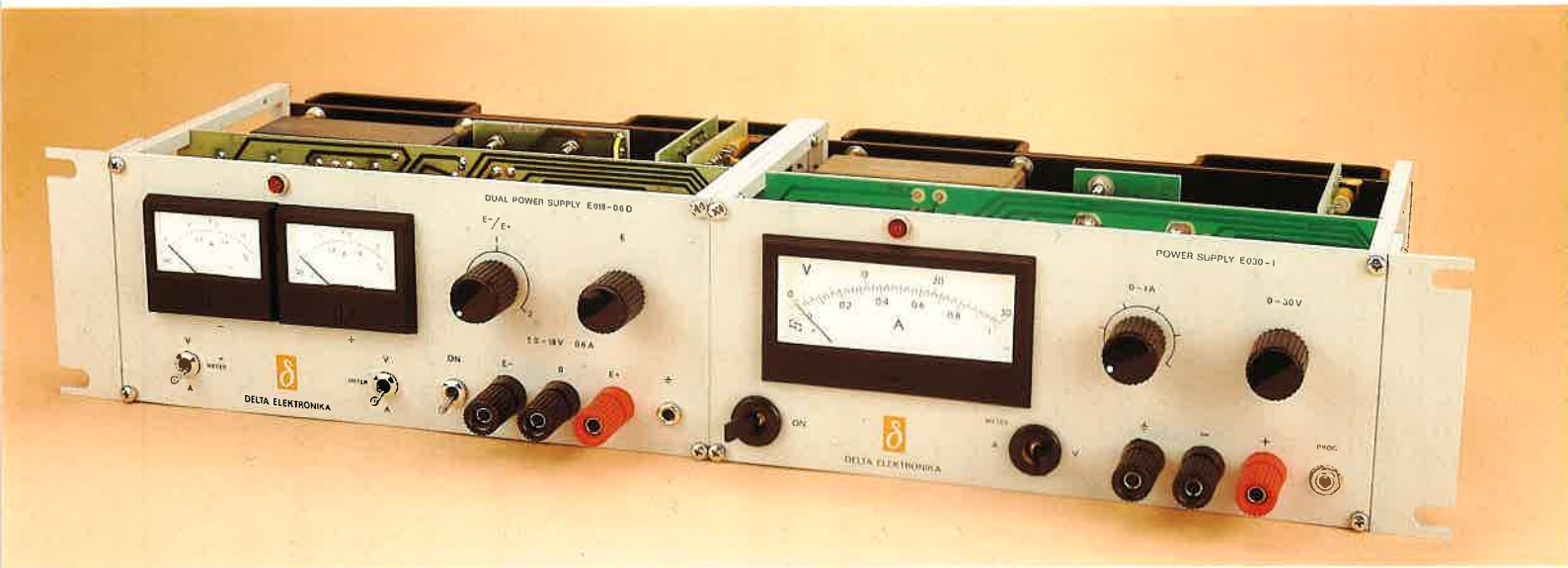
| | |
|---|---|
| **Input voltage** | 220 V 50 Hz standard. Other input voltages at special order. |
| **Input-output insulation** | 1500 V AC rms 1 minute (VDE 0550). |
| **Max. voltage between output and case** | 500 V DC. |
| **Max. ambient temperature** | 45°C. |
| **Meter** | Accuracy 1.5 % of fsd, selector switch for voltage and current measurement. |
| **Parallel and series connection** | Units can be connected parallel and in series. Series connection up to 300 V. |
| **Weight and size** | 2.8 kg 219 x 93 x 154 mm 30 Watts type.<br>5.7 kg 219 x 93 x 222 mm E 030-3 |

