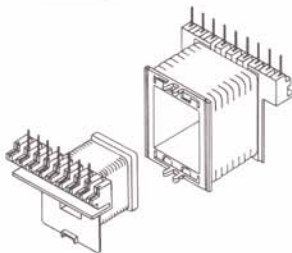


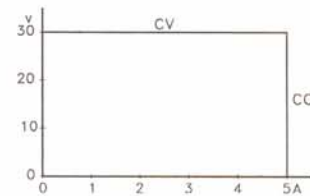


ES 030-5 POWER SUPPLY 
0-30 VDC 0-5 A

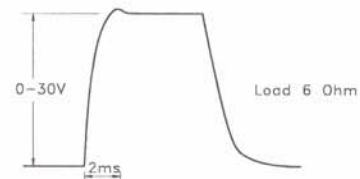
- Input autoranging for world wide use
- Small and light, only 1.8 kgs
- Efficiency 85 %
- Voltage and current control by 10-turn potentiometers
- Voltage and current programmable by 0-5 V
- Monitor outputs 0-5 V of voltage and current
- Split bobbin transformer provides safe 4 kV rms insulation between input and output
- Protected against all overload and short circuit conditions
- RFI suppression according to VDE 0871-B both on input and output



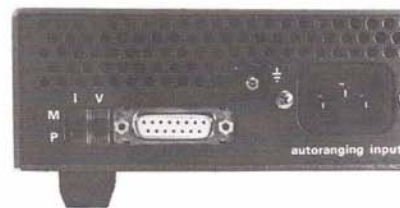
160 kHz transformer has two isolated bobbins, providing very safe 4 kV rms dielectric strength between input and output circuits.



Can be used as a constant voltage or as a constant current source



High programming speed of output voltage, 0-30 V in 1.5 ms (no electrolytic capacitors are used at the output)



D-connector with programming and monitoring connections at the rear panel

Input : Autoranging
 AC 99-132 V 50/60 Hz 2.3 A rms
 198-264 V 50/60 Hz 1.3 A rms
 DC 250-350 V 0.6 A
 Fuse 4A T

Inrush current limit : 10A with NTC resistor 30 Ohms cold resistance

Insulation
 Input / output : 4 kV rms (1 min.),
 8 mm creepage/clearance
 Input / case : 2.5 kV rms (1 min.),
 5 mm creepage/clearance
 Output / case : 600 V DC

Safety : EN 60950, EN 61010

EMC : EN 50081-1 EN 50082-1 and -2
 EN 55022-B
 EN 61000-4-2/-4-4/-4-5/-4-11
 ENV 50140 ENV 50141 ENV 50204
 VDE 0871 B at input and output

Efficiency : 85%

Voltage regulation
 Load 0 - 100% : 5 mV
 Line 190 - 264 V AC: 2 mV

Current regulation
 Load 0 - 100% : 6 mA
 Line 190 - 264 V AC: 3 mA

Ripple + noise
 CV : 5 mV rms, 18 mV p-p
 CC : 3 mA rms, 6 mA p-p

Stability : 3.10^{-4} during 8 hours under constant conditions after 1 hr warm up.

Temp. coefficient : 1.10^{-4} per °C (CV), 3.10^{-4} (CC)

Output impedance : Less than 0.30 Ohm up to 100 kHz

Recovery time : 50 μ s to recover to within 0.1V after a 50-100% load step.
 Max. deviation 0.4V.

Hold up time : 20 milliseconds at full load, 230V input

Ambient temperature
 Storage : - 40 to +85 °C
 Operating : - 20 to +50 °C
 Derate current linearly to zero from 50 - 85 °C

Series operation : Up to 600V total voltage. Also master/slave series operation is possible (equal voltage sharing).

Parallel operation : Unlimited. Also master/slave parallel operation is possible (equal current sharing).

Voltage and current control : By 10-turn potentiometers, resolution 0.03%.

Voltage and current programming : By 0-5 V (offset +/- 15 mV, full scale error 1%). Input impedance of programming input 500 kOhm.

Progr. response time With $R_{load} = 6$ Ohm
 Up : 1.5 milliseconds from 0-30V
 Down : 1.5 milliseconds from 30-5V

Voltage and current monitor output : 0-5V (offset +/- 10 mV, full scale error 1%). Output impedance of monitor output 1 kOhm.

Meters : Digital 0-30.0V / 0-5.00 A
 0.5% + 2 digits

CC status output : +5V (or 5 mA) when in constant current mode.

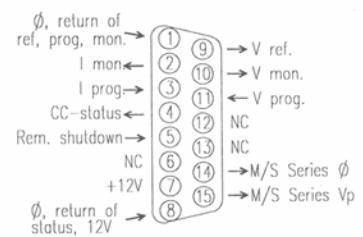
Remote sensing : Is not provided

Remote shut down : + 5 V (3.5 - 12 V) between pin 5 and pin 8 shuts down the output. Pin 8 is internally connected to minus output.

