DELTA ELEKTRONIKA BV

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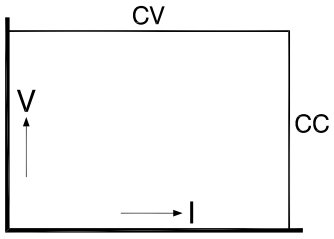
ES 150 - series

150 watts DC POWER SUPPLIES

ES 015-10	**0 - 15 V**	**0 - 10 A**
ES 030-5	**0 - 30 V**	**0 - 5 A**
ES 075-2	**0 - 75 V**	**0 - 2 A**
ES 0300-0.45	**0 - 300 V**	**0 - 450 mA**



- 4 mm Safety Sockets
- Weight only 1.7 kg
- Wide input voltage range:
  90 - 265 VAC, 48 - 62 Hz
- Active Power Factor Correction
- Efficiency up to 84 %
- 0 - 5 V analog programmable
  (on both voltage and current)
- Isolated analog programming with optional external ISO AMP MODULE to prevent earth loops
- Programming Inputs and Monitoring Outputs have a very low offset
- **Ethernet** or **RS232** programming with optional internal cards
- **IEEE488** programming with optional external interface PSC-488
- Very low output ripple
- Stable output voltage or current
- Input / output insulation 3750 V rms
- EMC: high immunity and low emission
- Designed for long life at full power
- Protected against all overload and short circuit conditions
- Voltage and current control with 10 turn potentiometers, resolution 0.03 %
- Optional rear panel output connection
  (option includes remote sensing)
- 48 hours burn-in

	ES 015-10	ES 030-5	ES 075-2	ES 0300-0.45
Output				
voltage	0 - 15 V	0 - 30 V	0 - 75 V	0 - 300 V
current	0 - 10 A	0 - 5 A	0 - 2 A	0 - 450 mA
Input				
AC single phase, 48 - 62 Hz	90 - 265 V			
Input current @ 230 VAC	1 A			
power factor, 110 / 230 VAC *full load*	0.99 / 0.83			
DC	contact factory			
internal fuses	4 AT			
standby input power (Vo=Io=0)	6 W			
standby input power (Vo=Vmax)	11 W			
Efficiency				
AC 230 V input, full load	83 %	84 %	84 %	84 %
AC 110 V input, full load	80 %	82 %	81 %	81 %
Regulation				
Load 0 - 100% **CV**				
internal sensing	15 mV	6 mV	5 mV	10 mV
optional external sensing	2 mV	2 mV	5 mV	10 mV
Line 90 - 265 V AC **CV**	0.2 mV	0.5 mV	1 mV	3 mV
Load 0 - 100% **CC**	3 mA	1 mA	0.5 mA	0.3 mA
Line 90 - 265 V AC **CC** (internal voltage sensing)	0.5 mA	0.2 mA	0.1 mA	0.05 mA
Ripple + noise (full load)				
rms (BW=300 kHz) **CV**	0.5 mV	0.6 mV	1 mV	7 mV
p-p (BW=50 MHz) **CV**	8 mV	10 mV	15 mV	50 mV (typical 30 mV)
rms (BW=300 kHz) **CC**	1.5 mA	0.5 mA	0.1 mA	0.03 mA
p-p (BW=50 MHz) **CC**	10 mA	2 mA	0.5 mA	0.2 mA
Temp. coeff., per °C **CV**	5.10^{-5}			
CC	10.10^{-5}			
Stability after 1 hr warm-up				
during 8 hrs **CV**	10.10^{-5}	10.10^{-5}	10.10^{-5}	10.10^{-5}
CC	10.10^{-5}	10.10^{-5}	10.10^{-5}	12.10^{-5}
tamb = 25 ± 1 °C, Vin = 230 VAC (internal voltage sensing for CC-stab.)				

Analog Programming	**CV**	**CC**
Programming inputs		
input range	0 - 5 V	0 - 5 V
accuracy	± 0.2%	± 0.8%
offset	0 … + 3 mV (on 5 V)	0 … + 10 mV (on 5 V)
temp. coeff. offset	10 µV / °C	60 µV / °C
input impedance	1 MOhm	1 MOhm
Monitoring output		
output range	0 - 5 V	0 - 5 V
accuracy	± 0.2%	± 0.8%
offset	– 1 … + 1 mV (on 5 V)	– 10 … 0 mV (on 5 V)
temp. coeff. offset	10 µV / °C	60 µV / °C
output impedance	2 Ohm / max. 4 mA	2 Ohm / max. 4 mA