| SPECIFICATIONS | E 015-2 | E 030-1 | E 030-3 | E 060-0.6 | E 0300-0.1 | E 018-0.6 D |
|---|---|---|---|---|---|---|
| **CONSTANT VOLTAGE MODE** | | | | | | |
| Line regulation for 198—242 V variation | 1 mV | 2 mV | 2 mV | 4 mV | 10 mV | 5 mV |
| Load regulation for 0 – 100% variation. | 2 mV | 4 mV | 4 mV | 8 mV | 20 mV | 5 mV |
| Temp. coefficient per °C (% of V max) | 0.01 % | 0.01 % | 0.01 % | 0.01 % | 0.01 % | 0.01 % |
| Drift per 8 hours under constant conditions after 15 minutes warm up | 0.1 % | 0.1 % | 0.1 % | 0.1 % | 0.1 % | 0.1 % |
| Ripple voltage, rms | 0.1 mV | 0.1 mV | 0.1 mV | 0.1 mV | 0.5 mV | 0.1 mV |
| Output impedance at 100 kHz load frequency | 100 mΩ | 100 mΩ | 100 mΩ | 100 mΩ | 10 Ω | 100 mΩ |
| Recovery time to within 30 mV after a step load change from 10 to 100% | 15 µS | 15 µS | 15 µS | 15 µS | 30 µS | 15 µS |
| Remote programming of output voltage by resistance | 0–5 kΩ | 0–5 kΩ | 0–5 kΩ | 0–10 kΩ | – | – |
| **CONSTANT CURRENT MODE** | | | | | | |
| Line regulation for 198 – 242 V variation | 0.3 mA | 0.3 mA | 0.4 mA | 0.3 mA | 0.03 mA | – |
| Load regulation for zero to max. load | 2 mA | 2 mA | 4 mA | 2 mA | 0.5 mA | – |
| Temp. coefficient per °C (% of I max.) | 0.05 % | 0.05 % | 0.05 % | 0.05 % | 0.05 % | – |
| Ripple current rms | 0.1 mA | 0.1 mA | 0.1 mA | 0.1 mA | 0.1 mA | – |

Simple construction and use of high quality components forms unique reliable unit.




For E 030-3 D = 222 mm, for all other models D = 154 mm.




Two uncased units can be mounted side by side, with the addition of two H6 brackets they can be inserted in a 19'' rack.

R = Ohm

| | | |
|---|---|---|
| 1 | = | 680 1W |
| 2 | = | 270 |
| 3 | = | CR |
| 4 | = | 470 |
| 5 | = | 3,9 k |
| 6 | = | 6,8 k |
| 7 | = | 1,8 k |
| 8 | = | 1 M |
| 9 | = | 470 |
| 10 | = | — |
| 11 | = | 27 k |
| 12 | = | CR |
| 13 | = | 470 |
| 14 | = | 47 |
| 15 | = | 470 |
| 16 | = | 470 |
| 17 | = | 15 k |
| 18 | = | CR |
| 19 | = | 1,8 k |
| 20 | = | CR |
| 21 | = | CR |
| 22 | = | 3,3 k |
| 23 | = | 560 |
| 24 | = | 330 |
| 25 | = | 27 k |
| 26 | = | 12 k |
| 27 | = | 2,2 k |
| 28 | = | 2,7 k |
| 29 | = | 15 k |
| 30 | = | 47 |
| 31 | = | 10 |
| 32 | = | 10 |
| 33 | = | 3,3 k |
| 34 | = | 15 k |
| 35 | = | 100 k |
| 36 | = | 220 |
| 37 | = | 2,2 k 1W |
| 38 | = | CR |
| 39 | = | 270 k |
| 40 | = | 10 |
| 41 | = | 1,5 k 1W |
| 42 | = | 5,6 M |
| 43 | = | 1 7W WW |
| 44 | = | 1 7W WW |
| 45 | = | 1 k trim. |
| 46 | = | 1,5 k |
| 47 | = | 12 k |
| 48 | = | 180 k |
| 49 | = | 33 k |
| 50 | = | 2 k trim. |
| 51 | = | 5 k potm. |
| 52 | = | 5 k 10 turn. potm. |
| 53 | = | CR |
| 54 | = | CR |

| | | | |
|---|---|---|---|
| T 1 | = | BC 182 | TI |
| 2 | = | BC 212 | TI |
| 3 | = | 2N3055 | RCA |
| 4 | = | 2N3055 | RCA |
| 5 | = | BD 239 | RCA |