MTBF : 500 000 hr

Dim. and weight : 52 x 224 x 202 mm 1.8 kg

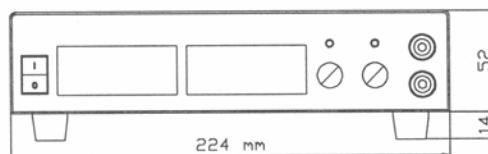
Enclosure : IP20



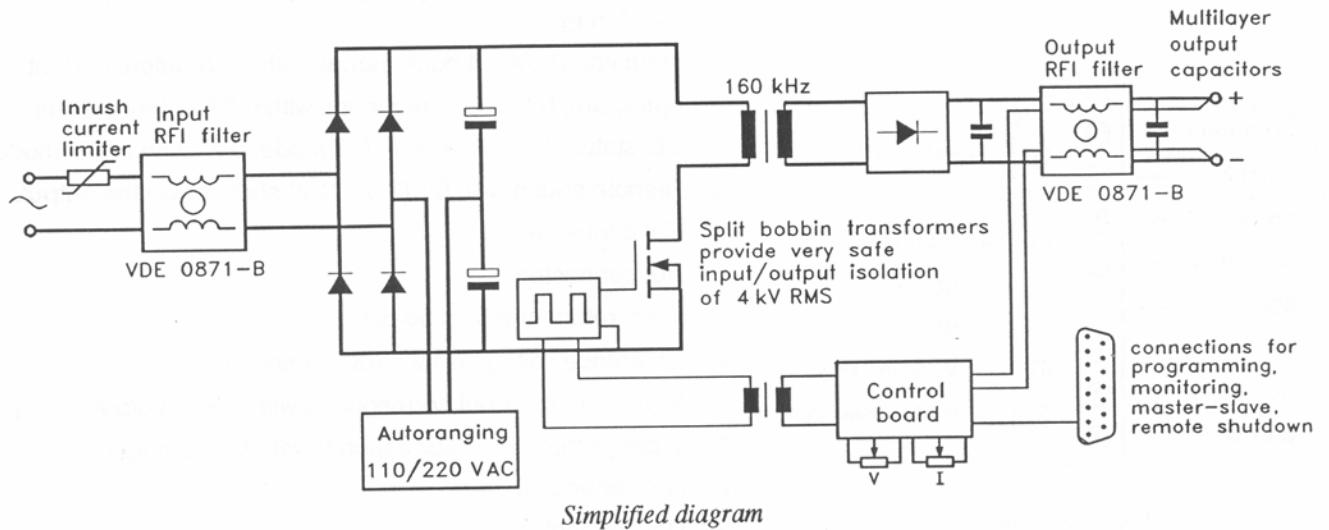
19" adapters, height 2U
 RA 19-1ES for one ES
 RA 19-2ES for two ES

RA 19-ESP for one ES and one PSC 44M
 RA19-ESRS for one ES and one PSC 232

Connections 15-p D-connector



Circuit description



The line voltage is rectified by a bridge rectifier and smoothed by electrolytic capacitors. The auto ranging circuit changes the rectifier automatically into a voltage doubler at the low input voltage range.

With an NTC resistor of $30\ \Omega$ cold resistance the inrush current is limited to about 10A peak. After switch on, the resistance of the NTC decreases rapidly and causes only a small loss during operation.

The pulse width regulated switcher is a 160 kHz forward converter. Much attention has been paid to the safety of input-output isolation. At the vital separation points split bobbin transformers are used.

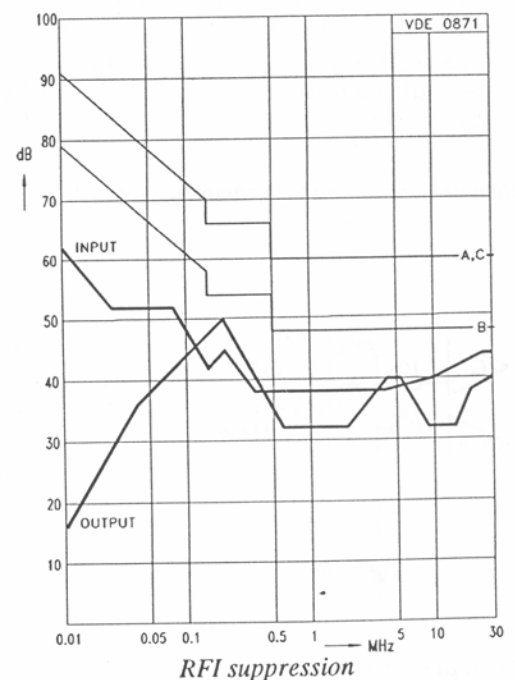
At the output multilayer capacitors are used instead of electrolytic capacitors. This makes it possible to program the output voltage fast (0-30V in 1.5 ms) without limitation of the repetition frequency.