Reference voltage		
on prog. connector	Vref	5.137 ± 10 mV (Ro = 2 Ohm, max. 4 mA)
	TC	50 ppm

+12 V output	Vo	12 V ± 0.5 V
on prog. Connector	Ro	100 Ohm

Status output		
CC - status	CC - operation	5 V / 5 mA = logic 1
Remote shutdown	with + 5 V, 1 mA or relay contact	
Indicators (front panel)	CV-mode, CC-mode	
Controls (front panel)	Mains on/off, CV- and CC-potmeter	

Programming speed (resistive load)	**ES 015-10**	**ES 030-5**	**ES 075-2**	**ES 0300-0.45**
Rise time (10 - 90%)				
output voltage step	0 → 15 V	0 → 30 V	0 → 75 V	0 → 300 V
time, (100% load)	7 ms	15 ms	17 ms	10 ms
time, (10% load)	3 ms	6 ms	7 ms	4 ms
Fall time (90 - 10%)				
output voltage step	15 → 0 V	30 → 0 V	75 → 0 V	300 → 0 V
time, (100% load)	7 ms	15 ms	17 ms	10 ms
time, (10% load)	70 ms	150 ms	160 ms	100 ms

	ES 015-10	**ES 030-5**	**ES 075-2**	**ES 0300-0.45**
Recovery time				
recovery within	50 mV	50 mV	50 mV	200 mV
di/dt of load step	250 mA/µs	125 mA/µs	70 mA/µs	6 mA/µs
time, @ 50 - 100% load step	100 µs	100 µs	100 µs	130 µs
max. deviation	160 mV	160 mV	150 mV	700 mV
@ 230 VAC input voltage				
Output impedance				
CV, 0-100 kHz	< 100 mOhm	< 200 mOhm	< 250 mOhm	< 5 Ohm
Pulsating load				
max. tolerable AC component of load current				
f > 1 kHz	2 A rms	2 A rms	2 A rms	2 A rms
f < 1 kHz	10 A peak	5 A peak	2 A peak	0.45 A peak

Insulation		
input / output	3750 Vrms (1 min.)	
creepage / clearance	8 mm	
input / case	2500 Vrms	
output / case	600 V DC	
Safety	EN 60950 / EN 61010	
EMC Power Supply Standard	**EN 61204-3**, Emission: residential, **light** industrial environment (CISPR22-Class **B**) Immunity: industrial environment	
Generic Emission	**EN 61000-6-3**, residential, **light** industrial environment (EN 55022 **B**)	
Generic Immunity	**EN 61000-6-2**, industrial environment	
Operating Temperature at full load	– 20 to + 50 °C derate output to 75% at 60 °C	
Humidity	max. 95% RH, non condensing, up to 40 °C max. 75% RH, non condensing, up to 50 °C	
Storage temperature	– 40 to + 85 °C	
Thermal protection	Output shuts down in case of insufficient cooling	
MTBF	500 000 hrs	

Hold-Up time (230 VAC input) Vout = 100% , Iout = 100% Vout = 85% , Iout = 100% Vout = 100% , Iout = 50%	 25 ms 40 ms 60 ms
Turn on delay (230 VAC input) after mains switch on	 250 ms
Inrush current	10 A with NTC resistor 30 Ohms cold resistance

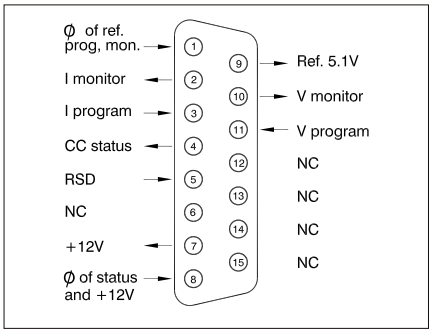
	ES 015-10	**ES 030-5**	**ES 075-2**	**ES 0300-0.45**
Series operation max. total voltage Master / Slave operation	600 V with optional external Master / Slave Adapter			
Parallel operation max. total current Master / Slave operation	no limit max. 4 units			
Remote sensing (optional)	option P119	option P120	option P121	option P122
max. voltage drop per load lead	2 V *Note: voltage drop across load leads will subtract from max. available output voltage*			
Over Voltage Limit (fixed)	max. 18 V	max. 40 V	max. 90 V	max. 330 V
Potentiometers front panel control with knobs resolution screwdriver adjustment at front panel	standard 0.03% option P001			
Meters scale voltage scale current accuracy V-meter accuracy A-meter	3.5 digit 0 - 15.00 V 0 - 10.00 A 0.5% + 2 digits 1% + 2 digits	3.5 digit 0 - 30.0 V 0 - 5.00 A 0.5% + 2 digits 1% + 2 digits	3.5 digit 0 - 75.0 V 0 - 2.00 A 0.5% + 2 digits 1% + 2 digits	3.5 digit 0 -300 V 0 - 450 mA 0.5% + 2 digits 1% + 2 digits