C = microfarad

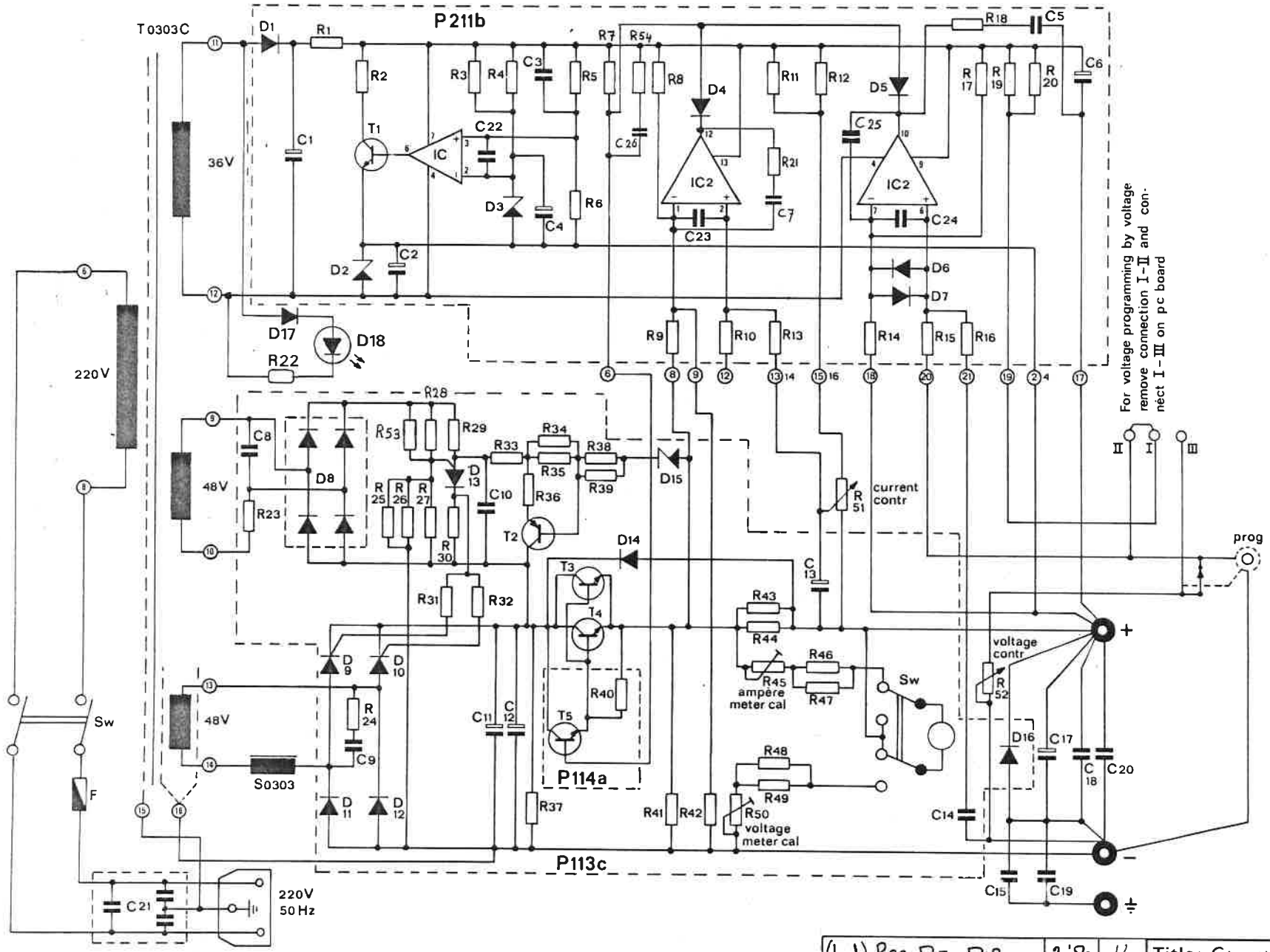
| | | | |
|---|---|---|---|
| 1 | = | 47 | 63 V |
| 2 | = | 22 | 25 V |
| 3 | = | 0,047 | 250 V |
| 4 | = | 2,2 | 35 V tt |
| 5 | = | CC | |
| 6 | = | 22 | 25 V |
| 7 | = | CC | |
| 8 | = | 1 | 250 V |
| 9 | = | 0,47 | 250 V |
| 10 | = | 0,22 | 63 V |
| 11 | = | 2200 | 63 V |
| 12 | = | 2200 | 63 V |
| 13 | = | 10 | 40 V |
| 14 | = | 10 | 100 V |
| 15 | = | 0,1 | 630 V |
| 16 | = | — | |
| 17 | = | 220 | 63 V |
| 18 | = | 0,33 | 100 V |
| 19 | = | 0,01 | 500 V |
| 20 | = | 0,01 | 500 V |
| 21 | = | 0,07+2x2500 | 250 V |
| 22 | = | 0,0001 | 250 V |
| 23 | = | 0,0001 | 250 V |
| 24 | = | 0,0001 | 250 V |
| 25 | = | 0,01 | 250 V |
| 26 | = | CC | |