The programming inputs and monitor outputs of voltage and current are standardised at 0-5V for 0 to full scale. In case of master/slave parallel operation the current monitor output of the master drives the current programming input of the slave.

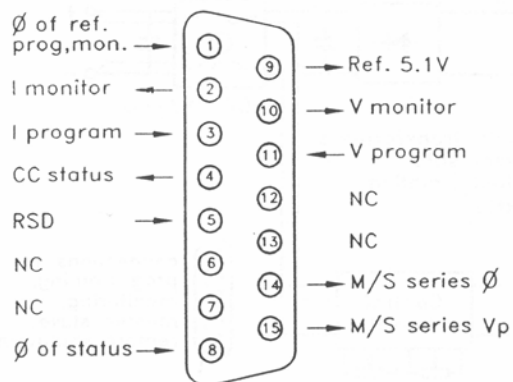
The result is equal current sharing. In case of master/slave series operation the slave voltage programming input is driven by a voltage equal to the voltage monitor output of the master. The result is equal voltage sharing.

RFI filters at input and output prevent radio frequencies, generated by the switcher, to be conducted to the line or to the load. It also prevents interference from outside to enter into the power supply circuits.

Radiated RFI is also very low because of the closed metal case.

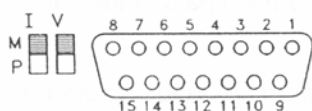


Connections 15-pole D-connector

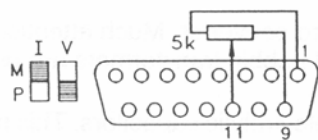


15-pole D-connector

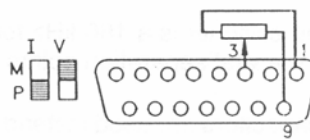
1. Reference zero, return of reference, programming and monitoring.
2. I-monitor, 0-5V out corresponds with 0-5A output current.
3. I-program, 0-5V in corresponds with 0-5A output current.
4. CC-status, 5V out when in CC mode, 0V when in CV mode.
5. Remote shut down, 5V (3.5 - 12V) shuts down the output.
6. Not connected
7. Not connected
8. Zero, return of status output.
9. Reference voltage 5.1V, 100 Ω impedance.
10. V-monitor, 0-5V out corresponds with 0-30V output voltage.
11. V-program, 0-5V in corresponds with 0-30V output voltage.
12. Not connected
13. Not connected
14. Master/slave series zero. To be connected to pin 1 of slave.
15. Master/slave series V_p . To be connected to pin 11 of slave.



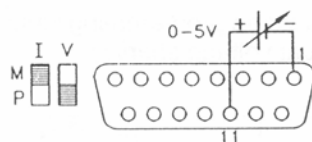
Voltage and current control by frontpanel potentiometer.



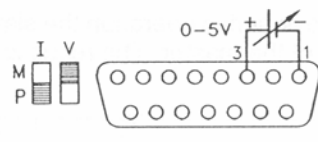
Voltage control by external potentiometer.



Current control by external potentiometer.

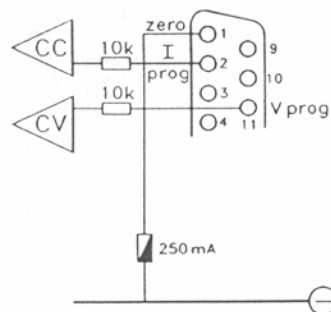


Programming of output voltage by 0-5V



Programming of output current by 0-5V

Remote control and programming connections



Internal connections

Warning:

The zero of the programming inputs is internally connected to minus output.

The internal fuse of 250 mA between pin 1 and minus output will blow when the load current flows through the programming zero return. This can happen when a minus power lead gets loose during programming.

Parallel and series operation

Power supplies ES 030-5 can be parallel and or series connected up to a total voltage of 500V. Voltage and current have to be set equal with the control knobs.

Master / slave parallel operation

A special way of parallel operation is master / slave parallel operation.

It has the advantage that the voltage and current can be set with the control knobs of the master. In case of programming the master is programmed and the slaves will follow with equal current.

The switches Manual /Program have to be put in the right position.

The current programming input of the slave (pin 3 and 1) is driven by the current monitor voltage of the master (pin 2 and 1).