Input Connector	Euro-connector at rear panel 10 Amp / 65 °C IEC320/C14, EN60320/C14
Output Terminals	Standard: 4 mm safety sockets at front-panel Option: screw terminals (0.2-4 mm^2) at rear-panel (sockets at front removed) only combined with remote sensing, see remote sensing for option numbers (P119 - 122)
Programming connector	15 pole D-connector at rear panel (FEMALE)
Cooling	Convection cooling
Enclosure degree of protection	IP20
Dimensions (h x w x d)	52 x 222 x 202 mm
Weight	1.7 kg

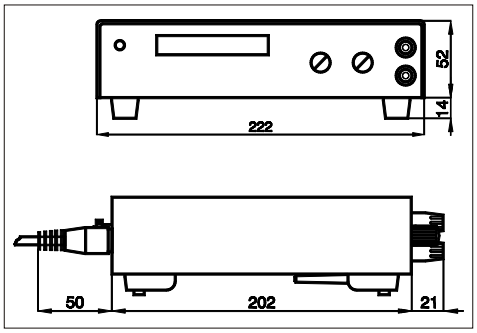
CV = Constant Voltage
CC = Constant Current

OVL = Over Voltage Limit

Specifications measured at t_{amb} = 25 ± 5 °C and Vin = 230 VAC, 50 Hz unless otherwise noted.



Connections programming connector

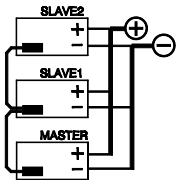


Dimensions

Screwdriver adjustment OPTION P001

- For a **fixed setting** of the output values, avoids accidental adjusting of the CV and CC settings.
- The potmeters are moved backwards just behind the frontpanel and plastic caps are inserted to cover the holes, see picture.

Master / Slave operation



- Parallel and Series operation with equal Current and Voltage sharing.
- This way two or more ES-units can be used together as one high power unit.
- Voltage and current of the units is controlled by the master (by potentiometers or by programming).
- For Parallel operation use 15 pole shielded cables, no special option required.
- For Series operation use the **Master / Slave Series Adapter** together with 15 pole shielded cables (1:1).

Increased max. output voltage/current OPTION P069

- The maximum output voltage or current can be increased by approximately 10%. Normally this results in a derating of the maximum ambient temperature or other parameters.
- Always add increased value for voltage or current in ordercode, for example **ES 030-5 P069 output 32V**.

For exact details consult the technical department, email 'Support@Delta-Elektronika.nl'.

Enforced secondary isolation 1000 V OPTION P089

- The secondary isolation between output and ground is increased from standard 600 V to 1000 V.

Remote sensing / Rear power outlet OPTION P119-122

- The voltage across the load is constant regardless of the output current.
- Rear connections for power leads.
- Maximum 2 V per load lead can be compensated.
- The sense leads are protected against accidental interruption.

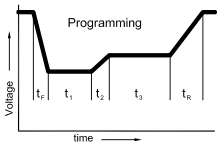
External ISO AMP for isolated analog programming ISO AMP MODULE

- Provides galvanic isolation when programming and monitoring.
- Prevents problems with earth loops and common mode voltages.
- Pin compatible with the programming connector on the rear side.
- Bench operation and rail mounting.

Internal Ethernet Power Supply Controller OPTION P150

- Internal Ethernet compatible interface to program a unit by a computer.
- Combination possible with P119 - P122 (rear output terminals).
  Note: built inside the ES150, the digital user in- and outputs of the PSC-ETH are not available. Use the external module PSC-ETH module instead.

Internal RS232 Power Supply Controller OPTION P148



- Internal RS232 compatible interface to program a unit by a computer.
- Combination possible with P119 - P122 (rear output terminals).

External IEEE488 Power Supply Controller PSC-488

- External IEEE488 compatible interface to program a unit by a computer.
- Pin compatible with the programming connector on the rear side.
- Bench operation and rail mounting.

Note: it is not possible to have a combination of multiple internal and/or external interfaces.

19" rack mounting

Panel **RA 19-1ES** for one ES

Panel **RA 19-2ES** for two ES

Panel **RA 19-ES-PSC** for one ES and one PSC-488 module

Rear Connections