| | | | |
|---|---|---|---|
| D 1 | = | 1N4003 | TI |
| 2 | = | ZY 6,2 | ITT |
| 3 | = | 1N825 | ITT |
| 4 | = | 1N4148 | ITT |
| 5 | = | 1N4148 | ITT |
| 6 | = | 1N4148 | ITT |
| 7 | = | 1N4148 | ITT |
| 8 | = | B125C1000 | Herman |
| 9 | = | 2N3668 | RCA |
| 10 | = | 2N3668 | RCA |
| 11 | = | 60 S 1 | IR |
| 12 | = | 60 S 1 | IR |
| 13 | = | D 13 T 1 | GE |
| 14 | = | 60 S 1 | IR |
| 15 | = | ZD 5,1 | ITT |
| 16 | = | 60 S 1 | IR |
| 17 | = | 1N4148 | ITT |
| 18 | = | 133 HR | Sloan |

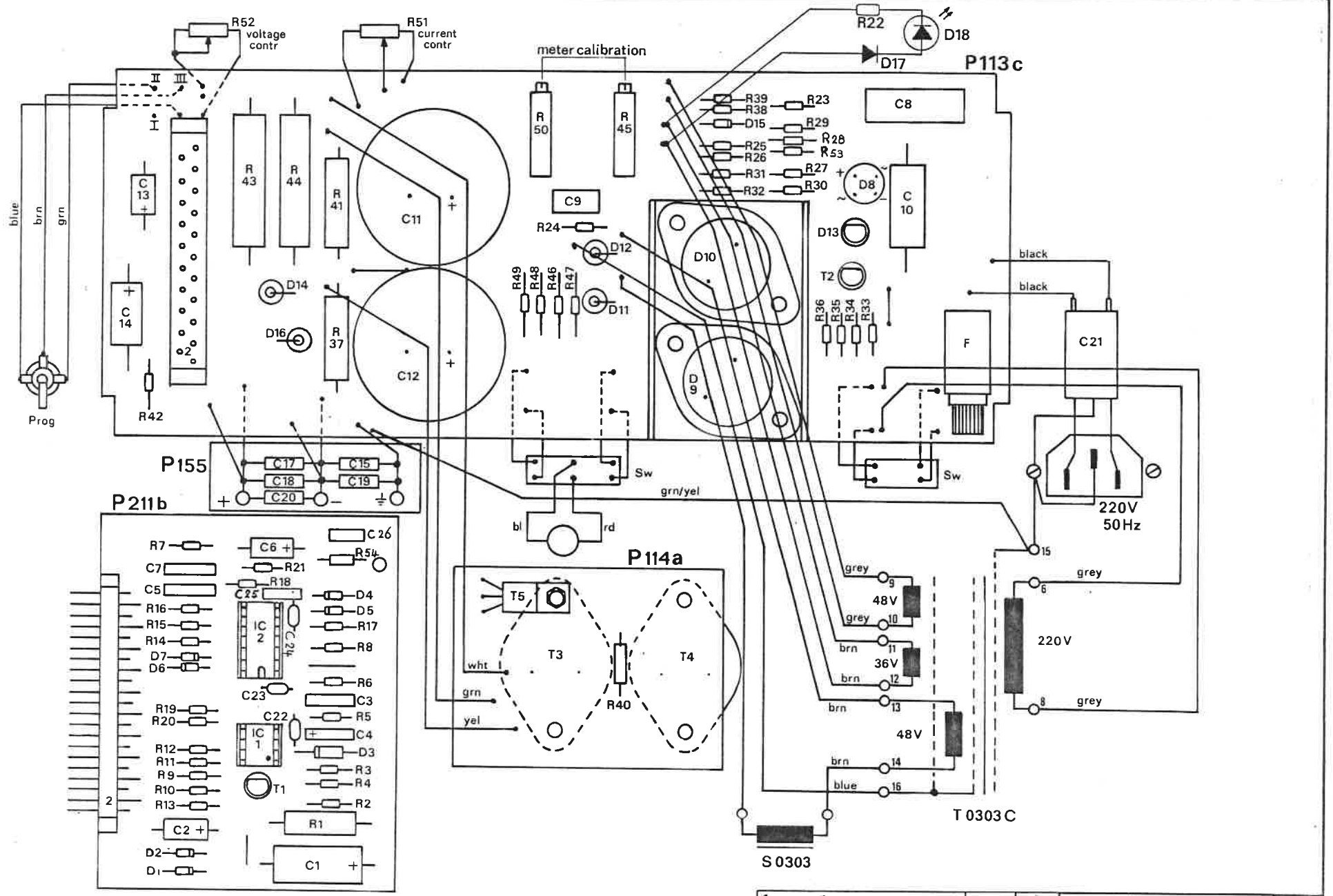
| | | | |
|---|---|---|---|
| IC1 | = | SN72741 P | TI |
| IC2 | = | SN72747 | TI |