Warning:

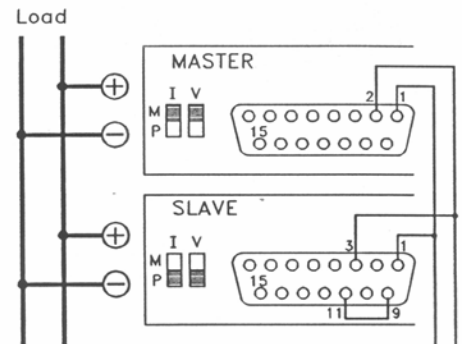
The zero of the programming inputs and monitoring outputs is internally connected (via a fuse) with the minus of the power output.

For this reason the power parallel connections may not be interrupted because this can blow this fuse.

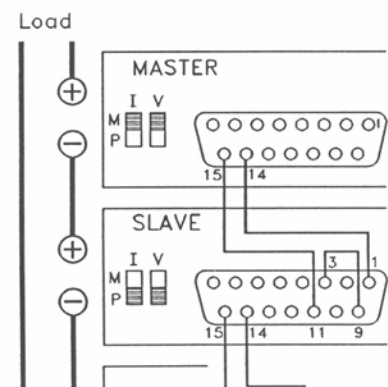
Master / slave series operation

This is a special way of series operation with the advantage that voltage and current can be set with the control knobs of the master or by programming the master.

The voltage programming input (pin 11 and 1) of the slave is driven by a voltage equal to the V-monitor voltage of the master (pin 14 and 15). This results in equal voltage sharing.



Master / slave parallel operation



Master / slave series operation

Calibration

General

The power supply is factory calibrated and normally needs no further calibration.