F = Fuse 2 A delay 5 x 20 mm.
CR = Calibration resistor.
CC = Calibration capacitor.
WW = Wire wound resistor.
tt = tantalum
All other resistor 0,4 W 2% metal film.

| | | | |
|---|---|---|---|
| (Led) R22, D17, D18 | 2-'82 | Vr | Title: Part list E030-3 |
| C25, R53/P211b, R54, C26 | 2-'82 | Vr | |
| Serial no 2498 and up. | Apr.'78 | Vr. | Date: Apr.'78 |
| Modifications | Date | App. | delta elektronika bv |




| | | | |
|---|---|---|---|
| (Led) R22, D17, D18 | 2-'82 | Vr. | Title: Circuit diagram |
| C25, R53 / P211b, R54, C26 | 2-'82 | Vr | E030-3 |
| Serial no 2498 and up | Apr.'78 | Vr. | Date: Apr.'78 |
| Modifications | Date | App | delta elektronika bv |




| | | | |
|---|---|---|---|
| (Led) R22, D17, D18 | 2.'82 | Vr | Title: Wiring diagram p.c. boards E030-3 |
| C25 / P211b, R54, C26 | 2.'82 | Vr | |
| Serial no 2498 and up | Apr.'78 | Vr | Date: Apr. '78 |
| Modifications | Date | App | delta elektronika bv |

R = Ohm

| | | |
|---|---|---|
| 1 = | 680 | PR 52 |
| 2 = | 270 | |
| 3 = | CR | |
| 4 = | 470 | |
| 5 = | 3,9 k | |
| 6 = | 6,8 k | |
| 7 = | 1,8 k | |
| 8 = | 1 M | |
| 9 = | 470 | |
| 10 = | - | |
| 11 = | 27 k | |
| 12 = | CR (270 k) | |
| 13 = | 470 | |
| 14 = | 47 | |
| 15 = | 470 | |
| 16 = | 470 | |
| 17 = | 15 k | |
| 18 = | CR (100) | |
| 19 = | 1,8 k | |
| 20 = | CR (8,25k) | |
| 21 = | CR (68) | |
| 22 = | 3,9 k | |
| 23 = | 560 | |
| 24 = | 330 | |
| 25 = | 27 k | |
| 26 = | 12 k | |
| 27 = | 2,2 k | |
| 28 = | 2,7 k | |
| 29 = | 15 k | |
| 30 = | 47 | |
| 31 = | 10 | |
| 32 = | 10 | |
| 33 = | 3,3 k | |
| 34 = | 15 k | |
| 35 = | 100 k | |
| 36 = | 220 | |
| 37 = | 2,2 k | PR 37 |
| 38 = | CR (267 k) | |
| 39 = | 270 k | |
| 40 = | 10 | |
| 41 = | 1,5 k | PR 37 |
| 42 = | 5,6 M | |
| 43 = | 1 | 7W WW 58 ER |
| 44 = | 1 | 7W WW 58 ER |
| 45 = | 1 k | trim. |
| 46 = | 1,5 k | |
| 47 = | 12 k | |
| 48 = | 270 k | |
| 49 = | 33 k | |
| 50 = | 2 k | trim. |
| 51 = | 5 k | 1 trn. potm. |
| 52 = | 5 k | 10 trn. potm. |
| 53 = | CR (47 k) | |
| 54 = | - | |
| 55 = | 2,2 M | |