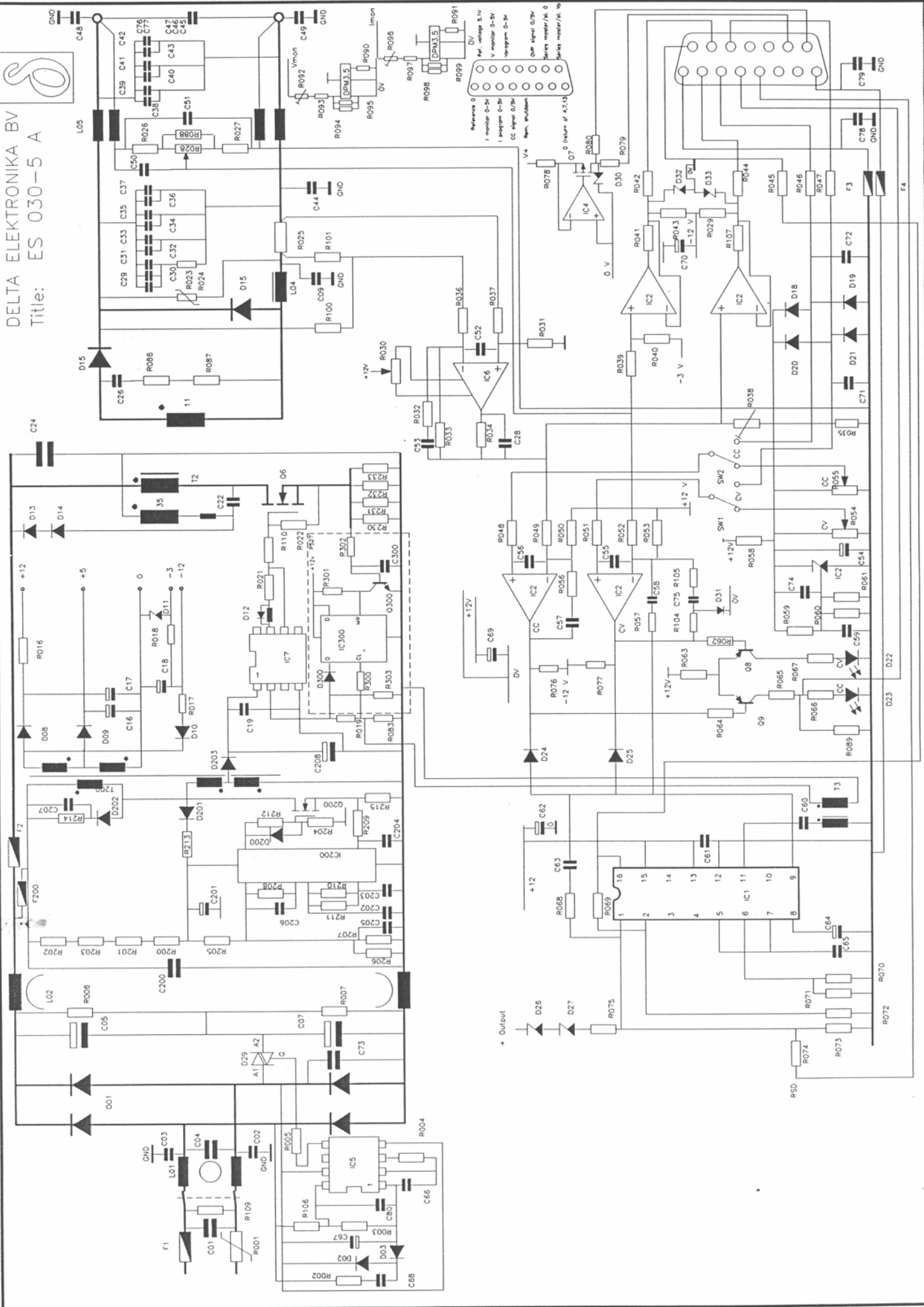
Meter calibration

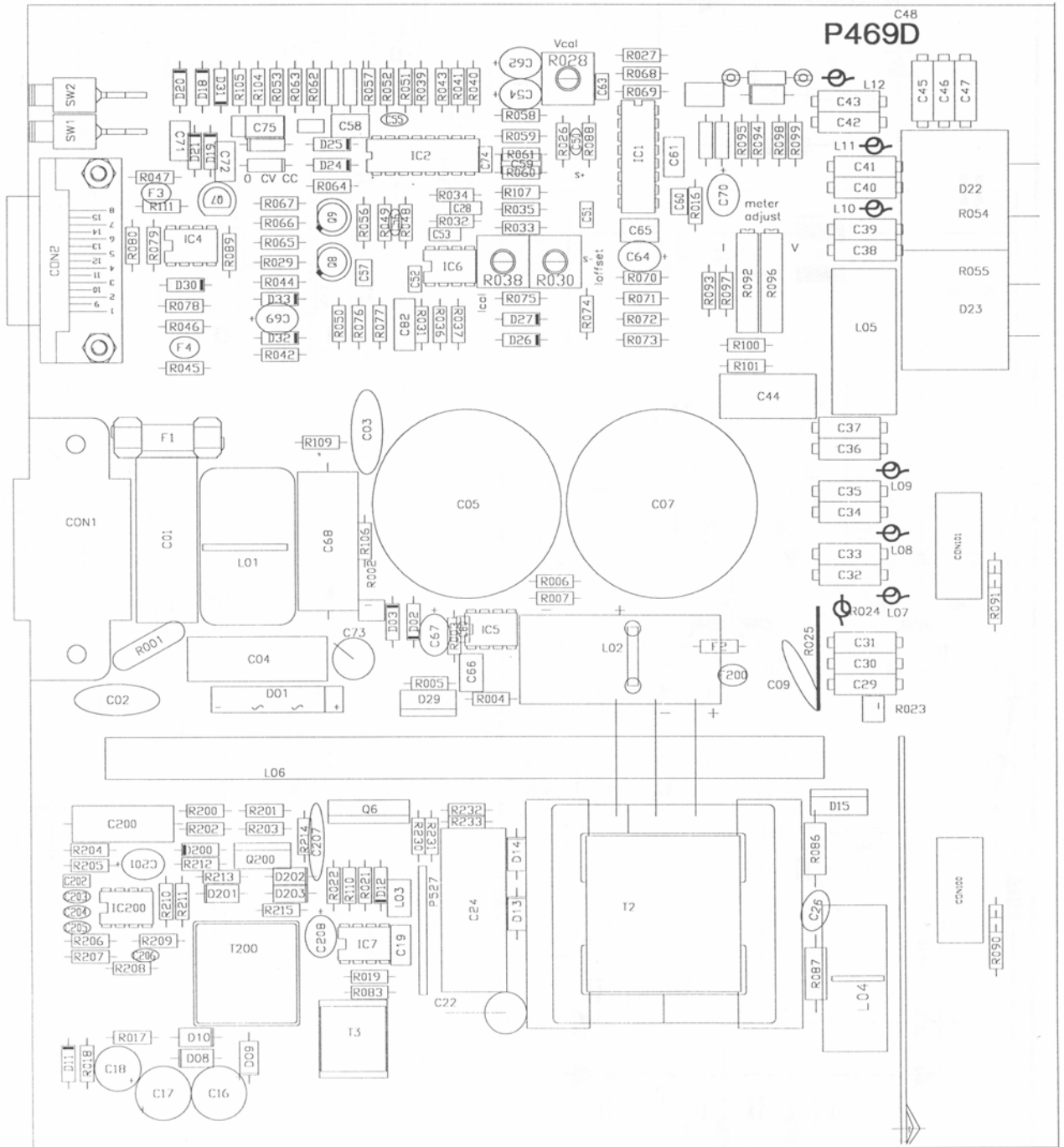
V-meter

Connect an accurate voltmeter on the output and set the output voltage to the maximum specified voltage. Calibrate the V-meter indication with R096.