T

| | | |
|---|---|---|
| 1 = | BC 546 A | Siemens |
| 2 = | BC 556 A | Siemens |
| 3 = | 2N3055 | RCA |
| 4 = | 2N3055 | " |
| 5 = | BD 239 A | " |

C = microfarad

| | | | |
|---|---|---|---|
| 1 = | 100 | 63V | EB |
| 2 = | 22 | 25V | EB |
| 3 = | 0,047 | 250V | MKT1818 |
| 4 = | 2,2 | 35V | TT |
| 5 = | 0,01 | 250V | MKT1818 |
| 6 = | 22 | 25V | EB |
| 7 = | 0,047 | 250V | MKT1818 |
| 8 = | 1 | 250V | MKT1822 |
| 9 = | 0,47 | 100V | MKT1822 |
| 10 = | 0,22 | 630V | MKT1813 |
| 11 = | 2200 | 63V | EYV |
| 12 = | 2200 | 63V | EYV |
| 13 = | 10 | 40V | EB |
| 14 = | 10 | 100V | EB |
| 15 = | 0,1 | 630V | MKT1813 |
| 16 = | - | | |
| 17 = | 220 | 63V | EG |
| 18 = | 0,33 | 250V | MKT1813 |
| 19 = | 0,01 | 500V | GEX |
| 20 = | 0,01 | 500V | GEX |
| 21 = | 68 nF+2x2700 pF | 250V | F1740 |
| 22 = | 0,0001 | 500V | GEB |
| 23 = | 0,0001 | 500V | GEB |
| 24 = | 0,0001 | 500V | GEB |
| 25 = | 0,01 | 250V | MKT1818 |

D

| | | |
|---|---|---|
| 1 = | 1N4004G | Philips |
| 2 = | ZPY 6,2 | ITT |
| 3 = | 1N825 | ITT |
| 4 = | 1N4148 | ITT |
| 5 = | 1N4148 | ITT |
| 6 = | 1N4148 | ITT |
| 7 = | 1N4148 | ITT |
| 8 = | KB10B250C1000 | Hermann |
| 9 = | 2N3668 | RCA |
| 10 = | 2N3668 | RCA |
| 11 = | MR 751 | Motorola |
| 12 = | MR 751 | Motorola |
| 13 = | 2N6027 | Philips |
| 14 = | MR 751 | Motorola |
| 15 = | ZPD 5,1 | ITT |
| 16 = | MR 751 | Motorola |
| 17 = | 1N4148 | ITT |
| 18 = | 133 BR | Sloan |