A-meter

Switch the unit off and connect an accurate Amp. meter across the output terminals. Switch the unit on and set the current to the maximum specified output current. Calibrate the A-meter indication with R092.





ES 030-5

C01	=	0.47UF 250V RMS	X2
C02	=	3900PF 400V RMS	SAFETY
C03	=	3900PF 400V RMS	SAFETY
C04	=	0.22UF 250V RMS	X2
C05	=	680UF 200V	CHEMI-CON
C07	=	680UF 200V	CHEMI-CON
C09	=	10NF 500V	CERAMIC
C16	=	220UF 35V	ERO
C17	=	220UF 35V	ERO
C18	=	47UF 63V	ERO
C19	=	0.22UF 100V	MULT LAYR
C22	=	68NF 250V RMS	X2
C24	=	1.5UF 400V	MET POLYES
C26	=	220PF 3000V	CERAMIC
C28	=	22NF 100V	FILM
C29	=	10UF 50V	MULT LAYR
C30	=	10UF 50V	MULT LAYR
C31	=	10UF 50V	MULT LAYR
C32	=	10UF 50V	MULT LAYR
C33	=	10UF 50V	MULT LAYR
C34	=	10UF 50V	MULT LAYR
C35	=	10UF 50V	MULT LAYR
C36	=	10UF 50V	MULT LAYR
C37	=	10UF 50V	MULT LAYR
C38	=	10UF 50V	MULT LAYR
C39	=	10UF 50V	MULT LAYR
C40	=	10UF 50V	MULT LAYR
C41	=	10UF 50V	MULT LAYR
C42	=	10UF 50V	MULT LAYR
C43	=	10UF 50V	MULT LAYR
C44	=	0.1UF 250V RMS	X2
C45	=	10UF 50V	MULT LAYR
C46	=	10UF 50V	MULT LAYR
C47	=	10UF 50V	MULT LAYR
C48	=	68NF 250V RMS	X2
C49	=	2500PF 250V	CERAMIC
C50	=	2200PF 100V	CERAMIC
C51	=	10NF 100V	MULT LAYR
C52	=	100PF 400V	CERAMIC
C53	=	22NF 100V	FILM
C54	=	33UF 10V	SOLID ALU
C55	=	470PF 500V	CERAMIC
C56	=	470PF 500V	CERAMIC
C57	=	47NF 100V	MULT LAYR
C58	=	1500PF 100V	POLYPROP
C59	=	0.33UF 100V	MULT LAYR
C60	=	0.1UF 100V	MULT LAYR
C61	=	0.33UF 100V	MULT LAYR
C62	=	15UF 16V	SOLID ALU
C63	=	10NF 100V	MULT LAYR
C64	=	15UF 16V	SOLID ALU
C65	=	1000PF 100V	POLYPROP
C66	=	150PF 100V	POLYPROP
C67	=	33UF 10V	SOLID ALU
C68	=	0.33UF 250V RMS	X2
C69	=	15UF 16V	SOLID ALU
C70	=	15UF 16V	SOLID ALU
C71	=	0.22UF 100V	MULT LAYR
C72	=	0.22UF 100V	MULT LAYR
C73	=	68NF 250V RMS	X2
C74	=	10NF 100V	MULT LAYR
C75	=	2200PF 100V	POLYPROP
C76	=	0.33UF 100V	MULT LAYR
C77	=	0.33UF 100V	MULT LAYR
C78	=	2500PF 250V	CERAMIC
C79	=	2500PF 250V	CERAMIC
C80	=	10NF 100V	MULT LAYR
C200	=	0.1UF 400V	MET POLYES
C201	=	22UF 16V	SOLID ALU
C202	=	10NF 100V	MULT LAYR
C203	=	2200PF 100V	CERAMIC
C204	=	2200PF 100V	CERAMIC
C205	=	2200PF 100V	CERAMIC
C206	=	100PF 400V	CERAMIC
C207	=	10NF 500V	CERAMIC
C208	=	15UF 16V	SOLID ALU
C300	=	2200PF 100V	POLYPROP
D01	=	D10XB60H	SHINDENGEN
D02	=	1N4148	PHILIPS
D03	=	1N4148	PHILIPS
D08	=	BYV26B	PHILIPS
D09	=	1N5818	MOTOROLA
D10	=	BYV26B	PHILIPS
D11	=	BZX55-C3V3	ITT
D12	=	1N4148	PHILIPS
D13	=	BYV26B	PHILIPS
D14	=	BYV26B	PHILIPS
D15	=	BYV32-200	PHILIPS
D15	=	BYV32-200	PHILIPS
D18	=	BAS45	PHILIPS
D19	=	BAT85	PHILIPS
D20	=	BAS45	PHILIPS
D21	=	BAT85	PHILIPS
D22	=	LED 3MM GREEN	AEG
D23	=	LED 3MM GREEN	AEG
D24	=	BAT85	PHILIPS
D25	=	BAT85	PHILIPS
D26	=	BZX55-C18	ITT
D27	=	BZX55-C15	ITT
D29	=	AVS10	ST
D30	=	BZX85C-43	ITT
D31	=	1N4148	PHILIPS
D32	=	BZX85-C6V2	ITT
D33	=	BZX85-C6V2	ITT
D200	=	1N4148	PHILIPS
D201	=	BYV26B	PHILIPS
D202	=	BYV26D	PHILIPS
D203	=	BYV26B	PHILIPS
D300	=	BAT85	PHILIPS
F1	=	FUSE 5X20 4T	
F2	=	FUSE PICO 2F	
F3	=	FUSE PTC 0.65A	BOURNS
F4	=	FUSE PTC 0.65A	BOURNS
F200	=	FUSE PTC 0.65A	BOURNS
IC1	=	IP3P125N	SEAGATE
IC2	=	LM614	NAT. SEMICON
IC4	=	TL081IP	TEXAS
IC5	=	AVS1A	ST
IC6	=	OP177GP	AD
IC7	=	4611	MICREL
IC200	=	UC3842	UNITRODE
IC300	=	40175	
L01	=	XL372	DELTA
L02	=	XL381	DELTA
L03	=	XL374	DELTA
L04	=	XL375	DELTA
L05	=	XL376	DELTA
L06	=	XL404	DELTA
L07	=	XL405	DELTA
L08	=	XL405	DELTA
L09	=	XL405	DELTA
L10	=	XL405	DELTA
L11	=	XL405	DELTA
L12	=	XL405	DELTA

Q200	=	BUK444-800B	PHILIPS
Q300	=	2N2222A	MOTOROLA
Q6	=	STH8N80FI	ST
Q7	=	BS250	ITT
Q8	=	2N2907A	ST
Q9	=	2N2907A	ST
R001	=	NTC 33	SIEMENS
R002	=	PTC 1.5K	C886 SIEMENS
R003	=	22.1K	MF/0.6W/350V
R004	=	56.2K	MF/0.6W/350V
R005	=	392	MF/0.6W/350V
R006	=	150K	MF/0.6W/350V
R007	=	150K	MF/0.6W/350V
R016	=	4.75	MF/0.6W/350V
R017	=	182	MF/0.6W/350V
R018	=	562	MF/0.6W/350V
R019	=	1.5K	MF/0.6W/350V
R021	=	33.2	MF/0.6W/350V
R022	=	10K	MF/0.6W/350V
R023	=	PTC 120	C883 SIEMENS
R024	=	RESISTOR	DWG1272
R025	=	SHUNT	100mV
R026	=	22.1K	MF/0.6W/350V
R027	=	3.92K	MF/0.6W/350V
R028	=	1K	TRIMPOTM 1 TURN
R029	=	12.1K	MF/0.6W/350V
R030	=	10K	TRIMPOTM 1 TURN
R031	=	12.1K	MF/0.6W/350V
R032	=	3.92K	MF/0.6W/350V
R033	=	12.1K	MF/0.6W/350V
R034	=	221	MF/0.6W/350V
R035	=	2.21K	MF/0.6W/350V
R036	=	221	MF/0.6W/350V
R037	=	221	MF/0.6W/350V
R038	=	5K	TRIMPOTM 1 TURN
R039	=	10K	MF/0.6W/350V
R040	=	5.6M	MF/0.25W/1600V
R041	=	1K	MF/0.6W/350V
R042	=	12.1	MF/0.6W/350V
R043	=	12.1K	MF/0.6W/350V
R044	=	12.1	MF/0.6W/350V
R045	=	100	MF/0.6W/350V
R046	=	1K	MF/0.6W/350V
R047	=	1K	MF/0.6W/350V
R048	=	475	MF/0.6W/350V
R049	=	475	MF/0.6W/350V
R050	=	825K	MF/0.6W/350V
R051	=	475	MF/0.6W/350V
R052	=	475	MF/0.6W/350V
R053	=	6.8M	MF/0.25W/1600V
R054	=	5K	POTM 10 TURNS
R055	=	5K	POTM 10 TURNS
R056	=	562	MF/0.6W/350V
R057	=	12.1K	MF/0.6W/350V
R058	=	1K	MF/0.6W/350V
R059	=	1.21K	MF/0.6W/350V
R060	=	3.92K	MF/0.6W/350V
R061	=	CR	MF/0.6W/250V
R062	=	22.1K	MF/0.6W/350V
R063	=	392	MF/0.6W/350V
R064	=	22.1K	MF/0.6W/350V
R065	=	681	MF/0.6W/350V
R066	=	562	MF/0.6W/350V
R067	=	1.21K	MF/0.6W/350V
R068	=	39.2K	MF/0.6W/350V
R069	=	5.62K	MF/0.6W/350V
R070	=	3.32K	MF/0.6W/350V
R071	=	CR	MF/0.6W/250V
R072	=	2.21K	MF/0.6W/350V
R073	=	10K	MF/0.6W/350V
R074	=	10K	MF/0.6W/350V
R075	=	10K	MF/0.6W/350V
R076	=	12.1K	MF/0.6W/350V
R077	=	12.1K	MF/0.6W/350V
R078	=	33.2K	MF/0.6W/350V
R079	=	5.62K	MF/0.6W/350V
R080	=	5.62K	MF/0.6W/350V
R083	=	1.21K	MF/0.6W/350V
R086	=	68	MF/2.0W/500V
R087	=	68	MF/2.0W/500V
R088	=	1.21K	MF/0.6W/350V
R089	=	10K	MF/0.6W/350V
R090	=	562	MF/0.6W/350V
R091	=	562	MF/0.6W/350V
R092	=	5K	TRIMPOTM 20 TURNS
R093	=	15K	MF/0.6W/350V
R094	=	CR	MF/0.6W/250V
R095	=	221	MF/0.6W/350V
R096	=	5K	TRIMPOTM 20 TURNS
R097	=	15K	MF/0.6W/350V
R098	=	121	MF/0.6W/350V
R099	=	CR	MF/0.6W/250V
R100	=	825K	MF/0.6W/350V
R101	=	1.0	MF/0.6W/350V
R104	=	6.81K	MF/0.6W/350V
R105	=	1K	MF/0.6W/350V
R106	=	1M	MF/0.25W/1600V
R107	=	1K	MF/0.6W/350V
R109	=	1.2M	MF/0.25W/1600V
R110	=	2.21	MF/0.6W/350V
R200	=	33.2K	MF/0.6W/350V
R201	=	33.2K	MF/0.6W/350V
R202	=	33.2K	MF/0.6W/350V
R203	=	33.2K	MF/0.6W/350V
R204	=	10K	MF/0.6W/350V
R205	=	68.1K	MF/0.6W/350V
R206	=	15K	MF/0.6W/350V
R207	=	CR	MF/0.6W/250V
R208	=	681K	MF/0.6W/350V
R209	=	221	MF/0.6W/350V
R210	=	100K	MF/0.6W/350V
R211	=	8.25K	MF/0.6W/350V
R212	=	475	MF/0.6W/350V
R213	=	33.2	MF/0.6W/350V
R214	=	100K	MF/0.6W/350V
R215	=	5.62	MF/0.6W/350V
R230	=	1.0	MF/0.6W/350V
R231	=	1.0	MF/0.6W/350V
R232	=	1.0	MF/0.6W/350V
R233	=	1.0	MF/0.6W/350V
R300	=	1.21K	MF/0.6W/350V
R301	=	3.32K	MF/0.6W/350V
R302	=	10	MF/0.6W/350V
R303	=	1K	MF/0.6W/350V
SW1	=	SWITCH SPDT 3A SLVE	
SW2	=	SWITCH SPDT 3A SLVE	
T2	=	XT379	DELTA
T3	=	XT378	DELTA
T200	=	XT437	DELTA