IC

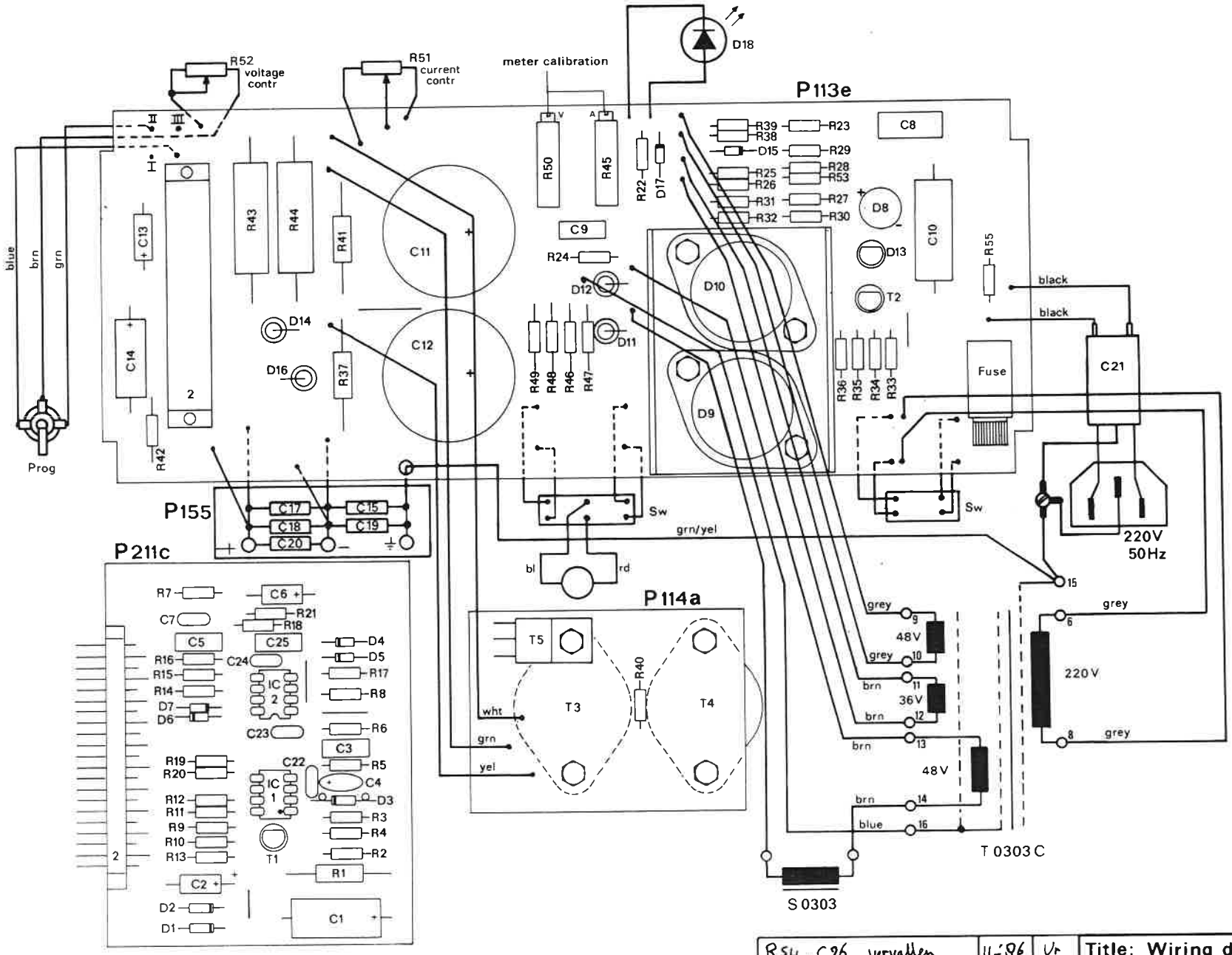
| | | |
|---|---|---|
| 1 = | TL 081 IP | TI |
| 2 = | TL 082 IP | TI |