EC Declaration of Conformity

We

Delta Elektronika
P.O. BOX 27
4300 AA Zierikzee
The Netherlands

declare under sole responsibility that the following Power Supply:

ES 030 - 5

meets the intent of Directives 89/336/EEC; 92/31/EEC; 93/68/EEC for Electromagnetic Compatibility and Directives 73/23/EEC; 93/68/EEC regarding Electrical Safety. (Low Voltage Directive) Compliance was demonstrated to the following specification as listed in the official Journal of the European Communities:

EN 50081-1 Generic Emissions: (residential, light industrial)

EN 55022	Radiated, Class B
EN 55022	Conducted, Class B
EN 60555-2	Power Harmonics
EN 61000-3-3	Voltage fluctuation and flicker

EN 50082-1 Generic Immunity: (residential, light industrial)

EN 50082-2 Generic Immunity: (industrial environment)

EN 61000-4-2	Electrostatic Discharge	Level 3.
EN 61000-4-4	Electrical Fast Transients / Bursts	Level 4.
ENV 50140	Radiated electromagnetic fields	Level 3.
ENV 50141	Conducted electromagnetic fields	Level 3.
EN 61000-4-5	Surge on DC output	Level 2.
EN 61000-4-5	Surge on line input	Level 4.
EN 61000-4-11	Voltage variations and dips	

EN 60950 Safety of IT equipment

IEC 1010 Safety of electrical equipment for measurement, control and laboratory use

Managing director