F = Fuse 2 A delay 5 x 20 mm

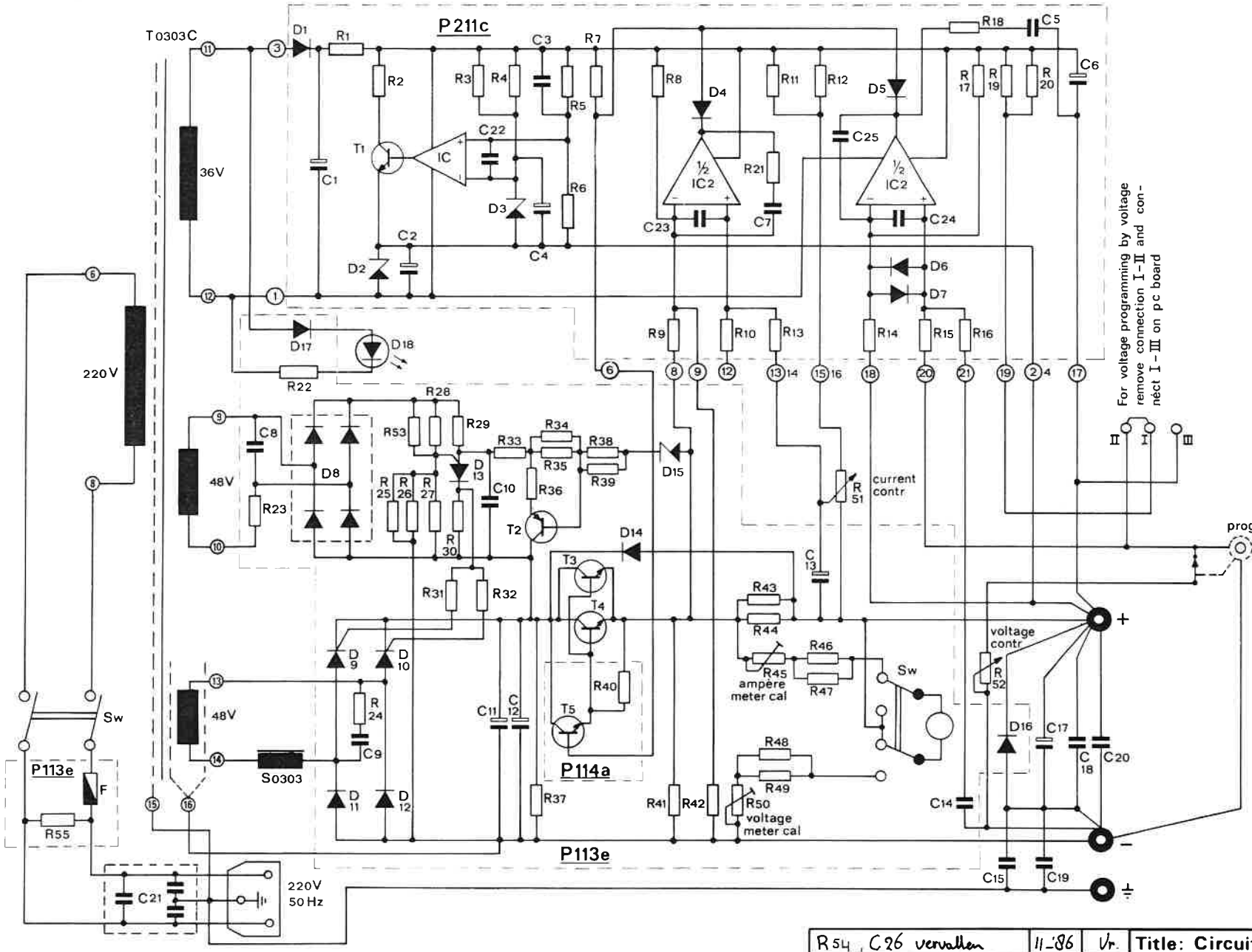
CR = Calibration resistor
WW = Wire wound resistor
MRS 25 = metal film 0,4 W 1%
PR 37 = " " 1,6 W 5%
PR 52 = " " 2,5 W 5%

All non specified resistors are of type MRS 25

| Modifications | Date | App. | |
|---|---|---|---|
| R54, C26 vervallen | 11-'86 | Vr. | Title: Part list E030-3 |
| C10 | 7-'88 | Vr. | Date: 4-'78 |
| | | | delta elektronika bv |




| | | | |
|---|---|---|---|
| R54, C26 vervallen | 11-'86 | Vr. | Title: Wiring diagram E030-3 |
| R55 (P113e) | 8-'86 | Vr. | |
| IC1,2 (P211c) | 2-'86 | Vr. | Date: 4-'78 |
| Modifications | Date | App | delta elektronika bv |




| | | | |
|---|---|---|---|
| R54, C26 vervallen | 11-'86 | Vr. | Title: Circuit diagram |
| R55 (P113e) | 8-'86 | Vr | E030-3 |
| IC 1, 2 (P211c) | 2-'86 | Vr. | Date: 4-'78 |
| Modifications | Date | App | delta elektronika bv |